RDB received 1/19/05

Chief, Rules and Directive Branch
Office of Administrative Services
Mailstop T-6D59
US Nuclear Regulatory Commission
Washington, DC 20555

12/7/04
69FR71437
(1)

January 11, 2005

Re: Millstone Nuclear Plant should be closed.

Dear Regulatory Commission Officer,

MPS-26-1 I write to you today on behalf of my family and close friends who all live near the Millstone Nuclear Plant. It has come to our attention that although the plant has already outlived its intended life span, it is slated for re-licensing for another 20 years. We strongly oppose this decision and regard it as shortsighted and foolhardy.

Nuclear power plants, risky even under the best conditions, should by no means be patched together to overextend their designed use. We simply roll the dice of fate every day we let this continue.

MPS-26-2 This is doubly alarming now that we face likely threats of terrorism on our own soil. Millstone is essentially a Weapon of Mass Destruction waiting to be detonated!

We wish, as our founding fathers did, to be free from remote tyranny. We will not let a remote tyrant (Bin Laden or the US NRC) risk our lives, health, environment and livelihoods.

We look forward to your reply and assurance that Millstone will not be re-licensed. Until then, I am

Sincerely Yours,

Lindsay Suter, AIA
Rogers Mill
16 Mill Road
North Branford, CT 06471
(203) 484-5059

E-RIDS=ADM-03
All=B.L. Enoch (RLE)

SESP Review Complete
Template=ADM-013

NRCREP - Response from "Comment on NRC Documents" Page 1

RDB received 1/25/05 (2)

From: Michael Hess <michael_d_hess@dom.com>
To: <nrcrep@nrc.gov>
Date: Tue, Jan 25, 2005 7:37 AM
Subject: Response from "Comment on NRC Documents"

2/9/04 69FR7137

Below is the result of your feedback form. It was submitted by

Michael Hess (michael_d_hess@dom.com) on Tuesday, January 25, 2005 at 07:37:42

(2)

Document_Title: Generic Environmental Impact Statement for License Renewal of Nuclear Plants, Supplement 22, Regarding Millstone Power Station, Units 2 and 3

MPS-27-1 Comments: QUESTION: Can the report be modified to make clear that entrainment of 20% of the larvae production does not result in 20% reduction of adult fish because the larvae entrained is outside of the river and this larvae may have little or no impact on the total population of adult Niantic River Winter Flounder?

BACKGROUND: Section 4.1.1 seems to assume that the percentage of Niantic River Winter Flounder larvae that result in adult fish is the same, regardless of whether the larvae is allowed to reach fry stage in the river or whether the larvae is released to Niantic Bay and Long Island Sound. It would seem that larvae released to the bay and sound would experience a more hostile environment, even without Millstone. Therefore, larvae that have left the river would have significantly less impact on the adult population than larvae that remains in the river. Since Millstone can only entrain larvae that has left the river, the effect of entrainment would seem to be greatly exaggerated by simple comparisons as a percentage of larvae production, as discussed on page 4-15 of the report.

organization: Representing Self

address1: 82B Old Black Point Road

address2:

city: Niantic

state: CT

zip: 06357

country: USA

phone: (860) 444-4202

E-RIDS=ADM-03

SISP Review Complete

Template=ADM-013

Add=RL-Euch (RLE)

RDB Received 2/17/05

2/9/04
69FR 7437
(3)

Chief, Rules and Directives Branch
Division of Administrative Services
Office of Administration
Mailstop T-6D 59
US Nuclear Regulatory Commission
Washington, DC 20555-0001

February 10, 2005

Commissioners:

MPS-28-1 The Green Party of New Haven opposes extension of operating licenses for Millstone's 2 and 3 nuclear power reactors in Waterford, Connecticut, owned by Dominion Nuclear Connecticut, Inc. for the following reasons:

MPS-28-2 1. After a hearing in Waterford on Jan.11, a fire broke out Jan.14 highlighting the vulnerability of these aging plants.

MPS-28-3 2. The draft Environmental Impact Statement (EIS) being prepared by the Nuclear Regulatory Commission (NRC) with respect to the license renewal does not address some highly-related issues such as the Evacuation Plan.

The current evacuation zone does not include the effect of a major release and its effect on Connecticut and its cities such as New Haven, only about 40 miles from the plant, nor does it consider the proximity of Long Island only a few miles away across the Sound where evacuation has been shown to be impossible.

MPS-28-4 3. Terrorism and sabotage are not included in the draft EIS even though these plants can be prime targets with their highly-radioactive spent fuel stored in unprotected pools or, as approved, in dry cask storage on the reactor site.

MPS-28-5 4. Environmental Justice issues were incorrectly discarded by not considering that the low-level radioactive wastes are shipped routinely to places such as Barnwell, S. Carolina, an area that has a predominately poor and African-American population.

MPS-28-6 5. There is a need for an independent epidemiological

SISP Review Complete

E-RIDS=ADM-03
Add = R.L. Emch (RLE)

Template = ADM-013

MPS-28-6 study of areas around the plant beyond Waterford and including New London County and parts of Long Island where cancer clusters have been identified. Radioactive and chemical contaminants are routinely released from the plants into air and water.

MPS-28-7 Dominion has a poor environmental record having been fined for having hidden violations of the Clean Air Act at another of its facilities.

MPS-28-8 Speaking for the New Haven Chapter of the Green Party, we feel the draft EIS, as proposed, is flawed, and thus a new process should be initiated with hearings that include all stakeholders and their concerns.

Sincerely,

Charlie Pillsbury
247 St. Ronan Street
New Haven CT 06511

Allan Brison
115 Everit Street
New Haven CT 06511

RDB received 01/5/05

12/9/04 69FR71437

From: "Dave Simpson" <david.simpson@po.state.ct.us>
To: <millstoneEIS@nrc.gov>
Date: Wed, Jan 5, 2005 3:11 PM
Subject: Millstone GEIS comments

Richard,

MPS-29-1 I reviewed the sections of the GEIS pertaining to entrainment and thought you folks did a very nice job, especially summarizing the available information and the debates/points of disagreement on models and analysis.

MPS-29-2 I have only a few minor comments on pages 2-25 and 2-26 reference is made to the Gulf of Maine stock - sure you meant southern New England.

MPS-29-3 pg 2-26 line 8 "The stock is at low biomass level and is considered to be OVER exploited" (NOAA 1998).

MPS-29-4 pg 2-25 "Commercial havrest is generally accomplished with trawl and seines". I'd scratch seines for our area. Virtually all landings are by trawl.

Thanks for sending us a copy of the report.

Dave

David Simpson
Supervising Fisheries Biologist
State of Connecticut
Department of Environmental Protection
Marine Fisheries Division
PO Box 719
Old Lyme, CT 06371

phone: (860)434-6043
fax: (860)434-6150
email: david.simpson@po.state.ct.us

SISP Review Complete
Template = ADM-013

E-RIDS = ADM-03
Add = R.L. Emch (RLE)

RDB Received 2/28/05

10/9/04
69 FR 71437
(5)

From: <Lirrcomm@aol.com>
To: <MillstoneEIS@nrc.gov>
Date: Thu, Jan 6, 2005 3:07 PM
Subject: EIS for Millstone Power Stations Units 2 & 3

To Whom It May Concern:

MPS-30-1 I want to go on record as Opposing the renewal for licensing for Units 2 and 3.

MPS-30-2 I have grave concerns about the safety of this power plant. In the event of a terrorist attack, the impact to the tri state area would be devastating. I would hate to have something occur as it relates to terrorism and this Power
MPS-30-3 Plants, to find that my concerns are correct. In addition to my concerns, it appears the NRC down plays the impact of EMF on the people and the environment.

MPS-30-4 There are alternative ways to generate electricity and Connecticut should be looking for those ways. In these uncertain times decisions can't always be about profits & shareholders. It must be more about safety and alternative ways to generate clean and efficient energy.

There are 69 issues for which the GEIS reached generic conclusions, but if we can be objective about these 69 issues, they would be frightening.

I oppose the renewal of this licensing for Units 2 & 3.

Sincerely,
Marie Domenici
330 Oldfield Court
Mattituck, NY 11952
631 298 7103

E-EIS = ADM-03
all = R. Emch (RLE)

SISP Review Complete
Template = ADM-013

RDB Received 8/08/05

From: "Baran, Marie" <Marie.Baran@nrb.gov>
To: <MillstoneEIS@nrc.gov>
Date: Fri, Jan 7, 2005 2:38 PM

12/9/04
69FR 71437

MPS-31-1 Until Long Island has and evaluation plan we should not have nuclear power plants operating within 100 miles of us. As I have learned, it's not if there will be an accident it's just when will it be. 911 should have taught us all that we are so vulnerable.

(6)

Marie Baran

SISP Review Complete
Template=ADM-013

E-RIDS=ADM-03
Add=R. Emch (RLE)

Page 1

RDB received 2/28/05

From: "Assemblywoman Pat Acampora" <acampop@assembly.state.ny.us>
To: <MillstoneEIS@nrc.gov>
Date: Mon, Jan 10, 2005 11:24 AM
Subject: Millstone License Renewal

January 10, 2005

10/9/04
69FR71437
(7)

Mr. Richard Emch, Jr.
Division of Regulatroy Improvement Programs
Office of Nuclear Reactor Regulation
United States Nuclear Regulatory Commission
Washington DC 20555

I write concerning the United States Nuclear Regulatory Commission's consideration for the Millstone Power Stations, Units 2 and 3 License Renewal for the next twenty years. Unfortunately, I will be unable to attend the during the Tuesday, January 11th public discussion forum held in Waterford, Connecticut. The New York State Legislature is in session on that date and therefore, I will be in Albany.

MPS-32-1 I wish to share with you my serious concerns that Millstone's operation poses a serious risk to the residents of the North Fork of Long Island. Without an emergency plan in place that expands the current 10 mile radius to a 50 mile radius including the North and South Forks, there should be no consideration of renewing Millstone's contract. In the event of an accident or terrorist attack, Long Island is currently extremely vulnerable. We must ensure that safety of the residents of Eastern Long Island. Therefore, I strongly oppose renewing the contract of The Millstone Power Station.

Thank you for your consideration of this extremely important matter. I would also like to be informed in the future regarding public meetings and discussions concerning the Millstone Power Station.

Sincerely,

Patricia L. Acampora
MEMBER OF ASSEMBLY

CC: <lirrcomm@aol.com>

ERIDS=ADM-03
Call = R.L. Emch (RLE)

SISP Review Complete
Template=ADM-013

RDB received 2/08/05

10/13/04

69FR 71437

(8)

From: Wayne Burgess <wayneburgess@snet.net>
To: NRC <MillstoneEIS@nrc.gov>
Date: Tue, Jan 11, 2005 10:49 AM
Subject: Renewal of the Millstone Power Station

January 11, 2005

To: MillstoneEIS@nrc.gov

From: Wayne J. Burgess-President

Southeastern Connecticut Central Labor Council, AFL-CIO

Re: Renewal of the Millstone Power Station operating license

MPS-33-1 The Southeastern Connecticut Central Labor Council, AFL-CIO has voted to support the renewal of the operating license for Millstone Power Station.

Many of our members and delegates have lived and worked in Southeastern Connecticut since Millstone Power Station started unit one. The Power Station has had some problems over the years. However, we believe the current management, Dominion Nuclear, Inc has demonstrated responsible behavior, has been a good member of the community and has worked to provide good jobs for citizens in Southeastern Connecticut.

Therefore we support the license renewal of units two and three at Millstone power station.

SISP Review Complete
Template = ADM-013

E-RIDS = ADM-03
Add = B. Emmel (RLE)

ADDressed - 2/28/05

From: "Barbara Doyle" <badoyle@comcast.net>
To: <MillstoneEIS@nrc.gov>
Date: Tue, Jan 11, 2005 11:14 AM
Subject: renewal

MPS-34-1 Hello NRC staff. I would like to not see a renewal of Units 2 & 3 at the Millstone Power Plant site in CT.

12/9/04
69FR 71437
(9)

MPS-34-2 Although I think that dry cask storage of radioactive waste at the plant is preferable to keeping the waste in a "wet" pool, the fact is that this is not a long term solution to the problem of disposing of the waste. We do not have a long term plan for dealing with the radioactive byproducts of nuclear power plants, so I would prefer that we not renew any nuclear power plant facility license.

Please keep in mind that any solution so far proposed to dealing with radioactive waste is expensive and should be considered part of the operating expense of any nuclear power plant. It is not a separate and unrelated cost to the running of such a facility and should not be presented to the public as so. I do not wish for my taxpaying dollars in any way to continue to support the license of new or renewal of any nuclear power facility.

Thank you, Barbara Doyle.

E-mail = ADM-03
Add = B. Emch (RLE)

SISP Review Complete
Template = ADM-013

RDB Received
01/28/05

From: Arlene <typewell@sbcglobal.net>
To: <MillstoneEIS@nrc.gov>
Date: Fri, Jan 14, 2005 11:40 AM
Subject: Millestone Nuclear Power Plant

MPS-35-1 I am a former Long Island resident and I strongly oppose the relicensing of the Millestone Nuclear Power
MPS-35-2 Plant, Units 2 and 3 to the year 2045. However, should the license be renewed, I believe it is imperative that the NCR expand the scope of its evacuation plant to a 50-mile radius to include all of Long Island. I implore you to consider this for the benefit and safety of the Long Island residents.

Arlene Farinacci
4812 W. 140th Street
Hawthorne, CA 90250

10/19/04
69FR 71137
(10)

SISP Review Complete
Template = ADM-013

E-RIDS = ADM-03
Add = B. Erick (RIE)

ADM received 4/28/05

From: <Caseathome@aol.com>
To: <MillstoneEIS@nrc.gov>
Date: Fri, Jan 14, 2005 3:43 PM
Subject: (no subject)

MPS-36-1 I am writing to voice my strong objection to the Millstone license renewal without making a plan for the evacuation of Long Island's north shore--within the 10 mile radius of Millstone This is unacceptable. My e-mail, in case you wish to respond is caseathome@aol. com.

10/9/04
69 FR 61437
(11)

SFSP Review Template
Template = ADM-013

E-RFDS = ADM-03
Acc = B. L. Emch (KLE)

RDB received
2/08/05

From: RANDAZZO <rafe1@optonline.net>
To: <MillstoneEIS@nrc.gov>
Date: Fri, Jan 14, 2005 4:28 PM
Subject: Millstone Power Plant - 10 Miles Off LI Sound - License Renewal

MPS-37-1 I am a Long Island resident and I strongly oppose the relicensing of the Millestone Nuclear Power Plant,
MPS-37-2 Units 2 and 3 to the year 2045. However, should the license be renewed, I believe it is imperative that the NCR expand the scope of its evacuation plant to a 50-mile radius to include all of Long Island. I implore you to consider this for the benefit and safety of the Long Island residents.

Janice Circo-Randazzo
213 Pine Road
Coram, NY 11727

10/9/04
69 FR 71437

(12)

SISP Review Complete
Template=ADM-013

E-RIDS=ADM-03
Add=B.L. Emch (BLE)

ADD Received 01/25/05

From: VicBarb <vicbarb9@optonline.net>
To: Marie Domenici <llrrcomm@aol.com>, <MillstoneEIS@nrc.gov>
Date: Mon, Jan 17, 2005 4:27 PM

Sir:

MPS-38-1 I would like to protest your scheduling a vital public meeting on operations at the Millstone nuclear plant without adequately notifying the residents who would be effected if an accident should happen. I read the New York Times every day. No notice was published. It looks

MPS-38-2 like you didn't want anyone to know there was a meeting. It is my understanding that the Nuclear Commission in the State of Connecticut have no plants for notification of residents who reside in a ten to fifty mile radius in the event of a nuclear malfunction. A plan for evacuation of this area is vital. Without a plan for viable evacuation, the plant should be shut down.

Barbara & Victor DiPaola
vicbarb9@optonline.net

10/9/04
69FR 61137
(13)

SISP Review Complete
Template = ADM-013

E-RIDS = ADM-03
Add = R. L. Emch (RLE)

RDB Received 2/28/05

From: <BeaconHA@aol.com>
To: <millstoneEIS@nrc.gov>
Date: Mon, Jan 17, 2005 5:05 PM
Subject: Millstone Nuclear Projects

MPS-39-1 I urge you to not allow the Millstone nuclear facilities to operate for all the safety, toxic waste, public health and national security reasons cited by so many for so long and documented over the years by members of the scientific community who have no economic or other pecuniary interests in the Millstone projects. Bill Garrett, 520 Savoy Street, Bridgeport, CT

10/7/04
69FR 71437
(14)

CC: <NancyBurtonEsq@aol.com>, <upthesun@cshore.com>

E-RIDS = ADM-03
Add = B.L. Emch (BLE)

SISP Review Complete
Template = ADM-013

BDB Received 2/28/05

From: <BeaconHA@aol.com>
To: <millstoneEIS@nrc.gov>
Date: Mon, Jan 17, 2005 5:05 PM
Subject: Millstone Nuclear Projects

MPS-39-1 *I urge you to not allow the Millstone nuclear facilities to operate for all* the safety, toxic waste, public health and national security reasons cited by so many for so long and documented over the years by members of the scientific community who have no economic or other pecuniary interests in the Millstone projects. Bill Garrett, 520 Savoy Street, Bridgeport, CT

10/9/04
69FR 71437
(14)

CC: <NancyBurtonEsq@aol.com>, <upthesun@cshore.com>

E-12 FDS = ADM-03

SISP Review Complete

Template = ADM-013

Add = R.L. Emch (RLE)

RDB Received 2/05/05

From: Maureen and Valerie <maureenandvalerie@yahoo.com>
To: <MillstoneEIS@nrc.gov>
Date: Mon, Jan 31, 2005 10:58 AM
Subject: renewing of Millstone lic.

MPS-40-1 We want to voice our concern about the renewal of the Millstone Power Plant license. We are strongly opposed to this, and hope that you will consider closing the plant.

MPS-40-2 We are very concerned that there is no apparant notification system in place - we site the recent fire, and site evacuation in Jan. 2005. There are no policies in places to notify neighboring states, this is a huge concern of ours. As residents of New Jersey, we would want to be fully advised, and alerted to when public meetings are being held to discuss/debate the renewal of the license.
Again, I urge you to refuse the renewal of the Millstone opereating Units 2&3
Sincerely,
Valerie Briody
Maureen Swearingen
9 Delsey Road
Kendall Park, NJ 08824
732.398.9454
Please live up to your mission statement:

12/9/04
69FR 71437
(15)

"NRC's primary mission is to protect public health and safety and the environment from the effects of radiation from nuclear reactors, materials, and waste facilities."

Do you Yahoo!?
Yahoo! Search presents - Jib Jab's 'Second Term'

E-RFDS = ADM-03
All = B.L. Emails (RLF)

SISP Review Complete
Template = ADM-013

BDB received 2/08/05

From: <TMJM1968@aol.com>
To: <MillstoneEIS@nrc.gov>
Date: Tue, Feb 1, 2005 11:00 AM
Subject: (no subject)

12/9/04
69FR71437
(16)

MPS-41-1 I have read the available information sent to me about Millstone. I am deeply distressed that you would even consider extending the opening of this facility. It seems that it would be common sense with all the other data in the world about this type of situation, that you would have no reason to keep this open or to extend the opening of it.
Please think about the future of our children and grand children and do the right thing.

In God We Trust
Josephine

SESP Review Complete
Template = ADM-013

E-RIDS = ADM-03
Add = B. A. Elliott (BAE)

ADM Template
2/28/05

From: john magnesi <magneslj2003@yahoo.com>
To: <millstoneeis@nrc.gov>
Date: Wed, Feb 9, 2005 7:30 AM
Subject: License Renewal at Millstone

Dear Sir,

MPS-42-1 I wish to register my opinion that license renewal for Millstone nuclear power plant be delayed. All the parties who have concerns about this renewal have not been fully heard. These parties include Long Island communities, citizen groups and anti-nuclear activists. The health effects of this power plant may not have been fully considered. As a consequence, I urge you to delay renewal of the license.
Sincerely,

John Magnesi
7 Partridge Run
Wallingford, CT 06492

12/9/04
69 FR 71437

(17)

SISP Review Complete
Template - ADM-013

E-RIDS = ADM-03
Add = R.L. Emch (RLE)

RDB, Receive
2/28/05

12/9/04
69FR71437

(18)

From: <Lirrcomm@aol.com>
To: <MillstoneEIS@nrc.gov>
Date: Wed, Feb 23, 2005 4:41 AM
Subject: Address Correction regarding Millstone and ...

Hello Mr. Emch,

I have submitted my written comments regarding the re licensing of the Millstone several many weeks ago and yesterday, I received communication from your office regarding subject:
"Response to Joshua Y. Horton, Southold Supervisor, Regarding Millstone Power Station, Units 2 and 3 License Renewal Review" and found the NRC has an incorrect address for me. The purpose of this email to ask that you correct my address to read as follows:

Marie Domenici
330 Oldfield Court
Mattituck, NY 11952

MPS-43-1 In the future, when posting "public meetings" I recommend the NRC place your notifications in no less than 3 newspapers:

1. NY Times
2. Newsday
3. Suffolk Times

The Easthampton Independent is a free newspaper that is distributed in local supermarkets and is not necessarily a well read newspaper. So, in fairness to the residents of Long Island, it would be prudent on your behalf to place your public notifications in the 3 newspapers stated above. If you require contact info on these newspapers, I will be happy to provide that information. Additionally, on January 12, I sent an email to Mr. Zalcman providing him with all the elected officials contact information, from the Town Supervisor all the way up to Governor Pataki to ensure that future notifications were made as appropriate. If you would like a copy of that email, please contact me.

Lastly, I ask that I be added as a contact name for future meetings that will be conducted as it relates to Millstone.

Thanking you in advance for your attention to this matter.

Marie Domenici
631 298 0211

SESP Review Complete
Template = ADM-013

E-RIDS = ADM-03
Add = R.L. Emch (RLE)

NRC FORM 659 (6-2003)

U.S. NUCLEAR REGULATORY COMMISSION

RDB Received 2/28/05

10/7/04
69FR 71437

Category 3

NRC PUBLIC MEETING FEEDBACK

(19)

Meeting Date: 01/11/2005

Meeting Title: Public Meeting to discuss the Draft Supplemental Environmental Impact Statement for License Renewal at Millstone Power Station, Units 2 and 3

In order to better serve the public, we need to hear from the meeting participants. Please take a few minutes to fill out this feedback form and return it to NRC.

1. How did you hear about this meeting?
   - [ ] NRC Web Page
   - [ ] NRC Mailing List
   - [x] Newspaper
   - [ ] Radio/TV
   - [ ] Other ______

		Yes	No (Please explain below)	Somewhat
2.	Were you able to find supporting information prior to the meeting?	☐	☐	☑
3.	Did the meeting achieve its stated purpose?	☐	☑	☐
4.	Has this meeting helped you with your understanding of the topic?	☐	☑	☐
5.	Were the meeting starting time, duration, and location reasonably convenient?	☑	☐	☐
6.	Were you given sufficient opportunity to ask questions or express your views?	☐	☐	☑
7.	Are you satisfied overall with the NRC staff who participated in the meeting?	☑	☐	☐

COMMENTS OR SUGGESTIONS: Thank you for answering these questions.

MPS-44-1 The hearing was poorly noticed; perhaps meeting legal requirements, but missing the major avenues for correctly notifying the public on the North Fork of Long Island. consequently we did not have enough time to read and consider the GEIS or SEIS.
The hearing shouldn't be a dog & pony show - you are there to hear public comments not present your views. I know what your view is before I arrive. I certainly didn't take a 1½ hr.

Continue Comments on the reverse. ⇨

OPTIONAL

Name Michael J. Domino Organization North Fork Environmental Council, Inc.

Telephone No. 298-8880 E-Mail NFEC@ospt.online.net

☑ Check here if you would like a member of NRC staff to contact you.

OMB NO. 3150-0197 Expires: 06/30/2004

Public Protection Notification: If a means used to impose an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

Please fold on the dotted lines with Business Reply side out, tape the bottom, and mail back to the NRC.

SISP Review Complete
Template = ADM-013

E-RIDS = ADM-03
Add = R.L. Emch (RLE)

NRC FORM 659 (6-2000) — U.S. NUCLEAR REGULATORY COMMISSION

RDB received 4/26/05

NRC PUBLIC MEETING FEEDBACK

10/7/04 69FR 71437

(20)

Category 3

Meeting Date: 01/11/2005

Meeting Title: Public Meeting to discuss the Draft Supplemental Environmental Impact Statement for License Renewal at Millstone Power Station, Units 2 and 3

In order to better serve the public, we need to hear from the meeting participants. Please take a few minutes to fill out this feedback form and return it to NRC.

1. How did you hear about this meeting?
   - ☐ NRC Web Page
   - ☐ NRC Mailing List
   - ☑ Newspaper
   - ☐ Radio/TV
   - ☐ Other _____

		Yes	No	Somewhat (Please explain below)
2.	Were you able to find supporting information prior to the meeting?	☐	☐	☑
3.	Did the meeting achieve its stated purpose?	☐	☑	☐
4.	Has this meeting helped you with your understanding of the topic?	☐	☑	☐
5.	Were the meeting starting time, duration, and location reasonably convenient?	☑	☐	☐
6.	Were you given sufficient opportunity to ask questions or express your views?	☐	☑	☐
7.	Are you satisfied overall with the NRC staff who participated in the meeting?	☐	☑	☐

COMMENTS OR SUGGESTIONS: Thank you for answering these questions.

MPS-45-1 Close Millstone Power Station 2+3 at ONCE. This Nuclear Power station is a Threat to The local Community's health. To the east coast, the United States, and the world.

MPS-45-2 Let alone it's a environmental hazzard to

MPS-45-3 Long Island Sounds living Fish + creatures + ~~Yard~~ water quality. It's Killing Long Island Sound. And the people living near it.

Continue Comments on the reverse. ⇨

OPTIONAL

Name Walter N. Parahas Organization Retired Long Island Sound Boater

Telephone No. 860-691-8377 E-Mail None ☑ Check here if you would like a member of NRC staff to contact you.

OMB NO. 3150-0137 Expires: 08/30/2004

Public Protection Notification: If a means used to impose an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

Please fold on the dotted lines with Business Reply side out, tape the bottom, and mail back to the NRC.

STOP Before Complete

Template = ADM-013

E-RIDS = ADM-03

Add = R. L. Emch (RLE)

RDB received 2/08/05

CONNECTICUT COALITION AGAINST MILLSTONE
P.O. Box Niantic CT 06357
www.mothballmillstone.org

10/9/04
69FR 61137
(21)

ANTI-MILLSTONE COALITION REPORTS MOUNTING EVIDENCE OF MILLSTONE LINK TO HIGH CANCER RATE IN NEW LONDON COUNTY

FOR IMMEDIATE RELEASE
JANUARY 11, 2005

Contact: Joseph J. Mangano Tel. 610-666-2985
Nancy Burton Tel. 203-938-3952
Michael Steinberg Tel. 860-739-7002

WATERFORD – Evidence is mounting of a scientific correlation between routine radiation emissions from the Millstone Nuclear Power Station and high cancer incidence in the surrounding area, the Connecticut Coalition Against Millstone reported today.

MPS-46-1 Laboratory analysis of baby teeth donated by children with cancer in the areas near the Millstone and Indian Point Nuclear Power Plants found levels of radioactive strontium-90 more than twice as high as found in teeth collected from other parts of the state, according to Joseph J. Mangano, National Coordinator of the Radiation and Public Health Project.

"The average level of strontium-90 concentration close to the nuclear power plants was 6.16 picocuries per gram of calcium, compared with 2.70 picocuries in other parts of the state," Mangano said.

Stsf Review Complete
Template = ADM-013

E-RIDS = ADM-03
Add = R.L. Emch (RLE)

MPS-46-1 "For children suffering from cancer, the average level of strontium-90 concentration was 7.03 picocuries per gram calcium," Mangano said.

"Strontium-90 is a radionuclide routinely emitted by the Millstone Nuclear Power Plant into the air and water," said Mangano, who as national coordinator of the Radiation and Public Health Project (RPHP) has participated in analysis of baby teeth collected from around the country. RPHP has published 21 articles in peer-reviewed medical journals (including 4 on the tooth study), and five books, since 1994.

"Strontium-90 mimics calcium and when it is taken into the body of an exposed person it collects in the teeth and bones," Mangano said.

MPS-46-1 "The presence of strontium-90 elevated levels near the nuclear power plants cannot be accounted for other than from their routine releases of strontium-90," Mangano said.

MPS-46-2 Mangano stated that cancer rates in the New London area, which used to be below the state average, have risen steadily during the period the Millstone nuclear reactors have been in operation, beginning in 1970.

"In the 1950s and 1960s, cancer incidence in New London County, where Millstone is located, was 8 per cent below the state rate," Mangano said. "After Millstone began operations in 1970, the state rate rose steadily until it reached a level of 6 per cent above the state rate in the late 1990s."

"New London County's current cancer rate is the highest of all counties in the state," Mangano said.

Mangano acknowledged that the information about strontium-90 levels in baby teeth in Connecticut is based on a sampling of 37 teeth, and therefore the information is still of a preliminary nature. The tooth-testing program is continuing to analyse baby teeth.

MPS-46-3 In its most recent report of radiological emissions to the environment, based on samplings taken in the year 2002, Dominion reported the presence of strontium-90 in the milk of goats living two miles downwind of Millstone.

"Despite information to the contrary in its own reports, the owners and operators of Millstone have denied that strontium-90 found in goat milk near and downwind from Millstone has been coming from their nuclear reactors," said Michael Steinberg, author of "Millstone and Me," a book analyzing Millstone's radiological releases.

Strontium-90 is only one of hundreds of radioactive waste products Millstone releases into the air and water during routine operations.

MPS-46-4 "Millstone has the third-highest record of airborne radiation releases to the environment of all nuclear power plants operating in the United States according to its own reports," said Mangano.

The official Tumor Registry maintained by the state of Connecticut shows the region around Millstone has the highest incidence of cancers known to be triggered by certain of the radionuclides routinely released by Millstone, according to Mangano.

MPS-46-5 According to the Coalition, Millstone radiological releases of tritium – radioactive hydrogen - to the environment are increasing to all-time highs.

The Connecticut Coalition Against Millstone comments were prepared for delivery to the U.S. Nuclear Regulatory Commission at a proceeding today to consider the draft Environmental Impact Statement (EIS) NRC staff prepared to assess environmental consequences of extending the Millstone operating license an additional twenty years.

MPS-46-6 In its draft EIS, the NRC concluded that the agency need not consider issues of human health as it relates to radiological emissions from nuclear power plants undergoing relicensing because

MPS-46-6 an NRC guidance document released in 1996 discounted health effects from nuclear power plant radiological releases.

"Millstone is poisoning our air and water and killing our children in the year 2005," said Nancy Burton, a founder of the Coalition, "We do not need its deadly megawatts. The community can no longer tolerate the Millstone menace."

The Coalition cited high cancer levels, environmental degradation and the threat of terrorism as causes for Millstone shutdown.

"Dominion sold itself to the people of Connecticut as a conscientious environmental steward when it bought Millstone for $1.3 billion in 2001," Burton said.

MPS-46-7 Yet, according to research by Public Citizen, a public-interest organization based in Washington, D.C., Dominion's record has proved otherwise.

According to Public Citizen, in April 2003, a Dominion subsidiary agreed to pay $1.2 billion in a settlement with the U.S. Department of Justice when it violated the Clean Air Act by increasing power-generating capacity of a huge coal-fired power plant in West Virginia without obtaining mandatory permits.

A year later, according to Public Citizen, Dominion paid a $500,000 civil penalty and had to offer a $4.5 million refund to its customers after the U.S. Federal Energy Regulatory Commission (FERC) caught the company violating federal regulations.

"When an outlaw company operates a killing machine that targets innocent families in our community, it is time to demand that its operations be terminated," Burton said.

The Connecticut Coalition Against Millstone is an organization of statewide safe-energy groups, Millstone whistleblowers and families.

4

RDB received 2/26/05

Dominion

Dominion Nuclear Connecticut, Inc.
Millstone Power Station
Rope Ferry Road
Waterford, CT 06385

12/9/04
69FR71437

(22)

February 25, 2005

Chief, Rules Review and Directives Branch
United States Nuclear Regulatory Commission
Mail Stop T6-D59
Washington, DC 20555-0001

Serial No.: 04-745
LR/RJG R0
Docket Nos.: 50-336
50-423
License Nos.: DPR-65
NPF-49

DOMINION NUCLEAR CONNECTICUT, INC. (DNC)
MILLSTONE POWER STATION UNITS 2 AND 3
LICENSE RENEWAL APPLICATIONS
COMMENTS ON DRAFT SUPPLEMENT 22
TO THE GENERIC ENVIRONMENTAL IMPACT STATEMENT

On December 9, 2004, the Nuclear Regulatory Commission (NRC) issued Draft Supplement 22 to the Generic Environmental Impact Statement (GEIS) regarding the license renewal applications (LRAs) for Millstone Power Station Units 2 and 3. Comments on the draft were solicited.

DNC has reviewed the draft and presents the following observations. Draft Supplement 22 fairly represents the environmental conditions associated with plant operation. Furthermore, we concur with the overall conclusions concerning the impacts associated with the station's operation, and offer the attached comments and clarifications concerning the content of the draft.

Should you have any questions regarding this letter, please contact Mr. William D. Corbin, Director, Nuclear Engineering Department, Dominion Resources Services, Inc., at (804) 273-2365.

Very truly yours,

E. S. Grecheck
Vice President – Nuclear Support Services

Attachment: Comments on Draft Supplement 22 to the GEIS for License Renewal

Commitments made in this letter: None.

E-RIDS-ADM-03
Add = B. L. Fech (BLF)

SISP Review Complete
Template = ADM-013

cc: U.S. Nuclear Regulatory Commission
Region I
475 Allendale Road
King of Prussia, PA 19406-1415

Mr. V. Nerses
Senior Project Manager
U.S. Nuclear Regulatory Commission
One White Flint North
11555 Rockville Pike
Mail Stop 8C2
Rockville, MD 20852-2738

Mr. S. M. Schneider
NRC Senior Resident Inspector
Millstone Power Station

Honorable Wayne L. Fraser
First Selectman
P.O. Box 519
Niantic, CT 06357-0519

Mr. Stephen Page
Central VT PSC
77 Grove Street
Rutland, VT 06701

Honorable Elizabeth Ritter
CT House of Representatives
24 Old Mill Road
Quaker Hill, CT 06375

Mr. Denny Galloway
Supervising Radiation Control Physicist
State of Connecticut – DEP
Division of Radiation
79 Elm Street
Hartford, CT 06106-5127

Honorable Christopher Dodd
US Senate
100 Great Meadow Road
Wethersfield, CT 06109

Ms. Catherine Marx
Governor's Eastern Office
P.O. Box 1007
171 Salem Turnpike
Norwich, CT 06360-1007

Mr. William Meinert
MMWEC
P.O. Box 426
Ludlow, MA 01056-0426

Honorable Andrea Stillman
CT State Senate
5 Coolidge Court
Waterford, CT 06385

Honorable Ed Jutila
CT House of Representatives
23 Brainard Road
Niantic, CT 06357

Honorable Robert Simmons
US Congress
2 Courthouse Square
Norwich, CT 06360

Mr. Thomas Wagner
Town of Waterford
Town Planner
15 Rope Ferry Road
Waterford, CT 06385

Dr. Edward L. Wilds
Director, Division of Radiation
State of Connecticut – DEP
79 Elm Street
Hartford, CT 06106-5127

Chairman Donald Downes
DPUC
10 Franklin Square
New Britain, CT 06051

Honorable Dennis L. Popp
Chairman – Council of
Governments
Municipal Building
295 Meridian Street
Groton, CT 06340

Chief Murray J. Pendleton
Director of Emergency
Management
41 Avery Lane
Waterford, CT 06385-2806

Honorable Richard Blumenthal
Attorney General
55 Elm Street
Hartford, CT 06106-1774

Mr. John Markowicz
Co-Chairman – NEAC
9 Susan Terrace
Waterford, CT 06385

Mr. Evan Woolacott
Co-Chairman – NEAC
128 Terry's Plain Road
Simsbury, CT 06070

Honorable M. Jodi Rell
Governor
State Capitol
Hartford, CT 06106

Mr. Mark Powers
4 Round Rock Road
Niantic, CT 06357

Mr. Jay Levin
23 Worthington Road
New London, CT 06320

Mr. Jim Butler
Executive Director – Council of
Governments
8 Connecticut Avenue
Norwich, CT 06360

Mr. Bill Palomba
Executive Director, DPUC
10 Franklin Square
New Britain, CT 06051

Honorable Ernest Hewett
State House of Representatives
29 Colman Street
New London, CT 06320

Honorable Terry Backer
CT House of Representatives
Legislative Office Building
Room 2102
Hartford, CT 06106

Honorable Kevin DelGobbo
CT House of Representatives
83 Meadow Street
Naugautuck, CT 06770

Honorable Thomas Herlihy
CT Senate
12 Riverwalk
Simsbury, CT 06089

Honorable Cathy Cook
CT Senate, 18th District
43 Pequot Avenue
Mystic, CT 06355

Mr. Edward Mann
Office of Senator Dodd
Putnam Park
100 Great Meadow Road
Wethersfield, CT 06109

Chairperson Pam Katz
CT Siting Council
10 Franklin Square
New Britain, CT 06051

Mr. Ken Decko
CBIA
350 Church Street
Hartford, CT 06103

Honorable Paul Eccard
First Selectman
Town of Waterford
15 Rope Ferry Road
Waterford, CT 06385

Mr. Richard Brown
City Manager
New London City Hall
181 State Street
New London, CT 06320

Honorable Jane G. Glover
Mayor, New London
New London City Hall
181 State Street
New London, CT 06320

SN: 04-745
Docket Nos.: 50-336/423
Subject: Comments on Draft Supplement 22 to the Generic Environmental Impact Statement

COMMONWEALTH OF VIRGINIA)
)
COUNTY OF HENRICO)

The foregoing document was acknowledged before me, in and for the County and Commonwealth aforesaid, today by Eugene S. Grecheck, who is Vice President - Nuclear Support Services, of Dominion Nuclear Connecticut, Inc. He has affirmed before me that he is duly authorized to execute and file the foregoing document in behalf of that Company, and that the statements in the document are true to the best of his knowledge and belief.

Acknowledged before me this 25th day of February, 2005.

My Commission Expires: May 31, 2006.

Vicki L. Hull
Notary Public

(SEAL)

Attachment

Millstone Power Station Units 2 and 3
License Renewal Applications

Comments on Draft Supplement 22 to the
Generic Environmental Impact Statement
for License Renewal

Dominion Nuclear Connecticut

MPS-47-1 **Section 2.1.1 External Appearance and Setting**

Page 2-2, Line 18

Draft GEIS Supplement 22 Statement

All development at Millstone is situated south of this mostly below-grade rail line.

Dominion Comment

After the word "Millstone," insert "except the training facility," such that the sentence reads:

"All development at Millstone, except the training facility, is situated south of this mostly below-grade rail line."

MPS-47-2 **Section 2.1.3 Cooling and Auxiliary Water Systems**

Page 2-7, Line 9

Draft GEIS Supplement 22 Statement

...cuts excavated from the bedrock at the eastern end of the quarry into Long Island Sound.

Dominion Comment

"eastern" should be changed to "southern," such that the line reads:

"...cuts excavated from the bedrock at the southern end of the quarry into Long Island Sound."

MPS-47-3 **Section 2.1.3 Cooling and Auxiliary Water Systems**

Page 2-7, Lines 29-32

Draft GEIS Supplement 22 Statement

Service water is withdrawn and diverted from the system before the water enters the condensers. This water is used in a variety of applications, including component cooling (e.g., pump bearings and spent fuel pool water) and fire protection. A maximum of 2.3 m^3/s (36,000 gpm) of service water is withdrawn.

MPS-47-3 **Dominion Comment**

The configuration of the service water system is somewhat different than that stated, and the stated pump capacity is that only for the three pumps at Unit 2. During normal operation, two pumps at each unit are operating, for a total of 3.4 m^3/s (54,000 gpm). Also, service water is used as backup for several other systems, but not for fire protection. This paragraph should be changed to read:

"Service water is also withdrawn inside the intake structures. This water is used in a variety of applications, including component cooling (e.g., pump bearings and spent fuel pool water) and as an emergency backup supply for some systems. During normal operation, approximately 3.4 m^3/s (54,000 gpm) of service water is withdrawn for both units."

MPS-47-4 **Section 2.1.4 Radioactive Waste Management Systems and Effluent Control Systems**

Page 2-8, lines 27-29

Draft GEIS Supplement 22 Statement

Millstone is in the process of obtaining a permit to construct a dry fuel storage area for additional spent fuel assemblies.

Dominion Comment

Millstone has obtained the permit described above. It is suggested that "is in the process of obtaining a permit to construct" be changed to "has constructed" so the sentence reads:

"Millstone has constructed a dry fuel storage area for additional spent fuel assemblies."

MPS-47-5 **Section 2.1.4.3 Solid Waste Processing**

Page 2-12, line 3

Draft GEIS Supplement 22 Statement

...volume was 24.3 m^3 (858 ft^3)...

MPS-47-5 **Dominion Comment**

Change to:

"...volume was 243 m^3 (8580 ft^3)...

MPS-47-6 **Section 2.1.5 Nonradioactive Waste Systems**

Page 2-12, Lines 11-12

Draft GEIS Supplement 22 Statement

Dominion has petitioned the CTDEP to be classified as a small-quantity generator because of a reduction in the amount of waste generated at Millstone.

Dominion Comment

Although Millstone generates hazardous waste at the rate of a small-quantity generator, the decision was made not to pursue classification as a small-quantity generator, in order to maintain flexibility in storage and shipping. It is suggested that this sentence be deleted.

MPS-47-7 **Section 2.1.5 Nonradioactive Waste Systems**

Page 2-12, Lines 17-19

Draft GEIS Supplement 22 Statement

Common types of hazardous waste generated at Millstone are lead acid sludges and batteries, solvent rags, and sawdust contaminated with chemicals regulated under RCRA.

Dominion Comment

Lead acid batteries and sawdust contaminated with chemicals are classified as Connecticut-regulated wastes. This sentence should be changed to the following:

"Common types of hazardous waste generated at Millstone are aerosol cans, paint-related waste materials, and solvent rags."

MPS-47-8 **Section 2.1.6 Plant Operation and Maintenance**

Page 2-12, line 37

Draft GEIS Supplement 22 Statement

Dominion assumes that an additional 60 employees will be needed...

Dominion Comment

Sentence should be changed to:

"Dominion assumes that no more than 5 additional employees will be needed..."

MPS-47-9 **Section 2.1.7 Power Transmission System**

Page 2-15, Line 2

Draft GEIS Supplement 22 Statement

All personnel applying herbicides are required to process a valid applicator's license.

Dominion Comment

It is suggested that the word "process" be changed to "possess," so that the sentence reads:

"All personnel applying herbicides are required to possess a valid applicator's license."

MPS-47-10 **Section 2.2.2 Water Use**

Page 2-17, Line 2

Draft GEIS Supplement 22 Statement

Additional minor amounts of ocean water are used for fire protection and other systems.

MPS-47-10 **Dominion Comment**

Although ocean water can be used as backup for some systems, it is not used in the fire protection system. The sentence should be modified as follows:

"Additional minor amounts of ocean water may be used as emergency backup for other systems."

MPS-47-11 **Section 2.2.2 Water Use**

Page 2-17, Lines 6-7

Draft GEIS Supplement 22 Statement

Dye tracer and modeling studies estimate that 20 percent of the Niantic River discharge goes through the plant.

Dominion Comment

These studies determined flow characteristics during three-unit operation. It is estimated that current two-unit operation results in approximately 15 percent of the Niantic River discharge going through the plant. The sentence should be changed to:

"Dye tracer studies estimated that 20 percent of the Niantic River discharge went through the plants during three-unit operation. It is estimated that current two-unit operation results in approximately 15 percent of Niantic River discharge going through the plants."

MPS-47-12 **Section 2.2.3 Water Quality**

Page 2-17, Line 36

Draft GEIS Supplement 22 Statement

The NPDES permit, which is renewed every five years, expired in 1997.

Dominion Comment

Change "expired in 1997" to "was set to expire in 1997 but remains in effect because a timely renewal application was filed with the CTDEP" so sentence reads:

MPS-47-12 "The NPDES permit, which is renewed every five years, was set to expire in 1997 but remains in effect because a timely renewal application was filed with the CTDEP."

MPS-47-13 **Section 2.2.3 Water Quality**

Page 2-18, Lines 7-8

Draft GEIS Supplement 22 Statement

Recent monitoring results show that the discharge quality occasionally exceeds permit limits.

Dominion Comment

It is suggested that the sentence be changed by adding "There have been occasional instances when" before "monitoring results," substituting "have been above" for "show that the discharge quality occasionally exceeds" and adding "These instances have been properly reported in Millstone's monthly discharge monitoring reports to the CTDEP" so the sentence reads:

"There have been occasional instances when monitoring results have been above permit limits (e.g., total suspended solids). These instances have been properly reported in Millstone's monthly discharge monitoring reports to the CTDEP."

MPS-47-14 **Section 2.2.3 Water Quality**

Page 2-18, Line 24

Draft GEIS Supplement 22 Statement

...may be present for no more than two hours in any one day.

Dominion Comment

After "two hours," insert "per unit," so the sentence reads:

"...may be present for no more than two hours per unit in any one day."

MPS-47-15 **Section 2.2.4 Air Quality**

Page 2-20, Lines 20-22

Draft GEIS Supplement 22 Statement

Air emissions from these sources are subject to Connecticut General Statutes section 22a-174-33 of the Regulations of Connecticut State Agencies (Connecticut Legislature 2003).

Dominion Comment

In addition to section 22a-174-33 (which regulates Title V air permits), air emissions from site sources are subject to other regulations. It is suggested that this sentence read:

"Air emissions from these sources are subject to Connecticut General Statutes, various sections of the Regulations of Connecticut State Agencies, Title 22a-174, 'Abatement of Air Pollution,' and various federal regulations."

MPS-47-16 **Section 2.2.5 Aquatic Resources**

Page 2-20, Lines 28-29

Draft GEIS Supplement 22 Statement

Millstone is located at Millstone Point, a small peninsula of land situated on the west shore of Long Island Sound near Waterford, Connecticut.

Dominion Comment

Change "west" to "north," and change "near" to "in," so the sentence reads:

"Millstone is located at Millstone Point, a small peninsula of land situated on the north shore of Long Island Sound in Waterford, Connecticut."

MPS-47-17 **Section 2.2.5 Aquatic Resources**

Page 2-20, Lines 38-39, and Page 2-21, Line 4.

MPS-47-17 **Draft GEIS Supplement 22 Statement**

...about 20 percent of the water discharged from the station from the Niantic River could be passed through the Millstone cooling water system under three-unit operation...

Dominion Comment

Delete "from the station," and add "and about 15 percent under two-unit operation" to the end of the sentence, so the sentence reads:

"...about 20 percent of the water discharged from the Niantic River could be passed through the Millstone cooling water system under three-unit operation, and about 15 percent under two-unit operation..."

MPS-47-18 **Section 2.2.5.1 General Water Body Characteristics**

Page 2-22, Lines 12-15

Draft GEIS Supplement 22 Statement

Millstone Point lies on the western shore of Long Island Sound, near the mouth of the sound. This area of Long Island Sound experiences a salinity of approximately 23 parts per thousand. Salinity is influenced by the presence of three major rivers: the Thames, the Housatonic, and the Connecticut. These rivers flow into the Sound in the vicinity of the site.

Dominion Comment

It is suggested that "western shore" be changed to "eastern end," that "23" be changed to "26-30," and that "These" be changed to "The Thames and Connecticut," so the sentence reads:

"Millstone Point lies on the eastern end of Long Island Sound, near the mouth of the sound. This area of Long Island Sound experiences a salinity of approximately 26-30 parts per thousand. Salinity is influenced by the presence of three major rivers: the Thames, the Housatonic, and the Connecticut. The Thames and Connecticut rivers flow into the Sound in the vicinity of the site."

MPS-47-19 **Section 2.2.5.5 Population Trends Associated with Important Fish and Shellfish Species**

Page 2-24, Line 41

Draft GEIS Supplement 22 Statement

...and the northern Atlantic cost of the U.S.

Dominion Comment

Change "cost" to "coast."

MPS-47-20 **Section 2.2.5.5 Population Trends Associated with Important Fish and Shellfish Species**

Page 2-25, Line 28

Draft GEIS Supplement 22 Statement

Individual females can produce up to 500,000 eggs.

Dominion Comment

It is suggested that the sentence be changed to read:

"Individual females can produce up to 2,500,000 eggs, but 500,000 eggs is an approximate average."

MPS-47-21 **Section 2.2.5.5 Population Trends Associated with Important Fish and Shellfish Species**

Page 2-25, Line 36 and Page 2-26, Figure 2-6.

Draft GEIS Supplement 22 Statement

...reporting years (Figure 2-6) (NOAA 1998; MacLeod 2003; National Marine Fisheries Service...

MPS-47-21 **Dominion Comment**

It is suggested that "Gottschall et al. 2003" be added to the reference list for Figure 2-6 on line 36, and in the figure itself. Gotschall et al. is the citation for the CTDEP Long Island Sound Trawl Survey.

MPS-47-22 **Section 2.2.5.5 Population Trends Associated with Important Fish and Shellfish Species**

Page 2-26, Lines 4-8

Draft GEIS Supplement 22 Statement

According to NOAA, "The continuing low levels of landings, catch per unit effort indices, and survey indices suggest that winter flounder abundance in the Gulf of Maine has been reduced substantially. Future improvements in the condition of the stock will depend on decreases in exploitation in both the recreational and commercial fisheries, and on improved recruitment. The stock is at a low biomass level and is considered to be exploited) (NOAA 1998).

Dominion Comment

It is suggested that the following information regarding the Southern New England stock be added to this paragraph, or as an additional paragraph:

"With regard to current winter flounder stock abundance, NEFSC (2003) stated that the Southern New England/Mid-Atlantic winter flounder stock complex has been overfished and overfishing is continuing to occur. The current assessment provided a much more pessimistic evaluation of stock status than the previous assessment made in 1998. Recruitment to the winter flounder stock has been below average since 1989, and indications are that the 2001 year-class is the smallest in 22 years."

The reference for this statement is:

NEFSC (Northeast Fisheries Science Center). 2003. B1. Southern New England/Mid-Atlantic (SNE/MA) winter flounder. Pages 139-220 in Report of the 36th northeast regional stock assessment workshop (SAW): stock assessment review committee (SARC) consensus summary of assessments. NOAA/National Marine Fisheries Service, Woods Hole, MA. Accessed via:

http://www.nefsc.noaa.gov/nefsc/publications/crd/crd0306

MPS-47-23 **Section 2.2.5.5 Population Trends Associated with Important Fish and Shellfish Species**

Page 2-28, Lines 15-16

Draft GEIS Supplement 22 Statement

...with commercial harvests over the past seven years for the Atlantis seaboard ranging from approximately 259 to over 300 MT (286 to 331 tons)...

Dominion Comment

Change "Atlantis" to "Atlantic." Also, all of the numbers in this sentence should be followed by "x 10^3."

MPS-47-24 **Section 2.2.5.5 Population Trends Associated with Important Fish and Shellfish Species**

Page 2-28, Line 25

Draft GEIS Supplement 22 Statement

The silverside (Menidia menidia, family Atherinidae) is a small...

Dominion Comment

Two different species of silverside are found in the area. It is suggested that the sentence be changed to:

"The silversides (*Menidia menidia/Menidia beryllina*, family Atherinidae) are small..."

MPS-47-25 **Section 2.2.5.5 Population Trends Associated with Important Fish and Shellfish Species**

Page 2-28, Line 32

MPS-47-25 **Draft GEIS Supplement 22 Statement**

Regional abundance data are not available.

Dominion Comment

Dominion notes that Gotschall et al (2003) observed similar fluctuations without trend throughout Long Island Sound.

MPS-47-26 **Section 2.2.5.6 Other Important Aquatic Resources**

Page 2-31, Line 8

Draft GEIS Supplement 22 Statement

...barnacles, the algae Fucus spp., the red alga Chondrus spp., and...

Dominion Comment

It is suggested that this sentence include *Ascophyllum nodosum,* and that it read:

"...barnacles, the brown algae *Fucus* spp. and *Ascophyllum nodosum*, the red alga *Chondrus crispus*, and...

MPS-47-27 **Section 2.2.5.6 Other Important Aquatic Resources**

Page 2-31, Line 22

Draft GEIS Supplement 22 Statement

...and the bivalve mollusc Nuculana annulata...

Dominion Comment

Change "*Nuculana*" to "*Nucula.*"

MPS-47-28 **Section 2.2.5.7 Threatened or Endangered Aquatic Species**

Page 2-33, Line 9

Draft GEIS Supplement 22 Statement

Adult-sized (10 cm [6 or more in.]) sturgeon are occasionally seen...

Dominion Comment

Dominion believes that the intent was to characterize adult-sized sturgeon as 6 feet long, rather than 6 inches.

MPS-47-29 **Section 2.2.6.1 Site Terrestrial Resources**

Page 2-36, line 10

Draft GEIS Supplement 22 Statement

...173 fledglings have been produced over this period.

Dominion Comment

As of the present time, the number of fledglings produced at Millstone stands at 186.

MPS-47-30 **Section 2.2.6.1 Site Terrestrial Resources**

Page 2-36, line 14

Draft GEIS Supplement 22 Statement

There are 18 species listed by FWS or the state of Connecticut as being known to occur on the site.

MPS-47-30 **Dominion Comment**

Dominion believes this sentence refers to the 18 species listed in Table 2-3. Some of those species have been observed on the site or along the transmission lines, and some have not been observed, but may occur. It is suggested that the sentence be changed to:

"There are 18 species listed by FWS or the State of Connecticut that have either been observed on the site or have the potential to occur in the area or along transmission lines."

MPS-47-31 **Section 2.2.6.1 Site Terrestrial Resources**

Table 2-3

Draft GEIS Supplement 22 Statement

This table lists terrestrial species known to occur or that potentially occur at Millstone or along the transmission lines.

Dominion Comment

Dominion notes the following:

- As of June 2004, the Cooper's hawk is no longer listed by the State of Connecticut.
- The piping plover is listed as "threatened" by the State of Connecticut.
- Dominion is unable to find any citation by the State of Connecticut that lists the New England cottontail as either threatened or endangered.
- The seabeach sandwort is listed by the State of Connecticut as a "special concern" species.

MPS-47-32 **Section 2.2.8.1 Housing**

Page 2-44, line 1

Draft GEIS Supplement 22 Statement

...while another 200 live in Niantic and East Lime.

MPS-47-32 **Dominion Comment**

Change "Lime" to "Lyme."

MPS-47-33 **Section 2.2.8.2 Public Services**

Page 2-47, Lines 10-12

Draft GEIS Supplement 22 Statement

A new water supply line was constructed in 2000 to supply Millstone, and this line replaced the use of two shallow low-yield wells that had been used to irrigate ball fields and supply concession stands on the Millstone site licensed to Waterford.

Dominion Comment

It is suggested that this paragraph be replaced with the following clarification:

"A new water supply line was constructed in 2000 to supply a concession stand at the ball fields licensed by Millstone to Waterford. The stand had been supplied by a shallow low-yield well, which continues to be used to irrigate the ball fields on a seasonal basis."

MPS-47-34 **Section 2.2.8.5 Demography**

Page 2-55, Line 30

Draft GEIS Supplement 22 Statement

Source: Dominion 20004a

Dominion Comment

Delete a zero in the date of the citation.

MPS-47-35 **Section 2.2.8.5 Demography**

Page 2-56, Line 35

MPS-47-35 **Draft GEIS Supplement 22 Statement**

...after September 11, 2000...

Dominion Comment

Change "2000" to "2001."

MPS-47-36 **Section 2.2.9.1 Cultural Background**

Page 2-60, Line 25

Draft GEIS Supplement 22 Statement

...Park overlooking the Thames River about 8km (5 mi) northwest of Millstone.

Dominion Comment

Change "northwest" to "northeast."

MPS-47-37 **Section 2.2.9.1 Cultural Background**

Page 2-63, Line 16

Draft GEIS Supplement 22 Statement

Actual power generation began in 1975.

Dominion Comment

Unit 1, which is not the subject of this report, began generating power in 1970. It is suggested that "at Unit 2" be inserted so sentence reads as follows:

"Actual power generation at Unit 2 began in 1975."

MPS-47-38 **Section 2.3 References**

Dominion Comment

It is suggested that the following new references be added to this list, as discussed in comments above:

"Gottschall, K.F., D.J. Pacileo, and D.R. Molnar. 2003. Job 2: Marine finfish survey. Part I: Long Island Sound trawl survey and Part II: estuarine seine survey. Pages 41-149 in: A study of marine recreational fisheries in Connecticut. CT Dept. of Envir. Prot., Bureau of Natural Resources, Fisheries Division."

and

"NEFSC (Northeast Fisheries Science Center). 2003. B1. Southern New England/Mid-Atlantic (SNE/MA) winter flounder. Pages 139-220 in Report of the 36th northeast regional stock assessment workshop (SAW): stock assessment review committee (SARC) consensus summary of assessments. NOAA/National Marine Fisheries Service, Woods Hole, MA. Accessed via:

http://www.nefsc.noaa.gov/nefsc/publications/crd/crd0306"

MPS-47-39 **Section 4.1 Cooling System**

Page 4-7, lines 38-39

Draft GEIS Supplement 22 Statement

The barrier prevents fish from entering the quarry. Since installation of the fish barriers, the licensee has not observed any fish kills related to the station discharge.

Dominion Comment

As discussed in section 4.1.3, page 4-28, lines 26-27, temperatures within the quarry occasionally exceed lethal temperature thresholds for some species. Some periodic, smaller-scale fish kills have occurred due to thermal stress for fish that entered the quarry as eggs/larvae, as juveniles, or during barrier maintenance activities. None of these occurrences have been of a magnitude that resulted in an impact to source populations, and they have been confined to the quarry. The sentences should be modified as follows:

MPS-47-39 "The barrier is designed to prevent fish from swimming into the quarry. Since installation of the fish barriers, the licensee has not observed any gas bubble disease-related fish kills related to the station discharge."

MPS-47-40 **Section 4.1.1 Entrainment of Fish and Shellfish in Early Life Stages**

Page 4-10, lines 17-19

Draft GEIS Supplement 22 Statement

Licensees are required to demonstrate compliance with the Phase II performance standards at the time of renewal of their NPDES permit.

Dominion Comment

"are" should be changed to "will be," and "at the time of renewal of their NPDES permit" should be changed to "in accordance with the provisions of the new rule" so the sentence reads as follows:

"Licensees will be required to demonstrate compliance with the Phase II performance standards in accordance with the provisions of the new rule."

MPS-47-41 **Section 4.1.1 Entrainment of Fish and Shellfish in Early Life Stages**

Page 4-10, Lines 19-21

Draft GEIS Supplement 22 Statement

Licensees may be required as part of the NPDES renewal to alter the intake structure, redesign the cooling system, modify station operation, or take other mitigative measures as a result of this regulation.

Dominion Comment

Delete the words "as part of the NPDES renewal" so the sentence reads as follows:

"Licensees may be required to alter the intake structure, redesign the cooling system, modify station operation or take other mitigative measures as a result of this regulation."

MPS-47-42 **Section 4.1.1 Entrainment of Fish and Shellfish in Early Life Stages**

Page 4-13, Table 4-4

Dominion Comment

The 2003 Annual Report (Dominion 2004b) contained minor changes to the data in this table. Also, the data columns are each $x10^6$. It is suggested that the table be replaced with the following:

MPS-47-42

Table 4-4

Estimated Number of Anchovies, Winter Flounder, American Sand Lance, Grubby, and Atlantic Menhaden Larvae Entrained Each Year from 1976 Through 2003 at Millstone and the Volume of Cooling Water on Which the Entrainment Estimates Were Based (From Dominion [2004b]).

	Anchovies		Winter Flounder		American Sand Lance[a]		Grubby		Atlantic Menhaden	
Year	No. entrained ($X10^6$)	Volume (m^3)[b] ($X10^6$)	No. entrained ($X10^6$)	Volume (m^3)[b] ($X10^6$)	No. entrained ($X10^6$)	Volume (m^3)[b] ($X10^6$)	No. entrained ($X10^6$)	Volume (m^3)[b] ($X10^6$)	No. entrained ($X10^6$)	Volume (m^3)[b] ($X10^6$)
1976	381	738	121	629	-	-	-	-	3	796
1977	418	821	29	444	81	954	30	489	2	773
1978	185	912	80	390	176	709	11	554	3	821
1979	805	786	44	343	110	919	20	546	<1	716
1980	877	633	168	562	111	960	32	699	2	643
1981	1,452	860	45	373	74	620	42	408	2	711
1982	451	635	184	638	27	932	48	648	14	743
1983	623	691	211	541	30	902	54	828	19	564
1984	189	801	84	508	18	835	38	524	4	557
1985	693	697	80	469	8	712	35	527	44	521
1986	1,096	1,208	123	1,064	4	1,577	53	844	5	1,217
1987	119	1,332	165	1,193	30	1,712	51	1,144	2	893
1988	386	1,790	184	1,173	74	1,291	112	1,132	6	791
1989	518	1,445	167	889	42	1,511	67	857	208	1,420
1990	981	1,483	133	1,174	39	1,607	47	998	33	1,367
1991	451	899	116	750	7	1,278	31	760	56	802
1992	157	1,091	492	1,076	19	1,302	76	1,293	51	1,220
1993	214	1,221	42	1,387	46	1,801	51	1,157	21	1,126
1994	507	1,033	173	920	58	899	56	843	66	868
1995	171	896	214	1,006	90	1,532	57	996	86	997
1996	24	138	51	472	18	729	41	467	23	92
1997	17	145	76	173	3	212	28	154	5	135
1998	64	480	84	358	11	440	22	300	33	615
1999	157	1,119	148	748	14	860	49	820	124	1,377
2000	75	875	333	1,003	88	1,459	47	754	466	1,571
2001	26	1,031	377	963	13	1,008	178	721	143	908
2002	28	881	119	880	6	760	33	875	1,454	1,088
2003	-	-	434	1,096	19	725	153	890	-	-

(a) Includes data from December of the previous calendar year.
(b) Volume was determined from the condenser and service cooling water flow at Millstone during the season of occurrence for each taxon.

MPS-47-43 **Section 4.1.1 Entrainment of Fish and Shellfish in Early Life Stages**

Page 4-14, Table 4-5

Dominion Comment

The 2003 Annual Report (Dominion 2004b) contained minor changes to the data in this table. It is suggested that the table be replaced with the following:

Table 4-5. Estimated Number of Cunner, Tautog, and Anchovy Eggs Entrained Each Year from 1979 through 2002 at Millstone and the Volume of Cooling Water on Which the Entrainment Estimates Were Based (From Dominion [2004b]).

	Cunner		Tautog		Anchovies	
Year	No. Entrained ($X10^6$)	Volume (m^3)[a] ($X10^6$)	No. entrained ($X10^6$)	Volume (m^3)[a] ($X10^6$)	No. Entrained ($X10^6$)	Volume (m^3)[a] ($X10^6$)
1979	1,055	423	445	680	323	383
1980	1,640	677	962	773	87	359
1981	1,535	620	1,353	620	285	583
1982	2,074	755	1,248	719	210	501
1983	1,888	462	1,019	627	411	377
1984	2,089	532	1,302	569	883	453
1985	2,809	737	1,717	774	26	441
1986	2,855	1,795	3,747	1,795	523	772
1987	4,082	1,713	3,575	1,713	31	740
1988	4,294	1,800	2,693	1,800	15	905
1989	4,306	1,436	3,001	1,510	5	632
1990	3,634	1,689	2,100	1,641	27	724
1991	4,116	1,223	1,513	1,214	105	538
1992	2,648	1,509	1,341	1,509	18	648
1993	5,379	1,492	2,048	1,492	228	626
1994	6,099	1,381	1,989	1,381	175	867
1995	5,524	1,198	2,481	1,198	29	737
1996	871	256	312	256	4	114
1997	569	185	105	134	<1	92
1998	577	718	494	709	47	376
1999	1,963	1,222	1,173	1,222	1	339
2000	4,800	1,254	2,149	1,369	<1	849
2001	4,339	1,416	3,015	1,416	8	635
2002	3,340	1,188	2,040	1,188	<1	750

(a) Volume was determined from the condenser cooling-water flow at Millstone during the season of occurrence for each taxon.

MPS-47-44 **Section 4.1.1 Entrainment of Fish and Shellfish in Early Life Stages**

Page 4-16, Line 1

Draft GEIS Supplement 22 Statement

...nonentrained, late stage larvae from reaching reproductive maturity.

Dominion Comment

It is suggested that "and subsequent juveniles" be inserted after larvae, so the sentence reads:

"...nonentrained, late stage larvae and subsequent juveniles from reaching reproductive maturity."

MPS-47-45 **Section 4.1.1 Entrainment of Fish and Shellfish in Early Life Stages**

Page 4-18, line 17

Draft GEIS Supplement 22 Statement

...cooling water entrained through the cooling system, the number of eggs entrained,...

Dominion Comment

It is suggested that "eggs" be changed to "larvae."

MPS-47-46 **Section 4.1.2 Impingement of Fish and Shellfish**

Page 4-22, lines 8-10

Draft GEIS Supplement 22 Statement

Licensees are required to demonstrate compliance with the Phase II performance standards at the time of renewal of their NPDES permit.

MPS-47-46 **Dominion Comment**

"are" should be changed to "will be," and "at the time of renewal of their NPDES permit" should be changed to "in accordance with the provisions of the new rule" so the sentence reads as follows:

"Licensees will be required to demonstrate compliance with the Phase II performance standards in accordance with the provisions of the new rule."

MPS-47-47 **Section 4.1.2 Impingement of Fish and Shellfish**

Page 4-22, lines 10-12

Draft GEIS Supplement 22 Statement

Licensees may be required as part of the NPDES renewal to alter the intake structure, redesign the cooling system, modify station operation, or take other mitigative measures as a result of this regulation.

Dominion Comment

Delete the words "as part of the NPDES renewal" so the sentence reads as follows:

"Licensees may be required to alter the intake structure, redesign the cooling system, modify station operation or make other mitigative measures as a result of this regulation."

MPS-47-48 **Section 4.1.2.1 Impingement Monitoring**

Page 4-24, Table 4-6

Dominion Comment

Dominion believes that the correct reference for this table is Jacobson et al (1998). See the comment below for Section 4.10 for the complete reference.

Also, on line 18, the species name for the rock crab is *irroratus*.

MPS-47-49 **Section 4.1.3 Heat Shock**

Page 4-29, Lines 9-15

Dominion Comment

Dominion offers the following minor edits:

Line 9, change *"concorta"* to *"contorta."*

Line 10, change *"gragile"* to *"fragile,"* and change *"Saragassum gilipendula"* to *"Sargassum filipendula."*

Line 13, change "abundance" to "nodal growth."

Line 15, change "abundance" to "growth."

MPS-47-50 **Section 4.4.2 Public Services: Public Utility Impacts During Operations**

Page 4-40, Lines 17-18

Draft GEIS Supplement 22 Statement

Millstone's 2000 to 2001 potable water usage averaged 1.257 X 10^6 L per day (3.320 X 10^6 gpd).

Dominion Comment

Change "3.320 X 10^6 gpd" to "3.320 X 10^5 gpd."

MPS-47-51 **Section 4.6.2 Terrestrial Species**

Page 4-52, Lines 33-34

Draft GEIS Supplement 22 Statement

Both the bald eagle (Haliaeetus leucocephalus) and the piping plover (Charadrius melodus) are known to occasionally use the Millstone site.

MPS-47-51 **Dominion Comment**

To Dominion's knowledge, the piping plover has not been observed on the Millstone site. Dominion believes the intent may have been to name the roseate tern, which has been observed on the site. It is suggested that the sentence be changed to:

"Both the bald eagle (Haliaeetus leucocephalus) and the roseate tern (Sterna dougallii) are known to occasionally use the Millstone site."

MPS-47-52 **Section 4.10 References**

Page 4-62

Dominion Comment

Add the following reference, as discussed above:

"Jacobson, P.M., E. Lorda, D.J. Danila, J.D. Miller, C.A. Tomichek, and R.A. Sher. 1998. Studies of cooling water intake effects at two large coastal nuclear power stations in New England. In Proceedings of a workshop on Clean Water Act Section 316(b) Technical Issues held at the Coolfont Conference Center, Berkeley Springs, WV, September 22-23, 1998. Electric Power Research Institute, Palo Alto, CA EPRI Technical Report."

MPS-47-53 **Section 8.1 No-Action Alternative**

Page 8-4, Lines 26-27

Draft GEIS Supplement 22 Statement

When the plant stops operating, there will be a reduction in use of groundwater.

Dominion Comment

The station itself does not use groundwater. The only use of groundwater is that used by the town of Waterford for seasonal irrigation of the ball fields. Therefore, closure of the plants would not necessarily result in a reduction in the use of groundwater.

MPS-47-54 **Section 8.2.5.10 Utility-Sponsored Conservation**

Page 8-50, Line 18

Draft GEIS Supplement 22 Statement

Dominion participates in State-wide residential, commercial, and industrial programs to reduce...

Dominion Comment

Dominion is not the local distributor of electricity. It is suggested that "Dominion participates in" be replaced with "Connecticut has" so the sentence reads:

"Connecticut has State-wide residential, commercial, and industrial programs to reduce..."

MPS-47-55 **Appendix H**

Page H-1, Lines 17-18

Draft GEIS Supplement 22 Statement

...or were related to a reactor coolant pump (RCP) seal loss of coolant accident (LOCA).

Dominion Comment

"loss of coolant accident (LOCA)" should be replaced with "dependency on charging pumps" so the sentence reads:

"...or were related to a reactor coolant pump (RCP) seal dependency on charging pumps."

RDB received
8/1/05

12/9/04
69FR 71437

(23)

Jean M. Thorsen
4 Bay View Avenue
Old Saybrook, CT 06475

February 20, 2005

Chief, Rules and Directives Branch
Division of Administrative Services
Office of Administration
Mailstop T-6D 59
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555-0001

Re: License Renewal Millstone 2 & 3

Dear Sir:

I attended the hearing on January 11, 2005 in Waterford, CT concerning the license renewal for Millstone. It appeared to me that your experts did an excellent job for their client, the Department of Energy.

MPS-48-1 In their comparisons of alternative methods of electricity production, I could not find a chart showing total dollar costs for production by the various alternative means.

When considering environmental costs, I feel that nuclear waste and the production of depleted uranium are the most undesirable. The cost of electricity keeps rising for Connecticut residents. As a citizen of this state I would prefer to pay more if the
MPS-48-2 power came from more environmentally friendly method of generation. Therefor, I hope you will not renew this license.

Sincerely,

Jean M Thorsen

Jean M. Thorsen

SISP Review Complete
Template = ADM-013

E-RIDS = ADM-03
Add = R.L. Emch (RLE)

RDB Received 3/1/05

12/9/04

69FR 71437

24

From: "saintrobert" <saintrobert@comcast.net>
To: <opa@nrc.gov>
Date: 2/28/05 9:01PM
Subject: Report Number NUREG-1437, Supplement 22

Please see the attached comments.

Robert Fromer

SISP Review Complete
Template=ADM-013

E-RIDS=ADM-03
Call = B.L. Emch (BLE)

P.O. Box 71
Windsor, CT 06095
February 28, 2005

Chief
Rule Review and Directives Branch
U.S. Nuclear Regulatory Commission
Mailstop T-6D59
Washington, DC 20555-0001

Re: **Draft Report For Comment on Generic Environmental Impact Statement for License Renewal of Nuclear Plants, Regarding Millstone Power Station, Units 2 and 3, NUREG-1437, Volumes 1 and 2, Supplement 22**

Dear Chief Rule Review and Directives Branch:

"[t]he problem at hand, which is that centrally generated electricity is a vulnerable genie. In order to be used it must travel on an ugly, complex and inefficient labyrinth of wires and substations Even from a security view (national or otherwise) such a fragile system is suicide." Gordes, Hartford Courant, Letter to the Editor, February 1978.

Dominion has not provided a comparative analysis and assessment of life cycle energy consumption to determine that re-licensing of Millstone is the preferred option. Nor, has Dominion considered cumulative alternatives (i.e., energy sources) to meet the current and future energy demands.

A. INTRODUCTION

"The United States Nuclear Regulatory Commission ("NRC") considered the environmental impacts of renewing nuclear power plant operating licenses ("Ols") for a 20-year period in its *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* (GEIS), NUREG-1437, Volumes 1 and 2, and codified the results in 10 Code of Federal Regulations (CFR) Part 51. In the GEIS (and its Addendum 1), the staff identifies 92 environmental issues and reaches generic conclusions related to environmental impacts for 69 of these issues that apply to all plants or to plants with specific design or site characteristics. Additional plant-specific review is required for the remaining 23 issues. These plant-specific reviews are to be included in a supplement to the GEIS." [GEIS, p. iii.]

"This draft supplemental environmental impact statement ("SEIS") has been prepared in response to an application submitted to the NRC by the Dominion Nuclear Connecticut (Dominion) to renew the OLs for Millstone Power Station, Units 2 and 3 (Millstone) for an additional 20 years under 10 CFR Part 54. This draft SEIS includes the NRC staff's analysis that considers and weighs the environmental impacts of the proposed action, the environmental impacts of alternatives to the proposed action, and mitigation measures available for reducing or avoiding adverse impacts. It also includes the staff's preliminary recommendation regarding the proposed action." Id.

Robert Fromer
Feb. 28, 2005

B. BACKGROUND

"By letter dated January 20, 2004, the Dominion Nuclear Connecticut, Inc. (Dominion) submitted an application to the U.S. Nuclear Regulatory Commission (NRC) to renew the operating licenses (OLs) for Millstone Power Station, Units 2 and 3 for an additional 20-year period. If the OLs are renewed, State regulatory agencies and Dominion will ultimately decide whether the plant will continue to operate based on factors such as the need for power or other matters within the State's jurisdiction or the purview of the owners. If the OLs are not renewed, then the plants must be shut down at or before the expiration dates of the current OLs, which are July 10 2015 for Unit 2 and November 2025 for Unit 3. The NRC has implemented Section 102 of the National Environmental Policy Act (NEPA) (42 United States Code [USC] 4321) in 10 CFR Part 51. In 10 CFR 51.20(b)(2), the Commission requires preparation of an environmental impact statement (EIS) or a supplement to an EIS for renewal of a reactor OL. In addition, 10 CFR 51.95(c) states that the EIS prepared at the OL renewal stage will be a supplement to the *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* (GEIS), NUREG-1437, Volumes 1 and 2." (Emphasis added.) [Executive Summary, p. xv.]

"Upon acceptance of the Dominion application, the NRC began the environmental review process described in 10 CFR Part 51 by publishing a notice of intent to prepare an EIS and conduct scoping. The NRC staff visited the Millstone site in May 2004 and held public scoping meetings on May 18, 2004, in Waterford, Connecticut. In the preparation of this draft supplemental environmental impact statement (SEIS) for Millstone, the staff reviewed the Dominion Environmental Report (ER) and compared it to the GEIS, consulted with other agencies, conducted an independent review of the issues following the guidance set forth in NUREG-1555, Supplement 1, the *Standard Review Plans for Environmental Reviews for Nuclear Power Plants, Supplement 1: Operating License Renewal*, and considered the public comments received during the scoping process. ..." Id.

"This draft SEIS includes the NRC staff's preliminary analysis, which considers and weighs the environmental effects of the proposed action, the environmental impacts of alternatives to the proposed action, and mitigation measures for reducing or avoiding adverse effects. It also includes the staff's preliminary recommendation regarding the proposed action." Id, xv-xvi.

"NRC regulations [10 CFR 51.95(c)(2)] contain the following statement regarding the content of SEISs prepared at the license renewal stage:

> The supplemental environmental impact statement for license renewal is not required to include discussion of need for power or the economic costs and economic benefits of the proposed action or of alternatives to the proposed action except insofar as such benefits and costs are either essential for a determination regarding the inclusion of an alternative in the range of alternatives considered or relevant to mitigation. In addition, the supplemental environmental impact statement prepared at the license renewal stage need not discuss other issues not related to the environmental effects of the proposed action and the alternatives, or any aspect of the storage of spent fuel for the facility within the scope of the generic determination in § 51.23(a) ["Temporary storage of spent

Robert Fromer
Feb. 28, 2005

fuel after cessation of reactor operation–generic determination of no significant environmental impact"] and in accordance with § 51.23(b)."

Id., xvi.

"If the Millstone operating licenses are not renewed and the units cease operation on or before the expiration of their current operating licenses, the adverse impacts of likely alternatives will not be smaller than those associated with continued operation of Millstone. *The impacts may, in fact, be greater in some areas.*" (Emphasis added.) Id., xix.

"The preliminary recommendation of the NRC staff is that the Commission determine that the adverse environmental impacts of license renewal for Millstone are not so great that preserving the option of license renewal for energy planning decisionmakers would be unreasonable. This recommendation is based on (1) the analysis and findings in the GEIS; (2) the ER submitted by Dominion; (3) consultation with other Federal, State, and local agencies; (4) the staff's own independent review; and (5) the staff's consideration of public comments received during the scoping process." (Emphasis added.) Id.

"1.3 The Proposed Federal Action

The proposed Federal action is renewal of the OLs for Millstone. The Millstone site is located in Waterford, Connecticut on the coast between the Niantic and Thames Rivers, approximately64 km (40 mi) east of New Haven, 64 km (40 mi) southeast of Hartford, and 32 km (20 mi) west of Rhode Island. Unit 2 is a Combustion Engineering-designed pressurized-water reactor with a design power level of 2700 megawatts thermal (MW[t]) and a net power output of 870 megawatts electric (MW[e]). Unit 3 is a Westinghouse-designed pressurized-water reactor with a design power level of 3411 MW(t) and a net power output of 1154 MW(e). Plant cooling is provided by a once-through cooling-water system that is withdrawn from Niantic Bay and dissipates heat by discharge into Long Island Sound. Units 2 and 3 produce electricity to meet about 50 percent of the electrical use of Connecticut. The current OL for Unit 2 expires on July 31, 2015, and for Unit 3 on November 25, 2025. By letter dated January 20, 2004, Dominion submitted an application to the NRC (Dominion 2004b) to renew these OLs for an additional 20 years of operation (i.e., until July 31, 2035, for Unit 2 and November 25, 2045, for Unit 3)." [GEIS, p. 1-8.]

"1.4 The Purpose and Need for the Proposed Action

Although a licensee must have a renewed license to operate a reactor beyond the term of the existing OL, the possession of that license is just one of a number of conditions that must be met for the licensee to continue plant operation during the term of the renewed license. Once an OL is renewed, State regulatory agencies and the owners of the plant will ultimately decide whether the plant will continue to operate based on factors such as the need for power or other matters within the State's jurisdiction or the purview of the owners. Thus, for license renewal reviews, the NRC has adopted the following definition of purpose and need (GEIS Section 1.3):

Robert Fromer
Feb. 28, 2005

> The purpose and need for the proposed action (renewal of an operating license) is to provide an option that allows for power generation capability beyond the term of a current nuclear power plant operating license to meet future system generating needs, as such needs may be determined by State, utility, and where authorized, Federal (other than NRC) decisionmakers."

[GEIS, p. 1-8.]

"This definition of purpose and need reflects the Commission's recognition that, unless there are findings in the safety review required by the Atomic Energy Act of 1954 or findings in the NEPA environmental analysis that would lead the NRC to reject a license renewal application, the NRC does not have a role in the energy-planning decisions of State regulators and utility officials as to whether a particular nuclear power plant should continue to operate. From the perspective of the licensee and the State regulatory authority, the purpose of renewing an OL is to maintain the availability of the nuclear plant to meet system energy requirements beyond the current term of the plant's license. (Emphasis added.) [GEIS, pp. 1-8 to 1-9.]

"1.5 Compliance and Consultations

Dominion is required to hold certain Federal, State, and local environmental permits, as well as meet relevant Federal and State statutory requirements. In its Environmental Review, Dominion provided a list of the authorizations from Federal, State, and local authorities for current operations, as well as environmental approvals and consultations associated with Millstone license renewal. Authorizations and consultations relevant to the proposed OL renewal action are included in Appendix E." [GEIS, p. 1-9.]

"The staff has reviewed the list and consulted with the appropriate Federal, State, and local agencies to identify any compliance or permit issues or significant environmental issues of concern to the reviewing agencies. These agencies did not identify any new and significant environmental issues. The ER states that Dominion is in compliance with applicable environmental standards and requirements for Millstone. The staff has not identified any environmental issues that are both new and significant." Id.

"8.2.5 Other Alternatives

Other generation technologies considered by NRC are discussed in the following paragraphs." [GEIS, p. .]

"8.2.5.1Wind Power

Wind power, by itself, is not suitable for large base-load electrical generation. As discussed in Section 8.3.1 of the GEIS, wind has a high degree of intermittency, and average annual capacity factors for wind plants are relatively low (less than 30 percent). Wind power, in

conjunction with energy storage mechanisms, might serve as a means of providing base-load power. However, current energy storage technologies are too expensive for wind power to serve as a large base-load generator." [GEIS, p. .]

"The State of Connecticut is in a wind power Class 2 region (average wind speeds at 10-m [30-ft]) elevation of 5.6 to 6.4 m/s [18 to 21 ft/s]). On the coast, Connecticut is in a wind power Class 3 region (average wind speeds at 10-m (30-ft) elevation of 6.4 to 7.0 m/s [21 to 23 ft/s]) (DOE 2004a). In wind power Class 2 areas wind turbines are economically marginal for development, but in Class 3 areas may be suitable with future technology (DOE 2004a)." Id.

"There are active wind power facilities in the region, and others are proposed. As of January 16 2003, there were approximately 48 MW of grid-connected wind power facilities in New York State, with an additional 410 MW of additional capacity in various stages of planning (American Wind Energy Association 2003). In addition, the U.S. Army Corps of Engineers (USACE) is preparing an environmental impact statement for a proposed wind farm to generate 420 MW(e) using 170 turbines off the coast of Massachusetts (USACE 2004)." Id.

"Access to many of the best land-based wind power sites near the coast likely would require extensive road building, as well as clearing (for towers and blades) and leveling (for the tower bases and associated facilities) in steep terrain. Also, many of the best quality wind sites are on ridges and hilltops that could have greater archaeological sensitivity than surrounding areas. For these reasons, development of large-scale, land-based wind-power facilities are not only likely to be costly, but could also have MODERATE to LARGE impacts on aesthetics, archaeological resources, land use, and terrestrial ecology." Id.

"The offshore wind speeds are higher than those onshore and could thus support greater energy production than onshore facilities. Ten offshore wind power projects are currently operating in Europe, but none have been developed in the United States. The European plants together provide approximately 250 MW(e), which is significantly less than the electrical output of Millstone (British Wind Energy Association 2003). For the preceding reasons, the staff concludes that locating a wind-energy facility on or near the Millstone site, or offshore as a replacement for Millstone generating capacity, is not only likely to be costly, but could also have MODERATE to LARGE impacts on aesthetics, aquatic ecology, and shipping lanes." Id.

"8.2.5.2Solar Power

Solar technologies use the sun's energy and light to provide heat and cooling, light, hot water, and electricity for homes, businesses, and industry. In the GEIS, the staff noted that by its nature, solar power is intermittent. Therefore, solar power by itself is not suitable for base-load capacity and is not a feasible alternative to license renewal of Millstone. The average capacity factor of photovoltaic cells is about 25 percent, and the capacity factor for solar thermal systems is about 25 percent to 40 percent (NRC 1996). Solar power, in conjunction with energy storage mechanisms, might serve as a means of providing base-load power. However, current energy storage technologies are too expensive to permit solar power to serve as a large base-load generator. Therefore, solar power technologies (photovoltaic and thermal) cannot

currently compete with conventional fossil-fueled technologies in grid-connected applications, due to high costs per kilowatt of capacity. (NRC 1996)." [GEIS, p. .]

"There are substantial impacts to natural resources (wildlife habitat, land-use, and aesthetic impacts) from construction of solar-generating facilities. As stated in the GEIS, land requirements are high - 14,000 ha (35,000 ac) per 1000 MW(e) for photovoltaic and approximately 5700 ha (14,000 ac) per 1000 MW(e) for solar thermal systems. Neither type of solar electric system would fit at the Millstone site, and both would have large environmental impacts at an alternate site." Id.

"The Millstone site receives approximately 3 to 3.5 kWh of solar radiation per square meter per day (Dominion 2004), compared to 6 to 8 kWh of solar radiation per square meter per day in areas of the western United States, such as California, which are most promising for solar technologies (DOE/EIA 2000). Because of the natural resource impacts (land and ecological), the area's relatively low rate of solar radiation, and high cost, solar power is not deemed a feasible base-load alternative to renewal of the Millstone OLs. Some solar power may substitute for electric power in rooftop and building applications. Implementation of nonrooftop solar generation on a scale large enough to replace Millstone would likely result in LARGE environmental impacts." Id.

"8.2.5.3Hydropower

Connecticut has an estimated 43.5 MW(e) of undeveloped hydroelectric resources (Idaho National Environmental and Engineering Laboratory 1995). This amount is far less than would be needed to replace the 2024 MW(e) capacity of Millstone. In Section 8.3.4 of the GEIS, the staff points out that hydropower's percentage of U.S. generating capacity is expected to decline because hydroelectric facilities have become difficult to site as a result of public concern about flooding, destruction of natural habitat, and alteration of natural river courses." [GEIS, p. .]

"In the GEIS, the staff estimated that land requirements for hydroelectric power are approximately 4.0 × 105 ha (1.0 × 106 ac) per 1000 MW(e). Replacement of Millstone generating capacity would require flooding more than this amount of land. Due to the relatively low amount of undeveloped hydropower resource in Connecticut, and the large land-use and related environmental and ecological resource impacts associated with siting hydroelectric facilities large enough to replace Millstone, the staff concludes that, on its own, local hydropower is not a feasible alternative to Millstone OLs renewal. Siting hydroelectric facilities large enough to replace Millstone would result in LARGE environmental impacts." Id.

"8.2.5.4Geothermal Energy

Geothermal energy has an average capacity factor of 90 percent and can be used for base-load power where available. However, geothermal technology is not widely used as base-load electrical generation due to the limited geographical availability of the resource and immature status of the technology (NRC 1996). As illustrated by Figure 8.4 in the GEIS, geothermal plants are most likely to be sited in the western continental United States, Alaska, and Hawaii where hydrothermal reservoirs are prevalent. There is no feasible eastern location

for geothermal capacity to serve as an alternative to Millstone. The staff concludes that geothermal energy is not a feasible alternative to renewal of the Millstone OLs." [GEIS, p. .]

"8.2.5.5Wood Waste

The use of wood waste to generate electricity is largely limited to those states with significant wood resources, such as California, Maine, Georgia, Minnesota, Oregon, Washington, and Michigan. Electric power is generated in these states by the pulp, paper, and paperboard industries, which burn wood and wood waste for electrical power generation, benefitting from the use of waste materials that could otherwise represent a disposal problem." [GEIS, p. .]

"A wood-burning facility can provide base-load power and operate with an average annual capacity factor of around 70 to 80 percent and with 20 to 25 percent efficiency (NRC 1996). The fuels required are variable and site-specific. A significant barrier to the use of wood waste to generate electricity is the high delivered-fuel cost and high construction cost per MW of generating capacity. The larger wood-waste power plants are only 40 to 50 MW(e) in size. Estimates in the GEIS suggest that the overall level of construction impact per MW of installed capacity should be approximately the same as that for a coal-fired plant, although facilities using wood waste for fuel would be built at smaller scales. Like coal-fired plants, wood-waste plants require large areas for fuel storage and waste disposal and involve the same type of combustion equipment." Id.

"Due to uncertainties associated with obtaining sufficient wood and wood waste to fuel a base-load generating facility, ecological impacts of large-scale timber cutting (e.g., soil erosion and loss of wildlife habitat), and low efficiency, the staff has determined that wood waste is not a feasible alternative to renewing the Millstone OLs." Id.

"8.2.5.6Municipal Solid Waste

Municipal waste combustors incinerate the waste and use the resultant heat to generate steam, hot water, or electricity. The combustion process can reduce the volume of waste by up to 90 percent and the weight of the waste by up to 75 percent (EPA 2001). Municipal waste combustors use three basic types of technologies: mass burn, modular, and refuse-derived fuel (DOE/EIA 2001). Mass burning technologies are most commonly used in the United States. This group of technologies processes raw municipal solid waste "as is," with little or no sizing, shredding, or separation before combustion." [GEIS, p. .]

"Growth in the municipal waste combustion industry slowed dramatically during the 1990s after rapid growth during the 1980s. The slower growth was due to three primary factors: (1) the Tax Reform Act of 1986, which made capital-intensive projects such as municipal waste combustion facilities more expensive relative to less capital-intensive waste disposal alternatives such as landfills; (2) the 1994 Supreme Court decision (*C&A Carbone, Inc. v. Town of Clarkstown*), which struck down local flow control ordinances that required waste to be delivered to specific municipal waste combustion facilities rather than the potentially lower-cost (lower fee) landfills; and (3) increasingly stringent environmental regulations that increased the

capital cost necessary to construct and maintain municipal waste combustion facilities (DOE/EIA 2001)." Id.

"The decision to burn municipal waste to generate energy is usually driven by the need for an alternative to landfills rather than by energy considerations. The use of landfills as a waste disposal option is likely to increase in the near term; however, it is unlikely that many landfills will begin converting waste to energy because of unfavorable economics, particularly with electricity prices declining in real terms. EIA projects that between 1999 and 2020, the average price of electricity in real 1999 dollars will decline by an average of 0.5 percent per year as a result of competition among electricity suppliers (DOE/EIA 2001)." Id.

"Municipal solid waste combustors generate an ash residue that is buried in landfills. The ash residue is composed of bottom ash and fly ash. Bottom ash refers to that portion of the unburned waste that falls to the bottom of the grate or furnace. Fly ash represents the small particles that rise from the furnace during the combustion process. Fly ash is generally removed from flue-gases using fabric filters and/or scrubbers (DOE/EIA 2001)." Id.

"Currently there are approximately 102 waste-to-energy plants operating in the United States. These plants generate approximately 2800 MW(e), or an average of approximately 28 MW(e) per plant (Integrated Waste Services Association 2001), much less than needed to replace the 2024 MW(e) of Millstone." Id.

"The initial capital costs for municipal solid-waste plants are greater than for comparable steam-turbine technology at wood-waste facilities. This is due to the need for specialized waste-separation and -handling equipment for municipal solid waste (NRC 1996). Furthermore, estimates in the GEIS suggest that the overall level of construction impact from a waste-fired plant should be approximately the same as that for a coal-fired plant. Additionally, waste-fired plants have the same or greater operational impacts (including impacts on the aquatic environment, air, and waste disposal). Some of these impacts would be moderate, but still larger than the environmental impacts of license renewal of Millstone. Therefore, municipal solid waste would not be a feasible alternative to renewal of the Millstone OLs, particularly at the scale required." Id.

"8.2.5.7Other Biomass-Derived Fuels

In addition to wood and municipal solid-waste fuels, there are several other concepts for fueling electric generators, including burning crops, converting crops to a liquid fuel such as ethanol, and gasifying crops (including wood waste). In the GEIS, the staff points out that none of these technologies has progressed to the point of being competitive on a large scale or of being reliable enough to replace a base-load plant such as Millstone. For these reasons, such fuels do not offer a feasible alternative to renewal of the Millstone OLs." [GEIS, p. .]

"8.2.5.8Fuel Cells

Fuel cells work without combustion and its environmental side effects. Power is produced electrochemically by passing a hydrogen-rich fuel over an anode and air over a cathode and separating the two by an electrolyte. The only by-products are heat, water, and

carbon dioxide. Hydrogen fuel can come from a variety of hydrocarbon resources by subjecting them to steam under pressure. Natural gas is typically used as the source of hydrogen." Id.

"Phosphoric acid fuel cells are generally considered first-generation technologies. These fuel cells are commercially available at a cost of approximately $4500 per kW of installed capacity (DOE 2004b). Higher-temperature, second-generation fuel cells achieve higher fuel-to-electricity and thermal efficiencies. The higher temperatures contribute to improved efficiencies and give the second-generation fuel cells the capability to generate steam for cogeneration and combined-cycle operations." Id.

"DOE has a new initiative to reduce costs to as low as $400 per kW by the end of the decade (DOE 2004b). For comparison, the installed capacity cost for a natural gas-fired, combined-cycle plant is about $456 per kW (DOE/EIA 2004a). As market acceptance and manufacturing capacity increase, natural gas-fueled fuel cell plants in the 50- to 100-MW range are projected to become available. At the present time, however, fuel cells are not economically or technologically competitive with other alternatives for base-load electricity generation. Fuel cells are, consequently, not a feasible alternative to renewal of the Millstone OLs."

C. Council on Environmental Quality Regulations, 40 Code of Federal Regulations

Sec. 1502.16. Environmental consequences.

This section forms the scientific and analytic basis for the comparisons under Sec. 1502.14. It shall consolidate the discussions of those elements required by sections 102(2)(C)(i), (ii), (iv), and (v) of NEPA which are within the scope of the statement and as much of section 102(2)(C)(iii) as is necessary to support the comparisons. The discussion will include the environmental impacts of the alternatives including the proposed action, any adverse environmental effects which cannot be avoided should the proposal be implemented, the relationship between short-term uses of man's environment and the maintenance and enhancement of long-term productivity, and any irreversible or irretrievable commitments of resources which would be involved in the proposal should it be implemented. This section should not duplicate discussions in Sec. 1502.14. It shall include discussions of:

(a) Direct effects and their significance (Sec. 1508.8).

(b) Indirect effects and their significance (Sec. 1508.8).

(c) Possible conflicts between the proposed action and the objectives of Federal, regional, State, and local (and in the case of a reservation, Indian tribe) land use plans, policies and controls for the area concerned. (See Sec. 1506.2(d).)

(d) The environmental effects of alternatives including the proposed action. The comparisons under Sec. 1502.14 will be based on this discussion.

(e) Energy requirements and conservation potential of various alternatives and mitigation measures. (Emphasis added.)

Robert Fromer
Feb. 28, 2005

(f) Natural or depletable resource requirements and conservation potential of various alternatives and mitigation measures.

(g) Urban quality, historic and cultural resources, and the design of the built environment, including the reuse and conservation potential of various alternatives and mitigation measures.

(h) Means to mitigate adverse environmental impacts (if not fully covered under Sec. 1502.14(f)).

Sec. 1508.8 Effects.

"Effects" include:

(a) Direct effects, which are caused by the action and occur at the same time and place.

(b) Indirect effects, which are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable. Indirect effects may include growth inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems.

Effects and impacts as used in these regulations are synonymous. Effects includes ecological (such as the effects on natural resources and on the components, structures, and functioning of affected ecosystems), aesthetic, historic, cultural, economic, social, or health, whether direct, indirect, or cumulative. Effects may also include those resulting from actions which may have both beneficial and detrimental effects, even if on balance the agency believes that the effect will be beneficial.

D. COMMENTS

MPS-49-1 Dominion has not provided a comparative analysis and assessment of life cycle energy consumption to determine that re-licensing of Millstone is the preferred option. Nor, has Dominion considered cumulative alternatives (i.e., energy sources) to meet the current and future energy demands.

1. Energy Considerations

a. Embodied Energy

Most people are familiar with the concept of improving the energy efficiency of buildings by reducing the operating energy they use and increasing thermal resistance to heat loss. It's a common claim that energy-efficiency measures can reduce the operating energy of an individual building by 60% or more. Comparatively, little attention has been focused, however, on recognizing or reducing the embodied energy of structures. Embodied energy, or "embedded energy," is an assessment that includes the energy required for extracting raw materials from nature, plus the energy used in primary and secondary manufacturing or construction/demolition activities to provide a finished product or result. There is embodied

Robert Fromer
Feb. 28, 2005

energy in every processed product, from a drinking cup to a car. In embodied energy terms, buildings represent a huge, relatively long-duration energy investment. Embodied energy can be defined as the quantity of energy required by all of the activities associated with some production or construction process including the acquisition of primary material, transportation, manufacturing and handling over its useful life plus the energy for demolition, recycling and/or reuse.

Take a clay brick, for example. This includes the energy to extract the clay, transport it to the brickworks, mould the brick, fire it in the kiln, transport it to the building site and put the brick into place. It also includes all the indirect energy required, i.e. all the energy required to manufacture the equipment and materials needed to manufacture a brick, e.g. trucks, kilns, mining equipment, etc. All have a proportion of their energy invested in that brick.

Embodied energy is highly dependent on factors such as geographical location, technology employed in the manufacturing/construction process, the degree of automation, mechanization and local methods of manufacture, etc. The value is by no means absolute and is different from on location to another.

Every building is a complex combination of many processed materials, each of which contributes to the building's total embodied energy. The energy required to extract and process the raw material for an individual component, as well the energy used to transport the finished product to the job site and install it, all become part of the embodied energy cost of the completed structure. Furthermore, energy involved in maintaining an individual building component, and finally removing it and recycling or otherwise disposing of it at the end of its useful life, can all be part of the embodied energy equation for a particular building material, depending on how the embodied energy is quantified.

As the operating energy required for buildings declines, the embodied energy they represent becomes a more significant percentage of the total energy buildings use over their life. In coming years, more efforts will probably be directed toward measuring and reducing the amount of embodied energy in buildings.

Where buildings no longer serve a particular use, waste includes the material debris and the demolition energy for disposal (i.e., in-state or out-of-state).

b. Need for Energy Conservation

Dr. Charles Hall, a Systems Ecologist[1] has previously testified as follows:

[1] Dr. Hall received his Doctorate of Philosophy at the University of North Carolina at Chapel Hill in the field of energy and natural resource relationships to economics, which is his primary scholarly and intellectual academic focus, studied under Dr. H.T. Odum, who is the most noted scholar in the field. Dr. Hall has published more than 160 papers and five books on energy, natural resources and its relationship to economics in prestigious journals. Dr. Hall is a full professor at the State University of New York College of Environmental Science and Forestry and has been a professor previously at the University of Montana (2 years), Cornell University

Robert Fromer
Feb. 28, 2005

1. Each dollar of cost requires the consumption of energy for meaning to that dollar. For the nation as a whole, the cost is roughly 5,000 kilocalories (i.e., 1 kilocalorie = 1,000 calories) consumed per dollar spent, roughly half a liter of oil or its equivalent as some other fuel. Certain activities, such as construction, tend to be more energy intensive per unit dollar spent. Very careful assessments of these energy costs were made in the 1970s and are still useful when corrected for inflation. Spending large amounts of money requires spending large quantities of energy for that money to have meaning;

2. An important consideration in our society is the energy expenditures of various social alternatives.... Energy consumption is the direct cause effectuating pollution, impairment or destruction of the air, water or other natural resources;

3. Any time energy is used there are environmental impacts and consequences ranging from impacts at extraction sites (e.g. oil facilities in Southern Louisiana, Alaska and Venezuela and coal mines in Wyoming or Pennsylvania), processing, fabrication and transportation and at sites of consumption (i.e. where cement or steel or bulldozers are made and also on site). These impacts include e.g. terrain disruption, sulfur dioxide emissions and so forth;

4. These impacts include essentially irrevocable changes to the atmosphere with possible severe climatic impacts. There is roughly one kilogram of carbon dioxide released per dollar of economic activity in the U.S. Thus each unit of economic activity generates very long term disruption to our atmosphere;

5. The principal source of our energy use is fossil fuel, by definition non-renewable. Our domestic petroleum and gas supplies are quite finite. For example, U.S. production of oil peaked in 1970 (as predicted by Hubbert in 1955). It has been declining steadily since then despite huge drilling investments, so that we now produce roughly half of what we did in the 70's. We make up the difference from imported oil, which now represents approximately 60 percent of our supply. It is not clear when the total world oil production will peak, but it might be as soon as about this year (predicted by Hubbert in 1968) or 2007 (predicted by Campbell in 1998). It is hard to find a prediction made by any competent researcher that pushes the peak beyond about 2030 assuming continued economic growth, and most suggest sooner. Natural gas supplies are harder to predict but might not be too different form oil. Amongst the world authorities on these estimates are my former students Cutler Cleveland and Robert Kaufmann, Director and Associate Professor of the Boston University Center for Energy and the Environment."

6. It is important to understand that there are many scientific, environmental, economic and political reasons for minimizing energy usage and waste, over foreseeable time.

(13 years) and Research Associate at the Ecosystems Center Woods Hole and Brookhaven National Laboratories.

Robert Fromer
Feb. 28, 2005

7 Historical resource planning has primarily concerned corrective considerations and .

8. Comparative energy assessments for the expected life of alternatives (a/k/a life-cycle energy assessment) provide the best scientific basis for selecting the preferred option to demolition for conservation of energy and natural resources.

c. Life Cycle Energy Analysis and Assessments.

This tool provides accurate energy analysis of projects (e.g., residential/commercial/industrial facilities) resulting in detailed reports designed to reduce energy consumption, greenhouse gas emissions and meet statutory energy requirements by comparative assessments of alternatives directed towards selection of the preferred option.

(1) Assessment of the phases of a product's lifecycle

Every product, service or facility has impacts on the environment. Those impacts don't just effect operations but also all activities from "cradle to grave":

Raw materials: The materials that are used to manufacture the product are either extracted from the Earth by mining, drilling and similar processes, or they are recycled from previous products.

Manufacturing/Fabrication/Assembly: In order to fabricate the product, a factory consumes energy and materials. Some of the materials, especially process chemicals, do not end up in the product, but rather are discarded and therefore have environmental impacts that are not easily known by the consumer.

Packaging, storage and transportation: The packaging used to transport and sell the product consumes energy and materials in its manufacture. Transportation of the product from the factory to store shelves, and then to the purchaser's home, also costs energy. Even storage of the product in a warehouse has impacts associated with construction and use of the warehouse.

Use: Some products have large environmental impacts while they are under use by the consumer. For instance, automobiles output large quantities of air pollutants and greenhouse gases as they are used, and homes consume large quantities of energy when they are heated and cooled.

Disposal: Most discarded products become "municipal solid waste," meaning they are either buried in a landfill or incinerated. Some products are partially or fully recycled, a process that itself requires certain amounts of heat, transportation and chemicals.

(2) Environmental (Energy) Impacts

Traditionally, environmental impacts of a given activity or project are catalogued across a spectrum of environmental realms, for instance, air quality, water quality and land use.

Robert Fromer
Feb. 28, 2005

However, of far greater significance are the environmental impacts of each phase of a project's lifecycle by measuring the total energy consumed during that phase.

By adding together the energy consumed in each project's phase, one can calculate an energy content for the product: the total amount of energy consumed during the project's entire lifetime. The projected energy consumed then becomes the "analytical embodied energy" of the project, and is a rough but effective measure of that project's total environmental impact.

Example of Life Cycle Analysis

The automobile instrument panel (IP) is a complex component that is fabricated of numerous parts and must fulfill a variety of requirements. As the engineering manager for one of the major automotive companies, your responsibility is to design and manufacture instrument panels for one of your company's most popular vehicles. For the current version of this vehicle, the structural parts of the IP are built primarily of steel. However, for the 1999 model, you and your staff are evaluating a design that is lighter and replaced much of the steel with magnesium.

Issue

Thus far, the new design appears to meet all of your company's safety, aesthetic, cost and other criteria. However, a recent technical report indicated that the material production energy of magnesium is much greater than that of any other materials used in current IP's. Since one of your company's objectives is to lower the life cycle energy of the instrument panel, you must now assess if the new design will achieve this objective. Does the new design lower the life cycle energy of the instrument panel? Please show your calculations and state assumptions.

Data

Material Production Data

Material	Material Production Energy (MJ/kg)	Current Design (kg)	New Design (kg)
Steel	40	10	4
Magnesium	285	0	3
Polyurethane Foam	72	3	3
PVC	65	2	2
Other Plastic	93	10	8
TOTAL		25	20

Manufacturing Phase Data

- Approximately 500 MJ/IP are required to produce either the current or new design.

Use Phase Data

- Average car last 180,000 km.

Robert Fromer
Feb. 28, 2005

- For this model of car, 1.0 MJ of energy are consumed to move one kg of weight for a distance of 1,000 km, i.e. the efficiency factor is 1.0 MJ/(kg*1000 km).

End of Life Phase Data

- For either design, a total of 10 MJ/IP are consumed during the shredding and other end of life processes.

Key Assumption:

The mass of each material in the product is equal to the mass of each material required for manufacturing. This assumes no scrap is generated.

Life Cycle Analysis

Material production:

$E_{material} = E_{steel} + E_{magnesium} + E_{polyurethane} + E_{PVC} + E_{other}$

$E_{current}$ = 10 kg * 40 MJ/kg + 0 kg * 285 MJ/kg + 3 kg * 72 MJ/kg + 2 kg * 65 MJ/kg + 10 kg * 93 MJ/kg
= 400 MJ + 0 MJ + 216 MJ + 130 MJ + 930 MJ
$E_{current}$ = 1676 MJ

E_{new} = 4 kg * 40 MJ/kg + 3 kg * 285 MJ/kg + 3 kg * 72 MJ/kg + 2 kg * 65 MJ/kg + 8 kg * 93 MJ/kg
= 160 MJ + 855 MJ + 216 MJ + 130 MJ + 744 MJ
E_{new} = 2105 MJ

Manufacturing Phase Data

E_{mfg} = 500 MJ for both the current and new designs

Use Phase Data

E_{use} = 1.0 MJ/(kg * 1000 km) * 180,000 km * W_{IP}
$E_{current}$ = 1.0 MJ/(kg * 1000 km) * 180,000 km * 25 kg
= 4500 MJ

E_{new} = 1.0 MJ/(kg * 1000 km) * 180,000 km * 20 kg
= 3600 MJ

End of Life Phase Data

E_{eol} = 10 MJ for both the current and new designs

Total Life Cycle Energy

$E_{total} = E_{material} + E_{mfg} + E_{use} + E_{eol}$

$E_{current}$ = 1676 MJ + 500 MJ + 4500 MJ + 10 MJ
= 6686 MJ

E_{new} = 2105 MJ + 500 MJ + 3600 MJ + 10 MJ
= 6210 MJ

Therefore, we can see that the new design does lower the life cycle energy of the instrument panel.

E. CONCLUSIONS

Dominion has not provided a comparative analysis and assessment of life cycle energy consumption to determine that re-licensing of Millstone is the preferred option. Nor, has Dominion considered cumulative alternatives (i.e., energy sources) to meet the current and future energy demands.

Cordially,

Robert J. Fromer

Robert Fromer
M.S.E.E., P.E., P.C., R.E.P.

Robert Fromer
Feb. 28, 2005

REFERENCES

40 CFR Part 1502. 16. Code of Federal Regulations, "Environmental Impact Statement", Council on Environmental Quality - Regulations for Implementing NEPA

Life Cycle Assessment Reviews:

Electric vs. Gasoline Automobiles. Seikei University, 2001
Lifestyle Impact Ratings. Union of Concerned Scientists, 1999
Manufacture vs. Use of Automobiles. Carnegie Mellon University, 1998
Reusable vs. Disposable Cups. University of Victoria, 1994
Product Packaging. Tellus Institute, 1992
Cloth vs. Disposable Diapers. Franklin Associates, Ltd., 1992
Paper vs. Plastic Bags. Franklin Associates, Ltd., 1990
Life Cycle Energy, Costs, and Strategies for Improving a Residential House. Journal of Industrial Ecology, Vol. 4, Issue 2 - Spring 2000

Appendix A, Part 3. Written Comments on the Draft EIS

RDB Received 3/8/05

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 1
1 CONGRESS STREET, SUITE 1100
BOSTON, MASSACHUSETTS 02114-2023

12/7/04
69FR 71437

OFFICE OF THE REGIONAL ADMINISTRATOR

25

March 2, 2005

Chief, Rules Review and Directives Branch
U.S. Nuclear Regulatory Commission
Mail Stop T6-D59
Washington, DC 20555-0001

Re: Draft Supplemental Environmental Impact Statement (DSEIS) for License Renewal of Nuclear Plants at the Millstone Power Station, Units 2 and 3, NUREG-1437, Supplement 22 (EPA ERP #NRC-B06005-CT)

Dear Sir/Madam:

In accordance with our responsibilities under the National Environmental Policy Act (NEPA) and Section 309 of the Clean Air Act we have reviewed the Nuclear Regulatory Commission's (NRC's) Draft Supplemental Environmental Impact Statement (DSEIS) for relicensing of Units 2 and 3 of the Millstone Nuclear Power Station in Waterford, Connecticut.

As described in the DSEIS, Dominion Nuclear Connecticut, Inc. (Dominion) as submitted an application to NRC for renewal of the operating licenses for an additional 20 years. The current operating licenses expire in 2015 for Unit 2 and 2025 for Unit 3. The DSEIS was prepared to provide site specific information to supplement NRC's 1996 Generic EIS for License Renewal of Nuclear Plants. It contains the NRC staff's preliminary recommendation that adverse environmental effects of license renewal at Millstone are not so great that preserving the option of license renewal would be unreasonable.

Our comments on the DSEIS, which are contained in the attachment to this letter, highlight areas where we believe additional information is needed to more fully describe the impacts of the Millstone facility. Specifically, these comments address the environmental impacts of operation, including entrainment and impingement of fish and shellfish, impacts from heat shock, and cumulative impacts. We encourage the NRC to address these issues prior to the close of the NEPA process. We also recognize that the intake and discharge of water at Units 2 and 3 are regulated under the Clean Water Act's National Pollutant Discharge Elimination System (NPDES) permit, administered in Connecticut by the Connecticut Department of Environmental Protection (CTDEP). As discussed in the DSEIS, Dominion has submitted an application to the CTDEP for renewal of the NPDES permit. The comments in this letter are based solely on our review of the information in the NRC's DSEIS from the standpoint of what is required by NEPA and are not intended to address the requirements of the Clean Water Act NPDES permit.

SESP Review Complete

E-RFDS = ADM-03
Cell = R.L. Emch (RLE)

617-918-1010
Internet Address (URL) • http://www.epa.gov/region1

Template = ADM-013

For the reasons discussed above (and in the attachment which follows), EPA has rated this DSEIS "EC-2 Environmental Concerns-Insufficient Information" in accordance with EPA's national rating system, a description of which is attached to this letter. We look forward to reviewing responses to the issues highlighted in this letter and technical attachment in the Final Supplemental Environmental Impact Statement (FSEIS). My staff is available to provide additional input, as necessary, to help the NRC respond to the issues discussed in this letter. Please feel free to contact me or Timothy Timmermann of the Office of Environmental Review at 617/918-1025 if you wish to discuss these comments further.

Sincerely,

Robert W. Varney
Regional Administrator

Attachment

cc:

Gina McCarthy, Commissioner, Connecticut Department of Environmental Protection

Summary of Rating Definitions and Follow-up Action

Environmental Impact of the Action

LO–Lack of Objections
The EPA review has not identified any potential environmental impacts requiring substantive changes to the proposal. The review may have disclosed opportunities for application of mitigation measures that could be accomplished with no more than minor changes to the proposal.

EC–Environmental Concerns
The EPA review has identified environmental impacts that should be avoided in order to fully protect the environment. Corrective measures may require changes to the preferred alternative or application of mitigation measures that can reduce the environmental impact. EPA would like to work with the lead agency to reduce these impacts.

EO–Environmental Objections
The EPA review has identified significant environmental impacts that must be avoided in order to provide adequate protection for the environment. Corrective measures may require substantial changes to the preferred alternative or consideration of some other project alternative (including the no action alternative or a new alternative). EPA intends to work with the lead agency to reduce these impacts.

EU–Environmentally Unsatisfactory
The EPA review has identified adverse environmental impacts that are of sufficient magnitude that they are unsatisfactory from the standpoint of public health or welfare or environmental quality. EPA intends to work with the lead agency to reduce these impacts. If the potentially unsatisfactory impacts are not corrected at the final EIS stage, this proposal will be recommended for referral to the CEQ.

Adequacy of the Impact Statement

Category 1–Adequate
EPA believes the draft EIS adequately sets forth the environmental impact(s) of the preferred alternative and those of the alternatives reasonably available to the project or action. No further analysis or data collection is necessary, but the reviewer may suggest the addition of clarifying language or information.

Category 2–Insufficient Information
The draft EIS does not contain sufficient information for EPA to fully assess environmental impacts that should be avoided in order to fully protect the environment, or the EPA reviewer has identified new reasonably available alternatives that are within the spectrum of alternatives analyzed in the draft EIS, which could reduce the environmental impacts of the action. The identified additional information, data, analyses, or discussion should be included in the final EIS.

Category 3–Inadequate
EPA does not believe that the draft EIS adequately assesses potentially significant environmental impacts of the action, or the EPA reviewer has identified new, reasonably available alternatives that are outside of the spectrum of alternatives analyzed in the draft EIS, which should be analyzed in order to reduce the potentially significant environmental impacts. EPA believes that the identified additional information, data, analyses, or discussions are of such a magnitude that they should have full public review at a draft stage. EPA does not believe that the draft EIS is adequate for the purposes of the NEPA and/or Section 309 review, and thus should be formally revised and made available for public comment in a supplemental or revised draft EIS. On the basis of the potential significant impacts involved, this proposal could be a candidate for referral to the CEQ.

ADC-1

Additional Detailed Comments
Draft Supplemental Environmental Impact Statement (DSEIS) for
License Renewal of Nuclear Plants at the Millstone Power Station, Units 2 and 3,
NUREG-1437, Supplement 22

Comments on Chapter 2 - Description of Nuclear Power Plant and Site, and Plant Interaction with the Environment

MPS-50-1 Pg. 2-1. The DSEIS identifies the years when construction began for each of Millstone's three units, but does not mention when the units came on line for commercial production of electricity. These dates, as well as dates when each unit was offline for extended periods, would be helpful in reviewing fish impingement and entrainment data, and should be included in the FSEIS.

MPS-50-2 Pg. 2-7. Intake velocity is estimated to be about 0.2 meters per second in front of the Unit 2 structure. The DSEIS does not state at what distance from the intake screen the velocity was measured. Intake velocity should be presented in feet per second and should be estimated as through-screen velocity, not in front of the screen, which estimates approach velocity. Additionally, no intake velocity data are provided for Unit 3. This information is important for assessing the potential of the intake structure to impinge organisms, and should be provided in the FSEIS.

MPS-50-3 Pg. 2-7. The DSEIS identifies some features of the intake structure (e.g., traveling screens, fish return trough), but additional information is needed to assess the adequacy of the system for returning fish and other organisms in good condition, as well as the potential to re-impinge organisms that have been discharged from the fish return troughs. We recommend that the FSEIS include information on the water pressure(s) of the spray wash system used to remove fish and debris from the traveling screens, the frequency at which the traveling screens are rotated, a spatial-view diagram that includes the location of the intake structures and fish return troughs of each unit, and any other information pertaining to system design or operation that may affect the impingement of organisms and the likely condition of those that are impinged.

Comments on Chapter 4 - Environmental Impacts of Operation

Among the various potential impacts to the environment associated with the operation of a power plant that utilizes once-through cooling water technology, the NRC identifies three issues that warrant a site-specific review at Millstone, identified in the DSEIS as Category 2 issues. These are 1) entrainment of fish and shellfish, 2) impingement of fish and shellfish, and 3) "heat shock". The following comments identify information that we believe should be provided in the FSEIS.

ADC-2

Entrainment

MPS-50-4 In Section 4.1.1 entitled "Entrainment of fish and shellfish in Early Lifestages," we could not find data or discussion about shellfish resources. While shellfish larvae may represent a small fraction of the total composition of all larvae entrained, we recommend that the FSEIS include a discussion about species such as lobster, which has suffered significant declines throughout Long Island Sound. Larval lobster are entrained at other coastal plants, and it is likely that there is some loss occurring at Millstone associated with the daily withdrawal of up to 2.1 billion gallons of water. We recommend that the FSEIS address the entrainment of larval lobster, blue crab, and other shellfish of commercial and recreational interest.

MPS-50-5 Pg. 4-12. Table 4-3 (Percent Composition of Fish Larvae and Eggs) is unclear on what the significance of the dates is for each column, and why dates for larvae differ from those for eggs. In addition, it is unclear why a 26-year average of percent composition data for larvae is compared to data from one year (2002-03). We believe it would be more useful to provide a graph that depicts how percent composition has changed annually over the past 27 years. We recommend that the graph include, at minimum, bay anchovy, winter flounder, Atlantic menhaden, American sandlance, grubby, tautog, and cunner.

MPS-50-6 Pg. 4-13. Table 4-4 presents larvae entrainment data for select species of fish. As presented, this table is not clear as to how many larvae are entrained on an annual basis. While knowing larval concentration (i.e., the number of larvae per volume of water sampled) is important in understanding the seasonal variations in larval abundance for each species, it does not in itself provide a clear sense of the annual loss of larvae from the plant's operation. We recommend that this table be replaced or accompanied by a table in the FSEIS that lists the estimated total larvae for each species entrained annually from 1976 - 2003. While the entrainment numbers may reflect differences in operating schedules from year to year and such considerations should be noted where they exist, of greatest interest is the number of larvae for each species being removed from the system. We recommend that that number be provided in the FSEIS.

Pg. 4-14. Table 4-5 presents similar data to Table 4-4, but for eggs of three fish species. However, Table 4-5 presents what appears to be the total numbers of eggs entrained annually and a volume that corresponds with the volume withdrawn during the period when these eggs were likely to be entrained. This may be what the DSEIS was intended to illustrate in Table 4-4 (the number listed multiplied by 1 million), but it was not noted on the headers of each column.

MPS-50-7 While an understanding of how many eggs and larvae are entrained annually is important, the significance of those numbers varies from species to species based on a number of variables including species fecundity, age to maturity, estimated annual mortality, recruitment, and status of the local population. Another consideration that we recommend be addressed is whether a species is an important forage source to local predatory species, and what the loss of their eggs and larvae represent in terms of foregone productivity to the local ecosystem. These analyses were likely performed by Millstone, and we recommend that the FSEIS provide additional information on what the loss of eggs and larvae represent in terms of adult equivalents, and the amount of

ADC-3

MPS-50-7
MPS-50-8

production foregone for forage species. Additionally, for species that are exhibiting depressed local stocks, such as winter flounder and cunner, we recommend that information on spawning stock biomass forgone also be provided. The loss of one adult winter flounder could represent the cumulative loss of future egg production for 14 years, or more.

MPS-50-9

Pg. 4-21. The DSEIS concludes that impacts to the Niantic River winter flounder population from entrainment is "moderate," though it suggests fishing mortality plays a much more significant role. Other stressors, including rising water temperatures, are also cited as possible contributing factors. According to the DSEIS (pg.1-4), "moderate" is defined as "Environmental effects are sufficient to alter noticeably, but not to destabilize, important attributes of the resource." From our review of the DSEIS, there seems to be general agreement that the Niantic River winter flounder stock has been destabilized, that multiple stressors are contributing to this condition, and that the entrainment of larvae at Millstone (e.g., 492 million in 1992) is one of the contributing stressors.

The DSEIS concludes that the NRC has no role in mitigating for entrainment impacts since such impacts are regulated under the Clean Water Act. We agree that these impacts are regulated under CTDEP's NPDES permit. However, we believe that under NEPA, the FSEIS needs to fully evaluate and disclose the potential environmental impacts from this operation, and identify possible operational and technology alternatives that could effectively mitigate for the loss of aquatic resources. The DSEIS correctly identifies the unique vulnerabilities associated with the winter flounder's habitat of returning to natal systems to spawn, suggesting that localized impacts could dramatically influence local population dynamics. However, the DSEIS includes only a very limited discussion on mitigation alternatives, and suggests that any reduction in entrainment losses would lessen the impact of the plant on the Niantic River winter flounder population. This assessment does not fully document the plant's impact on the decline of local winter flounder stocks.

MPS-50-10

Pg 4-20. The DSEIS concludes that there is no clear evidence of entrainment impact on species other than winter flounder. While other species may not exhibit the same site fidelity for spawning that winter flounder exhibit, data presented in the DSEIS indicate there is a potential cause for concern that additional losses associated with entrainment to already depressed fish stocks, such as bay anchovy and cunner, could impede stock recovery, at least locally. We believe that entrainment impacts to fish populations that are regionally depressed should receive closer scrutiny in the FSEIS.

MPS-50-11

The DSEIS notes that populations of sandlance, bay anchovy, and cunner have been depressed for decades. Anchovy populations reached a 27-year low in 2002. On pg. 4-27, the DSEIS states that anchovy declines appear to be reflecting a regional decline in the stock, but on pg. 2-28 it states that population data for anchovy are not available for Long Island Sound or the Mid-Atlantic region, and therefore "...it is not possible to assess whether decreasing abundance of this species near Millstone is a reflection of regional populations". For the FSEIS, we recommend that Millstone's potential impacts to anchovy populations be reassessed and clarified.

ADC-4

Impingement

MPS-50-12 Pg. 4-24. Table 4-6 provides impingement data for Units 1 and 2. Apparently, no data was collected for Unit 3 based on survival studies that indicated high survival rates for demersal species during cool and cold water periods. Pelagic species, including long-finned squid, bay anchovy, and Atlantic silversides, had poor rates of survival year-round. While these studies may provide some sense of the fish return system's effectiveness for demersal species in cool or cold water conditions, it also clearly demonstrates that some species such as bay anchovy and menhaden are not likely to survive impingement. In addition, it does not indicate what the survival rate is during the warm water months of summer and early fall when the newest year class of some species such as winter flounder are likely to be present in the vicinity of the intakes, and vulnerable to impingement. We recommend that Information on survival rates of demersal species during warmer periods be included in the FSEIS.

MPS-50-13 The DSEIS states (pg. 4-23) that the highest annual impingement of winter flounder for Unit 2 and 3 combined was 2,446 fish, in 1986. However, Table 4-6 indicates that the largest annual impingement of winter flounder was estimated to be 23,554. The table does not mention whether the number reflects impingement rates for Unit 3. The FSEIS should clarify the estimate of total annual impingement for winter flounder and other species listed in Table 4-6 that reflects impingement numbers for all units together.

MPS-50-14 The DSEIS states (pg. 4-27) that the measures in place at Millstone Units 2 and 3 provide mitigation for impacts related to impingement, and no new measures are warranted. This conclusion is a departure from NRC's approach taken for entrainment which is to defer the issue of mitigation to the CTDEP. It is unclear why the DSEIS advises that no further mitigation is warranted for impingement, but for entrainment impacts which the NRC believe are moderate, the question of need for, and alternative ways to accomplish, mitigation is largely deferred. As noted above, we believe that under NEPA, a discussion of appropriate mitigation alternatives should be in the FSEIS. In addition, we recommend that the FSEIS not view entrainment and impingement as mutually exclusive impacts, but instead assess the combined effects of entrainment, impingement, and the thermal plume on species such as winter flounder and anchovy that are vulnerable to two or all of these stressors.

Heat Shock

MPS-50-15 Pg 4-27. This section of the DSEIS provides a limited discussion of some potential environmental impacts associated with the discharge of heated effluent. The use of the term "heat shock" implies a fairly limited scope of review for a pollutant (i.e., heat) that can affect aquatic organisms and their habitats in many ways. We recommend that the FSEIS's discussion be expanded to address heat's less conspicuous ability to: 1) preclude the use of affected areas by temperature-sensitive species; 2) attract and expose organisms to areas of elevated temperature during spawning periods; and 3) expose eggs and larvae to water temperatures well above levels that are typical under ambient conditions.

MPS-50-15 While thermal plumes tend to remain near the surface during most of the year, they have been known to become negatively buoyant during the colder winter periods. If this is the case at Millstone, or if the thermal plume affects the entire water column in shallow areas of Niantic Bay, we recommend that the FSEIS address how the plume might affect adult winter flounder entering Niantic Bay in the winter months en route to spawning grounds in the Niantic River. The 8,000 foot thermal mixing zone, in which temperatures are permitted to exceed ambient levels by 4°F, appears to cover most of Niantic Bay. We recommend that the FSEIS provide a spatial-view graphic depicting maximum temperatures of the thermal plume under various tidal conditions and seasons, and a more comprehensive analysis of the potential sub-lethal effects caused by the thermal plume.

The DSEIS contains a preliminary conclusion that potential impacts to fish and shellfish due to heat shock are small, and that no new mitigation measures are warranted (pg. 4-29). As stated above, EPA believes that the FSEIS should provide a broader review to ensure that all of the possible thermal effects associated with Millstone's daily discharge of up to 2.1 billion gallons of heated water are adequately assessed. We recommend that the FSEIS re-evaluate Millstone's thermal impacts, at least for winter flounder, before reaching a final conclusion on this issue.

Cumulative Impacts

MPS-50-16 The DSEIS (pg. 4-57) identifies fishing mortality, entrainment from Millstone water withdrawals, environmental changes associated with regional increases in water temperature, and predator-prey interactions as the primary stressors contributing to continuing low winter flounder population levels in the Niantic River area. EPA agrees that there are multiple stressors affecting winter flounder, but we believe that other impacts from Millstone besides entrainment may be helping to impede stock recovery, if not contributing to the population decline.

Impacts from impingement on winter flounder and other depressed stocks have an additive effect to entrainment losses, and we recommend that they be discussed in the assessment of cumulative impacts. In addition, while the thermal plume from Millstone may not be causing acute mortality to winter flounder and other species, non-lethal effects may have a significant effect to the Niantic Bay area. According to the DSEIS, water temperatures in Long Island Sound (LIS) have increased over a 25-year period by 2.8°F/1.8°F (daily/annual mean). Temperatures in Millstone's mixing zone are permitted to be up to 4.0°F higher than ambient. The DSEIS states that elevated water temperatures in LIS may be a major contributing factor to the flounder's decline, but the report does not address possible effects elevated temperature from Millstone's thermal plume has on Niantic Bay, most of which is contained within the designated thermal mixing zone. If there is information supporting a conclusion that thermal effects are not having any adverse impacts on winter flounder behavior, spawning success, habitat use, young-of-year survival, changes in trophic dynamics or forage opportunities, we recommend that it be included in the FSEIS.

We recommend that the FSEIS provide maps with depictions of the thermal plume on multiple stages of the tide. These maps should include known aquatic resources, such as shellfish beds, fish spawning and nursery habitats and fish migration routes.

ADC-6

RDB received 3/3/05

CONNECTICUT COALITION AGAINST MILLSTONE

www.mothballmillstone.org

March 2,2005

12/9/04
69FR71437
(26)

Chief
Rules and Directives Branch
Division of Administrative Services
Office of Administration
Mailstop T-6D59
U.S. Nuclear Regulatory Commission
Washington DC 20555-0001

Re: Millstone Nuclear Power Station/Draft Environmental Impact Statement

Dear Sirs:

The Connecticut Coalition Against Millstone submits herewith preliminary comments concerning the draft Environmental Impact Statement (EIS) which the NRC staff has prepared in support of relicensing of Millstone nuclear reactors Units 2 and 3 to extend their terms to the years 2035 and 2045 respectively. These comments will be supplemented with a separate filing with attachments.

MPS-51-1 The Coalition strongly opposes Millstone relicensing.

The data available to the U.S. Nuclear Regulatory Commission in its environmental review establishes a clear link between Millstone's radiological and chemical discharges to the environment and **major health effects** in the surrounding community.

The data reviewed by the NRC is alarming.

MPS-51-2 The data strongly suggests – and indeed does so almost to a certainty – that Dominion Nuclear Connecticut, Inc. is operating and will continue to operate the Millstone Nuclear Power Station in violation of NRC regulations requiring limiting doses to the public of 15 millirems per year to any organ.

1

Put another way, the data strongly suggests that Dominion's Millstone daily operations exceed the permissible dose of radiation to the public and will continue to do so during the proposed relicensing period.

Based on Dominion's own reporting of radiation sampling in the environment, the Coalition believes the available data reviewed by the NRC for the years 2001, 2002 and 2003 prove that routine operations of Millstone are in violation of federal health standards and are illegal.

MRC-51-3 By its own admission, the NRC confined its review of Millstone radiological releases, for Environmental Impact Statement purposes, to the years 2001,2002 and 2003. ("Radioactive Waste Management Systems and Effluent Control Systems 2.1.4," DEIS at 2-9) (No explanation is provided in the DEIS as to why the years 1970-2000 and the year 2004 – with the most current data – were excluded from review.)

MRC-51-4 The Annual Radiological Environmental Operating Report submitted by Dominion Nuclear Connecticut, Inc. to the NRC for the year 2001 – one of the few reports the NRC specifically identified that it had reviewed in its EIS procedure - contains the following information:

> On September 19, 2001, a concentration of strontium-90 of 55.5 picoCuries per liter (pCi/l) was measured in a sample of goat milk taken from a location 5.5 miles north-northeast of the Millstone Nuclear Power Station. The uncertainty factor reported was plus or minus 5.3 pCi/L.

A concentration of 55.5 picoCuries per liter is an "extremely large concentration, close to twice the highest concentration measured in Connecticut pooled milk at the height of nuclear weapons testing in 1963 of 23 pCi/L," according to a report dated March 1, 2005 by Dr. Ernest J. Sternglass, Professor Emeritus of Radiological Physics at the University of Pittsburgh School of Medicine and an acknowledged pioneer in the field of the effects of low-level ionizing radiation on living cells. The report appears annexed hereto as Exhibit A.

MPS-51-4 Moreover, according to Dr. Sternglass, since the measured value is ten times as large as the measurement uncertainty, "this is an extremely significant result, with an astronomically small chance that it is a statistical fluctuation."

Put into perspective, an individual drinking two eight-ounce glasses of the strontium-90-contaminated goat milk on a daily basis would receive a maximum permissible dose of radiation – under NRC guidelines – within 30 days.

This assumes no other radiological contamination of the milk. However, strontium-90 never appears alone in the environment. When the radiological effects of identified concentrations of radionuclides also reported in the same goat milk sample - cesium-134, cesium-137, iodine-131, barium-140 and others – are considered, the effect is even more damaging and far less milk would need to be consumed over fewer days before the maximum permissible radiation does established by federal law would be exceeded, according to Dr. Sternglass.

'The dose to bone or the bone marrow when other fission products are present is some 5 to 6 times greater than from strontium-90 alone, and the Dominion reports for goat milk show significant concentrations of other fission products, such as cesium-137, in significant concentrations," Dr. Sternglass states in his report, Exhibit A.

'Using the NRC NUREG 1.109 dose factor of 0.0172 mrem/pCi/l [millirem] from Table A-5, a mere 2.4 pCi/l daily intake results in the maximum permissible dose to any organ of 15 mrem per year set by NRC guidelines, 23 times the amount measured in a single liter," according to the Sternglass report.

Attached to Dr. Sternglass' report are measurements, reported to the NRC by Dominion, of strontium-90 in goat milk sampled at locations within 5 miles of Millstone during the years 2001, 2002 and 2003.

MPS-51-4 The reported samples of measurements show concentrations of 13 to 14 pCi/l on other days during the three-year period. According to Dr. Sternglass, these are also significantly high readings since strontium-90, concentrating in milk due to atmospheric nuclear weapons testing which ended in 1980, has declined to less than 1 pCi/l in areas far removed from any nuclear reactors.

Since the samples are collected by Dominion only twice a month, it is unknown whether actual concentrations on other days exceeded the levels reported.

In 1997, Millstone's previous owner, Northeast Utilities, persuaded the NRC to permit it to discontinue sampling for strontium-90 in its air filter monitoring program. As the 1997 Annual Radiological Environmental Operating report states:

> Section 4.5 Air Particulate Strontium (Table 5)
> Table 5 in past years was used to report the measurement of Sr-89 and Sr-90 in quarterly composited air particulate filters. These measurements are not required by the Radiological Effluent Monitoring Manual (REMM) and have been discontinued. Previous data has shown the lack of detectable station activity in this media. This fact, and the fact that milk samples are a much more sensitive indicator of fission product existence in the environment, prompted the decision for discontinuation. In the event of widespread plant related contamination or special events such as the Chernobyl incident, these measurements may be made.

MPS-51-5 Strontium-90 is among the most deadly byproducts of nuclear fission. Once ingested, its highly-energetic electrons damage and cause mutations in nearby cells. Exposure to low levels of strontium-90 and other bone-seeking radioactive chemicals routinely released by nuclear power plants does not merely increase the risk of bone cancer or leukemia, but it weakens the immune defenses provided by the white cells of the blood that originate in the bone marrow. See Declaration of Ernest J. Sternglass (August 8, 2004) submitted to the NRC in In the Matter of Dominion Nuclear Connecticut, Inc., Docket No. 50-336-LR, 50-423-LR, ASLBP No. 04-824-01-LR, annexed hereto as Exhibit B.

MPS-51-5 'As recently shown in the 2003 report by the European Committee on radiation Risk, numerous epidemiological and laboratory studies have shown that the risk of cancer and other diseases produced by local internal doses to critical organs from fission products that are inhaled or ingested have been underestimated by extrapolation from high external doses by factors of hundreds to thousand of times," according to the Sternglass report, Exhibit A.

"This explains why it now appears that releases from nuclear plants, often acting synergistically with other environmental pollutants, are a major neglected reason for the recent rise of illness and deaths both among newborns and the elderly observed in the U.S. in the last two decades, as also discussed in the ECRR report," according to Dr. Sternglass. Id.

For these reasons, it is my professional opinion that the Millstone Nuclear Plant should not be relicensed," Dr. Sternglass stated. In his report, Exhibit A.

The Coalition has previously submitted, in these and the related Atomic Safety and Licensing Board proceedings, documentation from Joseph Mangano and Michael Steinberg which links the Millstone radiological effluent releases – including strontium-90 - to significant negative health consequences in the community. These documents are incorporated by reference herein.

CONNECTICUT COALITION AGAINST MILLSTONE

Nancy Burton

Please address correspondence to:
Nancy Burton
147 Cross Highway
Redding Ridge CT 06876
Tel. 203-938-3952

5

Exhibit "A"

Memorandum to: Nancy Burton
Date: 03/01/05
From: Ernest J. Sternglass, Ph. D.
Subject: Millstone Relicensing

I have recently had the opportunity to examine the levels of radioactivity in goat milk samples reported by Dominium Nuclear Connecticut, Inc. in their Annual Radiological Environmental Operating Reports and found that highly significant concentrations of carcinogenic fission products were measured, indicating that the Millstone nuclear plant continues to represent a major health hazard to the people of the area.

Thus, in the enclosed copy of Table 8 of the Report for the year 2001, a concentration of 55.5 picoCuries per liter (PCI/L) of milk of Strontium-90 was reported for Location 22 for the sample measured on September 19, 2001, with an uncertainty of plus or minus 5.3 PCI/L. This is an extremely large concentration, close to twice the highest concentration measured in Connecticut pooled milk at the height of nuclear weapons testing in 1963 of 23 PCI/L, as can be seen from the enclosed Figure 6-1 prepared by the Dominion Company for the period 1961 to 1993. Moreover, since the measured value is ten times as large as the measurement uncertainty, this is an extremely significant result, with an astronomically small chance that it is a statistical fluctuation.

To put this into perspective, using the NRC NUREG 1.109 dose factor of 0.0172 mrem/PCI from Table A-5, a mere 2.4 PCI daily intake results in the maximum permissible dose to any organ of 15mrem per year set by NRC guidelines, 23 times the amount measured in a single liter.

Moreover, since strontium-90 has a physical half-life of 28 years, it must have been present for a number of days that month. In fact, only 16 days at the measured concentration of 55 PCI/L are sufficient to reach the permissible dose.

As the enclosed samples of measurements show, concentrations of 13 to 14 PCI/L were found on other days, again significantly higher than the measurement uncertainty of 1-2 PCI/L.

Moreover, as discussed in the United Nations UNSCEAR reports, the dose to bone or the bone marrow when other fission products are present is some 5 to 6 times greater than from Sr-90 alone, and the Dominion Reports for milk show significant concentrations of other fission products, such as Cesium-137, again significant concentrations.

The high concentrations of Sr-90 and other isotopes measured clearly exclude the possibility that they are due to past nuclear bomb-tests. No other sources of Sr-90 exist other than the fission of Uranium, so the measured values represent releases from Millstone.

As recently shown in the 2003 report by the European Committee on Radiation Risk, numerous epidemiological and laboratory studies have shown that the risk of cancer and other diseases produced by local internal doses to critical organs from fission products that are inhaled or ingested, have been underestimated by extrapolation from high external doses by factors of hundreds to thousands of times. This explains why it now appears that releases from nuclear plants, often acting synergistically with other environmental pollutants, are a major neglected reason for the recent rise of illness and deaths both among newborns and *the* elderly observed in the U.S in the last two decades, as also discussed in the ECRR report.

For these reasons, it is my professional opinion that the Millstone Nuclear Plant should not be relicensed.

Ernest J. Sternglass, Ph. D.
Professor Emeritus of Radiological Physics
University of Pittsburgh School of Medicine

Home address:
University Square #2
4106 Fifth Ave.
Pittsburgh, PA 15213

03/01/2005 13:24 4126816251

MILLSTONE POINT 2001

TABLE B
GOAT'S MILK
(PCI/L)

LOCATION	COLLECTION DATE	SR-89	(+/-)	SR-90	(+/-)	I-131	(+/-)	CS-134	(+/-)	CS-137	(+/-)	BA-140	(+/-)
22	04/11/01	.	.	.	.	0.01	0.26	-0.2	2.1	3.7	2.7	-1	3
22	04/25/01	.	.	.	.	0.02	0.23	-3.2	3.2	4.5	4.0	-2	4
22	05/02/01 A	.	.	.	.	-0.27	0.34	-0.6	3.2	5.4	3.8	-4	5
22	05/09/01	.	.	.	.	0.02	0.26	1.4	3.6	7.0	4.8	-1	5
22	05/23/01	.	.	.	.	0.07	0.23	0.4	3.7	9.6	5.2	-4	5
22	06/13/01	.	.	.	.	-0.06	0.29	-1.4	4.8	18.2	6.8	-3	6
22	06/27/01	2.5	4.2	13.2	1.5	0.02	0.23	-2.4	3.2	15.8	4.9	0	5
22	07/11/01	.	.	.	.	0.08	0.17	-3.5	3.7	15.6	5.8	2	5
22	07/25/01	.	.	.	.	0.06	0.13	0.2	2.6	10.8	4.5	-4	4
22	08/08/01	.	.	.	.	-0.02	0.16	-0.1	2.1	21.9	4.7	-1	5
22	08/22/01	.	.	.	.	0.27	0.32	-0.1	2.3	21.4	4.2	-3	4
22	09/05/01	.	.	.	.	-0.04	0.11	1.6	2.8	14.9	4.3	0	5
22	09/19/01	5.2	11.1	15.8	15.3	0.04	0.22	2.2	4.2	12.6	5.2	1	6
22	10/10/01	.	. B	.	. B	0.07	0.26	0.9	3.2	67.2	7.6	-1	4
24C	04/25/01	.	.	.	.	0.15	0.22	2.3	3.5	5.8	3.9	2	5
24C	05/09/01	.	.	.	.	-0.08	0.19	-1.5	1.9	4.6	2.4	-1	4
24C	05/23/01	.	.	.	.	0.17	0.28	1.2	3.0	7.5	4.1	0	4
24C	06/13/01	.	.	.	.	0.15	0.38	3.5	3.1	11.8	4.9	-2	4
24C	06/27/01	-0.7	3.7	5.9	1.2	-0.01	0.16	2.5	3.6	4.0	3.9	1	4
24C	07/11/01	.	.	.	.	0.48	0.46	1.2	2.5	4.3	2.8	-1	4
24C	07/25/01	.	.	.	.	0.05	0.12	-0.1	2.9	7.2	3.6	-1	4
24C	08/08/01	.	.	.	.	0.04	0.18	1.3	2.6	3.3	3.5	1	4
24C	08/22/01	.	.	.	.	0.26	0.31	-0.7	3.1	3.9	3.7	6	4
24C	09/05/01	.	.	.	.	0.04	0.24	-1.1	2.9	11.4	4.5	-2	5
24C	09/19/01	1.8	5.1	5.7	1.2	0.04	0.11	-0.7	2.8	6.1	4.4	-1	4

PASTURE GRASS, HAY OR FEED WAS SAMPLED AS A SUBSTITUTE FOR UNAVAILABLE GOAT MILK.
STRONTIUM ANALYSES ARE COMPOSITES OF ALL MILK SAMPLED FROM A GIVEN LOCATION DURING THE QUARTER.
A: SPECIAL SAMPLE TAKEN TO MONITOR HIGHER THAN NORMAL STATION RELEASE OF IODINE (SEE SECTION 4.13).
B: SINGLE SAMPLE FOR THE QUARTER WAS NOT ANALYZED FOR SR89/90 DUE TO LAB DATA ENTRY ERROR.

TABLE 8
GOAT MILK
(PCI/L)

LOCATION	COLLECTION DATE	K-40	(+/-)	SR-89	(+/-)	SR-90	(+/-)	I-131	(+/-)	CS-134	(+/-)	CS-137	(+/-)	BA-140	(+/-)	LA-140	(+/-)
21	06/19/02	1041	84	4.7	9.8	1.29	0.87	0.53	0.51	-1.2	2.9	2.4	3.1	-1.7	5.3	-2.0	6.1
	07/11/02	1790	170					0.13	0.26	-5.3	3.9	5.6	4.9	4.1	5.9	4.7	6.8
	07/24/02	1660	130					0.06	0.14	-3.0	3.4	1.6	3.7	-2.8	5.4	-3.2	6.2
	08/07/02	1850	130					0.08	0.36	-0.5	3.3	3.7	4.2	1.3	4.8	1.5	5.8
	08/14/02		A					0.05	0.19		A		A		A		
	09/04/02	931	59					0.28	0.83	1.5	1.7	2.9	2.0	-0.6	2.9	-0.7	3.3
	09/25/02	1790	97	-5.0	3.3	0.99	0.97	0.63	0.71	-1.2	2.7	7.2	3.0	-0.7	4.8	-0.9	5.5
	10/09/02	583	61		C		C	-0.15	0.06	0.5	2.0	4.1	2.9	2.4	3.7	2.7	4.3
22	04/10/02	1760	110					0.04	0.21	1.2	2.5	-0.6	2.7	-2.7	3.7	-3.1	4.2
	04/24/02	1640	150					-0.03	0.06	1.8	3.5	5.0	4.1	-0.5	6.1	-0.6	7.0
	05/08/02	1890	160					0.20	0.35	2.2	5.4	-0.3	4.0	-0.6	6.5	-0.7	7.5
	05/22/02	1790	190					0.24	0.49	-0.2	3.8	5.4	3.9	1.6	4.5	1.8	5.2
	06/05/02	1760	140					0.06	0.25	-0.8	3.5	15.4	5.3	4.6	5.0	5.3	5.9
	06/19/02	1620	120	8.6	6.2	5.00	1.20	0.69	0.70	-0.9	2.9	4.0	4.5	1.8	4.1	2.1	4.7
	07/10/02	1910	130					0.06	0.25	0.8	2.7	17.3	64.7	0.5	3.2	0.6	3.7
	07/24/02	1630	110					0.01	0.13	0.6	2.7	17.3	64.7	0.5	3.2	0.6	3.7
	08/07/02	1420	130					0.58	0.66	1.4	3.3	16.7	5.2	0.6	5.4	0.5	6.2
	08/21/02	1390	130	6.4	6.3	1.90	1.10	0.06	0.28	-0.2	3.3	13.3	4.7	-0.8	3.7	-0.9	4.3
26C	04/24/02	1270	130					0.07	0.12	4.5	5.9	2.4	3.9	-2.5	5.2	-2.9	6.0
	05/08/02	1550	100					0.10	0.28	-1.6	2.6	3.8	2.9	1.1	4.1	1.2	4.7
	05/22/02	1630	150					0.15	0.42	-0.5	3.5	5.9	4.3	2.4	5.6	2.7	6.5
	06/05/02	1850	150					-0.02	0.14	0.2	3.6	-1.9	3.9	2.3	6.0	2.6	6.9
	06/19/02	1750	120	0.9	3.9	2.43	0.83	0.80	0.81	-2.7	3.0	13.5	4.3	0.3	3.9	0.3	4.5
	07/13/02	1580	160					0.07	0.25	3.2	4.3	2.3	4.3	-1.8	6.2	-2.1	7.1
	07/24/02	1630	120					0.01	0.11	0.4	2.6	1.2	3.3	1.0	3.9	1.1	4.5
	08/07/02	1470	110					-0.06	0.02	0.0	2.4	5.5	3.6	0.2	3.2	0.3	3.7
	08/21/02	1770	130					0.69	0.70	2.5	3.8	9.5	5.3	-2.5	4.7	-2.9	5.4
	09/04/02		B					0.05	0.35		B		B		B		
	09/25/02	1810	110	-6.1	5.0	14.30	1.70	0.68	0.69	-1.7	2.7	5.6	3.4	-4.1	5.5	-4.9	6.3
	10/09/02	1980	150	-15.6	9.4	1.77	0.83	0.03	0.33	-0.5	3.6	3.1	4.3	-1.8	6.8	-2.0	5.6

PASTURE GRASS, HAY OR FEED WAS SAMPLED AS A SUBSTITUTE FOR UNAVAILABLE GOAT MILK
STRONTIUM ANALYSES ARE COMPOSITES OF ALL MILK SAMPLED FROM A GIVEN LOCATION DURING THE QUARTER
A: GAMMA ANALYSIS NOT PERFORMED DUE TO TECHNICIAN ERROR
B: GAMMA ANALYSIS NOT PERFORMED DUE TO LAB ERROR
C: STRONTIUM ANALYSIS NOT PERFORMED DUE TO LAB ERROR

TABLE 8
GOAT MILK
(PCI/L)

LOCATION	COLLECTION DATE	K-40	(+/-)	SR-89	(+/-)	SR-90	(+/-)	I-131	(+/-)	CS-134	(+/-)	CS-137	(+/-)	BA-140	(+/-)	LA-140	(+/-)
21	05/06/03	1603	96					-0.01	0.21	1.6	2.5	7.0	3.4	0.0	3.8	0.0	3.5
	05/21/03	1650	120					0.17	0.34	-0.7	3.2	5.7	4.0	4.8	4.6	4.5	5.3
	06/10/03	1938	108					0.03	0.21	-0.5	3.6	1.5	3.3	-3.9	3.1	-4.5	3.6
	06/24/03	1610	100	3.1	5.7	0.00	0.38	-0.02	0.22	2.7	5.3	3.1	4.3	2.3	6.3	3.6	7.3
	07/08/03	1690	120					-0.18	0.04	8.5	3.3	3.7	3.2	-1.7	4.0	-1.9	4.6
	07/22/03	2321	86					0.46	0.58	1.3	2.5	2.7	3.4	-0.4	3.1	-0.5	3.6
	08/06/03	1430	116					0.45	0.48	2.7	3.2	3.4	4.0	-2.6	3.5	-3.0	4.1
	08/19/03	2738	63					0.45	0.85	1.7	1.8	3.9	2.8	-0.1	3.5	-0.2	4.0
	09/10/03	3070	149					0.00	0.11	-1.2	3.8	4.6	4.4	-0.4	5.7	-0.4	6.5
	09/23/03	1470	130	3.4	5.5	0.6	1.1	-0.10	0.84	3.3	4.8	11.4	5.8	-2.8	5.6	-3.2	6.4
22	04/23/03	1780	140					-0.06	0.16	-1.6	3.2	0.9	3.8	-6.5	6.0	-0.6	5.5
	05/06/03	1036	96					0.22	0.30	0.3	2.3	3.1	3.6	-4.3	3.4	-5.0	3.9
	05/21/03	1540	130					0.11	0.33	1.7	3.9	6.5	5.0	2.4	6.0	2.7	6.9
	06/10/03	1351	87					-0.08	0.03	-1.1	3.5	14.8	3.5	0.4	3.3	0.4	3.8
	06/24/03	1416	150	-8.2	5.7	9.2	1.2	0.14	0.35	8.9	6.2	1.1	4.2	0.7	5.3	0.8	6.3
	07/08/03	1770	110					0.07	0.15	0.1	2.8	21.7	4.4	1.0	3.7	1.1	4.2
	07/22/03	1518	110					0.09	0.28	-0.2	3.1	24.0	±5.1	-0.6	4.5	-0.7	5.2
	08/07/03	1120	89					0.03	0.18	1.1	2.8	30.2	±6.4	3.8	4.2	6.3	4.9
	08/19/03	2313	86	8	11	14.5	±1.0	0.09	0.06	1.6	2.5	19.8	±3.8	0.5	4.9	0.6	5.6
24C	05/22/03	1710	150					-0.08	0.03	2.5	3.6	5.5	3.8	3.6	6.2	-4.1	7.1
	06/11/03	1790	120					0.03	0.20	-1.7	3.3	7.3	6.1	-4.4	4.4	-5.1	5.1
	06/25/03	1790	130	-7.3	5.9	-1.5	1.1	0.12	0.25	1.1	4.3	-2.5	4.7	2.2	6.8	2.5	7.8
	07/09/03	1600	100					0.05	0.23	1.1	2.6	3.2	3.1	-2.6	3.5	-3.0	4.1
	07/22/03	2751	96					-0.64	0.02	1.7	3.8	3.6	2.8	2.6	3.4	2.9	3.9
	08/05/03	1840	120					0.36	0.45	1.0	3.0	2.7	3.3	-3.7	4.7	-4.3	5.4
	08/18/03	1866	67					0.03	0.38	-0.1	1.7	3.9	1.9	-0.2	3.3	-0.2	3.8
	09/09/03	2860	120					0.00	0.17	[illegible]	3.8	5.3	3.0	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	2.3	3.3	1.4	1.2	0.03	0.26	-0.3	4.6	-3.6	4.4	-3.3	5.2	-3.8	5.9
	10/09/03	2650	110					-0.28	0.07	0.6	2.9	2.2	2.6	-1.2	5.2	-1.4	6.0

PASTURE GRASS, HAY OR FEED WAS SAMPLED AS A SUBSTITUTE FOR UNAVAILABLE GOAT MILK
STRONTIUM ANALYSES ARE COMPOSITES OF ALL MILK SAMPLED FROM A GIVEN LOCATION DURING THE QUARTER

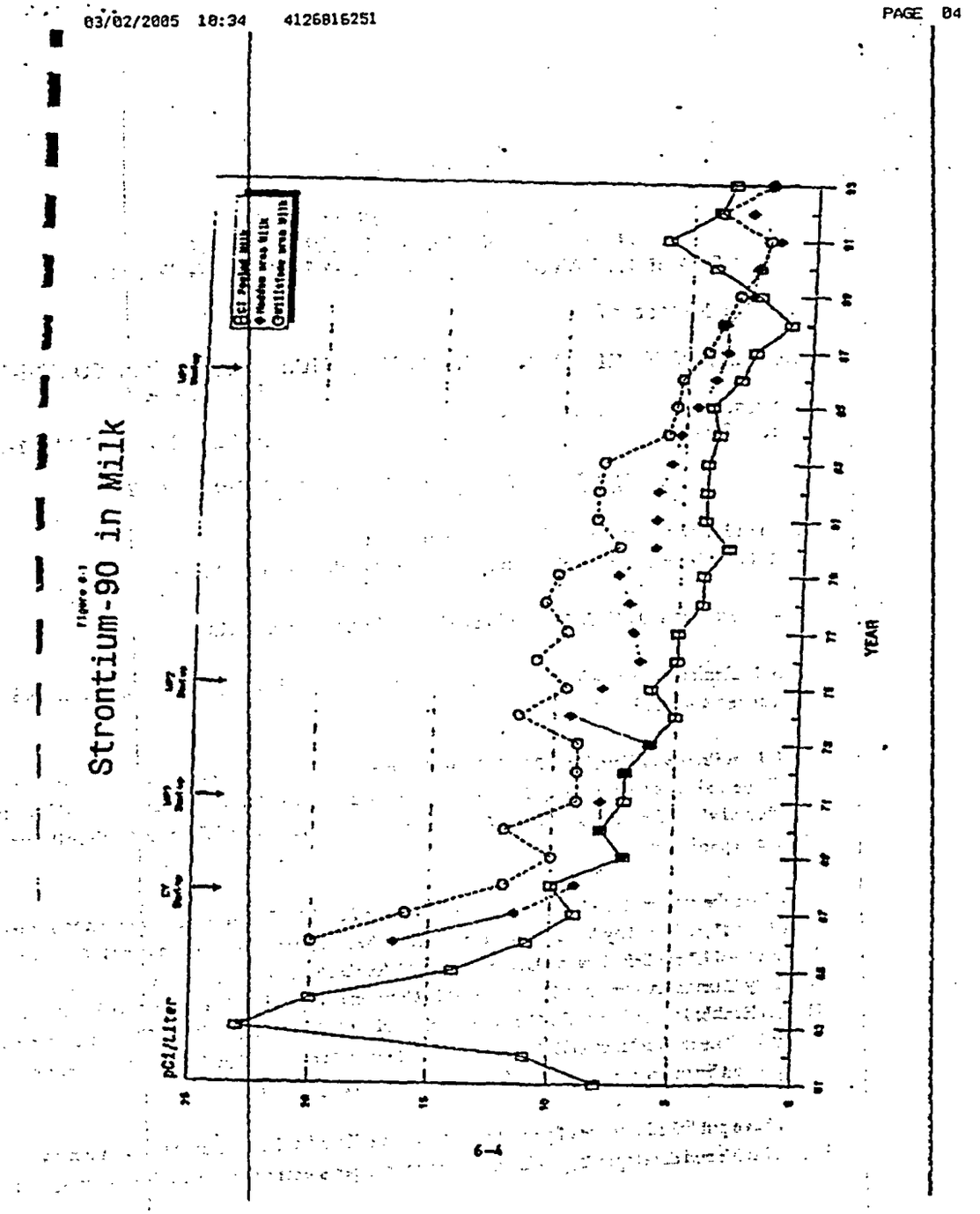

03/02/2005 10:34 4126816251
PAGE 04
Strontium-90 in Milk
pCi/Liter
YEAR

Exhibit "B"

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION
BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of

DOMINION NUCLEAR CONNECTICUT, INC.: Docket Nos. 50-336-LR, 50-423-LR

(Millstone Nuclear Power Station, Units 2 and 3) : ASLBP No. 04-824-01-LR

DECLARATION OF ERNEST J. STERNGLASS

I, Ernest J. Sternglass, do hereby declare as follows:

1. I am above the age of eighteen (18) years and I believe in the obligation of an oath.

2. I reside at 4601 Fifth Avenue in Pittsburgh, Pennsylvania, 15213.

3. I submit this declaration in support of Connecticut Coalition Against Millstone Intervention in the above referenced matter.

4. I am Professor Emeritus of Radiological Physics at the University of Pittsburgh School of Medicine and have written and published extensively in the area of low-level radiation and human health, and about the adverse effects of radioactive emissions from the Millstone Nuclear Power Station in particular.

5. I am the author of the book "Secret Fallout: Low-Level Radiation from Hiroshima to Three-Mile Island" published by McGraw-Hill in 1981, of the review article "Environmental Radiation and Human Health" published by the University of California Press in 1972, and the article "Cancer Mortality Changes Around Nuclear Facilities in Connecticut" published in "Radiation Standards and Human Health: Proceedings of a Congressional Seminar February 10, 1978, by The Environmental Policy Institute in Washington DC. The facts and statements contained in these publications are incorporated by reference herein as references 1, 2 and 3 respectively.

6. I have published a series of papers on the effects of low-level environmental radiation on human health and development produced by nuclear weapons tests and reactor releases for the last

forty years, and have testified on this subject at hearings held by the U.S. Congress, the National Academy of Sciences, State Legislatures and U.S. Government Regulatory Agencies as an expert on this subject.

7. It is my professional opinion that the radioactive releases from the Millstone Nuclear Power Station since its startup in 1970 have caused and will continue to cause excess infant mortality, low birthweight, leukemia and cancer as well as increased rates of both chronic and infectious diseases in the towns around Millstone as well as in New London County and Connecticut as a whole.

8. According to the NRC publication "Radioactive Materials Released From Nuclear Power Plants" (NUREG /CR -2907), by 1987 Millstone had released a total of 32 Curies of radioactive Iodine and Particulates into the air which include the highly carcinogenic Strontium-90 and Iodine -131, together with 6.7 million Curies of Total Fission and Activation gases such as Xenon and Krypton, and the highest liquid releases of Mixed Fission and Activation Products of any nuclear plant in the United States, namely 581 Curies or 581 trillion picoCuries, the unit of concern in milk and drinking water.

9. In a single year, 1975, Millstone released a record high of 9.99 Curies of Iodine and Particulates into the air, more than twice as high as the 4 Curies released shortly after startup in 1971, together with 29.7 million Curies of Total Fission and Activation Gases, and 199 Curies of liquid Mixed Fission and Activation Products into Long Island Sound, also a record for all U.S. nuclear reactors.

10. Between startup of Millstone in 1970 and 1975, as shown in the 1978 Millstone report (3), cancer mortality rose 58% in Waterford where the reactor is located, 44% in New London 5 miles to the north-east, 27% in New Haven 30 miles to the west, 12% for the State of Connecticut as a whole, 8% in nearby Rhode Island, 7% in Massachusetts and 1% in New Hampshire, while it actually declined by 6% in the most distant New England state, Maine, following the pattern of Strontium-90 in the milk shown in the same report.

11. As shown in Table 9 of reference (3), while the Strontium-90 concentration in the milk declined for the U.S. as a whole between 1970 and 1975 from 8 picoCuries per liter to only 3 pCi/l, it rose from 9.8 in 1970 to a high of 15.8 in 1973 and 14.8 in 1974 near the Millstone Nuclear Plant, remaining at 10.7 by 1975. This is far in excess of the U.S. average of 3 pCi/l, ruling out any significant contribution to the local milk from bomb test fallout by France and China that continued until 1980.

12. As shown in Table 10 of reference (3) the calculated yearly radiation dose to bone of a child due to the excess Strontium-90 within 10-15 miles of the plant in excess of the yearly dose for the U.S. rose from 33 millirem per year in the first full year of operation to 204 mrem/yr by 1974, nearly three times the normal background level of 70 mrem/yr in Connecticut.

13. These doses due to Strontium-90 alone may be compared with the 15 mrem/yr to any organ permitted under current NRC regulations, the 2 mrem produced to bone marrow in a typical chest X-ray of a child, and the 80 mrem/yr to a developing fetus found to produce a doubling of the rate of childhood leukemia in the studies of Dr. Alice Stewart cited in Reference 7 of reference (3) for exposure in the mother's womb to X-rays in the first three months of pregnancy.

14. These considerations, later supported by the more recent studies of Strontium-90 measured in baby teeth together with effects on cancer incidence and infant mortality as reported by Mangano submitted in the present case and referred to here as reference (4) provide overwhelming evidence for the existence of a causal relationship between the abnormally high levels of Strontium-90 in the milk and the pattern of cancer changes at various distances from the Millstone plant.

15. The existence of a direct causal relationship between Strontium-90 released from nuclear reactors and an increased risk of cancer is very strongly supported by the finding described by Mangano (4) that baby teeth of children diagnosed with cancer have close to double the concentration of Strontium-90 than children born the same year and in the same area. This finding has led to a lawsuit having been filed in Florida against the Florida Power and Light company by the family of a child with a very high Strontium-90 tooth concentration seeking compensation, a suit which a federal judge ruled to be of sufficient merit to go to trial in 2005, despite efforts of the defendant to have it dismissed (5).

16. As pointed out in reference (3), this conclusion is still further supported by the fact that the types of cancer that rose most strongly in the Connecticut area near the Millstone Nuclear Plant are exactly those that have been found to be most sensitive to radiation in earlier studies by national and international standard setting organizations, namely those that increased the most by 1975, such as respiratory cancers (37%), breast cancer (12%), and pancreatic cancer (32%).

17. Likewise, further support for a causal relationship of nuclear plant releases and adverse health effects is provided by the fact cited by Mancuso et al.(5) cited in reference (1) that cancer deaths showed a much greater rise in women than in men, namely 17% for white women and only 11% for

white males. This same difference between males and females was found by Mancuso and his co-investigators for atomic workers at the Hanford Nuclear Plants exposed to low doses of both internal exposures to critical organs due to inhaled and ingested radioactive elements similar to those released by Millstone over a period of years, together with protracted external exposures from gamma rays produced by fission products accumulated on the ground, rather than to very short X-ray exposures used in diagnostic procedures.

18. A renewed rise in infant mortality in the six towns nearest Millstone took place after a sharp decline by 18% when all three units had been shut down for most of 1996-97 as described in Table 9 of the 2004 report by Mangano (4), with a smaller decline of 3.1% in 1998-99 relative to 1994-95, followed by a rise of 8.8% in 2000-01. This is very strong evidence indicating that even the much smaller releases from the two remaining PWR type of reactors continue to adversely affect the health of the newborn so that there can be no safe operation of any existing type of nuclear plant for the developing children on whom the future of our nation depends.

19. The much greater risk to human health from radioactive gases and particles that are inhaled or ingested and concentrate in certain critical organs such as the bone marrow or in hormone producing glands such as the pituitary gland targeted by the highly radioactive daughter product of Strontium-90, the element Yttrium-90 that has different chemical properties and leaves the bone to concentrate in soft tissues. This results in very high local doses to both the bone marrow and the critical hormone producing glands over long periods of time that greatly exceed the whole-body dose and result in cancer and other adverse effects on health hundreds to thousands of times greater than had been expected by a linear extrapolation to low doses of the risk from short external exposures such as received by the survivors of Hiroshima and Nagasaki or individuals exposed to medical X-rays that do not concentrate in specific organs, as described in the ECRR report (6).

20. It is important to note that exposure to low levels of Strontium-90 and other bone seeking radioactive chemicals routinely released by nuclear plants that resemble Calcium do not merely increase the risk of bone cancer or leukemia, but they weaken the immune defenses provided by the white cells of the blood that originate in the bone marrow. As a result the rate of cancer development all over the body normally held in check by white cells is increased, and the defenses against infectious diseases such as influenza, pneumonia and AIDS are lowered, increasing both total and infant mortality due to all causes combined as discussed in references (1)(2)(3) and (6).

21. Unfortunately for the protection of human health, the operators of nuclear plants such as Millstone are no longer required to measure Strontium-90 in the milk, the soil, the water and other

environmental samples, nor does the government measure bone concentrations of this element after 1982, and milk concentrations of this critical element each month in a series of cities across the nation since 1990. Thus, presently the operators of nuclear reactors only need to measure gamma ray emitting elements such as Cesium-137 that can be more easily and cheaply measured than Strontium-90 that emits only short range electrons that cannot penetrate the Geiger counters used for gamma rays, and which requires more costly laboratory procedures for each sample.

22. As recently brought out in the ECCR report (6), the reason why the risk of low protracted exposures due to inhaled or ingested radioactive chemicals is some 100 to 1000 times greater than the same dose due to short exposures is that for the low doses given over a long period the damage by free-radicals of oxygen dominate over direct damage to the DNA and cell membranes. This leads to a dose-response curve that rises extremely rapidly for very small doses and then flattens out at high doses, thus causing the error made by a linear extrapolation to zero dose used to establish the existing safety standards for permitted releases from nuclear plants.

23. Thus, the ECRR report states in paragraph 10 of its executive summary "that the present cancer epidemic is a consequence of exposure to global atmospheric weapons fallout in the period 1959-63 and that more recent releases of radioisotopes to the environment from the operation of the nuclear fuel cycle will result in significant increases in cancer and other types of ill health (Emphasis added).

24. Thus, in the concluding paragraph of the executive summary, it says that it is "the committee's belief that nuclear power is a costly way of producing energy when human health deficits are included in the overall assessment" and that "the environmental consequences of radioactive discharges must be assessed in relation to the total environment, including both direct and indirect effects on all living systems."(6).

25. Although the most serious airborne radioactive releases so far have occurred from the operation of Unit I which was a Boiling Water Reactor (BWR) permanently closed in 1996, studies described in references (1) and (2) have found similar increases in infant mortality, low birthweight and cancer around Pressurized Water Reactors (PWR) such as Shippingport near Pittsburgh and Indian Point near New York City. Therefore, it is to be expected that a twenty year renewal of the operating licenses for Millstone Units 1 and 2 would further increase the adverse effects on human health and their associated cost in health care, as well as the damage to wildlife, birds and fish that have been rising alarmingly in recent years.

26. This further increase of damage to human health and the environment is not only due to the short-lived radioactive elements such as Iodine-131, but also due to the long half-life of many of the radioactive chemicals routinely released by nuclear plants such as the 28 years it takes for the activity of Strontium-90 to decrease by half. Thus, it is very likely that continued operation of the Millstone Nuclear Plant will further increase the rates of cancer, low birthweight, infant mortality and chronic diseases such as hypothyroidism, diabetes, and other diseases related to immune and hormonal system damage as these elements accumulate in the underground water table from which wells draw their water, making it impossible to safely protect the public.

27. The unexpectedly great risk to the life and future health of the newborn due to very small doses of radiation to critical organs has just been further supported by a study of the incidence of premature births leading to underweight infants as reported in the April 28, 2004 issue of the Journal of the American Medical Association (7). This study revealed that the very small dose due to scattered radiation to the thyroid in the neck of the mother produced by just one or two dental X-rays during the first three months of pregnancy, approximately 40 millirem each, significantly increased the risk of premature birth and low birth weight. This in turn is known to increase infant mortality as well as producing a greater danger of mental and physical problems for infants who survive as a result of recent advances in neonatal care, but at huge emotional cost to the family and rising health care costs to society.

28. In the light of current knowledge of the unanticipated serious adverse effects on human health of extremely small doses of prolonged environmental radiation exposures to Strontium-90 and other fission products as described above, it is my professional opinion that the Millstone 2 and 3 reactors would need to end all radiation releases in order to meet public health requirements for safety, and that therefore they should not be granted license renewals to continue operations during the proposed twenty year renewal periodwithout demonstrating that this objective can be achieved.

I hereby declare the foregoing to be true and accurate to the best of my knowledge, information and belief under penalty of perjury.

Ernest J. Sternglass

Dated: August 8, 2004

LIST OF REFERENCES

1) Ernest J. Sternglass, "Secret Fallout: Low-Level Radiation from Hiroshima to Three Mile Island" (McGraw - Hill, New York, 1981) Available on the website www.radiation.org.

2) Ernest J. Sternglass, "Environmental Radiation and Human Health", pp.145-216, Proceedings of the Sixth Berkeley Symposium on Mathematical Statistics and Probability: Effects of Pollution on Health", Edited by M. L. Lecam, J. Neyman El. Scott, University of California Press, Berkeley and Los Angeles, 1972.

3) Ernest J. Sternglass, "Cancer Mortality Changes Around Nuclear Facilities in Connecticut", pp. 174-212, "Radiation Standards and Human Health: Proceedings of a Congressional Seminar", February 10,1978 published by the Environmental Policy Istitute, Washington, DC.

4) . Joseph J. Mangano, "Risks of Cancer And Other Diseases From The Operation Of The Millstone Nuclear Plant," August 5, 2004, Radiation and Public Health Project, New York, NY.

5). Finestone vs. FLP, Case Number 03-140040-CIV-COHN/LYNCHC

6) Philippe P. Huel et al. "Antepartum Dental Radiography and Infant Low Birth Wright", Journal of the American Medical Association, Volume 291, No.16, April 28, 2004, pp. 1987-1993.

7) . "Health Effects of Ionizing Radiation Exposure at Low Doses for Radiation Protection Purposes: Recommendations of the European Committee on Radiation Risk", Edited by Chris Busby with Rosalie Bertell, Inge Schmitz - Feuerhake, Molly Scott Cato and Alexei Yablokov, Published for the ECRR by Green Audit Press, Castle Cottage, Aberystwyth, SY 23iDZ, United Kingdom. (2003) Website: www. euradcom.org 2003.

RDB received 3/10/05

COUNTY OF SUFFOLK

12/9/04
69FR 71437

(27)

OFFICE OF THE COUNTY EXECUTIVE

Steve Levy
COUNTY EXECUTIVE

Kevin S. Law
Chief Deputy County Executive

Michael J. Deering
Director of Environmental Affairs

February 23, 2005

Chief, Rules Review and Directives Branch
U.S. Nuclear Regulatory Commission
Mail Stop T-6 D59
Washington, D.C. 20555-0001

Re: Millstone Power Station, Units 2 and 3, NUREG-1437, Supplement 22

Dear Chief:

MPS-52-1 A draft supplemental impact statement (SEIS) has been submitted to the Nuclear Regulatory Commission (NRC) by Dominion Nuclear Connecticut, Incorporated concerning the application to renew the operating license for Millstone Power Station, Units 2 and 3 for an additional 20 years. The County of Suffolk finds the document overly narrow in scope, and lacking detail with regard to the issues of concern to the 1.4 million residents of our county. It appears that public notifications to areas in Suffolk County within the 10 and 50 mile emergency planning zones were neglected; that there is no need to rush operating license renewal for the plants decades prior to their license expiration; and, that radiological emergency evacuation plans for Suffolk County were not addressed.

I was dismayed that a public hearing was not held in Suffolk County concerning the renewal application and that the Commission failed to contact local municipalities and environmental groups on eastern Long Island (Supplement 22, Appendix D, Organizations Contacted). An analysis of major points of view concerning significant problems and objections raised by federal, state or local agencies is required by 10 CFR 51.71 in a draft environmental impact statement. In accordance with NRC policy regarding public involvement in reactor license renewal and as Suffolk County residents may be adversely affected by the renewal, we request that a public hearing be held in Suffolk County where the NRC and Dominion can respond to these issues.

MPS-52-2 Suffolk County views the applications to renew Millstone's operating licenses as premature at this time. The current operating licenses do not expire for periods of 10 and 20 years, until July 2015 for Unit 2 and November 2025 for Unit 3. With the advance of science in the next two decades, it is likely that alternative cleaner energy sources and/or conservation will negate the need for license renewal for outmoded and hazardous nuclear generating plants. It is clearly self-serving for the Commission to conclude that environmental impacts for future generating and conservation alternatives would be greater than those operating Millstone (Supplement 22, pages *xix* and 8-51). The *NRC Fact Sheet on Reactor License Renewal* states that the license renewal

H. LEE DENNISON BUILDING • 100 VETERANS MEMORIAL HIGHWAY • P.O. BOX 6100 • HAUPPAUGE, N.Y. 11788-0099 • (631) 853-4000

SISP Review Complete
Template = ADM-013

E-RIDS = ADM-03
Call = R. Lench (RLE)

MPS-52-2 procedure is expected to take no more than 30 months. Why then is there a push to renew operating licenses decades before it is necessary to perform such a review?

Suffolk County is an important stakeholder in the application to renew the operating licenses because the plants are located within 10 miles NNE of the tip of Orient Point and seven miles WNW of Fishers Island in Suffolk County. Fishers Island and a portion of the Plum Island Animal Disease Laboratory, now operated by the Department of Homeland Security, are located
MPS-52-3 within the Millstone Power Station's primary 10 mile Emergency Planning Zone (EPZ). In the event of an emergency, Fishers Island's residents are to be evacuated to either New London or Stonington Harbor and be bused north to Windham, CT. What is the fate of researchers and operations at Plum Island in the event of a severe accident at Millstone?

A 50-mile Ingestion Planning Zone is identified in the State of Connecticut's Radiological Emergency Plan in the event that a nuclear plant release is carried beyond 10 miles. This EPZ encompasses virtually all of Suffolk County east of the William Floyd Parkway in Brookhaven Township. Although ingestion suggests an assessment of food and drinking water, a release carried southward to Suffolk County is likely require additional public protective actions, up to and including evacuation. This had been deemed infeasible during the public discourse concerning the Shoreham nuclear plant due to the lack of adequate transportation infrastructure. Since that era, no new major east-west transportation facilities have been constructed, and there has been a significant increase in the population of eastern Suffolk County. Evacuation of eastern Suffolk County remains an infeasible scenario, a fact we consider to be a major factor impeding renewal of Millstone's operating licenses.

MPS-52-4 NRC regulations limit commercial power reactor licenses to 40 years, but also permit such licenses to be renewed where appropriate. In the case of Millstone, however, renewal for 20 years is not an appropriate public policy decision. The NRC recognizes that some structures and components of nuclear plants may have been engineered on the basis of an expected 40-year service life. Suffolk County is not reassured by the assumption made by the NRC in NUREG-1437, Vol.1, section 5.3.1.

> *"In assessing the impact on the environment from postulated accidents during the license renewal period, the assumption has been made that the license renewal process will ensure that aging effects on the plant are controlled and that the probability of any radioactive releases from accidents will not increase over the license renewal period."*

This does not appear to be a credible position in light of Dominion's statement (Supplement 22, page *xviii*) that it *"did not identify any major plant refurbishment activities or modifications as necessary to support the continued operation of Millstone for the license renewal period."* The county has difficulty reconciling the two positions that, 1) the NRC will "control" the effects of an aging plant forty years into the future, and yet 2) Dominion foresees no major maintenance activity as necessary for safe operation through the year 2045.

Other significant issues that are not adequately addressed in the SEIS include:

MPS-52-5 • The cumulative impact of routine operations to aquatic resources, although recognized as significant for winter flounder (Supplement 22, page 4-56), are not adequately addressed or mitigated by the SEIS.

MPS-52-6 • In the event of a severe accident at Millstone the probability of weighted consequences of a release to groundwater is stated to be small (Supplement 22, page 5-4). However, there is a potential for radioactive fallout directly onto the surface water bodies that serve as the

H. LEE DENNISON BUILDING • 100 VETERANS MEMORIAL HIGHWAY 2 • P.O. BOX 6100 • HAUPPAUGE, N.Y. 11788-0099 • (631) 853-4000

MPS-52-6 Fishers Island water supply. Radiological monitoring and the provision of an alternative public water supply for these Suffolk County residents are not addressed in the document.

- Dominion estimates that the dose to the population within 50 miles of the Millstone site from severe accidents to be between 12.8 and 17.4 person-rem. What is the expected dose to county residents living on Fishers Island and the North Fork that are in considerably closer proximity and what health risks are posed by this exposure?

Thank you for the opportunity to comment on this proposal and we look forward to hearing your response at a forum held in Suffolk County.

Sincerely,

Steve Levy
Suffolk County Executive

Cc: Diane Screnci, Public Affairs Officer, United States Nuclear Regulatory Commission, 475 Allendale Road, King of Prussia. Pennsylvania19406-1415
Kevin Law, Chief Deputy County Executive and General Counsel
Paul Sabatino II, Chief Deputy County Executive
Christine Malafi, County Attorney
Lynne Bizzarro, Deputy County Attorney
Michael Deering, Director of Environmental Affairs
Brian Harper, M.D. Commissioner, Department of Health
Vito Minei, Director, Division of Environmental Quality

H. LEE DENNISON BUILDING • 100 VETERANS MEMORIAL HIGHWAY 3 • P.O. BOX 6100 • HAUPPAUGE, N. Y. 11788-0099 • (631) 853-4000

RDB Received 3/10/05

From: Helga Walter <hg@optonline.net>
To: <rle@nrc.gov>
Date: 2/25/05 8:19PM
Subject: Deny Millstone's Relicensing

12/9/04

69 FR 71437

MPS-53-1 I urge you to deny Millstone's Relicensing

MPS-53-2 1. There are no emergency plans in place for Long Island in the event of an incident or accident at the facility.
The DEIS ignores the safety threats to Long Island residents and the environmental impacts of the aging reactors.

MPS-53-3 2. Millstone has been operating with an expired Clean Water Act discharge permit since 1997. The Clean Water Act mandates permit holders to obtain five-year permits so that every five years they will have to demonstrate that they have implemented best available technology to reduce or eliminate pollution if they want their permits renewed. Millstone has been able to get away with operating with non-updated technology an extra five years.

MPS-53-4 3. Millstone is responsible for the depletion of native fish species through the operations of its intake structures. All these assaults on the environment would end if (a) Millstone were shut down or (b) if Millstone converted to closed cooling system. This important issue certainly affects Long Island because of the dispersion of toxic and radioactive waste byproducts by tidal and wave action.

I urge you to deny Millstone's Relicensing !

H. Geisler Walter
Long Island Resident
hg@optonline.net

SISP Review Complete

Template = ADM-013

E-RIDS = ADM-03
Cc = R.L. Emch (RLE)

Richard Emch - Deny license extension to Millstone. Page 1

RDB received 3/10/05

From: Margie Brock <margieb3@optonline.net>
To: <rle@nrc.gov>
Date: 2/25/05 8:58PM
Subject: Deny license extension to Millstone.

MPS-54-1 Please deny the license extension to Millstone.

12/9/04

69FR71137

(29)

SESP Review Complete
Template = ADM-013

E-RIDS-ADM-03
Cadd = R.L. Emch (RLE)

RDD received 3/10/05

From: <SMEP2@aol.com>
To: <rle@nrc.gov>
Date: 2/26/05 9:38AM
Subject: (no subject)

To Whom It May Concern,
MPS-55-1 Nuclear energy has its attributes but plants should be located in sensible areas where evacuation in case of emergency is possible.
MPS-55-2 Please use your common sense and protect both the public and the fragile LI
MPS-55-3 Sound environment before you license Millstone to continue for another twenty years.
Sylvia Pafenyk
Southold, LI

12/9/04 69FR 71437

(30)

CC: <nfec@optonline.net>

SFSP Review Complete Template=ADM-013

E-RIDS=ADM-03 Add=R. L. Emch (RLE)

Richard Emch - relicensing of Millstone Page 1

RDB Received 3/10/05

From: <Caseathome@aol.com>
To: <rle@nrc.gov>
Date: 2/27/05 3:28PM
Subject: relicensing of Millstone

10/9/04
69FR 71437
(31)

MPS-56-1 Gentlemen: It is very upsetting to learn that you are considering relicensing the Millstone plant with all the negative considerations that has:
MPS-56-2 1. Millstone has been operating an expired clean water act permit for a full 5 years beyond the alloted time.
MPS-56-3 2. The Millstone operation depletes the native fish population due to ineffective intake methods
MPS-56-4 3. There is no plan in existance for a safe evacuation from Long Island in spite of the fact that it is 11 miles away. Shoreham was shut down for just that reason.

MPS-56-1 How can you be thinking of this? Millstone must be shut down. Dont fool with our lives!

Yours truly
Constance K. Case

SISP Review Complete
Template = ADM-013

E-RIDS = ADM-03
Add = R.L. Emch (RLE)

RDB Received 3/10/05

From: <Judgekk@aol.com>
To: <rle@nrc.gov>
Date: 2/26/05 11:34AM
Subject: Millstone Relicensing

10/9/04
69FR71437

(32)

Mr. Emch,

MPS-57-1 As a property owner on Long Island Sound at Northville Beach, I am opposed to the relicensing of the Millstone Nuclear Plant. My reasons are as follow:

MPS-57-2 1. The Millstone Draft Environmental Impact Statement is completely silent on impacts to Long Island. There are absolutely no evacuation plans in place for Long Island.

MPS-57-3 2. Millstone has been operating with an expired Clean Water Act discharge permit since 1997. The Clean Water Act mandates permit holders to obtain five-year permits so that every five years they will have to demonstrate that they have implemented best available technology to reduce or eliminate pollution if they want their permits renewed. Millstone has been able to get away with operating with non-updated technology an extra five years.

MPS-57-4 3. Millstone is responsible for the depletion of native fish species through the operations of its intake structures. All these assaults on the environment would end if (a) Millstone were shut down or (b) if Millstone converted to closed cooling system. This important issue certainly affects Long Island because of the dispersion of toxic and radioactive waste byproducts by tidal and wave action.

Kathleen McGraw

SISP Review Complete
Template = ADM-013

E-RIDS = ADM-03
Cadd = R.L. Emch (RLE)

RDB - Received 3/10/05

From: Justin Porter <justembase@yahoo.com>
To: <rle@nrc.gov>
Date: 2/28/05 10:09AM
Subject: I Oppose the Nuke Plant Relicensing at Millstone CT

12/9/04

Hi Dick,

MPS-58-1 I oppose renewing the license on the Millbrook Nuke. I feel it threatens the safety and security of Eastern Long Islanders. I am a US Citizen that votes.

69FR 71437

33

Justin Porter
848 Roanoke Ave
Riverhead NY 11901

--- NFEC <nfec@optonline.net> wrote:

> Tell the NRC to Deny Millstone's Relicensing! Deadline March 2, 2005!
>
> The operators of the Millstone Nuclear Reactors are seeking to renew their
MPS-58-2 > license. If renewed, these reactors will be up and running for another 20
> years, yet there are no emergency plans in place for eastern Long Island in
> the event of an incident or accident at the facility.
>
> The Nuclear Regulatory Commission is accepting comments on the Draft
> Environmental Impact Statement (DEIS) for relicensing. The DEIS ignores
> the safety threats to Long Island residents and the environmental impacts
> of the aging reactors.
> Reasons to oppose:
>
MPS-58-2 > 1. The Millstone DEIS is completely silent on impacts to Long Island. Shoreham did not come on line because we couldn't put an evacuation plan in place.
MPS-58-3 > 2. Millstone has been operating with an expired Clean Water Act discharge permit since 1997. The Clean Water Act mandates permit holders to obtain five-year permits so that every five years they will have to demonstrate that they have implemented best available technology to reduce or eliminate pollution if they want their permits renewed. Millstone has been able to get away with operating with non-updated technology an extra five years.
MPS-58-4 > 3. Millstone is responsible for the depletion of native fish species through the operations of its intake structures. All these assaults on the environment would end if (a) Millstone were shut down or (b) if Millstone

SISP Review Complete
Template = ADM-013

E-RIDS = ADM-03
Add = R.L. Emch (RLE)

MPS-58-4 > converted to closed cooling system. This important issue certainly
> affects
> Long Island because of the dispersion of toxic and radioactive waste
> byproducts by tidal and wave action.
>
>
> Tell the NRC to deny license extension to Millstone.
> Email your comments to rle@nrc.gov or send your comments to:
> Richard L.
> Emch, Environmental Project Manager, U.S. Nuclear Regulatory
> Commission,
> Washington DC 20555-0001.
>
> The deadline is March 2, 2005!
>
>
>
>
>
>

> powered by ebase(tm) v1.03. mailto:info@ebase.org,
> http://www.ebase.org
> -19-
>

>
> North Fork Environmental Council
> P.O. Box 799
> Mattituck, New York 11952
> 631-298-8880
> Fax: 631-298-4649
> E-mail: nfec@optonline.net
> www.nfec1.org

Do You Yahoo!?
Tired of spam? Yahoo! Mail has the best spam protection around
http://mail.yahoo.com

CC: NFEC <nfec@optonline.net>

RDB received 3/10/05

From: <ABenners@aol.com>
To: <rle@nrc.gov>
Date: 2/28/05 10:45AM
Subject: Millstone

10/7/04
69FR 71437
(34)

MPS-59-1 Deny license extension to Millstone

MPS-59-2 The operators of the Millstone Nuclear Reactors are seeking to renew their license. If renewed, these reactors will be up and running for another 20 years, yet there are no emergency plans in place for eastern Long Island in the event of an incident or accident at the facility.

The Nuclear Regulatory Commission is accepting comments on the Draft Environmental Impact Statement (DEIS) for relicensing. The DEIS ignores the safety threats to Long Island residents and the environmental impacts of the aging reactors.
Reasons to oppose:

MPS-59-2 1. The Millstone DEIS is completely silent on impacts to Long Island. Shoreham did not come on line because we couldn't put an evacuation plan in place.

MPS-59-3 2. Millstone has been operating with an expired Clean Water Act discharge permit since 1997. The Clean Water Act mandates permit holders to obtain five-year permits so that every five years they will have to demonstrate that they have implemented best available technology to reduce or eliminate pollution if they want their permits renewed. Millstone has been able to get away with operating with non-updated technology an extra five years.

MPS-59-4 3. Millstone is responsible for the depletion of native fish species through the operations of its intake structures. All these assaults on the environment would end if (a) Millstone were shut down or (b) if Millstone converted to closed cooling system. This important issue certainly affects Long Island because of the dispersion of toxic and radioactive waste byproducts by tidal and wave action.

Deny license extension to Millstone.

Andrew Benners
South Jamesport, NY

SISP Review Complete
Template = ADM-013

ERIDS = ADM-03
Add = RLEMCH (RLE)

ADB Received
3/10/05

From: Jenny Bloom <jennybloom@optonline.net>
To: <rle@nrc.gov>
Date: 2/28/05 5:22PM
Subject: Please deny Millstone's License

Richard L. Emch, Environmental Project Manager, U.S. Nuclear Regulatory Commission, Washington DC 20555-0001.

12/9/04
69FR 71437
(35)

Mr. Emch,

MPS-60-1 Please deny Millstone's operating license.

MPS-60-2 As a resident of the North Fork of Long Island it is unacceptable to me that Millstone be allowed to operate without a workable evacuation plan in place for my township.

MPS-60-3 MPS-60-4 The threat posed my Millstone's operation to Long Island's environment and quality of life are larger than the benefits to CT's energy costs.

Sincerely,

Jenny Bloom
11600 Main Rd
East Marion, NY 11939
(631) 477-3617

SISP Review Complete
Template = ADM-013

E-RIDS = ADM-03
Add = R.L. Emch (RLE)

Richard Emch - Millstone Page 1

BDO received 3/10/05

From: <SweetSen@aol.com>
To: <rle@nrc.gov>
Date: 2/28/05 5:08PM
Subject: Millstone

12/7/04
69FR 71437
(36)

Dear Richard L. Ech,

MPS_61-1 Does Millstone have an updated Clean Water Act discharge permit? I understand their's expired in 1997. If this is true, why has it been allowed to operate without one???

MPS-61-2 And if a closed cooling system existed, would that not have a postive impact upon the environment? Why isn't one being installed?

How can we face the guilt of destroying our envirment for our future generations because we are too cheap to do the right thing?

MPS-61-3 CLOSE MILLSTONE PLEASE.

Thank you.

Judi

ESP Review Complete

Template = ADM-013

FILES = ADM-03

CC = R.L. Emch (RLE)

RDB received 3/10/05

From: MBS <orange05@optonline.net>
To: <rle@nrc.gov>
Date: 2/28/05 2:28PM
Subject: Millstone Nuclear plant in CT

Greetings,

12/7/04

69FR71437

(37)

MPS-62-1 I am a resident of Connecticut and I am writing to you to strongly urge you to deny the renewal of the license for this plant. There are significant
MPS-62-2 health concerns associated with this plant that merit immediate
MPS-62-3 investigation. Also, the State of Connecticut has enacted legislation that mandates a move to Clean, Renewable energy (referred to as Class I renewable). This plant does not meet this criteria. The denial of this extension would go a long way to improving the health and environment of Ct as well as exepiting the move to Clean Energy.
I am sure that you have received many requests similar to this one; please look at the facts and make the right decision. What decision would you make if you lived next door to this plant? Reject this application for the sake of the residents, specifically the children of CT and of planet Earth.

Respectfully submitted,

Michael Schwartz
Orange, CT

"It is amazing what you can accomplish if you do not care who gets the credit."
–Harry S. Truman .

CC: <info@mothballmillstone.org>

E-RIDS = ADM-03
Add = R.L. Emch (RLE)

STSP Review Complete
Template = ADM-013

RDB Received 3/10/05

From: Amy Martin <amykm@optonline.net>
To: <rle@nrc.gov>
Date: 2/28/05 11:27AM
Subject: Millstone Nuclear Plant

10/9/04
69FR 71437
(38)

MPS-63-1 My husband and I live in Greenport NY and are seriously opposed to the relicensing of Millstone. It is and has been what itsname portends, a millstone around the neck of all who live on the eastern end of Long Island.

MPS-63-2 There is no way we can be safely evacuated, should there be a problem, the communications of warnings between the states seem to be nearly non-existent

MPS-63-3 and this plant is functioning with an expired clean Water discharge permit

MPS-63-4 for over 4 years time. Long Island Sound is dying and the NRC and EPA seem to care very little for the welfare of the people who consume the fish and shellfish that have managed to survive this long. Our rates of cancer have drastically increased in recent years and someone needs to address the fact that Millstone can be a serious contributor to the food chain poison we consume and breath.

Please do not relicense this plant until it is able to pass all CURRENT permit requirements such as the Clean water discharge permit and the health issues and evacuation route of Eastern Long Island are satisfiably addressed.

We live and work here, our lives are no less important than those of the citizens of Connecticut who receive their power from this plant. Make it safe or close it down.

Amy Martin
5th St
Greenport,
New York

STSP Review Complete
Template = ADM-013

E-RIDS = ADM-03
Cc = R.L. Emch (RLE)

Robert Fromer sent his comments to NRC's Office of Public Affairs by email message on February 28, 2005. His comments are located in comment document #24 (MPS-49), starting on page A-280. He also sent those same comments to NRC's Rules Review and Directives Branch (the address given in the draft SEIS), by letter dated 2/28/2005. Mr. Fromer's letter was received on March 10, 2005. His letter was designated as comment document #39 before it was realized that the letter was a duplicate of his email message (#24). Only the first page of his letter is reproduced here. All of his comments are reproduced, starting on page A-280.

RDB received 3/10/05

P.O. Box 71
Windsor, CT 06095
February 28, 2005

3/9/04
69FR 71437
(39)

Chief
Rule Review and Directives Branch
U.S. Nuclear Regulatory Commission
Mailstop T-6D59
Washington, DC 20555-0001

Re: Draft Report For Comment on Generic Environmental Impact Statement for License Renewal of Nuclear Plants, Regarding Millstone Power Station, Units 2 and 3, NUREG-1437, Volumes 1 and 2, Supplement 22

Dear Chief Rule Review and Directives Branch:

"[t]he problem at hand, which is that centrally generated electricity is a vulnerable genie. In order to be used it must travel on an ugly, complex and inefficient labyrinth of wires and substations Even from a security view (national or otherwise) such a fragile system is suicide." Gordes, Hartford Courant, Letter to the Editor, February 1978.

Dominion has not provided a comparative analysis and assessment of life cycle energy consumption to determine that re-licensing of Millstone is the preferred option. Nor, has Dominion considered cumulative alternatives (i.e., energy sources) to meet the current and future energy demands.

A. INTRODUCTION

"The United States Nuclear Regulatory Commission ("NRC") considered the environmental impacts of renewing nuclear power plant operating licenses ("OIs") for a 20-year period in its *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* (GEIS), NUREG-1437, Volumes 1 and 2, and codified the results in 10 Code of Federal Regulations (CFR) Part 51. In the GEIS (and its Addendum 1), the staff identifies 92 environmental issues and reaches generic conclusions related to environmental impacts for 69 of these issues that apply to all plants or to plants with specific design or site characteristics. Additional plant-specific review is required for the remaining 23 issues. These plant-specific reviews are to be included in a supplement to the GEIS." [GEIS, p. iii.]

"This draft supplemental environmental impact statement ("SEIS") has been prepared in response to an application submitted to the NRC by the Dominion Nuclear Connecticut (Dominion) to renew the OLs for Millstone Power Station, Units 2 and 3 (Millstone) for an additional 20 years under 10 CFR Part 54. This draft SEIS includes the NRC staff's analysis that considers and weighs the environmental impacts of the proposed action, the environmental impacts of alternatives to the proposed action, and mitigation measures available for reducing or avoiding adverse impacts. It also includes the staff's preliminary recommendation regarding the proposed action." Id.

B. BACKGROUND

E-RIDS = ADM-03
Acc = F.L. Emch (RLE)

SISP Review Complete
Template = ADM-013

Richard Emch - Millstone License Page 1

HDB Received 3/10/05

From: <Jpr3261761@aol.com>
To: <rle@nrc.gov>
Date: 3/2/05 9:47AM
Subject: Millstone License

10/7/04 69FR 71437 (10)

MPS-64-1 Do NOT reissue license to Millstone reactor in Connecticut. There is no
MPS-64-2 evacuation plan for eastern Long Island, and its clean water permit is expired.
MPS-64-3 Millstone is a serious danger.

John Rooney

PO Box 1622

(425 Maple Lane)

Southold NY 11971

SFSP Review Complete
Template = ADM-013

E-RIDS = ADM-03
Add = R.L. Emch (RLE)

ADM Received
3/10/05

From: amanda meisel <amandameisel@yahoo.com>
To: <millstoneeis@nrc.gov>
Date: Fri, Feb 25, 2005 1:19 PM
Subject: oppose nuclear revival

To Whom it may concern,
MPS-65-1 I am writing to oppose the license renewal for the millstone nuclear reactors in Waterford. I am a
MPS-65-2 physician and am truly concerned about the health impact of the radioactive particles on the residents and
MPS-65-3 workers int our area. I would appreciate your consideration of a new hearing to include all stakeholders,
MPS-65-4 including nearby Long Island Communities, as the effects are far-reaching. The nuclear site also makes
MPS-65-5 us a target for terrorist activity, which is certainly a concern in today's world. It has also come to my attention that nuclear waste is shipped to Barnswell, South Carolina and has a negative health impact on the poor community. This information about the destination and impact of nuclear waste from Waterford should be included in the NRC's environmental impact agenda. Please reconsider the decision to extend the operating licences for the Millstone 2&# reactors. Even a small percentage of cancer increase is too much, if it can be prevented.
Thank you, Amanda M. Levitt, ND

12/9/04

Do you Yahoo!?
Yahoo! Mail - Helps protect you from nasty viruses.

69FR 71137

141

SFSP Review Complete Template - ADM-013

E-RFDS = ADM-03
Add - R.L. Fuch (RLE)

MillstoneEIS - Millstone Page 1

RDB received
3/10/05

From: "Baran, Marie" <Marie.Baran@rrb.gov>
To: <MillstoneEIS@nrc.gov>
Date: Fri, Feb 25, 2005 11:40 AM
Subject: Millstone

MPS-66-1 I wish to voice my opposition to the Millstone Nuclear power plant

12/9/04
69FR 71437
(112)

MPS-66-2 1. The Millstone draft Environmental Impact Statement is completely silent on impacts to Long Island. This gross omission by the NRC is reason to deny re licensing on this basis alone. Meaning if and when there is a nuclear event (and there was one on January 14, 2005), they do not have to notify Long Island who is just 10 miles south of the Millstone along the Long Island Sound. Shoreham did not come on line because we couldn't put an evacuation plan in place. Millstone is our Shoreham!!

MPS-66-3 2. Millstone has been operating with an expired Clean Water Act discharge permit since 1997. The Clean Water Act mandates permit holders to obtain five-year permits so that every five years they will have to demonstrate that they have implemented best available technology to reduce or eliminate pollution if they want their permits renewed. Millstone has been able to get away with operating with non-updated technology an extra five years.

The Connecticut Coalition Against Millstone believes this is a flagrant violation of federal law. (In Connecticut, the Department of Environmental Protection is delegated by the federal EPA to implement the Clean Water Act and hence is the permitting agency. DEP has routinely issued "emergency authorizations" of indefinite duration which violate the permit conditions and which allow for increased pollution by toxic chemicals. This is a scandal! Meaning the NRC and Millstone are above the law and play by their own rules.

MPS-66-4 3. Millstone is responsible for driving the native fisheries stock to near-extinction through the operations of its intake structures. All these assaults on the environment would end if (a) Millstone were shut down or (b) if Millstone converted to closed cooling system. This important issue certainly affects Long Island because of the dispersion of toxic and radioactive waste byproducts by tidal and wave action.

Marie Baran

SISP Review Complete
Template - ADM-013

E-RIDS = ADM-03
Add = R.L. Emch (RLE)

2567 7th Avenue

East Meadow NY 11554

CC: <tim.bishop@mail.house.gov>, <jennifer.gunn@mail.house.gov>, <Jon.schneider@mail.house.gov>, <hilliary.clinton@mail.house.gov>

MillstoneEIS - Millstone Page 1

NRR receiving 3/10/05

From: <CayLea30@aol.com>
To: <MillstoneEIS@nrc.gov>
Date: Fri, Feb 25, 2005 11:27 AM
Subject: Millstone

12/9/04

MPS-67-1 Sirs: I want to go on record as being against the re licensing of
MPS-67-2 Millstone. They do not have an emergencey evacuation plan for where I live on Long Island.
Arthur Tillman,
Mattituck, N.Y.

691-5711137

(43)

SFSP Review Complete
Template = ADM-013

E-RIDS = ADM-03
Add = RL Emch (RLE)

RDB received 3/10/05

10/9/04 69 FR 61137

44

From: Kathleen Faraone <kathyfaraone@yahoo.com>
To: <rle@nrc.gov>
Date: 3/2/05 10:59AM
Subject: Millstone Power Plant relicensing

Kathleen Cunningham Faraone
44 Cosdrew Lane
East Hampton, New York 11937
t - 631-324-3581
f-631-324-7439
e-kathyfaraone@yahoo.com

Mr. Richard L. Emch
Environmental Project Manager
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

2 March 2005

Dear Mr. Emch,

MPS_68-1 I understand the operators of the Millstone Nuclear Reactors across Long Island Sound in Connecticut are seeking to renew their license. If renewed, these reactors will be up and running for another 20 years, yet there are no emergency plans in place for eastern Long Island in the event of an incident or accident at the facility. I also understand that the DEIS for this relicensing ignores the safety threats to Long Island, New York residents and the environmental impacts of the aging reactors.

I oppose the relicensing of these reactors for the following reasons:

1. The Millstone DEIS is completely silent on impacts to Long Island. A nuclear power plant in Shoreham, Long Island did not come on line because an evacuation plan could not be put in place, particularly for Eastern Long Island.

MPS-68-2 2. Millstone has been operating with an expired Clean Water Act discharge permit since 1997. The Clean Water Act mandates permit holders to obtain five-year permits so that every five years they will have to demonstrate that they have implemented best available technology to reduce or eliminate pollution if they want their permits renewed. Millstone has been able to operate with non-updated technology for an additional five years with no consequence.

MPS-68-3 3. Millstone is responsible for the depletion of native fish species through the operations of its intake structures. All these assaults on the environment would end if (a) Millstone were shut down or (b) if Millstone converted to closed cooling system. This important issue certainly affects Long Island because of the dispersion of toxic and radioactive waste byproducts by tidal and wave action.

SESP Review Complete
Template = ADM-013

E-RIDS = ADM-03
Add = R. L. Emch (RLE)

MPS-68-4 Please do not allow this power plant to reopen without mitigation of the above impacts.

Thank you.

Sincerely,

Kathleen Cunningham Faraone

Celebrate Yahoo!'s 10th Birthday!
Yahoo! Netrospective: 100 Moments of the Web
http://birthday.yahoo.com/netrospective/

RDB Received 3/10/05

From: Kersten Elenteny <kelenteny@mac.com>
To: <rle@nrc.gov>
Date: 3/2/05 11:30AM
Subject: I Oppose Millstone License Extension

Dear Mr. Emch -

MPS-69-1 MPS-69-2 MPS-69-3 I am writing to inform you that as a resident of New London County, I am in opposition of the license extension of Millstone. The plant has a negative environmental impact on our waterways and wildlife, in addition to the harmful health hazards posed to humans.

Please deny the Millstone license extension. Feel free to contact me with any questions or for further discussion.

12/9/04 69 FR 71437

Kersten Elenteny
33 Essex Street
Mystic, CT 06355

HG

CC: <pmcquown@mac.com>

SISP Review Complete
Template - RDB-013

E-RIDS=ADM-03
Add= A.L. Emch (RLE)

ADB Received 3/10/05

12/9/04 69 FR 71137 (46)

From: Andy Greene <ajgreene@optonline.net>
To: <rle@nrc.gov>
Date: 3/2/05 12:42PM
Subject: relicensing of Millstone

Dear Mr. Emch:

Kindly accept the following as my comments on the DEIS related to the relicensing of Millstone.

MPS-70-1 1. I am appalled that the Millstone DEIS is completely silent on impacts to Long Island. I live less than 25 miles from Millstone, in an area that is downwind from the plant several months a year. There is no question my family would be directly impacted in the event of any accident or a terrorist attack. How is it possible that you can ignore Long Island when considering Millstone?

MPS-70-2 2. Millstone has been operating with an expired Clean Water Act discharge permit since 1997. The Clean Water Act mandates permit holders to obtain five-year permits so that every five years they will have to demonstrate that they have implemented best available technology to reduce or eliminate pollution if they want their permits renewed. Millstone has been able to get away with operating with non-updated technology an extra five years. Why is Millstone allowed to subvert the intent of the law?

MPS-70-3 3. Millstone is responsible for the depletion of native fish species through the operations of its intake structures. All these assaults on the environment would end if (a) Millstone were shut down or (b) if Millstone converted to closed cooling system. This important issue certainly affects Long Island because of the dispersion of toxic and radioactive waste byproducts by tidal and wave action.

I hope that these crucial matters will be considered in the final DEIS.

Sincerely yours,

Andrew Greene
1220 Sigsbee Road
Mattituck, NY 11952

SFSP Reviewer Complete
Template = ADM-013

E-RIDS = ADM-03
Add = R.L. Emch (RLE)

RDB received 3/10/05

From: Rory MacNish <rm246@cornell.edu>
To: <MillstoneEIS@nrc.gov>
Date: Fri, Feb 25, 2005 3:21 PM
Subject: opposing the re licensing of Millstones Units 2 & 3

To Whom it may Concern,
MPS-71-1 My family, (which consists of my 4 children and my wife) and myself are opposed to the re licensing of Millstones Units 2 & 3.
Thank you,

12/9/04
69FR71137
(77)

Rory MacNish
370 Pacific Street
Mattituck NY 11952
rmacnish@optonline.net

CC: <jennifer.gunn@mail.house.gov>, <tim.bishop@mail.house.gov>, <jon.schneider@mail.house.gov>, <acampop@assembly.state.ny.us>, <Lirrcomm@aol.com>

SISP Review Complete
Template = ADM-013

E-RIDS-ADM-03
Add = R.L.Emch (RLE)

OFFICIAL COMMENTS OF THE TOWN OF SOUTHOLD
P.O. Box 1179
Southold, NY 11971-0959
Tel.: (631) 765-1889
Fax: (631) 765-1823

March 2, 2005

Chief, Rules and Directives Branch
Division of Administrative Services
Office of Administration
Mailstop T-6D 59
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001

RE: Objections to DEIS, Millstone Power Station Units 2 and 3

To Whom It May Concern:

MPS-72-1

I am Supervisor of the Town of Southold, the easternmost town on the North Fork of Long Island, located on a narrow peninsula directly opposite the Millstone plant across the Long Island Sound. On January 11, 2005, I appeared and made comments on the record on behalf of the residents of the Town of Southold at the public hearing on the Draft Environmental Impact Statement (DEIS) for the proposed renewal of the operating licenses for the Millstone Power Station, Units 2 and 3. Those comments stand; these written comments serve as supplemental objections to the renewal of those licenses in the absence of the due consideration for the safety of the affected nearby Long Island residents.

Furthermore, I hereby join in the request of other parties, including, without limitation, the Connecticut Coalition Against Millstone, for an extension of time in which to submit written comments due to the failure of the NRC to make available for review relevant documents such as the transcript of the January 11, 2005 hearing.

In the first instance, I object that the Town of Southold was given no notice whatsoever of the "scoping process" that was apparently held in this purportedly public environmental review procedure. It is precisely because we were not included in this process, and not afforded the opportunity to "identify the significant issues to be analyzed in depth", that critical issue of the safety of Long Island residents has been completely omitted from the environmental review.

U.S. Nuclear Regulatory Commission
Page 2
March 2,2005

MPS-72-2 This safety issue falls squarely under the topic of severe accident mitigation, which the DEIS is mandated to analyze in detail. However, completely omitted from all review was the topic of an evacuation plan for the residents of Southold Town or elsewhere on eastern Long Island. The reason for such omission is simple; no such plan exists, nor has one ever been studied or even considered. The geography of Long Island creates an extremely dangerous situation for those residents in the case of a severe accident at Millstone. At the very end of a narrow strip of land, there is only one direction for these residents to travel in the case of an emergency - West. There is, in some cases, only one road on which to travel - New York State Route 25 in the event of a Millstone-induced emergency, Southold residents will be unaccounted for by the NRC. By the time Southold residents evacuate and reach the mainland of Long Island, we will be lined up on the Long Island Expressway behind the literally millions of other Long Island residents who have the same one and only direction to travel. This is a "natural recipe for a manmade disaster" that must be avoided.

To the extent that the drafters of DEIS seek to avoid creating an evacuation plan for the Town of Southold and eastern Long Island on the purported grounds that federal regulations only require such plans to do so within a 10 mile radius, they should and must consider the extreme circumstances that are present. The North Fork of Long Island is directly across the Long Island Sound. Strong prevailing winds blow across the water directly to our shores. We are the first affected residents to the south of this plant. To say that we are beyond the affected area is just wrong and cannot be the basis for a proper EIS. With that knowledge, I believe it is imperative that the NRC expand the scope of its evacuation planning to include the residents of the Town of Southold and other affected areas of eastern Long Island.

MPS-72-3 Clearly, as far as safety of affected residents is concerned, the environmental review process has not yet begun. Since this is a matter of federal concern, and which is the subject of federal regulation, it is crucial that the NRC seek and heed the input of the federal elective officials in the surrounding areas for their input regarding the concerns of their constituents. The NRC must, therefore, seek formal input from the Senators and Representatives in New York as well as Connecticut.

Furthermore, the NRC must appropriate funding and conduct a proper study for the evacuation of eastern Long Island residents, which should then be included as part of the DEIS, and subject to public input, at a forum Long Island residents can attend - on Long Island. The DEIS must not, and cannot move forward until these crucial matters are properly considered and integrated into the document.

Very truly yours,

Joshua Y. Horton
Supervisor

ADB received 3/10/05

From: Gwynn Schroeder <gdsnfec@optonline.net>
To: <MillstoneEIS@nrc.gov>
Date: Tue, Mar 1,2005 4:58 PM
Subject: Millstone Licensure Renewal

10/7/04 69FR 61437 (49)

March 1,2005

Mr. Richard Emch, Jr.
Division of Regulatory Improvement Programs
Office of Nuclear Reactor Regulation
United States Nuclear Regulatory Commission
Washington DC 20555

Dear Mr. Emch:

North Fork Environmental Council (NFEC) is a grassroots advocacy group established in 1972. We are located in Mattituck, New York and represent over 1500 members in the Townships of Riverhead, Southold and Shelter Island.

MPS-73-1 On behalf of NFEC, I am writing to strongly oppose the relicensure of the Millstone Nuclear Reactors and to express my grave concerns about their continued operation. The Millstone reactors are located in Waterford, Connecticut and although the facility is located only 11 miles from the Town of Southold, the Nuclear Regulatory Commission continues to ignore the safety and environmental concerns held by the residents of the North Fork when considering the continued operations of these aging reactors.

MPS-73-2 If the NRC is not prepared to deny the request of Dominion to renew the operating license for the Millstone reactors, we request, at the very least, that the NRC hold an additional public hearing on Long Island. The actions of the NRC in this licensing renewal process will affect residents of the North Fork and it is morally reprehensible to deny our voice in the process. The January hearing held in Ct. was poorly noticed. Although the hearing may have met the legal requirements for notification, very few stakeholders on the North Fork were aware of the hearing, or for that matter, the entire scoping process. We certainly were not given ample time to fully read, consider and prepare thoughtful comments on the Generic Environmental Impact Statement (GEIS) for License Renewal of Nuclear Plants or the 449 page draft Supplemental Environmental Impact Statement (SEIS) which examines the renewal of the Millstone licenses specifically.

MPS-73-3 Residents, civic and environmental groups have joined many elected officials from the East End and across Long Island and called for the extension of the emergency planning zone from the current 10-miles radius to a 50 miles mile radius. By doing so, emergency planning for the North Fork would be required.

Because the North Fork is essentially a peninsula, surrounded by water on three sides, we have only one direction to evacuate west. Residents in Orient only have one Road heading west until Greenport. There are only two roads from Greenport to Mattituck, three from Mattituck to Riverhead. In the event of an emergency, evacuation of the 20,000 year round North Fork residents, or 30,000 summer residents would be virtually impossible not to mentions the hundreds of thousands of Long Island residents to the west. Because evacuation of Long Island is impossible, the Shoreham Nuclear Plant was shut down. Many of us live closer to Millstone than to

E-RIDS = ADM-03
Add. = R.L. Emch (RLE)

SISP Review Complete
Template = ADM-013

MPS-73-3 Shoreham.

MPS-73-4 It is common knowledge that nuclear power plants and the adjacent spent fuel pools are vulnerable to terrorist attack. In addition to living in close proximity to Millstone, North Fork residents live very close to other potential terrorist targets including the Plum Island Animal Disease Center (PIADC). If there were an incident at the Millstone Facility, there are no emergency plans in place for PIADC. The NRC would be negligent if these facts were not considered in your deliberations.

Sincerely,

Gwynn Schroeder
Executive Director

Gwynn Schroeder
Executive Director
North Fork Environmental Council
P.O. Box 799
Mattituck, New York 11952
631-298-8880
Fax: 631-298-4649
E-mail: gdsnfec@optonline.net
www.nfec1.org

ADD received 3/10/05

From: <Diane_Lazinsky@ios.doi.gov>
To: <MillstoneEIS@nrc.gov>
Date: Mon, Feb 28, 2005 11:11 AM
Subject: Comments, Millstone Power Station, NUREG-1437 [Virus checked]

Dear Mr. Emch:

10/9/04
69FR 71137
(30)

Please see the attached file for the Department of the Interior's comments on the draft Supplemental Environmental Impact Statement (SEIS) Millstone Power Station, Units 2 and 3, Waterford, Connecticut. Thank you and please feel free to contact me if you have any questions.

Sincerely,
Diane Lazinsky

Diane Lazinsky
U.S. Department of the Interior
Office of the Secretary
Office of Environmental Policy and Compliance
408 Atlantic Avenue., Room 142
Boston, MA 02210-3334
Phone: 617-223-8565 Fax: 617-223-8569

SISP Review Complete
Template=ADM-013

E-RIDS=ADM-03
Add.=R.A. Emch (RLE)

United States Department of the Interior
OFFICE OF THE SECRETARY
Office of Environmental Policy and Compliance
408 Atlantic Avenue – Room 142
Boston, Massachusetts 02210-3334

TAKE PRIDE IN AMERICA

February 28, 2005

ER 04/921

Richard L. Emch, Jr.
U.S. Nuclear Regulatory Commission
Mail Stop 011F1
Washington, DC 20555-0001

RE: COMMENTS
Review of a Draft Supplemental Environmental Impact Statement (SEIS), NUREG-1437, Supplement 22, License Renewal, Dominion Nuclear Connecticut, Millstone Power Station, Units 2 and 3, Waterford, Connecticut

Dear Mr. Emch:

The Department of the Interior (Department) has reviewed the Draft Supplemental Environmental Impact Statement (SEIS), NUREG-1437, Supplement 22, regarding Millstone Power Station, Units 2 and 3. The Department has no comment on, or concern with the Draft Supplemental Environmental Impact Statement.

Thank you for your attention to these comments.

Sincerely,

Andrew L. Raddant /s/
Regional Environmental Officer

RDB Hard Copy 3/14/05

From: WALLMULLER <JWALLY063@AOL.COM>
To: <operlic@nrc.gov>
Date: 1/17/05 1:08PM
Subject: Response from "Contact Us About Operator Licensing"

Below is the result of your feedback form. It was submitted by

WALLMULLER (JWALLY063@AOL.COM) on Monday, January 17, 2005 at 13:07:10

12/9/04 GFA 71437

---

recipient location: Washington, DC (Hdqtrs.)

MPS-75-1 comments: I am against Millstone Nuclear Power Plant which is located in Connecticut renewing its operating licenses. (57)

organization:

address1: PO BOX 1312

address2:

city: SMITHTOWN

state: NY

zip: 11787

country: USA

phone:

SISP Review Complete
Template = ADM-013

E-RIDS=ADM-03
Cdd = A.L. Emch (ALE)

Richard Emch - NO, TO MILLSTONE!!! Page 1

RDB received 3/14/05

From: <Carjam10@aol.com>
To: <opa@nrc.gov>
Date: 1/16/05 11:36PM
Subject: NO, TO MILLSTONE!!!

12/9/04
69FR71437
(52)

The Millstone spokesman adds that the company is in the beginning of the license renewal process so North Fork residents still have time to voice their opinions.

MPS-76-1 I am saying NO to this proposed Millstone license renewal. One can hardly get off Long Island now without there being a catastrophe! This renewal would put too many lives here on Long Island in danger should anything happen at the Millstone Nuclear plant...There is no feasable escape route possible for so many Long Island inhabitants.
A NUCLEAR LEAK OR ACCIDENT WOULD BE WORSE THAN A TSUNAMI HITTING LONG ISLAND!!!
NO, NO, NO TO THIS RENEWAL!

SISP Review Complete
Template = ADM-013

E-RIDS = ADM-03
Add = R. L. Emch (RLE)

ADD Review
3/19/05

From: "Merrily Gere" <merrily.gere@po.state.ct.us>
To: <MillstoneEIS@nrc.gov>
Date: Tue, Mar 8, 2005 9:45 AM
Subject: Comments of Connecticut DEP on Document NUREG-1437, Supplement22

Attached please find the comments of the Connecticut Department of Environmental Protection Bureau of Air Management on the Draft Generic Impact Statement for the License Renewal of the Millstone Power Station Units 2 and 3 (NUREG-1437, Supplement 22). These comments will also arrive by U.S. mail.

Merrily A. Gere
Environmental Analyst 2
Connecticut Department of Environmental Protection
Bureau of Air Management
79 Elm Street
Hartford, CT 06106-5127
Tel: (860) 424-3416
"To conserve, improve and protect the
natural resources and environment of the State"

12/9/04
69FR71437
53

CC: "Edward Wilds" <edward.wilds@po.state.ct.us>

E-RFDS=ADM-03
SISP Review Complete
Template - ADM-013
Cole = R.L. Emch (RE)

VIA ELECTRONIC AND REGULAR MAIL.

March 2, 2005

Chief, Rules and Directives Branch
U.S. Nuclear Regulatory Commission
Mail Stop T6-D59
Washington, DC 20555-0001
MillstoneEIS@nrc.gov

Re: *Comments of the Connecticut Department of Environmental Protection – Bureau of Air Management – Draft Generic Impact Statement for License Renewal of Nuclear Plants Regarding Millstone Power Station, Units 2 and 3 NUREG-1437, Supplement 22*

To the Chief of the Rules and Directive Branch:

The Connecticut Department of Environmental Protection Bureau of Air Management (the Bureau) submits these comments on the U.S. Nuclear Regulatory Commission's (NRC's) *Draft Generic Environmental Impact Statement for License Renewal of Nuclear Plants Regarding Millstone Power Station, Units 2 and 3* (Draft EIS). The Draft EIS discusses the environmental impacts of the proposal to renew the operating licenses for Units 2 and 3 of the Millstone Power
MPS-77-1 Station, including the alternatives to license renewal. The Bureau has considered the alternatives presented in the Draft EIS and is concerned that any fossil-fueled alternative electricity supply will have negative air quality impacts as compared to re-licensing the Millstone units.

If the license for the Millstone units is not renewed, additional fossil-fueled generation would likely be necessary to meet the state demand for electricity, as an alternative consisting only of demand reduction, energy efficiency and alternative energy sources is not feasible in the given timeframe. Moreover, the Connecticut Energy Advisory Board's 2004 energy plan specifically identified the inadequacy of the State's transmission infrastructure. Failure to re-license units 2 and 3 will further exacerbate this problem. The Bureau supports the use of clean alternative energy sources and measures that reduce electricity demand. However, the Bureau recognizes that such measures require immediate and substantial changes in behavior with regard to energy use, a substantial investment in low- and no-emitting resources and large-scale implementation of energy conservation and load reduction measures by residential and industrial energy users. Such changes can only occur over a longer timeframe than that allowed by denial of the license renewal.

The air quality impact of replacing the electricity generated by the Millstone units with electricity generation by large-scale fossil-fueled electric generators is substantial. As the Draft EIS identifies, emissions of nitrogen oxides (NOx), sulfur oxides, carbon monoxide, particulate

MPS-77-1 matter and hazardous air pollutants would increase. Increased NOx emissions are a particular

MPS-77-1 concern to the Bureau since reductions in emissions of ozone precursors are of immediate importance to Connecticut's strategy to attain and maintain the national ambient air quality standards (NAAQS) for ozone. In order to attain the new 8-hour ozone NAAQS statewide by 2010, as required by the U.S. Environmental Protection Agency (EPA), Connecticut is now in the process of identifying additional reductions that may be obtained from a variety of sources in the state. Furthermore, the same assessment is underway for fine particulate matter, in order to comply with EPA's designations under the NAAQS for particulate matter less than 2.5 microns in diameter.

The Bureau appreciates the opportunity to submit these comments and will be glad to provide any additional information that you may require.

Sincerely,

/s/Anne R. Gobin, Chief
Bureau of Air Management

ARG/MAG/mag

RPB Received 3/14/05

From: <Lirrcomm@aol.com>
To: <bxz@nrc.gov>
Date: 1/12/05 11:54PM
Subject: Millstone License Renewal - Letter of Opposition and Contact Information

A-9/104
69FR 71437
(54)

Dear Mr. Zalcman,

I would like to take this opportunity to thank you for listening to our concerns as it related to cutting short the NRCs presentation at the Millstone Meeting on Tuesday. I also appreciate the fact that myself, Mike Domino and Supervisor Horton were given the opportunity to speak first as we had to catch a 5:00 Ferry back to Long Island.

The attached email is from Assemblywoman Pat Acampora of Mattituck. Please take a moment to review her comments that were forwarded to Mr. Emch.

MPS-78-1 Lastly, I would like to provide you with contact information of our local representatives who should be put on your list of "people to contact" representing Long Island & NYS. These individuals should be advised of future meetings as it relates to the Millstone Power Plant license renewal or other matters relating to this plant. Please ensure your community affairs people have this information for future reference. Additionally, would like to recommend conducting this licensing meeting on Long Island for "public" feedback. If you would like to plan a meeting on Long Island, I recommend you contact one of the individuals listed below to determine a mutually agreeable location.

The following information applies:

Southold Town Supervisor
Joshua Horton
631 765 1889
Joshua.Horton@town.southold.ny.us
(mailto:Joshua.Horton@town.southold.ny.us)
Joshhorton03@yahoo.com (mailto:joshhorton03@yahoo.com)

Assemblywoman
Patricia Acampora
631 727 1363 (Long Island #)
518 455 5294 (Albany #)
acampop@assembly.state.ny.us (mailto:acampop@assembly.state.ny.us)

Congressman
Tim Bishop
3680 Route 112 Suite C
Coram, NY 11727
631 696 6500 (Coram) ask for Jennifer Gunn
631 259 8450 (Southampton Office)
Tim.Bishop@mail.house.gov (mailto:Tim.Bishop@mail.house.gov)
Jennifer.Gunn@mail.house.gov (mailto:Jennifer.Gunn@mail.house.gov)

County Legislator
Michael Caracciolo
423 Griffing Avenue
Riverhead, NY 11901

SISP Review Complete
Template = ADM-013

E-RIDS = ADM-03
Add = B. E. Emch (RLE)

631 852 3200
Michael.Caracciolo@co.suffolk.ny.us
(mailto:Michael.Caracciolo@co.suffolk.ny.us)

Senator
Ken LaValle
631 696 6900
LAVALLE@senate.state.ny.us (mailto:LAVALLE@senate.state.ny.us)

Governor
George Pataki
212 681 4580
631 952 6583

I would also like to add:

North Fork Environmental Council
Gwynn Schroeder
Executive Director
631 298 8880
gdsnfec@optonline.net (mailto:gdsnfec@optonline.net)

Marie Domenici
631 298 7103
Lirrcomm@aol.com (mailto:Lirrcomm@aol.com)

Thank you for taking the time to review this information and please feel free to contact me should you have any questions regarding this information.
Sincerely,
Marie Domenici

CC: <gdsnfec@optonline.net>, <rle@nrc.gov>, <JdSouthold@aol.com>

RDB received 6/28/05

STATE OF CONNECTICUT
DEPARTMENT OF PUBLIC UTILITY CONTROL

Letter postmarked 3/7/05

12/9/04

69FR 71437

(55)

DONALD W. DOWNES
CHAIRPERSON

Nils J. Diaz
Chairman
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

RE: Millstone Power Station Application for Renewed Operating License

Dear Chairman Diaz:

MPS-79.1 The Connecticut Department of Public Utility Control (Department) submits this letter in support of the Application for Renewed Operating License for Millstone Power Station, located in Waterford, Connecticut. Millstone Power Station consists of Unit 2 and Unit 3. Unit 2 is solely owned and operated by Dominion Nuclear Connecticut, Inc, (Dominion) and Unit 3 is jointly owned by Dominion, Central Vermont Public Service Corporation and Massachussetts Municipal Wholesale Electric Company. Dominion is the operator of Unit 3 and authorized to act as agent for the joint owners. Dominion is seeking renewal of the operating license for a period of 20 years beyond the expiration date of the current operating license for both units (Unit 2 current expiration date is July 31, 2015; Unit 3 current expiration date is November 25, 2025). This letter is in support of both applications for the units, collectively referred to herein as Millstone.

The Department believes that Dominion is one of the best nuclear plant operators in the country and that it has demonstrated an excellent history of nuclear plant operation and safety. The Department would like to offer two additional reasons for granting Millstone's request.

MPS-79.2 First, from a regional and Connecticut energy needs point of view, Millstone has been an essential resource for the existing bulk power system. This essential resource need is expected to continue as such into the future. It is for this reason that Millstone's license extension is important to continue to serve New England and Connecticut energy needs. The Independent System Operator for the New England bulk power supply system (ISO-NE) publishes an annual regional system plan meant to identify system needs that can impact regional users and identify system solutions that will benefit the entire region. It's most recent annual report, dated January 4, 2005, states that it "... has identified serious bulk power system problems in Connecticut that pose risks not only for reliable electric service in the state, but also in the entire New England region." Connecticut Energy Plan Framework, 2005 ISO New England, page 5.

FEDS=A3H-03

10 Franklin Square, New Britain, Connecticut 06051
An Equal Opportunity Employer

SISP Review Complete
Template=NRR-013

ACC=R.L.EMCH (RLE)

The ISO-NE annual report states that New England could face a capacity shortage if there is high demand for electricity beginning in 2006 and continuing into the future. Id., page 6. Possible means of resolving this looming problem includes, inter alia, additional generation. Accordingly, the Department is greatly concerned that existing, reliable, safe, high capacity factor units such as Millstone be allowed to continue and extend operation. This is especially true given the high demand for fossil fuels upon which MPS-79-3 most new generation is based. Keeping Millstone operational greatly adds to the diversity of fuel supply in Connecticut and the region.

Second, on August 28, 2001 Connecticut and the New England region committed to a Climate Change Action Plan. The goal of this plan is to mitigate the release of greenhouse gases that are emitted by the combustion of fossil fuels. As is well known, the greenhouse gas emissions from nuclear power plants are negligible. Continued operation of Millstone past its present license expiration dates will displace fossil generation, helping the region to meet its greenhouse gas reduction targets. Extension of the licenses for the Millstone units is very important to meeting this goal.

The Department urges the Commission to consider the above factors in reviewing the request for the Millstone license extension.

Sincerely,

Donald W. Downes
Chairman
Public Utilities Control Commission

RDB received 3/08/05

From: <SLKalee@aol.com>
To: <millstoneEIS@nrc.gov>
Date: Fri, Mar 11, 2005 8:15 AM
Subject: testimony

MPS-80-1 Do you believe that true costs are considered when assessments, such as the one you are about to read of, are done? Pollution from mining, transportation, processing, waste products and their disposal as well as the health and
MPS-80-2 environmental costs, etc. make up those unaccounted for costs. If we really want to cut C02 emissions we need to look at the big picture, wind, solar, geothermal, bio-diesel, methane from dumps used as a fuel source, forest conservation, green building, etc.

12/9/04
69FR71437
(56)

If we take a nuclear power plant off line, clearly any wind generated power will not make a dent in the C02 until there is more electricity produced from the wind source than by the nuclear power plant...and don't forget those hidden costs. How much C02 is produced in the processing, and other the other steps mentioned before? Have you ever heard of someone getting cancer from a wind generator or its by-products? How about the danger of a terrorist attack on a wind generator (shades of Don Quixote)? Is there a Price Anderson Bill to cover the insurance for wind generators and do we find an exclusion in our home insurance policies for damage caused by an accident or an attack upon a wind generator? And one last question, Is there a good evacuation plan in case of a major problem with a wind generator?

Larry Kaley

From:
http://www.wired.com/wired/archive/13.02/nuclear.html

Nuclear Now!
How clean, green atomic energy can stop global warming
By Peter Schwartz and Spencer ReissPage

Peter Schwartz (peter_schwartz@ gbn.com) is chair of Global Business Network, a scenario-planning firm. Contributing editor Spencer Reiss (spencer@ upperroad.net) wrote about pebble-bed nuclear reactors in issue 13.01. Additional research by Chris Coldewey.

On a cool spring morning a quarter century ago, a place in Pennsylvania called Three Mile Island exploded into the headlines and stopped the US nuclear power industry in its tracks. What had been billed as the clean, cheap, limitless energy source for a shining future was suddenly too hot to handle.

In the years since, we've searched for alternatives, pouring billions of dollars into windmills, solar panels, and biofuels. We've designed fantastically efficient lightbulbs, air conditioners, and refrigerators. We've built enough gas-fired generators to bankrupt California. But mainly, each year we hack 400 million more tons of coal out of Earth's crust than we did a quarter century before, light it on fire, and shoot the proceeds into the atmosphere.

The consequences aren't pretty. Burning coal and other fossil fuels is driving climate change, which is blamed for everything from western forest

E-RIDS = ADM-03
Acc = R.L. Euch (RLE)

Step Review Complete
Template = ADM-013

fires and Florida hurricanes to melting polar ice sheets and flooded Himalayan hamlets. On top of that, coal-burning electric power plants have fouled the air with enough heavy metals and other noxious pollutants to cause 15,000 premature deaths annually in the US alone, according to a Harvard School of Public Health study. Believe it or not, a coal-fired plant releases 100 times more radioactive material than an equivalent nuclear reactor - right into the air, too, not into some carefully guarded storage site. (And, by the way, more than 5,200 Chinese coal miners perished in accidents last year.)

Burning hydrocarbons is a luxury that a planet with 6 billion energy-hungry souls can't afford. There's only one sane, practical alternative: nuclear power.

We now know that the risks of splitting atoms pale beside the dreadful toll exacted by fossil fuels. Radiation containment, waste disposal, and nuclear weapons proliferation are manageable problems in a way that global warming is not. Unlike the usual green alternatives - water, wind, solar, and biomass - nuclear energy is here, now, in industrial quantities. Sure, nuke plants are expensive to build - upward of $2 billion apiece - but they start to look cheap when you factor in the true cost to people and the planet of burning fossil fuels. And nuclear is our best hope for cleanly and efficiently generating hydrogen, which would end our other ugly hydrocarbon addiction - dependence on gasoline and diesel for transport.

Some of the world's most thoughtful greens have discovered the logic of nuclear power, including Gaia theorist James Lovelock, Greenpeace cofounder Patrick Moore, and Britain's Bishop Hugh Montefiore, a longtime board member of Friends of the Earth (see "Green vs. Green," page 82). Western Europe is

quietly backing away from planned nuclear phaseouts. Finland has ordered a big reactor specifically to meet the terms of the Kyoto Protocol on climate change. China's new nuke plants - 26 by 2025 - are part of a desperate effort at smog control.

Even the shell-shocked US nuclear industry is coming out of its stupor. The 2001 report of Vice President Cheney's energy task force was only the most high profile in a series of pro-nuke developments. Nuke boosters are especially buoyed by more efficient plant designs, streamlined licensing procedures, and the prospect of federal subsidies.

In fact, new plants are on the way, however tentatively. Three groups of generating companies have entered a bureaucratic maze expected to lead to formal applications for plants by 2008. If everything breaks right, the first new reactors in decades will be online by 2014. If this seems ambitious, it's not; the industry hopes merely to hold on to nuclear's current 20 percent of the rapidly growing US electric power market.

That's not nearly enough. We should be shooting to match France, which gets 77 percent of its electricity from nukes. It's past time for a decisive leap out of the hydrocarbon era, time to send King Coal and, soon after, Big Oil shambling off to their well-deserved final resting places - maybe on a nostalgic old steam locomotive.

Besides, wouldn't it be a blast to barrel down the freeway in a hydrogen Hummer with a clean conscience as your copilot? Or not to feel like a planet

killer every time you flick on the A/C? That's how the future could be, if only we would get over our fear of the nuclear bogeyman and forge ahead - for real this time - into the atomic age.

The granola crowd likes to talk about conservation and efficiency, and surely substantial gains can be made in those areas. But energy is not a luxury people can do without, like a gym membership or hair gel. The developed world built its wealth on cheap power - burning firewood, coal, petroleum, and natural gas, with carbon emissions the inevitable byproduct.

Indeed, material progress can be tracked in what gets pumped out of smokestacks. An hour of coal-generated 100-watt electric light creates 0.05 pounds of atmospheric carbon, a bucket of ice makes 0.3 pounds, an hour's car ride 5. The average American sends nearly half a ton of carbon spewing into the atmosphere every month. Europe and Japan are a little more economical, but even the most remote forest-burning peasants happily do their part.

And the worst - by far - is yet to come. An MIT study forecasts that worldwide energy demand could triple by 2050. China could build a Three Gorges Dam every year forever and still not meet its growing demand for electricity. Even the carbon reductions required by the Kyoto Protocol - which pointedly exempts developing countries like China - will be a drop in the atmospheric sewer.

What is a rapidly carbonizing world to do? The high-minded answer, of course, is renewables. But the notion that wind, water, solar, or biomass will save the day is at least as fanciful as the once-popular idea that nuclear energy would be too cheap to meter. Jesse Ausubel, director of the human environment program at New York's Rockefeller University, calls renewable energy sources "false gods" - attractive but powerless. They're capital- and land-intensive, and solar is not yet remotely cost-competitive. Despite all the hype, tax breaks, and incentives, the proportion of US electricity production from renewables has actually fallen in the past 15 years, from 11.0 percent to 9.1 percent.

The decline would be even worse without hydropower, which accounts for 92 percent of the world's renewable electricity. While dams in the US are under attack from environmentalists trying to protect wild fish populations, the Chinese are building them on an ever grander scale. But even China's autocrats can't get past Nimby. Stung by criticism of the monumental Three Gorges project - which required the forcible relocation of 1 million people - officials have suspended an even bigger project on the Nu Jiang River in the country's remote southwest. Or maybe someone in Beijing questioned the wisdom of reacting to climate change with a multibillion-dollar bet on rainfall.

Solar power doesn't look much better. Its number-one problem is cost: While the price of photovoltaic cells has been slowly dropping, solar-generated electricity is still four times more expensive than nuclear (and more than five times the cost of coal). Maybe someday we'll all live in houses with photovoltaic roof tiles, but in the real world, a run-of-the-mill 1,000-megawatt photovoltaic plant will require about 60 square miles of panes alone. In other words, the largest industrial structure ever built.

Wind is more promising, which is one reason it's the lone renewable attracting serious interest from big-time equipment manufacturers like General Electric. But even though price and performance are expected to improve, wind, like solar, is inherently fickle, hard to capture, and widely dispersed. And wind turbines take up a lot of space; Ausubel points out that the wind equivalent of a typical utility plant would require 300 square miles of turbines plus costly transmission lines from the wind-scoured fields of, say, North Dakota. Alternatively, there's California's Altamont Pass, where 5,400 windmills slice and dice some 1,300 birds of prey annually.

What about biomass? Ethanol is clean, but growing the amount of cellulose required to shift US electricity production to biomass would require farming - no wilting organics, please - an area the size of 10 Iowas.

Among fossil fuels, natural gas holds some allure; it emits a third as much carbon as coal. That's an improvement but not enough if you're serious about

rolling back carbon levels. Washington's favorite solution is so-called clean coal, ballyhooed in stump speeches by both President Bush (who offered a $2 billion research program) and challenger John Kerry (who upped the ante to $10 billion). But most of the work so far has been aimed at reducing acid rain by cutting sulphur dioxide and nitrogen oxide emissions, and more recently gasifying coal to make it burn cleaner. Actual zero-emissions coal is still a lab experiment that even fans say could double or triple generating costs. It would also leave the question of what to do with 1 million tons of extracted carbon each year.

By contrast, nuclear power is thriving around the world despite decades of obituaries. Belgium derives 58 percent of its electricity from nukes, Sweden 45 percent, South Korea 40, Switzerland 37 percent, Japan 31 percent, Spain 27 percent, and the UK 23 percent. Turkey plans to build three plants over the next several years. South Korea has eight more reactors coming, Japan 13, China at least 20. France, where nukes generate more than three-quarters of the country's electricity, is privatizing a third of its state-owned nuclear energy group, Areva, to deal with the rush of new business.

The last US nuke plant to be built was ordered in 1973, yet nuclear power is growing here as well. With clever engineering and smart management, nukes have steadily increased their share of generating capacity in the US. The 103 reactors operating in the US pump out electricity at more than 90 percent of capacity, up from 60 percent when Three Mile Island made headlines. That increase is the equivalent of adding 40 new reactors, without bothering anyone's backyard or spewing any more carbon into the air.

So atomic power is less expensive than it used to be - but could it possibly be cost-effective? Even before Three Mile Island sank, the US nuclear industry was foundering on the shoals of economics. Regulatory delays and billion-dollar construction-cost overruns turned the business into a financial nightmare. But increasing experience and efficiency gains have changed all that. Current operating costs are the lowest ever - 1.82 cents per kilowatt-hour versus 2.13 cents for coal-fired plants and 3.69 cents for natural gas. The ultimate vindication of nuclear economics is playing out in the stock market: Over the past five years, the stocks of leading nuclear generating companies such as Exelon and Entergy have more than doubled. Indeed, Exelon is feeling so flush that it bought New Jersey's Public

Service Enterprise Group in December, adding four reactors to its former roster of 17.

This remarkable success suggests that nuclear energy realistically could replace coal in the US without a cost increase and ultimately lead the way to a clean, green future. The trick is to start building nuke plants and keep building them at a furious pace. Anything less leaves carbon in the climatic driver's seat.

A decade ago, anyone thinking about constructing nuclear plants in the US would have been dismissed as out of touch with reality. But today, for the first time since the building of Three Mile Island, new nukes in the US seem possible. Thanks to improvements in reactor design and increasing encouragement from Washington, DC, the nuclear industry is posed for unlikely revival. "All the planets seem to be coming into alignment," says David Brown, VP for congressional affairs at Exelon.

The original US nuclear plants, built during the 1950s and '60s, were descended from propulsion units in 1950s-vintage nuclear submarines, now known as generation I. During the '80s and '90s, when new construction halted in the US, the major reactor makers - GE Power Systems, British-owned Westinghouse, France's Framatome (part of Areva), and Canada's AECL - went after customers in Europe. This new round of business led to system improvements that could eventually, after some prototyping, be deployed back in the US.

By all accounts, the latest reactors, generation III+, are a big improvement. They're fuel-efficient. They employ passive safety technologies, such as gravity-fed emergency cooling rather than pumps. Thanks to standardized construction, they may even be cost-competitive to build - $1,200 per kilowatt-hour of generating capacity versus more than $1,300 for the latest low-emission (which is not to say low-carbon) coal plants. But there's no way to know for sure until someone actually builds one. And even then, the first few will almost certainly cost more.

Prodded by the Cheney report, the US Department of Energy agreed in 2002 to pick up the tab of the first hurdle - getting from engineering design to working blueprints. Three groups of utility companies and reactor makers have stepped up for the program, optimistically dubbed Nuclear Power 2010. The government's bill to taxpayers for this stage of development could top $500 million, but at least we'll get working reactors rather than "promising technologies."

But newer, better designs don't free the industry from the intense public oversight that has been nuclear power's special burden from the start. Believe it or not, Three Mile Island wasn't the ultimate nightmare; that would be Shoreham, the Long Island power plant shuttered in 1994 after a nine-year legal battle, without ever having sold a single electron. Construction was already complete when opponents challenged the plant's application for an operating license. Wall Street won't invest billions in new plants ($5.5 billion in Shoreham's case) without a clear path through the maze of judges and regulators.

Shoreham didn't die completely in vain. The 1992 Energy Policy Act aims to forestall such debacles by authorizing the Nuclear Regulatory Commission to

issue combined construction and operating licenses. It also allows the NRC to pre-certify specific reactor models and the energy companies to bank preapproved sites. Utility executives fret that no one has ever road-tested the new process, which still requires public hearings and shelves of supporting documents. An idle reactor site at Browns Ferry, Alabama, could be an early test case; the Tennessee Valley Authority is exploring options to refurbish it rather than start from scratch.

Meanwhile, Congress looks ready to provide a boost to the nuclear energy industry. Pete Domenici (R-New Mexico), chair of the Senate's energy committee and the patron saint of nuclear power in Washington, has vowed to revive last year's energy bill, which died in the Senate. Earlier versions included a 1.85 cent per-kilowatt-hour production tax credit for the first half-dozen nuke plants to come online. That could add up to as much as $8 billion in federal outlays and should go a long way toward luring Wall Street back into the fray. As pork goes, the provision is easy to defend. Nuclear power's extraordinary startup costs and safety risks make it a special case for government intervention. And the amount is precisely the same bounty Washington spends annually in tax credits for wind, biomass, and other zero-emission kilowattage.

Safer plants, more sensible regulation, and even a helping hand from Congress - all are on the way. What's still missing is a place to put radioactive waste. By law, US companies that generate nuclear power pay the Feds a tenth of a cent per kilowatt-hour to dispose of their spent fuel. The fund - currently $24 billion and counting - is supposed to finance a permanent waste repository, the ill-fated Yucca Mountain in Nevada. Two decades ago when the payments started, opening day was scheduled for January 31, 1998. But the Nevada facility remains embroiled in hearings, debates, and studies, and waste is piling up at 30-odd sites around the country. Nobody will build a nuke plant until Washington offers a better answer than "keep piling."

At Yucca Mountain, perfection has been the enemy of adequacy. It's fun to discuss what the design life of an underground nuclear waste facility ought to be. One hundred years? Two hundred years? How about 100,000? A quarter of a million? Science fiction meets the US government budgeting process. In court!

But throwing waste into a black hole at Yucca Mountain isn't such a great idea anyway. For one thing, in coming decades we might devise better disposal methods, such as corrosion-proof containers that can withstand millennia of heat and moisture. For another, used nuclear fuel can be recycled as a source for the production of more energy. Either way, it's clear that the whole waste disposal problem has been misconstrued. We don't need a million-year solution. A hundred years will do just fine - long enough to let the stuff cool down and allow us to decide what to do with it.

The name for this approach is interim storage: Find a few patches of isolated real estate - we're not talking about taking it over for eternity - and pour nice big concrete pads; add floodlights, motion detectors, and razor wire; truck in nuclear waste in bombproof 20-foot-high concrete casks. Voilà: safe storage while you wait for either Yucca Mountain or plan B.

Two dozen reactor sites around the country already have their own interim facilities; a private company has applied with the NRC to open one on the

Goshute Indian reservation in Skull Valley, Utah. Establishing a half-dozen federally managed sites is closer to the right idea. Domenici says he'll introduce legislation this year for a national interim storage system.

A handful of new US plants will be a fine start, but the real goal has to be dethroning King Coal and - until something better comes along - pushing nuclear power out front as the world's default energy source. Kicking carbon cold turkey won't be easy, but it can be done. Four crucial steps can help increase the momentum: Regulate carbon emissions, revamp the fuel cycle, rekindle innovation in nuclear technology, and, finally, replace gasoline with hydrogen.

. Regulate carbon emissions. Nuclear plants have to account for every radioactive atom of waste. Meanwhile, coal-fired plants dump tons of deadly refuse into the atmosphere at zero cost. It's time for that free ride to end, but only the government can make it happen.

The industry seems ready to pay up. Andy White, CEO of GE Energy's nuclear division, recently asked a roomful of US utility executives what they thought about the possibility of regulating carbon emissions. The idea didn't faze them. "The only question any of them had," he says, "was when and how much."

RDB Received 3/28/05

12/9/04 69FR71437 (57)

From: <connecticut.chapter@sierraclub.org>
To: <millstoneeis@nrc.gov>
Date: Fri, Mar 18, 2005 9:55 AM
Subject: Millstone license

Dear NRC

MPS-81-1 The Connecticut, United States, and worldwide community demands are clear....it's time to phase out nuclear power. It's an experiment that didn't work for a number of reasons.

MPS-81-2 If an accident happened we could not evacuate the population (we can't even get home during rush hour).

MPS-81-2 We have no way to deal with the contamination should an accident occur.

MPS-81-3 It appears we have not dealt with the environmental justice issue of shipping nuclear waste to poor communities.

MPS-81-4 Millstone has had radiation releases into the local environment many times.

MPS-81-5 And now we have to spend money on terrorist precautions. (If nuclear power was so safe, why do we have to worry about terrorists attacks? I've never heard of a terrorist attack on a solar panel)

MPS-81-5 Germany ("the old Europe") as already started to phase out all nuclear power. We have the technology and money to do the same in the U.S. Yes, this does mean in the next two decades you will have to look for another job. Can I interest you in something related to hydrogen fuel cells? (hydrogen produce from clean sources not nuclear)

MPS-81-6 The recent successes of hybrid cars and solar incentive programs are pointing to the same thing...do not renew the Millstone license . Nuclear power itself is over and Millstone's record are arguments enough to move on from nuclear. Besides, we have enough cancer in the U.S. without having to worry about another source like nuclear power.

John D. Calandrelli
State Coordinator
for 12,500 members of the CT Sierra Club

CC: <secy@nrc.gov>

SISP Review Complete. Template = ADM-013

E-RIDS = ADM-03
Cac = R.L. Emch (RLE)

CONNECTICUT COALITION AGAINST MILLSTONE

www.mothballmillstone.org

March 16, 2005

Chief
Rules and Directives Branch
Division of Administrative Services
Office of Administration
Mailstop T-6D59
U.S. Nuclear Regulatory Commission
Washington DC 20555-0001

Re: Millstone Nuclear Power Station/Draft Environmental Impact Statement/Supplemental Comments

Dear Sirs:

The NRC is committed to protecting the public health and safety.
- Statement of NRC's Organizational Values

The Connecticut Coalition Against Millstone submits herewith its supplemental comments concerning the draft Environmental Impact Statement (SEIS) which the NRC staff has prepared in support of relicensing of Millstone nuclear reactors Units 2 and 3 to extend their terms to the years 2035 and 2045 respectively. These comments were preceded by preliminary comments submitted on March 2, 2005.

Unfortunately, our review of the SEIS and our interaction with NRC's SEIS staff concerning its evaluation of the operational history of the Millstone Nuclear Power Station lead us to conclude that **in this instance the NRC has entirely departed from its self-defined organizational values (see above).**

Indeed, we are driven to conclude that, in this instance, the NRC staff is not even *remotely* concerned about the effects of Millstone releases of radiation to the public health and safety and to the environment.

Nor has the NRC staff adhered to the "Principles of Good Regulation" heralded on the NRC's website.[1]

The standard defining evaluation criteria for the NRC staff's environmental review is defined in 10 CFR 51.95(c)(4) as follows:

> . . . whether or not the adverse environmental impacts of license renewal are so great that preserving the option of license renewal for energy planning decisionmakers would be unreasonable.

MPS-82-1 The NRC staff has preliminarily concluded in its draft Environmental Impact Statement that the adverse environmental impacts of license renewal are not so great that preserving the option of license renewal for energy planning decisionmakers would be unreasonable.

This conclusion is clearly erroneous and based on incorrect and incomplete information, industry bias and flawed analysis. **It also manifests a profound disregard for the health and welfare of the community.**

This conclusion ignores substantial available evidence that Millstone operations have had and will continue to have devastating health impacts on a wide scale and will continue to cause irreversible environmental damage on a wide scale.

Our detailed comments follow. Following the Introduction, our comments appear in sequence conforming to the appearance of topics in the draft Environmental Impact Statement (SEIS). Our comments today address the SEIS up to 5.0 ("Environmental Impacts of Postulated Accidents"). Additional comments addressed to Section 5.0 *et seq.* will be provided subsequently hereto.

Introduction

The U.S. Nuclear Regulatory Commission ("NRC") is considering relicensing of the Millsone Nuclear Power Station, Units 2 and 3 for additional 20-year terms. Without relicensing, Unit 2's operating license

[1] See NRC's "Principles of Good Regulation," attached.

2

would expire in the year 2015 and Unit 3's operating license would expire in the year 2025.

MPS-82-2 Together with Unit 1, these reactors have had an operational history since 1970 which is among the ugliest in the annals of the nuclear industry.[2] Millstone's radioactive releases have been among the highest of all nuclear reactors in the United States.[3] Millstone's routine radiation releases were linked early-on with cancers and other diseases.[4] Millstone's treatment of its workforce by way of exposing it to unnecessary radiation levels[5] and its treatment of nuclear whistleblowers by ostracism and retaliatory firings have made it notorious within the nuclear industry.[6] While full-time inspectors from the NRC were onsite, Millstone lost two highly radioactive spent fuel rods. These irradiated rods contain plutonium and other fission elements which may be diverted to create dirty bombs. While Millstone's environmental monitoring program was being monitored by the NRC and Connecticut's Department of Environmental Protection ("DEP"), Millstone's personnel brazenly falsified environmental monitoring reports to the NRC and DEP and sabotaged the sample-taking activities.[7]

MPS-82-3 Connecticut's regulatory apparatus has failed to safeguard the public. Millstone's five-year National Pollution Discharge Elimination System ("NPDES") permit expired on December 14, 1997 – eight years ago - and it has not been renewed. Nevertheless, DEP has permitted Millstone to operate under the 1992 permit in brazen violation of the letter and spirit of the federal Clean Water Act. Former DEP Commissioner Arthur J. Rocque,

---

MPS-82-4 [2] For this reason, each of the environmental issues required for consideration in the Environmental Impact Statement process should be considered to be a Category 2 issue, subject to site-specific consideration.

[3] See Millstone & Me: Sex, Lies and Radiation in Southeastern Connecticut by Michael Steinberg (Black Rain Press 1998).

[4] See Testimony of Ernest J. Sternglass, Ph.D., presented to a Congressional Committee investigating nuclear power issues.

[5] See, e.g., www.mothballmillstone.org, experience of Charles D. Douton, Jr.

[6] See, James Plumb v. Northeast Nuclear Energy Company (Superior Court, Judicial District of New London); Clarence O. Reynolds v. Department of Public Utility Control (Superior Court, Judicial District of New Britain); John DelCore v. Northeast Nuclear Energy Co., U.S. District Court, District of Connecticut.

[7] See "Owner of Connecticut Nuclear Plant Accepts a Record Fine" (The New York Times September 28, 1999), attached.

3

MPS-82-3 Jr., routinely authorized "emergency authorizations" ("EAs") while recognizing his lack of legal authority to do so.[8] These EAs – of indefinite duration permitting releases of toxic and carcinogenic substances without enforceable limits – permit Millstone's owners and operators to do, *inter alia*, what Northeast Utilities pleaded guilty to doing wilfully and illegally when it pleaded guilty in the U.S. District Court in September 1999 to committing environmental felonies at Millstone and paying a $10 million fine. Clearly, the Clean Water Act prohibits major waivers of NPDES permit conditions without notice to the public and a meaningful opportunity for public input. Commissioner Rocque issued sequential EAs without notice to the public and he did not provide an opportunity for public comment. To our knowledge, Rocque's successor, DEP Commissioner Gina McCarthy, has done nothing to bring the Millstone operations into compliance with the law. She has permitted the *status quo* to reign. Connecticut Attorney General Richard S. Blumenthal is complicit in the illegal Millstone activities. Mr. Blumenthal successfully suppressed the truth of Millstone's illegal operations in litigation brought to require Millstone operations to comply with existing laws.

Regardless of whether Millstone has been technically out of compliance with the law during much or all of its 35-year operational life, its operations have systematically endangered the public health and safety.

Millstone operations are a clear and present danger to the public health, safety and welfare.

MPS-82-5 Although Millstone's reactors have been operating since 1970, and thus have generated a 35-year history of operations and record of environmental impact, the NRC selected only a *three-year period* (2001, 2002 and 2003) to review to assess Millstone radiological emissions for purposes of its SEIS evaluation. Necessarily, the NRC staff's superficial

---

MPS-82-3 [8] The Coalition attaches hereto the "Emergency Authorization" issued on October 13, 2000 which "legalizes" violations of the expired NPDES permit and which ex-Commissioner Rocque "transferred" to Dominion when it was a paper company without assets. Prior to issuing EAs for Millstone operations, Commissioner Rocque admitted in writing he lacked authority to issue emergency authorizations on an emergency basis for unlimited durations. The EA attached hereto has been in effect on an emergency basis since 2000 premised on a "finding" that it was required to avert "an imminent threat to health or safety."The SEIS makes no reference to this EA.

MPS-82-5 and selective review deprived it of the opportunity to engage in a meaningful assessment of the environmental impacts of Millstone's complete operating history to inform the evaluation necessary to evaluate the full scope of future effects during a potential period of license extension.

MPS-82-6 At the same time, the NRC staff virtually ignored the information available to it even in the limited area it selected for review: the years 2001-2003.[9]

The most glaring example we may provide you of this appears as the preliminary comment we provided to you on, together with the declaration of Ernest J. Sternglass, Ph.D.[10] Dr. Sternglass evaluated Dominion Nuclear Connecticut, Inc.'s reports of strontium-90 levels sampled in goat milk five miles from Millstone during 2001, 2002 and 2003. Although one sample measurement reported by Northeast Utilities in 2001 was at a level nearly twice the highest level of measured strntium-90 concentration in Connecticut milk during the height of the atmospheric nuclear weapons testing in the 1960s, this fact is not reported in the SEIS nor is it analyzed, nor are the other high strontium-90 measurements in goat milk sampled five miles downwind from Millstone analyzed.[11]

MPS-82-7 We perceive a determined lack of dedication by the NRC staff to genuinely understand the full scope of environmental - including human health - impacts of continued operations of Millstone. Documents which we provided to the NRC have apparently been destroyed.[12] Comments made in relicensing proceedings attended by the SEIS staff and documents submitted in such proceedings were ignored or disregarded by the SEIS staff.[13]

---

[9] Webster's Dictionary defines misfeasance as "the performance of a lawful action in an illegal or improper manner."
[10] Refer to the Coalition's March 2, 2005 submission and attachments thereto.
[11] Webster's Dictionary defines malfeasance as "wrongful conduct, especially by a public official."
[12] See Response of Richard L. Emch, Jr. to the Coalition's February 5, 2005 queries, Paragraph 7 (attached); Documents responsive to this request were presented to the NRC by the Coalition as attachments to the Affidavit of Cynthia M. Besade dated August 5, 2005.
[13] See Transcript of January 11, 2005 public informational meeting sponsored by the NRC's SEIS staff at the Waterford CT Town Hall.

5

MPS-82-7 We continue to be troubled by the fact that documents produced by the SEIS staff in response to our queries about the SEIS submitted to the SEIS staff on January 23, 2005 were withheld by the NRC's own Freedom of Information staff and have yet to be released.[14]

MPS-82-8 Similarly, we are astonished that the NRC staff most involved with the SEIS declined our invitation to attend the press conference we gave on the Niantic Bay shoreline 1.5 miles from Millstone on March 10, 2005. At our press conference, we introduced Zachary M. Hartley, a 7-year-old boy born with a rare cancer in his jawbone.[15] During critical months of her pregnancy, Zachary's mother swam regularly and unknowingly in the nuclear "mixing zone"[16] which is known locally as the Hole-in-the-Wall Beach. We invited the entire NRC to attend the press conference and address questions to our expert, Dr. Helen Caldicott, world-renowned pediatrician, co-founder of Physicians for Social Responsibility and a leading authority on the health effects of low-level ionizing radiation such as is routinely emitted by Millstone. Zachary's medical records were available for NRC review. Not a single representative of the NRC appeared, not even one of the resident inspectors assigned to Millstone. Dr. Caldicott linked young Zachary's rare jawbone cancer to Millstone's radiological and toxic chemical emissions as being the likely causative agent. Dr. Caldicott acknowledged that, while there cannot be a 100-per-cent certainty that Millstone caused Zachary's medical condition, cesium-137 which Northeast Utilities found in a fish in the same nuclear "mixing zone" in 1997 – the year of Zachary's mother's pregnancy – and which contamination it admitted was discharged by Millstone, is known to be associated with cancer, including cancer of the bone. We are transcribing Dr. Caldicott's comments and will provide the NRC with a copy as soon as the transcription is available.

In light of the facts which have come light regarding Zachary M. Hartley, the Coalition has requested that the Connecticut General Assembly's Public Health and Environment Committees convene a special public

[14] The Coalition will address this issue in a subsequent filing.
[15] Press clippings from the Hartford Courant, Norwich Bulletin and The New London Day are attached.
[16] See SEIS at 4.1.3.

6

hearing to consider our request to close the Niantic shoreline beaches.[17] We understand that the legislature may find it necessary, in order to adequately protect the public health and safety, to enact legislation to close Millstone forthwith. Governor M. Jodi Rell has referred our request to the Commissioner of Public Health; we are asking him to exercise his authority to close the Niantic beaches as a health hazard. We further anticipate that the Connecticut DEP will order that Millstone convert from its once-through cooling system to a closed cooling system, thereby virtually eliminating the discharge of radioactive and toxic chemical contaminants to the Niantic and

MPS-82-9 Waterford shorelines. The SEIS does not address the prospect that Millstone will undergo a major refurbishment in the conversion from the once-through to a closed cooling system. This is a major omission in the SEIS.

We recognize that the events in question in Zachary's life arose in 1997, prior to Dominion's takeover of Millstone in 2001. However, Zachary's sickness is a factor which must be considered in the operational history of Millstone. Under Dominion ownership, Millstone has continued to release the same radioactive and toxic chemical waste byproducts as NU before.

MPS-82-10 Indeed, Dominion is currently seeking permission from CTDEP to add **new chemicals** to the "mixing zone" and continue the routine discharge of others. Nowhere in the SEIS is it stated that the NRC staff reviewed Dominion's application for renewal of the NPDES permit. Nowhere are these facts assessed in the SEIS.

MPS-82-11 The SEIS fails to meaningfully consider the routine environmental impacts of Millstone's radiological releases, relying on the "conclusion" in the NRC's Generic Environmental Impact Statement that all the nation's nuclear power plants release radiation within levels permitted under the NRC's regulations and therefore may be expected to continue to do so in the future. These conclusions do not apply to Millstone. See discussion at infra.

Even NRC's Generic Environmental Impact Statement ("GEIS") states that ***cesium-137 – for one – may be expected to bioaccumulate such that its buildup in the environment will increase by 35 per cent during***

[17] See Coalition letter to Connecticut General Assembly Public Health and Environment Committees dated March 4, 2005, attached.

7

the postulated renewal period at each of the nation's nuclear power plants undergoing relicensing.[18]

GEIS section 4.6.1.1 states in part as follows:

> To determine whether the added period of operation following license renewal would, by virtue of buildup, result in significant (double) added dose, the ratios of buildup factors for midlives of 30 to midlives of 20 years were evaluated. **These ratios amount to a 35 per cent increase for Cesium-137 and a 6 per cent increase for cobalt-60.**
>
> **In certain cases, the bioaccumulation factors may require reexamination. These principally involve fish (in the human food chain) that are bottom feeders. Bottom feeders may ingest worms and other biota that may remobilize radioactive materials accumulated in the sediments.**
>
> **Accumulation of radioactive materials in the environment is of concern not only to license renewal but also to operation under present licenses.**

(Emphasis added.)

MPS-82-12 This reference is entirely omitted from consideration in the SEIS. The SEIS omits any analysis of the predicted buildup of cesium-137 or cobalt-60 or any other radionuclides in the environment surrounding Millstone. To the extent that cesium-137 released to the environment will have enhanced effects, the NRC's staff's failure to assess the impact to the health and safety of the community – including Niantic Bay beachgoers who may be pregnant - borders on reckless endangerment.

It is known that cobalt-60 released by Millstone bioaccumulates in the sediment of Jordan Cove and is therefore subject to being ingested by worms and thereby enter the food chain.[19] Yet, the SEIS fails to "re-examine" this phenomenon – and the potential for bioaccumulation of other radionuclides in the environment surrounding Millstone - consistent with GEIS section 4.6.1.1.

[18] GEIS 4.6.1.1.
[19] See [citation to follow]

8

MPS-82-13 Nor does the SEIS examine the quality of environmental stewardship exercised by Dominion in its other corporate activities.

We suggest you review the October 2003 report by Public Citizen, "Dominion Resources, Inc.; A Public Citizen Corporate Profile." [20] Public Citizen reports that "[I]n April 2003, Dominion's VEPCO agreed to a $1.2 **billion** enforcement settlement with the US Department of Justice and the US Environmental Protection Agency for violations of the Clean Air Act." (Emphasis added.)

The report further states that Dominion's VEPCO failed to install pollution control equipment at its coal-fired Mount Storm Power Plant in West Virginia after it made significant modifications that increased power-generating capacity. This was a violation of the Clean Air Act and, "according to the EPA, resulted in the release of 'massive amounts' of sulfur dioxide, nitrogen oxide, and particulate matter."

Dominion's Dominion Energy, owner of the Brayton Point Power Station in Massachusetts, releases 240 pounds of toxic mercury annually from that facility – enough to poison 120 million pounds of fish part of the Dominion network of companies, according to the Providence (RI) Journal of March 11, 2005.[21] Eating mercury in fish and shellfish presents a danger to children and pregnant mothers by harming developing nervous systems. Dominion Energy has been served with a notice of intent to sue by the Conservation Law Foundation, according to the newspaper report.

According to the SEIS, four states and all or parts of 15 counties fall within the 50-mile radius of Millstone (eight in Connecticut, four in Rhode Island, two in Massachusetts and one in New York). An estimated 2,868,207 people live within this area. This equates to a population density of 219 persons/square kilometer or 567 persons per square mile. In the GEIS matrix of rank of sparseness (Category 4) and proximity (Category 4) result in the conclusion that Millstone is located in a high-population area.
MPS-82-14 Moreover, the population within a 10-mile radius of Millstone increases seasonally as a result of an influx of approximately 10,500 summer

[20] A copy of the report is attached.
[21] See "Conservation Group Sues Brayton Point" (Providence Journal, March 11, 2005), attached.

MPS-82-14 residents. The SEIS contains no figures of the seasonal influx of visitors to the eastern end of Long Island although it is within the 50-mile radius of Millstone.

MPS-82-15 **In conclusion, it is clear that the adverse environmental impacts of license renewal are so great that preserving the option of license renewal for energy planning decisionmakers would be beyond "unreasonable" – license renewal for Millstone is a license to kill.**

This conclusion is unassailable when the full scope of available information about Millstone's environmental impacts is properly considered.

Detailed Comments

GEIS Is Inapplicable to the Millstone EIS

MPS-82-16 The Millstone Draft Environmental Impact Statement analysis largely avoids the **primary issue** presented by the prospect of relicensing Millstone Units 2 and 3 for additional 20-year terms: the effects of routine releases of radiological and toxic chemical releases to human health and the environment surrounding the nuclear facility.

The troubled nuclear industry knew that if the truth about the radiological impacts of nuclear power plant operations could be addressed in relicensing proceedings, no community in American would accept the prospect to hosting a nuclear power plant beyond its initial 40-year licensing term. The GEIS is a fiction contrived by the nuclear industry and adopted by the NRC to deny the public an opportunity to challenge relicensing of nuclear power plants based on radiological impacts to human health and the environment.

MPS-82-17 The NRC's Generic Environmental Impact Statement ("GEIS") was published in the year 1996, or nine (9) years prior to the NRC's invitation for public comment on the SEIS, at a time when Unit 2 had operated for 26 years, Unit 1 for 21 and Unit 3 for 10 years. Necessarily, when the GEIS refers to "current levels" of radiation, it is referring to radiation levels which were "current" in 1996 or earlier. The GEIS is not itself current, but is

MPS-82-17 outdated and fails to account for the past nine (9) years of operations within the U.S. nuclear industry.

The GEIS itself is obsolete. Although the NRC staff states in the SEIS it was not required to consider site-specific aspects of Millstone's routine radiological emissions because Millstone site-specific routine radiological emissions were considered in the GEIS at Appendix E, GEIS Appendix E is limited to "routine" radiological emissions during the years 1985-1987. No explanation is given why a report published by the NRC in 1996 relies on 10-year-old data, when its purpose is to project radiation levels five decades into the future. At best, GEIS's radiological analysis of "routine" Millstone radiological emissions is incomplete and superficial.

More significantly, the GEIS fails to account for any of the following facts and circumstances – routine and extraordinary – which have occurred at Millstone since 1996, including the following:

MPS-82-18 1. The NRC placed the entire Millstone Nuclear Power Station on its "Watch List" and ordered an unprecedented three-reactor two-year shutdown in 1996 because of national media exposure of wilful, systemic disregard for safety standards and licensing requirements; Unit 1 never restarted, Unit 3 restarted in 1996 and Unit 3 restarted in 1999;

MPS-82-19 2. In 1996, after workers in the site maintenance department at Millstone were diagnosed with brain cancers and Northeast Utilities dismissed the entire department – after securing releases the workers would not sue Northeast Utilities if the company paid them double severence pay – and hired transient contract workers to perform hot and dirty tasks within the plant, two of the workers died untimely deaths due to their brain cancers.

3. On December 16, 1997, Zachary M. Hartley was born with a rare jawbone cancer which required major life-threatening surgery. His mother swam regularly in the nuclear/chemical "mixing zone" otherwise known as the Hole-in-the-Wall Beach on the Niantic Bay shoreline during critical months of her pregnancy with Zachary.

4. In 1997, Northeast Utilities caught a fish contaminated with cesium-137, a deadly carcinogen, it admitted releasing into Niantic Bay, in the nuclear/chemical "mixing zone" which stretches from the Millstone

11

MPS-82-19 discharge point to the Niantic Bay shoreline, a popular summer destination for families with young children.

5. On or before 1997, Millstone dispensed with its measurement of strontium-90 in quarterly composited air particulate filters, relying instead on infrequent sampling of goat milk in the community to determine whether its strontium-90 emissions reached harmful levels after-the-fact.

MPS-82-20 6. In September 1999, Northeast Utilities, predecessor to Dominion, pleaded guilty to committing environmental felonies including falsifying environmental monitoring records and releasing hydrazine, a carcinogen, illegally into the Long Island Sound.[22]

MPS-82-21 7. A Connecticut Superior Court judge enjoined the restart of Millstone Unit 2 in 1999 because he was persuaded that the health and stability of the indigenous Niantic winter flounder stocks were endangered by operations of the Millstone intake structures through entrainment and impingement. Fish Unlimited v. Northeast Utilities.

8. In 2000, two commercial fishermen sued Northeast Utilities for tortiously causing the collapse of the formerly commercially viable Niantic winter flounder fishing stocks; their suit remains pending.

MPS-82-22 9. In 2000, Northeast Utilities acknowledged that – even under daily supervision by onsite inspectors of the NRC – it had lost two highly radioactive spent fuel rods from the Unit 1 spent fuel pool.

10. In 2000, the Connecticut Department of Public Utility Control ("DPUC") oversaw a "public auction" by Northeast Utilities to sell the Millstone Nuclear Power Station; the public was excluded from the "public auction"; virtually all key "public auction" documents were redacted and ordered sealed by the DPUC; over public protest, and despite the Coalition's disclosure that Dominion had the worst safety record in the nuclear industry including the deaths of seven nuclear workers at its nuclear facilities in Virginia, the DPUC approved the sale of Millstone to Dominion Nuclear Connecticut, Inc., ("DNC") at the time a paper entity with no assets with only a post office box in Niantic, Connecticut; when the Connecticut Coalition Against Millstone obtained a Superior Court hearing date for a judge to consider its challenge to the rigged sale and the prospective transfer of expired environmental permits to DNC, lawyers for Northeast Utilities and DNC met *ex parte* with Superior Court Chief

[22] See "Owner of Connecticut Nuclear Plant Accepts a Record Fine" (New York Times September 28, 1999), attached.

12

Administrative Judge John J. Langenbach and obtained an order suspending the hearing so the sale could proceed without court review; when the matter was brought to the Connecticut Supreme Court, Justice Christine Vertefeuille, beneficiary of a Northeast Utilities 401K plan, recused herself; Connecticut Attorney General Richard S. Blumenthal, although entitled to automatic party status in the DPUC proceedings, declined participation. So occurred the "public auction" of Connecticut's worst polluter.

MPS-82-23 11. In April 2001, Connecticut's Commissioner of Environmental Protection, Arthur J. Rocque, Jr., "transferred" an expired NPDES (National Pollution Discharge Elimination System) permit (it had expired four years earlier) and "emergency authorizations" (which he admitted in writing he lacked legal authority to issue) to "Dominion Nuclear Connecticut, Inc.," at that time a paper company with a post office box in Niantic but no assets. Dominion has been operating under the authority of the expired permit for four years and DEP has not renewed the permit in the intervening time.

MPS-82-24 12. In 2001, Dominion reported concentration levels of strontium-90 contamination in goat milk sampled within five (5) miles downwind of the Millstone Nuclear Power Station nearly twice as high as the highest recording measurement of strontium-90 concentrations in Connecticut milk during the height of the 1960s atmospheric nuclear weapons testing.

MPS-82-25 13. In 2001, terrorists who had targeted nuclear power plants hijacked a passenger jet and flew over the Indian Point Nuclear Power Plant 29 miles of New York City before slamming into the World Trade Center. The U.S. Department of Homeland Security, subsequently created, designated the Millstone Nuclear Power Plant a terrorist's target of choice.

14. In 2004, Connecticut State Senator Melodie Peters, Chairman of the powerful Energy and Technology Committee, took a paying job with Dominion in public relations to advocate for Millstone relicensing, without giving up her legislative commitments.

MPS-82-26 11. On August 16, 2003, Joseph H. Besade became the seventh known pipefitter to die prematurely from workplace exposures at Millstone.

MPS-82-27 15. On August 5, 2004, Cynthia M. Besade reported to the NRC in an affidavit her personal knowledge of some 67 cancers in persons known directly or indirectly to her, all living within or close to the five-mile radius surrounding Millstone, including childhood cancers and

MPS-82-27 the case of a 17-year-old Waterford high school student diagnosed with ovarian cancer; from one street alone – Seabreeze Drive, north-northeast and less than two miles downwind of Millstone – seven (7) cases of cancer were reported.

MPS-82-28 16. On August 5, 2004, Richard Heaton drove seven (7) hours from the University of Pennsylvania Medical Center to New London to participate in a press conference and proceeding before the NRC to share the facts of his daughter's rare thyroid cancer which developed following her exposure to Millstone effluents at age 10.

MPS-82-29 17. In 2004, Dominion rejected the U.S. Department of Homeland Security's offer of a free security enhancement to protect the three Millstone intake structures from terrorist attack.[23]

MPS-82-30 18. In February 2005, the Coalition discovered that Zachary M. Hartley's rare jawbone cancer, believed caused by his mother's *in utero* exposure to Millstone radiological and chemical effluents in the nuclear/chemical "mixing zone" in 1997, was knowingly excluded from listing in the State of Connecticut's Tumor Registry because part of the orange-size cancerous tumor removed from Zachary's mouth in life-saving surgery was determined to be benign.

MPS-82-31 19. On March 10, 2005, Dr. Helen Caldicott, world-renowned pediatrician, authority on the health effects of low-level ionizing radiation and co-founder of Physicians for Social Responsibility, declared the likelihood that 7-year-old Zachary M. Hartley's rare jawbone cancer was caused by his mother's exposure to Millstone's radiological and chemical effluents.

MPS-82-32 Moreover, Millstone is unique in the annals of the U.S. nuclear industry: Millstone has released the highest levels of radionuclides of any nuclear power station in the country at various times over the past 35 years of its operational history.

From 1970 to 1987, Millstone had released a total reported release of 32 curies of radioactive iodine and particulates into the air, which included the highly carcinogenic strontium-90 and iodine-131, together with 6.7 million curies of total fission and activation gases such as xenon and krypton. During the same period, Millstone released 581 curies or 581 trillion picoCuries of radiation in the highest liquid volume of such releases

[23] See "Millstone Owner Turned Down Free Homeland Security Device" (The New London Day, March 9, 2005)

14

MPS-82-32 of mixed fission and activation products of any nuclear plant in the United States.[24]

In a single year, 1975, Millstone released a record reported high of 9.99 curies of iodine and particulates into the air and 199 curies of liquid mixed fission and activation products into the Long Island Sound, also a record for all U.S. reactors.[25] Id.

MPS-82-33 While the strontium-90 concentration in milk declined for the United States as a whole between 1970 and 1975, from 8 pCi/l to 3 pCi/l, it rose from 9.8 in 1970 to a high of 15.8 in 1973 and 14.8 in 1974 near Millstone, remaining at 10.7 by 1975. This is far in excess of the U.S. average of 3 pCi/l, ruling out any significant contribution to the local milk from bomb test fallout by France and China that continued until 1980.[26]

The calculated yearly radiation dose to bone of a child due to excess strontium-90 within 10 to 15 miles of Millstone, in excess of the yearly dose for the United States, rose from 33 millirem per year in the first full year of operation to 204 millirem per year by 1974, nearly three times the normal background level of 70 millirems per year in Connecticut.[27]

These doses of strontium-90 alone may be compared with the 15 millirem per year to any organ permitted under current NRC regulations, the 2 millirem produced to bone marrow in a typical X-ray of a child, and the 80 millirem per year to a developing fetus found to produce a doubling of the rate of childhood leukemia in the studies of the renowned Dr. Alice Stewart.[28]

MPS-82=34 Given all these facts and circumstances, the application of a "Generic Environmental Impact Statement" to Millstone, thereby precluding site-

[24] See Declaration of Ernest J. Sternglass, Ph.D., In the Matter of Dominion Nuclear Connecticut, Inc., Docket No. 50-336-LR, 50-423-LR, ASLBP No. 04-824-01-LR (August 8, 2004)

[25] Id.
[26] Id.
[27] Id.
[28] Id.

15

MPS-82-34 specific analysis in the Environmental Impact Statement, is so deeply flawed as to be fraudulent.

The Coalition and others have provided "new and significant" information which compels the NRC to conduct a site-specific analysis of the environmental impacts of relicensing Millstone Units 2 and 3. See discussion at pages 32 *et seq. infra*.

MPS-82-35 At the very least, the NRC should be required to evaluate the environmental impact of Millstone's radiological and chemical effluents – singly, in synergy and cumulatively - under site-specific analysis to qualify under the standards of the National Environmental Policy Act.

2.1.4.2 Gaseous Waste Processing Systems and Effluent Controls

In this section, the SEIS describes the liquid, gaseous and solid waste management systems presently in place to collect and treat the radioactive materials which are produced as a by-product of the nuclear plant operations.

The SEIS states as follows:

> Radioactive material produced from fission of uranium-235 and neutron activation of metals in the reactor coolant system is the primary source of liquid, gaseous and solid waste. The radioactive fission products build up within the fuel. Most of these fission products are contained in the fuel pellets and sealed fuel rods, but small quantities escape from the fuel rods into the reactor coolant. Neutron activation of trace concentrations of metals entrained in reactor coolant such as zirconium, iron and cobalt creates radioactive isotopes of these metals. Both fission and activation products in liquid and gaseous forms are continuously removed from reactor coolant and captured on several different types of filter media. Units 2 and 3 operate separate liquid and gaseous processing systems. Gaseous discharges for each unit are monitored separately before they are discharged to the stack or to other designated release points for each unit. All liquid discharges are directed to a canal which terminates in the old quarry and the quarry discharges to Long Island Sound.

16

MPS-82-36 Despite these comments, it is clear that station monitoring of radioactive effluents is presently inadequate and incomplete and that some radionuclides are released into the environment without measurement or documentation.

For example, In 1997, Northeast Utilities reported in its Annual Radiological Environmental Operating Report as follows:

> Section 4.5 Air Particulate Strontium (Table 5)
> Table 5 in past years was used to report the measurement of Sr-89 and Sr-90 in quarterly composited air particulate filters. **These measurements are not required by the Radiological Effluent Monitoring Manual (REMM) and have been discontinued.** Previous data has shown the lack of detectable station activity in this media. This fact, and the fact that milk samples are a much more sensitive indicator of fission product existence in the environment, prompted the decision for discontinuation. In the event of widespread plant related contamination or special events such as the Chernobyl incident, these measurements may be made.

MPS-82-37 As Dr. Sternglass has pointed out,[29] in 2001, Dominion recorded concentrations of strontium-90 in goat milk sampled five miles from Millstone at a level nearly twice that of the highest recorded concentration of strontium-90 in milk in Connecticut during the peak of atmospheric atomic bomb testing in the 1960s.

MPS-82-38 In 1997 alone, there were numerous reported incidences of station radiation monitors being inoperable:

- Unit 1 Liquid Radwaste Effluent Monitor (inoperable 6/7/96 – 3/25/97 – 83 days in 1997, 291 days total)
- Unit 1 Service Water Effluent Monitor (inoperable 6/9/96 – 7/18/97 – 198 days in 1997, 404 days total)

[29] See Coalition's March 2, 2005 filing to the NRC.

MPS-82-38 Unit 2 Steam Generator Blowdown Monitor (inoperable 2/22/96 – 8/26/97 – 237 days in 1997, 551 days total)(NU claims no discharges were made during this period)

Unit 2 Clean Waste Monitor Tank Radiation Monitor (inoperable 5/25/97 – 7/1/97 – 37 days)(NU claims no discharges were made during this period)

Even the GEIS acknowledges that some airborne radioactive effluent releases are not monitored, recorded or documented.

Within the entire body of radioactive airborne effluents released by Millstone over the course of its 35-year operational life, the SEIS only specifically considers those reported by Dominion in 2002 as follows:

Unit 2: Total fission and activation gas activity released 128 Curies
Iodine-131 4.90 X 10 –3 Curies
Particulates 1.22 X 10 –5 Curies
Tritium 31.2 Curies

Unit 3: Total; fission and activation gas activity released 2.45 Curies
Iodine-131 1.52 X 10 –6 Curies
Particulates 6.08 X 10 –5 Curies
Tritium 47.3 Curies

MPS-82-39 These figures do not break down the radioisotopes released, other than for Iodine-131 and Tritium, and do not identify nor quantify which radioactive gases are emitted, such as xenon-137 (with a half-life of 3.9 minutes decaying to cesium-137 with a half-life of 30 years); xenon-135 (with a half-life of 9.17 hours decaying to cesium-135 with a half-life of 3,000,000 years); nor krypton-89 (with a half-life of 3.2 minutes decaying to strontium-89 with a half-life of 52 days). These radioactive materials are long-lived and have cumulative impacts. The SEIS does not analyze these environmental impacts.

18

The SEIS states: "These releases from both units are typical of annual releases from Millstone and are not expected to increase during the renewal period."

MPS-82-40 Since the SEIS analysis was self-limited to the years 2001, 2002 and 2003, and annual releases for the 32 other years Millstone has been operating were not considered, the statement that "These releases from both units are typical of annual releases from Millstone" is not substantiated.

Moreover, the SEIS statement, that [these releases] are not expected to increase during the renewal period" is incorrect. First, releases of tritium, a known cancer-causing radioactive toxic with a half-life of 12.3 years. are trending upward.[30] Second, as Units 2 and 3 operate for longer periods at full capacity, airborne radioactive emissions will increase. Similarly, if during the renewal period Millstone Units 2 or 3 receive approval for power upgrades, airborne radioactive emissions will increase. The consequences of these reasonably foreseeable circumstances were not analyzed in the SEIS.

MPS-82-41 Moreover, the SEIS does not identify nor quantify strontium-90 releases, nor note the absence of strontium-90 monitoring from the station stack, while strontium-90 concentrations are regularly found to be inordinately high in goat milk taken from samples five miles from Millstone.

2.2.7 Radiological Impacts

In section 2.2.7, Radiological Impacts, on page 2-43, the section concludes, "The applicant does not anticipate any significant changes to the radioactive effluent releases or exposures from Millstone operations during the renewal period and, therefore, the impacts to the environment are not expected to change."

MPS-82-42 However, in Dominion Nuclear Connecticut Millstone Station Annual Radiological Operating Report 2003, in section 4.14, Seawater, on page 4-9, it is stated, "since the restart of Unit 3 in 1998 and Unit 2 in 1999, tritium

[30] See discussion at page 20 infra.

MPS-82-42 releases in liquid effluents have risen to levels at ***or above*** [emphasis added] those observed during pre-shutdown period."

Dominion records indicate that Millstone released 1854 curies of liquid radiation in 2000, an all time high. Such reported releases totaled 1273 curies in 2001, 1537 in 2002 and 1278 in 2003. NRC records for Millstone's liquid tritium releases totaled from 1970-1994 totaled 11,550 curies. The total from 1995-2003 was 8551 curies.

This trend of increasing amounts of tritium releases is dangerous because tritium has carcinogenic, mutagenic, teratogenic and transmutational properties whose effect upon the environment which have not been considered in the SEIS.[31]

The coastline around Millstone is lined with beaches and shoreline communities, with many summer residents as well. Human activities in the area include swimming, boating, fishing, clamming, scalloping. Thus there are ample opportunities for liquid tritium contamination of people and shore and marine life.

MPS-82-43 It is undeniable that the more the pressurized water reactors of Units 2 and 3 operate, the more tritium by-products they will create and release into the environment.

The current stated policy of both Dominion and the nuclear power industry in general is to operate power reactors as close to maximum capacity as possible. In 2003 Millstone 3 operated at almost 100% capacity. Millstone 2 operated at 80% capacity, but only because it shut down for refueling.

The increasing amounts of tritium discharged into Long Island Sound means that Dominion's claim that it "does not anticipate any significant changes to radioactive releases or exposures from Millstone operations during the renewal period" is false. Therefore the NRC's conclusion that "impacts to the environment are not expected to change" is also false.

---

[31] See "The Carcinogen, Mutagenic, Teratogenic and Transmutational Effects of Tritium," Citizens Awareness Network, April 1994.

20

MPS-82-44 Given this history, the NRC should mandate the immediate installation of filters to mitigate liquid tritium discharges from Millstone units 2 and 3. In addition, the NRC should mandate the testing of drinking water, well water and groundwater and in marine life in areas affected by Millstone for the presence of tritium. At present only sea water is tested for tritium.

Until these measures have been put into place and monitoring results have been made public until Millstone's current operating licenses expire, or units 2 and 3 permanently shut down, the NRC should not consider granting license extensions for Millstone units 2 and 3, in consideration of the health and safety of the public.

4.1 Cooling System

MPS-82-45 The GEIS identifies the issue of scouring caused by discharged cooling water as a Category 1 issue. As a "Category 1" issue, the NRC staff will not review it on a Millstone site-specific basis in the absence of "new and significant information."

The SEIS states the NRC staff "has not identified any significant new information during its independent review of the Dominion ER, the staff's site visit, the scoping process, its review of monitoring programs, or its evaluation of other available information."

MPS-82-45 Yet, scouring caused by discharged cooling water was identified by a technician in the Millstone Environmental Laboratory as an irreversible environmental impact during a recent public presentation on Dominion's environmental impacts presented at the Three Rivers Community College.

Accordingly, the NRC staff should request Dominion to release details to it of this "new and significant information."

4.1.1 Entrainment of Fish and Shellfish in Early Life Stages

Entrainment of winter flounder larvae at the Millstone intakes is a major issue and it is one which has been the subject of much litigation in the Connecticut courts. Lawsuits have been brought by local fishermen

21

complaining that Millstone intake structures have driven the indigenous Niantic winter flounder population to near-extinction. The fishermen have successfully resisted dilatory and repetitive motions on the part of Dominion and Northeast Utilities to dismiss their claims.

The SEIS states:

"The staff independently reviewed the Millstone Units 2 and 3 ER [Environmental Report], visited the site, and reviewed the applicant's NPDES permit. The staff also reviewed relevant scientific articles and agency documents (CTDEP) and NOAA (National Oceanic and Atmospheric Administration) Fisheries (also known as National Marine Fisheries Service [NMFS], interviewed agency staff, and interviewed a faculty member at the University of Connecticut who has conducted research on entrainment at Millstone." [Crivello 2003]

MPS-82-46 Astonishingly, the NRC staff does not report any attempt to consult with the **fishermen** who are targeted in the SEIS for the demise of the Niantic winter flounder population. Had the NRC staff attempted to locate commercial fishermen who fish for Niantic winter flounder near Millstone, it would have learned that the resource has vanished and, with it, the fishermen and a way of life.

Nor, apparently, did the NRC staff make any effort to consult with the experts who have testified in court proceedings to the overwhelming evidence that the suction action of the Millstone intake structures is the predominant cause of the collapse of the Niantic winter flounder population and has been since 1986, when Millstone Unit 3 went online.

Northeast Utilities obtained operating licenses for Millstone in the 1970s based on projections – possibly knowingly bogus – that the Millstone intake structures would have a far less devastating effect on the Niantic winter flounder larvae than has in fact occurred.

MPS-82-47 Although NRC staff spoke with Prof. Crivello of the University of Connecticut, who has studied Millstone entrainment, the staff does not explicitly identify Prof. Crivello as a paid consultant to Millstone's owners and operators each time his name appears in the SEIS.

MPS-82-48 Why did the NRC staff not meet with DEP's Victor Crecco, author of reports debunking Dominion's theorizing about the Millstone impacts on the Niantic winter flounder collapse?

MPS-82-49 The SEIS analysis of the collapse of the indigenous fishing stocks does not mention the discovery of a fish caught in Niantic Bay in 1997 contaminated with cesium-137 – nor Northeast Utilities' acknowledgment that the cesium-137 originated in its nuclear operations.[32]

The SEIS analysis does not mention the build-up of cobalt-60 in Jordan Cove near the Millstone discharge point[33] nor does the SEIS analyze the contribution of cobalt-60 buildup in sediment as a contributing factor in the collapse of the population of the bottom-feeding Niantic winter flounder.

MPS-82-50 Attributing the collapse of the fishing stocks to elevated water temperatures, the SEIS fails to consider the contribution of Millstone's 24-hour-a-day, seven-day-a-week thermal discharges to the Long Island Sound.

MPS-82-51 While the SEIS reports that "[T]he CTDEP [Division of Marine Fisheries which has been analyzing this issue for nearly a decade] believes that Millstone is having a significant impact due to entrainment of winter flounder larvae," the SEIS relies on NOAA and NMFS reports – which contain no data of the unique conditions at Niantic Bay but are devoted to a broad, regional analysis of fishing stocks - to discredit CTDEP Division of Marine Fisheries, as follows:

> Regulatory agencies concerned with the management of winter flounder have concluded that the resource is overfished and overexploited (NOAA 1998; NMFS 2003) and have instituted measures to reduce fishing pressure throughout Long Island Sound and the southern New England-middle-Atlantic region. Thus, there is ample evidence to suggest that fishing pressure is directly contributing to the decline **both local and regional levels** at and

[32] See Northeast Utilities 1997 Annual Radiological Environmental Operating Report at Section 4.17.2 ("Cs-137 was detected in one sample from the Niantic Bay (location 35). Positive indications are seldom seen in this media outside of the immediate discharge vicinity.")

[33] See [citation to follow]

MPS-82-51 may represent the major impact to this resource. The extent to which Dominion contributes to or exacerbates the problem in the Niantic River system is not elucidated by fish population studies reviewed in this SEIS." [Emphasis added.]

As stated, the SEIS does not identify either a NOAA or NFSS study specific to the Niantic River winter flounder nor the recent fishing habits of commercial fishermen in the area; thus, its failure to accord credit to the CTDEP for its insights appears to be result-driven, to obscure and downplay the fact that the Millstone Nuclear Power State has been the primary factor in driving indigenous fishing stocks to collapse. Or, as Rhode Island expert on Niantic winter flounder, Mark Gibson – a witness whose testimony aided Connecticut Superior Court Judge Robert Hale in issuing a temporary restraining order keeping Millstone Unit 2 shut down during the 1999 spawning season to avoid harmful entrainment effects to the fish population – has stated, Millstone is the worst predator of fish in the Northeast.

The SEIS concludes:

> The staff's evaluation of past impacts of entrainment on Niantic River winter flounder is inconclusive because unresolved questions remain about population dynamics, life history, and unknown factors that may be impacting the population. The available data do not allow us to unequivocally link or decouple population declines with Millstone operations . . . Because the spawning adult population is very low, and in consideration of the 20-year license renewal period, the staff's conclusion is that the impacts would be moderate.

MPS-82-52 The Coalition has reference to Figure 2-6 ("Comparison of Winter Flounder Population Trends in Niantic River and Long Island Sound".[34] This figure illustrates clearly that while the winter flounder fishing stocks in the region are rebounding – perhaps due in part to fishing restrictions that apply throughout the region – the Niantic River winter flounder population continues its collapse.

[34] Draft NUREG-1437, Supplement 22, 2-26 (December 2004)

MPS-82-52 The facts available to the NRC staff demonstrate that the sole factor which has prevented the Niantic River winter flounder population from enjoying a rebound as has the species elsewhere in the region due to tightened fishing restrictions is the most obvious one: the Millstone Nuclear Power Station.

It is submitted that if the SEIS staff had pondered the ramifications of Figure 2-6 in consultation with the Niantic fishermen who have gone out of business and the fishermen's expert witnesses and CTDEP's marine biologist Victor Crecco, in light of all the facts and circumstances, the NRC staff would have been compelled to categorize the impact to Niantic winter flounder from continued operations of Millstone in a license renewal period to be "major" and devastating and probably irreversible.

The weight of credible evidence is that the operations of the Millstone Nuclear Power Station have driven the winter flounder to virtual extinction, a phenomenon not contemplated in the original Millstone environmental impact statement. Future entrainment during the license renewal period will definitely assure that the once-abundant, commercially important resource will never return.

4.1.2.1 Impingement Monitoring
4.1.2.2. Impingement Mortality

At the request of Northeast Utilities, CT DEP permitted routine impingement monitoring for Unit 2 to cease in December 1987. Unit 2 did not have a fish return and all impinged marine organisms were presumed lost. Routine impingement monitoring has never been conducted for Unit 3.

MPS-82-53 The most recent data for Unit 2 involves sampling collected biweekly from July 2000 to June 2001. It is questionable whether the Unit 2 fish return was in operation during such period.[35] Data for Unit 3 involve samplings collected biweekly from January to December 1993.

These samplings do not suffice in frequency to form a data base to support conclusions about impingement during the 35-year operations of Millstone, nor to provide an adequate basis for extrapolation to the future.

[35] Report of a commercial lobsterman to the Coalition.

25

MPS-82-53 Thus, the SEIS statement:

> Based on the assessment to date, the staff expects that the measures in place at Millstone Units 2 and 3 (i.e., aquatic organism return systems) provide mitigation for impacts related to impingement, and no new mitigation measures are warranted.

is not supported by genuine evidence.

4.1.3 Heat Shock

MPS-82-54 The SEIS states:

> Millstone has remained in compliance with the NPDES thermal and discharge volume limits at the quarry cut. [SEIS at page 4-28]

Yet, the SEIS report is absent any indicia of an independent basis from which to render such a conclusion.

The SEIS states:

> The [NRC] staff also independently reviewed monitoring reports for the cooling-water discharge mixing zone. . . .the boundary of the mixing zone cannot exceed a radius of 2438 m (8000 ft) from discharge outlet at the quarry cut.

The SEIS report does not identify a single monitoring report by date or otherwise; any conclusions regarding the cooling-water discharge mixing zone are utterly unsubstantiated.

4.3 Radiological Impacts of Normal Operations

The NRC SEIS staff review of Millstone data on the most critical issue of "radiological impacts of normal operations" was self-limited to the years 2001, 2002 and 2003.

MPS-82-55 The NRC GEIS staff review of Millstone data on the most critical issue of "radiological impacts of normal operations" was self-limited to the years 1985, 1986 and 1987.[36]

Thus, in its consideration of whether the Millstone Nuclear Power Station should be permitted to operate in the years 2015-2025 (Unit 2) and 2025-2045 (Unit 3), the NRC deliberately failed to consider the "radiological impacts of normal operations" for the years 1970-1984, 1988-2000 and 2004 to the present.

Put another way, the NRC considered Millstone's "radiological impacts of normal operations" for only 6 of the 35 years the Millstone nuclear reactors have been routinely releasing harmful radiation into the environment – just 17 per cent of Millstone's operational history. Twenty-nine (29) years of Millstone's routine releases of harmful radiation releases to the environment are not evaluated in either the GEIS or the SEIS.

By limiting the pool of data considered in the GEIS and the SEIS to a period of time which encompasses only 17 per cent of Millstone's operational history of harmful radiation releases to the environment, the NRC failed to consider all available information. The NRC's evaluation of future impacts based on past impacts rests of an inadequate data base and its conclusions are accordingly unreliable, if not invalid. Certainly, the NRC staff's consideration of "cumulative" impacts (SEIS section 4.8.3) is scientifically unsound if not indeed scientifically fraudulent, since the NRC staff did not review, tabulate or assess the full scope of past impacts to be able to "accumulate" cumulate impacts..

On its website, www.nrc.gov/who-we-are/values.html, the NRC states that it "adheres" to "Principles of Good Regulation" which include the following:

> Independence: . . . Final decisions must be based on objective, unbiased assessments of all information, and must be documented with reasons explicitly stated."

[36] See GEISS Appendix E.19

The SEIS and GEIS systematically exclude all available information concerning Millstone's radiological effluents for the years 1970-1985, 1988-2000 and 2004 to the present. No reason for such exclusion is explicitly stated.

The GEIS addresses radiological impacts of "normal" operations of nuclear power plants during a projected renewal period as follows:

Radiation exposures to public (license renewal term):

GEIS: "Radiation doses to the public will continue at current levels associated with normal operations." (GEIS 4.6.2)

Occupational radiation exposures (license renewal term):

GEIS: "Projected maximum occupational doses during the license renewal term are within the range of doses experienced during normal operations and normal maintenance outages, and would be well below regulatory limits.

The GEIS categorizes the issue of "radiological impacts of normal operations" as a Category 1 issue, meaning that the SEIS reviewing staff need not consider site-specific issues at all in the absence of "new and significant information."

MPS-82-56 The Coalition believes that "radiological impacts of normal operations" must be considered on a site-specific basis with regard to Millstone Units 2 and 3 as a Category 2 issue. See discussion at page 32 *et seq. infra*. Because the SEIS did not consider the issue as a Category 2 issue, the SEIS is deeply flawed and inadequate and falls far short of meeting the NRC's "Principles of Good Regulation."

MPS-82-57 Finally, as stated, the SEIS states that the NRC staff is not required to evaluate Millstone radiation releases on a site-specific basis because Millstone releases were subjected to site-specific analysis in the GEIS which found them to be "well within regulatory limits." This statement is most misleading in that it fails to acknowledge that the NRC GEIS staff limited itself to reviewing Millstone's reported radiological emissions for the

MPS-82-57 years 1985, 1986 and 1987 only.[37] Millstone's largest reactor, the 1,220-megaWatt Unit 3 – was still under construction in 1985. By the year 1987, it had not established an operational record; it has since substantially increased output and, hence, "routine" radiological emissions.

GEIS Section 4.6 ("Radiological Impacts of Normal Operation") provides in pertinent part as follows:

> This section provides an evaluation of the radiological impacts on occupational personnel and members of the public during normal operation following license renewal. This evaluation extends to all 118 nuclear power reactors. Radiation exposures occurring after license renewal are projected based on present levels of exposures. Estimates of additional maintenance, testing and inspections as a result of a variety of age-related changes in operational procedures were made based on the anticipated changes to current operation and are detailed in Section 2.6 and Appendix B. Added maintenance, testing, and inspection will be accompanied by increased exposure time to members of the work force but are not expected to significantly influence dose to members of the public.

As noted,[38] the GEIS was published in 1996. Hence the above statement, "Radiation exposures occurring after license renewal are projected based on present levels of exposures," must be read with regard to 1996-or-earlier levels of exposure, rather than actual "current" exposures. However, the NRC SEIS staff limited its review to 2001-2003 data, rather than actual "current" exposures. As also noted, the NRC GEIS staff only reviewed Millstone's 1985-1987 exposure data.

With regard to the above statement:

> Estimates of additional maintenance, testing and inspections as a result of a variety of age-related changes in operational procedures were made based on the anticipated changes to current operation and are detailed in Section 2.6 and Appendix B.

[37] See GEIS, Table E19.
[38] See discussion at page 10 supra.

MPS-82-58 the SEIS fails to identify or evaluate any "additional maintenance, testing and inspections as a result of a variety of age-related changes in operational procedures" at Millstone.

With regard to the above statement:

> Added maintenance, testing, and inspection will be accompanied by increased exposure time to members of the work force but are not expected to significantly influence dose to members of the public

the SEIS fails to identify or evaluate any "added maintenance, testing, and inspection "at Millstone and hence fails to evaluate increased exposure time to members of the work force and members of the public during the proposed renewal period.

MPS-82-59 The SEIS also fails to consider the environmental impact of Dominion's August 24, 2004 submittal to the NRC requesting approval of the "Nuclear Facility Quality Assurance Program Description." According to an Request for Additional Information ("RAI"), dated February 24, 2005, this program deletes from the Millstone Quality Assurance program radiological protection responsibilities which include "maintaining records and reports on radioactive contamination levels." If this application is approved, a safeguard to protect against excessive worker radiological contamination will be lost and there will be no basis for the NRC to conclude now that occupational radiation exposures during the license renewal term will be small and within regulatory limits.

MPS-82-60 The NRC SEIS staff accepted at face value Dominion's self-assessment that it would not conduct "major" refurbishment in the future. Thus, the NRC SEIS staff considered neither "major" or "minor" refurbishments. The NRC SEIS staff's conclusions about the radiological impacts during refurbishment are therefore necessarily flawed. Given the strong likelihood that major refurbishment in the form of a stationwide conversion from once-through cooling to closed cooling systems will be ordered by the Connecticut DEP – to avoid future exposure of pregnant women and others to harmful radioactive and toxic waste effluents in the "mixing zone" and to avoid irreversible impacts to the indigenous Niantic winter flounder – the radiological impacts from such refurbishment should have been fully explored and analyzed in the SEIS.

30

The NRC's GEIS further states at section 4.6.1.1:

> To determine whether the added period of operation following license renewal would, by virtue of buildup, result in significant (double) added dose, the ratios of buildup factors for midlives of 30 to midlives of 20 years were evaluated. These ratios amount to a 35 per cent increase for Cesium-137 and a 6 per cent increase for cobalt-60. This added increase due to buildup will not significantly change the total dose to members of the public.
>
> In certain cases, the bioaccumulation factors may require reexamination. These principally involve fish (in the human food chain) that are bottom feeders. Bottom feeders may ingest worms and other biota that may remobilize radioactive materials accumulated in the sediments.
>
> Accumulation of radioactive materials in the environment is of concern not only to license renewal but also to operation under present licenses.

MPS-82-61 As stated,[39] the bioaccumulation of cobalt-60 in sediment in Jordan Cove near the Millstone discharge point has been established. The SEIS does not address this phenomenon, even though required by the GEIS.

Millstone's monitoring of the aquatic environment in the area of the discharge has also revealed the presence of the following plant-related radionuclides: cobalt-60, zinc-65, silver-110 and cesium-137.[40]

In 1997 and at other times, "[I]ndications of plant releases were observed" in aquatic flora, including detectable levels of cobalt-60, zinc-65 and silver-110. According to the 1997 Radiological Environmental report filed by Northeast Utilities,

> The detection of these [radio]nuclides throughout the year, as witnessed by positives detected in other aquatic media, correspond to radioactive liquid discharges from the three Millstone units. Sampling

[39] See discussion at page 8 supra.
[40] See 1997 Annual Radiological Environmental Monitoring Program Report.

MPS-82-61 of this media provides useful information because it is very sensitive to plant discharges. However, since seaweed is not consumed, other media are utilized in the determination of dose consequences (e.g., see Shellfish and Fish results)

The presence of cesium-137 in a fish caught in the "mixing zone" within the Niantic Bay – as identified as a plant-related contamination in the 1997 Millstone effluent report – suggests widespread bioaccumulation of that carcinogenic radioisotope within the environment, requiring a "re-examination pursuant to GEIS standards.

The "radiological impacts of normal operations" should be analyzed as a site-specific Category 2 issue.

4.4 Socioeconomic Impacts of Plant Operations During the License Renewal Period

MPS-82-62 The SEIS considers the economic contribution to the community through payment of Dominion's workforce; however, the SEIS does not separate out the economic investment made in maintaining a workforce to monitor Unit 1, a nuclear power plant undergoing decommissioning, and its repository of spent nuclear fuel. Nor does the SEIS consider the prospect of a continuing workforce required to maintain Units 2 and 3 in the event each or both units is/are decommissioned or prematurely shut down before or during the renewal period.

MPS-82-63 The SEIS does not consider the enormous health care costs associated with the community's long-term exposure to low-level ionizing radiation, nor worker illnesses related to their exposures. We are aware of a recent surgery, upon a patient whose cancer is fairly linked to Millstone radiological and toxic chemical emissions, which cost in excess of $2.5 million. This does not include follow-up or lifelong care.

The SEIS is incomplete and inaccurate in its assessment of socioeconomic impacts.

4.4.6 Environmental Justice

32

MPS-82-64 The SEIS does not address the environmental justice issues involved in the transportation and storage of nuclear waste generate by the Millstone Nuclear Power Station, either during its 35 years of operations or in the future. Transportation through poor urban areas and storage of Millstone's nuclear waste in poor rural communities both implicate environmental justice concerns; neither aspect was addressed in the SEIS.

4.7 Evaluation of Potential New and Significant Information on Impacts of Operations During the Renewal Term

The Connecticut Coalition Against Millstone and others have provided the SEIS staff with "new and significant information" which, once considered, dictates site-specific review as Category 2 issues or, in the alternative, rejection of the SEIS *in toto*.

The "new and significant" information may be summarized as follows:

Millstone causes cancer and Millstone is responsible for an increased cancer incidence in the surrounding community.

The SEIS states that "commentators" have provided "no evidence to support a causal relationship between increased cancer incidence and Millstone operations."

The NRC's SEIS staff concluded that the information provided during the scoping process was not new and significant with respect to the findings of the GEIS on the health effects to the public from radiological effluent releases due to the Millstone operations."

MPS-82-65 To the contrary: the Coalition and others have presented overwhelming and unrebutted evidence of a causal relationship between increased cancer incidence and Millstone operations.

33

While these facts are "significant," they are not "new."

Since practically the onset of Millstone nuclear operations, Millstone's radiological emissions have been linked to heightened cancer incidences.[41]

This is hardly surprising.

Since the onset of its operations, Millstone's owners and operators have submitted reports to the NRC and the DEP detailing their radiological[42] and chemical[43] effluent emissions to the air and water.

Millstone routinely releases to the air and water the following radioactive materials:

Ag
Be-7
Ce-144
Co-57
Co-58
Co-60
Cr-51
Cs-134
Cs-137
Fe-55
Fe-59
I-131
I-133
Kr-85
Kr-88
La-140
Mn-54
Mo-99
Na-24
Nb-95
Nb-97

[41] See footnote 4 supra.
[42] See the list of radionuclides listed at pages 34-35.
[43] See the list of chemical effluent emissions listed at pages 36-40.

34

Ru-105
Sb-122
Sb-124
Sb-125
Sn-113
Sr-89
Sr-90
Sr-92
TC-99M
TC-101
TC-104
Tritium
Xe-133
Xe-135
Zn-69M
Zr-95
Zr-97[44]

This list is not exhaustive.

MPS-82-66 **All radionuclides released by Millstone cause cancer.[45]**

According to the U.S. Environmental Protection Agency,

> **Radioactive materials that decay spontaneously produce ionizing radiation. Any living tissue in the human body can be damaged by ionizing radiation. Cancer is considered by most people the primary health effect from radiation exposure. Simply put, cancer is the uncontrolled growth of cells. Ordinarily, natural processes control the rate at which cells grow and replace themselves. They also control the body's processes for repairing and replacing damages tissue. Damage occurring at the cellular or molecular level can disrupt the control processes, permitting the uncontrolled growth of cells – cancer. This is why ionizing radiation's ability to break chemical bonds**

[44] Fission and Activation Products – Millstone Unit 2 Liquid Effluents – Batch Sampling – 1997 as reported in 1997 Radiological Environmental Monitoring Program.
[45] See selected bibliography prepared by Nuclear Information Resource Service, attached.

35

MPS-82-66 **in atoms and molecules makes it such a potent carcinogen. . . . There is no firm basis for setting a "safe" level of exposure above background for stochastic effects [those resulting from long-term, low-level exposure to radiation]. . . . Other than cancer, the most prominent long-term health effects [from radiation exposure] are teratogenic [those that result from the exposure of fetuses or unborn children to radiation] and genetic [those that can be passed from parent to child] mutations.[46]**

According to the U.S. Nuclear Regulatory Commission, genetic effects and the development of cancer are the primary health concerns attributed to radiation exposure.[47]

MPS-82-67 **Many chemicals discharged by Millstone are known carcinogens, such as hydrazine, hexavalent chromium, cadmium, lead and benzene and many others.**

Millstone routinely discharges into the nuclear/chemical "mixing zone" which extends 8,000 feet toward the Niantic and Waterford shorelines, the following chemicals and others:[48]

Chemicals & Metals "Known or Suspected Present" in Discharge [156 compounds listed]

Aluminum
Antimony
Ammonia
Ammonium Hydroxide
Arsenic
Barium
Beryllium
Boric Acid
Boron

[46] U.S. Environmental Protection Agency website, "Understanding Radiation: Health Effects" (3/16/05)
[47] U.S. Nuclear Regulatory Commission website, "Fact Sheet: Biological Effects of Radiation." (3/26/05)
[48] Millstone 1997 Radiological Environmental Monitoring Program Report and documents filed with Connecticut DEP.

36

Bromide
Bulab 6002
Cadmium
Carbohydrazide
Chlorine
Chromium
Cobalt
Conquor 3585 (methoxypropylamine and diethylhydroxylamine)
Copper
Cyanide
Dietylhydroxylamine
Epichlorohydrin
Ethanolomine
Fluoride
Freon
Hexavalent Chromium
Hydrazine
Hydrogen Peroxide
Iron
Methoxypropylamine
Molybdate
Molybdenum
Nalcolyte
Nickel
Nitrogen
Oil & Grease
Phosphorus
Selenium
Silver
Styrene
Sulfate
Sulfide
Sulfite
Surfactants
Thallium
Tin
Titanium
Tolyltriazole
Xylene

Zinc
Zirconium

Volatiles
Acrolein
Acrylonitrile
Benzene
Bromoform
Carbon Tetrachloride
Chlorobenzene
Chlorodibromomethane
Chloroethane
2-Chloroethylvinyl Ether
Chloroform
Dichlorobromomethane
1, 1-Dichloroethane
1, 2-Dichloroethane
1, 1-Dichloroethylene
1, 2-Dichloropropane
1, 3-Dichloropropylene
Ethylbenzene
Methylbromide
Methylchloride
Methylene Chloride
1, 1, 2, 2, -Tetrachloroethane
Tetrachloroethylene
Toluene
1, 2-Trans-Dichloroethylene
1, 1, 1-Trichloroethane
1, 1, 2-Trichloroethane
Trichloroethylene
Vinyl Chloride

GC/MS Fraction Acid Compounds
2-Chlorophenol
2, 4-Dichlorophenol
2, 4-Dimethylphenol
4, 6-Dinitro-O-Cresol
2, 4-Dinitrophenol

38

2-Nitrophenol
4-Nitrophenol
P-Chloro-M-Cresol
Pentachlorophenol
Phenol
2, 4, 6-Trichlorophenol

Base Neutral Compounds
Acenaothylene
Benzidine
Benzo(a)anthracene
Benzo(a)pyrene
Benzo(ghi)perylene
Benzo(k)fluoranthene
Bis(2-Chloroethyl) Ether
Bis(2-Ethylhexyl)phthalate
Chrysene
Dibenzo(ah)anthracene
1,2-Dichlorobenzene
1.3-Dichlorobenzene
1.4-Dichlorobenzene
3.3-Dichlorobenzidines
Diethyl phthalate
Dimethyl phthalate
Di-n-butyl phthalate
2,4-Dinitrotoulene
1,2-Diphenylhydrazine
Fluoranthene
Fluorene
Hexachlorobenzene
Hexachlorocyclopentadiene
Hexachloroethane
Indenol1,2,3-ed)pyrene
Isophorone
Nurobenzene
N-Nitrosodimethylamine
N-Nitrosodiphenylamine
Phenanthrene
Pyrene

39

Pesticides
Aldrin
Chlordane
DDT
DDE
Dieldrin
Endosulfan(alpha)
Endosulfan (beta)
Endosulfan Sulfae
Endrin
Endrin Aldehyde
Heptachlor
Heotachlor epoxide
Arochlor 1016(PCB)
Arochlor 1232(PCB)
Arochlor 1242(PCB)
Arochlor 1248 (PCB)
Arochlor 1254 (PCB)
Arochlor 1260 (PCB)
Toxaphene

Other Substances
Ammonia
Benzo(b)fluoranthene
Chlorine
Hexachlorocyclohexane (Alpha)
Hexachlorocyclohexane (Beta)
Hexachlorocyclohexane (Gamma)
2,3,7,8-TCDD

MPS_82-68 **The interaction of radionuclides and chemicals has been established to create a synergy, multiplying the harmful effects of each.[49]**

[49] See Memorandum of Ernest J. Sternglass, Ph.D. dated March 8, 2005 ("Synergistic Interaction of radiation, Air Pollution and Chemicals") and references therein (copy

MPS-82-69 **Millstone discharges these radionuclides and chemicals – and more – into the air and into the nuclear/chemical "mixing zone" known as Niantic Bay, Pleasure Beach and Jordan Cove, defined as an area within 8,000 feet of the Millstone discharge point.**

Some of the radionuclides, such as cesium-137, have been found in fish swimming in Niantic Bay.[50]

Some of the radionuclides, such as cobalt-60, have been found in the sediment of Jordan Cove where they enter the food chain when they are ingested by worms.[51]

Some of the radionuclides and toxic chemicals very likely entered Zachary M. Hartley's mother while she was swimming in the nuclear/chemical"mixing zone" popularly known as Hole-in-the-Wall Beach during critical months of her pregnancy with Zachary, according to an expert on the health effects of low-level ionizing radiation, Dr. Helen Caldicott.[52] Four pathways are possible: breathing, swallowing, skin contact and eating a radioactive fish. Zachary was born with a rare cancer in his jawbone requiring lifesaving surgery.

In SEIS section 4.7, beginning on page 4-53, the NRC states, "During scoping, some commentators suggested that operation of Millstone resulted in excess cancers in populations around the plant site," and "other support of these positions at the May 2004 public meeting or thereafter commentators suggested there is no relationship between cancer incidence and nuclear power plants."

MPS-82-70 Millstone's cumulative dose to the environment and humans, based on annual Millstone reports filed with the NRC since 1970, totals over 6.5 curies. As reported in the response to section 2.2.7, releases of tritium into

---

attached). And see "Health Effects of selected Industrial Chemicals and Radionuclides" (STAND Technical Report 2003-2) at page 5 (copy attached).

[50] See 1997 Annual Radiological Environmental Operating Report at page 4-5.

[51] See [citation to follow]

[52] See footnote 14 supra.

41

MPS-82-70 Long Island Sound since Millstone's restart in 1998 are at all time highs in its operating history.

Current annual plant reports indicate that Millstone Units 2 and 3, as in the years since 1970, have been releasing radionuclides such as strontium-90, cesium-137, iodine-131, -133 and -135, cobalt -58 and -60, krypton-85, xenon-131, -133 and -135, and other such radioactive chemicals, all known to be carcinogenic.

The NRC's denial of a causal relationship between Millstone's 35 years of radioactive releases and elevated cancer rates in nearby towns, and in New London County as a whole, does not hold up to scrutiny.

The most glaring example of the NRC's denial in the Millstone SEIS is its complete omission of consideration of the August 17, 2004 declaration of Dr. Ernest J. Sternglass. The Millstone SEIS lists, on page C-9, Dr. Sternglass' declaration as received on August 17, 2004. This is the only mention of it in the SEIS.

Consequently, the declaration was omitted from the NRC's evaluation of potential new and significant information in section 4.7.

In his declaration, Dr. Sternglass presents his credentials as an expert in the field of radiation and human health. He has written and published numerous studies in this field in peer reviewed scientific journals and testified to Congress and other government agencies on this subject. The NRC knows full well who Dr. Sternglass is. He first brought up the problem of radioactive releases in relation to increasing cancer rates around nuclear plants, and in towns near Millstone in particular, to the public eye in the 1970s. He has conducted and published studies informing the public of this continuing problem ever since.

In his declaration, Dr. Sternglass methodically outlines the "causal relationship between abnormally high doses of strontium-90 in milk produced near Millstone and the pattern of cancer changes at various distances from the Millstone plant.

MPS-82-71 Dr. Sternglass also states in his declaration, "It is my professional opinion that the radioactive releases from the Millstone Nuclear Power

42

MPS-82-71 Station since its startup have caused and ***will continue to cause*** [emphasis added] excess infant mortality, low birthweight, leukemia and cancer as well as increased rates of both chronic and infectious diseases in the towns around Millstone as well as in New London County and Connecticut as a whole."

For the NRC to exclude Dr. Sternglass' declaration from section 4.7 is a glaring major error in that in and of itself invalidates the NRC's conclusion that "information provided during the scoping process was not new and significant with respect to the findings of the GEIS on the health effects to the public from radiological effluent releases due to the Millstone operations."

This statement rather is indicative of the NRC's determination to support the nuclear industry's–and in this case Dominion's–rush to relicense old unsafe nuclear plants, to the detriment of the public's health and safety. This bias is repeated in statements and omission throughout section 4.7, as the following will demonstrate.

MPS-82-72 For example, in dealing with the Connecticut Tumor Registry's report, "Cancer Incidence in Connecticut Counties 1995-99," the NRC does report that New London County "had the highest incidence rate of all invasive tumors for females," but omits that this rate was second highest for males, as was reported at the May 2004 public meeting.

Furthermore, the NRC characterizes information in the report indicating that New London County had the highest rate for 12 specific kinds of cancers as "several forms," a choice of words that seeks to minimize a major health crisis.

The NRC also fails to mention information from the report, which was testified to at the May 2004 public meeting, that New London County had the second highest rate for six more kinds of cancer, third highest for five additional ones, and fourth highest for seven more, totally 30 out of 39 kinds of cancers in which New London County was counted separately.

All of the above reveals a deliberate and systematic attempt to exclude the most important "new and significant" information about Millstone radioactive releases and its effects on human health.

MPS-82-73 Similarly, in dealing with a 2003 study by Joseph Mangano et al, presented at the May 2004 public meeting, "Elevated Childhood Cancer Incidence Proximate to U.S. Nuclear Power Plants," the SEIS selectively focuses on information from the study that indicates there may not be a causal relationship between Millstone's radioactive releases and health problems. So the NRC states the study "reported no significant difference in childhood cancer mortality rates between counties surrounding the nuclear plants and the U.S. population."

This would be fine and fair if the agency did not also exclude the major finding of the study, which is that "cancer incidence for children less than 10 years of age, who live within 30 miles of each of 14 plants [one of which is Millstone] in the eastern U.S. (49 counties with a population of more than 16 million) exceeds the national average. The excess 12.4% suggests that 1 in 9 cancers among children who reside near nuclear reactors is linked to radioactive emissions."

Once again, this omission is deliberate and systematic, serving the nuclear industry's interests to the detriment of the public's health and safety.

MPS-82-74 The NRC also failed to mention numerous other studies listed in the bibliography of study that have linked radioactive releases from nuclear facilities to elevated cancers.

MPS-82-75 Another example of this exclusion of new and significant information is the NRC's treatment of the 1990 National Cancer Institute study of cancer in counties near nuclear power plants.

That study found that the risk for leukemia in children under 10 in New London County was over 3 times higher than for same aged children in "control counties" used for comparison. The NRC focused on NRC information that sought to downplay of that finding.

MPS-82-76 However, the NRC excluded other NCI information cited by Joseph Mangano in his report, also presented and testified to at the May 2004 public meeting, entitled "2500 Excess Cancer Cases in New London County Since 1970; Radioactive Emissions From Millstone May Be Cause." In that report Mangano stated, "in Millstone's first 14 years, leukemia cases

MPS-82-76 for New London County children under 10 were ***55% higher*** than the state, and leukemia deaths ***45% higher***. All scientists agree that children are most sensitive to low-level radiation's effects."

Once again, the NRC's failure to give equal weight to critical evidence invalidates its analysis and makes its conclusions false, as well as disqualifying itself as a just arbiter.

Another example is its treatment of another Connecticut Tumor Registry report, which examines cancer incidence in Connecticut towns 1995-99, rather than by county.

First of all, this report was not brought in by the public during the scoping process. The NRC decided to do so on its own as part of its response to information presented at the May 2004 public meeting and thereafter. Why? The NRC reported on the results of the study for only one town, Waterford, site of Millstone. The NRC reported "The town of Waterford does not have the highest ratio of observed cancers to expected cancers for any form of cancer analyzed."

MPS_82-77 As the NRC well knows, there is no barrier to prevent Millstone radioactive emissions from traveling beyond the boundaries of the town of Waterford. A more comprehensive such analysis would have included other towns near Millstone. But the NRC didn't do that, once again excluding critical information.

However, investigative journalist and author Michael Steinberg of Niantic, CT, did perform such an analysis, including the towns of Waterford, East Lyme, Old Lyme, New London and Groton together. Steinberg's analysis, included herein, found higher than expected incidence of cancer in these towns together for: all female cancers, lung cancer for females, colorectal cancers for females, prostate cancer for males, breast cancer for females, melanoma for both males and females, and cervical cancer for females.[53]

These findings are consistent with findings presented from the Connecticut Tumor Registry's study of Connecticut Counties 1995-99, as

[53] See "Cancer Incidences in Connecticut Towns 1995-1999," as compiled by Michael Steinberg, attached.

MPS-82-77 well as information presented in Mangano's 1998 study "2500 Excess Cancer Cases...", Sternglass' declaration, and a new study by Mangano presented at the January 11, 2005 meeting.

MPS-82-78 Finally, the NRC reports in section 4.7 that a 2000 study by the Connecticut Academy of Science and Engineering (CASE) found that "The town of Waterford was not in the highest ratio category for any cancer except thyroid cancer, and at least three other town had higher ratios for thyroid cancer. At least 30 town had higher ratios for pediatric leukemia (ages 0 to 14) than Waterford."

First of all, this analysis, as reported above, is defective by limiting it to Waterford. Secondly, the CASE study focused on the Connecticut Yankee Nuclear Plant, and Millstone is never mentioned in it. Therefore radioactive emissions from Millstone are not considered in its analysis. Furthermore, information for cancer is not reported statistically by town, other than in maps where towns are not identified specifically but are marked by varying shades of white to black.

Nevertheless, the maps do indicate elevated cancers in towns around Millstone for all the specific kinds of cancers studied: thyroid cancer is elevated not only in Waterford, but also in Groton, Old Lyme and Stonington. Multiple myeloma is elevated for Waterford. And acute adult leukemia is elevated for Groton and Ledyard, both downwind of Millstone. However, while the CASE study uses information from the Connecticut Tumor Registry for 1976-95, I does not look for trends over those years (e.g. by comparing cancer rate increases or decreases over 5 year periods, as was done in studies by Sternglass and Mangano).

The CASE study was initiated in 1997. At that time, all three Millstone reactors had been shut down for two years because of gross mismanagement and harassment of whistleblowers. At that time Northeast Utilities owned and operated Millstone, and still owned the permanently shut down Connecticut Yankee Nuclear Plant. CASE reports that Northeast Utilities was one of its top financial supporters at that time, and its website still shows NU at the top of its list of financial supporters.[54]

[54] We attach a study critical of the CASE report, entitled "Epidemiological Evaluation of the CASE Report Entitled 'Study of Radiation Exposure from the Connecticut Yankee Nuclear Power Plant'"(Suzanne Gutter and Edwin van Wijngarden)(February 21, 2001)

46

Thus NU in effect was a major funder of the CASE study, which means CASE had a major conflict of interest, one that put pressure on it to come up with results that would please the hand that feeds it.

MPS-82-79 All the above points to the failure of the NRC to conduct a fair and unbiased analysis of the critical information given as public testimony at the May 2004 pubic meeting in Waterford, Connecticut, and in documents presented there and thereafter to the NRC.

As a result the NRC's conclusion that there is not new and significant information is fatally flawed. The agency excluded and downplayed the critical information that was presented, information that establishes a strong and clear relationship between Millstone's 35 years of radioactive emissions and the concurrent rise of cancers and other diseases in towns around Millstone and in New London County, as well as across Connecticut and into Rhode Island.

MPS-82-80 While the Connecticut Tumor Registry is a source of much information about the heightened incidence of cancer and related diseases in the area surrounding Millstone, it is not a completely reliable source of information.

Zachary M. Hartley is not the only victim of Millstone's radiological and toxic chemical releases. In any individual cancer case, a 100 per cent positive correlation with a suspected causative agent cannot be made. That is why we rely on all available information obtained formally – such as the Connecticut Tumor Registry and epidemiological research – as well as informally, through reports of victims themselves or their family members to understand the scope of this public health emergency.

Although Zachary was born in Connecticut with a life-threatening cancer in his jaw and although a tumor the size of an orange was removed from his face when he was 14 months of age, the Connecticut Tumor Registry does not list Zachary's cancer. The Registry's explanation is that a portion of Zachary's tumor was benign and therefore it does not qualify for listing in the Connecticut Tumor Registry.

MPS-82-81 The NRC SEIS staff relies on a report of the National Cancer Institute (NCI 1990), which in turn relies on data of the Connecticut Tumor Registry.

47

MPS-82-81 According to the Connecticut Tumor Registry website, it obtains its funding from the National Cancer Institute.[55] The NCI report is fifteen (15) years old. The NCI report was released four (4) years after Millstone Unit 3 commenced generating nuclear energy and long before many cancers associated with its dangerous emissions might be detected. It does not reflect the extremely high concentrations of strontium-90, a carcinogen, found in goat milk sampled within five miles of Millstone in 2001. It does not report the case of Zachary M. Hartley. It does not report the case of Rachel Heaton, who developed a rare form of thyroid cancer years after swimming in the Niantic shoreline "mixing zone" because she moved from the area. Nor does it report the brain tumor of Charles D. Douton, Jr., one of three former Millstone site maintenance workers who developed brain tumors and were dismissed from their jobs at Millstone by Northeast Utilities, as identified by Cynthia M. Besade in her August 5, 2004 affidavit. The NCI report does not include any of the seven (7) cancer cases recently identified to the NRC SEIS staff among residents or former residents of a single road - Seabreeze Drive - in Waterford two miles downwind from Millstone. The Connecticut Coalition Against Millstone is actively investigating to determine to what extent the Connecticut Tumor Registry fails to maintain records of other Millstone victims.

The Connecticut Coalition Against Millstone is also actively investigating information it has received of rare cancers – including a fatal skin cancer confined to the feet of a woman who frequently waded for long periods in the nuclear/chemical "mixing zone" to the east of the Millstone discharge point – in the community surrounding Millstone. The information under review includes dozens of cases of early childhood death and disease.

MPS-82-82 The Coalition attaches a selected Bibliography compiled by the Nuclear Information Resource Service ("NIRS") linking nuclear power plant radiological emissions with cancers in their communities. For example, NIRS reports a 400 per cent increase in leukemia incidence in the population living downwind from the Pilgrim (MA) Nuclear Power Plant during the first five years after nuclear fuel was known to have leaked excess radioactivity. A necessary review of Millstone records will reveal the occurrence of leaking fuel at Unit 2 after Dominion assumed ownership.

[55] See www.dph.state.ct.us/OPPE/hptumor.htm

48

MPS-82-83 The Coalition notes that the European Committee on Radiation Risk ("ECRR") has reported that radiation dose models employed by the NRC and other governmental agencies are probably 100 to 1,000 times too high to be accurate.[56]

The NRC SEIS staff had to be reminded at the NRC's January 11, 2005 public meeting on the SEIS that the Coalition and others had previously submitted documentation to the NRC establishing a causative link between Millstone radiological and toxic effluent emissions and the heightened cancer rates in the area surrounding Millstone.

The NRC SEIS staff did not adhere to the NRC's Principles of Good Regulation, which require in part:

> Independence: Nothing but the highest possible standards of ethical performance and professionalism should influence regulation. However, independence does not imply isolation. All available facts and opinions must be sought openly from licensees and other interested members of the public. The many and possibly conflicting public interests involved must be considered.

The SEIS states that the NRC staff

> and its contractors discussed Millstone's history of radiological effluent and environmental monitoring with officials from CTDEP's Division of Radiation. The reports cited above by CTDPH, CASE and the national Cancer Institute were also discussed. CTDEP conducts its own radiological environmental monitoring program around Millstone. STDEP had also reviewed the reports by CTDPH, CASE and the National Cancer Institute. CTDEP concluded that Millstone's radiological effluent and environmental monitoring data were accurate. CTDEP also concluded that the reports cited above by CTDPH, CASE and the National Cancer Institute reports showed no evidence of a causal link between public exposure to Millstone's radiological effluents and cancer in Connecticut towns."

[56] See "ECRR Report Challenges Entrenches Radiation Assumptions" (MIRS, February 21, 2003)

The Connecticut Coalition Against Millstone has sent correspondence to Dr. Edward C. Wilds, Director of the DEP Radiation Bureau, to determine what conversations occurred with the SEIS staff, whether the DEP staff agrees with the characterizations of its conduct and input in the SEIS. Finally, the Coalition asked Dr. Wilds if he agreed with the SEIS statement that "CTDEP concluded that Millstone's radiological effluent and environmental monitoring data were accurate," and if so, to specify what radiological effluent and environmental monitoring data were referenced and, further, if so, how such statement could be reconciled with Northeast Utilities' plea of guilty in 1999 in the U.S. District Court to committing environmental felonies, including falsifying environmental monitoring records.

To date, Dr. Wilds has failed to respond to the Coalition's request.

4.8.3. Cumulative Radiological Impacts

The GEIS did not perform a meaningful analysis of cumulative radiological impacts because its data base was limited to Millstone effluent discharges from 1985-1987.

The GEIS further states:

> In addition, the radiological environmental monitoring program conducted by Dominion in the vicinity of Millstone measures radiation and radioactive material from all sources, including Millstone; therefore, the monitoring program measures cumulative radiological impacts.

The Health Physics Society defines cumulative dose as follows:

> The total dose resulting from repeated exposures of ionizing radiation to the same portion of the body, or to the whole body, over a period of time.

MPS-82-84 Correspondingly, the SEIS failed to conduct the analysis required by virtue of GEIS 4.6.1.1, which provides:

MPS-82-84 To determine whether the added period of operation following license renewal would, by virtue of buildup, result in significant (double) added dose, the ratios of buildup factors for midlives of 30 to midlives of 20 years were evaluated. These ratios amount to a 35 per cent increase for Cesium-137 and a 6 per cent increase for cobalt-60. This added increase due to buildup will not significantly change the total dose to members of the public.

In certain cases, the bioaccumulation factors may require reexamination. These principally involve fish (in the human food chain) that are bottom feeders. Bottom feeders may ingest worms and other biota that may remobilize radioactive materials accumulated in the sediments.

Accumulation of radioactive materials in the environment is of concern not only to license renewal but also to operation under present licenses.

Accordingly, the SEIS is substantially flawed on the issue of cumulative radiological impacts.

Conclusion

It has been demonstrated herein that the adverse environmental impacts of Millstone license renewal are so great that preserving the option of license renewal for energy planning decisionmakers would be unreasonable. The NRC should reach such a conclusion in its final Environmental Impact Statement.

In the alternative, the NRC should recognize that its staff has failed to consider the full scope of the environmental impacts of present or future Millstone operations, and similarly, the licensee has failed to fully apprise the NRC of all pertinent facts and circumstances sufficient to enable the NRC to undertake meaningful review; in the absence of such complete evaluation the NRC must deny relicensing.

CONNECTICUT COALITION AGAINST MILLSTONE

Nancy Burton
147 Cross Highway
Redding Ridge CT 06876
Tel. 203-938-3952

52

Memo to: Nancy Burton, Esq.
From: E. J. Sternglass
Date: March 8, 2005
Subject: Synergistic interaction of radiation, air pollutants and chemicals

The synergistic or "super-additive" action of radioactivity and chemicals or air pollutants has been discussed extensively in the scientific literature. A very comprehensive review of the subject was published in a monograph by Wriedt in the Department of Labor and Health of the City of Hamburg, Germany in 1989 (1). Particularly strong synergistic effects have been found for radiation exposure combined with such chemicals as lead, mercury, magnesium, sulfate and carbon-tetrachloride known or suspected to be emitted by the Millstone Nuclear Plant together with fission products and neutron-activated radioactive elements.

Also, an unexpected super-additive effect was discovered for the action of tranquilizers taken by a woman during pregnancy with radiation exposure in the cancer mortality of her children (2).

The synergistic action of smoke particles and radioactive gases and particulates, such as exist in uranium mines and in heavily polluted urban areas near nuclear plants, was discussed in an article by Radford and Hunt as long ago as 1963 (3).

The increase in cancer rates due to the combination of small airborne particles such as cigarette smoke and radioactive gases was studied by a series of authors beginning as early as 1938 (4)(5)(6). This explains the extremely high incidence of lung cancer in uranium miners who smoked. In the particular case of radioactive gases such as Radon and other radioactive gases such as Xenon and Krypton isotopes that are routinely emitted in large quantities by nuclear plants. Thus, Cassarett pointed out in his introductory article in "Radionuclide Carcinogenesis" in 1972 (7) that "the lung is highly vulnerable to the potential cancer promoting action of localized damage resulting from infections and inflammatory conditions caused by other air pollutants."

Increased risk of infections is known to be produced by the fission product Strontium-90 emitted from nuclear plants due to its action on the cells of the immune system produced in the bone marrow, and so are inflammatory conditions produced by abnormal white cells mutated by the beta particles emitted by Strontium-90 and other bone-seeking fission products such as Barium-140. Moreover, Yttrium-90, the highly radioactive daughter product of Strontium-90, is known to seek out soft tissues like the lung, causing inflammation and cancer. This is strongly supported by the fact reported by the U.S. Department of Health and Human Services in the report "Health in the United States 1994 and 1996" that the age-adjusted respiratory cancer mortality of white U.S. females over 16 years of age began to rise only after 1960, increasing more than five-fold from 5 to 28 per hundred thousand by 1995, while the percent smoking actually declined from 35 to 23% (See enclosed graph).

Not only cancer but also infant mortality, first linked to Strontium-90 releases in nuclear weapons testing (8), can be increased by the synergistic interaction with fine particulates in the urban atmosphere (9). Thus, the 2002 rise in infant mortality (10) which was the first increase since 1958 following the largest atmospheric tests in Nevada in 1957, was probably due to the combination of urban Diesel exhaust and nuclear fission product releases that increased in direct relation to the record rise in nuclear energy generated per reactor as capacity factors were pushed from 58 to over 90% (11) with decreased time for inspection, maintenance and repair of aging nuclear power plants.

Still another way in which the airborne releases from nuclear power plants produce unforeseen biological damage to humans as well as to animals and plants arises from the interaction of the radioactive rare gases Krypton-85 and Xenon-133 that cannot be readily filtered out of the effluent with the nitrogen and oxygen molecules in clean air. This has been described in detail by Graeub (12), who reviewed the evidence that the radiation emitted by these gases ionizes the air just as ultraviolet radiation from the Sun does, resulting in the formation of toxic ozone and nitric oxides. The ozone in turn interacts with the chemicals emitted in automobile exhaust, producing smog that damages the lung, and contributes to the dying of the trees seen downwind from nuclear plants. Furthermore, when the nitric oxides are brought down by precipitation, they act like fertilizer run-off that is carried by the rivers into the estuaries where they lead to blooming plankton that produce dead-zones depleted in oxygen where marine animals live, leading to declines in shrimp and other fisheries as recently seen especially in the Gulf of Mexico.

Thus, not only human life but marine life and the life of birds, land animals and plants is adversely affected not only by the direct effect of fission and neutron-activated radioactive chemicals released from nuclear plants, but also by the indirect effects involving clean air as well as chemical and particulate pollutants..

REFERENCES

(1) H. Wriedt, Department of Labor, Health and Social Services, Hamburger Strasse 47, 2000 Hamburg 76, Germany, December 1989.

(2) L. M. Kinnier-Wilson, G. W. Kneal and A. M. Stewart, Lancet 11 ,314-315 (1981)

(3) E. P. Radford and V. R. Hunt, Science 143, January 12,. 247-249. (1964)

(4) J. C. Mottram, Am. J. Cancer 32, 76 (1938)

(5) P. Shubik et al, Nature,171, 934 (1953)

(6) F. G. Bock and G. E. Moore J. Nat'l. Cancer Institute 22, 401 (1959)

(7) G. W. Cassarett, Radionuclide Carcinogenesis C. L. Sanders et al Editors, U. S. Atomic Energy Commission, Office of Inf. Services CONF-720505, 15-24, June 1973

(8) E, J. Sternglass, Radiation Biology of the Fetal and Juvenile Mammal, Edited by M. R. Sikow and D. D. Mahlum, U. S. Atomic Energy Commission, 693-717, December 1969.

(9) T. J. Woodruff, J. Grillo and K. C. Schoendorf, Environmental Health Perspectives 105, 608-612 (1997)

(10) Health United States 2004, Table 19, Center for Disease Control, Dep't of Health and Human Services.

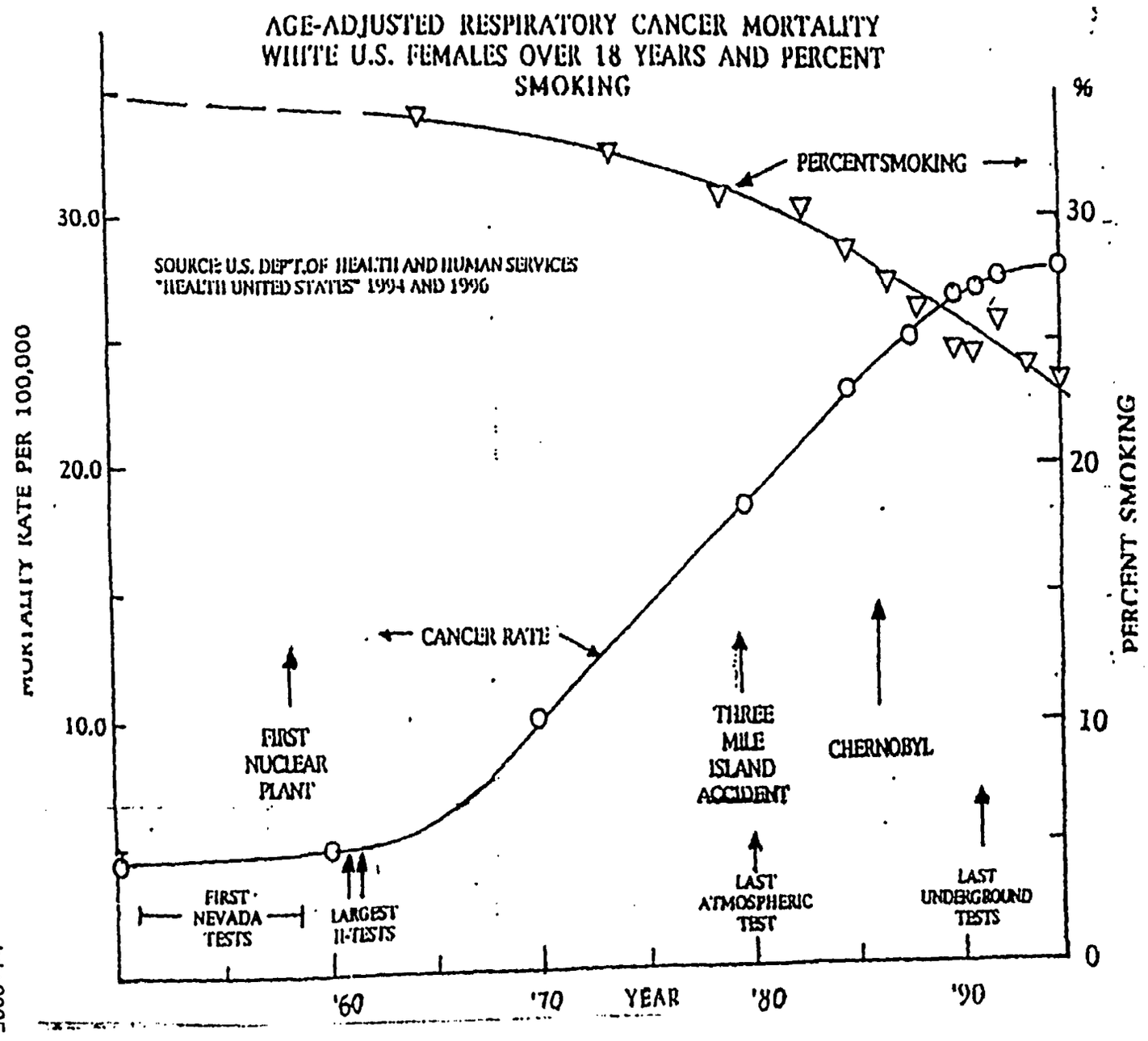
(11) Nuclear Regulatory Commission (NRC) Information Digest 2000 Edition, NUREG 1350, Vol. 12.

(12) R. Graeub, The Petkau Effect: Nuclear Radiation, People and Trees. Four Walls Eight Windows, New York (1992).

Ernest J. Sternglass, Ph.D.

Ernest J Sternglass

Professor Emeritus of Radiology
University of Pittsburgh School of Medicine
Home address:
4601 Fifth Ave. # 824
Pittsburgh, PA 15213


AGE-ADJUSTED RESPIRATORY CANCER MORTALITY
WHITE U.S. FEMALES OVER 18 YEARS AND PERCENT SMOKING
SOURCE: U.S. DEPT. OF HEALTH AND HUMAN SERVICES
"HEALTH UNITED STATES" 1994 AND 1996
PERCENT SMOKING
CANCER RATE
MORTALITY RATE PER 100,000
PERCENT SMOKING
%
30.0
20.0
10.0
30
20
10
0
FIRST NUCLEAR PLANT
THREE MILE ISLAND ACCIDENT
CHERNOBYL
FIRST NEVADA TESTS
LARGEST H-TESTS
LAST ATMOSPHERIC TEST
LAST UNDERGROUND TESTS
'60
'70
YEAR
'80
'90

21 February 2003, WISE/NIRS Nuclear Monitor 583 9

ECRR REPORT CHALLENGES ENTRENCHED RADIATION ASSUMPTIONS

A recently-released report claims that the radiation dose model of the International Commission on Radiological Protection (ICRP) is inadequate for internal irradiation, and proposes a new model. The report made headlines with its predictions of over 61 million deaths from cancer attributable to nuclear activities since 1945.

(583.5493) NIRS – The European Committee on Radiation Risk (ECRR) is an independent committee formed in 1997 after a meeting at the European Parliament to review the controversial issue of low-level radiation.

Shortly after it was set up, a meeting of the European Parliament's Scientific and Technological Options Assessment unit (STOA) considered evidence that low-level exposure to man-made radiation caused ill health and that models used by ICRP failed to predict these effects.

The ECRR was asked to come up with an alternative analysis.

The resulting report, *2003 Recommendations of the European Committee on Radiation Risk*, addresses not only the science behind the low-dose debate, but also the ethical basis for allowable radiation exposures.

The intellectual breadth and depth, and scientific inclusiveness of this report are a refreshing change from current radiation establishment tactics.

If society is ever to have a proper debate on the effects of low-doses and dose rates of ionizing radiation, it must challenge the very basis of radiation dose and risk assessment. This report does.

For its models, the ICRP uses ethical justifications which are based on overall societal benefit rather than individual benefit. This does not account for rights-based philosophies which are part of the UN declaration of human rights. Since any dose of radiation has a small probability of fatal harm, the ECRR argues, the "collective dose" should be employed for all practices and time scales dealing with avoidable radiation exposure.

Among inadequacies in the ICRP risk model, the ICRP makes assumptions that are based on a series of value judgments. Often the risk model runs counter to actual and epidemiological study results. Additionally, population dose is not accurate for each individual since it averages the effects of many people who are genetically variable.

Current ICRP risk models do not differentiate enough between radiation delivered externally and that delivered internally; a difference the report likens to "a man warming himself in front of a fire and a man eating a red hot coal."

Further, the ICRP risk model takes a high dose to a single cell and averages it over a larger tissue mass.

The ECRR accepts the ICRP's "linear no threshold" model for external irradiation. However, because of the complex mechanism of cells, the ECRR says that the current linear damage model is not suitable for internal irradiation. The linear model must, according to the committee, be superseded in favor of relationships that show much higher effects at low doses.

To help correct for these shortcomings, ECRR has developed mathematical terms that extend the risk model of the ICRP. They include two new weighting factors in the calculation of effective dose (for internal exposures) which address ionization density in time and space at the cellular level. Ionization densities vary by radiation type (alpha, beta or gamma).

The committee also makes weighting adjustments for certain types of radionuclides which undergo damaging transmutation; and they make enhancement weightings based on biological and biophysical aspects of certain exposures.

ECRR derives these weighting factors from studies showing harm from low-dose exposures.

The committee recommends:

- the total maximum permissible dose to members of the public from all human nuclear practices be not more than 0.1mSv and 5mSv for workers

- all new nuclear practices must be justified by considering the rights of all individuals.

- total consequences of radioactive discharge must be assessed for both direct and indirect effects on all living systems.

- radiation exposures must be kept as low as reasonably achievable using best available technology.

For more information, visit the committee website at www.euradcom.org.
Source and contact: Cindy Folkers at NIRS (cindyf@nirs.org)

Cancer Incidences in Connecticut Towns 1995-1999
Source: Connecticut Tumor Registry

All Sites – Female

Town	Cancers	Expected	SIR
East Lyme	251	239.04	1.05
Groton	475	469.02	1.05
New London	365	302.10	1.21
Old Lyme	134	114.58	1.17
Waterford	320	323.42	.99
TOTAL	1,545	1,448.16	1.07

All Sites – Male

Town	Cancers	Expected	SIR
East Lyme	222	253.68	.88
Groton	448	468.98	.96
New London	314	292.52	1.07
Old Lyme	143	134.05	1.07
Waterford	325	337.83	.96
TOTAL	1,452	1,487.06	.98

Lung (Males)

Town	Cancers	Expected	SIR
East Lyme	24	38.59	.62
Groton	69	69.92	.99
New London	54	43.70	1.24
Old Lyme	10	20.88	.48
Waterford	46	52.39	.88
TOTAL	203	225.48	.90

Lung (Females)

East Lyme	32	29.81	1.07

Groton	67	58.87	1.14
New London	51	37.51	1.36
Old Lyme	16	14.86	1.08
Waterford	48	42.56	1.13
TOTAL	214	183.61	1.17

Colorectal (Males)

East Lyme	26	29.62	.88
Groton	55	55.58	.99
New London	32	34.99	.91
Old Lyme	46	41.08	1.12
TOTAL	170	177.2	.96

Colorectal (Female)

East Lyme	24	26.32	.91
Groton	77	57.58	1.34
New London	50	37.79	1.32
Old Lyme	13	13.21	.98
Waterford	40	41.37	.97
TOTAL	204	176.27	1.16

Prostate

East Lyme	80	71.88	1.11
Groton	118	128.37	.92
New London	83	79.67	1.04
Old Lyme	57	39.00	1.46
Waterford	97	97.22	1.00
TOTAL	435	416.14	1.05

Breast, Females

East Lyme	78	77.33	1.01
Groton	139	143.17	.97
New London	103	91.22	1.13
Old Lyme	53	36.62	1.45
Waterford	78	98.17	.79
TOTAL	451	446.51	1.01

Melanoma, Males

East Lyme	15	11.63	1.29
Groton	33	21.42	1.54
New London	10	13.33	.75
Old Lyme	13	5.79	2.25
Waterford	12	14.53	.84
TOTAL	83	66.53	1.25

Melanoma, Females

East Lyme	18	8.92	2.02
Groton	17	16.48	1.03
New London	13	10.57	1.23
Old Lyme	6	3.95	1.52
Waterford	14	10.46	1.34
TOTAL	68	50.38	1.35

Uterine/Cervix

East Lyme	7	4.72	1.48
Groton	9	8.52	1.06
New London	9	5.44	1.65
Old Lyme	3	1.98	1.52
Waterford	6	5.10	1.18
TOTAL	34	25.76	1.32

Health Effects
of Selected Industrial Chemicals and Radionuclides:
an introduction

STAND
Technical Report 2003 – 2

July 2003

STAND is a 501(c)(3) non-profit grassroots organization
dedicated to government
that is accountable to the community,
to citizen responsibility for the welfare of our communities,
and
to a forum for public debate in which to find solutions.

STAND's goal is
the protection of human health and the long-term
preservation of the natural resources entrusted to our care.

Supported by a grant from the
Citizens' Monitoring and Technical Assessment Fund.

Health Effects
of Selected Industrial Chemicals and Radionuclides: *an introduction*

by

Valerie Navab, M.S., Rachael Hawkins, M.S. and Marvin Resnikoff, Ph.D.

Radioactive Waste Management Associates

prepared for

STAND

July 2003

TABLE OF CONTENTS

Introduction

The purpose of this report is to provide information about the health hazards that exposures to industrial chemicals and radionuclides may pose to the community. Sources of additional information are provided in Appendix 3. In this way, the community might better understand the heath issues and hazards related to these chemicals and contaminants.

Determining and classifying health hazards to humans exposed to varying amounts of contaminants is difficult and subtle. The risks of serious illness as a function of exposure is not the same for all compounds, and one should not be misled by the similarities of the health effects due to the different toxic chemicals inventoried in this report. The quantitative aspects of exposure are as important as the seriousness of the health consequences. Indeed, the geographical spread of the contaminants and their temporal evolutions would also vary; leading us to naturally consider the seriousness of contamination as a function of quantity, consequences, and also temporal evolution. Therefore, the notion of "acceptable" risk levels for a site goes much further than just establishing a list of contaminants and their legal dose limits.

Some of the reasons that make the understanding of "acceptable" exposure more subtle than it first appears are provided below.

Regulating Agencies and Guidelines

The federal government is charged with developing regulations and recommendations to protect public health. These regulations can be enforced by law.

Federal agencies that develop regulations for toxic substances include the Environmental Protection Agency (EPA), the Occupational Safety and Health Administration (OSHA), and the Food and Drug Administration (FDA). Recommendations provide valuable guidelines to protect public health but cannot be enforced by law. Federal organizations that develop recommendations for toxic substances include the Agency for Toxic Substances and Disease Registry (ATSDR) and the National Institute for Occupational Safety and Health (NIOSH).

It is important to remember in this regard that as far as radioactive materials are concerned, the Department of Energy (DOE) regulates

its own facilities. Through its contractors, DOE also operates these facilities. DOE funds health studies that determine the hazard of radioactive materials.

National Primary Drinking Water Regulations are determined by the EPA for certain toxic and radioactive chemicals. These regulations, known as the Maximum Contaminant Level (MCL), are legally enforceable in the United States. These legal standards set limits to the amount of contamination in the public drinking water supply.

Many other agencies study the effects and patterns of some toxic materials, such as the World Health Organization (WHO), the International Agency for Research on Cancer (IARC), and the United States Department of Health and Human Services (US DHHS). These organizations recommend limits on the concentrations, or amounts, of contamination to be allowed in drinking water.

In this report, many of the chemicals discussed do not have assigned MCLs. In these cases, additional guidelines are provided. The American Conference of Governmental Industrial Hygienists (ACGIH) has set Threshold Limit Values (ACGIH TLV); these values are time-weighted averages to which a worker can be exposed in a normal 8-hour day, 40-hour workweek without any effect on human health. The NIOSH has determined Recommended Exposure Limits (REL) which are guidelines based on risk evaluations using human health effects for levels feasibly achieved and measured by engineering controls. However, these two guidelines are difficult to compare. In addition, the WHO has set its own recommended levels for contaminants allowed in drinking water.

Standards

Regulations and recommendations can be expressed in "not-to-exceed" levels in air, water, soil, or food that are usually based on levels that affect animals, then adjusted to protect people. Sometimes these "not-to-exceed" levels differ among federal organizations because of different exposure times (an 8-hour workday or a 24-hour day), the use of different animal studies, or other factors. Recommendations and regulations are also periodically updated and change as more information becomes available. Unfortunately, the number of new chemicals introduced into the workplace each year numbers in the hundreds or thousands, completely over-whelming the ability of federal agencies to determine the hazards of each.

2

So, it is not uncommon that different studies reach different conclusions about which contaminants are most prevalent or of highest priority. Similarly, the Hazard Rating (HR) assigned to each material in the form of a number (1, 2, and 3) that briefly identifies the level of toxicity or hazard varies according to different agencies and organizations.

Factors

When a substance is released from a large area, such as an industrial plant, or a container, such as a drum or bottle, it enters the environment. This release does not always lead to exposure. One can be exposed to a substance only when in contact with it by breathing, eating, touching, or drinking. The consequences may vary in each case.

When exposed to a chemical, many factors determine whether a person would likely be harmed or not. These factors include the dose (how much), the duration (how long), the form (which chemical compound), and the way the contact occurs. Other important parameters could be the presence of other chemicals that enhance or diminish the toxicity, and the age, sex, diet, family traits, lifestyle, and state of health of the person. Therefore, classifying the health hazards to humans becomes difficult and research-intensive. Varying test environments and procedures will alter results in the patient. Also, health effects for the majority of these chemicals are better known for animals than humans. The same effects seen in animals may also be seen in humans to some extent. However, humans do not react in the same way when exposed to the same chemicals and, therefore, more research is needed to determine the full extent of harm to human health.

In addition, medical tests on individuals to detect and evaluate exposures to a chemical may have used various "techniques" and resulted in contradictory results. Measurements in the blood, feces, or urine can determine if one has been exposed to larger-than-normal amounts of chemicals. But these measurements will obviously depend on each individual, their overall health and how long after the exposure the measurement is taken.

It is difficult to obtain information on target organs. For example, all the persons suspected of having died prematurely because of a precise exposure have not necessarily been autopsied so the information

about which organs have been partially or completely damaged is lacking.

Further, correlations can be difficult to establish. An organ may not be lethally damaged, but its malfunction could accelerate the deterioration of another part of the body and lead to a fatality. For example, smoking or chronic bronchitis due to exposure to dust would make a person more sensitive to radioactivity.

Fetuses, children, and adults also exhibit different susceptibilities to various contaminants.

Cancer Reviews and Classifications

Along with other agencies, the U.N. International Agency for Research on Cancer (IARC) examines suspected potential carcinogens. The results, which vary widely between animals and humans, usually fall into one of three groups defined as follows:

1) Class I – Confirmed Carcinogens
These substances are capable of causing cancer in exposed humans.

2) Class II – Suspected Carcinogens
These substances may be capable of causing cancer in exposed humans. The evidence is suggestive, but not sufficient to convince expert review committees. Some entries have not yet had expert review, but contain experimental reports of carcinogenic activity.
As more studies are published, many Class II carcinogens will have their carcinogenicity confirmed. On the other hand, some may be judged non carcinogenic.

3) Class III – Questionable Carcinogens
These entries have minimal published evidence of possible carcinogenic activity. The reported endpoint is often neoplastic growth with no spread or invasion characteristic of carcinogenic pathology.

It should be noted that these three categories refer only to the strength of the experimental evidence that a chemical is carcinogenic, and not to the extent of its carcinogenic activ-

ity nor to the mechanism involved. The classification of any chemical may change as new information becomes available.

For a substance to belong in Class III, the report may simply have lacked control animals, may have used a very small sample size, lacked complete pathology reporting, or may have suffered other design defects. Many of these were designed for other-than-carcinogenic evaluation, and the reported carcinogenic effect is a by-product of the study, not the goal. The data were presented because some of the substances may be carcinogens. There are simply insufficient data to affirm or deny the possibility.

Synergistic Effects of Multiple Contaminants

Complicating the assessment of toxicity for a contaminated site is the presence of a mixture of contaminants. Aggregated chemicals could mean aggregated risks.

In a survey of 91 DOE waste sites, for example, Riley and Zachara (1992) found that mixtures of two or more compounds were present at 65 % of the sites. In soils, the most frequently occurring mixtures were metals combined with radionuclides, but various combinations of metals and radionuclides with organic contaminants were also observed at some sites. In groundwater, the most common mixtures were metals and chlorinated hydrocarbons.

The consequences of the synergy, linked to the presence of several contaminants at a time in a contaminated site, still need to be thoroughly examined. Chemical and radioactive risks are generally increased if these substances are carcinogenic to the same organ.

Other auxiliary parameters may also interfere with the total toxic impact of chemicals, and should not be underestimated. For example, a smoker with damaged cilia in his lung passages will not be able to properly expel radioactive materials, and therefore could be subject to greatly increased health effects. Weather and temperature, for example, may also have favorable or deleterious consequences.

5

Chlorinated Solvents

A solvent is typically a liquid that dissolves another substance, thereby forming a solution. A chlorinated solvent is one that is a chlorine compound. As chlorinated solvents move through the ground, the materials act as an oily liquid. Groundwater flowing in the soil will dissolve only a small portion of the contaminant and the rest enters and contaminates the groundwater.

A dioxin is a specific type of chlorinated solvent; dioxins are a group of 219 different toxic chlorinated solvents. These solvents are fat-soluble and therefore accumulate in the tissues of animals and humans in the food chain. Humans are typically exposed to these chemicals through the consumption of fish, meat, and milk. Dioxins are formed through the burning of chlorine-based compounds. Dioxins may be transported great distances if airborne. Materials that enter the water will bind to sediments and are transported along with marine wildlife through ingestion. Similarly, dioxins can settle on the leaves of plants and are ingested by animals.

Exposure results in a drop in sperm count, an increase in testicular and prostate cancer, endometriosis, and an increased risk of developing breast cancer. The toxicity of these chemicals varies but dioxins have similar potencies.[1] Results of exposure to dioxins create adverse health effects and vary depending on the level of exposure, time of exposure, and length of exposure. Typical effects as a result of exposure to large amounts of dioxin include skin rashes, skin discoloration, excessive body hair, and possibly mild liver damage. Cancer as a result of excessive dioxin exposure is a main concern in adults.

Although the carcinogenicity of chlorinated solvents remains unknown, cancer as a result of exposure is a great concern.

Carbon Tetrachloride

Carbon tetrachloride, also known as carbon chloride, methane tetrachloride, perchloromethane, tertrachloroethane, or benziform, is a clear liquid with a sweet smell that can be detected at low-levels. This synthetic chemical was most typically used in the production of refrigeration fluid and propellants for aerosol cans, as a pesticide, as

6

a cleaning fluid and degreasing agent, in fire extinguishers, and in spot removers. It is now only used in some industrial applications as a result of its harmful health effects. High-levels of exposure through inhalation and ingestion and possibly through exposure to the skin can cause liver, kidney, and central nervous system damage. The liver and kidney cells are damaged or destroyed by this chemical. Kidney and liver repair can occur when low-levels of exposure are stopped. High-levels of exposure affect the nervous system, including the brain. This chemical has been linked to brain cancer. Effects of exposure include: headaches, intoxication, dizziness, drowsiness, nausea, and vomiting, and can lead to coma and even death. The US DHHS has determined this chemical is a probable carcinogen. The MCL is set at 0.005 mg/L and the ACGIH TLV is set at 5 ppm. The NIOSH REL is set at 2 ppm or 12.6 mg/m^3.

Chloride
Chloride has a very low toxicity. Ingestion of large amounts of chloride may lead to fluid retention and altered acid-base balance. Chlorine as a gas or liquid is irritating and toxic. The main source of exposure is through the consumption of salt. Effects of long-term exposure are unknown.

Chlorobenzene
Chlorobenzene, also known as benzene chloride, was used to make other chemicals such as phenol and DDT. Currently, this chemical is used as a solvent to make other chemicals. This chemical is a strong narcotic with slight irritant qualities. Health effects from repeated low-levels of exposure are unknown. Symptoms of exposure include: irritation to the eyes, skin, and nose, drowsiness, incoordination, and central nervous system depression. The carcinogenicity of this chemical is unknown. The ACGIH TLV is set at 10 ppm.

Chloroform
Chloroform, also known as trichloromethane and methyl trichloride, is a colorless liquid with a pleasant, nonirritating odor and a slightly sweet taste. This chemical will burn only when it reaches very high temperatures. Initially, chloroform was used as an anesthetic. Currently, it is used to make other chemicals. Inhalation results in irritation to the respiratory tract, and effects on the central nervous system including headache, drowsiness, and dizziness. Results of inhalation may also lead to unconsciousness, liver injury, blood disorders, and even death. Ingestion results in severe burning to the mouth and

7

throat, vomiting and similar results as inhalation. Sores develop on skin with contact to large amounts of chloroform. The US DHHS declares chloroform to be a probable carcinogen. The MCL is not determined for this chemical, but the ACGIH TLV is set at 10 ppm. The NIOSH REL is set at 2 ppm or 9.78 mg/m^3.

Chloromethane

Chloromethane is also known as methyl chloride. Symptoms often seen include: convulsions, nausea or vomiting, dizziness, drowsiness, incoordination, confusion, abdominal pains, hiccoughs, diplopia, delirium, convulsions, irritation to the eye, coma, and even death. High levels of exposure greatly affect the nervous system, liver, kidneys, and heart. No evidence exists to imply that chloromethane is a carcinogen. However, the EPA has determined that it is a probable carcinogen. The ACGIH TLV is set at 50 ppm. The NIOSH REL is set at 100 ppm.

Dibromochloromethane

Dibromochloromethane is also known as chlorodibromomethane. Symptoms often seen include: irritation and narcotic effects. No cases of cancer are seen in humans exposed to this chemical. The MCL for this chemical is set at 0.10 ppm.

Dichlorodifluoromethane

Dichlorodifluoromethane exposure symptoms often seen include: dizziness, tremor, asphyxia, unconsciousness, cardia arrhythmias, cardiac arrest, conjunctiva irritation, fibrosing alveolitis, liver changes, and narcotic effects. The ACGIH TLV and NIOSH REL are set at 1000 ppm.

Freon-113

Freon-113, also known as 1,1,2-Trichloro-1,2,2-trifluoroethane, is a mildly toxic chemical. Symptoms often seen include: irritation to skin and throat, drowsiness, dermatitis, and central nervous system depression. The NIOSH REL is set at 1000 ppm.

Methylene Chloride

Methylene Chloride, also known as dichloromethane, is not found naturally in the environment. This chemical is a colorless liquid with a mild, sweet odor used as an industrial solvent and paint stripper. Inhalation of low-levels results in a person becoming less attentive and less accurate. Effects of inhalation at high-levels have a narcotic

8

effect. Symptoms often seen include: dizziness, nausea, mental confusion, fatigue, vomiting, headaches, and a tingling sensation in the fingers and toes. Contact with this chemical by skin results in irritation, redness, pain, and even burning. The WHO declares methylene chloride as carcinogenic to humans. The US DHHS and the EPA have determined that this chemical is a probable carcinogen. The MCL has not been determined for this chemical, but the ACGIH TLV has been set at 50 ppm.

Octachlorodibenzo-p-dioxin (OCDD)
Octachlorodibenzo-p-dioxin (OCDD) is an experimental teratogen and an irritant to the eye. Ingestion of this chemical results in poisoning. These solvents are fat-soluble and therefore accumulate in the tissues of animals and humans in the food chain. Humans are typically exposed to these chemicals through the consumption of fish, meat, and milk. Exposure to dioxins results in a drop in sperm count, an increase in testicular and prostate cancer, endometriosis, and an increased risk of developing breast cancer. The MCL and ACGIH TLV have not been determined for this chemical.

Pentachlorinated dibenzofurans
Pentachlorinated dibenzofurans is a chemical with great health effects to the human body. A significant reduction of thymus weight and suppression of the activity of cytotoxic T lymphocytes, in addition to a suppression on both cell-mediated and humoral immunity. The MCL and ACGIH TLV have not been determined for this chemical.

Perchloroethylene (PCE)
PCE, also known as perchloroethylene or tetrachloroethylene, is a moderately toxic chemical. Inhalation results in conjunctiva irritation, general anesthesia, hallucinations, distorted perceptions, local anesthesia, coma, and pulmonary changes. Symptoms of exposure may include irritation to eyes, skin, nose, throat, and respiratory system, as well as nausea, dizziness, incoordination, headache, drowsiness, skin erythema, and liver damage. Ingestion results in irritation to the gastrointestinal tract. This chemical is a potential carcinogen. The MCL has not been determined for this chemical, but the ACGIH TLV is set at 50 ppm. The NIOSH REL recommends that workplace exposure is minimized.

Titanium tetrachloride

Titanium tetrachloride is a colorless to pale yellow liquid that has fumes with a strong odor. If it comes in contact wit water, it rapidly forms hydrochloric acid, as well as titanium compounds. It is not found naturally in the environment and is made from minerals that contain titanium. It is used to make titanium metal and other titanium-containing compounds, such as titanium dioxide, which is used as a white pigment in paints and other products.

Titanium tetrachloride is very irritating to the eyes, skin, mucous membranes, and the lungs. Breathing in large amounts can injure the lungs seriously enough to cause death. There is no evidence that chronic exposure to titanium tetrachloride causes cancer in humans. The MCL and ACGIH TLV haven't been determined for this chemical. The NIOSH REL is set at 0.001 mg/m^3.

1,2,4-Trichlorobenzene

1,2,4-Trichlorobenzene is an experimental teratogen. This chemical is an irritant to the eyes, skin, and mucous membrane. Symptoms often affect the liver, kidney, and adrenal gland. The carcinogenicity of this chemical is unknown. The MCL is set at 0.07 mg/L. The ACGIH TLV is set at 5 ppm.

1,1,1-trichloroethane

1,1,1-trichloroethane is synthetic material that is also known as methyl chloroform. Symptoms often seen include: dizziness, conjunctiva irritation, hallucinations or distorted perceptions, motor activity changes, irritability, aggression, hypermotility, diarrhea, poor equilibrium, dermatitis, nausea or vomiting, cardiac arrhythmias, and other gastrointestinal changes. The IARC has determined the carcinogenicity of this chemical is not classifiable. The ACGIH TLV and NIOSH REL are set at 350 ppm.

Trichloroethylene (TCE)

TCE is also known as trichloroethylene. Symptoms of inhalation and ingestion are mildly toxic to humans and include: eye irritation, somnolence, hallucinations or distorted perceptions, gastrointestinal changes, and jaundice. Addiction results in those that work with the chemical. High-levels of exposure lead to headache and drowsiness, and eventual ventricular fibrillation resulting in cardiac failure, which in turn damages the liver and other organs. NIOSH has determined this chemical to be a potential occupational carcinogen; the recom-

10

mended REL is 2 ppm. The MCL is set at 0.005 mg/L and the ACGIH TLV is set at 50 ppm.

Tetrahydrofuran
Tetrahydrofuran, also known as tetramethylene oxide or THF, is a mildly toxic chemical. Symptoms often seen include: general anesthesia, irritant to eyes, mucous membranes, and upper respiratory system, narcotic in high concentrations, liver and kidney damage, and central nervous system depression. The NIOSH REL is set at 200 ppm.

Vinyl Chloride
Vinyl Chloride is moderately toxic by ingestion and a severe irritant to skin, eyes, and mucous membranes. High concentrations of vinyl chloride act as an anesthetic and chronic exposure can lead to liver injury. The carcinogenicity of vinyl chloride is confirmed in producing a rare cancer in the liver and blood tumors. The production of vinyl chloride is also a source of dioxins.[3] The MCL is set at 0.002 mg/L and the ACGIH TLV is set at 5 ppm.

High Explosives Compounds

Explosives are chemical compounds or mixtures that are typically used in detonators in bombs. Large amounts of gas and heat are generated with the production of sudden pressure effects. As a result, the explosives vary in intensity and resistance. Mixing of chemicals produces varied effects and intensities upon explosion.

1,3-Dinitrobenzene
1,3-dinitrobenzene, also known as 2,4-dinitrobenzene, is a synthetic explosive formed as a by-product from the manufacturing of TNT. Mixing this chemical with tetranitromethane results in a high explosive that is very sensitive to sparks. No odor or taste is associated with this chemical. This chemical is slightly soluble in water and does not stick strongly to soil and as a result travels through the soil into the groundwater. Symptoms of exposure include headache, anoxia, cyanosis, visual disturbance, central scotomas, bad taste, burning mouth, dry throat, thirst, anemia, liver damage, nausea, and dizziness. Long-term exposure results in a reduction of the number of red blood cells. The carcinogenicity of this chemical is undetermined for humans. The NIOSH REL is set at 1 mg/m^3.

Dinitrotoluene (DNT)

Dinitrotoluene (DNT) is a poison that is carcinogenic with experimental tumorigenic and teratogenic data. Symptoms of exposure may include anozia, cyanosis, anemia, jaundice, and reproductive effects. The MCL has not been determined for this chemical but the ACGIH TLV is set at 1.5 mg/m³. The NIOSH REL is set at 1.5 mg/m³.

2,6-Dinitrotoluene

2,6-Dinitrotoluene is a synthetic explosive that is one of the six forms of chemicals of dinitrotoluene. This chemical is a pale yellow solid with a slight odor. Health effects from exposure to this chemical are uncertain. The nervous system and blood of exposed workers may be affected. The IARC has determined that this chemical is a potential carcinogen.

HMX

HMX, also known as cyclotetramethylene tetranitrate, is an acronym for High Melting Explosive. Other names for this chemical include: octogen and cyclotetramethylene-tetranitramine. It is a colorless solid that dissolves slightly in water with an unknown taste and smell. This chemical is made from other chemicals known as hexamine, ammonium nitrate, nitric acid, and acetic acid. The high volatility of this chemical enabled its use in explosives, rocket fuels, and burster chargers. No information is known on how you might be exposed to HMX in the environment and the information on adverse health effects is limited. The EPA has concluded that the carcinogenicity to humans is not classifiable. The MCL and ACGIH TLV have not been determined for this chemical.

4-Nitrotoluene

4-Nitrotoluene is a poison that is moderately toxic by ingestion. Contact with skin is mildly toxic. This chemical is combustible upon exposure to heat or flame. Symptoms of exposure may include anoxia, cyanosis, headache, weakness and exhaustion, dizziness, ataxia, difficulty breathing, tachycardia, nausea, and vomiting. When it is combined with tetranitromethane a very sensitive high explosive is created. The NIOSH REL is set at 11 mg/m³.

4-PETN (Pentaerythritol Tetranitrate)

PETN, also known as Pentaerythritol Tetranitrate, is a hazardous chemical that explodes when shocked or exposed to heat. Ingestion

12

results in dermatitis. Other symptoms of exposure include: headaches, weakness, and fall in blood pressure. The MCL and ACGIH TLV have not been determined for this chemical.

4-Perchlorate
Perchlorate is synthetic and man-made. Perchlorates are incredibly unstable materials. Irritation to the body results in contact with any perchlorate. Mixtures of this chemical form explosives. This chemical affects the functioning of the thyroid gland. Alteration to thyroid gland functions can potentially lead to the formation of tumors.

4-RDX
RDX, otherwise known as Royal Demolition Explosive, is one of the most powerful high explosives in use today. Other names for this chemical include: cyclotrimethylene-trinitramine;cyclonite, cyclonite, and 1,3,5-trinitro-1,3,5-triazine. As a synthetic, white powder, when RDX is burned fumes are created. This chemical is rarely used alone and is typically combined with other explosives, oils, or waxes. Symptoms of exposure to RDX include: seizures, nausea, headache, irritability, weakness and exhaustion, tremor, dizziness, insomnia, and vomiting. Knowledge of birth defects or affects on reproduction in humans is yet to be discovered. The carcinogenic properties of RDX are unknown. The MCL has not been determined for this chemical, but the ACGIH TLV is set at 1.5 mg/m^3. The NIOSH REL is set at 1.5 mg/m^3.

Tetryl
Tetryl is also known as nitramine and 2,4,6-trinitrophenyl-n-methylnitramine. This explosive is an extremely sensitive high explosive, more so than TNT to shock and friction. When combined on contact with trioxygen difluoride the chemical explodes on contact. This chemical is an irritant, sensitizer, and allergen. Symptoms of exposure may include sensitization dermatitis, redness, inflammation of the cornea, sneeing, anemia, cough, coryza, irritability, malaise, headache, weakness and exhaustion, insomnia, nausea, vomiting, and liver and kidney damage. The NIOSH REL is set at 1.5 mg/m^3.

2,4,6-Trinitrotoluene
2,4,6-Trinitrotoluene is an explosive commonly referred to as TNT. Ingestion results in hallucinations or distorted perceptions, cyanosis, and gastrointestinal changes. Contact with this chemical results in

skin irritation. Health effects include jaundice, cyanosis, sneezing, cough, sore throat, peripheral neuropathy, muscle pain, kidney damage, cataract, sensitization dermatitis, headaches, weakness, anemia, and liver injury. The MCL has not been determined for this chemical, but the ACGIH TLV is set at 0.5 mg/m^3. The NIOSH REL is set at 0.5 mg/m^3.

Fuel Components and other Organic Chemicals

Toxic chemicals are known to disrupt normal bodily functions, including the functions of hormones. Hormones provide a number of services as natural chemicals to the human body including: act as messengers, travel through the blood stream, regulate various bodily processes, and coordinate the body's activities to maintain health through controlling growth, development, and behavior.[2]

Acenapthylene

Acenapthylene is a Polycyclic Aromatic Hydrocarbon (PAH). The presence of this chemical arises from the use of fuel components and other organic chemicals. This chemical is a danger to humans and enters in all tissues that contain fat. Acenapthylene is stored mostly in the kidneys, liver, and fat with smaller amounts stored in the spleen, adrenal glands, and ovaries. The US DHHS has determined that acenapthylene is a known animal carcinogen; however, the EPA has determined that the human carcinogenicity is not classifiable. The MCL and ACGIH TLV have not been determined for this chemical.

Acetone

Acetone is a colorless liquid with a distinct smell and taste that is naturally found in the environment as well as manufactured. Other names for this chemical include: dimethylketone, 2-propanone, and beta-ketopropane. In small amounts, the liver breaks acetone down into energy making chemicals used for normal body functions. Exposure results in entry of acetone into the blood stream and is subsequently carried to the rest of the organs. Inhalation of moderate-to-high amounts for even short periods of time can result in nose, throat, lung, and eye irritation, headaches, light-headedness, confusion, increased pulse rate, effects on blood, nausea, vomiting, unconsciousness and possibly coma, and the shortening of the menstrual cycle in women. Ingestion of small amounts typically does not cause harm. However, ingestion of high levels results in abdominal pain, nausea,

and vomiting. Effects of long-term exposure to acetone include kidney, liver, and nerve damage, increased birth defects, metabolic changes, and coma. The use of alcoholic beverages enhances the toxic effects of acetone. The US DHHS, the IARC, and the EPA have not classified acetone for carcinogenicity in humans. The MCL has not been determined for this chemical. The ACGIH TLV is set at 750 ppm. The NIOSH REL is set at 0.1 ppm.

Ammonia
Ammonia exposure symptoms often seen include: irritation to eyes and mucous membranes. Symptoms often seen include: breathing difficulty, wheezing, chest pain, pulmonary edema, skin burns, liquid, and frostbite. High-levels of exposure result in blindness, lung damage, heart attack, or death. The US DHHS, IARC, and the EPA have not classified the carcinogenicity of ammonia. The ACGIH TLV and NIOSH REL are set at 25 ppm.

Anthracene
Anthracene is a skin irritant and allergen. The carcinogenicity of this chemical is probable.

9,10-Anthracenedione
9,10-Anthracenedione, also known as anthraquinone, is a mild allergen.

Asbestos
Asbestos is comprised of six different minerals that are found in nature. This chemical enters the drinking water from natural sources in addition to corroded asbestos worn away from cement pipes. The separable, heat resistant fibers that make up the minerals are strong and flexible enough to be spun and woven. As a result, asbestos was widely used in building materials, friction products, heat resistant fabrics, packaging, gaskets, and coatings. Inhalation of lower levels of asbestos may result in changes called plaques in the linings. Long-term inhalation of asbestos fibers may result in scar-like tissue in the lungs and in the lining that surrounds the lung. Breathing difficulties, restricted pulmonary function, and heart enlargements arise as a result of exposure, eventually leading to disability and death. The US DHHS, the WHO, and the EPA have determined that asbestos is a human carcinogen and produces lung tumors. The MCL is set at 7 million fibers/L and the ACGIH TLV is set at 2 fibers/cubic centimeters.

15

Benzaldehyde
Benzaldehyde is an allergen. Symptoms often seen include: dermatitis, central nervous system depression, and anesthetic. The carcinogenicity of this chemical is probable.

Benzene
Benzene is a colorless liquid with a sweet odor that is formed from natural processes as well as human activities. With its wide distribution throughout the US, the uses of benzene are expansive, some of which include rubbers, lubricants, dyes, degreasers, detergents, drugs, pesticides, and as a major component of gasoline. This chemical enters the drinking water through leaking underground gasoline and petroleum tanks or improper waste disposal. Inhalation of high levels of benzene can result in drowsiness, dizziness, rapid heart rate, headaches, tremors, confusion, unconsciousness, and even death. Diseases that result from inhalation include Hodgkin's Disease and lymphomas. Ingestion of benzene is moderately toxic and is a severe eye and moderate skin irritant. Long-term exposure results in harmful effects on the bone marrow, leading to myeloid leukemia, as well as a decrease in red blood cells that leads to anemia. In addition excessive bleeding can occur and the immune system can be affected. Long-term exposure of workers to this chemical is linked to brain cancer and leukemia. Additionally, other possible health complications may arise in reproductive and developmental effects. The US DHHS has determined that benzene is a known human carcinogen. The MCL is set at 0.005 mg/L and the ACGIH TLV is set at 10 ppm. The NIOSH REL is set at 0.1 ppm.

n-Butanol
n-Butanol is also known as n-butyl alcohol. Symptoms often seen include: conjunctiva irritation, unspecified respiratory system and nasal effects, severe skin and eye irritant, corneal inflammation, slight headache and dizziness, slight irritation of the nose and throat, and dermatitis. The ACGIH TLV and NIOSH REL are set at 50 ppm.

Delta-BHC
Delta-BHC is also known as delta-benzenehexachloride and is a moderately toxic chemical.

Gamma BHC
Gamma BHC is also known as the gamma isomer of benzene hexachloride. Symptoms often seen include: irritation to the eyes skin, nose, and throat, headache, nausea, respiratory difficulty, convulsions, dyspnea, and cyanosis. This chemical is a known carcinogen. The ACGIH TLV and NIOSH REL are set at 0.5 mg/m^3.

Benzo(a)anthracene
Benzo(a)anthracene is a Polycyclic Aromatic Hydrocarbon (PAH). The presence of this chemical arises from the use of fuel components and other organic chemicals. This chemical is a danger to humans and enters all tissues that contain fat. PAHs are stored mostly in the kidneys, liver, and fat with smaller amounts stored in the spleen, adrenal glands, and ovaries. This chemical is a poison by intravenous routes that is commonly an air contaminant of food, water, and smoke. The IARC and the EPA have determined it is a probable human carcinogen. The MCL and ACGIH TLV levels have not been determined.

Benzo(a)pyrene
Benzo(a)pyrene is a Polycyclic Aromatic Hydrocarbon (PAH). The presence of this chemical arises from the use of fuel components and other organic chemicals. This chemical is a danger to humans and enters all tissues that contain fat. PAHs are stored mostly in the kidneys, liver, and fat with smaller amounts stored in the spleen, adrenal glands, and ovaries. This chemical is a poison via subcutaneous, intraperitoneal, and intrarenal routes that is commonly an air contaminant of food, water, and smoke. Experimental teratogenic and reproductive effects have been found. The IARC and the EPA have determined it is a probable human carcinogen. The MCL is set at 0.0002 mg/L and the ACGIH TLV has not been determined for this chemical.

Benzo(b)fluoranthene
Benzo(b)fluoranthene is a Polycyclic Aromatic Hydrocarbon (PAH). The presence of this chemical arises from the use of fuel components and other organic chemicals. This chemical is a danger to humans and enters all tissues that contain fat. PAHs are stored mostly in the kidneys, liver, and fat with smaller amounts stored in the spleen, adrenal glands, and ovaries. The IARC and the EPA have determined this chemical to be a possible human carcinogen. The MCL and ACGIH TLV have not been determined for this chemical.

17

Benzo(k)fluoranthene
Benzo(k)fluoranthene is a known carcinogen.

Benzo(g,h,i)perylene
Benzo(g,h,i)perylene is a Polycyclic Aromatic Hydrocarbon (PAH). The presence of this chemical arises from the use of fuel components and other organic chemicals. This chemical is a danger to humans and enters all tissues that contain fat. PAHs are stored mostly in the kidneys, liver, and fat with smaller amounts stored in the spleen, adrenal glands, and ovaries. The IARC and the EPA have determined this chemical not classifiable as to the carcinogenicity to humans. The MCL and ACGIH TLV have not been determined for this chemical.

Benzoic Acid
Benzoic Acid is found naturally in resins and manufactured synthetically. It is a colorless crystalline solid and is used as a food preservative and in pharmaceuticals and cosmetics. Inhalation affects the human nervous system, dypsnea, and allergic dermatitis. This chemical is a poison by subcutaneous route and is moderately toxic by ingestion and intraperitoneal routes. In addition, it is a severe eye and skin irritant. The MCL and ACGIH TLV have not been determined for this chemical.

Bis-(2-ethylhexyl)phthalate
Bis-(2-ethylhexyl)phthalate, also known as di-sec-octyl phthalate, is a poison upon entry into the blood stream. Ingestion affects the gastrointestinal tract. In addition, this chemical is a mild skin and eye irritant and can cause liver damage. This chemical is a confirmed carcinogen with experimental carcinogenic and tumorigenic data. The MCL is set at 0.006 mg/L and the ACGIH TLV is set at 5 mg/m^3. The NIOSH REL is set at 5 mg/m^3.

Carbazole
Carbazole is a pesticide poisonous by intraperitoneal routes. Ingestion is moderately toxic. It is a questionable carcinogen. The MCL and ACGIH TLV have not been determined for this chemical.

Carbon disulfide
Carbon disulfide is found naturally as well as a commercially made chemical. Symptoms often seen include: narcotic and anesthetic ef-

18

fects to the central nervous system, dizziness, headache, poor sleep, anorexia, weight loss, Parkinson-like syndrome, coronary heart disease, gastritis, kidney, liver injury, eye and skin burns, respiratory failure, and even death. The US DHHS, the IARC, and the EPA have not determined the carcinogenicity of this chemical. The ACGIH TLV is set at 10 ppm. The NIOSH REL is set at 1 ppm.

Chrysene
Chrysene is a Polycyclic Aromatic Hydrocarbon (PAH). The presence of this chemical arises from the use of fuel components and other organic chemicals. This chemical is a danger to humans and enters all tissues that contain fat. PAHs are stored mostly in the kidneys, liver, and fat with smaller amounts stored in the spleen, adrenal glands, and ovaries. The IARC has determined the carcinogenicity is not classifiable for humans. The EPA has determined that this chemical is a probable human carcinogen. The MCL and ACGIH TLV have not been determined for this chemical.

Cyclohexane
Cyclohexane is also known as benzene hexahydride and hexahydrobenzene. Symptoms often seen include: irritation to eyes, skin, and respiratory system, drowsiness, dermatitis, narcosis, and coma. The ACGIH TLV and NIOSH REL is set at 300 ppm.

Cyclohexanone
Cyclohexanone is a severe eye irritant. Symptoms often seen include: changes in the sense of smell, headache, narcosis, coma, dermatitis, conjunctiva irritation, and unspecified respiratory system changes, mild narcotic, and a skin and eye irritant. The ACGIH TLV and NIOSH REL are set at 25 ppm.

Dibenz(a,h)anthracene
Dibenz(a,h)anthracene is a Polycyclic Aromatic Hydrocarbon (PAH). The presence of this chemical arises from the use of fuel components and other organic chemicals. This chemical is a danger to humans and enters all tissues that contain fat. PAHs are stored mostly in the kidneys, liver, and fat with smaller amounts stored in the spleen, adrenal glands, and ovaries. The US DHHS has determined that this chemical is a known animal carcinogen. The MCL and ACGIH TLV have not been determined for this chemical.

19

Di-n-octylphthalate

Di-n-octylphthalate is also known as di-sec-octylphthalate. This chemical affects the gastrointestinal tract, central nervous system, liver, reproductive system, and gastrointestinal tract. This chemical is also a mild skin and eye irritant. This chemical is a known carcinogen. The ACGIH TLV and NIOSH REL are set at 5 mg/m^3.

1,2-Diphenylhydrazine

1,2-Diphenylhydrazine, also known as Hydrazobenzene, is a white solid with no information on smell or flammability. This manufactured chemical does not dissolve easily in water and when placed in water it rapidly breaks down into other toxic chemicals. This chemical is currently used in medicines to treat inflammation and a type of arthritis. Effects of ingestion lead to chemical poisoning. Diphenylhydrazine is a confirmed carcinogen with experimental carcinogenic and tumorigenic data. Poison by ingestion. The MCL and ACGIH TLV have not been determined for this chemical.

Ethyl Acetate

Ethyl Acetate is a chemical that can cause dermatitis. Inhalation results in severe irritation to mucous membranes and upper respiratory tract, poisoning, human systemic effects such as olfactory changes, conjunctiva irritation, and pulmonary changes. Ingestion of this chemical is mildly toxic in causing irritation to the gastrointestinal tract with symptoms such as nausea, vomiting, and diarrhea. Long-term exposure yields conjunctival irritation and corneal clouding, congestion of the liver and kidneys. High concentrations have a narcotic effect in addition to resultant liver and kidney damage. Chronic poisoning may lead to anemia with leukocytosis (a transient increase in the white blood cell count), cloudy swelling, and fatty degeneration of the viscera. The MCL has not been determined for this chemical and the ACGIH TLV is set at 400 ppm. The NIOSH REL is set at 400 ppm.

Ethylbenzene

Ethylbenzene is a moderately toxic chemical. Symptoms often seen include: eye, sleep, and pulmonary changes, eye and skin irritation, headache, dermatitis, narcosis, coma, dizziness, irritation of the nose and throat, and a sense of constriction in the chest. The ACGIH TLV and NIOSH REL are set at 100 ppm.

Fluoranthene
Fluoranthene is a moderately toxic chemical. The carcinogenicity is probable.

n-Hexane
n-Hexane is a slightly toxic chemical made from crude oil. Symptoms often seen include: irritation to the eyes, skin, respiratory system, central nervous system, and peripheral nervous system, paralysis, and hallucinations. The US DHHS, the IARC, and the EPA have not classified the carcinogenicity of this chemical. The ACGIH TLV and NIOSH REL are set at 50 ppm.

2-Hexanone
2-Hexanone is also known as Butyl methyl ketone or Methyl butyl ketone. This chemical is moderately toxic. Symptoms often seen include: irritation to the eyes and nose, peripheral neuropathy, weakness, exhaustion, paresthesia, vomiting, dermatitis, headache, and drowsiness. This chemical is a skin and eye irritant. The ACGIH TLV is set at 5 ppm. The NIOSH REL is set at 1 ppm.

Indeno(1,2,3-c,d)pyrene
Indeno(1,2,3-c,d)pyrene is a Polycyclic Aromatic Hydrocarbon (PAH). The presence of this chemical arises from the use of fuel components and other organic chemicals. This chemical is a danger to humans and enters all tissues that contain fat. PAHs are stored mostly in the kidneys, liver, and fat with smaller amounts stored in the spleen, adrenal glands, and ovaries. The IARC has determined this chemical to be a possible human carcinogen. The MCL and ACGIH TLV have not been determined for this chemical.

Methyl Ethyl Ketone (MEK)
Methyl Ethyl Ketone (MEK) is a strong irritant that affects the peripheral nervous system and central nervous systems. Effects of inhalation at low-levels of exposure result in human systemic effects, including conjunctiva irritation and effects on the nose and respiratory system. Inhalation at high levels results in headaches, dizziness, nausea, shortness of breath, and vomiting, in addition to central nervous system depression and unconsciousness. Effects of ingestion result in abdominal pain and nausea. Contact by skin results in redness, itching, and pains; long-term exposure results in dermatitis. The MCL has not been determined for this chemical, but the ACGIH TLV has been set at 200 ppm. The NIOSH REL is set at 200 ppm.

21

Methyl methacrylate
Methyl methacrylate is a moderately toxic chemical. Symptoms often seen include: sleep effects, excitement, anorexia, and blood pressure decrease. This chemical is a severe skin, eye, nose, and throat irritant. The ACGIH TLV and NIOSH REL are set at 100 ppm.

2-Methylnapthalene
2-Methylnapthalene is a white solid that is found naturally in fossil fuels. High-levels of exposure damages red blood cells. Symptoms of acute poisoning include: fatigue, lack of appetite, restlessness, and pale skin. Symptoms of a higher exposure include: nausea, vomiting, diarrhea, blood in the urine, and a yellow color to the skin. The US DHHS, the IARC, and the EPA have not classified the carcinogenicity of this chemical. The MCL and ACGIH TLV have not been determined for this chemical.

Nitrates
Nitrates ingested in large amounts can result in death. Symptoms often seen include: dizziness, abdominal cramps, vomiting, bloody diarrhea, weakness, convulsions, collapse, and even mental impairment. The carcinogenicity of this chemical is probable.

Nitrobenzene
Nitrobenzene is an industrial chemical typically used to manufacture aniline. Symptoms often seen include: general anesthetic, anoxia, dermatitis, anemia, respiratory stimulation, and vascular changes. This chemical is also an eye and skin irritant and is absorbed readily through the skin. The IARC has determined this chemical to be a probable carcinogen. The ACGIH TLV and NIOSH REL are set at 1 ppm.

N-nitrosodi-n-propylamine
N-nitrosodi-n-propylamine is a manufactured chemical for use in research and as a weed killer. The effect on humans remains unknown for this chemical. The US DHHS has determined that n-nitrosodi-n-propylamine is a probable carcinogen. The MCL and ACGIH TLV have not been determined for this chemical.

Octadecanoic acid
Octadecanoic acid is also known as stearic acid. This chemical is a skin irritant. The carcinogenicity of this chemical is probable.

Pentachlorophenol (PCP)
Pentachlorophenol (PCP) occurs as a colorless crystal. The smell varies with the temperature of this manufactured chemical. Uses of this chemical include use as a biocide and wood preservative. Symptoms of exposure may include sneezing, cough, weakness and exhaustion, anorexia, weight loss, sweating, headache, dizziness, nausea, vomiting, dyspnea, chest pain, high fever, and damage to the liver, kidneys, blood, lungs, nervous system, immune system, and gastrointestinal tract. Contact with skin and eyes cause dermatitis and irritation. The IARC has determined that this chemical is a possible carcinogen to humans. The MCL is set at 0.001 mg/L and the ACGIH TLV is set at 0.5 mg/m^3. The NIOSH REL is set at 0.5 mg/m^3.

Pheneanthrene
Pheneanthrene is a Polycyclic Aromatic Hydrocarbon (PAH). The presence of this chemical arises from the use of fuel components and other organic chemicals. This chemical is a danger to humans and enters all tissues that contain fat. PAHs are stored mostly in the kidneys, liver, and fat with smaller amounts stored in the spleen, adrenal glands, and ovaries. The US DHHS has determined that pheneanthrene is a known animal carcinogen; however, the EPA has determined not classifiable to human carcinogenicity. The MCL and ACGIH TLV have not been determined for this chemical.

PCBs
PCBs are also known as polychlorinated biphenyls. Of the 109 PCBs, many affect hormones and are linked with brain cancer. This chemical is moderately toxic by ingestion and skin contact. The carcinogenicity of this chemical is probable. The MCL is set at 0.0005 mg/L, but the ACGIH TLV has not been determined for this chemical.

Pyrene
Pyrene is a poison through inhalation. This chemical is a skin irritant. The carcinogenicity of this chemical is probable.

Sulfates
Sulfates are elements combined with both sulfur and oxygen. These materials vary in toxicity.

Toluene

Toluene is a poison to humans via various routes. Inhalation, intravenous and subcutaneous routes prove to be mildly toxic. Effects of inhalation result in hallucinations, distorted perceptions, motor activity changes, antipsychotic, pyschophysiological test changes, and bone marrow changes. Other Symptoms of exposure may include irritation to nose and eyes, weakness and exhaustion, confusion, dizziness, headache, anxiety, muscle fatigue, insomnia, paresthesia, dermatitis, and liver and kidney damage. This chemical is an irritant to the eyes and skin and is linked to brain cancer. The MCL is set at 1 mg/L and the ACGIH TLV is set at 100 ppm. The NIOSH REL is set at 100 ppm.

1,3,5-Trinitrobenzene

1,3,5-Trinitrobenzene is a powerful explosive that has more power for shattering than TNT, but less sensitive to impact. This chemical is difficult to produce. Ingestion has proven moderately toxic. The MCL and ACGIH TLV have not been determined for this chemical.

Metals

Metals are found naturally in the environment and tend to remain for a long time, thereby increasing a greater likelihood for exposure. Some metals are useful in small amounts and even necessary for good health. Metals can accumulate in vegetables, grains, fruits, fish, and shellfish from surrounding soil and water. Health effects caused by heavy metals include reduced growth and development, cancer, and organ damage, which can lead to autoimmunity, rheumatoid arthritis, and diseases of the kidneys, circulatory system, and nervous system. Metals have a greater effect on children and exposure can result in learning difficulties, memory impairment, damage to the nervous system, and behavioral problems.[3]

Aluminum

Aluminum occurs naturally and makes up about 8% of the surface of the earth. It is always found combined with other elements such as oxygen, silicon and fluorine. This metal is silver-white and flexible. Uses primarily include cooking utensils, containers, appliances, build-

ing materials, paints, fireworks, glass, rubber, ceramics and consumers products such as antacids, astringents, buffered aspirins, food additives and antiperspirants. Low-level exposure to aluminum from food, air, water, or contact with skin is not thought to harm your health. Aluminum, however, is not a necessary substance for our bodies and too much may be harmful. People who are exposed to high levels of aluminum may have respiratory problems, bone diseases and skeletal problems, skin rashes and delays in neurological development. The Department of Health and Human Services, the International Agency for Research on Cancer, and the EPA have not classified aluminum for carcinogenicity. The SMLC is set at 0.05-0.2 mg/L. Both ACGIH and NIOSH have established guidelines values from 2 mg/m³ for soluble salts to 10 mg/m³ for aluminum for total dust.

Antimony

Antimony is a silvery-white, corrosive metal found naturally in the earth's crust. Typically, antimony is brought into the United States for processing, mixed with alloys for strength, and used in the flame retardant industry. Other uses of this chemical include: ceramics, glass, batteries, fireworks, and explosives. Antimony enters the drinking water through natural weathering of rock, industrial production, municipal waste disposal or manufacturing processes. Inhalation of high-levels will result in lung problems. Ingestion of high-levels of antimony will result in heart problems, stomach pain, diarrhea, vomiting, and stomach ulcers; other unknown effects may result from ingestion. Contact with this chemical results in irritation and burns. Medicinal uses of antimony exist in treating people infected with parasites. The US DHHS, the IARC, and the EPA have not classified antimony as to its human carcinogenicity. The MCL is set at 0.006 mg/L and the ACGIH TLV is set at 0.5 mg/m³. The NIOSH REL is set at 0.5 mg/m³.

Arsenic

Arsenic is a naturally occurring element widely distributed in the earth's crust. In the environment, arsenic is combined with oxygen, chlorine and sulfur to form inorganic compounds. Arsenic in animals and plants combines with carbon and hydrogen to form organic arsenic compounds. It is mainly used to preserve wood. Its use in pesticides has been canceled or restricted.

It cannot be destroyed in the environment; it can only change its form. Organic arsenic compounds are less toxic than inorganic arsenic compounds.

25

Arsenic was listed as the most dangerous substance in the Top 20 hazardous substances on the CERCLA priority List of Hazardous Substances for 2001.

Ingesting high levels of inorganic arsenic can result in death. Lower levels of arsenic can cause nausea and vomiting, decreased production of red and white cells, abnormal heart rhythm, damage to blood vessels, darkening of the skin, and a sensation of "pins and needles" in hand and feet. Arsenic is a human carcinogen and can notably increase the risk of cancer in the lung, skin, bladder, liver, kidney and prostate. The MLC is set at 0.05 mg/L, the ACGIH TLV at 0.5 mg/m^3, and the NIOSH REL at 0.002 mg/m^3. The WHO has established a provisional guideline value of 0.01 mg/L for arsenic in drinking water.

Barium

Barium is a silvery-white metal found in nature and can be produced synthetically. This chemical is typically found in compounds combined with sulfur, carbon, or oxygen and enters the drinking water after dissolving from naturally occurring minerals in the ground. Uses of barium include: oil and gas drilling muds, auto paint, bricks, tiles and jet fuels. The effect on a person's health is greatly dependent on how well the compound dissolves in water. Compounds that do not dissolve well in water are not generally harmful and are often used for medicinal purposes. Ingestion of high-levels result in difficulties in breathing, increased blood pressure, changes in heart rhythm, stomach irritation, brain swelling, muscle weakness, damage to the liver, kidney, heart, and spleen. Symptoms of barium contamination include vomiting, colic, diarrhea, slow irregular pulse, transient hypertension, and convulsive tremors and muscular paralysis. Death may occur in a few hours to a few days. The US DHHS, the IARC, and the EPA have not classified barium as to its human carcinogenicity. The MCL is set at 2 mg/L and the ACGIH TLV is set at 0.5 mg/m^3.

Beryllium

Beryllium in its pure form is a hard, grayish metal with no particular smell. Naturally, it can be found in compounds within mineral rocks, coal, soil, and volcanic dust and enters the drinking water from runoff from mining operations, discharge from processing plants and improper waste disposal. This chemical is often used in electrical equipment and electrical components. Effects of inhalation depend on exposure possibly causing lung damage and a disease resembling pneumonia leading to death. Ingestion of beryllium is not known to

cause effects in humans due to the restriction of movement from the stomach and intestines into the bloodstream. However, it is a deadly poison by intravenous routes. Rashes or ulcers arise from direct contact. The US DHHS has determined that this chemical is a probable human carcinogen. The MCL is set at 0.004 mg/L and the ACGIH TLV is set at 0.002 mg/m³. The NIOSH REL is set at 0.0005 mg/m³.

Bismuth
Bismuth is poisonous to humans. Symptoms often seen include: kidney damage, malaise, albuminuria, diarrhea, skin reactions, exodermatitis, and even death

Boron
Boron is an incredibly toxic material. Symptoms often seen include: irritation of the nose, throat, and eyes, depression of the circulation, persistent vomiting and diarrhea, shock, coma, and even death. Ingestion of large amounts may damage the stomach, intestines, liver, kidney, and brain. Health effects for long-term exposure are not known. The US DHHS, the IARC, and the EPA have not classified the carcinogenicity of boron.

Cadmium
Cadmium is found naturally in the crust, typically as a mineral combined with other elements. This chemical does not corrode easily and is used in batteries, pigments, metal coatings, and plastics. Inhalation of high levels of cadmium will severely damage the lungs and can lead to death. Ingestion of high levels of cadmium irritates the stomach, leading to vomiting and diarrhea. Cadmium will build up in the kidneys, cause damage to the lungs, and creates fragile bones through long-term exposure to lower levels of cadmium. Skin contact with cadmium is not known to cause health effects in humans or animals. Beneficial effects of cadmium are unknown. The US DHHS has determined cadmium and cadmium compounds are probable carcinogens. The MCL is set at 0.005 mg/L and the ACGIH TLV is set at 0.005 mg/m³.

Chromium
Chromium occurs naturally in the ground with no taste or smell associated with this element. This element is found in a few different forms, namely chromium (III) as an essential nutrient and chromium (VI) and chromium (0) typically produced industrially for use in electroplating of metals. Runoff from old mining operations and improper

waste disposal are the modes in which chromium typically enters the groundwater. Inhalation of high-levels of chromium (VI) causes irritations to the nose, such as runny nose, nosebleeds, ulcers, and holes in the nasal septum. Ingestion of high-levels of chromium (VI) can cause stomach upsets and ulcers, convulsions, kidney and liver damage, and even death. Skin contact also results in skin ulcers. Other symptoms to exposure include severe redness and swelling of the skin in addition to an increased risk of lung cancer. The World Health Organization has determined that chromium (VI) is a human carcinogen. The MCL is set at 0.1 mg/L and the ACGIH TLV is set at 0.5 mg/m^3. The NIOSH REL is set at 0.5 mg/m^3.

Cobalt

Cobalt is a naturally occurring metal that may cause dermatitis or pulmonary damage. This metal is important to human health as a part of vitamin B12 and used to treat anemia. However, high levels of exposure severely affect the lungs. Symptoms often seen from inhalation include: cough, breathing difficulty, wheezing, decreased pulmonary function, weight loss, dermatitis, respiratory hypersensitivity, and asthma. Ingestion of soluble salts produces nausea and vomiting. The IARC has determined that cobalt is a probable carcinogen. The ACGIH TLV and NIOSH REL are set at 0.05 mg/m^3.

Copper

Copper is an essential element for all living things. This metal is also a potentially explosive chemical. Liquid copper explodes on contact with water. Symptoms often seen include: nausea and vomiting, diarrhea, stomach cramps, irritation to the eyes and respiratory system, cough, difficulty breathing, and wheezing. The IARC has determined the carcinogenicity of this chemical is unknown. The ACGIH TLV and NIOSH REL are set at 1 mg/m^3.

Fluoride

Fluoride is a pale, yellow-green gas that has a strong sharp odor. Fluorides are found throughout the environment at very low levels. Inhalation of high-levels of hydrogen fluoride gas causes damage to the lungs and heart and can even lead to death. Low-levels of hydrogen fluoride gas can irritate the eyes, skin, and lungs. Low-levels of sodium fluoride do help reduce tooth cavities, while high levels of sodium fluoride are dangerous to one's health. The carcinogenicity of fluoride has not been determined. The MCL is set at 4 mg/L, but the ACGIH TLV has not been determined.

28

Lead
Lead naturally occurs in the crust and is found throughout the environment. This element is used for many purposes and can affect nearly every organ and system of the body. It typically enters the drinking water supply through contact of water with corroded materials containing lead. The effects of inhalation and ingestion are the same; however, the major systems affected by lead poisoning include the nervous system, blood system, and kidneys. Symptoms of lead poisoning include: decreased reaction time, muscle weakness, loss of appetite, anemia, malaise, insomnia, headache, irritability, muscle and joint pains, tremors, flaccid paralysis without anesthesia, hallucinations, and distorted perceptions. Lead poisoning greatly diminishes the intellectual capacity of children, creates delays in normal physical and mental development in babies and young children, and slight deficits in attention span. The US DHHS has determined that more information is needed to determine the carcinogenicity in humans. The MCL has not been determined for this chemical, but the ACGIH TLV has been set at 0.15 mg/m^3. The NIOSH REL is set at 0.05 mg/m^3.

Manganese
Manganese is a naturally occurring metal that is critical to human health in trace amounts. This chemical reacts violently with certain compounds. Symptoms often seen include: degenerative brain changes, change in motor activity, muscle weakness, insomnia, mental confusion, metal fume fever, dry throat, cough, chest tightness, breathing difficulty, vomiting, malaise, kidney damage, and a skin and eye irritant. The carcinogenicity of this chemical is probable. High levels of exposure include: mental and emotional disturbances and slow and clumsy body movements. The EPA has determined the carcinogenicity to be unclassifiable. The ACGIH TLV is set at 5 mg/m^3. The NIOSH REL is set at 1 mg/m^3.

Mercury
Mercury occurs naturally in the environment occupying several forms. The nervous system is greatly affected by this element. High-levels of exposure can lead to permanent damage of the brain, kidneys, and developing fetus. Other limited effects of long-term effects result in irritability, shyness, and tremors, changes in vision or hearing and memory problems. This chemical is corrosive to skin, eyes, and mucous membranes. Symptoms of exposure may include gastrointes-

tinal disturbance, muscle weakness, anorexia, weight loss, headache, tinnitus, hypermotility, diarrhea, liver changes, dermatitis, and fevers. Mercury builds up in the tissues of fish and can then be ingested by humans. The carcinogenic effect of all forms of mercury is unknown. However, the EPA has determined that mercuric chloride and methylmercury are possible human carcinogens. The MCL is set at 0.002 mg/L and the ACGIH TLV is set at 0.05 mg/m³. The NIOSH REL is set at 0.05 mg/m³.

Molybdenum

Molybdenum is a poison and an experimental teratogen. Symptoms often seen in animals include: irritation to the eyes, nose, and throat, anorexia, diarrhea, weight loss, listlessness, liver, and kidney damage. This chemical reacts violently with oxidants. The ACGIH TLV is set at 5 mg/m³.

Nickel

Nickel is an abundant, hard, silvery-white metal found in nature with no characteristic odor or taste. Uses for nickel are expansive and include plating, jewelry, and as catalysts for chemical reactions. Small amounts of nickel are possibly essential to human life. Contact to skin may include allergic contact dermatitis, pulmonary asthma, conjunctivitis, and inflammatory reactions. Inhalation of high-levels of nickel affects the lungs, including chronic bronchitis and reduced lung function. Ingestion of high-levels of nickel affects the stomach, blood, and kidneys. The US DHHS has determined that nickel is a probable carcinogen. The MCL has not been determined for this chemical, but the ACGIH TLV is set at 1 mg/m³. The NIOSH REL is set at 0.015 mg/m³.

Potassium

Potassium is an essential dietary element. This chemical is a dangerous fire hazard. Ingestion of excessive amounts results in kidney failure, nausea, vomiting, abdominal discomfort, diarrhea, heart arrhythmia leading to cardiac arrest., muscular weakness, and temporary paralysis.

Selenium

Selenium is found in the environment in rocks and soil. Inhalation of selenium can result in soreness, coughing, labored breathing, and lung edema. Symptoms of exposure to high-levels include: dizziness, fatigue, irritation, collection of fluid in the lungs, and severe bronchi-

30

tis. Ingestion of high-levels could result in irritation to the mouth and throat, in addition to nausea, gastrointestinal disturbance, and vomiting. Other results of exposure include brittle hair, anemia, cirrhosis, deformed nails, and even death. Contact with skin results in rashes, swelling, and pain. Chronic exposure might result in pallor, nervousness, depression, garlic odor of breath and sweat, gastrointestinal disturbances, and dermatitis. The US DHHS has declared that selenium sulfide is a probable carcinogen. The EPA has declared that the carcinogenicity of selenium compounds is not classifiable. The MCL is set at 0.05 mg/L and the ACGIH TLV is set at 0.2 mg/m³. The NIOSH REL is set at 0.2 mg/m³.

Silver

Silver occurs naturally and is typically found in the environment combined with other elements. Uses primarily include jewelry, brazing alloys and solders, disinfectant of drinking water and water in swimming pools, and as an antibacterial agent. Inhalation of high-levels may lead to lung and throat irritation, and stomach pains. Ingestion of high-levels may result in death. Skin contact may result in a rash, swelling, and inflammation. Exposure at low-levels may result in the deposition of silver into the skin. Long-term exposure at high-levels may lead to arygria, a discoloration of the skin and other body tissues. The carcinogenicity of silver is unknown for humans. The MCL is not determined for this chemical, but the ACGIH TLV is set at 0.1 mg/m³. The NIOSH REL is set at 0.1 mg/m³.

Tin

Tin is a natural element in the earth's crust. It is a soft, white, silvery metal that doesn't dissolve in water, Tin is used mainly to make cans. The EPA has limited its use in paints. Large amounts of tin compounds can cause stomachaches, anemia, liver and kidney problems. Breathing or swallowing this chemical can cause breathing problem, eye irritation, and can interfere with the way your brain and nervous system work. In severe cases, it can cause death.

There is no evidence that tin or tin compounds cause cancer in humans or animals, and tin hasn't been classified for carcinogenicity. The MLC hasn't been determined for this chemical. Both the ACGIH TLV and the NIOSH REL are set at 2 mg/m³.

Thallium

Thallium is a radionuclide found in nature. Ingestion of this chemical results in nerve or sheath structural changes, extra-ocular muscle

changes, sweating, and other effects. The MCL is set at 0.002 mg/L and the ACGIH TLV is set at 0.1 mg/m³.

Vanadium

Vanadium has a variable toxicity. Exposure to this chemical results in conjunctivities, rhinitis, reversible irritationism of the respiratory tract, bronchitis, bronchospasms, and asthma-like diseases in more severe cases. The MCL and ACGIH TLV have not been determined for this chemical.

Zinc

Zinc is a skin irritant. Symptoms often seen include: cough, dyspnea, sweating, throat dryness, sweet taste in mouth, cough, weakness, aches, chills, fever, nausea, and vomiting.

Pesticides

After the publication of Rachel Carson's book *Silent Spring* in 1962, concern arose for the use of chemical pesticides entering the food chain. Pesticides are toxic to living organisms and yet little is known about the extent of health effects on humans. Despite the obvious benefit to eradicating disease-carrying and crop-eating insects, the behavior of such chemicals is not completely understood. It is known that pesticides accumulate in fat deposits in the body. A mode of excretion occurs through breast milk, thereby transferring the harmful chemicals ingested from mother to child. Pesticides greatly affect the developing fetus, infants and young children. Health effects resulting from exposure cause serious diseases and disorders, damage to the nervous system, reproductive system and other organs, developmental and behavioral abnormalities, disruption of normal hormonal function, and immune dysfunction.

Acrylonitrile

Acrylonitrile is synthetic material used to make other chemicals. In the past, acrylonitrile was combined with carbon tetrachloride for use as a pesticide. Symptoms often seen include: conjunctive irritation, somnolence, general anesthesia, cyanosis, diarrhea, increased salivation, photophobia, deepened respiration, nausea, vomiting, weakness, headache, jaundice, anemia, nose and eye irritant, and leucocytosis. The effect that this chemical has on the human body in-

hibits respiratory enzymes of tissue and renders the tissue cells incapable of oxygen absorption. This chemical is carcinogenic. The US DHHS has determined that acrylonitrile is a probable carcinogen. The ACGIH TLV is set at 2 ppm. The NIOSH REL is set at 1 ppm.

Aldrin and Dieldrin
Aldrin and Dieldrin are chemicals that are similar in nature and in effect on humans. In pure form, both are white powders with a mild chemical odor and do not occur naturally in the environment. Aldrin quickly breaks down into dieldrin in the body and in the environment. By 1987 all uses of these chemicals were banned, including the use as a pesticide and for termite control. These chemicals mainly affect the central nervous system. Ingestion of significantly high-levels of these chemicals results in buildup, convulsions, coma and even death. The effects of low-levels of exposure include headaches, dizziness, vomiting, irritability, uncontrolled muscle movements. The IARC has determined that both aldrin and dieldrin are not classifiable as to their carcinogenicity to humans. The MCL has not been determined for these chemicals. The ACGIH TLV and NIOSH REL for both aldrin and dieldrin is set at 0.25 mg/m^3.

Alpha BHC
Alpha BHC, also known as Benzene Hexachloride-alpha-isomer, is a poison by ingestion. This chemical is a confirmed carcinogen with experimental carcinogenic, tumorigenic, and neoplastigenic data. The MCL and ACGIH TLV have not been determined for this chemical.

Beta BHC
Beta BHC is also known as trans-alpha-benzenehexachloride. This chemical is a confirmed carcinogen with experimental neoplastigenic data. Ingestion of Beta BHC is mildly toxic. The MCL and ACGIH TLV have not been determined for this chemical.

Chlordane
Chlordane is a thick liquid whose color ranges from colorless to amber with a mild and irritating smell that was manufactured for use as a pesticide. Uses of this chemical were completely banned in 1988 by the EPA. Although chlordane is not very mobile in soils, it is known to enter the drinking water after application on crops near the water supply intakes or well. Exposure to this chemical affects the nervous system, digestive system, and the liver. It has been found that chlordane lacks the ability to disrupt hormones by itself but greatly

33

magnifies the ability of other chemicals to disrupt hormones. Inhalation of high-levels of chlordane include: headaches, irritability, confusion, weakness, vision problems, vomiting, stomach cramps, diarrhea, and jaundice have occurred in people who breathed air containing high concentrations of chlordane or accidentally swallowed small amounts of chlordane. Ingestion of high-levels leads to convulsions and death. The IARC has determined that chlordane is not classifiable as to its carcinogenicity to humans. The MCL is set at 0.002 mg/L and the ACGIH TLV and NIOSH REL are set at 0.5 mg/m^3.

DDD

DDD, also known as 1,1-bis(4-chlorophenyl)-2,2-di-chloroethane, was once used as a pesticide. Uses for this chemical have been banned. This chemical contaminates DDT products and DDT typically breaks down into DDE or DDD. The nervous system is greatly affected. Symptoms often seen include: excitability, tremors, and seizures. Ingestion results in poisoning. The US DHHS has not determined the carcinogenicity for DDD. This pesticide is a known carcinogen.

DDE

DDE, also known as 2,2-Bis(p-Chlorophenyl)-1,1-Di-Chloroethylene, sometimes is a contaminant for DDT products with no commercial use. The US DHHS has not classified DDE as to the carcinogenicity to humans. The EPA has determined that this chemical is a probable carcinogen. The MCL and ACGIH TLV have not been determined for this chemical.

DDT

DDT, also called 1,1,1-trichloro-2,2-bis(p-chlorophenyl)ethane, is a manufactured chemical used as a pesticide. This chemical is a white, crystalline solid with no odor or taste. The use of this chemical was banned in the United States, aside from public health emergencies. Symptoms of exposure may include irritation to the eyes and skin, anxiety, dizziness, confusion, discomfort, headache, weakness and exhaustion, convulsions, vomiting, excitability, tremors, and seizures. Long-term exposure to this chemical affects the nervous system and results in changes in the levels of liver enzymes. The US DHHS has determined that this chemical is a probable human carcinogen. The MCL has not been determined for this chemical, but the ACGIH TLV is set at 1 mg/m^3. The NIOSH REL is set at 0.5 mg/m^3.

Di-n-butyl phthalate
Di-n-butyl phthalate exposure symptoms often seen include: eye, stomach, and upper respiratory irritation, hallucinations, distorted perceptions, nausea or vomiting, and kidney, ureter or bladder changes. The ACGIH TLV and NIOSH REL are set at 5 mg/m^3.

Dicamba
Dicamba, also known as 2-Methoxy-3,6-Dichlorobenzoic Acid, is moderately toxic by ingestion. The MCL and ACGIH TLV have not been determined for this chemical.

1,2-Dichloroethane
1,2-Dichloroethane, also known as ethylene dichloride, is a synthetic chemical that is used to make other chemicals. Symptoms often seen include: somnolence, cough, jaundice, nausea or vomiting, hypermotility, diarrhea, ulceration or bellding from the stomach, fatty liver degeneration, change in cardiac rate, cyanosis, coma, dermatitis, edema of the lungs, toxic effects on the kidneys, and severe corneal effects. The US DHHS, the IARC and the EPA have not classified the carcinogenicity of this chemical. The ACGIH TLV is set at 10 ppm. The NIOSH REL is set at 1 ppm.

Dinoseb
Dinoseb, also known as 2-sec-Butyl-4,6-dinitrophenol, is a widely used herbicide. This chemical enters the drinking water after application on orchards, vineyards, and other crops. This chemical is a poison by ingestion and a severe irritant to the eyes. Pathways the chemical may travel into the body include: skin contact, subcutaneous, and intraperitoneal routes. The carcinogenicity is questionable with experimental tumorigenic data. The MCL is set at 0.007 mg/L for the chemical, while the ACGIH TLV has not been determined.

Endosulfan II
Endosulfan II is a pesticide and wood preservative found in solid form as crystals or flakes. This chemical smells similar to turpentine and does not burn. This chemical affects the central nervous system but does not accumulate significantly in human tissue. Symptoms of exposure may include irritation to the skin, hyperactivity, nausea, dizziness, headache, tremors, or convulsions, and even death may occur. The carcinogenicity of this chemical is unknown. The MCL has not been determined for this chemical, but the ACGIH TLV and NIOSH REL are set at 0.1 mg/m^3.

35

Endothall
Endothall is a poison extremely irritating to skin, eyes, and mucus membranes. Symptoms often include: diarrhea.

Endrin
Endrin is a pesticide that is a solid, white, almost odorless substance that is banned from use in the United States. This chemical accumulates in sediments and aquatic and terrestrial biota. Exposure to endrin can cause various harmful effects including death and severe central nervous system (brain and spinal cord) injury. Ingestion of this chemical may cause convulsions and will kill you in a matter of minutes to a matter of hours. This chemical does not accumulate in human tissue. Symptoms resulting from exposure include headaches, dizziness, nervousness, confusion, nausea, vomiting, and convulsions. Effects of inhalation or contact are not known. The EPA has declared the human carcinogenicity to be unknown. The MCL is set at 0.002 mg/L and the ACGIH TLV and NIOSH REL are set at 0.1 mg/m^3.

Gamma-chlordane
Gamma-chlordane is no longer permitted for use as a termiticide or pesticide. Symptoms often seen include: tremors, convulsions, excitement, diarrhea, jaundice, vomiting, stomach cramps, vision problems, ataxia, central nervous system stimulant, and gastritis. The IARC has not determined the carcinogenicity of this chemical. The ACGIH TLV and NIOSH REL are set at 0.5 mg/m^3.

Heptachlor and Heptachlor Epoxide (Epoxyheptachloris)
Heptachlor and Heptachlor Epoxide (Epoxyheptachloris) are manufactured chemicals found as a white powder that smell like camphor (mothballs). Heptachlor breaks down into heptachlor epoxide. These chemicals were used primarily as insecticides until 1988. Ingestion of heptachlor results in dizziness, confusion, or convulsions. The full extent of heptachlor and heptachlor epoxide poisoning are unknown for humans, other than damage to the nervous system. Low-levels of exposure have caused liver damage and the symptoms include tremors, convulsions, kidney damage, respiratory collapse, and death. The IARC has determined that heptachlor and heptachlor epoxide are not classifiable to their carcinogenicity to humans. The MCL for heptachlor is set at 0.0004 mg/L and the MCL for heptachlor epoxide is set at 0.0002 mg/L. The ACGIH TLV has not been determined for these chemicals. The NIOSH REL is set at 0.5 mg/m^3.

Heptachlorinated dibenzo-p-dioxins
Heptachlorinated dibenzo-p-dioxins is a type of dioxin. Dioxins are understood to function in a similar manner as a steroid hormone. This implies that the dioxins enter the body and bind to a protein. A complex is then formed that attaches to the cell's chromosomes, thereby altering the genetic material and affecting the body in many different ways. The MCL and ACGIH TLV have not been determined for these chemicals.

Isopropanol
Isopropanol is also known as Isopropyl alcohol and is a moderately toxic chemical. Symptoms often seen include: flushing, pulse rate decrease, blood pressure lowering, anesthesia, narcosis, headache, dizziness, mental depression, drowsiness, hallucinations, distorted perceptions, dyspnea, respiratory depression, nausea or vomiting, and coma. The ACGIH TLV and NIOSH REL are set at 400 ppm.

Lindane
Lindane, also known as benzene hexachloride, is a pesticide that mimics natural hormones. Under favorable soil and climatic conditions, lindane enters the drinking water through runoff of contaminated materials into surface water or by leaching into the groundwater. Inhalation results human systemic effects by headache, nausea or vomiting, and fever. Pathways taken by this chemical into the body include: ingestion, skin contact, and subcutaneous routes. This chemical is more toxic than DDT or dieldrin and is shown to damage the nervous system and circulatory system. Lindane is a confirmed carcinogen with experimental carcinogenic, neoplastigenic, and tumorigenic data by ingestion and skin contact. The MCL is set at 0.0002 mg/L, but the ACGIH TLV has not been determined for this chemical.

Methylene chloride
Methylene chloride is a synthetic material that is also a severe skin and eye irritant. Symptoms often seen include: dizziness, nausea, decreased attentiveness, paresthesia, somnolence, altered sleep time, convulsions, euphoria, change in cardiac rate, and a severe eye and skin irritant. The US DHHS, the WHO, and the EPA have determined that methylene chloride is a probable carcinogen. This chemical is a known carcinogen. The ACGIH TLV is set at 50 ppm.

Napthalene
Napthalene is a naturally occurring material typically used to make the insecticide carbaryl. Symptoms often seen include: damage to red blood cells, fatigue, lack of appetite, restlessness, nausea, skin and eye irritant, headache, diaphoresis, hematuria, fever, anemia, liver damage, vomiting, renal shutdown, corneal damage, convulsions, and coma. The US DHHS, the IARC, and the EPA have determined the carcinogenicity of this chemical is not classifiable. The ACGIH TLV and NIOSH REL are set at 10 ppm.

Pentachlorophenol
Pentachlorophenol is a synthetic chemical that is extremely dangerous and was used as a pesticide. Symptoms often seen include: acute poisoning marked by weakness, changes in respiration, blood pressure, and urinary output, dermatitis, convulsions and collapse, anorexia, weight loss, sweating, headache, dizziness, nausea, vomiting, breathing difficulty, chest pain, and liver and kidney injury. The EPA and the IARC have determined this chemical to be a probable carcinogen. This chemical is a known carcinogen. The ACGIH TLV and NIOSH REL are set at 0.5 mg/m^3.

Phenol
Phenol is a synthetic chemical that was widely used as a pesticide. Symptoms often seen include: severe eye and skin irritation, kidney, liver, pancreas, and spleen damage, edema of the lungs, anorexia, weight loss, weakness and exhaustion, muscle ache, pain, corrosion of the lips, mouth, throat, esophagus and stomach, gangrene and even death. The carcinogenicity of this chemical is unknown. The ACGIH TLV and NIOSH REL are set at 5 ppm.

Toxaphene
Toxaphene, also known as Chlorinated Camphene, is an insecticide that mimics natural hormones. Ingestion and skin contact result in somnolence, convulsions or effect on seizure threshold coma, and allergic skin dermatitis. Symptoms of exposure may include nausea, confusion, agitation, tremor, convulsions, unconsciousness, or dry and red skin. Carcinogenicity of toxaphene is probable. The MCL is set at 0.003 mg/L and the ACGIH TLV is set at 0.5 mg/m^3.

2,4,5-TP
2,4,5-TP, also known as (2,4,5-Trichlorophenoxyl)Proprionic Acid, is commonly referred to as Silvex. Ingestion results in poisoning.

The carcinogenicity of Silvex is probable. The MCL is set at 0.05 mg/L, but the ACGIH TLV has not been determined.

2,4,5-T
2,4,5-T, also known as 2,4,5-trichlorophenoxyacetic acid, is readily absorbed through inhalation and ingestion and slowly through contact. Effects of exposure include: weakness, lethargy, anorexia, diarrhea, ventricular fibrillation. Chronic exposure can result in cardiac arrest and even death. The MCL has not been determined, but the ACGIH TLV and NIOSH REL are set at 10 mg/m³.

Xylene
Xylene is a naturally occurring material in petroleum and coal tar. This chemical is a severe skin and eye irritant and greatly affects the brain. Symptoms often seen include: olfactory changes, conjunctiva irritation, pulmonary changes, headaches, lack of muscle coordination, dizziness, confusion, difficulty breathing, and gastrointestinal discomfort. This chemical is a dangerous fire hazard when exposed to heat or flame. The IARC has determined the carcinogenicity of this chemical is not classifiable. The ACGIH TLV is set at 100 ppm.

o-Xylene
o-Xylene, also known as 1,2-Dimethylbenzene, is a mildly toxic chemical. This chemical is a very dangerous fire hazard when exposed to heat or flame. Symptoms often seen include: irritation to the eyes, skin, nose, and throat, dizziness, excitement, drowsiness, incoordination, staggering gait, corneal vacuolization, anorexia, nausea, vomiting, abdominal pain, and dermatitis. The ACGIH TLV and NIOSH REL are set at 100 ppm.

Radionuclides

Radionuclides are atoms with structures that are out of balance. The atoms are continually changing, or decaying, into a more stable form. The decay process releases energy, otherwise known as radiation. Any alteration to the delicate balance that atoms maintain affects the structure and stability of the cell. As radiation strikes an atom, the balance is disrupted and the atom gains a positive or negative charge. These atoms are called ions and the ionization of atoms and molecules inside a living cell results in damage to the cell.

Ionizing radiation results in health problems. There are three important types of radiation that cause ionizing radiation: alpha and beta particles, and gamma rays. Alpha particles are large enough particles that the outer layer of dead skin will prevent the penetration of alpha particles into the human body. However, if an alpha particle does indeed enter into the lungs, the ionizing energy will break through cell walls. These particles have a charge of +2. The positive charge enables these particles to be effective ionizers that travel at relatively slow speeds and short ranges.

Beta particles are smaller negatively charged particles that are the equivalent to electrons. These particles originate in the nucleus whereas electrons originate outside the nucleus. Although beta particles are not radioactive, the atoms that emit the particles are. The energy and speed result in damage to cells. Solid objects stop these particles easily.

Gamma rays have incredibly high energy and can easily pass through lead and several feet of concrete. These particles don't need to be ingested or inhaled to seriously damage the human body.

Damage brought about by exposure to radioactivity results in cancer. All radionuclides are known carcinogens. In regards to other chemicals, the carcinogenicity is not always certain.

Plutonium

Plutonium is a radionuclide that is extremely dangerous. Plutonium-236 is an alpha emitter. The high radiotoxicity of plutonium determines the toxicity of plutonium compounds in addition to other atoms in the compounds they form. Any event that further spreads this radionuclide into the environment is dangerous to the life and land. This chemical was created expansively in nuclear weapons production and nuclear power plants. The MCL is set at 15 pCi/L.

Strontium

Strontium is a radionuclide with similar properties to calcium. Strontium-90 is a beta emitter. The stable form has low toxicity and ignites spontaneously in air. When strontium is combined with water or steam, it reacts vigorously to evolve into hydrogen. The MCL is set at 50 pCi/L.

40

Thorium
Thorium is a radionuclide found in nature. Thorium -232 is an alpha emitter. The carcinogenicity of thorium is probable. The MCL is set at 15 pCi/L.

Tritium
Tritium is a radionuclide that is not an external radiation hazard. This radionuclide is an alpha emitter. When tritiated water is ingested, the blood distributes the materials equally among all of the body fluids. As a human is exposed to tritium, the soft tissues are irradiated. The MCL is set at 20,000 pCi/L.

Uranium
Uranium is a radionuclide found in the environment that is highly toxic on an acute basis. Uranium-238 is an alpha emitter. Exposure at high-levels to uranium results in kidney damage, acute arterial lesions, and cancer. Soluble uranium compounds can be absorbed rapidly into the body. The MCL is set at 20 µg/L and the ACGIH TLV is set at 0.2 mg/m³.

ENDNOTES

[1] Rachel's Environmental Health News, #640 – Chlorine Chemistry News, March 04, 1999.

[2] Rachel's Environmental Health News, #498 – Dangers of Chemical Combinations, June 13, 1996.

[3] http://www.environhealthaction.org/toxics/heavy_metals/

APPENDIX 1. Abbreviations and Acronyms

ACGIH – American Conference of Governmental Industrial Hygienists
ATSDR – Agency for Toxic Substances and Disease Registry
DHHS – Department of Health and Human Services
DOE – U.S. Department of Energy
EPA – Environmental Agency
FDA – Food and Drug Administration
HR – Hazard Rating
IARC – International Agency for Research on Cancer
MCL – Maximum Contaminants Levels (mg/L)
NIOSH – National Institute for Occupational Safety and Health
OSHA – Occupational Safety and Health Administration
The OSHA sets permissible exposure limits (PELs) to protect workers against adverse health effects resulting from exposure to hazardous substances.

PAH – Polycyclic Aromatic Hydrocarbon
PCB – Polychlorinated biphenyl
pCi – pico-Curies, measurement of radioactivity
PELs – Permissible Exposure Limits
The PELs determined hazardous substances are enforceable, regulatory limits on allowable indoor air concentrations.

PETN – Pentaerythritol tetranitrate
REL – Recommended Exposure Level
SMCL – Secondary Maximum Contaminants Levels (mg/L)
TLV – Threshold Limit Value
WHO – World Health Organization

42

APPENDIX 2. Glossary

- **Anemia:** A decreased ability of the blood to transport oxygen
- **Carcinogen:** Any substance that produces or promotes cancer
- **Carcinogenicity:** Ability to cause cancer
- **Irritant:** Abnormal reaction to a substance
- **Long-term:** 365 days or longer
- **Milligram (mg):** One thousandth of a gram
- **Tumor:** An abnormal mass of tissue

APPENDIX 3. Bibliography

BWXT-Pantex, LLC. "2000 Site Environmental Report for Pantex Plant", DE-AC04-00AL66620, May 2001: Tables 6.1-6.2.

Lewis, Richard J. "Hazardous Chemicals Desk Reference," 1993.

Office of the Federal Registry National Archives and Records Administration. *Code of Federal Regulations: Protection of Environment.* Volume 40, Parts 100 to 149. Revised as of July 1, 1994: p. 722-742.

Office of Water, US EPA. "Drinking Water Standards and Health Advisories", EPA 822-B-00-001, Summer 2000.

S.M. Stoller Corporation. "Final FY 2000 Summary and Progress Report for Groundwater Investigations at DOE Pantex Plant", Volume 1. January 29, 2001.

Websites:

ATSDR. "ToxFAQs: Frequently Asked Questions about Contaminants Found at Hazardous Waste Sites", <http://www.atsdr.cdc.gov/toxfaq.html>.

ESER Program. "Gross Alpha Radiation", "Gross Beta Radiation". <http://www.stoller-eser.com/FactSheet/>.

National Institute for Occupational Safety and Health. "NIOSH Pocket Guide to Chemical Hazards", <http://www.cdc.gov/niosh/npg/npg.html>.

US EPA. "Chemicals in the Environment: OPPT Chemical Fact Sheets", April 25, 2001, <www.epa.gov/opptintr/facts.htm>.

US EPA. "Current Drinking Water Standards", January 23, 2002, <http://www.epa.gov/safewater/mcl.html>.

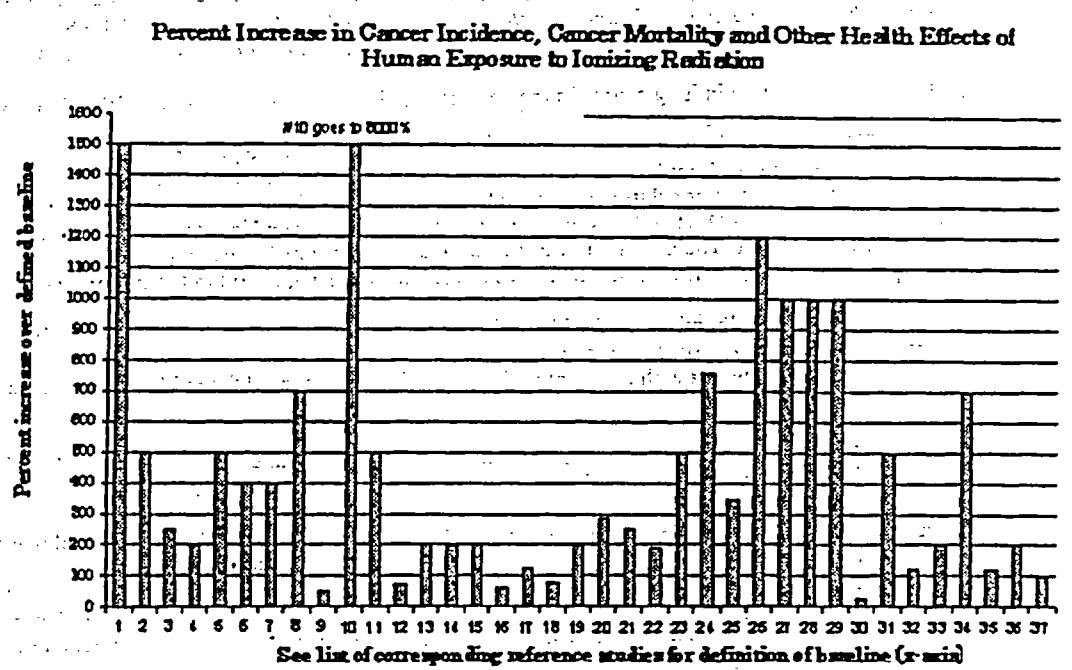
US EPA. "IRIS Substance List", <http://www.epa.gov/iris/subst/index.html>.

US EPA. "List of Contaminants and MCLs", <http://www.epa.gov/safewater/mcl.html>, <http://www.epa.gov/safewater/regs/cfr141.pdf>.

WHO. "Guidelines for drinking water quality." <http://www.who.int/water_sanitation_health/GDWQ/>.

Reigart, J. & Roberts, J. "Recognition and Management of Pesticide Poisonings", Fifth Edition, 1999: <http://www.epa.gov/oppfead1/safety/healthcare/handbook/handbook.pdf>.

http://www.gis.usu.edu/~sanduku/papers/gisca/node14.html



Legend for "Percent Increase in Cancer Incidence, Cancer Mortality, and Other Health Effects of Human Exposure to Ionizing Radiation"

1. 1500% increase in incidence of testicular and ovarian cancer in children on Navaho reservation in uranium mining area
2. 500% increase in bone cancer in children affected by uranium
3. 250% increase in leukemia (all ages) in the Navaho population
4. 200% increase in each of the following non-cancer effects: miscarriage, infant death, congenital defects, genetic abnormalities, learning disorders.
   Baseline for 1-4: Navajo residents living near Uranium facilities were compared to Navajo resider in non-uranium areas

5. 500% increase in birth defects when compared to the national average.
   (Southwest Research and Information Center. "Uranium Legacy." *The Workbook*, v 8, no 6. Albuquerque, NM: 1983.)

6. 400% increase in leukemia incidence in the population living downwind of the Pilgrim nuclear pov reactor in Massachusetts in the first 5 years after fuel was know to have leaked excess radioactivity **Baseline:** Disease in population before and after Pilgrim radioactive releases and comparison to

upwind population.
(Morris M. Knorr R. *The Southeastern Massachusetts Health Study 1978-1986-Report of the Massachusetts Department of Public Health.* October 1990. See also: Clapp R. Cobb S. et al. "Leukemia Near Massachusetts Nuclear Power Plant." Letter in *Lancet.* December 5, 1987.)

7. 300—400% increase in lung cancer in the general population within the plume of the Three Mile Island accident releases
8. 600—700% increase in leukemia in the general population within the plume of Three Mile Island accident releases **Baseline:** Disease in population upwind (out of the radiation plume path) is compared to disease in population downwind (in the pollution plume.)
(Wing S. Richardson D. et al. "A Reevaluation of Cancer Incidence Near the Three Mile Island Nuclear Power Plant: The Collision of Evidence and Assumptions." *Environmental Health Perspectives*, v 105, no 1. National Institutes of Health. Bethesda, Maryland. January 1997.)

9. 50% increase in childhood cancer incidence in the Three Mile Island area for each 10 millirem increase in radiation exposure per year.
Baseline: Children living with different radiation levels are compared for evidence of disease.

(Hatch M. et al. "Background Gamma Radiation and Childhood Cancers Within Ten Miles of a US Nuclear Power Plant." *International Journal of Epidemiology*, v 19, no 3. 1990.)

10. 8000% increase in thyroid cancer in Belarussian children living near Chernobyl, reported 6 years a the meltdown.
Baseline: Comparison of population health before and after the Chernobyl explosion.
(Hudson RL. "Child Cancers Found to Rise Near Chernobyl." The Wall Street Journal. September 1992. *The article they quote was published in Nature on the same day and was researched by the World Health Organization.*)

Further effects found in victims of the Chernobyl accident less than ten years after the meltd
11. 500% increase in thyroid cancer in Ukrainian children.

12. 75% increased incidence of heart disease
13. 200% increase in respiratory and digestive disease
14. 200% increase in birth defects
15. 200% increase in spontaneous abortions
Baseline: Comparison of population health before and after the Chernobyl explosion
(Rupert J. "Illness Tied to Disaster Still on Rise." The Washington Post. June 24, 1995. *The reporte was quoting Britain's Imperial Cancer Research Fund, The Ukrainian Health Ministry and the Un Nations.*)

16. 63% increase in leukemia incidence among workers at Oak Ridge National Laboratories(US) who received very low doses of external (gamma) radiation on the job.
17. 123% increase in leukemia incidence in the same population where there were also very low intern doses of radioactivity
Baseline: Cohort comparison of worker deaths and radiation exposure levels
(Wing S. Shy C. et al. "Mortality Among Workers at Oak Ridge National Laboratory: Evidence of Radiation Effects in Follow-up Through 1984." *JAMA*, v 265 no 11. March 20, 1991.)

18. 80% increase in eight types of cancer deaths in Department of Energy atomic workers exposed to

external doses of radiation. **Baseline:** Various baselines. Usually cohort comparison of workers wi various doses and their deaths from resulting diseases were used.
(Mancuso TF. Stewart A. Kneale G. "Radiation Exposures of Hanford Workers Dying From Canc and Other Causes." *Health Physics*, v 33. Pergamon Press, Great Britain. November 1977.)

19. 200% increase in leukemia in children of atomic workers **Baseline:** The parents of children with cancer were compared for occupation to discern if those adults who worked with radiation had mo children with cancer than those who worked in other jobs.
(Roman E. et al. "Case-control Study of Leukemia and Non-Hodgkin's Lymphoma Among Childn Aged 0-4 years Living in West Berkshire and North Hampshire Health Districts." *BMJ* 1993 #306.

20. 287% increase in cancer incidence in children of nuclear workers who received internal radiation i England
Baseline: The parents of children with cancer were compared for occupation to discern if those ad who worked with radiation had more children with cancer than those who worked in other jobs.
(Sorahan T. Roberts PJ. "Childhood Cancer and Paternal Exposure to Ionizing Radiation: Prelimin Findings From the Oxford Survey of Childhood Cancers." *American Journal of Industrial Medicin* 23: 343-354. 1993.)

21. 250% increase in all cancers among atomic workers
22. 190% increase in leukemia incidence
Baseline: General Population
(Kendall. GM. et al. "Mortality and Occupational Exposure to Radiation: First Analysis of the National Registry for Radiation Workers." *BMJ* v 304: 220-5. 1992.)

23. 500% increase in childhood leukemia in children visiting the beach once a week near the French nuclear reprocessing facility at LaHague
24. 760% increase in childhood leukemia if they ate the local fish regularly
25. 345% increase in childhood leukemia associated with drinking well water from the vicinity of the nuclear facility
Baseline: Observed leukemia cases were compared to expected leukemia cases.
(Viel JF. Pobel D. Incidence of Leukaemia in Young People Around the La Hague Nuclear Waste Reprocessing Plant: A Sensitivity Analysis." *Statistics in Medicine*, v 14: 2459-2472. 1995.)

26. 1200% increase in all cancers exist around the Sellafield, (formerly Windscale) reprocessing facili and of these,
27. 600-1000% increase in leukemia of children whose fathers were exposed to certain amounts of radiation prior to conception
28. 1000% increase in lymphoma was found in children near a reprocessing facility in Cumbria
Baseline: Local and Area Controls
(Gardner et al. "Results of Case-control Study of Leukemia and Lymphoma Among Young People Near Sellafield Nuclear Plant in West Cumbria." *BMJ* v 300. February 17, 1990.)

29. 1000% increase in leukemia incidence in children living near a nuclear reprocessing facility
Baseline: Children of the same age in the same area prior to the facility's operation.
(Heasman et al. "Childhood Leukemia in Northern Scotland." *Lancet*, v 1:266. 1986.)

30. 27.3% increase in all cancer deaths among atomic workers exposed to internal doses of radiation
Baseline: Comparison of worker deaths and radiation exposure levels.
(Morgenstern H. Froines J. Epidemiologic Study to Determine Possible Adverse Effects to Rocketdyne/Atomics International Workers from Exposure to Ionizing Radiation. State of Californ

Health and Welfare Agency. June 1997.)

31. 500% increase in leukemia among Utah nuclear bomb test Downwinders
32. 121% increase in thyroid cancer incidence in the same group
33. 200% increase in breast cancer
34. 700% increase in bone cancer
    Baseline: Utah Mormons exposed to bomb fallout are compared to all Utah Mormons.
    (Johnson CJ. "Cancer Incidence in an Area of Radioactive Fallout Downwind From the Nevada Te Site." JAMA, v 251 n 2: 231-6. January 13, 1984.)

35. a greater then 120% increase in thyroid cancer in those who drank milk laced with Iodine-131 fron atmospheric nuclear weapons tests
    Baseline: Estimated cases are based on dose reconstruction where estimated exposures were betwe 6-112 rads per individual child in the bombs' plumes.
    (Ortmeyer P. Makhijani A. "Let Them Drink Milk." *The Bulletin of the Atomic Scientists*, Nov/Dec 1997.)

36. 200% increase in lung cancer in women who received radiation treatments for breast cancer
    Baseline: Breast cancer patients treated with radiation were compared to those who were treated o by other methods.
    (Bishop JE. "Study Links Breast Cancer Treatment to Higher Risk of the Disease in Lungs." The V Street Journal, May 14, 1993: B6.)

37. 66—96% increase in early cancer deaths due to background radiation
    Baseline: Deaths of children living with different radiation levels are compared for cancer.
    (Kneale GW. Stewart AM. "Childhood Cancers in the UK and their Relation to Background Radiation." *Radiation and Health*. 1987.)

This list was compiled by Cindy Folkers & Mary Olson on 4/24/98, Nuclear Information & Resource Service, 1424 16 th St, NW Suite 404, Washington, DC 20036 (202)328-0002 -- it is arbitrarily based on what studies are on file at NIRS.

A partial list of non-cancer health effects of human exposure to radiation:

Downs Syndrome
Hydrocephaly
Microhydrocephaly
Cleft Lip and Palate
Epilepsy
Kidney and Liver Damage
Thyroid Disease
Low Birthweight
Increased Infant Mortality
Increased Stillbirth
Genetic Mutations/Chromosomal Aberrations
Spinal Defects
Congenital Malformations

RJB received 3/29/05

From: <NancyBurtonEsq@aol.com>
To: <rle@nrc.gov>
Date: 3/21/05 12:13PM
Subject: Millstone - Notice of Intent to Sue

12/9/04
69 FR 71437
(59)

Mr. Emch:
Please include this message and the attachmnent in your EIS review.
Thank you.
Nancy Burton

CONNECTICUT COALITION AGAINST MILLSTONE
www.mothballmillstone.org (http://www.mothballmillstone.org)

COALITION ANNOUNCES SUIT AGAINST MILLSTONE;
CHARGES ILLEGAL DISCHARGES ENDANGER HEALTH AND ENVIRONMENT

For Immediate Release: March 21, 2005
Contact: Nancy Burton 203-938-3952

Waterford – The Connecticut Coalition Against Millstone announced today it will bring a federal lawsuit to stop alleged illegal discharges of chemical and radioactive waste into the Long Island Sound by the Millstone Nuclear Power Station.

The Coalition served Dominion Nuclear Connecticut, Inc., owner and operator of the nuclear facility, with a formal notice of intent to sue, a legal pre-requisite to bring a federal lawsuit under the provisions of the Federal Clean Water Act.

The Coalition's notice alleges that permits issued by Connecticut's Department of Environmental Protection have expired, were issued beyond DEP's authority and were illegally transferred to Dominion by Northeast Utilities in 2001.

"Dominion and its predecessor, Northeast Utilities, have treated the Long Island Sound as if it were their private nuclear and toxic waste dump," said Nancy Burton, a Coalition leader.

"With this lawsuit, Dominion's dumping days will be over," Burton said.

The Coalition listed 38 radioactive isotopes and 146 metals and chemicals – many of them carcinogens – which are believed to be routinely discharged into the Long Island Sound under permits which have expired or are illegal.

"The Long Island Sound would be spared contamination by these deadly radioactive and toxic agents if the government ordered Millstone to convert to a closed cooling system such as we have advocated since 1999," Burton said.

"The links between Millstone's effluent discharges – which are washed by the tides and currents onto the shorelines of Waterford and East Lyme - and human health effects are established," Burton said.

On March 10, 2005, at a press conference convened by the Coalition, Dr. Helen Caldicott, a world-recognized authority on the health effects of low-level ionizing radiation, publicly linked Millstone effluents with the rare jawbone cancer found in Zachary M. Hartley when he was born on December 16.

SISP Review Complete
Template = ADM-013

E-RIDS = ADM-03
Add = R.J. Emch (RLE)

1997.

Zachary's mother swam daily during critical months of her pregnancy at the Hole-In-the-Wall beach on Niantic Bay 1.5 miles from Millstone's discharge point.

Under the permits which the Coalition says have expired and were illegally issued, Millstone is permitted to discharge radioactive and toxic chemical effluents at heightened concentrations to a "mixing zone" which is defined as the area in Long Island Sound within 8,000 feet – or roughly 1.5 miles – from its discharge point.

One radionuclide – cesium-137, which Dr. Caldicott identified as a possible factor in Zachary's jawbone cancer – was found in a fish caught by NU in Niantic Bay in 1997, the year of Zachary's gestation. NU admitted the contamination originated from its effluent releases.

The Coalition is investigating other instances of cancers which have developed in people who have swum and sunbathed on the Niantic and Waterford shorelines near Millstone.

Note to Editors: The Coalition's Notice of Intent to Sue (10 pages) is attached.

- 30 -

CC: <ajk1@nrc.gov>, <secy@nrc.gov>

CONNECTICUT COALITION AGAINST MILLSTONE

www.mothballmillstone.org

March 21, 2005

Dominion Nuclear Connecticut, Inc.
Millstone Nuclear Power Station
314 Rope Ferry Road
Waterford CT 06385

Dominion Generation
P.O. Box 26666
Richmond VA 23261

Re: Notice of Intent to Sue

Dear Sirs:

The Connecticut Coalition Against Millstone ("the Coalition") is an organization uniting statewide clean-energy groups, Millstone whistleblowers and families and individuals who reside in Connecticut and elsewhere, including within the emergency evacuation zone of the Millstone Nuclear Power Station ("Millstone").

Section 505(b) of the Clean Water Act ("CWA"), 33 U.S.C. Section 1365(b) requires that sixty days prior to filing a citizen suit in federal court under section 505(a) of the CWA, 33 U.S.C. Section 1365(a), the alleged violators, the U.S. Environmental Protection Agency and the state in which the alleged violations occur be given notice of the alleged violations.

MPS-83-1 The Coalition hereby places Dominion Nuclear Connecticut, Inc. and Dominion Generation and their related Dominion corporate entities (collectively, "Dominion") on notice pursuant to section 505(b) of the CWA, 33 U.S.C. section 1365(b), that it believes that Dominion has violated and continues to violate "an effluent standard or limitation" under section 505(a)(1)(A) of the CWA, 33 U.S.C. Section 1365(a)(1)(A), by failing to comply with National Pollution Discharge Elimination System ("NPDES") permit number CT0003253, issued

1

MPS-83-1 pursuant to section 402(b) of the CWA, 33 U.S.C. Section 1342(b) by the Connecticut Department of Environmental Protection ("DEP") pursuant to authority delegated to it.

MPS-83-2 Based on records maintained by the DEP, the Coalition believes that Dominion has discharged and will continue to discharge pollutants into the Long Island Sound in violation of effluent standards or limitations of the NPDES permit issued on December 15, 1992 in one or more of the following ways:

1. NPDES permit number CT0003253 expired on December 14, 1999 and has been of no lawful effect since such date; accordingly, all effluent discharges otherwise permitted under the terms of the permit since such date have occurred in violation of the CWA effluent standards and limitations;

2. The DEP, commencing on or about 1998 and consistently thereafter, has issued and renewed "emergency authorizations" for indefinite periods purportedly pursuant to Connecticut General Statutes Section 22a-6(k) for purposes of permitting effluent discharges otherwise disallowed by the 1992 NPDES permit which expired on December 14, 1997 and all in the absence of notice to the public and an opportunity for meaningful public comment; accordingly, all effluent discharges released pursuant to said "emergency authorizations" since 1998 have occurred in violation of CWA effluent standards and limitations. The most recent such "emergency authorization" ("EA"), which is of indefinite duration, was issued by DEP on October 20, 2000 and has been "in effect" since such date;

3. On or about April 1, 2001, DEP purported to authorize the transfer of NPDES permit number CT0003253 and the "EA" from the Northeast Nuclear Energy Company ("NNECO") to Dominion; subsequent thereto, NNECO "transferred" the expired NPDES permit number CT0003253 and the EA to Dominion;

4. Insofar as DEP lacked lawful authority to transfer the expired NPDES permit and to transfer the EA, insofar as such EA had been issued initially in the absence of legal authority, all

effluent discharges released by Dominion since April 1, 2001 into the Long Island Sound have occurred without legal authority and in violation of CWA effluent standards and limitations;

5. It appears that DEP issued the EA and its predecessor "emergency authorizations" in knowing violation of the law, Connecticut General Statutes Section 22a-6(k), which limits the issuance of emergency authorizations to address discrete events involving "an imminent threat to human health or the environment" and not for terms of unlimited duration;

6. On or about December 20, 1999, Arthur J. Rocque, Jr., then-DEP Commissioner, authorized renewal of one such "emergency authorization" concerning discharges from the Millstone Unit 3 nuclear reactor after noting as follows:

   "I really hate these [NNECO requests for renewal of emergency authorizations]. Statutes are very limited in what the[y] define as 'emergency.' Continuing emergency is not even contemplated." (Emphasis in original)

   A copy of the internal DEP memorandum on which Rocque wrote such statement in his own handwriting is attached hereto;

7. In September 1999, NNECO pleaded guilty in the U.S. District Court for the District of Connecticut to committing environmental felonies in violation of the terms and conditions of the said NPDES permit number CT0003253;

8. Dominion, through its corporate-related entities, recently settled an environmental lawsuit brought by the U.S. Department of Justice and the U.S. Environmental Protection Agency for violations of the Clean Air Act for $1.2 billion;

9. On or about March 11, 2005, the Conservation Law Foundation announced its intent to sue Dominion's corporate related entities for alleged illegal discharges of mercury into the

environment;

10. In consideration of these and other illegal activities carried out by NNECO at Millstone and by Dominion's corporate related entities at Millstone and elsewhere, Connecticut DEP lacks legal authority to renew the NPDES permit;

11. Dominion routinely discharges radioactive and toxic chemical and metal discharges into the Long Island Sound through its Millstone operations and it has done so continuously since on or about April 1, 2001 to the present;

12. Dominion routinely discharges some or all of the following radionuclides, chemicals and metals into the Long Island Sound, all in knowing and continuing violation of the CWA:

Ag
Be-7
Ce-144
Co-57
Co-58
Co-60
Cr-51
Cs-134
Cs-137
Fe-55
Fe-59
I-131
I-133
Kr-85
Kr-88
La-140
Mn-54
Mo-99
Na-24
Nb-95
Nb-97
Ru-105

4

Sb-122
Sb-124
Sb-125
Sn-113
Sr-89
Sr-90
Sr-92
TC-99M
TC-101
TC-104
Tritium
Xe-133
Xe-135
Zn-69M
Zr-95
Zr-97
Aluminum
Antimony
Ammonia
Ammonium Hydroxide
Arsenic
Barium
Beryllium
Boric Acid
Boron
Bromide
Bulab 6002
Cadmium
Carbohydrazide
Chlorine
Chromium
Cobalt
Conquor 3585 (methoxypropylamine and diethylhydroxylamine)
Copper
Cyanide
Dietylhydroxylamine
Epichlorohydrin
Ethanolomine
Fluoride
Freon

5

Hexavalent Chromium
Hydrazine
Hydrogen Peroxide
Iron
Methoxypropylamine
Molybdate
Molybdenum
Nalcolyte
Nickel
Nitrogen
Oil & Grease
Phosphorus
Selenium
Silver
Styrene
Sulfate
Sulfide
Sulfite
Surfactants
Thallium
Tin
Titanium
Tolyltriazole
Xylene
Zinc
Zirconium
Acrolein
Acrylonitrile
Benzene
Bromoform
Carbon Tetrachloride
Chlorobenzene
Chlorodibromomethane
Chloroethane
2-Chloroethylvinyl Ether
Chloroform
Dichlorobromomethane
1, 1-Dichloroethane
1, 2-Dichloroethane
1, 1-Dichloroethylene

1, 2-Dichloropropane
1, 3-Dichloropropylene
Ethylbenzene
Methylbromide
Methylchloride
Methylene Chloride
1, 1, 2, 2, -Tetrachloroethane
Tetrachloroethylene
Toluene
1, 2-Trans-Dichloroethylene
1, 1, 1-Trichloroethane
1, 1, 2-Trichloroethane
Trichloroethylene
Vinyl Chloride
2-Chlorophenol
2, 4-Dichlorophenol
2, 4-Dimethylphenol
4, 6-Dinitro-O-Cresol
2, 4-Dinitrophenol
2-Nitrophenol
4-Nitrophenol
P-Chloro-M-Cresol
Pentachlorophenol
Phenol
2, 4, 6-Trichlorophenol
Acenaothylene
Benzidine
Benzo(a)anthracene
Benzo(a)pyrene
Benzo(ghi)perylene
Benzo(k)fluoranthene
Bis(2-Chloroethyl) Ether
Bis(2-Ethylhexyl)phthalate
Chrysene
Dibenzo(ah)anthracene
1,2-Dichlorobenzene
1.3-Dichlorobenzene
1.4-Dichlorobenzene
3.3-Dichlorobenzidines
Diethyl phthalate

7

Dimethyl phthalate
Di-n-butyl phthalate
2,4-Dinitrotoulene
1,2-Diphenylhydrazine
Fluoranthene
Fluorene
Hexachlorobenzene
Hexachlorocyclopentadiene
Hexachloroethane
Indenol1,2,3-ed)pyrene
Isophorone
Nurobenzene
N-Nitrosodimethylamine
N-Nitrosodiphenylamine
Phenanthrene
Pyrene
Aldrin
Chlordane
DDT
DDE
Dieldrin
Endosulfan(alpha)
Endosulfan (beta)
Endosulfan Sulfae
Endrin
Endrin Aldehyde
Heptachlor
Heotachlor epoxide
Arochlor 1016(PCB)
Arochlor 1232(PCB)
Arochlor 1242(PCB)
Arochlor 1248 (PCB)
Arochlor 1254 (PCB)
Arochlor 1260 (PCB)
Toxaphene
Ammonia
Benzo(b)fluoranthene
Chlorine
Hexachlorocyclohexane (Alpha)
Hexachlorocyclohexane (Beta)

8

Hexachlorocyclohexane (Gamma)
2,3,7,8-TCDD

13. The conduct described herein may involve knowing and deliberate violation of federal law by Dominion, NNECO and DEP.

MPS-83-3 The Coalition believes that the Millstone discharges as described above are causing grave and irreparable harm to the marine environment and to human health and that such conduct imperils the health and safety of its membership.

MPS-83-4 The Coalition further represents that some or all of the discharges to the Long Island Sound as listed hereinabove are unnecessary; if the Millstone Nuclear Power Station were to convert from a "once-through" to a "closed" cooling system, some or all of these harmful discharges to the Long Island Sound would be eliminated.

MPS-83-5 The Millstone discharges as described above are believed to be directly associated with the rare jawbone cancer found in Zachary M. Hartley at his birth on December 16, 1997. The Millstone discharges as described above are believed to be directly associated with a high and increasing incidence of cancer and related diseases among the human population that resides near the Millstone Nuclear Power Station and utilizes the surrounding beaches at Niantic Bay and Jordan Cove, if not beyond.

The Coalition hereby places Dominion on notice of its grounds for initiation of legal action pursuant to the Clean Water Act. The Coalition reserves its rights to include any additional violations in the forthcoming complaint. If you have any questions or wish to discuss this matter with us, please do not hesitate to contact us.

Very truly yours,

Nancy Burton

Please reply to:
Nancy Burton
147 Cross Highway

Redding Ridge CT 06876
Tel. 203-938-3952

cc:

Northeast Nuclear Energy Company
Northeast Utilities Service Company
Connecticut Light & Power Company
P.O. Box 270
Hartford CT 06141-0270

Attorney General
Department of Justice
10th Street and Constitution Avenue NW
Washington DC 20530

Environmental Protection Agency
1200 Pennsylvania Avenue NW
Washington DC 20460

Regional Administrator
Environmental Protection Agency
1 Congress Street
Suite 1100 (RAA)
Boston MA 02114-2023

Hon. Gina McCarthy
Commissioner
Department of Environmental Protection
79 Elm Street
Hartford CT 06106

Appendix B

Contributors to the Supplement

Appendix B

Contributors to the Supplement

The overall responsibility for the preparation of this supplement was assigned to the Office of Nuclear Reactor Regulation, U.S. Nuclear Regulatory Commission (NRC). The statement was prepared by members of the Office of Nuclear Reactor Regulation with assistance from other NRC organizations, the Los Alamos National Laboratory, and the Pacific Northwest National Laboratory.

Name	Affiliation	Function or Expertise
	NUCLEAR REGULATORY COMMISSION	
Richard Emch, Jr.	Nuclear Reactor Regulation	Project Manager
Leslie Fields	Nuclear Reactor Regulation	Backup Project Manager
John Tappert	Nuclear Reactor Regulation	Section Chief
Andrew Kugler	Nuclear Reactor Regulation	Section Chief
Barry Zalcman	Nuclear Reactor Regulation	Program Manager
Michael T. Masnik	Nuclear Reactor Regulation	Ecology
James Wilson	Nuclear Reactor Regulation	Ecology
Jennifer Davis	Nuclear Reactor Regulation	Project Support
Stacey Imboden	Nuclear Reactor Regulation	Project Support
Harriet Nash	Nuclear Reactor Regulation	Project Support
Meghan Thorpe-Kavanaugh	Nuclear Reactor Regulation	Project Support
Samuel Hernandez-Quinones	Nuclear Reactor Regulation	Project Support
Mark Rubin	Nuclear Reactor Regulation	Severe Accident Mitigation Alternatives, Section Chief
Robert Palla	Nuclear Reactor Regulation	Severe Accident Mitigation Alternatives
Nina Barnett	Nuclear Reactor Regulation	Administrative Support
	LOS ALAMOS NATIONAL LABORATORY[a]	
Ted B. Doerr		Task Leader
Keeley Costigan		Air Quality
Brian Colby		Decommissioning, Radiation Protection
Bruce Gallaher		Water Use, Hydrology
Samuel R. Loftin		Terrestrial Ecology
Lisa J. Henne		Aquatic Ecology
W. Bruce Masse		Cultural Resources
Dan Pava		Socioeconomics, Land Use, Related Federal Programs
Vin LoPresti		Technical Editor
Teresa Hiteman		Document Design
Jolene Catron		Document Design
	PACIFIC NORTHWEST NATIONAL LABORATORY[b]	
Jeffrey Ward		Aquatic Ecology

Name	Affiliation	Function or Expertise
	INFORMATION SYSTEMS LABORATORY	
Kim Green		Severe Accident Mitigation Alternatives
Bob Schmidt		Severe Accident Mitigation Alternatives

(a) Los Alamos National Laboratory is operated for the U.S. Department of Energy by the University of California.
(b) Pacific Northwest National Laboratory is operated for the U.S. Department of Energy by Battelle Memorial Institute.

Appendix C

Chronology of NRC Staff Environmental Review Correspondence Related to Dominion Nuclear Connecticut, Inc.'s Applications for License Renewal of Millstone Power Station, Units 2 and 3

Appendix C

Chronology of NRC Staff Environmental Review Correspondence Related to Dominion Nuclear Connecticut, Inc.'s Applications for License Renewal of Millstone Power Station, Units 2 and 3

This appendix contains a chronological listing of correspondence between the U.S. Nuclear Regulatory Commission (NRC) and Dominion Nuclear Connecticut, Inc. (DNC) and other correspondence related to the NRC staff's environmental review, under 10 CFR Part 51, of DNC's applications for renewal of the Millstone Power Station (Millstone), Units 2 and 3, operating licenses. All documents, with the exception of those containing proprietary information, have been placed in the Commission's Public Document Room, at One White Flint North, 11555 Rockville Pike (first floor), Rockville, MD, and are available electronically from the Public Electronic Reading Room found on the Internet at the following Web address: <http://www.nrc.gov/reading-rm.html>. From this site, the public can gain access to the NRC's Agencywide Documents Access and Management System (ADAMS), which provides text and image files of NRC's public documents in the publicly available records component of ADAMS. The ADAMS accession number for each document is included below.

January 20, 2004 — Letter from Mr. David A. Christian, DNC, to NRC submitting the applications for the renewal of the operating licenses for Millstone Power Station, Units 2 and 3 (Accession No. ML040260070).

January 23, 2004 — NRC Press Release No. 04-011 "NRC Makes License Renewal Application Available for the Millstone Nuclear Power Plant" (Accession No. ML040230280).

January 28, 2004 — NRC staff letter to Mr. David A. Christian regarding the receipt and availability of the license renewal applications for Millstone Power Station, Units 2 and 3 (Accession No. ML040280258).

February 5, 2004 — NRC staff letter to Ms. Mildred Hodge, Library Director, Thames River Campus, Norwich, Connecticut, regarding the maintenance of reference material for public access related to the Millstone Power Station license renewal environmental review (Accession No. ML040400181).

February 5, 2004	NRC staff letter to Ms. Judy Liskov, Assistant Director, Waterford Public Library, Waterford, Connecticut, regarding the maintenance of reference material for public access related to the Millstone Power Station license renewal environmental review (Accession No. ML040400209).
February 6, 2004	NRC Press Release No. 04-002 "NRC to Hold Public Meeting in Connecticut on License Renewal Application for Millstone 2 and 3" (Accession No. ML040370209).
March 8, 2004	NRC staff letter to Mr. David A. Christian regarding the determination of acceptability and sufficiency for docketing, proposed review schedule, and opportunity for hearing regarding the license renewal applications for Millstone Power Station, Units 2 and 3 (Accession No. ML040680968).
March 17, 2004	NRC staff letter to Ms. Patricia A. Kurkul, Regional Administrator, National Marine Fisheries Service (NOAA Fisheries), Request for List of Protected Species Within the Area Under Evaluation for the Millstone Power Station, Units 2 and 3, License Renewal (Accession No. ML040770760).
March 18, 2004	NRC staff letter to Mr. Marvin Moriarty, Regional Director, U.S. Fish and Wildlife Service, Request for List of Protected Species Within the Area Under Evaluation for the Millstone Power Station, Units 2 and 3, License Renewal (Accession No. ML040780653).
March 25, 2004	Memo from Mr. Richard Gallagher, Dominion, regarding telecommunication on March 22, 2004 to NRC requests for Documents which Pertain to the Study of the Winter Flounder Population in the area around Millstone (Accession No. ML040930048).
March 29, 2004	Memo from Mr. Richard Gallagher, Dominion, regarding telecommunication on March 22, 2004 to NRC requests for Documents Pertaining to the Study of the Winter Flounder Population in the area around Millstone (Accession No. ML040930259).
March 30, 2004	NRC staff letter to Mr. Paul Loether, Director, Connecticut Historical Commission, regarding Millstone Power Station, Units 2 and 3, License Renewal Review (Accession No. ML040900503).

March 31, 2004	NRC staff letter to Mr. David A. Christian, Senior Vice President and Chief Nuclear Officer, DNC, Notice of Intent to Prepare an Environmental Impact Statement and Conduct Scoping Process for License Renewal for the Millstone Power Station, Units 2 and 3 (Accession No. ML040920231).
April 8, 2004	NRC staff letter to Mr. Dona Klima, Director, Office of Federal Agency Programs, Advisory Council on Historic Preservation, Regarding Millstone Power Station, Units 2 and 3, License Renewal Review (Accession No. ML041000158).
April 12, 2004	Notice of Public Meeting to Discuss Environmental Scoping Process for Millstone Power Station, Units 2 and 3, License Renewal Application (Accession No. ML041050788).
April 14, 2004	NRC staff letter to the Honorable Matthew Thomas, Chief Sachem, Narragansett Indian Tribe, Request for Comments Concerning Millstone Power Station, Units 2 and 3, Operating License Renewal (Accession No. ML041050878).
April 14, 2004	NRC staff letter to the Honorable Michael J. Thomas, Chairman, Mashantucket Pequot Tribal Nation, Request for Comments Concerning Millstone Power Station, Units 2 and 3, Operating License Renewal (Accession No. ML041050880).
April 15, 2004	Letter from Mr. Michael J. Amaral, U.S. Fish and Wildlife Service, providing a response to the March 18, 2004, NRC staff letter requesting information regarding threatened and endangered species in the vicinity of the Millstone Power Station, Units 2 and 3 (Accession No. ML041190230).
April 16, 2004	Memo from Mr. Richard Gallagher, DNC to NRC, regarding email on April 15, 2004, requesting documents pertaining to the study of the winter flounder population in the area around Millstone (Accession No. ML041120271).
April 19, 2004	Email to Mr. Ted B. Doerr from NRC, providing comments regarding the Site Audit Needs (Accession No. ML041240396).

April 26, 2004	Email to Mr. Richard Gallagher from NRC, regarding questions and comments on the List of Onsite Data Needs (Accession No. ML041240402).
April 27, 2004	Letter from Mr. Charles H. Evans, Director, Connecticut Department of Environmental Protection, Office of Long Island Sound Programs to NRC and Dominion regarding coastal zone consistency concurrence (Accession No. ML041320497).
April 29, 2004	Email from Richard Gallagher, Dominion, to NRC, requesting additional information regarding severe accident mitigation alternatives review for Millstone (Accession No. ML041240405).
May 11, 2004	NRC Press Release No. 04-030 "NRC Seeks Public Input On Environmental Impact Statement For Proposed Millstone Nuclear Plant License Renewal" (Accession No. ML041320568).
May 18, 2004	NRC Public Meeting Feedback Form "Public Scoping Meetings to Discuss Environmental Issues Pertaining to the Application for License Renewal of Millstone Power Station, Units 2 and 3" (Accession No. ML041700578).
May 24, 2004	Note to file regarding the docketing of additional documents pertaining to winter flounder in support of the environmental review of Millstone Power Station, Units 2 and 3 license renewal application (Accession No. ML041460138).
May 24, 2004	Note to file regarding the docketing of additional documents pertaining to winter flounder in support of the environmental review of Millstone Power Station, Units 2 and 3 license renewal application (Accession No. ML041460283).
May 24, 2004	Note to file regarding the docketing of emails sent to DNC in support of the environmental review of Millstone Power Station, Units 2 and 3 license renewal application (Accession No. ML041460250).
May 24, 2004	Comment letter from the Honorable Fred W. Thiele, Jr., Assemblyman, regarding the environmental review of Millstone Power Station, Units 2 and 3 license renewal application (Accession No. ML041620373).

June 1, 2004	Note to file regarding the docketing of documents pertaining to winter flounder in support of the environmental review of Millstone Power Station, Units 2 and 3 license renewal application (Accession No. ML041560169).
June 1, 2004	Email from Mr. Charles D. Stephani providing scoping comments regarding Millstone Power Station, Units 2 and 3 license renewal review (Accession No. ML041770290).
June 2, 2004	Email from Hortense and Ralph Carpenter providing scoping comments regarding Millstone Power Station, Units 2 and 3 license renewal review (Accession No. ML041770288).
June 3, 2004	Email from Kelly L. Streich providing scoping comments regarding Millstone Power Station, Units 2 and 3 license renewal review (Accession No. ML041770177).
June 4, 2004	Email from Mr. Douglas Schwartz providing scoping comments regarding Millstone Power Station, Units 2 and 3 license renewal review (Accession No. ML041770175).
June 4, 2004	Letter from Ms. Nancy Burton, Esq., to NRC staff regarding the Millstone Power Station, Units 2 and 3 license renewal review (Accession No. ML041770182).
June 22, 2004	NRC staff letter to Mr. David A. Christian, DNC, forwarding request for additional information regarding severe accident mitigation alternatives for the Millstone Power Station, Units 2 and 3 license renewal review (Accession No. ML041740175).
June 24, 2004	Summary of Public Scoping Meetings to Support Review to support the review of Millstone Power Station, Units 2 and 3 license renewal review (Accession No. ML041830272).
July 27, 2004	NRC letter to DNC forwarding the summary of site audit to support the review of Millstone Power Station, Units 2 and 3 license renewal review (Accession No. ML042100293).
July 28, 2004	Letter from First Selectman Paul B. Eccard, Town of Waterford, to NRC regarding Millstone Power Station, Units 2 and 3 license renewal review (Accession No. ML042160111).

August 13, 2004	Letter from Leslie N. Hartz, DNC, to NRD forwarding response to request for additional information regarding Millstone Power Station, Units 2 and 3 license renewal review (Accession No. ML042320613).
August 17, 2004	NRC staff letter to Mr. Paul B. Eccard, acknowledging receipt of comments regarding Millstone Power Station, Units 2 and 3 license renewal review (Accession No. ML042320342).
August 27, 2004	NRC staff letter to Mr. David A. Christian, DNC, forwarding the environmental scoping summary report associated with the staff's review of Millstone Power Station, Units 2 and 3 applications (Accession No. ML042400543).
September 16, 2004	Email correspondence between NRC staff and DNC regarding the SAMA review for Millstone Power Station, Units 2 and 3 applications (Accession No. ML042710222).
September 21, 2004	Letter from Ms. Mary A. Colligan, NOAA Fisheries, to P.T. Kuo, NRC, providing a response to the March 18, 2004, NRC staff letter requesting information regarding threatened and endangered species in the vicinity of the Millstone Power Station, Units 2 and 3 (Accession No. ML042810294).
September 24, 2004	Summary of telephone conference conducted with the Town of Waterford regarding Millstone Power Station, Units 2 and 3 applications (Accession No. ML042710257).
September 24, 2004	Summary of telephone conference regarding the SAMA review of Millstone Power Station, Units 2 and 3 applications (Accession No. ML042710529).
October 6, 2004	Letter from Mr J. Paul Loether, Connecticut State Historic Preservation Officer, to P.T. Kuo, NRC, providing comments regarding Millstone Power Station, Units 2 and 3 License Renewal Application effect on historic properties (Accession No. ML042880497).

October 6, 2004	Letter from First Selectman Paul B. Eccard, Town of Waterford, to Richard L. Emch, Jr., NRC, response to September 24, 2004, letter from NRC regarding Millstone Power Station, Units 2 and 3 license renewal review (Accession No. ML043210191).
October 25, 2004	Note to File from Richard L. Emch, Jr., NRC. Subject: Summary of Telephone Conference Regarding SAMA Analyses Conducted on October 7, 2004, with Dominion Connecticut Nuclear, Inc. In Support of the Environmental Review of the License Renewal Application for Millstone Power Station Units 2 and 3. (Accession No. ML043000449).
October 29, 2004	Note to File from Richard L. Emch, Jr., NRC. Subject: Correction of Summary Dated September 24, 2004, of Telephone Conference Regarding SAMA Analyses Conducted on September 13, 2004, with Dominion Connecticut Nuclear, Inc. in Support of the Environmental Review of the License Renewal Application for Millstone Power Station Units 2 and 3. (Accession No. ML 043030362).
November 9, 2004	NRC staff letter to Ms. Patricia A. Kurkul, Regional Administrator, NOAA Fisheries, Request for Concurrence - Biological Assessment for Millstone Power Station, Units 2 and 3 (Accession No. ML043170594).
November 9, 2004	NRC staff letter to Mr. Marvin Moriarty, Regional Director, U.S. Fish and Wildlife Service, Request for Concurrence - Biological Assessment for Millstone Power Station, Units 2 and 3 (Accession No. ML043170643).
December 2, 2004	NRC staff letter to U.S. Environmental Protection Agency, Filing of Draft Supplement 22 to NUREG-1437 (Accession No. ML043370472).
December 2, 2004	NRC staff letter to Mr. David A. Christian, Senior Vice President and Chief Nuclear Officer, Dominion Nuclear Connecticut, Inc., Notice of Availability of Draft Supplement 22 to NUREG-1437 (Accession No. ML043370478).
December 9, 2004	NRC press release announcing the public meeting regarding the Draft Supplement 22 to NUREG-1437 (Accession No. ML043440093).
December 20, 2004	NRC memorandum regarding the public meeting for the Draft Supplement 22 to NUREG-1437, including the meeting agenda and notice (Accession No. ML043560137).

January 5, 2005	Letter from Mr. Michael J. Amaral, Endangered Species Specialist, U.S. Fish and Wildlife Service, to Mr. P.T. Kuo, NRC, Concurrence and consultation closure (Accession No. ML050210354).
January 11, 2005	Email from Ms. Nancy Burton to R. Emch, NRC, requesting copies of RAIs and RAI responses (Accession No. ML051330301).
January 12, 2005	Letter from Ms. Patricia A. Kurkul, Regional Administrator, NOAA Fisheries, to P.T. Kuo, NRC, Millstone Power Station, Units 2 and 3 license renewal (Accession No. ML051021054).
January 23, 2005	Email from Ms. Nancy Burton to R. Emch, NRC, submitting a FOIA request (Accession No. ML051330300).
January 31, 2005	Email from Ms. Nancy Burton to R. Emch, NRC, regarding FOIA response schedule (Accession No. ML051330298).
February 2, 2005	Email from Ms. Nancy Burton to R. Emch, NRC, regarding questions about the DSEIS (Accession No. ML051330296).
February 2, 2005	NRC staff letter to Mr. Joshua Y. Horton, Supervisor, Southold Town, response regarding Millstone Power Station, Units 2 and 3 license renewal review (Accession No. ML050340609).
February 4, 2005	Email from Ms. Nancy Burton to R. Emch, NRC, regarding questions about the DSEIS (Accession No. ML051330292).
February 8, 2005	Email from Ms. Nancy Burton to R. Emch, NRC, regarding questions about the DSEIS (Accession No. ML051330285).
February 10, 2005	Email from Ms. Nancy Burton to R. Emch, NRC, regarding questions about the DSEIS (Accession No. ML051330297).
February 10, 2005	Email from Ms. Nancy Burton to R. Emch, NRC, regarding questions about the DSEIS (Accession No. ML051330293).
February 15, 2005	Email from Ms. Nancy Burton to R. Emch, NRC, regarding questions about the DSEIS (Accession No. ML051330290).
February 18, 2005	Email from Ms. Nancy Burton to R. Emch, NRC, regarding the schedule for meeting transcripts (Accession No. ML051330286).

February 18, 2005	Email from R. Emch, NRC, to Ms. Nancy Burton including attached transcripts from the public meeting (Accession No. ML051330034).
February 21, 2005	Email from Ms. Nancy Burton to A. Kugler, NRC, regarding questions about the DSEIS (Accession No. ML051330352).
February 23, 2005	Email from R. Emch, NRC, to Ms. Nancy Burton regarding questions about the DSEIS (Accession No. ML051330072).
February 23, 2005	Email from R. Emch, NRC, to Ms. Nancy Burton regarding questions about the DSEIS (Accession No. ML051330077).
February 24, 2005	Email from Ms. Nancy Burton to A. Kugler, NRC, regarding questions about the DSEIS (Accession No. ML051330349).
February 24, 2005	Email from Ms. Nancy Burton to R. Emch, NRC, regarding questions about the DSEIS (Accession No. ML051330141).
February 24, 2005	Email from A. Kugler, NRC, to Ms. Nancy Burton regarding questions about the DSEIS (Accession No. ML051470090).
February 24, 2005	Email from R. Emch, NRC, to Ms. Nancy Burton regarding questions about the DSEIS (Accession No. ML051330083).
February 24, 2005	Email from Ms. Nancy Burton to R. Emch, NRC, regarding questions about the DSEIS (Accession No. ML051330138).
February 25, 2005	Summary of the public meeting for the Draft Supplement 22 to NUREG-1437 (Accession No. ML050610357).
February 28, 2005	Email from Ms. Nancy Burton to A. Kugler, NRC, requesting extension of the comment period (Accession No. ML051330135).
February 28, 2005	Email from Ms. Nancy Burton to the NRC Commissioners requesting extension of the comment period (Accession No. ML050670486).
February 28, 2005	Email from R. Emch, NRC, to Ms. Nancy Burton regarding request for extension of the comment period (Accession No. ML051330040).
March 9, 2005	Email from Ms. Nancy Burton to R. Emch, NRC, regarding questions about the DSEIS (Accession No. ML051330132).

March 9, 2005	Email from Ms. Nancy Burton to R. Emch, NRC, inviting the NRC to a press conference (Accession No. ML051330126).
March 9, 2005	Email from R. Emch, NRC, to Ms. Nancy Burton regarding her FOIA request (Accession No. ML051330143).
March 10, 2005	Email from A. Kugler, NRC, to Ms. Nancy Burton declining her invitation to the press conference (Accession No. ML05133032).
March 11, 2005	Email from Ms. Nancy Burton to A. Kugler, NRC, sending a news article about Millstone (Accession No. ML051330118).
March 11, 2005	Email from Ms. Nancy Burton to A. Kugler, NRC, sending a news article about Millstone (Accession No. ML051330115).
March 11, 2005	Email from Ms. Nancy Burton to A. Kugler, NRC, sending a news article about Millstone (Accession No. ML051330110).
March 12, 2005	Email from Ms. Nancy Burton to R. Emch, NRC, regarding comments on the DSEIS (Accession No. ML051330097).
March 13, 2005	Email from Ms. Nancy Burton to R. Emch, NRC, requesting a cited reference from the NRC (Accession No. ML051330095).
March 14, 2005	Email from Ms. Nancy Burton to R. Emch, NRC, regarding comments about the DSEIS (Accession No. ML051330088).
March 15, 2005	Email from R. Emch, NRC, to Ms. Nancy Burton regarding questions about the DSEIS (Accession No. ML051330050).
March 16, 2005	Email from Ms. Nancy Burton to R. Emch, NRC, indicating that her supplemental comments are attached (Accession No. ML051330082).
March 16, 2005	Email from Ms. Nancy Burton to R. Emch, NRC, including the supplemental comments that were not attached to previous email (Accession No. ML051330078). [Ms. Burton submitted a corrected version of these comments on March 22, 2005, by email; the corrected version is included in Appendix A.]

March 21, 2005	Email from Ms. Nancy Burton to R. Emch, NRC, notifying the NRC of the Connecticut Coalition Against Millstone's intent to sue Dominion (Accession No. ML051330092).
March 27, 2005	Email from Ms. Nancy Burton to R. Emch, NRC, requesting information about NRC's offsite visits (Accession No. ML051330075).
March 28, 2005	Email from Ms. Nancy Burton to R. Emch, NRC, regarding questions about the DSEIS (Accession No. ML051330079).
March 28, 2005	Email from Ms. Nancy Burton to R. Emch, NRC, requesting a document (Accession No. ML051330089).
March 28, 2005	Email from Ms. Nancy Burton to Commissioner McCarthy, Connecticut Department of Environmental Protection, regarding the coastal zone management consistency review (Accession No. ML051330100).
March 28, 2005	Email from Ms. Nancy Burton to R. Emch, NRC, regarding comments on the DSEIS (Accession No. ML051330103).
March 28, 2005	Email from R. Emch, NRC, to Ms. Nancy Burton regarding closure of the comment period (Accession No. ML051330063).
March 28, 2005	Email from R. Emch, NRC, to Ms. Nancy Burton sending her a requested document (Accession No. ML051330057).
March 30, 2005	Email from Ms. Nancy Burton to R. Emch, NRC, with her attached letter to the editor sent to The New London Day (Accession No. ML051330107).
March 30, 2005	Email from R. Emch, NRC, to Ms. Nancy Burton regarding the closure of the comment period (Accession No. ML051330090).
March 30, 2005	Email from Ms. Nancy Burton to R. Emch, NRC, regarding comments on the DSEIS (Accession No. ML051330113).
March 30, 2005	Email from Ms. Nancy Burton to R. Emch, NRC, submitting a press release about Millstone (Accession No. ML051330119).

April 8, 2005	Email from Ms. Nancy Burton to C. Santos, NRC, notifying the Advisory Committee on Reactor Safeguards of documents submitted to the NRC (Accession No. ML051330125).
April 14, 2005	Email from Ms. Nancy Burton to R. Emch, NRC, providing copy of letter from Ms. Burton to Donald W. Downes, Connecticut Department of Public Utility (Accession No. ML051330137).
May 17, 2005	Note to file from R. Emch summarizing telephone conference with EPA, Region 1, on April 5, 2005 (Accession No. ML051380272).
May 17, 2005	Note to file from R. Emch summarizing telephone discussion with representative of Connecticut Tumor Registry on April 8, 2005 (Accession No. ML051380488).

Appendix D

Organizations Contacted

Appendix D

Organizations Contacted

During the course of the staff's independent review of environmental impacts from operations during the renewal term, the following Federal, State, regional, local, and Native American tribal agencies were contacted:

Chamber of Commerce of Eastern Connecticut, Inc., Gales Ferry, CT

Connecticut Commercial Realty, New London, CT

Connecticut Department of Environmental Protection, Bureau of Air Management, Division of Radiation, Hartford, CT

Connecticut Department of Environmental Protection, Bureau of Waste Management, Hartford, CT

Connecticut Department of Environmental Protection, Bureau of Water Management, Hartford, CT

Connecticut Department of Environmental Protection, Marine Fisheries Division, Old Lyme, CT

Connecticut Department of Environmental Protection, Office of Long Island Sound Programs, Hartford, CT

Connecticut Department of Public Health, Connecticut Tumor Registry, Hartford, CT

Connecticut Historical Commission, Hartford, CT

National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Northeast Fisheries Science Center, Milford Laboratory, Milford, CT

Southeastern Connecticut Council of Governments, Norwich, CT

Southeastern Connecticut Enterprise Region, New London, CT

Town of Waterford, CT

U.S. Environmental Protection Agency, Region 1, Boston, MA.

Appendix D

U.S. Geological Survey, Woods Hole, MA

United Way of Southeastern Connecticut, Gales Ferry, CT

University of Connecticut, Department of Physiology and Neurobiology, Storrs, CT

Waterford Public Schools, Waterford, CT

Appendix E

Millstone Compliance Status and Consultation Correspondence

Appendix E

Millstone Compliance Status and Consultation Correspondence

Correspondence received during the process of evaluation of the application for renewal of the operating licenses for Millstone Power Station Units 2 and 3 (Millstone) are identified in Table E-1. Copies of the correspondence are included at the end of this appendix.

The licenses, permits, consultations, and other approvals obtained from Federal, State, regional, and local authorities for Millstone are listed in Table E-2.

Table E-1. Consultation Correspondence

Source	Recipient	Date of Letter
U.S. Nuclear Regulatory Commission (P. T. Kuo)	NOAA Fisheries (P. A. Kurkul)	March 17, 2004
U.S. Nuclear Regulatory Commission (P. T. Kuo)	U.S. Fish and Wildlife Service (M. Moriarty)	March 18, 2004
U.S. Nuclear Regulatory Commission (P. T. Kuo)	Connecticut Historical Commission (Paul Loether)	March 30. 2004
U.S. Nuclear Regulatory Commission (P. T. Kuo)	Advisory Council on Historic Preservation (D. Klima)	April 8, 2004
U.S. Nuclear Regulatory Commission (P. T. Kuo)	Narragansett Indian Tribe (M. Thomas, Chief Sachem)	April 14, 2004
U.S. Nuclear Regulatory Commission (P. T. Kuo)	Mashantucket Pequot Tribal Nation (M. J. Thomas)	April 14, 2004
U.S. Fish and Wildlife Service (M. J. Amaral)	U.S. Nuclear Regulatory Commission (P. T. Kuo)	April 15, 2004
Connecticut Department of Environmental Protection (C. H. Evans)	U.S. Nuclear Regulatory Commission (R. Emch)	April 27, 2004
NOAA Fisheries (M. A. Colligan)	U.S. Nuclear Regulatory Commission (P.T. Kuo)	September 21, 2004

Table E-1. Consultation Correspondence (contd.)

Source	Recipient	Date of Letter
State of Connecticut Commission on Culture and Tourism (J. Paul Loether)	U.S. Nuclear Regulatory Commission (P. T. Kuo)	October 6, 2004
U.S. Nuclear Regulatory Commission (P. T. Kuo)	NOAA Fisheries (P. A. Kurkul)	November 9, 2004
U.S. Nuclear Regulatory Commission (P. T. Kuo)	U.S. Fish and Wildlife Service (M. Moriarty)	November 9, 2004
U.S. Fish and Wildlife Service (M. Amaral)	U.S. Nuclear Regulatory Commission (P. T. Kuo)	January 5, 2005
NOAA Fisheries (P. Kurkul)	U.S. Nuclear Regulatory Commission (P. T. Kuo)	January 12, 2005

Table E-2. Federal, State, Local, and Regional Licenses, Permits, Consultations, and Other Approvals for Millstone

Agency	Authority	Description	Number	Issue Date	Expiration Date	Remarks
NRC	10 CFR Part 50	Operating license, Millstone Unit 2	DPR-65	09/26/75	07/31/15	Authorizes operation of Unit 2.
NRC	10 CFR Part 50	Operating license, Millstone Unit 3	NPF-49	01/31/86	11/25/25	Authorizes operation of Unit 3.
USACE	Section 10, River and Harbor Act (33 USC 403)	Permit	CT-NIAN-78-507	10/11/78	No expiration date	Install and maintain sandbag dike for ecology laboratory mariculture work.
USACE	Section 10, River and Harbor Act (33 USC 403)	Permit	CT-NIAN-77-377 (LOP)	09/19/77	No expiration date	Install and maintain ecology laboratory seawater intake pipes.
USDOT	49 USC 5108	Registration	061202550034KL	06/13/02	06/30/04	Shipment of hazardous materials.
FWS	Migratory Bird Treaty Act (16 USC 703-712)	Depredation Permit	MB728673-0	06/07/03	06/30/04	Removal of birds, eggs and nests from utility structures and property.
FWS	Section 7 of the Endangered Species Act (16 USC 1536)	Consultation		01/05/05		Requires a Federal agency to consult with FWS regarding whether a proposed action would affect endangered or threatened species.
NMFS	Section 7 of the Endangered Species Act (16 USC 1536)	Consultation		01/12/05		Requires a Federal agency to consult with NOAA Fisheries regarding whether a proposed action would affect endangered or threatened species.

Table E-2. (contd.)

Agency	Authority	Description	Number	Issue Date	Expiration Date	Remarks
Connecticut Historical Commission	Section 106 of the National Historic Preservation Act (16 USC 470f)	Consultation				The National Historic Preservation Act requires Federal agencies to take into account the effect of any undertaking on any district, site, building, structure, or object that is included in or eligible for inclusion in the National Register of Historic Places.
Connecticut Department of Environmental Protection (CTDEP)	Section 307 of the Coastal Zone Management Act [16 USC 1456(c)(3)(A)]	Consistency determination with the Connecticut Coastal Management Program				The Connecticut Department of Environmental Protection waived the review to coordinate with the State NPDES permit review process.
CTDEP	CGS 4-182, 22a-430, 22a-430-1 et seq.	National Pollution Discharge Elimination System Permit	NPDES permit CT0003263	12/14/92		Renewal application submitted 6/13/97; plant discharges to Long Island Sound.
CTDEP	CGS 22a-430b	General Permit for stormwater discharges	GSI001430	09/25/03		Stormwater discharges; industrial activities.
CTDEP	CGS 22a-6K	Emergency Authorization	EA 0100176	10/13/00		Transferred 3/31/01: plant discharges to Long Island Sound.
CTDEP	CGS 22a-430	General Permit for Discharge of Minor Photographic Processing Wastewater	GPH000354	10/20/95	10/20/05	Discharge of minor photographic process wastewater to municipal sewer
CTDEP	CGS 22a-430	General Permit for the Discharge of Water Treatment Wastewater	GWT 000175	03/26/01	05/01/05	Water treatment wastewater.

Table E-2. (contd)

Agency	Authority	Description	Number	Issue Date	Expiration Date	Remarks
CTDEP	CGS 22a-430	General Permit for Miscellaneous Discharges of Sewer Compatible Wastewater	GMI000012	03/13/02	04/30/11	Wastewater discharges from Fire Training Facility.
CTDEP	Ct. P.A. 82-402, Section 4	Registration	2000-018-PWR-SU (Unit 2)	07/12/83		Transferred on 03/31/01; No expiration date; Divert large volume of water from Long Island Sound for steam condenser cooling water.
CTDEP	Ct. P.A. 82-402, Section 4	Registration	2000-019-PWR-SU (Unit 3)	07/12/83		Transferred on 03/31/01; No expiration date; Divert large volume of water from Long Island Sound for steam condenser cooling water.
CTDEP	CGS 22a-174	Permit	199-0003-0043	08/10/00		Emissions from fire training mock-up facility and two propane-fired water pumps.
CTDEP	CGS 22a-174	Permit	199-0003-0044	04/27/99		Emissions from diesel-fired trash water pump.
CTDEP	CGS 22a-174	Permit	199-0003-0045	04/27/99		Emissions from diesel-fired motorpool air compressor
CTDEP	CGS 22a-174	Permit	199-0003-0046	04/27/99		Operate diesel-fired motorpool air compressor.
CTDEP	CGS 22a-174	Permit	199-0004-0056	11/09/99		Emissions from Unit 2 emergency diesel generator (1 of 2).

Table E-2. (contd.)

Agency	Authority	Description	Number	Issue Date	Expiration Date	Remarks
CTDEP	CGS 22a-174	Permit	199-0003-0055	11/09/99		Emissions from Unit 2 emergency diesel generator (2 of 2).
CTDEP	CGS 22a-174	Permit	199-0003-0007	01/24/86		Emissions from Unit 3 auxiliary boiler (1 of 2).
CTDEP	CGS 22a-174	Permit	199-0003-0008	01/24/86		Emissions from Unit 3 auxiliary boiler (2 of 2).
CTDEP	CGS 22a-174	Permit	199-0003-0009	05/21/85		Emissions from Unit 3 emergency diesel generator (1 of 2).
CTDEP	CGS 22a-174	Permit	199-0003-0010	05/21/85		Emissions from Unit 3 emergency diesel generator (2 of 2).
CTDEP	CGS 22a-174	Permit	199-0003-0017	08/25/92		Emissions from station blackout emergency diesel generator (3 of 3)
CTDEP	CGS 22a-174	Permit	199-0003-0053	05/27/99		Emissions from Unit 3 ESF diesel compressor.
CTDEP	CGS 22a-449	Notification Site ID	170-8414	03/27/01		Unit 3 emergency generator underground storage tank E6, #2 diesel oil.
CTDEP	CGS 22a-449	Notification Site ID	170-8414	03/27/01		Unit 3 emergency generator underground storage tank E7, #2 diesel oil.
CTDEP	CGS 22a-449	Notification Site ID	170-8414	03/27/01		Unit 3 auxiliary boiler underground storage tank F8, #4 heating oil.
CTDEP	CGS 22a-449	Notification Site ID	170-8414	03/27/01		Unit 3 auxiliary boiler underground storage tank F9, #4 heating oil.

Table E-2. (contd.)

Agency	Authority	Description	Number	Issue Date	Expiration Date	Remarks
CTDEP	CGS 22a-449	Notification Site ID	170-8425	03/27/01		Simulator building underground storage tank, #2 heating oil.
CTDEP	CGS 22a-449	Notification Site ID	170-8486	03/27/01		Unit 2 emergency diesel underground storage tank, #2 fuel oil. This tank has been retired.
South Carolina Department of Health and Environmental Control	South Carolina Radioactive Waste Transportation and Disposal Act (Act No. 429 of 1980)	Permit	0013-06-04	12/10/03	12/31/04	Transport radioactive wastes.
Tennessee Department of Environment and Conservation	Rule 1200-2-10.32	License	T-CT003-L04	12/02/03	12/31/04	Ship radioactive materials.
CTDEP	CGS 26-60	Scientific Collector Permit	219	01/17/03	01/16/06	Collect fish and lobsters.
CTDEP	CGS Title 22a, Chapter 445	Permit (Part A application)	not applicable	12/22/00		Store radioactive hazardous (i.e., mixed) waste.
CTDEP	CGS 22a-174	Permit	199-0038-TV	01/29/03	01/29/08	Emissions (Title V permit).

CFR = Code of Federal Regulations
USACE = U.S. Army Corps of Engineers
USDOT = U.S. Department of Transportation
FWS = U.S. Fish and Wildlife Service
NRC = U.S. Nuclear Regulatory Commission
EPA = U.S. Environmental Protection Agency
NOAA = National Oceanic and Atmospheric Administration
USC = United States Code
CGS = Connecticut General Statutes
ESF = Engineered Safeguards Features

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

March 17, 2004

Patricia A. Kurkul, Regional Administrator
NOAA Fisheries
Northeast Regional Office
One Blackburn Drive
Gloucester, MA 09130-2298

SUBJECT: REQUEST FOR LIST OF PROTECTED SPECIES WITHIN THE AREA UNDER EVALUATION FOR MILLSTONE POWER STATION, UNITS 2 AND 3, LICENSE RENEWAL

Dear Ms. Kurkul:

The U.S. Nuclear Regulatory Commission (NRC) is reviewing an application submitted by Dominion Nuclear Connecticut Inc. (DNC) for the renewal of the operating licenses for Millstone Power Station, Units 2 and 3 (MPS). MPS is located on the north shore of Long Island Sound in Waterford, Connecticut, approximately 40 miles southeast of Hartford, Connecticut. As part of the review of the license renewal application, the NRC is preparing a Supplemental Environmental Impact Statement (SEIS) under the provisions of the National Environmental Policy Act (NEPA) of 1969, as amended, which include an analysis of pertinent environmental issues, including endangered or threatened species and impacts to fish and wildlife. This letter is being submitted under the provisions of the Endangered Species Act of 1973, as amended, and the Fish and Wildlife Coordination Act of 1934, as amended.

The proposed action would include the use and continued maintenance of existing plant facilities and transmission lines. The MPS site covers approximately 525 acres, of which approximately 220 acres are industrial. The area surrounding MPS is characterized by old field, mesic hardwood forest, coastal marsh and beach habitats. DNC also maintains a 50-acre wildlife refuge in the eastern portion of the MPS site.

Each MPS unit uses a once-through open-cycle cooling system with intakes on Niantic Bay and surface discharges to an old quarry cut, which empties into Long Island Sound. Occasional dredging or de-mucking at the intakes is performed as a normal part of operation.

For the specific purpose of connecting MPS to the regional transmission system, there is a total of approximately 91 miles of transmission line corridors that occupy approximately 3,052 acres of land. These transmission line corridors are being evaluated as part of the SEIS process. The transmission line corridors traverse New London, Toland, Hartford, Middlesex, and New Haven Counties. The corridors pass through land that is primarily agricultural and forest land. The enclosed transmission line map shows the transmission system that is being evaluated in the SEIS. Four 345-kilovolt (kV) lines connect MPS to the electric grid. All four transmission lines run northward from the plant in a common corridor (415 to 500 feet wide) for 9.1 miles to Hunts Brook Junction. At Hunts Brook Junction, the lines diverge, with two lines running north

to the Card and Manchester Substations, one line running east to the Montville Station, and one line running west to the Southington Substation. These four lines share corridors with other previously existing transmission lines.

To support the EIS preparation process and to ensure compliance with Section 7 of the Endangered Species Act of 1973, the NRC requests a list of endangered, threatened, candidate, and proposed species, and designated and proposed critical habitat under the jurisdiction of NOAA Fisheries, that may be in the vicinity of MPS site and its transmission line corridors. In addition, please provide any information you consider appropriate under the provisions of the Fish and Wildlife Coordination Act. The NRC has also contacted the Fish and Wildlife Service and requested a list of species and information on protected, proposed, and candidate species and critical habitat that may be in the vicinity of MPS and its associated transmission lines.

We plan to hold two public NEPA scoping meetings on May 18, 2004, at the Waterford Town Hall Auditorium, 15 Rope Ferry Road in Waterford, Connecticut. On May 19, 2004, we plan to conduct a site audit. You and your staff are invited to attend both the site audit and the public meetings. Your office will receive a copy of the draft SEIS along with a request for comments. The anticipated publication date for the draft SEIS is December 2004.

If you have any questions concerning the NRC staff review of this license renewal application, please contact Mr. Richard L. Emch, Jr., Senior Project Manager at 301-415-1590 or RLE@nrc.gov.

Sincerely,

Pao-Tsin Kuo, Program Director
License Renewal and Environmental Impacts
Division of Regulatory Improvement Programs
Office of Nuclear Reactor Regulation

Docket Nos.: 50-336 and 50-423

Enclosures: 1. MPS Transmission Line Map
2. MPS Site Layout

cc w/end.: See next page

Figure 3-2
Transmission Line Map

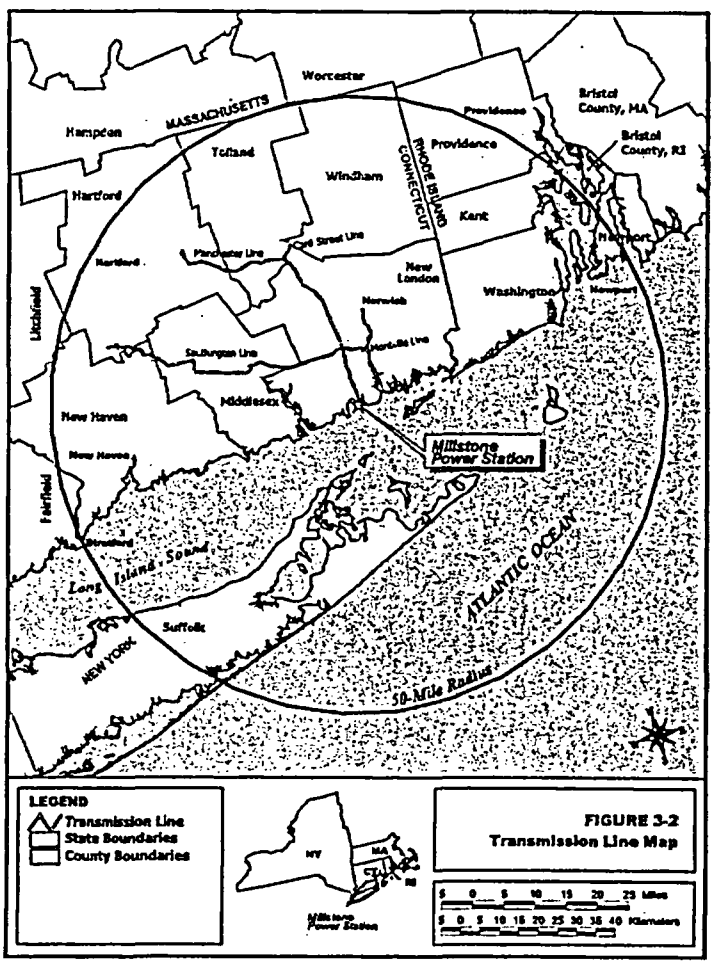
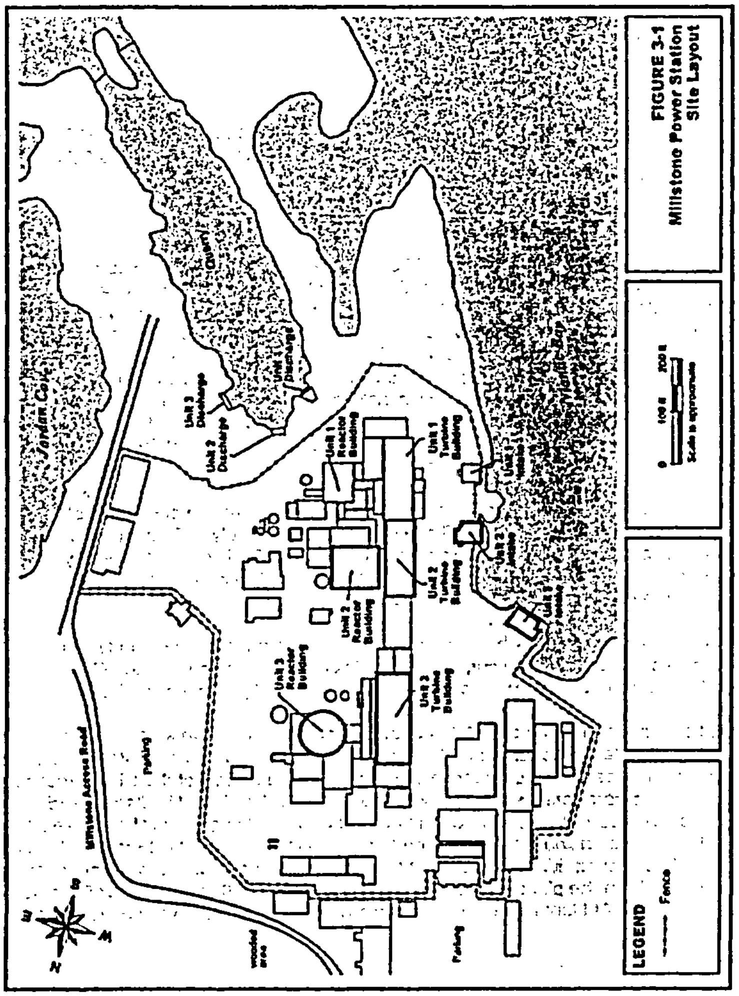


Figure 3-1
Millstone Power Station Site Layout



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

March 18, 2004

Marvin Moriarty, Regional Director
Northeast Regional Office
U.S. Fish and Wildlife Service
300 Westgate Center Drive
Hadley, MA 01035-9589

SUBJECT: REQUEST FOR LIST OF PROTECTED SPECIES WITHIN THE AREA UNDER EVALUATION FOR THE MILLSTONE POWER STATION, UNITS 2 AND 3 LICENSE RENEWAL

Dear Mr. Moriarty:

The U.S. Nuclear Regulatory Commission (NRC) is reviewing an application submitted by Dominion Nuclear Connecticut Inc. (DNC) for the renewal of the operating licenses for Millstone Power Station, Units 2 and 3 (MPS). MPS is located on the north shore of Long Island Sound in Waterford, Connecticut, approximately 40 miles southeast of Hartford, Connecticut. As part of the review of the license renewal application, the NRC is preparing a Supplemental Environmental Impact Statement (SEIS) under the provisions of the National Environmental Policy Act (NEPA) of 1969, as amended, which includes an analysis of pertinent environmental issues, including endangered or threatened species and impacts to fish and wildlife. This letter is being submitted under the provisions of the Endangered Species Act of 1973, as amended, and the Fish and Wildlife Coordination Act of 1934, as amended.

The proposed action would include the use and continued maintenance of existing plant facilities and transmission lines. The MPS site covers approximately 525 acres, of which approximately 220 acres is industrial. The area surrounding MPS is characterized by old field, mesic hardwood forest, coastal marsh and beach habitats. DNC also maintains a 50-acre wildlife refuge in the eastern portion of the MPS site.

Each MPS unit uses a once-through open-cycle cooling system with intakes on Niantic Bay and surface discharges to an old quarry cut, which empties into Long Island Sound. Occasional dredging or de-mucking at the intakes is performed as a normal part of operation.

For the specific purpose of connecting MPS to the regional transmission system, there is a total of approximately 91 miles of transmission line corridors that occupy approximately 3,052 acres of land. These transmission line corridors are being evaluated as part of the SEIS process. The transmission line corridors traverse New London, Toland, Hartford, Middlesex, and New Haven Counties. The corridors pass through land that is primarily agricultural and forest land. The enclosed transmission line map shows the transmission system that is being evaluated in the SEIS. Four 345-kilovolt (kV) lines connect MPS to the electric grid. All four transmission lines run northward from the plant in a common corridor (415 to 500 feet wide) for 9.1 miles to Hunts Brook Junction. At Hunts Brook Junction, the lines diverge, with two lines running north

to the Card and Manchester Substations, one line running east to the Montville Station, and one line running west to the Southington Substation. These four lines share corridors with other previously existing transmission lines.

To support the SEIS preparation process and to ensure compliance with Section 7 of the Endangered Species Act, the NRC requests a list of species and information on protected, proposed, and candidate species and critical habitat that may be in the vicinity of MPS and its associated transmission lines. In addition, please provide any information you consider appropriate under the provisions of the Fish and Wildlife Coordination Act.

We plan to hold two public NEPA scoping meetings on May 18, 2004, at the Waterford Town Hall Auditorium, 15 Rope Ferry Road in Waterford, Connecticut. On May 19, 2004, we plan to conduct a site audit. You and your staff are invited to attend both the site audit and the public meetings. Your office will receive a copy of the draft SEIS along with a request for comments. The anticipated publication date for the draft SEIS is December 2004.

If you have any questions concerning the NRC staff review of this license renewal application, please contact Mr. Richard L. Emch, Jr., Senior Project Manager at 301-415-1590 or RLE@nrc.gov.

Sincerely,

/RA/

Pao-Tsin Kuo, Program Director
License Renewal and Environmental Impacts
Division of Regulatory Improvement Programs
Office of Nuclear Reactor Regulation

Docket Nos.: 50-336, 50-423

Enclosures: 1. MPS Transmission Line Map
2. MPS Site Layout

cc w/encl.: See next page

Figure 3-2
Transmission Line Map

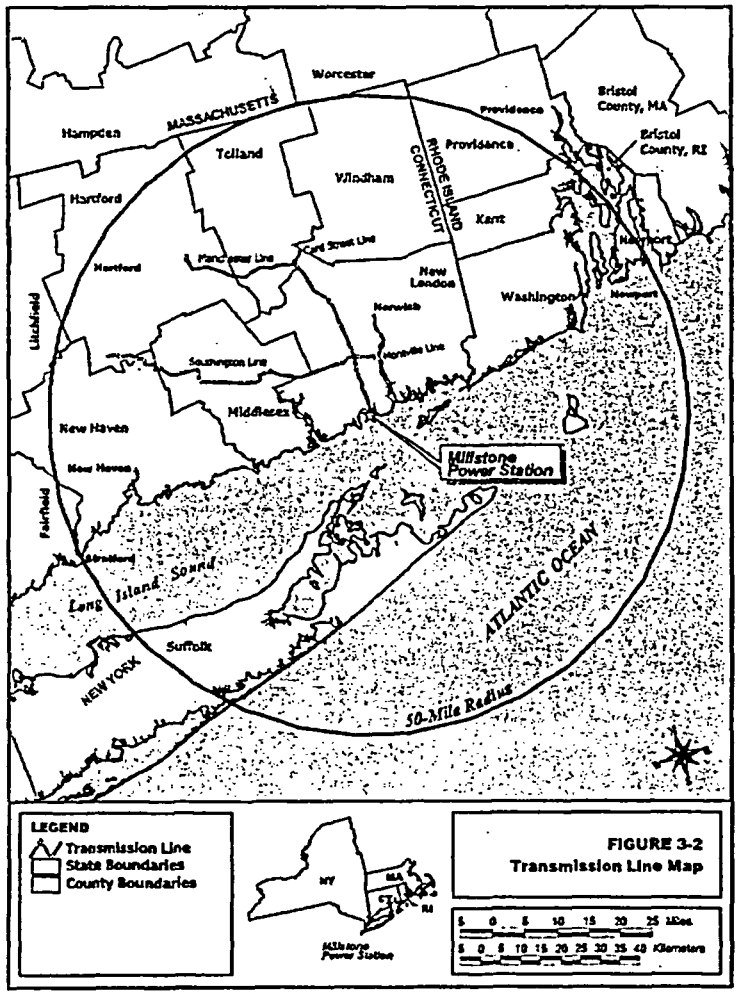
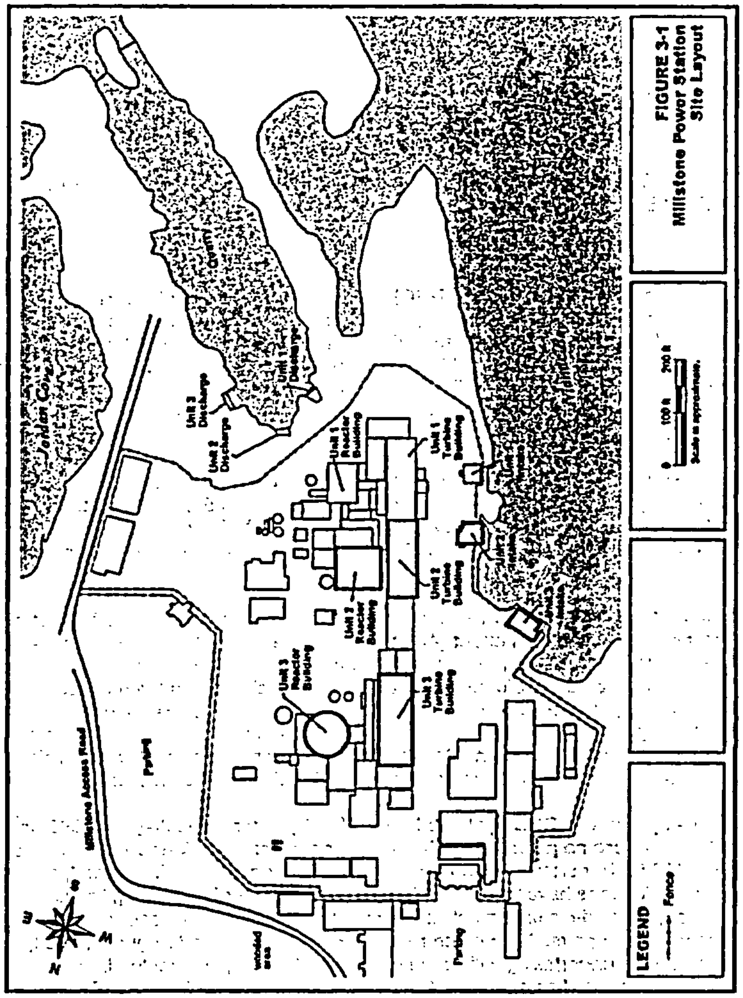


Figure 3-1
Millstone Power Station Site Layout



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

March 30, 2004

Mr. Paul Loether, Director
Connecticut Historical Commission
59 South Prospect Street
Hartford, CT 06106

SUBJECT: MILLSTONE POWER STATION, UNITS 2 AND 3 LICENSE RENEWAL REVIEW

Dear Mr. Loether:

The U.S. Nuclear Regulatory Commission (NRC) staff is reviewing an application to renew the operating licenses for Millstone Power Station, Units 2 and 3 (MPS), which is located on the north shore of Long Island Sound in Waterford, Connecticut, approximately 40 miles southeast of Hartford, Connecticut. MPS is operated by Dominion Nuclear Connecticut Inc. (DNC). The application for renewal was submitted by DNC on January 22, 2004, pursuant to NRC requirements at Title 10 of the *Code of Federal Regulations* Part 54 (10 CFR Part 54). The NRC has established that, as part of the staff review of any nuclear power plant license renewal action, a site-specific Supplemental Environmental Impact Statement (SEIS) to its "Generic Environmental Impact Statement for License Renewal of Nuclear Plants" (GEIS), NUREG-1437, will be prepared under the provisions of 10 CFR Part 51, the NRC rules that implement the National Environmental Policy Act of 1969 (NEPA). In accordance with 36 CFR 800.8, the SEIS will include analyses of potential impacts to historic and archaeological resources.

In the context of the National Historic Preservation Act of 1966, as amended, the NRC staff has determined that the area of potential effect (APE) for a license renewal action is the area at the power plant site and its immediate environs that may be impacted by post-license renewal land-disturbing operations or projected refurbishment activities associated with the proposed action. The APE may extend beyond the immediate environs in those instances where post-license renewal land-disturbing operations or projected refurbishment activities, specifically related to license renewal, may potentially have an effect on known or proposed historic sites. This determination is made irrespective of ownership or control of the lands of interest.

While preparing its application, DNC contacted your office by letter dated July 31, 2003. In its letter, DNC stated there are no plans to significantly alter current operations over the license renewal period. DNC further stated that no expansion of existing facilities is planned, and no major structural modifications have been identified for the purpose of supporting license renewal. In addition, no land-disturbing activities are anticipated beyond those required for routine maintenance and repairs. Your office responded in a letter dated August 5, 2003, stating that the proposed undertaking will have no effect on historic, architectural, or archaeological resources listed on or eligible for the National Register of Historic Places.

On May 18, 2004, the NRC will conduct two public NEPA scoping meetings at the Waterford Town Hall Auditorium, 15 Rope Ferry Road in Waterford, Connecticut. You and your staff are invited to attend. Your office will receive a copy of the draft SEIS along with a request for comments. The anticipated publication date for the draft SEIS is December 2004. If you have any questions or require additional information, please contact Mr. Richard L. Emch, Jr., Senior Project Manager at 301-415-1590 or RLE@nrc.gov.

Sincerely,

Pao-Tsin Kuo, Program Director
License Renewal and Environmental Impacts
Division of Regulatory Improvement Programs
Office of Nuclear Reactor Regulation

Docket Nos.: 50-336, 50-423

Enclosure: As stated

cc w/o encl.: See next page

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

April 8, 2004

Mr. Don Klima, Director
Office of Federal Agency Programs
Advisory Council on Historic Preservation
Old Post Office Building
1100 Pennsylvania Avenue, NW, Suite 809
Washington, DC 20004

SUBJECT: MILLSTONE POWER STATION, UNITS 2 AND 3 LICENSE RENEWAL REVIEW

Dear Mr. Klima:

The U.S. Nuclear Regulatory Commission (NRC) staff is reviewing an application to renew the operating licenses for Millstone Power Station, Units 2 and 3 (MPS), which is located on the north shore of Long Island Sound in Waterford, Connecticut, approximately 40 miles southeast of Hartford, Connecticut. MPS is operated by Dominion Nuclear Connecticut Inc. (DNC). The application for renewal was submitted by DNC on January 22, 2004, pursuant to NRC requirements at Title 10 of the *Code of Federal Regulations* Part 54 (10 CFR Part 54). The NRC has established that, as part of the staff review of any nuclear power plant license renewal action, a site-specific Supplemental Environmental Impact Statement (SEIS) to its "Generic Environmental Impact Statement for License Renewal of Nuclear Plants" (GEIS), NUREG-1437, will be prepared under the provisions of 10 CFR Part 51, which implements the National Environmental Policy Act of 1969 (NEPA). In accordance with 36 CFR 800.8, the SEIS will include analyses of potential impacts to historic and cultural resources. A draft SEIS is scheduled for publication in December of 2004, and will be provided to you for review and comment.

If you have any questions or require additional information, please contact the Senior Project Manager for the Millstone project, Mr. Richard L. Emch, Jr., at 301-415-1590 or RLE@nrc.gov.

Sincerely,

Pao-Tsin Kuo, Program Director
License Renewal and Environmental Impacts
Division of Regulatory Improvement Programs
Office of Nuclear Reactor Regulation

Docket Nos.: 50-336, 50-423

cc: See next page

April 14, 2004

The Honorable Matthew Thomas, Chief Sachem
Narragansett Indian Tribe
P.O. Box 268
Charlestown, RI 02813

SUBJECT: U.S. NUCLEAR REGULATORY COMMISSION REVIEW OF MILLSTONE POWER STATION, UNITS 2 AND 3 LICENSE RENEWAL APPLICATIONS

Dear Chief Thomas:

The U.S. Nuclear Regulatory Commission (NRC) is seeking input for its environmental review of applications from the Dominion Nuclear Connecticut, Inc. (DNC) to renew the operating licenses for the Millstone Power Station, Units 2 and 3 (MPS). MPS is located on the north shore of Long Island Sound in Waterford, Connecticut, approximately 40 miles southeast of Hartford, Connecticut. MPS is in close proximity to lands that may be of interest to the Narragansett Indian Tribe. As described below, the NRC process includes an opportunity for public and inter-governmental participation in the environmental review. We want to ensure that you are aware of our efforts and, pursuant to 10 CFR 51.28(b), the NRC invites the Narragansett Indian Tribe to provide input to the scoping process relating to the NRC's environmental review of the application. A copy of this letter is also being forwarded to Mr. John Brown, your Tribal Preservation Officer. In addition, as outlined in 36 CFR 800.8, the NRC plans to coordinate compliance with Section 106 of the National Historic Preservation Act of 1966 through the requirements of the National Environmental Policy Act of 1969.

Under NRC regulations, the original operating license for a nuclear power plant is issued for up to 40 years. The license may be renewed for up to an additional 20 years if NRC requirements are met. The current operating licenses for MPS Units 2 and 3 will expire in July 2015 and November 2025, respectively. DNC submitted its application for renewal of the MPS operating licenses on January 22, 2004.

The NRC is gathering information for a MPS-specific supplement to its "Generic Environmental Impact Statement for License Renewal of Nuclear Plants" (GEIS), NUREG-1437. The supplement will contain the results of the review of the environmental impacts on the area surrounding the MPS site that are related to terrestrial ecology, aquatic ecology, hydrology, historic and archaeological resources, and socioeconomic issues (among others) and will contain a recommendation regarding the environmental acceptability of the license renewal action.

The NRC will hold two public scoping meetings for the MPS license renewal supplement to the GEIS on May 18, 2004, at the Waterford Town Hall Auditorium, 15 Rope Ferry Road in Waterford, Connecticut, 06385. There will be two sessions to accommodate interested parties. The first session will convene at 1:30 p.m. and will continue until 4:30 p.m., as necessary. The second session will convene at 7:00 p.m., with a repeat of the overview portions of the meeting, and will continue until 10:00 p.m., as necessary. Additionally, the NRC staff will host informal discussions one hour before the start of each session. To be considered, comments must be provided either at the transcribed public meetings or in writing. No formal comments on the proposed scope of the supplement to the GEIS will be accepted during informal discussions.

The application is electronically available for inspection from the Publicly Available Records component of NRC's Agencywide Documents Access and Management System (ADAMS) under Accession Number ML040260070. ADAMS is accessible at http://www.nrc.gov/reading-rm/adams.html which provides access through the NRC's Public Electronic Reading Room (PERR) link. If you do not have access to ADAMS or if there are problems in accessing the documents located in ADAMS, contact the NRC's Public Document Room (PDR) Reference staff at 1-800-397-4209, 1-301-415-4737, or by e-mail at pdr@nrc.gov. In addition, the application can be viewed on the Internet at http://www.nrc.gov/reactors/operating/licensing/renewal/applications.html.

A paper copy of the application can be viewed at the NRC's PDR, located at One White Flint North, 11555 Rockville Pike (first floor), Rockville, Maryland, 20852-2738; the Waterford Public Library, located at 49 Rope Ferry Road, Waterford, Connecticut, 06385; and at the Thames River Campus Library at Three Rivers Community College, 574 New London Turnpike, Norwich, Connecticut, 06360. The GEIS, which assesses the scope and impact of environmental effects that would be associated with license renewal at any nuclear power plant site, can also be found on the NRC's website or at the NRC's PDR.

Please submit any written comments that the Narragansett Indian Tribe may have to offer on the scope of the environmental review by June 4, 2004. Comments should be submitted by mail to the Chief, Rules and Directives Branch, Division of Administrative Services, Mail Stop T-6D59, U.S. Nuclear Regulatory Commission, Washington D.C. 20555-0001, or by e-mail to *MillstoneEIS@nrc.gov*. At the conclusion of the scoping process, the NRC staff will prepare a summary of the significant issues identified and the conclusions reached and will mail a copy to you.

The NRC will issue the draft supplemental environmental impact statement (SEIS) for public comment (anticipated publication date, December 2004), and will hold another set of public meetings in the site vicinity to solicit comments on the draft. A copy of the draft SEIS will be sent to you for your review and comment. After consideration of public comments received on the draft, the NRC will prepare a final SEIS. The issuance of a final SEIS for MPS is planned for July 2005. If you need additional information regarding the environmental review process, please contact Mr. Richard L. Emch, Jr., Senior Environmental Project Manager, at (301) 415-1590.

Sincerely,

/RA/
Pao-Tsin Kuo, Program Director
License Renewal and Environmental Impacts
Division of Regulatory Improvement Programs
Office of Nuclear Reactor Regulation

Docket Nos.: 50-336, 50-423

The application is electronically available for inspection from the Publicly Available Records component of NRC's Agencywide Documents Access and Management System (ADAMS) under Accession Number ML040260070. ADAMS is accessible at http://www.nrc.gov/reading-rm/adams.html which provides access through the NRC's Public Electronic Reading Room (PERR) link. If you do not have access to ADAMS or if there are problems in accessing the documents located in ADAMS, contact the NRC's Public Document Room (PDR) Reference staff at 1-800-397-4209, 1-301-415-4737, or by e-mail at pdr@nrc.gov. In addition, the application can be viewed on the Internet at http://www.nrc.gov/reactors/operating/licensing/renewal/applications.html.

A paper copy of the application can be viewed at the NRC's PDR, located at One White Flint North, 11555 Rockville Pike (first floor), Rockville, Maryland, 20852-2738; the Waterford Public Library, located at 49 Rope Ferry Road, Waterford, Connecticut, 06385; and at the Thames River Campus Library at Three Rivers Community College, 574 New London Turnpike, Norwich, Connecticut, 06360. The GEIS, which assesses the scope and impact of environmental effects that would be associated with license renewal at any nuclear power plant site, can also be found on the NRC's website or at the NRC's PDR.

Please submit any written comments that the Narragansett Tribal Community may have to offer on the scope of the environmental review by June 4, 2004. Comments should be submitted by mail to the Chief, Rules and Directives Branch, Division of Administrative Services, Mail Stop T-6D59, U.S. Nuclear Regulatory Commission, Washington D.C. 20555-0001, or by e-mail to *MillstoneEIS@nrc.gov*. At the conclusion of the scoping process, the NRC staff will prepare a summary of the significant issues identified and the conclusions reached and will mail a copy to you.

The NRC will issue the draft supplemental environmental impact statement (SEIS) for public comment (anticipated publication date, December 2004), and will hold another set of public meetings in the site vicinity to solicit comments on the draft. A copy of the draft SEIS will be sent to you for your review and comment. After consideration of public comments received on the draft, the NRC will prepare a final SEIS. The issuance of a final SEIS for MPS is planned for July 2005. If you need additional information regarding the environmental review process, please contact Mr. Richard L. Emch, Jr., Senior Environmental Project Manager, at (301) 415-1590.

Sincerely,
/RA/
Pao-Tsin Kuo, Program Director
License Renewal and Environmental Impacts
Division of Regulatory Improvement Programs
Office of Nuclear Reactor Regulation

Docket Nos.: 50-336 and 50-423

Distribution: See next page

Accession No. ML041050878
C:\ORPCheckout\FileNET\ML041050878.wpd

OFFICE	LA:RLEP	GS:RLEP	PM:RLEP	OGC (NLO)	SC:RLEP	PD RLEP
NAME	MJenkins*	JDavis*	REmch*	CMarco*	JTappert	PTKuo
DATE	03/29/04	03/29/04	03/29/04	04/7/04	04/13/04	04/14/04

OFFICIAL RECORD COPY

DISTRIBUTION: Ltr to The Honorable (Chief) M. Thomas. Re: Millstone. Dated: April 14, 2004
Accession No. ML041050878
DMatthews/FGillespie
PTKuo
REmch
JTappert
LFields
JDavis
RArrighi
JEads
CMarco
VNerses
JTrapp, RGN I
MSchenider, RGN I
SKennedy, RGN I
KManagan, RGN I
TDoerr (LANL)
RLEP R/F

Millstone Power Station, Units 2 and 3

cc

Lillian M. Cuoco, Esquire
Senior Counsel
Dominion Resources Services, Inc.
Rope Ferry Road
Waterford, CT 06385

Edward L. Wilds, Jr., Ph D.
Director, Division of Radiation
Department of Environmental Protection
79 Elm Street
Hartford, CT 06106-5127

Regional Administrator, Region I
U.S. Nuclear Regulatory Commission
475 Allendale Road
King of Prussia, PA 19406

Paul Eccard
First Selectman
Town of Waterford
15 Rope Ferry Road
Waterford, CT 06385

Mr. P. J. Parulis
Manager - Nuclear Oversight
Dominion Nuclear Connecticut, Inc.
Rope Ferry Road
Waterford, CT 06385

Mr. W. R. Matthews
Senior Vice President - Nuclear Operations
Dominion Nuclear Connecticut, Inc.
Rope Ferry Road
Waterford, CT 06385

Mr. John Markowicz
Co-Chair
Nuclear Energy Advisory Council
9 Susan Terrace
Waterford, CT 06385

Mr. Evan W. Woollacott
Co-Chair
Nuclear Energy Advisory Council
128 Terry's Plain Road
Simsbury, CT 06070

Senior Resident Inspector
Millstone Power Station
c/o U.S. Nuclear Regulatory Commission
P. O. Box 513
Niantic, CT 06357

Mr. G. D. Hicks
Director - Nuclear Station Safety
and Licensing
Dominion Nuclear Connecticut, Inc.
Rope Ferry Road
Waterford, CT 06385

Ms. Nancy Burton
147 Cross Highway
Redding Ridge, CT 00870

Mr. William D. Meinert
Nuclear Engineer
Massachusetts Municipal Wholesale
Electric Company
Moody Street
P.O. Box 426
Ludlow, MA 01056

Mr. J. Alan Price
Site Vice President
Dominion Nuclear Connecticut, Inc.
Rope Ferry Road
Waterford, CT 06385

Mr. Chris L. Funderburk
Director, Nuclear Licensing and
Operations Support
Dominion Resources Services, Inc.
Innsbrook Technical Center
5000 Dominion Boulevard
Glen Allen, VA 23060-6711

Mr. David W. Dodson
Licensing Supervisor
Dominion Nuclear Connecticut, Inc.
Rope Ferry Road
Waterford, CT 06385

Millstone Power Station, Units 2 and 3

cc

Mr. S E. Scace
Assistant to the Site Vice President
Dominion Nuclear Connecticut, Inc.
Rope Ferry Road
Waterford, CT 06385

Mr. M. J. Wilson
Manager - Nuclear Training
Dominion Nuclear Connecticut, Inc.
Rope Ferry Road
Waterford, CT 06385

Mr. A. J. Jordan, Jr.
Director - Nuclear Engineering
Dominion Nuclear Connecticut, Inc.
Rope Ferry Road
Waterford, CT 06385

Mr. S. P. Sarver
Director - Nuclear Station Operations
and Maintenance
Dominion Nuclear Connecticut, Inc.
Rope Ferry Road
Waterford, CT 06385

Mr. Charles Brinkman, Director
Washington Operations Nuclear Services
Westinghouse Electric Company
12300 Twinbrook Pkwy, Suite 330
Rockville, MD 20852

Mr. David A. Christian
Sr. Vice President and Chief Nuclear Officer
Dominion Nuclear Connecticut, Inc.
Innsbrook Technical Center
5000 Dominion Boulevard
Glen Allen, VA 23060-6711

Mr. Fred Emerson
Nuclear Energy Institute
1776 I Street, NW, Suite 400
Washington, DC 20006-3708

Ms. Judy Liskov, Assistant Director
Waterford Public Library
49 Rope Ferry Road
Waterford, CT 06385

Three Rivers Community College
Thames River Campus Library
574 New London Turnpike
Norwich, CT 06360

Mr. John Brown
Tribal Preservation Officer
Narragansett Indian Tribe
P.O. Box 700
Wyoming, RI 02898

April 14, 2004

The Honorable Michael J. Thomas, Chairman
Mashantucket Pequot Tribal Nation
P.O. Box 268, Indian Town Road
Mashantucket, CT 06339-3060

SUBJECT: U.S. NUCLEAR REGULATORY COMMISSION REVIEW OF MILLSTONE POWER STATION, UNITS 2 AND 3 LICENSE RENEWAL APPLICATIONS

Dear Chairman Thomas:

The U.S. Nuclear Regulatory Commission (NRC) is seeking input for its environmental review of applications from the Dominion Nuclear Connecticut, Inc. (DNC) to renew the operating licenses for the Millstone Power Station, Units 2 and 3 (MPS). MPS is located on the north shore of Long Island Sound in Waterford, Connecticut, approximately 40 miles southeast of Hartford, Connecticut. MPS is in close proximity to lands that may be of interest to the Mashantucket Pequot Tribal Nation. As described below, the NRC process includes an opportunity for public and inter-governmental participation in the environmental review. We want to ensure that you are aware of our efforts and, pursuant to 10 CFR 51.28(b), the NRC invites the Mashantucket Pequot Tribal Nation to provide input to the scoping process relating to the NRC's environmental review of the application. In addition, as outlined in 36 CFR 800.8, the NRC plans to coordinate compliance with Section 106 of the National Historic Preservation Act of 1966 through the requirements of the National Environmental Policy Act of 1969.

Under NRC regulations, the original operating license for a nuclear power plant is issued for up to 40 years. The license may be renewed for up to an additional 20 years if NRC requirements are met. The current operating licenses for MPS Units 2 and 3 will expire in July 2015 and November 2025, respectively. DNC submitted its application for renewal of the MPS operating licenses on January 22, 2004.

The NRC is gathering information for a MPS-specific supplement to its "Generic Environmental Impact Statement for License Renewal of Nuclear Plants" (GEIS), NUREG-1437. The supplement will contain the results of the review of the environmental impacts on the area surrounding the MPS site that are related to terrestrial ecology, aquatic ecology, hydrology, historic and archaeological resources, and socioeconomic issues (among others) and will contain a recommendation regarding the environmental acceptability of the license renewal action.

The NRC will hold two public scoping meetings for the MPS license renewal supplement to the GEIS on May 18, 2004, at the Waterford Town Hall Auditorium, 15 Rope Ferry Road in Waterford, Connecticut, 06385. There will be two sessions to accommodate interested parties. The first session will convene at 1:30 p.m. and will continue until 4:30 p.m., as necessary. The second session will convene at 7:00 p.m., with a repeat of the overview portions of the meeting, and will continue until 10:00 p.m., as necessary. Additionally, the NRC staff will host informal discussions one hour before the start of each session. To be considered, comments must be provided either at the transcribed public meetings or in writing. No formal comments on the proposed scope of the supplement to the GEIS will be accepted during informal discussions.

The application is electronically available for inspection from the Publicly Available Records component of NRC's Agencywide Documents Access and Management System (ADAMS) under Accession Number ML040260070. ADAMS is accessible at http://www.nrc.gov/reading-rm/adams.html which provides access through the NRC's Public Electronic Reading Room (PERR) link. If you do not have access to ADAMS or if there are problems in accessing the documents located in ADAMS, contact the NRC's Public Document Room (PDR) Reference staff at 1-800-397-4209, 1-301-415-4737, or by e-mail at pdr@nrc.gov. In addition, the application can be viewed on the Internet at http://www.nrc.gov/reactors/operating/licensing/renewal/applications.html.

A paper copy of the application can be viewed at the NRC's PDR, located at One White Flint North, 11555 Rockville Pike (first floor), Rockville, Maryland, 20852-2738; the Waterford Public Library, located at 49 Rope Ferry Road, Waterford, Connecticut, 06385; and at the Thames River Campus Library at Three Rivers Community College, 574 New London Turnpike, Norwich, Connecticut, 06360. The GEIS, which assesses the scope and impact of environmental effects that would be associated with license renewal at any nuclear power plant site, can also be found on the NRC's website or at http://www.nrc.gov/reading-rm/pdr.html NRC's PDR.

Please submit any written comments that the Mashantucket Pequot Tribal Nation may have to offer on the scope of the environmental review by June 4, 2004. Comments should be submitted by mail to the Chief, Rules and Directives Branch, Division of Administrative Services, Mail Stop T-6D59, U.S. Nuclear Regulatory Commission, Washington D.C. 20555-0001, or by e-mail to *MillstoneEIS@nrc.gov*. At the conclusion of the scoping process, the NRC staff will prepare a summary of the significant issues identified and the conclusions reached and will mail a copy to you.

The NRC will issue the draft supplemental environmental impact statement (SEIS) for public comment (anticipated publication date, December 2004), and will hold another set of public meetings in the site vicinity to solicit comments on the draft. A copy of the draft SEIS will be sent to you for your review and comment. After consideration of public comments received on the draft, the NRC will prepare a final SEIS. The issuance of a final SEIS for MPS is planned for July 2005. If you need additional information regarding the environmental review process, please contact Mr. Richard L. Emch, Jr., Senior Environmental Project Manager, at 301-415-1590.

Sincerely,
/RA/
Pao-Tsin Kuo, Program Director
License Renewal and Environmental Impacts
Division of Regulatory Improvement Programs
Office of Nuclear Reactor Regulation

Docket Nos.: 50-336, 50-423

The application is electronically available for inspection from the Publicly Available Records component of NRC's Agencywide Documents Access and Management System (ADAMS) under Accession Number ML040260070. ADAMS is accessible at http://www.nrc.gov/reading-rm/adams.html which provides access through the NRC's Public Electronic Reading Room (PERR) link. If you do not have access to ADAMS or if there are problems in accessing the documents located in ADAMS, contact the NRC's Public Document Room (PDR) Reference staff at 1-800-397-4209, 1-301-415-4737, or by e-mail at pdr@nrc.gov. In addition, the application can be viewed on the Internet at http://www.nrc.gov/reactors/operating/licensing/renewal/applications/millstone.html.

A paper copy of the application can be viewed at the NRC's PDR, located at One White Flint North, 11555 Rockville Pike (first floor), Rockville, Maryland, 20852-2738; the Waterford Public Library, located at 49 Rope Ferry Road, Waterford, Connecticut, 06385; and at the Thames River Campus Library at Three Rivers Community College, 574 New London Turnpike, Norwich, Connecticut, 06360. The GEIS, which assesses the scope and impact of environmental effects that would be associated with license renewal at any nuclear power plant site, can also be found on the NRC's website or at http://www.nrc.gov/reading-rm/pdr.html NRC's PDR.

Please submit any written comments that the Mashantucket Pequot Tribal Community may have to offer on the scope of the environmental review by June 4, 2004. Comments should be submitted by mail to the Chief, Rules and Directives Branch, Division of Administrative Services, Mail Stop T-6D59, U.S. Nuclear Regulatory Commission, Washington D.C. 20555-0001, or by e-mail to *MillstoneEIS@nrc.gov*. At the conclusion of the scoping process, the NRC staff will prepare a summary of the significant issues identified and the conclusions reached and will mail a copy to you.

The NRC will issue the draft supplemental environmental impact statement (SEIS) for public comment (anticipated publication date, December 2004), and will hold another set of public meetings in the site vicinity to solicit comments on the draft. A copy of the draft SEIS will be sent to you for your review and comment. After consideration of public comments received on the draft, the NRC will prepare a final SEIS. The issuance of a final SEIS for MPS is planned for July 2005. If you need additional information regarding the environmental review process, please contact Mr. Richard L. Emch, Jr., Senior Environmental Project Manager, at 301-415-1590 or by e-mail at RLE@nrc.gov.

Sincerely,

/RA/
Pao-Tsin Kuo, Program Director
License Renewal and Environmental Impacts
Division of Regulatory Improvement Programs
Office of Nuclear Reactor Regulation

Docket Nos.: 50-336 and 50-423

Distribution: See next page

Accession No.ML041050880

C:\ORPCheckout\FileNET\ML041050880.wpd

OFFICE	LA:RLEP	GS:RLEP	PM:RLEP	OGC (NLO)	SC:RLEP	PD RLEP
NAME	MJenkins*	JDavis*	REmch*	CMarco*	JTappert	PTKuo
DATE	03/25/04	03/25/04	03/25/04	04/7/04	04/13/04	04/14/04

OFFICIAL RECORD COPY

DISTRIBUTION: Ltr. to the Honorable M. Thomas, Re: Millstone Dated: April 14, 2004
Accession No.ML041050880

DMatthews/FGillespie
PTKuo
REmch
JTappert
LFields
JDavis
RArrighi
JEads
CMarco
VNerses
JTrapp, RGN I
MSchenider, RGN I
SKennedy, RGN I
KManagan, RGN I
TDoerr (LANL)
RLEP R/F

Millstone Power Station, Units 2 and 3

cc

Lillian M Cuoco, Esquire
Senior Counsel
Dominion Resources Services, Inc.
Rope Ferry Road
Waterford, CT 06385

Edward L. Wilds, Jr., Ph D.
Director, Division of Radiation
Department of Environmental Protection
79 Elm Street
Hartford, CT 06106-5127

Regional Administrator, Region I
U.S. Nuclear Regulatory Commission
475 Allendale Road
King of Prussia, PA 19406

Paul Eccard
First Selectman
Town of Waterford
15 Rope Ferry Road
Waterford, CT 06385

Mr. P. J. Parulis
Manager - Nuclear Oversight
Dominion Nuclear Connecticut, Inc.
Rope Ferry Road
Waterford, CT 06385

Mr. W. R. Matthews
Senior Vice President - Nuclear Operations
Dominion Nuclear Connecticut, Inc.
Rope Ferry Road
Waterford, CT 06385

Mr. John Markowicz
Co-Chair
Nuclear Energy Advisory Council
9 Susan Terrace
Waterford, CT 06385

Mr. Evan W. Woollacott
Co-Chair
Nuclear Energy Advisory Council
128 Terry's Plain Road
Simsbury, CT 06070

Senior Resident Inspector
Millstone Power Station
c/o U.S. Nuclear Regulatory Commission
P. O. Box 513
Niantic, CT 06357

Mr. G. D. Hicks
Director - Nuclear Station Safety
and Licensing
Dominion Nuclear Connecticut, Inc.
Rope Ferry Road
Waterford, CT 06385

Ms Nancy Burton
147 Cross Highway
Redding Ridge, CT 00870

Mr. William D. Meinert
Nuclear Engineer
Massachusetts Municipal Wholesale
Electric Company
Moody Street
P.O. Box 426
Ludlow, MA 01056

Mr. J. Alan Price
Site Vice President
Dominion Nuclear Connecticut, Inc.
Rope Ferry Road
Waterford, CT 06385

Mr. Chris L. Funderburk
Director, Nuclear Licensing and
Operations Support
Dominion Resources Services, Inc.
Innsbrook Technical Center
5000 Dominion Boulevard
Glen Allen, VA 23060-6711

Mr. David W. Dodson
Licensing Supervisor
Dominion Nuclear Connecticut, Inc.
Rope Ferry Road
Waterford, CT 06385

Millstone Power Station, Units 2 and 3

cc

Mr. S. E. Scace
Assistant to the Site Vice President
Dominion Nuclear Connecticut, Inc.
Rope Ferry Road
Waterford, CT 06385

Mr. M. J. Wilson
Manager - Nuclear Training
Dominion Nuclear Connecticut, Inc.
Rope Ferry Road
Waterford, CT 06385

Mr. A. J. Jordan, Jr.
Director - Nuclear Engineering
Dominion Nuclear Connecticut, Inc.
Rope Ferry Road
Waterford, CT 06385

Mr. S. P. Sarver
Director - Nuclear Station Operations
and Maintenance
Dominion Nuclear Connecticut, Inc.
Rope Ferry Road
Waterford, CT 06385

Mr. Charles Brinkman, Director
Washington Operations Nuclear Services
Westinghouse Electric Company
12300 Twinbrook Pkwy, Suite 330
Rockville, MD 20852

Mr. David A. Christian
Sr. Vice President and Chief Nuclear Officer
Dominion Nuclear Connecticut, Inc.
Innsbrook Technical Center
5000 Dominion Boulevard
Glen Allen, VA 23060-6711

Mr. Fred Emerson
Nuclear Energy Institute
1776 I Street, NW, Suite 400
Washington, DC 20006-3708

Ms. Judy Liskov, Assistant Director
Waterford Public Library
49 Rope Ferry Road
Waterford, CT 06385

Three Rivers Community College
Thames River Campus Library
574 New London Turnpike
Norwich, CT 06360

United States Department of the Interior

FISH AND WILDLIFE SERVICE
New England Field Office
70 Commercial Street, Suite 300
Concord, New Hampshire 03301-5087

RE: License Renewal, Millstone Power Station, Units 2 & 3
Waterford, CT

April 15, 2004

Pao-Tsin Kuo
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001

Dear Mr. Kuo:

I have reviewed your request for information on endangered and threatened species and their habitats for the above-referenced project. The following comments are provided in accordance with Section 7 of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531-1543) and the Fish and Wildlife Coordination Act (48 Stat., 401, as amended; 16 U.S.C. 661 et seq.).

The following is a list of federally-protected and candidate species that may be in the vicinity of MPS and the associated transmission lines: the federally-endangered roseate tern (*Sterna dougallii dougallii*) nests on the Atlantic coast/islands, federally-threatened piping plover (*Charadrius melodus*) nests on the Atlantic coast, the federally-threatened puritan tiger beetle (*Cicindela puritana*) is found in Middlesex County, the federally-threatened small whorled pogonia (*Isotria medeoloides*) is found in Hartford/New Haven/Fairfield/New London/Windham/Tolland /Middlesex and Litchfield Counties, and the federally-threatened bald eagle (*Haliaeetus leucocephalus*) uses the entire state for migratory/nesting purposes. In addition, the New England cottontail (*Sylvilagus transitionalis*) has been proposed as a canditate for federal listing. The New England cottontail may be found in the vicinity of the MPS and associated transmission lines.

With regard to our concerns under the provisions of the Fish and Wildlife Coordination Act, we are unable to provide detailed comments on the potential effects of the proposed action on fish and wildlife resources at this time. We will provide further comments after we review the Supplemental Environmental Impact Statement.

Thank you for your cooperation and please contact me at 603-223-2541, extension 23, for endangered species questions, and contact Greg Mannesto of our Rhode Island office at 401-364-9124 for any other concerns you might have. In the future, in order to expedite your reply, please direct any inquiries of this nature to this office at the above address.

Sincerely yours,

Michael J. Amaral

Michael J. Amaral
Endangered Species Specialist
New England Field Office

STATE OF CONNECTICUT
DEPARTMENT OF ENVIRONMENTAL PROTECTION

April 27, 2004

Mr. Richard Emch
Environmental Project Manager
USNRC OWFN
11555 Rockville Pike
Rockville, MD 20852

and

Ms. P. F. Faggert
V.P. and Chief Env. Officer
Dominion
5000 Dominion Blvd.
Glen Allen, VA 23060

RE: Request to renew the operating licenses for
Units 2 and 3 of the Millstone Power Station in
Waterford, Connecticut
Dominion Nuclear Connecticut, applicant

Dear Mr. Emch and Ms. Faggert:

We are in receipt of a request for Federal coastal consistency concurrence for renewal of the operating licenses for Units 2 and 3 at the Millstone Power Station in Waterford, Connecticut. This consistency concurrence request was submitted pursuant to 15 CFR 930.50.

Continued operation of the Millstone Nuclear Power plant requires renewal of the NPDES permit previously issued for the discharge of cooling waters. A request for that permit renewal was submitted by the applicant in a timely fashion and is currently pending before the Department.

In the interest of permit coordination, we have elected to waive the separate Federal coastal consistency review for this particular operating license application. However, this waiver should not be construed as our determination that the proposed activities are consistent with Connecticut's approved coastal management program. Instead, the State of Connecticut will evaluate the consistency of this proposed activity for conformance with the relevant coastal management policies, standards and criteria in conjunction with the State's NPDES permit review process as required by the Connecticut Coastal Management Act [Connecticut General Statutes (CGS) sections 22a-90 through 22a-112].

Phone 860.424.3034 Fax 860.424.4054

(Printed on Recycled Paper)
79 Elm Street • Hartford, CT 06106 - 5127
An Equal Opportunity Employer

This waiver is provided in response to the Federal coastal consistency concurrence request and the supporting documentation submitted to this Office on January 27, 2004. Any subsequent modification, addition or deletion to the proposed activity, regardless of its magnitude or impact, constitutes a new application for the purposes of federal consistency certification. Accordingly, all such modifications, additions or deletions must be submitted to the State of Connecticut for a coastal consistency concurrence pursuant to 15 CFR 930.50.

If you have any questions regarding this matter, you may contact Margaret Welch of this Office via e-mail at margaret.welch@po.state.ct.us or by phone at 860.424.3034. Thank you.

Sincerely,

Charles H. Evans, Director
Office of Long Island Sound Programs

CHE/MLW/w

cc: Allison Castellan
Charles Nezianya
Edward Wilds

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
NORTHEAST REGION
One Blackburn Drive
Gloucester, MA 01930-2298

SEP 21 200

Pao-Tsin Kuo
Program Director
License Renewal and Environmental Impacts
Division of Regulatory Improvement Programs
Office of Nuclear Reactor Regulation
US Nuclear Regulatory Commission
MS T-11 F1
Washington, DC 20555

Re: Millstone Power Station Units 2 and 3 license renewal

Dear Mr. Kuo,

This is in response to your letter dated March 17, 2004 requesting information on the presence of threatened, endangered, candidate and proposed species listed under the jurisdiction of the National Marine Fisheries Service (NOAA Fisheries) in the vicinity of the Millstone Power Station located on the north shore of Long Island Sound in Waterford, Connecticut. The US Nuclear Regulatory Commission (NRC) is reviewing an application submitted by Dominion Nuclear Connecticut Inc. (DNC) for the renewal of the operating licenses for Millstone Power Station, Units 2 and 3 (MPS). In support of this review, the NRC is currently preparing a Supplemental Environmental Impact Statement (EIS).

Four species of federally threatened or endangered sea turtles under the jurisdiction of the National Marine Fisheries Service (NOAA Fisheries) may be found seasonally in the waters of Long Island. Sea turtles are expected to be in the vicinity of the project area in warmer months, typically from May 1 to November 15. The sea turtles in northeastern nearshore waters are typically small juveniles with the most abundant being the federally threatened loggerhead (*Caretta caretta*) followed by the federally endangered Kemp's ridley (*Lepidochelys kempi*). Loggerhead turtles have been found to be relatively abundant off the Northeast (from near Nova Scotia, Canada to Cape Hatteras, North Carolina). From November to March in 1985 through 1988, 130 cold-stunned turtles were collected along the Long Island shoreline, including 97 Kemp's ridleys. The waters of Long Island Sound have also been found to be warm enough to support federally endangered green sea turtles (*Chelonia mydas*) from June through October. The three species of chelonid turtles found in the Northeast remain very briefly in open ocean waters, spending most of their time during the summer months in harbors and estuarine waters. Federally endangered leatherback sea turtles (*Dermochelys coriacea*) may be found in the waters of Long Island Sound during the warmer months as well.

Federally endangered North Atlantic right whales (*Eubalaena glacialis*), humpback whales (*Megaptera novaeangliae*), and fin whales (*Balaenoptera physalus*) may all also be found seasonally in Northeast waters. North Atlantic right whales have been documented in the nearshore waters of New York from January through September. Humpback whales feed during the spring, summer, and fall over a range that encompasses the eastern coast of the United States. Fin whales are common in waters of the United States Exclusive Economic Zone, principally offshore from Cape Hatteras northward. While these whale species are not considered residents of Long Island Sound, it is possible that transients may enter the area during seasonal migrations.

The entrainment and impingement of sea turtles at several nuclear power plants on the East Coast has been documented. As sea turtles may be seasonally present in the vicinity of the intakes associated with the MPS, NOAA Fisheries recommends that this impact be fully addressed in the SEIS being prepared in anticipation of license renewal actions. NOAA Fisheries staff look forward to reviewing the SEIS and will be available to NRC staff to discuss any potential impacts on listed species. Please contact Julie Crocker of my staff ((978)281-9328 x6530 or julie.crocker@noaa.gov) if you would like to set up a conference call or meeting.

Section 7(a)(2) of the Endangered Species Act (ESA) of 1973, as amended, states that each Federal agency shall, in consultation with the Secretary, insure that any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of a listed species or result in the destruction or adverse modification of designated critical habitat. Any discretionary federal action that may affect a listed species must undergo Section 7 consultation. As listed species may be present in the project area, the NRC is responsible for determining whether the proposed action is likely to affect any listed species. The NRC should then submit their determination along with a request for concurrence, to the attention of the Endangered Species Coordinator, NOAA Fisheries, Northeast Regional Office, Protected Resources Division, One Blackburn Drive, Gloucester, MA 01930. After reviewing this information, NOAA Fisheries would then be able to conduct a consultation under section 7 of the ESA.

Should you have any questions about these comments or about the section 7 consultation process in general, please contact Julie Crocker at (978)281-9328 ext. 6530.

Sincerely,

Mary A. Colligan
Assistant Regional Administrator
for Protected Resources

Cc: Ludwig, F/NER4

File Code: Sec 7 NRC Millstone Nuclear Power Plant

STATE OF CONNECTICUT

COMMISSION ON CULTURE AND TOURISM

October 6, 2004

Mr. Pao-Tsin Kuo
License Renewal and Environmental Impacts
Division of Regulatory Improvement Programs
Office of Nuclear Reactor Regulation
Nuclear Regulatory Commission
Washington, DC 20555-0001

Subject: Millstone Power Station
Units 2 and 3 License Renewal
Waterford, CT

Dear Mr. Kuo:

The State Historic Preservation Office has reviewed the above-named project. This office expects that the proposed undertaking will have no effect on historic, architectural, or archaeological resources listed on or eligible for the National Register of Historic Places.

This office appreciates the opportunity to have reviewed and commented upon the proposed undertaking.

We recommend that the responsible agency provide concerned citizens with the opportunity to review and comment upon the proposed undertaking in accordance with the National Historic Preservation Act and the Connecticut Environmental Policy Act.

For further information please contact Dr. David A. Poirier, Staff Archaeologist.

Sincerely,

J. Paul Loether
Division Director and Deputy
State Historic Preservation Officer

A106

Historic Preservation and Museum Division
Amos Bull House, 59 South Prospect Street, Hartford, Connecticut 06106
860-566-3005 860-566-5078 fax

An Equal Opportunity Employer

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

November 9, 2004

Ms. Patricia A. Kurkul, Regional Administrator
NOAA Fisheries
Northeast Regional Office
One Blackburn Drive
Gloucester, MA 09130-2298

SUBJECT: REQUEST FOR CONCURRENCE - BIOLOGICAL ASSESSMENT FOR MILLSTONE POWER STATION, UNITS 2 AND 3 LICENSE RENEWAL

Dear Ms. Kurkul:

The U.S. Nuclear Regulatory Commission (NRC) has prepared the enclosed biological assessment (BA) to evaluate whether the proposed renewal of the Millstone Power Station, Units 2 and 3 (MPS) operating licenses for a period of an additional 20 years would have adverse effects on listed species. The proposed action (license renewal) is not a major construction activity. MPS is located on the north shore of Long Island Sound in Waterford, Connecticut, approximately 40 miles southeast of Hartford, Connecticut.

By letter dated March 17, 2004, to the National Oceanic and Atmospheric Administration (NOAA) - Fisheries, the NRC requested a list of Federally threatened or endangered aquatic species that may be in the vicinity of MPS and its associated transmission lines. In a letter dated September 21, 2004, NOAA Fisheries provided a list of Federally threatened or endangered species. Your office identified one threatened and three endangered species of sea turtles that may be seasonally found in the waters of Long Island. These include the loggerhead (*Caretta caretta*), Kemp's ridley (*Lepidochelys kempi*), green turtles (*Chelonia mydas*), and leatherback turtles (*Dermochelys coriacea*). The letter also identified three other endangered species known to occur seasonally in Northeast waters, the North Atlantic right whales (*Eubalaena glacialis*), humpback whales (*Megaptera novaeangliae*), and fin whales (*Balaenoptera physalus*). The NRC has also included in its evaluation the endangered shortnose sturgeon (*Acipenser brevirostrum*); this species is known to occur in the Connecticut River, which flows into Long Island Sound approximately 10 miles east of the Millstone site.

In addition the staff also contacted U.S. Fish and Wildlife Service (FWS) by letter dated March 18, 2004, requesting a list of Federally threatened or endangered terrestrial species that may be in the vicinity of MPS. In a letter dated April 15, 2004, FWS identified the following terrestrial species: the endangered roseate tern (*Sterna dougallii dougallii*); the threatened piping plover (*Charadrius melodus*), puritan tiger beetle (*Cicindela puritana*), small whorled pogonia (*Isotria medeoloides*), and bald eagle (*Haliaeetus leucophalus*); and one candidate species, the New England cottontail (*Sylvilagus transitionalis*).

The staff has determined that license renewal for Millstone would have no effect on the puritan tiger beetle, shortnose sturgeon, loggerhead sea turtle, green sea turtle, leatherback sea turtle, Kemp's ridley sea turtle, piping plover, right whale, finback whale, and humpback whale. License renewal may affect, but is not likely to adversely affect, the bald eagle, roseate tern, New England cottontail, and small whorled pogonia.

P. Kurkul -2-

We are requesting your concurrence with our determination. In reaching our conclusion, the NRC staff relied on information provided by the licensee, on literature research and interviews with experts performed by NRC staff, and on information provided by FWS (i.e., including current listings of species provided by the FWS, Concord, New Hampshire, New England Field Office) and NOAA Fisheries (Northeast Regional Office).

If you have any questions regarding this BA or the staff's request, please contact Mr. Richard L. Emch, Jr., Senior Environmental Project Manager, at 301-415-1590 or via e-mail at rle@nrc.gov.

Sincerely,

Pao-Tsin Kuo, Program Director
License Renewal and Environmental Impacts Program
Division of Regulatory Improvement Programs
Office of Nuclear Reactor Regulation

Docket Nos.: 50-336 and 50-423

Enclosures: As stated

cc w/encl.: See next page

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

November 9, 2004

Mr. Marvin Moriarty, Regional Director
Northeast Regional Office
U.S. Fish and Wildlife Service
300 Westgate Center Drive
Hadley, MA 01035-9589

SUBJECT: REQUEST FOR CONCURRENCE - BIOLOGICAL ASSESSMENT FOR MILLSTONE POWER STATION, UNITS 2 AND 3 LICENSE RENEWAL

Dear Mr. Moriarty:

The U.S. Nuclear Regulatory Commission (NRC) has prepared the enclosed biological assessment (BA) to evaluate whether the proposed renewal of the Millstone Power Station, Units 2 and 3 (MPS) operating licenses for a period of an additional 20 years would have adverse effects on listed species. The proposed action (license renewal) is not a major construction activity. MPS is located on the north shore of Long Island Sound in Waterford, Connecticut, approximately 40 miles southeast of Hartford, Connecticut.

By letter dated March 18, 2004, to the U.S. Fish and Wildlife Service (FWS), the NRC requested a list of Federally threatened or endangered terrestrial species that may be in the vicinity of MPS and its associated transmission lines. In a letter dated April 15, 2004, the FWS provided a list of Federally threatened or endangered species. The FWS identified the following terrestrial species: the endangered roseate tern (*Sterna dougallii dougallii*); the threatened piping plover (*Charadrius melodus*), puritan tiger beetle (*Cicindela puritana*), small whorled pogonia (*Isotria medeoloides*), and bald eagle (*Haliaeetus leucophalus*); and one candidate species, the New England cottontail (*Sylvilagus transitionalis*).

In addition the staff also contacted the National Oceanic and Atmospheric Administration - Fisheries (NOAA Fisheries) by letter dated March 17, 2004, requesting a list of Federally threatened or endangered aquatic species that may be in the vicinity of MPS. In a letter dated September 21, 2004, NOAA Fisheries identified one threatened and three endangered species of sea turtles that may be seasonally found in the waters of Long Island. These are the loggerhead (*Caretta caretta*), Kemp's ridley (*Lepidochelys kempi*), green turtles (*Chelonia mydas*) and leatherback turtles (*Dermochelys coriacea*). The letter also identified three other endangered species known to occur seasonally in Northeast waters, North Atlantic right whales (*Eubalaena glacialis*), humpback whales (*Megaptera novaeangliae*), and fin whales (*Balaenoptera physalus*). The NRC has also included in its evaluation the endangered shortnose sturgeon (*Acipenser brevirostrum*); this species is known to occur in the Connecticut River, which flows into Long Island Sound approximately 10 miles east of the Millstone site.

The staff has determined that license renewal for Millstone would have no effect on the puritan tiger beetle, shortnose sturgeon, loggerhead sea turtle, green sea turtle, leatherback sea turtle, Kemp's ridley sea turtle, piping plover, right whale, finback whale, and humpback whale. License renewal may affect, but is not likely to adversely affect, the bald eagle, roseate tern, New England cottontail, and small whorled pogonia.

M. Moriarty -2-

We are requesting your concurrence with our determination. In reaching our conclusion, the NRC staff relied on information provided by the licensee, on literature research and interviews with experts performed by NRC staff, and on information provided by FWS (i.e., including current listings of species provided by the FWS, Concord, New Hampshire, New England Field Office) and NOAA Fisheries (Northeast Regional Office).

If you have any questions regarding this BA or the staff's request, please contact Mr. Richard L. Emch, Jr., Senior Environmental Project Manager, at 301-415-1590 or via e-mail at rle@nrc.gov.

Sincerely,

Pao-Tsin Kuo, Program Director
License Renewal and Environmental Impacts Program
Division of Regulatory Improvement Programs
Office of Nuclear Reactor Regulation

Docket Nos.: 50-336 and 50-423

Enclosures: As stated

cc w/encl.: See next page

ENCLOSURE 1

BIOLOGICAL ASSESSMENT

Biological Assessment

Millstone Power Station
License Renewal Review

October 2004

Docket Numbers
50-336
50-423

U.S. Nuclear Regulatory Commission
Rockville, Maryland

1.0 Introduction

The U.S. Nuclear Regulatory Commission (NRC) issues operating licenses for domestic nuclear power plants in accordance with the provisions of the Atomic Energy Act of 1954, as amended, and NRC implementing regulations. The purpose and need for the proposed action (that is, renewal of an operating license) is to provide an option that allows electric power generation to continue beyond the term of the current nuclear power plant operating license, so future generating needs can be met if the operator and State regulatory agencies pursue that option.

Dominion Nuclear Connecticut, Inc. (Dominion) has prepared an environmental report in conjunction with its application for renewal of the Millstone Nuclear Plant, Units 2 and 3 (Millstone) operating licenses, as provided for by the following NRC regulations:

- Title 10, Energy, Code of Federal Regulations (CFR) Part 54, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants," Section 54.23, Contents of application - environmental information (10 CFR 54.23).

- Title 10, Energy, CFR Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions," Section 51.53, Postconstruction environmental reports, Subsection 51.53(c), Operating license renewal stage [10 CFR 51.53(c)].

The NRC is reviewing an application submitted by Dominion (the applicant) for the renewal of the operating licenses for Millstone for a period of an additional 20 years. There will be no major construction, refurbishment, or replacement activities associated with this action. This biological assessment examines the potential effects of the continued operation of Millstone on 14 Federally listed species and one species proposed for candidate listing that could occur within the Millstone site, near the site, or along its associated transmission line rights-of-way (ROWs). This consultation is pursuant to Section 7(a)(2) of the Endangered Species Act.

In letters dated March 17 and 18, 2004, the NRC requested that the National Oceanographic and Atmospheric Administration (NOAA) - Fisheries (also known as the National Marine Fisheries Service or NMFS) and the U.S. Fish and Wildlife Service (FWS), respectively to provide lists of Federally listed endangered or threatened species and information on protected, proposed, and candidate species, as well as any designated critical habitat, that may be in the vicinity of Millstone and its associated transmission line ROWs (NRC 2004a, 2004b). The project area is defined as the Millstone site, its associated transmission line ROWs, and adjacent areas of Long Island Sound. In letters from the FWS (FWS 2004a) and the NMFS (NMFS 2004a), the NRC was provided a list of Federally protected species in the project area. A total of eight aquatic and six terrestrial species afforded protection under the Endangered Species Act of 1973 or candidates for such protection were identified that could potentially inhabit the project area.

2.0 Proposed Action

The proposed action is the renewal of the operating licenses for Millstone. The current operating license for Unit 2 expires on July 31, 2015, and for Unit 3 on November 25, 2025. Dominion has submitted an application to the NRC to renew these operating licenses for an additional 20 years of operation (i.e., until July 31, 2035, for Unit 2 and November 25, 2045, for Unit 3). The renewed licenses, if issued, will be effective from their date of issuance until 20 years after the expiration date of the current operating licenses.

Millstone is located on Millstone Point in Niantic Bay, between the Niantic and Thames Rivers on Long Island Sound, near Waterford in New London County, Connecticut (Figure 1). The nearest large cities are New Haven, approximately 64 km (40 mi) to the west, and Hartford, approximately 64 km (40 mi) to the northwest. The site is situated on the edge of Long Island Sound and Niantic Bay and is approximately 32 km (20 mi) west of Rhode Island. At one time, there were three operating nuclear power plants at the Millstone site. Construction on Unit 1 began in 1966, on Unit 2 in 1970, and on Unit 3 in 1974. Unit 1 was a boiling-water reactor that was permanently shut down in 1995. The facility is in long-term storage awaiting decontamination and dismantlement as part of station decommissioning. Unit 1 is not part of this license renewal application. Millstone Unit 2 is a two-loop, closed-cycle, pressurized-water nuclear reactor with a calculated electrical output of approximately 870 megawatts electric (MW[e]); while Millstone Unit 3 is a four-loop, closed-cycle, pressurized-water nuclear reactor with a calculated electrical output of approximately 1,154 MW(e) (Dominion 2004a).

Long Island Sound is the source of water for the once-through turbine condenser cooling systems at Millstone. The system withdraws salt water from Long Island Sound though intakes, pumps the water through the condenser for cooling, and surface discharges heated water to Long Island Sound approximately 610 m (2000 ft) southeast of the withdrawal points (Dominion 2004a).

Intake structures for Units 2 and 3 are located on the eastern shore of Niantic Bay, which is fed by Long Island Sound (Figure 2). The structures consist of four reinforced-concrete bays for Unit 2 and six bays for Unit 3. When both Units 2 and 3 are operating at full power, the 10 pumps (one for each bay) pump a total of 92 m^3/s (1.46 million gpm) into 2-m (7-ft) diameter conveyance pipes. Cooling water then moves through the condensers. After passing through each unit's condensers, cooling water is discharged to the former granite quarry. The heated discharge water then flows through two cuts excavated from the bedrock at the eastern end of the quarry into Long Island Sound. Figure 2 shows the intake structures, quarry, and discharge points for the Millstone circulating water system.

The intake structures are designed to minimize the possibility of clogging or impingement of aquatic organisms. Before the intake water reaches the circulating water pumps, the water passes through trash racks consisting of 1-cm (3/8-in. thick) metal bars spaced horizontally on 5-cm (2-in.) centers. The water then flows through vertical traveling screens with 1-cm (3/8-in.) mesh that prevent debris and large organisms from entering the cooling system. A cutoff wall in front of the intake extends 2.7 m (9 ft) below the surface to prevent surface water debris and organisms from entering the intake. Individual trash and fish return troughs collect and sluice debris and fish from the screens. Unit 3 was originally constructed with a fish return trough;

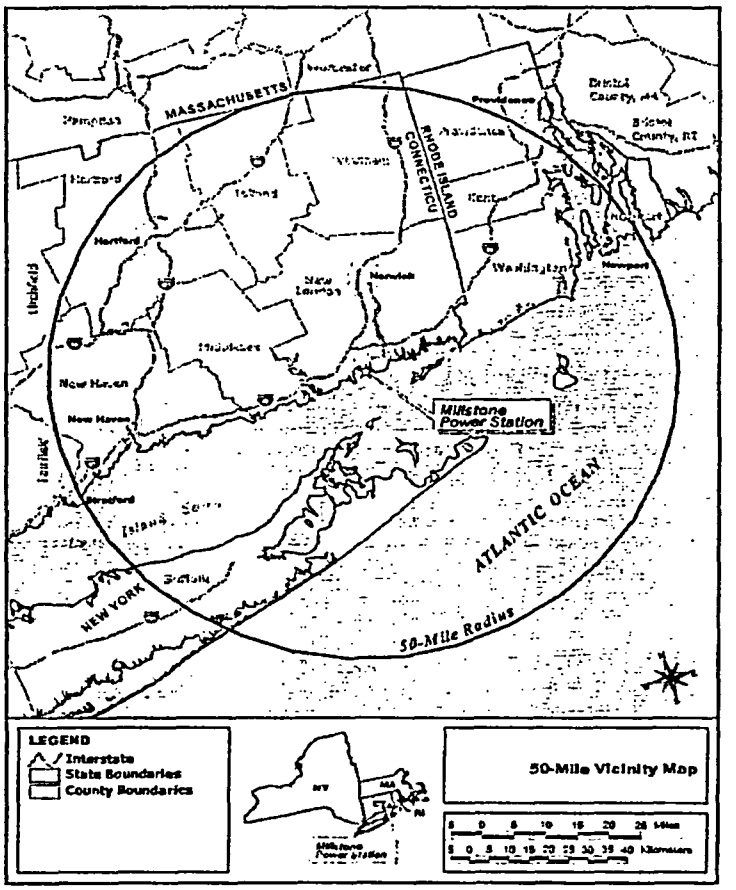


Figure 1. Location of Millstone, 80-km (50-mi) Region

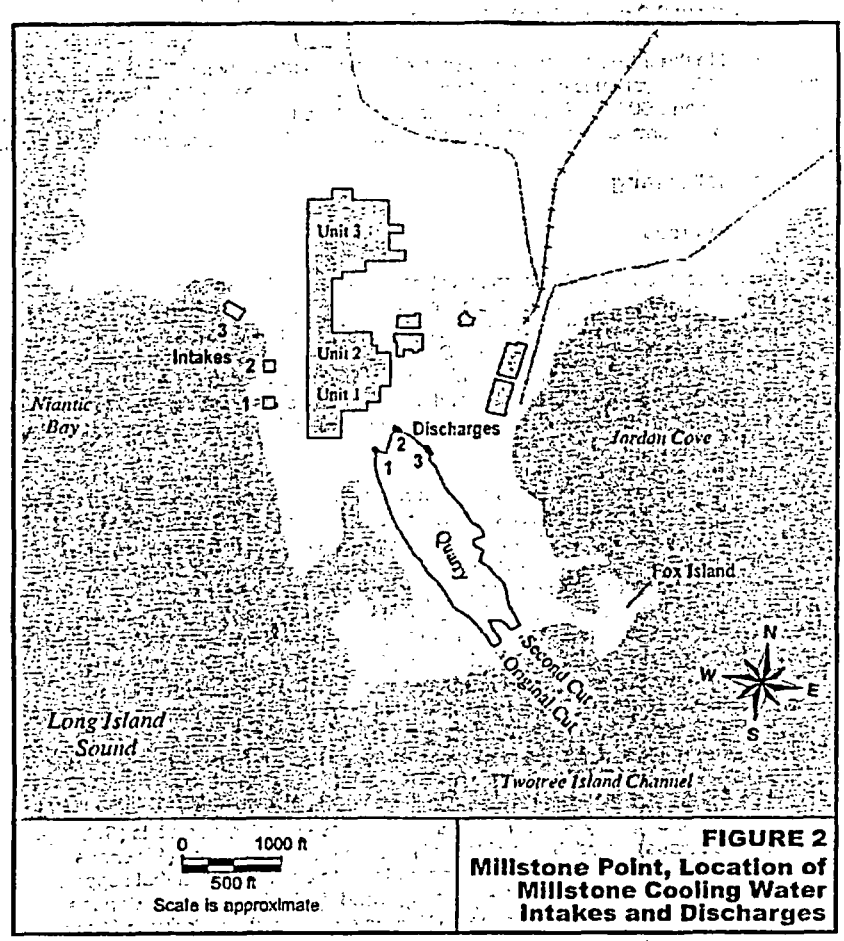


Figure 2. Millstone Point, Location of Millstone Cooling Water Intake and Discharges

a fish return trough was added to Unit 2 in 2000. Water velocity in front of the Unit 2 structure is estimated to be about 0.2 m/s (0.6 ft/s) (Dominion 2004a).

Biocides are added to the intake water to prevent biofouling. Sodium hypochlorite is injected on a periodic basis, and the system is designed to maintain a 0.2 parts per million (ppm) chlorine concentration (Dominion 2004a). Residual chlorine is monitored in the effluent water. Thermal backwashing is also performed to prevent mussels from fouling the intake structure pump bays.

3.0 Environmental Setting

3.1 Terrestrial Resources

The Millstone site is located in the Southern New England Coastal Plains and Hills of the Northeastern Coastal Zone ecoregion (U.S. Environmental Protection Agency [EPA] 2004a). Pre-settlement vegetation would have consisted primarily of winter deciduous hardwood forests with some salt marsh and beach habitat types. Out of approximately 212 ha (525 ac) that comprise the Millstone site, current land use includes approximately 89 ha (220 ac) of developed area, a 20-ha (50-ac) natural area, and a 12-ha (30-ac) ballpark licensed to the town of Waterford. Until 1960, the site was used as a granite quarry, which operated for 200 years (Dominion 2004a).

The current terrestrial environment includes old field habitats dominated by eastern red cedar (*Juniperus virginiana*), scarlet oak (*Quercus coccinea*), black cherry (*Prunus serotina*), and blackberry (*Rubus* spp.) (Dominion 2004a). Common invasive exotics in this habitat include multiflora rose (*Rosa multiflora*) and Japanese honeysuckle (*Lonicera japonica*). Winter deciduous hardwood forest dominated by various species of oak (*Quercus* spp.), pignut hickory (*Carya glabra*), black birch (*Betula lenta*), red maple (*Acer rubrum*), and American beech (*Fagus grandifolia*) is the most common undisturbed habitat type. Along the coast, beach and coastal marsh habitats are dominated by beach grass (*Ammophila breviligulata*), toadflax (*Linaria vulgaris*), evening primrose (*Oenothera biennis*), seaside goldenrod (*Solidago sempervirens*), salt meadow grass (*Spartina patens*), salt grass (*Distichlis spicata*), Bigelow's glasswort (*Salicornia bigelovii*), and smooth cordgrass (*Spartina alterniflora*). Ponds and wetlands in the eastern portion of the site are managed as a wildlife refuge.

Terrestrial habitats on the Millstone site support common wildlife species such as white-tailed deer (*Odocoileus virginianus*), gray squirrel (*Sciurus carolinensis*), cottontail rabbits (*Sylvilagus* spp.), red fox (*Vulpes vulpes*), woodchucks (*Marmota monax*), and wild turkey (*Meleagris gallopavo*). Coastal marshes and the wildlife refuge on the site contain habitat that supports waterfowl such as mallard ducks (*Anas platyrhynchos*), wood ducks (*Aix sponsa*), Canada geese (*Branta canadensis*), common mergansers (*Mergus merganser*), black ducks (*Anas rubripes*), herons, and egrets. Osprey (*Pandion haliaetus*) nest platforms have been maintained at Millstone for over 35 years and 173 fledglings have been produced over that time period (Dominion 2004a).

Four 345-KV transmission lines connect Millstone to the power grid (Table 1) (Dominion 2004a). The ROWs traverse New London, Middlesex, Hartford, Tolland, and the northeast corner of New Haven counties. The four lines share a common ROW for 14.5 km (9 mi) north to Hunts

Brook Junction (Figure 3). At Hunts Brook Junction two lines run north in the same ROW to the Card Street Substation where one line continues on to the Manchester Substation, one line runs east to the Montville Station and one line runs west to the Southington Substation. All Millstone lines share ROWs with lines from other sources and would be maintained if Millstone ceased operating. Transmission lines traverse abandoned fields, pasture, cultivated fields, forests, and wetlands as well as a number of conservation areas (Dominion 2004a). The Card Street/Manchester line crosses the Pease Brook Wildlife Management Area. The Southington line crosses the Nehantic State Forest, Cockaponset State Forest, and Hartman Park, a municipal park owned by the town of Lyme, Connecticut.

Table 1. Millstone Transmission Line Corridors.

		Length		Width		Max Area[a]	
Substation	kV	km	(mi)	m	(ft)	ha	(ac)
Hunts Brook Junction	345	14	(9)	152	(500)	220	(545)
Montville	345	6	(4)	99	(325)	64	(158)
Card Street	345	32	(20)	91	(300)	294	(727)
Manchester	345	61	(38)	91	(300)	559	(1382)
Southington	345	71	(44)	76	(250)	539	(1333)

[a] Max area calculations use maximum right-of-way width estimates (Dominion 2004a).

Connecticut Light and Power (CL&P), a subsidiary of Northeast Utilities conducts maintenance activities on these transmission lines and ROWs. These activities include, but are not restricted to, maintenance of vegetation in each ROW, replacement of poles or towers, installation of lightning arresters and counterpoise, and upgrading of existing equipment.

CL&P manages vegetation within the ROWs with an approach it calls "two-zone maintenance" (NU 2004). The area directly beneath the transmission lines and extending out 4.5 m (15 ft) on either direction is called the "wire zone." Most vegetation in the wire zone is kept short except for the occasional clusters of eastern red cedar that are maintained for nesting habitat. The area from the edge of the wire zone to the outside edge of the ROWs is called the "side zone." The side zone acts as a transition between the towers and conductors of the wire zone and the forest. The side zone is maintained as a multi-layered habitat with low growing trees and shrubs.

Vegetation is managed through a combination of mowing, trimming, and herbicide treatments. All personnel applying herbicides are required to possess a valid applicator's license (NU 2004). Wetlands and other water bodies are protected from herbicides by a 3-m (10-ft) vegetative border (NU 2004). Mowing is conducted only between the months of November and April to minimize impacts to wet soils, nesting birds, and wildlife forage. The Connecticut Department of Environmental Protection (CTDEP) reviews all ROW management plans to assure protection

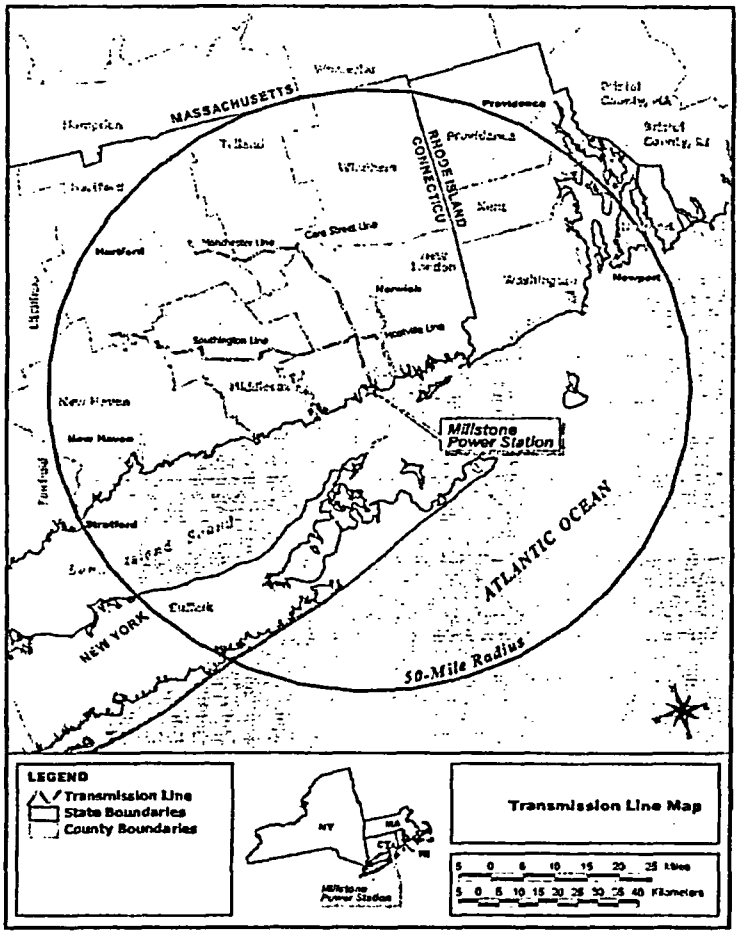


Figure 3. Millstone Site and Associated Transmission Lines

of threatened and endangered species. CL&P personnel work closely with maintenance crews to ensure that treatments are implemented properly.

CL&P encourages collaboration with conservation groups to use the ROWs for wildlife habitat improvement. It has also developed a list of plant species and wildlife habitat types that it attempts to promote through its vegetation management actions. Contractors are required to identify and target non-native, invasive plant species (NU 2004).

3.2 Aquatic Resources

Aquatic resources in the vicinity of Millstone are primarily associated with marine and estuarine environments that are part of Long Island Sound. Millstone is bordered on the west by Niantic Bay, to the east by Jordan Cove, and to the south by the Twotree Island Channel (Dominion 2004b). The plant is located approximately 1.6 km (1 mi) southeast of the mouth of the Niantic River, and approximately 5.5 km (3.5 mi) west of the Thames River. Cooling water intakes are located in Niantic Bay on the western shoreline of Millstone Point and are situated approximately 4.6 to 7.6 m (15 to 25 ft) below mean sea level. Once-through cooling water is discharged into an abandoned granite quarry located in approximately the center of Millstone Point. Water then flows from the quarry over a weir into Long Island Sound near the Twotree Island Channel (Figure 2). Rated flows for Millstone Units 2 and 3 are 36 and 59 $m^3 s^{-1}$ (1275 and 2097 $ft^3 s^{-1}$) respectively.

Long Island Sound is a large water body, with a surface area of 3420 km^2 (1320 mi^2), and 965 km (600 mi) of coastline. The drainage area associated with the water body is approximately 27,070 km^2 (16,820 mi^2). The average depth of the sound is 19 m (63 ft); and the approximate volume is 68 trillion L (18 trillion gallons). Millstone Point lies on the western shore of Long Island Sound, near the mouth of the sound. This area of Long Island Sound experiences a salinity of approximately 23 parts per thousand due to the influence of three major rivers: the Thames, the Housatonic, and the Connecticut Rivers. Ambient water temperature near the Millstone cooling water intakes can range from 1°C to 22°C (34°F to 72°F) over the course of a year. Linear regression performed on daily and annual seawater temperatures near Millstone over a 25-year period revealed a significant long-term increase in water temperature of 1.55°C (2.8°F) based on daily means and 1.01°C (1.8°F) based on annual means (Keser et al. 2003).

Millstone Point is situated approximately 5.6 km (3.5 mi) west of the Thames River, in an area that experiences strong tidal currents that influence the nearshore ecosystem, which include rocky coastlines and boulder and gravel substrate beaches that support a variety of fish, invertebrate, and marine plant life . The average tidal flow through Twotree Island Channel is approximately 3400 $m^3 s^{-1}$ (1.2×10^6 $ft^3 s^{-1}$) with a maximum flow of about 8500 $m^3 s^{-1}$ (3.0×10^6 $ft^3 s^{-1}$). This translates into current velocities of about 1.8 to 3.30 km hr^{-1} (1 to 1.8 knots), with slightly lower velocities near the plant. Weak currents predominate in both the Niantic River and Jordan Cove. Tidal fluctuation in this area is not severe, with mean and maximum ranges of 0.8 and 1.0 m (2.6 to 3.3 ft), respectively (Dominion 2004b).

EPA Region 1 has identified Long Island Sound as "an estuary of national significance" and listed six problem areas of concern associated with water quality (EPA 2004b):

1. Low dissolved oxygen (hypoxia)
2. Toxic contamination
3. Pathogen contamination
4. Floatable debris
5. Habitat degradation and loss, and living resource health associated with items 1-4
6. Land use and development resulting in habitat loss and degradation of water quality

These problem areas have resulted in a variety of long-term, integrated studies of Long Island Sound by both state and Federal agencies.

- **Chemical Contaminants Near Millstone**

Specific chemical data associated with sediment, water, or biota near the Millstone study area were not available for review, but in general, surficial sediment associated with the eastern portion of Long Island Sound exhibits lower levels of common contaminants (heavy metals, polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), pesticides) than the western portion. United States Geological Survey (USGS) data (Mecray et al. 2004) showed regional patterns of high metals concentrations in the western sound, with relatively low concentrations associated with the eastern sound in the vicinity of Millstone. Draft data (Battelle 1999) associated with surficial samples from the Thames River indicated most metals were below NOAA effects-range-median (Long et al. 1998), and organic constituents were at or near detection limits with the exception of the PAH, perylene, which was detected at concentrations ranging from approximately 20 to 1200 µg/kg dry weight. It is suspected the source of this compound is biogenic rather than anthropogenic.

A citizens' group conducted limited chemical and radiological monitoring of bottom sediments in the vicinity of Millstone and reported possible elevated levels of hydrazine and uranium in the bottom sediments of Jordon Cove (CTDEP 2002). The chemical compound 1,1-dimethylhydrazine (UMDH) was reported as detected in two sediment samples at low levels. It was postulated that the UMDH might be due to hydrazine used at Millstone for corrosion control. CTDEP reviewed available information and concluded that the detections likely were false positives because of questionable quality of the analytical procedures, and it was unlikely that hydrazine could accumulate in bottom sediments because it degrades rapidly into water and nitrogen. In addition, the particular chemical form of hydrazine used at Millstone is different than UMDH. There are also industrial facilities in the area that commonly use hydrazine. CTDEP also concluded that the types and levels of uranium measured in sediments near Millstone reflected naturally occurring background levels (CTDEP 2002). Neither concern was judged by CTDEP to be sufficiently credible to warrant further investigation.

- **Important Fish and Shellfish Communities Near Millstone**

A variety of commercially, recreationally, or environmentally important fish and shellfish live or spend a portion of their life cycle in the vicinity of Millstone, and also commonly occur in Long

Island Sound (Table 2). Many of these species live in the waters near Millstone, travel through the area during their seasonal migrations in and out of Long Island Sound, or pass close to the plant as they enter rivers adjacent to Millstone during their spawning seasons. Because of their proximity to Millstone, they may be susceptible to entrainment, impingement, or to lethal or sublethal effects associated with plant operations. In order to assess relative species abundance near Millstone operations, a variety of collection and enumeration methods have been employed, including sampling cooling water discharge using plankton nets to determine ichthyoplankton (fish eggs and larvae) abundance, shore-zone seines to capture small fish, and bottom trawls to capture larger, demersal fish (Dominion 2004b). In general, assessments of fish and shellfish have included sampling stations in direct proximity to the plant (e.g., within a radius of approximately 3 km [2 mi]). Sampling stations have included a station located near the Unit 2 and 3 cooling water discharge, stations in the Niantic River and Bay, and stations in Jordan Cove. Far-field reference sites were not included in the fish and shellfish monitoring programs, nor were sampling grids located at varying distances from the area of interest to identify environmental gradient effects. Plume dynamic studies and assessments of intertidal ecosystems, however did use far-field reference or control sites.

Table 2. Important Fish and Shellfish Species.

Common Name	Scientific Name
winter flounder	*Pseudopleuronectes americanus*
lobster	*Homarus americanus*
American sandlance	*Ammodytes americanus*
anchovy	*Anchoa* spp.
silversides	*Menidia* spp.
grubby	*Myoxocephalus aenaeus*
cunner	*Tautogolabrus adspersus*
tautog	*Tautoga onitis*

Eelgrass Community

Eelgrass (*Zostera marina*) is one of the dominant seagrasses in coastal regions of the northern hemisphere, and common in eastern Long Island Sound near the Millstone facility. This seagrass is important because of its significant influence on the nearshore environment. Eelgrass beds provide habitat and cover for many larval and juvenile forms of fish and invertebrates, support significant primary and secondary production, and serve as a food source for numerous waterfowl or planktonic grazers (Kesar et al., 2003). Eelgrass beds in the vicinity of Millstone have been monitored for many years to evaluate population dynamics and document change over time. Sampling locations included areas associated with thermal plume discharge (Jordan Cove, White Point), and reference locations associated with the Niantic River (Dominion 2004b). Studies near Millstone and in Long Island Sound have shown considerable variation in the extent of eelgrass beds at all locations, probably due to water body temperature

fluctuations, eutrophication, sedimentation, turbidity, the presence of nuisance organisms (mussels and green algae blooms) and possible changes associated with nearshore hydrodynamics. Studies conducted at Millstone have suggested that eelgrass abundance and distribution at Jordan Cove and White Point has been affected by the thermal plume discharge, but have observed relative stable biomass and distribution over the past 16 years at other locations adjacent to the facility (Dominion 2004b). Studies have also noted dramatic changes in eelgrass populations in the Niantic River, resulting in multiple relocations of reference sites over the past 20 years due to die-off that is attributable to poor water quality and potential biological disturbances (Dominion 2004b).

Rocky Intertidal Communities

A rich and varied rocky intertidal habitat exists in the region surrounding Millstone, and includes marine alga, polychaeteous annelids, crustaceans, and molluscs. All of these organisms are important contributors to the structure and function of nearshore ecosystems. Environmental studies conducted by Dominion have included sites at Fox Island, Millstone Point, White Point, and a reference location near Giant's Neck (Figure 2). Cooling water discharge stations have included a location close to the quarry cuts and one location approximately 200 m (660 ft) southeast of the quarry cut. Millstone monitoring programs have been in effect since 1979 and are intended to provide 1) an environmental baseline of abundance of important species, and 2) a means to detect change in community structure and function near the Millstone facility.

Algal studies have been conducted since 1979, and have identified over 140 species that occur or have occurred in the area during the study duration. Dominion scientists have data on organisms that represent the more common marine flora or fauna, including barnacles, the algae *Fucus* spp., the red alga *Chondrus* spp., and the marine mussel *Mytilus edulis*. Community analyses using clustering techniques suggest that plant impacts are generally limited to approximately 150 m (490 ft) of shoreline on the east side of the discharge to Long Island Sound (Dominion 2004b). Detectable changes at the community level have been observed in the study area, as have ecosystem-level changes (e.g. water temperature fluctuations, nutrient concentrations, light intensity). Of particular note is the presence of the red alga *Antithamnion pectinatum*, an exotic species native to the Pacific Ocean that was not previously reported in the Atlantic.

Benthic Infauna

Benthic infaunal communities near Millstone are consistent with soft-bottom, nearshore environments associated with New England. These communities typically contain a diverse assemblage of species that collectively contribute to the stability of the nearshore food web. Subtidal communities in the vicinity of Millstone and at a reference site located near Giants Neck have been sampled and studied since 1980. During the 2003 sampling, marine polychaetes were the most abundant taxa, followed by oligochaetes, arthropods, and molluscs (Dominion 2004b). The following infaunal taxa were selected as representative of sites affected by Millstone: oligochaetes, the polychaetes *Aricidea catherinae*, *Mediomastus ambiseta*, *Tharyx* spp., *Polycirrus eximius*, *Protodorvillea gaspeensis*, *Parapionosyllis longicirrata*, and the bivalve mollusc *Nuculana annulata* (Dominion 2004b). Monitoring studies have been helpful in detecting changes in benthic infauna community structure and linking the observed changes to

both natural and anthropogenic disturbances. Millstone activities relating to cooling water discharge and required maintenance dredging have produced observable effects to the structure of benthic communities in the immediate vicinity of the plant. This was clearly evident by the response of the benthic community during extended shutdowns during 1996-1998.

4.0 Assessment of Federally Listed Species

Several Federally listed species are known to occur in the vicinity of the Millstone site or associated transmission line ROWs. No FWS-designated critical habitat is found within the site or associated ROWs.

4.1 Aquatic Species

Eight Federally listed marine species could occur in Long Island Sound in the vicinity of Millstone. These include three species of whales and four species of turtle (NMFS 2004a, FWS 2004b) (Table 3). The staff has also evaluated the potential impacts of continued Millstone operation on the shortnose sturgeon (*Acipenser brevirostrum*). The shortnose sturgeon is a Federally listed endangered species that is found in the Connecticut River, which flows into Long Island Sound approximately 10 miles east of the Millstone site.

Table 3. Aquatic Endangered and Threatened Aquatic Species

Scientific Name	Common Name	Federal Status[a]
	FISH	
Acipenser brevirostrum	shortnose sturgeon	Endangered
	TURTLES	
Caretta caretta	loggerhead	Endangered
Chelonia mydas	green turtle	Threatened
Dermochelys coriacea	leatherback turtle	Endangered
Lepidochelys kempii	Kemp's Ridley	Endangered
	WHALES	
Balaena glacialis	right whale	Endangered
Balaenoptera physalus	finback whale	Endangered
Megaptera novaengliae	humpback whale	Endangered

(a) FWS 2004b, NMFS 2004a.

Shortnose Sturgeon (*Acipenser brevirostrum*)

The shortnose sturgeon is Federally listed as endangered in the entire range (FWS 2004b). Two populations of shortnose sturgeon are present in the Connecticut River. One of these is landlocked in the upper part of the river between the Holyoke dam and Turners Falls dam in Massachusetts, and the other population is located in the lower Connecticut River from the Holyoke Dam to Long Island Sound. An estimated 1200 to 1500 shortnose sturgeon are found in freshwater and estuarine portions of the Connecticut River and are presumed to occasionally

range into adjacent areas of Long Island Sound (FWS 2001). No shortnose sturgeon have been impinged or captured in more than 30 years of sampling at Millstone (Dominion 2004a). The primary threats to this species are dam building, water pollution, and dredging (NatureServe 2004).

Although this species has not been recorded for the area and it is highly unlikely that individuals could even occasionally be present. The intake structures at Dominion have been fitted with fish sluiceways that return fish and other organisms that become impinged during cooling water intake. It is unknown how impingement and returns affect mortality of shortnose sturgeon but it is expected that the mortality rate would be low. The species has a bottom orientation, it is a strong swimmer and its robustness would likely minimize the potential for impingement.

The staff reviewed the design, operation, and location of the intake and discharge structures at Millstone and the impingement and entrainment data collected during plant operation. The staff also visited the site and reviewed the life history information about the shortnose sturgeon. On the basis of this information, the staff has determined that the continued operation of Millstone over the 20-year renewal period will have no effect on the shortnose sturgeon.

Loggerhead (*Caretta caretta*)

The loggerhead sea turtle is Federally listed as threatened throughout its range (FWS 2004b). There are currently no critical habitats designated for this species, although the NMFS is currently working on a status review based on a 2002 petition to reclassify the Northern and Florida Panhandle subpopulations with endangered status and to designate critical habitat for both subpopulations (NMFS 2004b). The range for the Atlantic population of loggerheads extends from Newfoundland to Argentina, with primary nesting areas located in Florida, Georgia, and the Carolinas.

The NMFS (2004b) has noted that loggerheads can become impinged on intake structures of coastal power plants and estimates the mortality rate for impingement is 2 percent (NMFS 2004b). The applicant has not reported any incidences of impingement of loggerheads or incidental takes during trawling studies in over 30 years of sampling operations.

The staff reviewed the design, operation, and location of the intake and discharge structures at Millstone and the impingement and entrainment data collected during plant operation. On the basis of this information, and that previously provided for the aquatic resources in the vicinity of the plant, the staff has determined that continued operation of Millstone over the 20-year renewal period will have no effect on the loggerhead sea turtle.

Green Turtle (*Chelonia mydas*)

The green sea turtle is Federally listed as endangered in the breeding colony populations in Florida and on the Pacific coast of Mexico and threatened for all other areas (FWS 2004b). The western Atlantic population of green turtles ranges from Massachusetts south to the U.S. Virgin Islands and Puerto Rico, with important feeding grounds in Florida, and primary nesting sites on the east coast of Florida, the U.S. Virgin Islands and Puerto Rico (NMFS 2004c).

NMFS (2004c) has noted that green sea turtles can become impinged on intake structures of coastal power plants and estimates the impingement mortality for green sea turtles at 7 percent (NMFS 2004c). The applicant has not reported any incidences of impingement of green turtles or incidental takes during trawling studies in over 30 years of sampling operations.

The staff reviewed the design, operation, and location of the intake and discharge structures at Millstone and the impingement and entrainment data collected during plant operation. On the basis of this information, and that previously provided for the aquatic resources in the vicinity of the plant, the staff has determined that continued operation of Millstone over the 20-year renewal period will have no effect on the green turtle.

Leatherback Turtle (*Dermochelys coriacea*)

The leatherback sea turtle is Federally listed as endangered throughout its range (FWS 2004b). The western Atlantic population of leatherback sea turtles ranges from Nova Scotia to Puerto Rico and the U.S. Virgin Islands. During the summer, leatherbacks are typically found along the east coast of the U.S. from the Gulf of Maine to central Florida. Critical habitat designated in the area around the U.S. Virgin Islands, with nesting sites located from Georgia to the U.S. Virgin Islands (NMFS 2004d).

The primary threats to the survival of leatherback sea turtles include habitat destruction, incidental catch in commercial fisheries, and harvest of eggs and meat (NMFS 2004d). Impingement of leatherback sea turtles is not listed by NMFS as one of the human impacts on this species (NMFS 2004d). The applicant has not reported any incidences of impingement of leatherback turtles or incidental takes during trawling studies in over 30 years of sampling operations.

The staff reviewed the design, operation, and location of the intake and discharge structures at Millstone and the impingement and entrainment data collected during plant operation. On the basis of this information, and that previously provided for the aquatic resources in the vicinity of the plant, the staff has determined that continued operation of Millstone over the 20-year renewal period will have no effect on the leatherback turtle.

Kemp's Ridley (*Lepidochelys kempii*)

The Kemp's ridley sea turtle is Federally listed as endangered throughout its range (FWS 2004b). This species is found primarily in coastal areas of the Gulf of Mexico and the northwestern Atlantic, with a major nesting beach on the northeastern coast of Mexico (NMFS 2004e).

Habitat degradation, pollution, and ingestion of floating debris are among the most significant threats to Kemp's ridley sea turtles (NMFS 2004e). Impingement of Kemp's ridley was not listed in NMFS (2004e) as one of the human impacts on this species. The applicant did not report any incidences of impingement of Kemp's ridley or incidental takes during trawling studies in over 30 years of sampling operations.

The staff reviewed the design, operation, and location of the intake and discharge structures at Millstone and the impingement and entrainment data collected during plant operation. On the basis of this information, and that previously provided for the aquatic resources in the vicinity of the plant, the NRC concludes that continued operation of Millstone over the 20-year renewal period will have no effect on the Kemp's ridley.

Right Whale (*Eubalaena glacialis*)

The right whale is Federally listed as endangered throughout its range (FWS 2004b). With a population estimated at 291 individuals in 1998, the North Atlantic right whale is considered to be one of the most critically endangered populations of large whales in the world (NMFS 2002). This population ranges from wintering and calving grounds in the coastal waters of the southeastern United States to summer feeding and nursery grounds in New England waters and northward (NMFS 2002). In 1994, the NMFS designated three critical habitats for the North Atlantic right whale: Cape Cod Bay/Massachusetts Bay, Great South Channel, and the Southeastern USA. At the present time, injuries and mortality caused by ship strikes are the primary source of human impacts to right whales, with some additional impacts from fishery entanglements. Right whales have been sighted near Long Island Sound (NMFS 2004a), but are not known to move into the shallow waters immediately offshore of the Millstone site (Dominion 2004b).

On the basis of this information, and that previously provided for the aquatic resources in the vicinity of the plant, the staff has determined that continued operation of Millstone over the 20-year renewal period will have no effect on the right whale.

Finback Whale (*Balaenoptera physalus*)

The finback (fin) whale is Federally listed as endangered throughout its range (FWS 2004b). The current minimum population estimate from a 1999 survey for the western North Atlantic fin whale was 2362 (NMFS 2002). Fin whales are found principally in waters from North Carolina north to Nova Scotia. New England waters provide an important feeding ground for this species. There are no critical habitats designated for the fin whale, although a recovery plan has been drafted. At the present time, injuries and mortality caused by ship strikes are the primary source of human impacts to fin whales. It is possible that fin whales could enter Long Island Sound, but they are not known to move into the shallow waters immediately offshore of the Millstone site (Dominion 2004b).

On the basis of this information, and that previously provided for the aquatic resources in the vicinity of the plant, the staff has determined that continued operation of Millstone over the 20-year renewal period will have no effect on the fin whale.

Humpback Whale (*Megaptera novaengliae*)

The humpback whale is Federally listed as endangered throughout its range (FWS 2004b). The overall abundance for the North Atlantic humpback whale population was estimated in 1992/1993 at 11,570 individuals (NMFS 2002). North Atlantic humpback whales are found during the spring, summer, and fall over a range covering the eastern coast of the United

States. New England waters are an important feeding ground for this species. A recovery plan for humpback whales has been developed and implemented. Injuries and mortality from fishery entanglements and ship strikes are the primary human impacts on humpback whales. Disturbance from whale watching traffic is also of concern, particularly in coastal New England waters. It is possible that humpback whales could enter Long Island Sound, but they are not known to move into the shallow waters immediately offshore of the Millstone site (Dominion 2004b).

On the basis of this information, and that previously provided for the aquatic resources in the vicinity of the plant, the staff has determined that continued operation of Millstone over the 20-year renewal period will have no effect on the humpback whale.

4.2 Terrestrial Species

A total of five Federally listed and one potential candidate terrestrial species was identified (FWS 2004a) as having the potential to occur in New London county or counties traversed by transmission line ROWs (Middlesex, Hartford, Tolland, and the northeast corner of New Haven) (Table 4).

Table 4. Terrestrial Endangered and Threatened Species

Scientific Name	Common Name	Federal Status[a]
	INSECTS	
Cicindela puritana	Puritan tiger beetle	Threatened
	BIRDS	
Charadrius melodus	piping plover	Threatened
Haliaeetus leucocephalus	bald eagle	Endangered
Sterna dougallii dougallii	roseate tern	Endangered
	MAMMALS	
Sylvilagus transitionalis	New England cottontail	Proposed for Candidacy
	PLANTS	
Isotria medeoloides	small whorled pogonia	Threatened

(a) FWS 2004a, 2004b.

Puritan Tiger Beetle (*Cicindela puritana*)

The Puritan tiger beetle is Federally listed as threatened. This species is known from two disjunct populations, one along Chesapeake Bay in Maryland and one along the Connecticut River, in northern Connecticut (CTDEP 2004). Although this species is reported to occur in Middlesex County (FWS 2004b), CTDEP distribution maps clearly show the Connecticut population to be centered primarily along the Connecticut River in Hartford County (CTDEP 2004). The Millstone ROW for the Manchester transmission line does not cross the Connecticut River in Hartford County. The Puritan tiger beetle is restricted to sandy habitats typically found along river banks. Habitat has been depleted through riverbank stabilization and

flood control practices. There is no known habitat for this species near the Millstone site or within associated transmission line ROWs.

The staff has determined that continued operation of Millstone over the 20-year license renewal term will have no effect on the Puritan tiger beetle.

Piping Plover (*Charadrius melodus*)

The piping plover is Federally listed as threatened. This species is a shorebird that is found nesting in sandy beach habitats along seacoasts (CTDEP 2004). Piping plovers nest from North Carolina north to Nova Scotia. Nesting generally occurs from March through July. Historically, these birds were killed for consumption and the feathers used for adornment. Current threats include development and beach stabilization.

CTDEP range maps (CTDEP 2004) show piping plover habitat extending no further east than the east side of the mouth of the Connecticut River. There have been no reported sitings of piping plovers at the site. It is not likely that the necessary beach habitat for nesting is present in the vicinity of the site.

For these reasons, the staff has determined that continued operation of Millstone over the 20-year license renewal term will have no effect on the piping plover.

Bald Eagle (*Haliaeetus leucocephalus*)

The bald eagle is Federally listed as threatened. This species is a large raptor that is found along the coastline and around lakes and rivers. Eagles generally nest in tall trees or on cliff faces near water and away from human disturbance. Eagle populations have declined in the Connecticut due to loss of habitat, human disturbance, and pesticide contamination. There are reported to be up to 100 eagles wintering along major rivers and reservoirs in Connecticut (CTDEP 2004). There are no known nesting pairs near the Millstone site or along transmission corridors. However, individuals have been seen foraging in the area.

Although no bald eagles are known to nest at the Millstone site, Dominion does maintain a raptor reporting program and will follow CTDEP recommendations should bald eagles nest on the Millstone site. For these reasons, the staff has determined that continued operation of Millstone over the 20-year license renewal term may affect, but is not likely to adversely affect, the bald eagle.

Roseate Tern (*Sterna dougallii dougallii*)

The roseate tern is Federally listed as endangered. This species is a seabird that is found almost exclusively on saltwater coastlines. Roseate terns nest in colonies on coastal beaches and offshore islands. Historically, tern populations in Connecticut have been impacted by unrestricted market hunting and more recently by the expansion of predatory great black-backed and herring gull populations throughout their range in the state (CTDEP 2004).

Fox Island (Figure 2) is a small promontory extending off the Millstone site and into Long Island Sound. This site is used by multiple species of seabirds and it is known to be used by roseate terns during the fall migration period. Roseate terns are not known to nest in the vicinity of the Millstone site (Dominion 2004a). Fox Island is managed as a tern sanctuary in the fall and access is strictly controlled. For these reasons, the staff has determined that continued operation of Millstone over the 20-year license renewal term may affect, but is not likely to adversely affect, the roseate tern.

New England Cottontail Rabbit (*Sylvilagus transitionalis*)

The FWS is in the process of determining if the New England cottontail rabbit will be proposed for listing as a candidate species. Populations in Connecticut were considered abundant through the mid 1930s, but competition from introduced Eastern cottontails (*Sylvilagus floridanus*) and loss of agriculture-related habitat has led to a decline is numbers (CTDEP 2004). This species is found in brushy habitats associated with fencelines and edges of fields and forests. Transmission line corridors are not considered high quality habitat due to the abundance of perching raptors and other predators that use the corridors. However, the species may use corridors for dispersal from one site to another. Surveys of eastern and New England cottontail rabbits have found New England cottontail rabbits near the Millstone site and in areas crossed by transmission lines (Goodie et al. 2004). Considering the population trends of this species it is likely to be listed before or during the period of license renewal.

Vegetation management techniques used on the Millstone site and associated transmission line corridors maintain the early successional habitat types that the New England cottontail requires. The CTDEP reviews all ROW management plans to assure protection of threatened and endangered species. CL&P personnel work closely with maintenance crews to ensure that treatments are implemented properly. The staff has determined that with implementation of current management procedures and safeguards, continued operation of Millstone over the 20-year license renewal term may affect, but is not likely to adversely affect, the New England cottontail.

Small Whorled Pogonia (*Isotria medeoloides*)

The small whorled pogonia is Federally listed as threatened. This species occurs in isolated populations throughout the eastern United States. In Connecticut it is reported to occur in New London, Middlesex, Tolland, Hartford, and New Haven counties. New England populations of this orchid are found almost exclusively on acidic, well drained, fragipan (a subsurface impermiable layer) soils (NatureServe 2004). Common plant associates include red maple, eastern hemlock (*Tsuga canadensis*), paper birch (*Betula papyrifera*), northern red oak (*Quercus rubra*), eastern white pine (*Pinus strobus*), and American beech (*Fagus grandifolia*). Isotria populations are found in second growth and mature forests. The major threats to this species are habitat destruction through development and forestry.

Habitat for the small whorled pogonia may exist at the Millstone site or along associated transmission line ROWs. The Millstone site is covered by glacial soils (Dominion 2004a) which can have subsurface fragipan layers. Some of the common plant associates are found on the site (red maple, American beech). This plant has been recorded in the towns of Lyme and

Glastonbury, Connecticut but is not known to currently occur at these sites (NRC 1984). ROW maintenance activities should not greatly impact the small whorled pogonia as long as soil disturbance is minimized. Mowing of some portions of the transmission line ROWs is only conducted between the months of November and April to minimize impacts to wet soils (NU 2004).

The CTDEP reviews all ROW management plans to assure protection of threatened and endangered species. CL&P personnel work closely with maintenance crews to ensure that treatments are implemented properly. The staff has determined that with implementation of current management procedures and safeguards, continued operation of Millstone over the 20-year license renewal term may affect, but is not likely to adversely affect, the small whorled pogonia.

5.0 Conclusions

The staff identified six terrestrial and eight aquatic species listed as threatened, endangered, or proposed for candidate under the Endangered Species Act that have a reasonable potential to occur in the vicinity of Millstone, along associated transmission line ROWs, or in adjacent areas of Long Island Sound. The Millstone site and the transmission line ROWs may cross or contain suitable habitat for some of these species. Given this possibility, Northeast Utilities has designed and implemented maintenance procedures for its transmission line rights-of-way that protect listed species and their habitats.

The staff has determined that license renewal for Millstone would have no effect on the Puritan tiger beetle, shortnose sturgeon, loggerhead, green turtle, leatherback turtle, Kemp's ridley, piping plover, right whale, finback whale, and the humpback whale. License renewal may affect, but is not likely to adversely affect, the bald eagle, the roseate tern, the New England cottontail, and the small whorled pogonia.

6.0 References

Atomic Energy Act of 1954. 42 United States Code (USC) 2011, et seq.

Battelle Duxbury Operations (Battelle). 1999. *Draft Final Data Report for Thames River Vibratory Core Sampling at Uncasville*, CT. Duxbury, Maryland.

Connecticut Department of Environmental Protection (CTDEP). 2002. Letter from Water Management Bureau, Robert L. Smith, Chief, to Scott M. Cullen, STAR Foundation.

Connecticut Department of Environmental Protection (CTDEP). 2004. *Wildlife in Connecticut, Endangered and Threatened Species Series*. Accessed at: http://dep.state.ct.us/burnatr/wildlife/factshts on April 27 through Sept 21, 2004.

Dominion Nuclear Connecticut (Dominion). 2004a. Applicants Environmental Report-Operating License Renewal Stage, Millstone Power Station Units 2 and 3, Dominion Nuclear Connecticut. Docket No. 50-336, License No. DPR-65; Docket No. 50-423, License No. NPF-49. January 2004.

Dominion Nuclear Connecticut (Dominion). 2004b. *Annual Report 2003. Monitoring the Marine Environment of Long Island Sound at Millstone Power Station, Waterford, Connecticut.* Millstone Environmental Laboratory, Dominion Nuclear Connecticut. April 2004.

Goodie, T.J., M.A. Gregonis, and H.J. Kilpatrick. 2004. *Preliminary assessment of New England cottontail (Sylvilagus transitionalis) and eastern cottontail (Sylvilagus floridanus) distribution in Connecticut, October 2000-March 2004.* Connecticut Department of Environmental Protection.

Keser, M., J.T. Swenarton, J.M. Vozarik, and J.F. Foertch. 2003. *Decline in eelgrass (Zostera marina L.) in Long Island Sound near Millstone Point, Connecticut (USA) unrelated to thremal input.* Journal of Sea Research 49, 11-26.

Long, E.R., L.S. Field, D.P. MacDonald. 1998. *Predicting toxlity in marine sediments with numerical sediment quality guidelines.* Environmental Toxicology and Chemistry 17(4):714-727.

Mecray, E.L., M.R. Buchholtz ten Brink, and S. Shah. 2004. *Metal Distributions in the surface sediments of Long Island Sound.* U.S. Geological Survey (USGS), USGS OFR 00-304: Chapter 6. http://pubs.usgs.gov/of/of00-304/htmldocs/chap06/index.htm#RESULTS

National Marine Fisheries Service (NMFS). 2002. *U.S. Atlantic and Gulf of Mexico Marine Mammal Stock Assessments - 2002.* Accessed at: http://www.nmfs.noaa.gov/prot_res/PR2/Stock_Assessment_Program/sars.html#Overview. on June 24, 2004.

National Marine Fisheries Service (NMFS). 2004a. Letter from National Marine Fisheries Service, providing a response to the March 17, 2004 NRC staff letter requesting information regarding threatened and endangered species in the vicinity of the MPS, Units 2 and 3. (Accession No. ML042810294)

National Marine Fisheries Service (NMFS). 2004b. *Loggerhead Sea Turtles (Caretta caretta).* Accessed at: http://www.nmfs.noaa.gov/prot_res/species/turtles/loggerhead.html. on June 24, 2004.

National Marine Fisheries Service (NMFS). 2004c. *Green Sea Turtle (Chelonia mydas)* Accessed at: http://www.nmfs.noaa.gov/prot_res/species/turtles/green.html. on June 24, 2004.

National Marine Fisheries Service (NMFS). 2004d. *Hawksbill Sea Turtle (Eretmochelys imbricata).* Accessed at http://www.nmfs.noaa.gov/prot_res/species/turtles/hawksbill.html. on June 24, 2004.

National Marine Fisheries Service (NMFS). 2004e. *Kemp's Ridley Turtle (Lepidochelys kempli)* Accessed at: http://www.nmfs.noaa.gov/prot_res/species/turtles/kemps.html. on June 24, 2004.

NatureServe 2004. *NatureServe Explorer: an Online Encyclopedia of Life.* Version 3.1, NatureServe, Arlington, Virginia. Accessed at: http://www.natureserve.org. on September 17-21, 2004

Northeast Utilities (NU). 2004. *Section III, Technical Requirements. Specification for Rights-of-Way Vegetation Management.*

U.S. Environmental Protection Agency (EPA). 2004a. *Ecoregions of Massachusetts, Connecticut, and Rhode Island.* Accessed at: http://www.epa.gov/wed/pages/ecoregions/mactri_eco.htm on September 21, 2004.

U.S. Environmental Protection Agency (EPA). 2004b. *Long Island Sound, An Estuary of National Significance.* U.S. Environmental Protection Agency, Region 1: New England. Access at: http://www.epa.gov/region01/eco/lis/ccmp.intro.html. on June 24, 2004.

U.S. Fish and Wildlife Service (FWS). 1999. Title 50- Wildlife and Fisheries, Part 17- Endangered and Threatened Wildlife and Plants, Subpart B- Lists. U.S. Fish and Wildlife Service, December 21, 1999.

U.S. Fish and Wildlife Service (FWS). 2001. *Fish Facts - Shortnose Sturgeon.* Connecticut River Coordinator's Office website. Accessed at: http://www.fws.gov/r5crc/fish/zf_acbr.html. on June 24, 2004.

U.S. Fish and Wildlife Service (FWS). 2004a. Letter from U.S. Fish and Wildlife Service, providing a response to the March 18, 2004 NRC staff letter requesting information regarding threatened and endangered species in the vicinity of the MPS, Units 2 and 3. (Accession No. ML041190230)

U.S. Fish and Wildlife Service (FWS). 2004b. *Species Information, Threatened and Endangered Animals and Plants website.* Accessed at http://endangered.fws.gov/wildlife.html. Accessed August 2, 2004 through September 23, 2004.

U.S. Nuclear Regulatory Commission (NRC). 1984. *Final Environmental Statement related to operation of Millstone Nuclear Power Station, Unit No. 3.* Docket No. 50-423. NUREG-1064. Washington, D.C.

U.S. Nuclear Regulatory Commission (NRC). 2004a. NRC staff letter to Ms. Patricia A. Kurkul, Regional Administrator, National Marine Fisheries Service (NOAA Fisheries), Request for List of Protected Species Within the Area Under Evaluation for the MPS, Units 2 and 3, License Renewal. (Accession No. ML040780653)

U.S. Nuclear Regulatory Commission (NRC). 2004b. NRC staff letter to Mr. Marvin Moriarty, Regional Administrator, National Marine Fisheries Service (NOAA Fisheries), Request for List of Protected Species Within the Area Under Evaluation for the MPS, Units 2 and 3, License Renewal. (Accession No. ML040770760)

Millstone Power Station, Units 2 and 3

cc:
Lillian M. Cuoco, Esquire
Senior Counsel
Dominion Resources Services, Inc.
Rope Ferry Road
Waterford, CT 06385

Edward L. Wilds, Jr., Ph.D.
Director, Division of Radiation
Department of Environmental Protection
79 Elm Street
Hartford, CT 06106-5127

Regional Administrator, Region I
U.S. Nuclear Regulatory Commission
475 Allendale Road
King of Prussia, PA 19406

Paul Eccard
First Selectman
Town of Waterford
15 Rope Ferry Road
Waterford, CT 06385-2886

Mr. P. J. Parulis
Manager - Nuclear Oversight
Dominion Nuclear Connecticut, Inc.
Rope Ferry Road
Waterford, CT 06385

Mr. W. R. Matthews
Senior Vice President - Nuclear Operations
Dominion Nuclear Connecticut, Inc.
Rope Ferry Road
Waterford, CT 06385

Mr. John Markowicz
Co-Chair
Nuclear Energy Advisory Council
9 Susan Terrace
Waterford, CT 06385

Mr. Evan W. Woollacott
Co-Chair
Nuclear Energy Advisory Council
128 Terry's Plain Road
Simsbury, CT 06070

Senior Resident Inspector
Millstone Power Station
c/o U.S. Nuclear Regulatory Commission
P. O. Box 513
Niantic, CT 06357

Mr. G. D. Hicks
Director - Nuclear Station Safety
and Licensing
Dominion Nuclear Connecticut, Inc.
Rope Ferry Road
Waterford, CT 06385

Ms. Nancy Burton
147 Cross Highway
Redding Ridge, CT 00870

Mr. William D. Meinert
Nuclear Engineer
Massachusetts Municipal Wholesale
Electric Company
Moody Street
P.O. Box 426
Ludlow, MA 01056

Mr. J. Alan Price
Site Vice President
Dominion Nuclear Connecticut, Inc.
Rope Ferry Road
Waterford, CT 06385

Mr. Chris L. Funderburk
Director, Nuclear Licensing and
Operations Support
Dominion Resources Services, Inc.
Innsbrook Technical Center
5000 Dominion Boulevard
Glen Allen, VA 23060-6711

Mr. David W. Dodson
Licensing Supervisor
Dominion Nuclear Connecticut, Inc.
Rope Ferry Road
Waterford, CT 06385

Millstone Power Station, Units 2 and 3

cc:
Mr. S. E. Scace
Assistant to the Site Vice President
Dominion Nuclear Connecticut, Inc.
Rope Ferry Road
Waterford, CT 06385

Mr. M. J. Wilson
Manager - Nuclear Training
Dominion Nuclear Connecticut, Inc.
Rope Ferry Road
Waterford, CT 06385

Mr. A. J. Jordan, Jr.
Director - Nuclear Engineering
Dominion Nuclear Connecticut, Inc.
Rope Ferry Road
Waterford, CT 06385

Mr. S. P. Sarver
Director - Nuclear Station Operations
and Maintenance
Dominion Nuclear Connecticut, Inc.
Rope Ferry Road
Waterford, CT 06385

Mr. Charles Brinkman, Director
Washington Operations Nuclear Services
Westinghouse Electric Company
12300 Twinbrook Pkwy, Suite 330
Rockville, MD 20852

Mr. David A. Christian
Sr. Vice President and Chief Nuclear Officer
Dominion Nuclear Connecticut, Inc.
Innsbrook Technical Center
5000 Dominion Boulevard
Glen Allen, VA 23060-6711

Mr. Fred Emerson
Nuclear Energy Institute
1776 I Street, NW, Suite 400
Washington, DC 20006-3708

Ms. Roslyn Rubenstein, Director
Waterford Public Library
49 Rope Ferry Road
Waterford, CT 06385-2899

Mildred Hodge, Director
Three Rivers Community College
Thames River Campus Library
574 New London Turnpike
Norwich, CT 06360

Ralph Bunge
NRC Proceedings Representative
for Waterford, CT
510 Carr Ave
Rockville, MD 20850

Thomas V. Wagner, AICP
Planning Director
Town of Waterford
15 Rope Ferry Road
Waterford, CT 06385

David R. Lewis
Shaw Pittman, LLC
2300 N Street, NW
Washington, DC 20037

Mr. William D. Corbin
Director - Nuclear Projects Department
Innsbrook Technical Center
5000 Dominion Boulevard
Glen Allen, VA 23060-6711

Mr. William R. Watson, Jr.
Supervisor - License Renewal Project
Building 475/5
Millstone Power Station
Rope Ferry Road
Waterford, CT 06385

Millstone Power Station, Units 2 and 3

cc:
Robert A. Avena
Town Attorney for Waterford, CT
Kepple, Morgan & Avena, P.C.
Box 3A Anguilla Park
20 South Anguilla Road
Pawcatuck, CT 06379

Michael J. Amaral
U.S. Fish and Wildlife Service
New England Field Office
70 Commercial Street, Suite 300
Concord, NH 03301-5087

United States Department of the Interior

FISH AND WILDLIFE SERVICE

New England Field Office
70 Commercial Street, Suite 300
Concord, New Hampshire 03301-5087

January 5, 2005

Pao-Tsin Kuo
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001

Dear Mr. Kuo:

We are in receipt of your biological assessment and request for concurrence for the proposed renewal of the Millstone Power Station, Units 2 and 3, Waterford, Connecticut. The following comments are provided in accordance with Section 7 of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531-1543).

Based on information currently available to us, and the information contained within the biological assessment, the U.S. Fish and Wildlife Service concurs that the proposed action will have no effect on threatened puritan tiger beetles and piping plovers. We also concur that the proposed license is not likely to adversely affect the bald eagle, roseate tern and small whorled pogonia.

Further consultation with us under Section 7 of the Endangered Species Act is not required. This concludes our review of listed species and critical habitat in the project location and environs referenced above. No further Endangered Species Act coordination of this type is necessary for a period of one year from the date of this letter, unless additional information on listed or proposed species becomes available.

Thank you for your coordination. Please contact us at 603-223-2541 if we can be of further assistance. In the future, in order to expedite your reply, please direct any inquiries of this nature to this office at the above address.

Sincerely yours,

Michael J. Amaral

Michael J. Amaral
Endangered Species Specialist
New England Field Office

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
NORTHEAST REGION
One Blackburn Drive
Gloucester, MA 01930-2298

JAN 12 2005

Pao-Tsin Kuo
Program Director
License Renewal and Environmental Impacts
Division of Regulatory Improvement Programs
Office of Nuclear Reactor Regulation
US Nuclear Regulatory Commission
MS T-11 F1
Washington, DC 20555

Re: Millstone Power Station Units 2 and 3 license renewal

Dear Mr. Kuo,

This is in response to your letter dated November 9, 2004 regarding the proposed renewal of the operating licenses for Units 2 and 3 of the Millstone Power Station for a period of 20 years. The Millstone Power Station is located on the north shore of Long Island Sound in the town of Waterford, CT. Included with your letter was a Biological Assessment (BA) which evaluates whether the proposed license renewal of the Millstone Power Station would have an adverse affect on listed species in Long Island Sound. The U.S. Nuclear Regulatory Commission (NRC) has made a preliminary determination that the proposed action will have no effect on listed species under the jurisdiction of the National Marine Fisheries Service (NOAA Fisheries).

In a letter dated September 21, 2004, NOAA Fisheries provided the NRC with a list of federally threatened and endangered species that are known to be seasonally present in the waters of Long Island Sound. Four species of federally threatened or endangered sea turtles may be found seasonally in the waters of Long Island Sound. Sea turtles are expected to be in the vicinity of the project area in warmer months, typically from May 1 to November 15. The sea turtles in Long Island waters are typically small juveniles with the most abundant being the federally threatened loggerhead (*Caretta caretta*) followed by the federally endangered Kemp's ridley (*Lepidochelys kempi*). The waters of Long Island Sound have also been found to be warm enough to support federally endangered green sea turtles (*Chelonia mydas*) from June through October. The three species of chelonid turtles found in the Northeast remain very briefly in open ocean waters, spending most of their time during the summer months in harbors and estuarine waters, such as those found in

Long Island Sound. Federally endangered leatherback sea turtles (*Dermochelys coriacea*) may be found in the waters of Long Island Sound during the warmer months as well.

Three species of federally endangered whales, North Atlantic right whales (*Eubalaena glacialis*), humpback whales (*Megaptera novaeangliae*), and fin whales (*Balaenoptera physalus*), may also be found seasonally in Northeast waters, although it rare that these species will travel into Long Island Sound. Federally endangered shortnose sturgeon (*Acipenser brevirostrum*) are know to occur in the Connecticut River which flows into Long Island Sound approximately 10 miles east of the Millstone site; however, shortnose sturgeon are not known to participate in coastal migrations and no shortnose sturgeon are likely to occur near the project site.

The entrainment and impingement of sea turtles has been documented at several nuclear power plants on the East Coast. The Millstone system withdraws water from Long Island Sound through intakes. Water withdrawn from Long Island Sound is filtered through trash and debris screens at a rate of 0.2 m/s^2. The debris screens are an effective mechanism to reduce the likelihood that aquatic organisms, including turtles, will be impinged or entrained on the intakes. The Millstone operators have been monitoring the intakes for over 20 years and no sea turtles have been documented to be impinged or entrained during that time. Based on the size of the screens, the rate of intake and the lack of sea turtle impingements or entrainments in the past, it is unlikely that sea turtles will be affected by the intakes through the term of the new license.

Water taken into the plant is pumped through a turbine condenser cooling system which causes the water temperature to increase. The heated water then surface discharges through a former granite quarry and flows out two cuts excavated from the bedrock into Long Island Sound. At full discharge flow the water temperature will have increased 9 to 14° C from its intake temperature. The National Pollutant Discharge Elimination System (NPDES) permit for the Millstone Power Station limits the discharge temperature to 40° C and limits the maximum increase in water temperature from intake to discharge to 18° C. Based on the volume of water in the discharge area, the ability for sea turtles to avoid the area of heated water, and the known tolerance of sea turtles to tropical water temperatures, it is unlikely that sea turtles will be affected by the discharge of heated water into Long Island Sound.

Based on the analysis above, NOAA Fisheries is able to concur with the NRC's determination that this project will have no effect on shortnose sturgeon, fin whales, humpback whales, or right whales. NOAA Fisheries is not able to concur with a no effect determination for the four species of sea turtles; however, based on the assessment above, it has been determined that the proposed action is not likely to adversely affect sea turtles. Therefore, no further consultation pursuant to section 7 of the ESA is required. Should project plans change or new information become

available that changes the basis for this determination, consultation should be reinitiated. Should you have any questions about these comments, please contact Sara McNulty at (978) 281-9328 ext. 6520.

Sincerely,

for Patricia A. Kurkul
Regional Administrator

Cc: Scida, F/NER3
Williams, GCNE
Rusanowsky, F/NER4

File code: Sec. 7, NRC Millstone Power Station

Appendix F

GEIS Environmental Issues Not Applicable to Millstone Power Station, Units 2 and 3

Appendix F

GEIS Environmental Issues Not Applicable to Millstone Power Station, Units 2 and 3

Table F-1 lists those environmental issues listed in the *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* (GEIS) (NRC 1996; 1999)[a] and 10 Code of Federal Regulations (CFR) Part 51, Subpart A, Appendix B, Table B-1, that are not applicable to Millstone Power Station, Units 2 and 3, because of plant or site characteristics.

Table F-1. GEIS Environmental Issues Not Applicable to Millstone Power Station, Units 2 and 3

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	Category	GEIS Sections	Comment
SURFACE WATER QUALITY, HYDROLOGY, AND USE (FOR ALL PLANTS)			
Altered thermal stratification of lakes	1	4.2.1.2.3 4.4.2.2	Millstone does not discharge into a lake.
Temperature effects on sediment transport capacity	1	4.2.1.2.3 4.4.2.2	Millstone does not discharge into a small river.
Eutrophication	1	4.2.1.2.3 4.4.2.2	Millstone does not discharge into a lake.
Water-use conflicts (plants with cooling ponds or cooling towers using makeup water from a small river with low flow)	2	4.3.2.1 4.4.2.1	The Millstone cooling system does not use make-up water from a small river with low flow.
AQUATIC ECOLOGY (FOR ALL PLANTS)			
Premature emergence of aquatic insects	1	4.2.2.1.7 4.4.3	Aquatic insects are only present in freshwater environments.
AQUATIC ECOLOGY (FOR PLANTS WITH COOLING TOWER BASED HEAT DISSIPATION SYSTEMS)			
Entrainment of fish and shellfish in early life stages	1	4.3.3	This issue is related to heat-dissipation systems that are not installed at Millstone.
Impingement of fish and shellfish	1	4.3.3	This issue is related to heat-dissipation systems that are not installed at Millstone.

(a) The GEIS was originally issued in 1996. Addendum 1 to the GEIS was issued in 1999. Hereafter, all references to the "GEIS" include the GEIS and its Addendum 1.

Table F-1. (contd)

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	Category	GEIS Sections	Comment
AQUATIC ECOLOGY (FOR PLANTS WITH COOLING TOWER BASED HEAT DISSIPATION SYSTEMS)			
Heat shock	1	4.3.3	This issue is related to heat-dissipation systems that are not installed at Millstone.
GROUND-WATER USE AND QUALITY			
Ground-water use conflicts (potable and service water, and dewatering; plants that use >100 gpm)	2	4.8.1.1 4.8.2.1	Millstone uses <100 gpm of groundwater.
Ground-water use conflicts (plants using cooling towers withdrawing makeup water from a small river)	2	4.8.1.3 4.4.2.1	This issue is related to heat-dissipation systems that are not installed at Millstone.
Ground-water use conflicts (Ranney wells)	2	4.8.1.4	Millstone does not have or use Ranney wells.
Ground-water quality degradation (Ranney wells)	1	4.8.2.2	Millstone does not have or use Ranney wells.
Ground-water quality degradation (cooling ponds in salt marshes)	1	4.8.3	Millstone does not use cooling ponds.
Ground-water quality degradation (cooling ponds at inland sites)	2	4.8.3	Millstone is not located at an inland site.
TERRESTRIAL RESOURCES			
Cooling tower impacts on crops and ornamental vegetation	1	4.3.4	This issue is related to a heat-dissipation system that is not installed at Millstone.
Cooling tower impacts on native plants	1	4.3.5.1	This issue is related to a heat-dissipation system that is not installed at Millstone.
Bird collisions with cooling towers	1	4.3.5.2	This issue is related to a heat-dissipation system that is not installed at Millstone.
Cooling pond impacts on terrestrial resources	1	4.4.4	This issue is related to a heat-dissipation system that is not installed at Millstone.

Table F-1. (contd)

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	Category	GEIS Sections	Comment
	HUMAN HEALTH		
Microbial organisms (occupational health)(plants with cooling towers)	1	4.3.6	This issue is related to a heat-dissipation system that is not installed at Millstone.
Microbial organisms (public health) (plants using lakes or canals, or cooling towers or cooling ponds that discharge to a small river).	2	4.3.6	This issue is related to a heat-dissipation system that is not installed at Millstone.

F.1 References

10 CFR Part 51. Code of Federal Regulations, Title 10, *Energy*, Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions."

U.S. Nuclear Regulatory Commission (NRC). 1996. *Generic Environmental Impact Statement for License Renewal of Nuclear Plants.* NUREG-1437, Volumes 1 and 2, Washington, D.C.

U.S. Nuclear Regulatory Commission (NRC). 1999. *Generic Environmental Impact Statement for License Renewal of Nuclear Plants: Main Report, Section 6.3, Transportation, Table 9.1, Summary of findings on NEPA issues for license renewal of nuclear power plants, Final Report.* NUREG-1437, Volume 1, Addendum 1, Washington, D.C.

Appendix G

Connecticut State-Listed Terrestrial Species for Hartford, Middlesex, New London, and Tolland Counties with the Potential to Occur at the Millstone Site or Along Associated Transmission Line Rights-of-Way

Appendix G

Connecticut State-Listed Terrestrial Species for Hartford, Middlesex, New London, and Tolland Counties with the Potential to Occur at the Millstone Site or Along Associated Transmission Line Rights-of-Way

Table G-1. Connecticut State-Listed Terrestrial Species for Hartford, Middlesex, New London, and Tolland Counties with the Potential to Occur at the Millstone Site or Along Associated Transmission Line Rights-of-Way

Scientific Name	Common Name	State Status[a]
	AMPHIBIANS	
Ambystoma jeffersonianum	Jefferson salamander	SC
Ambystoma laterale	blue-spotted salamander	T
Gyrinophilus porphyriticus	northern spring salamander	T
Rana pipiens	northern leopard frog	SC
Scaphiopus holbrookii	eastern spadefoot	E
	BIRDS	
Aegolius acadius	northern saw-whet owl	SC
Ammodramus caudacutus	saltmarsh sharp-tailed sparrow	SC*
Ammodramus henslowii	Henslow's sparrow	SC*
Ammodramus maritimus	seaside sparrow	SC
Ammodramus savannarum	grasshopper sparrow	E
Anas discors	blue-winged teal	T
Asio flammeus	short-eared owl	T
Asio otus	long-eared owl	E
Bartramia longicauda	upland sandpiper	E
Botaurus lentiginosus	American bittern	E
Caprimulgus vociferus	whip-poor-will	SC
Cistothorus platensis	sedge wren	E
Corvus corax	common raven	SC

Table G-1. (contd)

Scientific Name	Common Name	State Status[a]
	BIRDS	
Egretta caerulea	little blue heron	SC
Empidonax alnorum	alder flycatcher	SC
Eremophila alpestris	horned lark	E
Falco peregrinus	peregrine falcon	E
Falco sparverius	American kestrel	T
Gallinula chloropus	common moorhen	E
Gavia immer	common loon	SC
Haematopus palliatus	American oystercatcher	SC
Ixobrychus exilis	least bittern	T
Laterallus jamaicensis	black rail	E
Melanerpes erythrocephalus	red-headed woodpecker	E
Parula americana	northern parula	SC
Passerculus sandwichensis	savannah sparrow	SC
Passerculus sandwichensis ssp. *princeps*	Ipswich sparrow	SC
Plegadis falcinellus	glossy ibis	SC
Pooecetes gramineus	vesper sparrow	E
Progne subis	purple martin	T
Rallus elegans	king rail	E
Sterna hirundo	common tern	SC
Sturnella magna	eastern meadowlark	SC
Toxostoma rufum	brown thrasher	SC
Tyto alba	barn owl	E
Vermivora chrysoptera	golden-winged warbler	E
	INVERTEBRATES	
Acronicta lanceolaria	a noctuid moth	SC*
Apamea burgessi	a noctuid moth	SC
Apodrepanulatrix liberiaria	New Jersey tea inchworm	SC

Table G-1. (contd)

Scientific Name	Common Name	State Status[a]
	INVERTEBRATES	
Callophrys henrici	Henry's elfin	SC
Callophrys irus	frosted elfin	T
Calopteryx dimidiata	sparkling jewelwing	SC
Catocala pretiosa	precious underwing moth	SC*
Chaetaglaea cerata	a noctuid moth	SC*
Cicindela formosa ssp. *generosa*	pine barrens tiger beetle	SC
Cicindela hirticollis	beach-dune tiger beetle	SC
Cicindela lepida	dune ghost tiger beetle	E
Cicindela purpurea	tiger beetle	SC*
Cicindela tranquebarica	dark-bellied tiger beetle	SC
Citheronia regalis	regal moth	SC*
Cordulegaster erronea	tiger spiketail	T
Cucullia speyeri	a noctuid moth	SC
Eacles imperialis ssp. *imperialis*	imperial moth	SC*
Enallagma doubldayi	Atlantic bluet	SC
Enallagma minusculum	little bluet	SC
Enallagma pictum	scarlet bluet	SC
Erynnis brizo	sleepy duskywing	T
Erynnis lucilius	columbine duskywing	E
Erynnis martialis	mottled duskywing	SC*
Erynnis persius ssp. *persius*	persius duskywing	E
Eucoptocnemis fimbriaris	a noctuid moth	SC
Euphyes bimacula	two-spotted skipper	T
Exyra rolandiana	pitcher plant moth	SC
Geopinus incrassatus	a ground beetle	SC
Gomphus adelphus	mustached clubtail dragonfly	T

Table G-1. (contd)

Scientific Name	Common Name	State Status[a]
	INVERTEBRATES	
Gomphus descriptus	harpoon clubtail dragonfly	T
Gomphus fraternus	midland clubtail dragonfly	T
Gomphus vastus	cobra clubtail dragonfly	SC
Gomphus ventricosus	skillet clubtail dragonfly	SC
Grammia phyllira	phyllira tiger moth	SC*
Hetaerina americana	American rubyspot	SC
Hemileuca maia maia	buckmoth	E
Hybomitra frosti	a horse fly	T
Hybomitra typhus	a horse fly	SC
Ladona deplanata	blue corporal dragonfly	SC
Lepipolys perscripta	scribbled sallow	SC
Leptophlebia bradleyi	a mayfly	SC
Leucorrhinia glacialis	crimson-winged whiteface dragonfly	T
Lycaena epixanthe	bog copper	SC
Lycaena hyllus	bronze copper	SC
Merycomyia whitneyi	tabanid fly	SC
Mitoura hesseli	Hessel's hairstreak	E
Papaipema duovata	seaside goldenrod stem borer	SC
Paraleptophlebia assimilis	a mayfly	SC
Pomatiopsis lapidaria	slender walker	SC
Psectraglaea carnosa	pink sallow	T
Schinia spinosae	a noctuid moth	SC
Speyeria idalia	regal fritillary	SC*
Sphodros niger	purse-web spider	SC
Stylurus amnicola	riverine clubtail dragonfly	T
Tabanus fulvicallus	horse fly	SC
Williamsonia lintneri	banded bog skimmer	E

Table G-1. (contd)

Scientific Name	Common Name	State Status[a]
	INVERTEBRATES	
Zale curema	a noctuid moth	SC
Zale obliqua	a noctuid moth	SC
Zale submedia	a noctuid moth	T
	MAMMALS	
Cryptotis parva	least shrew	E
Lasiurus borealis	eastern red bat	SC
Lasiurus cinereus	hoary bat	SC
Puma concolor ssp. *couguar*	eastern cougar	SC*
Synaptomys cooperi	southern bog lemming	SC
	PLANTS	
Acalypha virginica	Virginia copperleaf	SC
Agalinis acuta	sandplain gerardia	E
Agastache nepetoides	yellow giant hyssop	SC*
Agastache scrophularifolia	purple giant hyssop	E
Alopecurus aequalis	orange foxtail	T
Amelanchier sanguinea	roundleaf shadbush	E
Andromeda glaucophylla	bog rosemary	T
Angelica lucida	sea-coast angelica	E
Angelica venenosa	hairy angelica	SC*
Aplectrum hyemale	puttyroot	SC*
Arenaria glabra	smooth mountain sandwort	T
Arenaria macrophylla	large-leaved sandwort	E
Arethusa bulbosa	arethusa	SC*
Aristida longespica	needlegrass	SC
Aristida purpurascens	arrowfeather	SC
Aristolochia serpentaria	Virginia snakeroot	SC

Table G-1. (contd)

Scientific Name	Common Name	State Status[a]
	PLANTS	
Asclepias purpurascens	purple milkweed	SC
Asclepias variegata	white milkweed	SC*
Asplenium montanum	mountain spleenwort	T
Asplenium ruta-muraria	wallrue spleenwort	T
Aster nemoralis	bog aster	E
Aster prenanthoides	crooked-stem aster	SC*
Aster radula	rough-leaved aster	E
Aster spectabilis	showy aster	T
Aster X blakei	Blake's aster	E
Aster X herveyi	Hervey's aster	SC
Bidens eatonii	Eaton's beggar-ticks	T
Blephilia ciliata	downy woodmint	SC*
Blephilia hirsuta	hairy woodmint	SC*
Calystegia spithamaea	low bindweed	SC*
Cardamine longii	Long's bitter-cress	SC*
Carex aestivalis	summer sedge	SC
Carex alata	broadwing sedge	E
Carex barrattii	Barratt's sedge	E
Carex bushii	sedge	SC
Carex buxbaumii	brown bog sedge	E
Carex collinsii	Collins' sedge	SC*
Carex crawfordii	Crawford sedge	SC*
Carex cumulata	clustered sedge	T
Carex davisii	Davis' sedge	E
Cares exilis	sedge	E
Carex hitchcockiana	Hitchcock's sedge	SC
Carex limosa	sedge	E

Table G-1. (contd)

Scientific Name	Common Name	State Status[a]
	PLANTS	
Carex lupuliformis	false hop sedge	SC
Carex nigromarginata	black-edge sedge	SC*
Carex oligocarpa	eastern few-fruit sedge	SC
Carex oligosperma	few-seeded sedge	SC*
Carex polymorpha	variable sedge	E
Carex pseudocyperus	cyperus-like sedge	E
Carex squarrosa	sedge	SC
Carex sterilis	dioecious sedge	SC
Carex tuckermanii	Tuckerman sedge	SC
Carex typhina	sedge	SC
Castilleja coccinea	indian paintbrush	E
Cercis canadensis	eastern redbud	SC*
Chamaelirium luteum	devil's-bit	E
Chenopodium rubrum	coast blite	SC*
Chrysopsis falcata	sickle-leaf golden-aster	E
Cirsium horridulum	yellow thistle	E
Coeloglossum viride var. *virescens*	long-bracted green orchid	SC
Corollorhiza trifida	early coralroot	SC
Corydalis flavula	yellow corydalis	T
Crassula aquatica	pygmyweed	E
Cuphea viscosissima	blue waxweed	SC*
Cuscuta coryli	hazel dodder	SC*
Cypripedium parviflorum	yellow lady's-slipper	SC
Cypripedium reginae	showy lady's slipper	E
Deschampsia caespitosa	tufted hairygrass	SC
Desmodium glabellum	Dillen tick-trefoil	SC

Table G-1. (contd)

Scientific Name	Common Name	State Status[a]
	PLANTS	
Desmodium humifusum	trailing tick-trefoil	SC
Desmodium sessilifolium	sessile-leaf tick-trefoil	SC*
Dicentra canadensis	squirrel-corn	T
Diplachne maritima	saltpond grass	E
Diplazium pycnocarpon	narrow-leaved glade fern	E
Draba reptans	whitlow-grass	SC
Dryopteris goldiana	Goldie's fern	SC
Echinodorus tenellus var. *parvulus*	bur-head	E
Eleocharis equisetoides	horse-tail spikerush	E
Eleocharis microcarpa var. *filiculmis*	spike-rush	SC*
Eleocharis quadrangulata var. *crassior*	spike-rush	E
Elymus trachycaulus var. *subsecundus*	slender wheatgrass	SC
Elymus wiegandii	Wiegand's wild rice	SC
Equisetum palustre	marsh horsetail	SC*
Equisetum pratense	meadow horsetail	E
Eriocarpon parkeri	Parker's pipewort	E
Eriophorum vaginatum var. *spissum*	hare's tail	T
Eupatorium album	white thoroughwort	E
Eupatorium aromaticum	small white snakeroot	E
Gaultheria hispidula	creeping snowberry	T
Gaylussacia dumosa var. *bigeloviana*	dwarf hucklberry	T
Geranium bicknellii	Bicknell northern crane's-bill	SC*
Gnaphalium purpureum	purple cudweed	SC*
Goodyera repens var. *ophioides*	dwarf rattlesnake plantain	SC*
Helianthemum propinquum	low frostweed	T
Hemicarpha micrantha	dwarf bulrush	E
Hottonia inflata	featherfoil	SC

Table G-1. (contd)

Scientific Name	Common Name	State Status[a]
	PLANTS	
Houstonia longifolia	longleaf bluet	E
Hudsonia ericoides	golden-heather	E
Hudsonia tomentosa	false beach-heather	SC
Hydrastis canadensis	golden-seal	E
Hydrocotyle umbellata	water pennywort	E
Hydrocotyle verticillata	whorled pennywort	E
Hydrophyllum virginianum	Virginia waterleaf	SC
Hypericum adpressum	creeping St. John's wort	SC*
Hypericum pyramidatum	great St. John's wort	SC
Ilex glabra	ink-berry	T
Isanthus brachiatus	false pennyroyal	E
Juncus debilis	weak rush	SC*
Lachnanthes caroliana	Carolina redroot	E
Ledum groenlandica	Labrador tea	T
Liatris scariosa var. *novae-anglica*	blazing star	SC
Ligusticum scothicum	scotch lovage	E
Lilaeopsis chinensis	lilaeopsis	SC
Limosella subulata	mudwort	SC
Linnaea borealis var. *americana*	twinflower	E
Linum intercursum	sandplain flax	SC*
Linum sulcatum	yellow flax	SC
Liparis liliifolia	lily-leaved twayblade	E
Liquidambar styraciflua	sweet gum	SC
Ludwigia polycarpa	many-fruit false-loosestrife	SC*
Ludwigia sphaerocarpa	globe-fruited false-loosestrife	E
Lycopus amplectens	clasping-leaved water-horehound	SC

Table G-1. (contd)

Scientific Name	Common Name	State Status[a]
	PLANTS	
Lygodium palmatum	climbing fern	SC
Malaxis unifolia	green adder's-mouth	E
Megalodonta beckii	water-marigold	T
Milium effusum	tall millet-grass	SC*
Mimulus alatus	winged monkey-flower	SC
Moneses uniflora	one-flower wintergreen	E
Myriophyllum pinnatum	cutleaf water-milfoil	E
Nuphar advena	large yellow pond lily	SC*
Nuphar microphylla	small yellow pond lily	SC
Nymphaea odorata var. *tuberosa*	water lily	SC*
Onosmodium viginianum	gravel-weed	E
Ophioglossum pusillum	adder's tongue	T
Opuntia humifusa	eastern prickly-pear	SC
Orontium aquaticum	golden club	SC
Oryzopsis pungens	slender mountain-ricegrass	SC
Oxalis violacea	violet wood-sorrel	SC
Panax quinquefolius	American ginseng	SC
Panicum amarum	panic grass	T
Panicum commonsianum	panic grass	SC
Panicum rigidulum var. *elongatum*	tall flat panic grass	SC*
Panicum scabriusculum	panic grass	E
Panicum xanthophysum	panic grass	SC*
Paronychia fastigiata	hairy forked chickweed	SC*
Paspalum laeve	field paspalum	E
Paspalum setaceum var. *psammophilum*	bead grass	SC*
Pedicularis lanceolata	swamp lousewort	T
Phaseolus polystachios var. *aquilonius*	wild kidney bean	SC*

Table G-1. (contd)

Scientific Name	Common Name	State Status[a]
	PLANTS	
Pinus resinosa	red pine	E
Plantago virginica	hoary plantain	SC
Platanthera blephariglottis	white-fringed orchid	T
Platanthera ciliaris	yellow-fringed orchid	T
Platanthera dilatata	tall white bog orchid	SC*
Platanthera flava	pale green orchid	SC
Platanthera hookeri	Hooker orchid	SC*
Platanthera orbiculata	large roundleaf orchid	SC*
Podostemum ceratophyllum	threadfoot	SC
Polygala cruciata	field milkwort	SC
Polygala nuttallii	Nuttall's milkwort	E
Polymnia canadensis	small-flowered leafcup	E
Populus heterophylla	swamp cottonwood	E
Potamogeton confervoides	pondweed	SC*
Potemogeton pusillus var. *gemmiparus*	capillary pondweed	E
Potamogeton vaseyi	Vasey's pondweed	E
Potentilla arguta	tall cinquefoil	SC
Prunus alleghaniensis	Alleghany plum	SC*
Puccinellia langeana ssp. *alaskana*	goose grass	SC*
Pycnanthemum clinopodioides	basil mountain-mint	E
Pyrola secunda	one-sided pyrola	SC*
Ranunculus ambigens	water-plantain spearwort	E
Ranunculus cymbalaria	seaside crowfoot	SC*
Ranunculus pensylvanicus	bristly buttercup	SC*
Ranunculus sceleratus	cursed crowfoot	SC
Rhynchospora macrostachya	beaked rush	T

Table G-1. (contd)

Scientific Name	Common Name	State Status[a]
	PLANTS	
Rhynchospora scirpoides	long-beaked baldrush	E
Ribes glandulosum	skunk currant	T
Ribes rotundifolium	wild currant	SC*
Ribes triste	swamp red currant	E
Rosa nitida	shining rose	SC
Rotala ramosior	toothcup	T
Rubus cuneifolius	sand bramble	SC
Rumex maritimus var. *fueginus*	sea-side dock	SC*
Sabatia stellaris	marsh pink	E
Sagittaria cuneata	waputo	SC*
Sagittaria subulata	arrowleaf	SC
Salix exigua	sandbar willow	T
Salix pedicellaris	bog willow	E
Salix petiolaris	slender willow	SC*
Saururus cernuus	lizard's tail	E
Scheuchzeria palustris	pod grass	E
Schizachne purpurascens	purple oat	SC
Schwalbea americana	chaffseed	SC*
Scirpus cylindricus	salt-marsh bulrush	SC
Scirpus hudsonianus	cotton bulrush	SC*
Scirpus longii	Long's bulrush	SC*
Scirpus paludosus var. *atlanticus*	bayonet grass	SC
Scirpus torreyi	Torrey's bulrush	T
Scleria pauciflora var. *caroliniana*	few-flowered nutrush	E
Scleria reticularis	reticulated nutrush	E
Scleria triglomerata	nutrush	E
Scutellaria integrifolia	hyssop skullcap	E

Table G-1. (contd)

Scientific Name	Common Name	State Status[a]
	PLANTS	
Senecio pauperculus	ragwort	E
Senna hebecarpa	wild senna	SC
Silene stellata	starry campion	SC
Smilacina trifolia	three-leaved false Solomon's-seal	T
Solidago elliottii	Elliott goldenrod	SC
Solidago rugosa var. sphagnophila	early wrinkle-leaved goldenrod	SC*
Spergularia canadensis	Canada sand-spurry	T
Spiranthes tuberosa var. *grayi*	little ladies'-tresses	SC*
Sporobolus clandestinus	rough dropseed	E
Sporobolus neglectus	small dropseed	E
Stachys hyssopifolia	hyssop-leaf hedge-nettle	E
Stachys tenuifolia	smooth hedge-nettle	SC
Stellaria borealis	northern stitchwort	SC
Streptopus amplexifolius var. *americanus*	white mandarin	T
Thuja occidentalis	northern white cedar	T
Trichomanes intricatum	Appalachian gametophyte	SC
Triosteum angustifolium	narrow-leaved horse gentian	SC*
Triphora trianthophora	nodding pogonia	SC*
Trisetum spicatum var. *molle*	spiked false oats	SC*
Utricularia fibrosa	fibrous bladderwort	SC*
Utricularia resupinata	bladderwort	E
Uvularia grandiflora	large-flowered bellwort	E
Vaccinium myrtilloides	velvetleaf blueberry	SC*
Vaccinium vitis-idea var. *minus*	mountain cranberry	SC*
Valerianella radiata var. *fernaldii*	beaked corn-salad	SC*
Verbena simplex	narrow-leaved vervain	SC*

Table G-1. (contd)

Scientific Name	Common Name	State Status[a]
	PLANTS	
Vibernum nudum	possum haw	SC*
Viola canadensis	Canada violet	SC
Viola selkirkii	great-spurred violet	SC
Vitis novae-angliae	New England grape	SC
Waldsteinia fragarioides	barren strawberry	SC
Xyris montana	northern yellow-eyed grass	T
Xyris smalliana	Small's yellow-eyed grass	E
Zizia aptera	golden alexanders	E
	REPTILES	
Clemmys insculpta	wood turtle	SC
Crotalus horridus	timber rattlesnake	E
Eumeces fasciatus	five-lined skink	T
Heterodon platirhinus	eastern hognose snake	SC
Terrapene carolina	eastern box turtle	SC
Thamnophis sauritus	eastern ribbon snake	SC

(a) E=endangered, T = threatened, SC = species of concern, (*) = believed extirpated (CTDEP 2004)

Appendix H

NRC Staff Evaluation of Severe Accident Mitigation Alternatives (SAMAs) for Millstone Power Station, Unit 2, in Support of the License Renewal Application Review

Appendix H

NRC Staff Evaluation of Severe Accident Mitigation Alternatives (SAMAs) for Millstone Power Station, Unit 2, in Support of the License Renewal Application Review

H.1 Introduction

Dominion Nuclear Connecticut, Inc. (Dominion) submitted an assessment of SAMAs for Millstone Power Station, Unit 2 (MPS2) as part of the Environmental Report (ER) (Dominion 2004a). This assessment was based on the most recent MPS2 Probabilistic Risk Assessment (PRA) available at that time, a plant-specific off-site consequence analysis performed using the MELCOR Accident Consequence Code System 2 (MACCS2) computer program, and insights from the MPS2 Individual Plant Examination (IPE) (NNECO 1993) and Individual Plant Examination of External Events (IPEEE) (NNECO 1995). In identifying and evaluating potential SAMAs, Dominion considered SAMA analyses performed for other operating plants, as well as industry and NRC documents that discuss potential plant improvements, such as NUREG-1560 (NRC 1997a). Dominion identified 196 potential SAMA candidates. This list was reduced to 44 unique SAMA candidates by eliminating SAMAs that were not applicable to MPS2 due to design differences, had already been implemented, or were related to a reactor coolant pump (RCP) seal dependency on charging pumps. Dominion assessed the costs and benefits associated with each of the remaining SAMAs and concluded in the ER that one of the candidate SAMAs evaluated would be cost-beneficial for MPS2.

Based on a review of the SAMA assessment, the NRC issued a request for additional information (RAI) to Dominion by letter dated June 22, 2004 (NRC 2004). Key questions concerned the following areas: peer reviews of the PRA, dominant risk contributors at MPS2 and the SAMAs that address these contributors, the mapping of Level 1 PRA results into the Level 2 analysis, the potential impact of external event initiators and uncertainties on the assessment results, detailed information on some specific candidate SAMAs, and consideration of additional SAMAs. Dominion submitted additional information by letter dated August 13, 2004 (Dominion 2004b) including, summaries of peer review comments and their impact on the SAMA analysis; importance measures and corresponding SAMA candidates; information regarding the Level 2 analysis; information related to the resolution of IPEEE outliers and the impact of external events in the risk analysis; an assessment of the impact of uncertainties; and additional information regarding specific SAMAs. Dominion's responses addressed the staff's concerns. As a result, Dominion identified one SAMA that is cost-beneficial, and a second SAMA that would be cost-beneficial if it can be accomplished via a severe accident management guideline, without a hardware modification.

An assessment of SAMAs for MPS2 is presented below.

H.2 Estimate of Risk for MPS2

Dominion's estimates of offsite risk at MPS2 are summarized in Section H.2.1. The summary is followed by the staff's review of Dominion's risk estimates in Section H.2.2.

H.2.1 Dominion's Risk Estimates

Two distinct analyses are combined to form the basis for the risk estimates used in the SAMA analysis: (1) the MPS2 Level 1 and 2 PRA model, which is an updated version of the IPE (NNECO 1993), and (2) a supplemental analysis of offsite consequences and economic impacts (essentially a Level 3 PRA model) developed specifically for the SAMA analysis. The identification of candidate SAMAs was based on Revision 2 of the PRA model, dated April 2001; the quantification of SAMA benefits was based on Revision 3, dated October 2002 (Dominion 2004b). The scope of the MPS2 PRA does not include external events.

The baseline core damage frequency (CDF) for the purpose of the SAMA evaluation is approximately 7.17×10^{-5} per year. The CDF is based on the risk assessment for internally initiated events. Dominion did not include the contribution to risk from external events or internal flooding within the MPS2 risk estimates; however, it did account for the potential risk reduction benefits associated with external events by increasing the estimated benefits for internal events by 30 percent. This is discussed further in Sections H.4 and H.6.2.

The breakdown of CDF by initiating event is provided in Table H-1. As shown in this table, loss of coolant accidents (LOCAs), loss of cooling water to the primary side components (COOL) including service water (SW) and reactor building closed cooling water (RBCCW), loss of DC power, and transients including anticipated transients without scram (ATWS) are dominant contributors to the CDF. LOCAs are dominated by small-break LOCAs which make up about 36 percent of the total CDF. Bypass events [i.e., steam generator tube rupture (SGTR) and interfacing systems loss of coolant accident (ISLOCA)] contribute less than 4 percent to the total internal events CDF. In response to an RAI, Dominion estimated the contribution to CDF from internal floods to be approximately 2×10^{-7} per year (Dominion 2004b).

The Level 2 PRA model is based on the original Level 2 model of the IPE (NNECO 1993). The model has been revised to reflect modified plant damage states and new release categories. These revisions were made to make the plant damage states (PDSs) and release categories consistent with those used for Millstone Power Station, Unit 3 (MPS3). The result of this analysis is a matrix that transforms the PDS frequencies to the release category frequencies. The source terms for each release category (also termed the source term category) were obtained from the results of MAAP 3.0B analyses of the dominant core damage sequences in the IPE.

Table H-1. MPS2 Core Damage Frequency

Initiating Event or Accident Class	CDF (Per Year)	% Contribution to CDF
LOCA	2.66×10^{-5}	37.1
COOL (SW+Seal LOCA+ RBCCW)[(a)]	1.44×10^{-5}	20.1
Loss of DC power	1.03×10^{-5}	14.4
ATWS	8.68×10^{-6}	12.1
Transients	4.66×10^{-6}	6.5
SGTR	2.22×10^{-6}	3.1
Station blackout (SBO)	2.15×10^{-6}	3.0
Steamline and main feed line breaks	1.72×10^{-6}	2.4
Loss of offsite power (LOOP)	8.60×10^{-7}	1.2
ISLOCA	1.43×10^{-7}	0.2
Total CDF	7.17×10^{-5}	100

(a) COOL represents the loss of cooling water to the primary side components, leading to an eventual degradation of the reactor coolant pump seal integrity.

The offsite consequences and economic impact analyses use the MACCS2 code to determine the offsite risk impacts on the surrounding environment and public. Inputs for this analysis include plant-specific and site-specific input values for core radionuclide inventory, source term and release characteristics, site meteorological data, projected population distribution within a 80 kilometer (km) (50-mile [mi]) radius for the year 2030, emergency response evacuation modeling, and economic data. The core radionuclide inventory is based on the generic pressurized water reactor (PWR) inventory provided in the MACCS2 manual, adjusted to represent the MPS2 power level of 2700 megawatts thermal (MW[t]). The magnitude of the onsite impacts (in terms of clean-up and decontamination costs and occupational dose) is based on information provided in NUREG/BR-0184 (NRC 1997b).

In the ER, Dominion estimated the dose to the population within 80 km (50 mi) of the MPS2 site to be approximately 0.174 person-sieverts (person-Sv) (17.4 person-roentgen equivalents man [person-rem]) per year. The breakdown of the total population dose by containment release mode is summarized in Table H-2. Intermediate containment failures dominate the population dose risk at MPS2, followed by SGTR and late-containment failures. Early-containment failures and ISLOCAs make relatively small contributions, each being less than 3 percent of the total. Containment isolation and basemat failures are each indicated to be zero contributors to risk. As indicated in the response to an RAI, these release modes are incorporated into other release modes with similar characteristics (Dominion 2004b).

Table H-2. Breakdown of Population Dose by Containment Release Mode (Unit 2)

Containment Release Mode	Population Dose (Person-rem[a] Per Year)	% Contribution
Intermediate failure	12.4	71
SGTR	2.5	14.4
Late failure	1.63	9.4
Early failure	0.48	3
ISLOCA	0.42	2.4
Containment isolation failure	0	0
Basemat failure	0	0
Total Population Dose	**17.4**	**100**

(a) One person-rem = 0.01 person-Sv

H.2.2 Review of Dominion's Risk Estimates

Dominion's determination of offsite risk at MPS2 is based on the following three major elements of analysis:

- the Level 1 and 2 risk models that form the bases for the 1993 IPE submittal (NNECO 1993) and the 1995 IPEEE submittal (NNECO 1995),
- the major modifications to the IPE models that have been incorporated in the MPS2 PRA, and
- the MACCS2 analyses performed to translate fission product source terms and release frequencies from the Level 2 PRA model into offsite consequence measures.

Each of these analyses was reviewed to determine the acceptability of Dominion's risk estimates for the SAMA analysis, as summarized below.

The staff's review of the MPS2 IPE is described in an NRC report dated May 21, 1996 (NRC 1996). Based on a review of the original IPE submittal, the staff concluded that IPE submittal met the intent of Generic Letter 88-20 (NRC 1988); that is, the IPE was of adequate quality to be used to look for design or operational vulnerabilities. The staff did, however,

identify a number of weaknesses in the IPE analysis. In response to an RAI, Dominion indicated that all of these weaknesses have been addressed in the PRA used for the SAMA analysis (Dominion 2004b).

A comparison of internal events risk profiles between the IPE and the PRA used in the SAMA analysis indicates an increase of approximately 3.8×10^{-5} per year in the total CDF (from 3.4×10^{-5} per year to 7.17×10^{-5} per year). The change is a net result of modeling changes and some minor plant design changes that have been implemented at MPS2 since the IPE. A summary listing of those changes that resulted in the greatest impact on the total CDF was provided in the ER and in response to RAIs (Dominion 2004a, 2004b), and include the following:

- added credit for passive ventilation in the intake structure
- updated the loss of normal power event frequency
- added new cross-tie to Unit 3 AC power sources to mitigate SBO conditions at Unit 2
- modified the total loss of cooling event tree by updating nodes for failure of the operator to trip the reactor coolant pumps and reactor coolant pump seal LOCA
- modified the AC power distribution logic by adding the MPS2 normal station service transformer as the power source (not previously modeled)
- modified the DC logic to (1) transfer to the loss of DC when emergency diesel generators and DC buses are not available, and (2) add a loss of DC bus A and B event as first event to be considered in the SBO event tree.

An additional change that has a significant impact on the CDF value is the truncation value used in the PRA model. For the PRA version used for the SAMA analysis, Dominion used a truncation value of 1.0×10^{-11}. In contrast, use of a truncation value of 2.0×10^{-9} (as used in previous versions of the PRA) would result in a CDF of about 5×10^{-5} per year. This alone would account for approximately half of the noted increase in CDF since the IPE.

The IPE CDF value for MPS2 is comparable to the CDF values reported in the IPEs for other Combustion Engineering (CE) PWR plants. Figure 11.6 of NUREG-1560 shows that the IPE-based total internal events CDF for CE PWRs ranges from 1×10^{-5} to 3×10^{-4} per year (NRC 1997a). It is recognized that other plants have reduced their values for CDF after the IPE submittals due to modeling and hardware changes. The current internal events CDF results for MPS2 remain comparable to the results for other plants of similar vintage and characteristics.

The staff considered the peer review performed for the MPS2 PRA, and the potential impact of the review findings on the SAMA evaluation. In response to an RAI, Dominion described the

external peer review, which was the Combustion Engineering Owners Group (CEOG) Peer Review of PRA Revision 0 performed in 1999 (Dominion 2004b). The review resulted in 25 Level A facts and observations (extremely important and necessary to address to ensure technical adequacy) and 59 Level B facts and observations (important and necessary to address but may be deferred until next PRA update). The majority of the recommendations from this review were addressed or reflected in Revision 3 of the MPS2 PRA. Seven of the Level A recommendations are yet to be resolved, while 25 of the Level B recommendations are yet to be resolved. Those Level A recommendations not yet incorporated are in the areas of accident sequence analysis, human reliability analysis, dependency analysis, and quantification. The Level B recommendations not yet incorporated affect all PRA elements. Dominion has reviewed all of the unresolved facts and observations and concluded that they have negligible impact on the SAMA analysis (Dominion 2004b). The staff has also reviewed Dominion's assessment of the impacts of the outstanding peer review comments and has come to the same conclusion.

Given that (1) the MPS2 PRA has been peer reviewed and the potential impact of the peer review findings on the SAMA evaluation has been assessed, (2) Dominion satisfactorily addressed staff questions regarding the PRA (Dominion 2004b), and (3) the CDF falls within the range of contemporary CDFs for CE plants, the staff concludes that the Level 1 PRA model is of sufficient quality to support the SAMA evaluation.

The licensee submitted an IPEEE in December 1995 (NNECO 1995), in response to Supplement 4 of Generic Letter 88-20. While the IPEEE submittal did not specifically state a criterion for identifying a vulnerability to severe accident risk in regard to the external events related to seismic, fire, or other external events, a number of outliers or "opportunities for safety enhancements" were identified. The current status of these outliers was provided by Dominion in response to a staff RAI. In the response, Dominion stated that of a total of 29 items, 21 were resolved prior to 2003. The remaining eight items were closed in August 2003 (Dominion 2004b). In a letter dated January 12, 2001, the staff concluded that the IPEEE submittal met the intent of Supplement 4 to Generic Letter 88-20, and that the licensee's IPEEE process is capable of identifying the most likely severe accidents and severe accident vulnerabilities (NRC 2001).

The seismic portion of the IPEEE consisted of a 0.3g (the acceleration due to the gravitation force [g]) focused-scope seismic evaluation using the Electric Power Research Institute (EPRI) methodology for Seismic Margins Assessment (SMA). A total of 16 components were initially estimated to have high-confidence low-probability of failure (HCLPF) capacities less than the review level earthquake peak ground acceleration of 0.3g. The lowest of these were included in the list of outliers to be resolved. The actions taken by the licensee to resolve seismic outliers included modification of the RBCCW and chilled water surge tanks supports, and modification to anchorage of battery racks. Other items were resolved by verifying component adequacy by

calculation or by correcting housekeeping problems. After resolution of these outliers, three components remained with HCLPF values less than the 0.3g review level earthquake: the turbine building housing the auxiliary feedwater (AFW) pumps (0.25g), the 125 VDC vital bus 201B (0.26g), and the RBCCW heat exchangers (0.29g). Dominion concluded that because of adequate seismic margins and the complexity associated with increasing the seismic capacity of a structure, no cost-effective SAMAs related to seismic events could be identified (Dominion 2004b). The staff agrees that it is unlikely that cost-effective SAMAs that address seismic vulnerabilities will exist. This is due to high cost of structural modifications compared to the benefits expected.

The MPS2 IPEEE does not provide numerical estimates of the CDF contributions from seismic initiators. Section F.2.4 of the ER indicates that the seismic CDF is 9.1×10^{-6} per year. Since the SMA does not result in a numerical value, the staff asked Dominion to provide the basis for the seismic CDF value given in the ER (NRC 2004). In response, Dominion indicated that the value used is the seismic CDF for Millstone Power Station, Unit 3 (MPS3) obtained from the MPS3 seismic PRA. The staff notes that for MPS3 all of the plant components or structures whose failure would significantly impact CDF have HCLPF values equal to or greater than the review level earthquake acceleration of 0.3g, whereas MPS2 has three components/structures with HCLPF values that are below 0.3g. This would indicate that the seismic CDF for MPS2 may be greater than that for MPS3.

Even though the MPS2 seismic CDF may be larger than that used to estimate the added benefit of SAMA candidates due to their impact on seismic risk, the staff believes that the seismic CDF would remain a relatively small contributor to the total CDF. This is due to the small contribution that low-magnitude earthquakes make to the CDF. The impact of low-magnitude earthquakes (in the range of 0.1 to 0.3 g) is principally in causing initiating events and for a LOOP reducing the likelihood of offsite power recovery. The frequency of these seismic initiating events is several orders of magnitude less than that due to random failures. Even a station blackout following a seismic LOOP has a frequency considerably less than that due to internal events. For higher-magnitude earthquakes, the impact of structural failures starts to become more important. However, as indicated above, SAMAs to mitigate these risk contributors are not expected to be cost effective.

The licensee's IPEEE fire analysis was based on EPRI's Fire Induced Vulnerability Evaluation methodology. This methodology employs a graduated focus on the most important fire zones using qualitative and quantitative screening criteria. The fire zones or compartments were subjected to at least two screening phases. In the first phase, a zone was screened out if a fire could not cause an initiating event and if the zone contained no equipment or cables needed to mitigate an initiating event. In the second-phase screening, three quantitative criteria were used: (1) a zone is screened out if the CDF is less than 1×10^{-6} per year from evaluating the plant model assuming all equipment in the zone is lost, (2) a zone is screened out if contains a single train of safety equipment and the fire induced unavailability is small compared to that due

to internal events, and (3) a zone is screened out if the effect of a fire is similar to but less severe than that in another analyzed zone. Of a total of 87 fire zones, 13 zones comprising five fire areas were not screened out and were subjected to a more detailed quantitative analysis. These areas are as follows:

Fire Area	Description	CDF (per year)
AUXB-1	auxiliary building	2.76×10^{-6}
A-24	cable vault	2.83×10^{-7}
A-25	main control room	6.57×10^{-7}
I-1A	intake structure pump room	9.66×10^{-7}
TB	turbine building general areas	1.63×10^{-6}

The fire CDF for MPS2 is approximately 6.3×10^{-6} per year or about nine percent of the MPS2 internal events CDF.

In an RAI, the staff asked Dominion to explain, for each important fire area, what measures were taken to further reduce risk, and explain why these CDFs cannot be further reduced in a cost-effective manner (NRC 2004). For each area, Dominion provided a discussion of the major fire contributors assumed in the analysis and the existing plant features to address fire events. Dominion identified several improvements that have been implemented to address fire-related issues and confirmed that all fire-related plant outliers identified in IPEEE were implemented prior to the SAMA analysis. Dominion also discussed the potential for further cost-effective hardware changes to address the fire-related matters listed above, including improvements to detection systems, enhancements to suppression capabilities, and changes that would improve cable separation and train separation (Dominion 2004b). Dominion concluded that no further modifications would be cost-effective for any of the fire areas.

The staff notes that although additional SAMAs to reduce the fire risk contributors might be viable, given the low level of risk from fires and the improvements that have already been implemented, it is unlikely that further modifications would both substantially reduce risk and remain cost-beneficial.

The risk associated with other external events at MPS2 is small. While the CDFs due to high winds, floods and other events were not estimated since they were screened out using the NUREG-1407 approach (NRC 1991), a number of possible enhancements were identified in the IPEEE. These enhancements, primarily related to high winds and external flooding, have all been resolved (NRC 2001).

In the SAMA analysis, Dominion accounted for the additional risk contribution due to external events by increasing the benefit derived from the internal events model by 30 percent. This was determined by summing the following CDF contributions:

- Fire 6.3×10^{-6} per year
- Internal flooding 0.2×10^{-6} per year
- Seismic 9.1×10^{-6} per year

The fire contribution is discussed above. The internal flood contribution is based on the IPE analysis, but has subsequently been dropped from the internal events model. The total external events CDF from the above is 1.6×10^{-5} per year, or approximately 22 percent of the CDF due to internal events. This was rounded up to 30 percent for the SAMA analysis.

The MPS2 Level 2 PRA analysis is based on the IPE. The IPE results were transformed to reflect new plant damage state and release category definitions. This process is described in Section F.2.3 of the ER (Dominion 2004a), and further clarified in response to RAIs (Dominion 2004b, 2004c). The resulting plant damage state to release category transformation matrix and release category frequencies are provided in Tables F.2-4 and F.2-6 of the ER, respectively (Dominion 2004a). The release fractions for each release category were obtained from MAAP 3.0B analysis for the dominant sequences in the IPE and are provided in Table F.1-2 of the ER (Dominion 2004a). In response to an RAI concerning the use of IPE dominant sequences to determine the release fractions used in the SAMA analysis, Dominion provided a discussion and a comparison of the plant damage states and release categories for the IPE and SAMA analyses (Dominion 2004b). The staff reviewed Dominion's source term estimates for the major release categories and found the release fractions to be within the range of the release fractions for similar plants. Dominion also provided the results of several sensitivity studies relative to the source term and release characteristics including doubling the plume release height, doubling the duration of source term release time, setting source term for M9 and M11 (late and basemat failures with sprays) equal to M10 (basemat failure without sprays), and using the MPS3 data for release category M1A (ISLOCA sequence). The results showed that these parameter variations had only a minor impact (less than 10 percent) on the estimated dollar benefits for the candidate SAMAs. The staff concludes that the process used for determining the release category frequencies and source terms is reasonable and appropriate for the purposes of the SAMA analysis.

As discussed previously, the fission product inventory used in the consequence analysis is based on a fission product inventory scaled from generic information. In response to an RAI concerning the impact of current and future fuel management practices, Dominion described a conservative bounding analysis of core fission product inventory considering a range of enrichments and burnups (Dominion 2004b). Using this inventory would result in a 22-percent increase in total benefit from eliminating all risk. Using realistic mid-life or average conditions

would result in a smaller increase in the maximum benefit. The staff concludes that the scaling based on the plant-specific power level yields sufficiently accurate and reasonable results for the dose assessment.

The staff reviewed the process used by Dominion to extend the containment performance (Level 2) portion of the PRA to an assessment of offsite consequences (essentially a Level 3 PRA). This included consideration of the major input assumptions used in the offsite consequence analyses. The MACCS2 code was utilized to estimate offsite consequences. Plant-specific input to the code includes the source terms for each release category and the MPS2 reactor core radionuclide inventory (both discussed above), site-specific meteorological data, projected population distribution within a 80 km (50 mile) radius for the year 2030, and emergency evacuation modeling. This information is provided in Appendix F to the ER (Dominion, 2004a).

Dominion used site-specific meteorological data processed from hourly measurements for the 2000 calendar year as input to the MACCS2 code. The hourly data (wind direction, wind speed, and stability class) were collected from the onsite meteorological tower. Precipitation data were recorded at the Green Airport near Providence, Rhode Island, the closest weather station to Millstone. Morning and afternoon mixing height values were obtained from the National Climatic Data Center. The applicant also considered the impact on SAMA benefits of using meteorological data for 1998 and 1999. The results of these sensitivity cases showed that the benefits increased by an average of about five percent. The staff considers the use of the 2000 data in the base case to be reasonable.

The population distribution the applicant used as input to the MACCS2 analysis was estimated for the year 2030, based primarily on SECPOP90 (NRC 1997c). U.S. Census Bureau Year 2000 population data, projected to year 2030, was then used to update the SECPOP90 population data (Dominion 2004a). The staff questioned the difference between the use of SECPOP90 and SECPOP2000, and what the impact would be if the latter was used. In response, Dominion noted that the expected impact of using SECPOP2000 would be negligible since census data from 2000 were used to update the SECPOP90 file. The staff considers the methods and assumptions for estimating population reasonable and acceptable for purposes of the SAMA evaluation.

The emergency evacuation model was modeled as a single evacuation zone extending out 16 km (10 mi) from the plant. It was assumed that 100 percent of the population would move at an average speed of approximately 1.49 meters per second with a delayed start time of 7200 seconds from the offsite alarm reference time point (Dominion 2004a). Dominion performed sensitivity studies exploring the impact of the fraction of population that evacuates and the evacuation speed. The results demonstrated that the total dose and economic cost

results are insensitive to these parameters (Dominion 2004a). The staff concludes that the evacuation assumptions and analysis are reasonable and acceptable for the purposes of the SAMA evaluation.

Much of the site-specific economic data was provided from SECPOP90 (NRC 1997c) by specifying the data for counties surrounding the plant to a distance of 50 miles. The SECPOP90 input file was updated to 2001 using cost of living and other data from the Bureau of the Census and the Department of Agriculture (Dominion 2004a). The agricultural economic data were updated using available data from the 1997 Census of Agriculture (USDA 1998).

The staff concludes that the methodology used by Dominion to estimate the offsite consequences for MPS2 provides an acceptable basis from which to proceed with an assessment of risk reduction potential for candidate SAMAs. Accordingly, the staff based its assessment of offsite risk on the CDF and offsite doses reported by Dominion.

H.3 Potential Plant Improvements

The process for identifying potential plant improvements, an evaluation of that process, and the improvements evaluated in detail by Dominion are discussed in this section.

H.3.1 Process for Identifying Potential Plant Improvements

Dominion's process for identifying potential plant improvements (SAMAs) consisted of the following elements:

- review of the most significant basic events from the MPS2 PRA Model, Rev. 2 (April 2001),
- review of items not already evaluated and/or implemented during the IPE and IPEEE,
- review of SAMA analyses submitted in support of original licensing and license renewal activities for other operating nuclear power plants, and
- review of other NRC and industry documentation discussing potential plant improvements.

Based on this process, an initial set of 196 candidate SAMAs was identified. In Phase 1 of the evaluation, Dominion performed a qualitative screening of the initial list of SAMAs and eliminated SAMAs from further consideration using the following criteria:

- the SAMA is not applicable at MPS2,
- the SAMA has already been implemented at MPS2, or the MPS2 design meets the intent of the SAMA, or

- the SAMA is related to a RCP seal vulnerability stemming from charging pump dependency on component cooling water (CCW). (MPS2 does not have this vulnerability because it relies on the RBCCW system rather than CCW for RCP seal cooling.)

Based on this screening, 152 SAMAs were eliminated leaving 44 for further evaluation. Of the SAMAs eliminated, 53 were eliminated because they were not applicable, 91 were eliminated because they already had been implemented, five were eliminated because they were related to RCP seal vulnerability, and three were similar to and combined with other SAMAs. A cost estimate was prepared for each of the 44 remaining candidates to focus on those that had a possibility of having a net positive benefit. To account for the potential impact of external events, the estimated benefits based on internal events were multiplied by a factor of 1.3 for all SAMAs except those related to ISLOCA and SGTR-initiated events.

Of the 44 SAMAs evaluated, one was identified as potentially cost-beneficial. Other SAMAs were evaluated and subsequently eliminated, as described in Sections H.4 and H.6.1 below.

H.3.2 Review of Dominion's Process

Dominion's efforts to identify potential SAMAs focused primarily on areas associated with internal initiating events. The initial list of SAMAs generally addressed the accident categories that are dominant CDF contributors or issues that tend to have a large impact on a number of accident sequences at MPS2.

The preliminary review of Dominion's SAMA identification process raised some concerns regarding the completeness of the set of SAMAs identified and the inclusion of plant-specific risk contributors. The staff requested additional information regarding the top 30 cut sets and certain sequences (NRC 2004). In response to the RAI, Dominion provided a listing of the top contributors to risk, the associated plant damage state, and a cross-reference between the top contributors to risk from a later version of the PRA and the SAMAs that addressed those risk contributors (Dominion 2004b).

The staff noted that Dominion based the SAMA identification process on PRA Revision 2 (dated April 2001) and the SAMA quantification on Revision 3 (dated October 2002). The staff questioned Dominion regarding the impact on the SAMA identification process if the later version of the PRA was used to identify potential SAMAs (NRC 2004). In response, Dominion reassessed the SAMA identification process considering the later PRA revision. The basic events not included in the initial Unit 2 PRA importance list were identified. Those events with a risk reduction worth greater than or equal to 1.005 from the more recent PRA model were specifically evaluated. These events were compared to the SAMA list to determine which events were already addressed by a SAMA. Dominion determined that all of the additional basic events map to previously identified SAMAs. As a result, no new SAMAs were created

(Dominion 2004c). Based on these additional assessments, Dominion concluded that the set of 196 SAMAs evaluated in the ER addresses the major contributors to CDF and offsite dose, and that the review of the top risk contributors does not reveal any new SAMAs.

The staff questioned Dominion regarding use of the second screening criterion (i.e., screening out a SAMA on the basis that it has already been implemented at MPS2) to eliminate SAMAs that were identified based on review of the PRA (NRC 2004). In response, Dominion provided qualitative or quantitative details on the plant-specific SAMAs that were screened using this criterion (SAMAs 161, 162, 163, 164, 167, 168, 169, 171, 177, 178, 180, 181, 188, and 196). None of these SAMAs were determined to be cost-beneficial based on this further evaluation.

The staff questioned Dominion about lower-cost alternatives to some of the SAMAs evaluated, including the use of portable battery chargers and a direct-drive diesel AFW pump (NRC 2004). In response, Dominion identified several lower-cost alternatives, all of which are covered by an existing procedure or severe accident management guideline (SAMG), or could be instituted following evaluation and guidance by the Technical Support Center (Dominion 2004b). This is discussed further in Section H.6.2.

The staff also questioned Dominion about several other candidate SAMAs that were found to be potentially cost-beneficial at another CE plant but not addressed by MPS2 (NRC 2004). In response, Dominion provided an evaluation of the applicability and/or costs and benefits for these SAMAs at MPS2. Based on this assessment, all of the SAMAs were dismissed except one involving adding a capability to flash the field on the emergency diesel generator to enhance SBO event recovery (Dominion 2004b). This is discussed further in Section H.6.2.

The staff notes that the set of SAMAs submitted is not all inclusive, since additional, possibly even less expensive, design alternatives can always be postulated. However, the staff concludes that the benefits of any additional modifications are unlikely to exceed the benefits of the modifications evaluated and that the alternative improvements would not likely cost less than the least-expensive alternatives evaluated, when the subsidiary costs associated with maintenance, procedures, and training are considered.

The staff concludes that Dominion used a systematic and comprehensive process for identifying potential plant improvements for MPS2, and that the set of potential plant improvements identified by Dominion is reasonably comprehensive and, therefore, acceptable. This search included reviewing insights from the IPE and IPEEE and other plant-specific studies, reviewing plant improvements considered in previous SAMA analyses, and using the knowledge and experience of its PRA personnel. While explicit treatment of external events in the SAMA identification process was limited, it is recognized that the prior implementation of plant modifications for seismic events and the absence of external event vulnerabilities reasonably justifies examining primarily the internal events risk results for this purpose.

H.4 Risk Reduction Potential of Plant Improvements

Dominion evaluated the risk-reduction potential of the 44 remaining SAMAs that were applicable to MPS2. A majority of the SAMA evaluations were performed in a bounding fashion in that the SAMA was assumed to completely eliminate the risk associated with the proposed enhancement. Such bounding calculations overestimate the benefit and are conservative.

Dominion estimated the potential benefits for each SAMA by generating a revised set of plant damage state frequencies. Using these revised frequencies, a revised Level 3 (dollars averted) calculation was performed. The benefit was calculated using the fault trees, event trees, and databases from Revision 3 of the MPS2 PRA. The assumptions made to evaluate the benefit were provided in response to an RAI (Dominion 2004b, 2004c). Table H-3 lists the assumptions considered to estimate the risk reduction for each of the evaluated SAMAs, the estimated risk reduction in terms of percent reduction in CDF and population dose, and the estimated total benefit (present value) of the averted risk (including the 1.3 multiplier to account for benefits in external events). The determination of the benefits for the various SAMAs is further discussed in Section H.6.

The staff has reviewed Dominion's bases for calculating the risk reduction for the various plant improvements and concludes that the rationale and assumptions for estimating risk reduction are reasonable and generally conservative (i.e., the estimated risk reduction is higher than what would actually be realized). Accordingly, the staff based its estimates of averted risk for the various SAMAs on Dominion's risk reduction estimates. The estimated risk reduction for several of the SAMAs was negligible or zero. In these instances, the SAMA either affects sequences or phenomena that do not contribute to risk at MPS2, or represents an ineffective plant improvement. As such, a minimal impact on risk is not unreasonable in those cases.

H.5 Cost Impacts of Candidate Plant Improvements

Dominion personnel experienced in estimating the cost of performing work at a nuclear plant estimated the costs of implementing the 44 candidate SAMAs. For some of the SAMAs considered, the cost estimates were sufficiently greater than the benefits calculated such that it was not necessary to perform a detailed cost estimate. Cost estimates typically included procedures, engineering analysis, training, and documentation, in addition to any hardware.

The staff reviewed the bases for the applicant's cost estimates (presented in Section F.3 of Appendix F to the ER). For certain improvements, the staff also compared the cost estimates to estimates developed elsewhere for similar improvements, including estimates developed as

Table H-3. SAMA Cost-Benefit Screening Analysis for Millstone Power Station, Unit 2

SAMA	Assumptions	% Risk Reduction		Total Benefit ($)	Cost ($)
		CDF	Population Dose		
3 - Enhance loss of RBCCW procedure to ensure cool down of reactor coolant system (RCS) prior to seal LOCA	**Set RCP seal failure and loss of the RBCCW system to zero (This SAMA is bolded because it was determined to be cost-beneficial)**	**7.8**	**4.9**	**173,300**	**100,000**
8 - Eliminate RCP thermal barrier dependence on RBCCW such that loss of RBCCW does not result directly in core damage	Set loss of the RBCCW system to zero	6.9	4.6	155,500	5,000,000
10 - Create an independent RCP seal cooling system, with dedicated diesel	Eliminate the need for RCP cooling from the fault tree	6	3.9	135,400	6,000,000
11 - Create an independent RCP seal cooling system, without dedicated diesel	Same as SAMA #10	6	3.9	135,400	5,000,000
22 - Improve ability to cool residual heat removal heat exchangers	Set RBCCW heat exchanger failures to zero	0.3	0.3	7,300	2,500,000
34 - Install a containment vent large enough to remove ATWS decay heat	Set the electrical and mechanical reactor trip probabilities to zero	9.9	4.0	204,300	10,000,000
35 - Install a filtered containment vent to remove decay heat	Set the containment spray component failures to zero	16.2	16.0	414,300	12,000,000
36 - Install an unfiltered hardened containment vent	Same as SAMA #35	16.2	16.0	414,300	10,000,000

Table H-3. SAMA Cost-Benefit Screening Analysis for Millstone Power Station, Unit 2 (Cont.)

SAMA	Assumptions	% Risk Reduction		Total Benefit ($)	Cost ($)
		CDF	Population Dose		
43 - Create a reactor cavity flooding system	Re-bin intermediate and late containment failures without sprays into corresponding release categories with sprays	0	16.4	84,700	18,000,000
44 - Create other options for reactor cavity flooding	Same as SAMA #43	0	16.4	84,700	18,000,000
75 - Create a water backup for diesel cooling	Set loss of emergency diesel generator (EDG) 'A' and 'B' and common cause failure (CCF) of EDG 'A' and 'B' to zero	1.5	2.8	44,600	10,000,000
77 - Provide a connection to alternate offsite power source (the nearby dam)	Remove cutsets containing loss of the Unit 3 cross-tie and grid and weather related losses of normal power from the base case. Set Unit 3 cross-tie and grid and weather related initiators to zero	8.3	13.9	234,900	6,000,000
81 - Install a fast acting motor generator output breaker	Set 125 VDC Buses 201A and 201B initiators to zero	1.0	1.7	29,200	3,000,000
87 - Replace steam generators with new design	Set steam generator tube rupture initiating event frequency to zero	3	12.7	126,900	200,000,000
93 - Install additional instrumentation and inspection to prevent ISLOCA sequences	Set the ISLOCA containment release category frequency to zero	0.2	2.4	22,100	12,000,000
94 - Increase frequency of valve leakage testing	Same as SAMA #93	0.2	2.4	22,100	2,000,000
99 - Ensure all ISLOCA releases are scrubbed	Same as SAMA #93	0.2	2.4	22,100	4,000,000

Table H-3. SAMA Cost-Benefit Screening Analysis for Millstone Power Station, Unit 2 (Cont.)

SAMA	Assumptions	% Risk Reduction		Total Benefit ($)	Cost ($)
		CDF	Population Dose		
100 - Add redundant and diverse limit switch to each containment isolation valve	Same as SAMA #93	0.2	2.4	28,700	18,000,000
123 - Provide capability for diesel-driven, low pressure vessel makeup	Set failure of the low pressure safety injection (LPSI) pumps and CCF of the LPSI pumps to zero	0	0	0	7,500,000
124/125 - Provide an additional high pressure injection pump with independent diesel	Set failure of the high pressure safety injection (HPSI) pumps and CCF of the HPSI pumps to zero	10.5	13.0	286,100	10,000,000
127 - Implement a reactor water storage tank (RWST) makeup procedure	Set probability of RWST rupture and RWST unavailability to zero	0.2	0.5	7,400	50,000
150 - Provide an additional instrumentation & control system (e.g. ATWS Mitigation System Actuation Circuitry)	Set electrical reactor trip and turbine trip to zero	8.7	3.5	177,900	600,000
159 - Install turbine-drive AFW pump	Set failure of the turbine driven AFW pumps to zero	8.0	5.1	178,100	12,000,000

Table H-3. SAMA Cost-Benefit Screening Analysis for Millstone Power Station, Unit 2 (Cont.)

SAMA	Assumptions	% Risk Reduction		Total Benefit ($)	Cost ($)
		CDF	Population Dose		
165 - Install independent air-operated valve (AOV) around existing RBCCW/engineered safeguards feature room service (ESFRS) AOV in "A" train to improve reliability of engineered safety feature room cooler	Set failure of RBCCW/ESFRS AOV 2-RB-68.1A to open to zero	0.2	0.3	4,900	4,000,000
166 - Install additional motor-driven AFW pump	Set failure of the motor driven AFW pumps 'A' and 'B' to zero	2.2	1.1	47,400	12,000,000
170 - Install redundant parallel containment sump motor-operated valve (MOV) to provide additional flow path during containment swapover in recirculation	Set failure of MOV 2-CS-16.1A to open to zero	6.0	5.3	146,900	2,000,000
172 - Add a redundant 125 VDC bus	Set loss of 125 VDC buses 201A and 201B initiators and bus faults to zero	0.1	0.3	4,100	5,000,000
173 - Install diverse valve around existing service water AOV in each train to improve reliability of cooling water supply to RBCCW heat exchangers	Set failure of AOVs 2-SW-8.1A/B/C to open and CCF to open to zero	8.0	4.6	175,000	1,000,000
174 - Install additional AOV in series with existing AOV in each train to improve isolation of RBCCW supply to non-essential Spent Fuel Pool heat exchanger	Set failure of AOV 2-RB-8.1A to close to zero	3.4	2.1	74,900	2,000,000

Table H-3. SAMA Cost-Benefit Screening Analysis for Millstone Power Station, Unit 2 (Cont.)

SAMA	Assumptions	% Risk Reduction		Total Benefit ($)	Cost ($)
		CDF	Population Dose		
176 - Install additional AOV around existing service water AOV in "A" train to improve reliability of cooling water supply to RBCCW heat exchanger	Set failure of AOV 2-SW-8.1A to open to zero	2.2	1.3	48,600	3,000,000
179 - Automate RCP trip circuitry on loss of seal cooling	Set failure of operator to trip RCPs on loss of thermal barrier cooling to zero	6.0	3.9	135,400	3,000,000
182 - Automate the start and alignment of the RBCCW pump	Set failure of operator to align stand-by RBCCW pump to zero	0	0	0	1,000,000
183 - Automate isolation feature of faulted steam generator	Set failure of operator to isolate faulted steam generator to zero	1.3	0.6	27,400	5,000,000
184 - Install redundant AFW regulating valve following regulating valve fail to open	Set failure of operator to open AFW regulating bypass valve on failure of AFW regulating valve to open to zero	0.7	0.4	15,900	2,000,000
185 - Install redundant ESFRS fan	Eliminate the need for ESFRS fan F-15B from the fault tree and set the unavailability of ESFRS fans F-15A and F-15B as well as their CCF to zero	0.2	0.3	4,900	450,000
186 - Install diverse strainers L-1A, B, C to all three SW pump discharge lines to prevent CCF	Set failure of CCF of all 3 SW pump strainer initiator as well as CCF of strainers to operate to zero	0.5	0.7	13,200	2,000,000
187 - Automate start capability of Terry turbine	Set failure of operator to start the Terry turbine to zero	0.2	0.3	4,500	1,500,000
189 - Automate emergency boration of RCS	Set the electrical and mechanical reactor trip probabilities to zero	0.9	0.5	18,700	2,000,000

Table H-3. SAMA Cost-Benefit Screening Analysis for Millstone Power Station, Unit 2 (Cont.)

SAMA	Assumptions	% Risk Reduction		Total Benefit ($)	Cost ($)
		CDF	Population Dose		
190 - Install redundant parallel valve in charging pump suction line to RWST	Set failure of the RWST isolation valve AOV 2-CH-192 to open to zero	1.0	0.5	22,100	1,000,000
192 - Install additional MOV on volume control tank outlet line similar to MOV-CH-501 for closure to assure boric acid flow to charging pump	Set all failures relating to MOV 2-CH-501 to close to zero	0.7	0.4	15,500	2,000,000
193 - Install additional AFW bypass line with diverse check valves and regulating valves similar to check valves 2-FW-12A and 12B and regulating valves 2-FW-43A and 43B to steam generators	Set failure of the AOVs 2-FW-43A/B to open, their CCF to open, their air accumulators to operate, as well as CCF of CVs 2-FW-12A/B to open to zero	1.0	0.5	21,700	1,000,000
195 - Install an MOV around existing RBCCW/ESFRS AOV in each train to improve reliability of ESF room coolers	Set failures of AOVs 2-RB-68.1A/B to open and CCF to open to zero	0.4	0.7	11,600	500,000

part of other licensees' analyses of SAMAs for operating reactors and advanced light-water reactors. The cost estimates provided were in the form of ranges. For purposes of evaluating specific SAMAs, the staff selected the low end values from the range to represent the costs. For some SAMAs, the costs appeared to be overestimated. Therefore, the staff asked the applicant to justify the costs for those SAMAs that had significant benefits (NRC 2004). In response to the staff's request, Dominion provided a discussion of the components and activities that were considered in estimating the costs of those SAMAs for which the benefit was determined to be $50,000 or more. The discussion included a description of the modification, if any procedure changes and training would be required, and if any new instrumentation and maintenance would be required (Dominion 2004b). The staff reviewed the costs and subsequent explanations and found them to be reasonable and generally consistent with estimates provided in support of other plants' analyses.

The staff concludes that the cost estimates provided by Dominion are sufficient and adequate for use in the SAMA evaluation.

H.6 Cost-Benefit Comparison

Dominion's cost-benefit analysis and the staff's review are described in the following sections.

H.6.1 Dominion Evaluation

The methodology used by Dominion was based primarily on NRC's guidance for performing cost-benefit analysis, i.e., NUREG/BR-0184, *Regulatory Analysis Technical Evaluation Handbook* (NRC 1997b). The guidance involves determining the net value for each SAMA according to the following formula:

$$\text{Net Value} = (\text{APE} + \text{AOC} + \text{AOE} + \text{AOSC}) - \text{COE}$$

where,

APE = present value of averted public exposure ($)
AOC = present value of averted offsite property damage costs ($)
AOE = present value of averted occupational exposure costs ($)
AOSC = present value of averted onsite costs ($)
COE = cost of enhancement ($).

If the net value of a SAMA is negative, the cost of implementing the SAMA is larger than the benefit associated with the SAMA and it is not considered cost-beneficial. Dominion's derivation of each of the associated costs is summarized below.

Averted Public Exposure (APE) Costs

The APE costs were calculated using the following formula:

APE = Annual reduction in public exposure (Δperson-rem/year)
x monetary equivalent of unit dose ($2,000 per person-rem)
x present value conversion factor (10.76 based on a 20-year period with a 7-percent discount rate).

As stated in NUREG/BR-0184 (NRC 1997b), it is important to note that the monetary value of the public health risk after discounting does not represent the expected reduction in public health risk due to a single accident. Rather, it is the present value of a stream of potential losses extending over the remaining lifetime (in this case, the renewal period) of the facility. Thus, it reflects the expected annual loss due to a single accident, the possibility that such an accident could occur at any time over the renewal period, and the effect of discounting these potential future losses to present value. For the purposes of initial screening, Dominion calculated an APE of approximately $375,000 for the 20-year license renewal period, which assumes elimination of all severe accidents.

Averted Offsite Property Damage Costs (AOC)

The AOCs were calculated using the following formula:

AOC = Annual CDF reduction
x offsite economic costs associated with a severe accident (on a per-event basis)
x present value conversion factor.

For the purposes of initial screening, which assumes all severe accidents are eliminated, Dominion calculated an annual offsite economic risk of about $13,700 based on the Level 3 risk analysis. This results in a discounted value of approximately $147,500 for the 20-year license renewal period.

Averted Occupational Exposure (AOE) Costs

The AOE costs were calculated using the following formula:

AOE = Annual CDF reduction
x occupational exposure per core damage event
x monetary equivalent of unit dose
x present value conversion factor.

Dominion derived the values for averted occupational exposure from information provided in Section 5.7.3 of the regulatory analysis handbook (NRC 1997b). Best estimate values provided

for immediate occupational dose (3300 person-rem) and long-term occupational dose (20,000 person-rem over a 10-year cleanup period) were used. The present value of these doses was calculated using the equations provided in the handbook in conjunction with a monetary equivalent of unit dose of $2,000 per person-rem, a real discount rate of 7 percent, and a time period of 20 years to represent the license renewal period. For the purposes of initial screening, which assumes all severe accidents are eliminated, Dominion calculated an AOE of approximately $27,300 for the 20-year license renewal period.

Averted Onsite Costs (AOSC)

Averted onsite costs (AOSC) include averted cleanup and decontamination costs and averted power replacement costs. Repair and refurbishment costs are considered for recoverable accidents only and not for severe accidents. Dominion derived the values for AOSC based on information provided in Section 5.7.6 of the regulatory analysis handbook (NRC 1997b).

Dominion divided this cost element into two parts — the Onsite Cleanup and Decontamination Cost, also commonly referred to as averted cleanup and decontamination costs, and the replacement power cost.

Averted cleanup and decontamination costs (ACC) were calculated using the following formula:

ACC = Annual CDF reduction
x present value of cleanup costs per core damage event
x present value conversion factor.

The total cost of cleanup and decontamination subsequent to a severe accident is estimated in the regulatory analysis handbook to be $1.5 billion (undiscounted). This value was converted to present costs over a 10-year cleanup period and integrated over the term of the proposed license extension. For the purposes of initial screening, which assumes all severe accidents are eliminated, Dominion calculated an ACC of approximately $831,700 for the 20-year license renewal period.

Long-term replacement power costs (RPC) were calculated using the following formula:

RPC = Annual CDF reduction
x present value of replacement power for a single event
x factor to account for remaining service years for which replacement power is required
x reactor power scaling factor

Dominion based its calculations on the value of 870 megawatts electric (MW[e]). Therefore, Dominion applied a power scaling factor of 870 MW(e)/910 MW(e) to determine the

replacement power cost. For the purposes of initial screening, which assumes all severe accidents are eliminated, Dominion calculated the RPC to be approximately $540,300.

Using the above equations, Dominion estimated the total present dollar value equivalent associated with completely eliminating severe accidents at MPS2 to be about $1,920,000.

Dominion's Results

The total benefit associated with each of the 44 SAMAs evaluated by Dominion is provided in Table H-3. These values were determined based on the above equations for the various averted costs together with the estimated annual reductions in CDF and population dose, and then increased by a multiplier of 1.3 to account for additional risk reduction in external events. The values for total benefit reported in Table H-3 include this multiplier. As a result, one of the 44 SAMAs was considered to be cost beneficial:

SAMA 3: Enhance loss of RBCCW procedure to ensure cool down of RCS prior to seal LOCA. The resolution of this issue is expected to be either a new procedure or a procedure modification that will require actions to prevent/mitigate a seal LOCA upon loss of RBCCW.

As stated in the ER, Dominion is addressing SAMA 3 as part of a comprehensive industry initiative in response to Generic Safety Issue 23, "Reactor Coolant Pump Seal Failure." Additionally, the CEOG is addressing this issue in CEOG Task 1136, "Model for Failure of RCP Seals Given Loss of Seal Cooling." The SAMA is anticipated to be implemented before the period of extended operation, and is being addressed under the current license (Dominion 2004b).

In response to an RAI, Dominion assessed the applicability and feasibility of several SAMAs considered by another CE plant. As a result, Dominion eliminated all of the SAMAs questioned except one — adding a capability to flash the field on the EDG (using a portable generator) to enhance SBO event recovery. Dominion stated that this SAMA is not expected to be cost-beneficial because it would likely require a plant modification to install a disconnect to allow the connection of a portable (temporary) generator, as well as development of a new SAMG. However, Dominion stated that if this SAMA can be accomplished via a SAMG without a hardware modification, the SAMA would be cost-beneficial and will be implemented prior to the period of extended operation (Dominion 2004b).

H.6.2 Review of Dominion's Cost-Benefit Evaluation

The cost-benefit analysis performed by Dominion was based primarily on NUREG/BR-0184 (NRC 1997b) and was conducted in a manner consistent with this guidance.

In order to account for uncertainties in the cost estimates, Dominion applied a factor of two margin in assessing whether SAMAs were cost-beneficial, i.e., a SAMA was considered to be cost-beneficial if the total benefit is within a factor of two of the estimated cost. The staff asked the applicant to consider the impact of uncertainty in the CDF (NRC 2004). In response, Dominion stated that CDF uncertainty calculations are not available in the current version of the Millstone PRA model. However, based on a review of recent SAMA analyses in support of license renewal, the 95th percentile CDF ranged from a factor of 2.0 to a factor of 6.4 greater than the mean CDF. Dominion stated that, in order to provide conservatism, it compared the costs to twice the calculated benefit. Dominion further indicated that most of the benefit calculations were performed in a bounding fashion, i.e., the SAMA is completely effective, and that such estimates would be substantially less if a more realistic analysis were performed for each SAMA (Dominion 2004b).

The staff questioned the approach of increasing the benefit (based on internal events) by 30 percent to account for external events (NRC 2004). In response to the RAI, Dominion stated that a multiplier of 1.3 was used because the external events analyses are not readily quantifiable (Dominion 2004b). The use of a multiplier on the benefits obtained from the internal events PRA to incorporate the impact of external events makes the implicit assumption that the consequences from external events sequences are the same as the consequences from internal events sequences. To demonstrate the robustness of the analysis, Dominion performed a sensitivity study that increased the assumed contribution from external events from 30 percent to 60 percent of the internal event benefits. The result was that the increased benefit exceeded the lower bound of the cost estimate range for only SAMA 3, which was already determined to be cost-beneficial. Therefore, Dominion concluded that the use of the 1.3 multiplier is acceptable.

Dominion assessed the impact of other factors on the analysis results, such as the contribution of external event initiators that were not explicitly included in the MPS2 risk profile, the use of a 3 percent discount rate as compared to the 7 percent discount rate used in the baseline calculations, as well as a 15-percent real discount rate (Dominion 2004a). These sensitivity cases resulted in an increase in the benefit calculation of about 30 percent or less. These analyses did not change Dominion's conclusion that none of the candidate SAMAs would be cost-beneficial except as noted above. In addition, Dominion performed sensitivity analyses that addressed assumptions made in other parts of the cost-benefit analysis, including meteorological data, source term, and evacuation. Dominion also considered the sensitivity to the impact of current and future fuel management practices. These sensitivity cases are bounded by the 3-percent discount rate sensitivity study.

The staff notes that accounting for each of these factors would tend to increase the benefit as compared to the baseline case analysis. However, the calculated benefits used in the baseline analysis are generally over estimated and, therefore, conservative. The staff concludes that the

use of the factor of two to account for uncertainties, coupled with the fact that the calculated benefits are generally conservative, provides a reasonable treatment of uncertainties and is adequate for the SAMA evaluation.

The staff questioned Dominion about lower cost alternatives to some of the SAMAs evaluated, including the use of a direct-drive diesel AFW pump (NRC 2004). In response, Dominion identified and evaluated several lower-cost alternatives to those considered in the ER. These alternatives included 1) installing a RBCCW header cross-tie, 2) using the hydrogen purge system as an unfiltered hardened containment vent, 3) using the existing systems to flood the reactor cavity, 4) providing reactor water storage tank makeup, and 5) using the diesel fire pump as a backup to the turbine-driven AFW pump. Dominion concluded that all of the alternatives considered are either covered by an existing procedure or SAMG, or could be instituted following evaluation and guidance by the Technical Support Center. With regard to the specific lower cost alternative involving a direct-drive diesel AFW pump, Dominion stated that the alternative would not be viable at MPS2 due to room and ventilation constraints as well as costs. Dominion further stated that MPS2 has a SAMG for using the diesel fire pump to provide water to the AFW system (Dominion 2004b).

The staff also questioned Dominion about several other candidate SAMAs that were found to be potentially cost-beneficial at another CE plant but not addressed by MPS2 analysis (NRC 2004). In response, Dominion provided an evaluation of the applicability and/or costs and benefits for these SAMAs at MPS2. Based on this assessment, all of the SAMAs were dismissed except one involving adding a capability to flash the field on the emergency diesel generator to enhance SBO event recovery. Dominion stated that the ability to flash the field on the EDG (using a portable generator) to enhance SBO event recovery would likely require a plant modification to install a disconnect to allow the connection of a portable (temporary) generator, as well as a new SAMG. However, If a hardware modification is not required, then the SAMA would be cost-beneficial. Dominion committed to complete its evaluation of this SAMA and develop a SAMG prior to the period of extended operation if it found to be cost-beneficial (Dominion 2004b).

The staff concludes that, with the exception of the two potentially cost-beneficial SAMAs discussed above, the costs of the SAMAs would be higher than the associated benefits. This conclusion is supported by uncertainty assessment and sensitivity analysis and upheld despite a number of additional uncertainties and nonquantifiable factors in the calculations, summarized as follows:

- A factor of two was used to account for uncertainties. Even if a higher factor were considered to reflect a larger uncertainty in CDF, e.g., a factor of five, only two additional SAMAs would be close to becoming cost-beneficial — SAMAs 150 and 175. However, these SAMAs involve hardware modifications that are not expected to be cost-beneficial under more realistic assumptions regarding risk reduction.

- Sensitivity calculations were performed with respect to the discount rate (3 percent and 15 percent) and various MACCS2 parameters, including meteorological data, evacuation speed, evacuation delay time, and source terms. The results of these sensitivity studies showed that none of the risk benefits were increased by more than 30 percent. Since this is less than the margin between cost and benefit for the SAMAs considered, the uncertainties in these parameters would not alter the conclusions.

H.7 Conclusions

Dominion compiled a list of 196 SAMA candidates using the SAMA analyses as submitted in support of licensing activities for other nuclear power plants, NRC and industry documents discussing potential plant improvements, plant-specific insights from the MPS2 PRA model. A qualitative screening removed SAMA candidates that (1) were not applicable at MPS2 due to design differences, (2) had already been implemented at MPS2, or (3) were related to RCP seal vulnerability. A total of 152 SAMAs were eliminated, leaving 44 for further evaluation.

For the remaining SAMA candidates, a more detailed design and cost estimate were developed as shown in Table H-3. The cost-benefit analyses showed that one of the SAMA candidates was cost-beneficial. Upon completion of a 3-percent discount rate sensitivity study, as well as other sensitivity studies, no additional SAMA candidates were determined to be cost-beneficial. To account for uncertainties, Dominion compared the costs of the SAMA with twice the calculated benefit. As a result, no additional SAMAs were cost-beneficial.

The staff reviewed the Dominion analysis and concluded that the methods used and the implementation of those methods were sound. The treatment of SAMA benefits and costs, the generally large negative net benefits, and the inherently small baseline risks support the general conclusion that the SAMA evaluations performed by Dominion are reasonable and sufficient for the license renewal submittal. The unavailability of an external event PRA model precluded a quantitative evaluation of SAMAs specifically aimed at reducing risk of external event initiators; however, improvements that have been realized as a result of the IPEEE process and the inclusion of a multiplier to account for external events would minimize the likelihood of there being cost-beneficial enhancements in this area.

Based on its review of the Dominion SAMA analysis, the staff concurs that none of the candidate SAMAs are cost-beneficial, except for SAMA 3 and possibly an additional SAMA involving adding a capability to flash the field on the EDG (using a portable generator) to enhance SBO event recovery. This is based on conservative treatment of costs and benefits. This conclusion is consistent with the low residual level of risk indicated in the MPS2 PRA and the fact that MPS2 has already implemented many of plant improvements identified from the IPE and IPEEE processes. Although the one SAMA candidate is cost-beneficial and a second SAMA may be cost-beneficial if it can be implemented via procedural enhancements, neither of

these SAMAs relates to adequately managing the effects of aging during the period of extended operation. Therefore, they need not be implemented as part of the license renewal pursuant to 10 CFR Part 54.

H.8 References

10 CFR Part 54. Code of Federal Regulations, Title 10, *Energy*, Part 54, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants."

Dominion Nuclear Connecticut, Inc. (Dominion). 2004a. *Applicant's Environmental Report–Operating License Renewal Stage, Millstone Power Station, Units 2 and 3.* Dominion Nuclear Connecticut, Inc., Richmond, Virginia. January 2004.

Dominion Nuclear Connecticut, Inc. (Dominion). 2004b. Letter from Leslie N. Hartz, Dominion, to United States Nuclear Regulatory Commission Document Control Desk. Subject: Dominion Nuclear Connecticut, Inc., Millstone Power Station, Units 2 and 3, Response to Request for Additional Information, License Renewal Applications. (August 13, 2004).

Dominion Nuclear Connecticut, Inc. (Dominion). 2004c. Email from Richard J. Gallagher, Dominion, to Richard Emch, NRC. Subject: Clarification of RAI Responses. (September 16, 2004).

Northeast Nuclear Energy Company (NNECO). 1993. Letter from S. E. Scace, NNECO, to U.S. Nuclear Regulatory Commission Document Control Desk. Subject: Millstone Nuclear Power Station, Unit 2, Response to Generic Letter 88-20 Individual Plant Examination for Severe Accident Vulnerabilities Summary Report. (December 30, 1993).

Northeast Nuclear Energy Company (NNECO). 1995. Letter from D. B. Miller, NNECO, to U.S. Nuclear Regulatory Commission Document Control Desk. Subject: Millstone Nuclear Power Station, Unit 2, Response to Generic Letter 88-20, Supplements 4 and 5 Individual Plant Examination for External Events Summary Report. (December 29, 1995).

U.S. Nuclear Regulatory Commission (NRC). 1988. Generic Letter 88-20, "Individual Plant Examination for Severe Accident Vulnerabilities." (November 23, 1988).

U.S. Nuclear Regulatory Commission (NRC). 1990. NUREG-1150, *Severe Accident Risks: An Assessment for Five U.S. Nuclear Power Plants*, Washington, D.C.

U.S. Nuclear Regulatory Commission (NRC). 1991. NUREG-1407, *Procedural and Submittal Guidance for the Individual Plant Examination of External Events (IPEEE) for Severe Accident Vulnerabilities*, Washington, D.C.

U.S. Nuclear Regulatory Commission (NRC). 1996. Letter from Daniel G. McDonald, U.S. NRC, to Ted C. Feigenbaum, Northeast Utilities Service Company. Subject: NRC Staff's Evaluation of the Individual Plant Examination (IPE) Submittal for Millstone Nuclear Power Station, Unit No. 2 (B14702), (TAC NO. M74433). (May 21, 1996).

U.S. Nuclear Regulatory Commission (NRC). 1997a. NUREG-1560, *Individual Plant Examination Program: Perspectives on Reactor Safety and Plant Performance*, Washington, D.C.

U.S. Nuclear Regulatory Commission (NRC). 1997b. NUREG/BR-0184, *Regulatory Analysis Technical Evaluation Handbook*, Washington, D.C.

U.S. Nuclear Regulatory Commission (NRC). 1997c. NUREG/CR-6525, *SECPOP90: Sector Population, Land Fraction, and Economic Estimation Program*, Washington, D.C.

U.S. Nuclear Regulatory Commission (NRC). 2001. Letter from Jacob I. Zimmerman, U.S. NRC, to R. G. Lizotte, Northeast Nuclear Energy Company. Subject: Millstone Nuclear Power Station, Unit No. 2 — Individual Plant Examination of External Events (IPEEE) (TAC NO. M83642). (January 12, 2001).

U.S. Nuclear Regulatory Commission (NRC). 2004. Letter from Richard L. Emch, Jr., NRC, to David A. Christian, Dominion. Subject: Request for Additional Information (RAI) Regarding Severe Accident Mitigation Alternatives for the Millstone Power Station, Units 2 and 3 (TAC NOS. MC1827 and MC1828). (June 22, 2004).

U.S. Department of Agriculture (USDA). 1998. 1997 Census of Agriculture, National Agriculture Statistics Service, 1998.

Appendix I

NRC Staff Evaluation of Severe Accident Mitigation Alternatives (SAMAs) for Millstone Power Station, Unit 3, in Support of the License Renewal Application Review

Appendix I

NRC Staff Evaluation of Severe Accident Mitigation Alternatives (SAMAs) for Millstone Power Station, Unit 3, in Support of the License Renewal Application Review

I.1 Introduction

Dominion Nuclear Connecticut, Inc. (Dominion) submitted an assessment of SAMAs for Millstone Power Station, Unit 3 (MPS3) as part of the Environmental Report (ER) (Dominion 2004a). This assessment was based on the most recent MPS3 Probabilistic Risk Assessment (PRA) available at that time, a plant-specific offsite consequence analysis performed using the MELCOR Accident Consequence Code System 2 (MACCS2) computer program, and insights from the MPS3 Individual Plant Examination (IPE) (NNECO 1990) and Individual Plant Examination of External Events (IPEEE) (NNECO 1991). In identifying and evaluating potential SAMAs, Dominion considered SAMA analyses performed for other operating plants, as well as industry and NRC documents that discuss potential plant improvements, such as NUREG-1560 (NRC 1997a). Dominion identified 185 potential SAMA candidates. This list was reduced to 52 unique SAMA candidates by eliminating SAMAs that were not applicable to MPS3 due to design differences, had already been implemented, or were related to a reactor coolant pump (RCP) seal loss of coolant accident (LOCA). Dominion assessed the costs and benefits associated with each of the remaining SAMAs and concluded in the ER that none of the candidate SAMAs evaluated would be cost-beneficial for MPS3.

Based on a review of the SAMA assessment, the NRC issued a request for additional information (RAI) to Dominion by letter dated June 22, 2004 (NRC 2004). Key questions concerned the following areas: peer reviews of the PRA, dominant risk contributors at MPS3 and the SAMAs that address these contributors, the mapping of Level 1 PRA results into the Level 2 analysis, the potential impact of external event initiators and uncertainties on the assessment results, detailed information on some specific candidate SAMAs, and consideration of additional SAMAs. Dominion submitted additional information by letter dated August 13, 2004 (Dominion 2004b) including summaries of peer review comments and their impact on the SAMA analysis; importance measures and corresponding SAMA candidates; information regarding the Level 2 analysis; information related to the resolution of IPEEE outliers and the impact of external events in the risk analysis; an assessment of the impact of uncertainties; and additional information regarding specific SAMAs. Dominion's responses

addressed the staff's concerns. As a result, Dominion identified one SAMA that would be cost-beneficial if it can be accomplished via a severe accident management guideline, without a hardware modification.

An assessment of SAMAs for MPS3 is presented below.

I.2 Estimate of Risk for MPS3

Dominion's estimates of offsite risk at MPS3 are summarized in Section I.2.1. The summary is followed by the staff's review of Dominion's risk estimates in Section I.2.2.

I.2.1 Dominion's Risk Estimates

Two distinct analyses are combined to form the basis for the risk estimates used in the SAMA analysis: (1) the MPS3 Level 1 and 2 PRA model, which is an updated version of the IPE (NNECO 1990), and (2) a supplemental analysis of offsite consequences and economic impacts (essentially a Level 3 PRA model) developed specifically for the SAMA analysis. The identification of candidate SAMAs was based on Revision 4 of the PRA model, dated October 1999; the quantification of SAMA benefits was based on an October 2002 update of the PRA (referred to as Revision 0, using a new naming convention) (Dominion 2004b). The scope of the MPS3 PRA does not include external events.

The baseline core damage frequency (CDF) for the purpose of the SAMA evaluation is approximately 2.57×10^{-5} per year. The CDF is based on the risk assessment for internally initiated events. Dominion did not include the contribution to risk from external events or internal flooding within the MPS3 risk estimates; however, it did account for the potential risk reduction benefits associated with external events by increasing the estimated benefits for internal events by 60 percent. This is discussed further in Sections I.4 and I.6.2.

The breakdown of CDF by initiating event is provided in Table I-1. As shown in this table, LOCAs, RCP seal LOCAs, transients including anticipated transients without scram (ATWS), and loss of offsite power (LOOP) are dominant contributors to the CDF. Bypass events (i.e., steam generator tube rupture [SGTR] and interfacing systems LOCA [ISLOCA])] contribute less than 5 percent to the total internal events CDF. The contribution to CDF from internal floods is estimated to be 8.6×10^{-7} per year (NNECO 1990).

The Level 2 PRA model is based on the Level 2 model used in the Millstone Unit 3 Probabilistic Safety Study (NNECO 1983) and the IPE (NNECO 1990). The result of this analysis is a set of formulae for transforming the MPS3 plant damage state (PDS) frequencies into containment

release category frequencies. The source terms for each release category (also termed the source term category) were obtained from the results of MAAP 4 analyses of the dominant core damage sequences in the IPE.

Table I-1. MPS3 Core Damage Frequency

Initiating Event or Accident Class	CDF (Per Year)	% Contribution to CDF
RCP Seal LOCA	5.66×10^{-6}	22.0
Transients	4.04×10^{-6}	15.7
LOCAs	3.42×10^{-6}	13.3
LOOP	2.77×10^{-6}	10.8
ATWS	2.39×10^{-6}	9.3
Steamline break inside containment	2.31×10^{-6}	9.0
Station blackout (SBO)	1.78×10^{-6}	6.9
Total loss of service water	1.28×10^{-6}	5.0
SGTR	1.00×10^{-6}	3.9
Loss of one vital DC bus	4.18×10^{-7}	1.6
Steamline break outside containment	3.79×10^{-7}	1.5
ISLOCA	2.21×10^{-7}	0.9
Instrument tube LOCA	5.04×10^{-8}	0.2
Total CDF	**2.57×10^{-5}**	**100**

The offsite consequences and economic impact analyses use the MACCS2 code to determine the offsite risk impacts on the surrounding environment and public. Inputs for this analysis include plant-specific and site-specific input values for core radionuclide inventory, source term and release characteristics, site meteorological data, projected population distribution within a 80 kilometer (km) (50-mile [mi]) radius for the year 2040, emergency response evacuation modeling, and economic data. The core radionuclide inventory is based on the generic pressurized water reactor (PWR) inventory provided in the MACCS2 manual, adjusted to represent the MPS3 power level of 3411 megawatts thermal (MW[t]). The magnitude of the onsite impacts (in terms of clean-up and decontamination costs and occupational dose) is based on information provided in NUREG/BR-0184 (NRC 1997b).

In the ER, Dominion estimated the dose to the population within 80 km (50 mi) of the MPS3 site to be approximately 0.128 person-sieverts (person-Sv) (12.8 person-roentgen equivalent man [person-rem]) per year. The breakdown of the total population dose by containment release

mode is summarized in Table I-2. Late-containment failures dominate the population dose risk at MPS3, followed by SGTR and ISLOCAs. Early failures and containment isolation failures are each indicated to be zero contributors to risk. As indicated in the response to an RAI, these release modes were deleted from the IPE model because of low contribution (i.e., <0.1 percent) (Dominion 2004b).

Table I-2. Breakdown of Population Dose by Containment Release Mode (Unit 3)

Containment Release Mode	Population Dose (Person-rem[a] Per Year)	% Contribution
Late failure	6.60	51.5
SGTR	2.77	21.6
ISLOCA	2.23	17.4
Intermediate failure	0.93	7.2
No containment failure	0.24	1.9
Basemat failure	0.05	0.4
Early failure	0	0
Containment isolation failure	0	0
Total Population Dose	**12.8**	**100**

(a) One person-rem = 0.01 person-Sv

I.2.2 Review of Dominion's Risk Estimates

Dominions's determination of offsite risk at MPS3 is based on the following three major elements of analysis:

- the Level 1 and 2 risk models that form the bases for the 1990 IPE submittal (NNECO 1990) and the 1991 IPEEE submittal (NNECO 1991),
- the major modifications to the IPE models that have been incorporated in the MPS3 PRA, and
- the MACCS2 analyses performed to translate fission product source terms and release frequencies from the Level 2 PRA model into offsite consequence measures.

Each of these analyses was reviewed to determine the acceptability of Dominion's risk estimates for the SAMA analysis, as summarized below.

The staff's review of the MPS3 IPE is described in an NRC report dated May 5, 1992 (NRC 1992). Based on a review of the original IPE submittal, the staff concluded that IPE submittal met the intent of Generic Letter 88-20 (NRC 1988); that is, the IPE was of adequate quality to be used to look for design or operational vulnerabilities. The staff did, however, identify a number of weaknesses in the IPE analysis. In response to an RAI, Dominion indicated that all of these weaknesses have been addressed in the PRA used for the SAMA analysis (Dominion 2004b).

A comparison of internal events risk profiles between the IPE and the PRA used in the SAMA analysis indicates a decrease of approximately 3×10^{-5} per year in the total CDF (from 5.52×10^{-5} per year to 2.57×10^{-5} per year). The change is a net result of modeling improvements and some minor plant design changes that have been implemented at MPS3 since the IPE was submitted. A summary listing of those changes that resulted in the greatest impact on the total CDF was provided in the ER and in response to an RAI (Dominion 2004a, 2004b), and include the following:

- modified the SBO logic to consider the SBO diesel battery capacity limitation and hardware/procedural changes implemented to cope with the condition,
- incorporated the latest revision of the MPS3 plant-specific database,
- modified the SBO event tree to incorporate the results of core uncovery time based on the most probable RCP seal LOCA leakage rates,
- incorporated the accident sequence analysis for LOCAs, SBO, ATWS, and total loss of service water (SW),
- removed initiating events associated with common cause failure (CCF) to run 3 and 4 SW pumps, based on industry guidance on identification of CCF groupings.

An additional change that has a significant impact on the CDF value is the truncation value used in the PRA model. For the PRA version used for the SAMA analysis, Dominion used a truncation value of 1.0×10^{-11}. In contrast, use of a truncation value of 2.0×10^{-9} (as used in previous versions of the PRA) would result in a CDF of about 2.04×10^{-5} per year rather than a value of 2.57×10^{-5} per year as used in the SAMA analysis.

The IPE CDF value for MPS3 is comparable to the CDF values reported in the IPEs for other Westinghouse PWR plants. Figure 11.6 of NUREG-1560 shows that the IPE-based total internal events CDF for four-loop Westinghouse plants ranges from 4×10^{-6} to 3×10^{-4} per year (NRC 1997a). It is recognized that other plants have reduced the values for CDF subsequent

to the IPE submittals due to modeling and hardware changes. The current internal events CDF results for MPS3 remain comparable to the results for other plants of similar vintage and characteristics.

The staff considered the peer review performed for the MPS3 PRA, and the potential impact of the review findings on the SAMA evaluation. In response to an RAI, Dominion described the external peer review, which was the Westinghouse Owners Group Peer Review performed in September 1999 (Dominion 2004b). The review resulted in four Level A facts and observations (extremely important and necessary) and 41 Level B facts and observations (important and necessary but may be delayed until next update). Two of the Level A and 24 of the Level B recommendations are yet to be incorporated. The Level A recommendations not yet incorporated are in the areas of accident sequence analysis and human reliability analysis. Both involve the completeness of the treatment of pre-initiator human errors. The Level B recommendations not yet incorporated affect essentially all PRA elements. Dominion has reviewed all of the unresolved facts and observations and concluded that they have negligible impact on the SAMA analysis (Dominion 2004b). The staff has also reviewed Dominion's assessment of the impacts of the outstanding peer review comments and has come to the same conclusion.

Given that (1) the MPS3 PRA has been peer reviewed and the potential impact of the peer review findings on the SAMA evaluation has been assessed, (2) Dominion satisfactorily addressed staff questions regarding the PRA (Dominion 2004b), and (3) the CDF falls within the range of contemporary CDFs for Westinghouse plants, the staff concludes that the Level 1 PRA model is of sufficient quality to support the SAMA evaluation.

The licensee included external events in the IPE submittal in August 1990 (NNECO 1990). The external events analysis in the IPE/IPEEE is taken from the "Millstone Unit 3 Probabilistic Safety Study" (NNECO 1983). This submittal and several updates were reviewed extensively by the NRC staff as documented in NUREG-1152 (NRC 1985a) and by contractors as documented in NUREG/CR-4142 (NRC 1985b) and NUREG/CR-4143 (NRC 1985c). While the IPEEE submittal did not identify any vulnerabilities to severe accident risk from external events, a number of minor improvements were identified. In a letter dated May 26, 1998, the staff concluded that the IPEEE submittal met the intent of Supplement 4 to Generic Letter 88-20, and that the licensee's IPEEE process is capable of identifying the most likely severe accidents and severe accident vulnerabilities (NRC 1998).

The seismic PRA performed for MPS3 resulted in a seismic CDF of 9.1×10^{-6} per year. The dominant contributor to this was seismically induced SBO. In NUREG-1152, the staff recommended that two alternatives be further evaluated (improve the anchorage system for the emergency diesel generator lube oil coolers and add a manually-operated, AC independent containment spray system). In response to an RAI, Dominion indicated that the first of these

alternatives has been implemented at MPS3. Dominion provided additional information concerning the costs related to the other alternative. Dominion concluded that, because of adequate seismic margins and the complexity associated with increasing the seismic capacity of a structures and components, no cost-effective SAMAs could be identified (Dominion 2004b). The staff agrees that it is unlikely that cost-effective SAMAs to further reduce seismic risk will exist. This is due to high cost of structural modifications compared to the benefits expected.

The fire PRA performed for MPS3 resulted in a fire CDF of 4.9×10^{-6} per year. The dominant contributors are fires in the charging and component cooling pump area, cable spreading area, and control room. The dominant fire areas and the associated CDF for those areas are:

Fire Area	Description	CDF (per year)
AB-1	Charging and component cooling pumps area	1.07×10^{-6}
CB-8	Cable spreading area	9.89×10^{-7}
CB-9	Control room	7.28×10^{-7}

A subsequent modification to the fire detection system in the cable spreading area has reduced the CDF in this area to 3.75×10^{-7} per year (Dominion 2004b).

In a RAI, the staff asked Dominion to explain, for each important fire area, what measures were taken to further reduce risk, and explain why these CDFs cannot be further reduced in a cost-effective manner (NRC 2004). For each area, Dominion provided a discussion of the major fire contributors assumed in the analysis and the existing plant features to address fire events. Dominion identified several improvements that have been implemented to address fire-related issues. Dominion also discussed the potential for further cost-effective hardware changes to address the fire-related matters listed above, including improvements to detection systems, enhancements to suppression capabilities, and changes that would improve cable separation and train separation (Dominion 2004b). Dominion concluded that no further modifications would be cost-effective for any of the fire areas.

The staff notes that although additional SAMAs to reduce the fire risk contributors might be viable, given the low level of risk from fires and the improvements that have already been implemented, it is unlikely that further modifications would both substantially reduce risk and remain cost-beneficial.

In the SAMA analysis, Dominion accounted for the additional risk contribution due to external events by increasing the benefit derived from the internal events model by 60 percent. This was determined by summing the following CDF contributions:

- Fire 4.9×10^{-6} per year
- Internal flooding 0.9×10^{-6} per year
- Seismic 9.1×10^{-6} per year

The fire contribution is discussed above. The internal flooding CDF of 8.6×10^{-7} per year was obtained directly from the MPS3 IPE (NNECO 1990). This value is the result of a bounding, screening-type analysis. The total external events CDF from the above is 1.49×10^{-5} per year, or approximately 58 percent of the CDF due to internal events. This was rounded up to 60 percent for the SAMA analysis.

The MPS3 Level 2 PRA analysis is based on the IPE (NNECO 1990). The result of this analysis is a set of formulae for transforming the MPS3 plant damage state (PDS) frequencies into containment release category frequencies. This is described in Section I.2.3 of the ER (Dominion 2004a), and further clarified in response to RAIs (Dominion 2004b, 2004c). The formulae and the release category frequencies are provided in Tables I.2-4 and I.2-6 of the ER, respectively (Dominion 2004a). The release fractions for each release category were obtained from MAAP 4 analysis for the dominant sequences in the IPE and are provided in Table I.1-2 of the ER (Dominion 2004a). In response to an RAI concerning the use of IPE dominant sequences to determine the release fractions used in the SAMA analysis, Dominion provided a discussion and a comparison of the PDSs and release categories for the IPE and SAMA analyses (Dominion 2004b). The staff reviewed Dominion's source term estimates for the major release categories and found the release fractions to be within the range of the release fractions for like plants. Dominion also provided results of several sensitivity studies relative to the source term and release characteristics including doubling the plume release height, doubling the duration of source term release time, and varying source term release fractions. The results showed that these parameter variations had only a minor impact (less than 20 percent) on the estimated dollar benefits for the candidate SAMAs. The staff concludes that the process used for determining the release category frequencies and source terms is reasonable and appropriate for the purposes of the SAMA analysis.

During the staff's review of the Level 2 model, the staff identified an error in the formulae used to translate PDS frequencies into release category frequencies. Dominion confirmed the error and determined that it resulted in a slight overestimation of the benefits for candidate SAMAs, which is conservative for the cost-benefit analysis (Dominion 2004b).

As discussed previously, the fission product inventory used in the consequence analysis is based on a fission product inventory scaled from generic information. In response to an RAI concerning the impact of current and future fuel management practices, Dominion described a conservative bounding analysis of core fission product inventory considering a range of enrichments and burnups (Dominion 2004b). Using this inventory would result in a 28-percent increase in total benefit from eliminating all risk. Using realistic mid-life or average conditions

would result in a smaller increase in the maximum benefit. The staff concludes that the scaling based on the plant-specific power level yields sufficiently accurate and reasonable results for the dose assessment.

The staff reviewed the process used by Dominion to extend the containment performance (Level 2) portion of the PRA to an assessment of offsite consequences (essentially a Level 3 PRA). This included consideration of the major input assumptions used in the offsite consequence analyses. The MACCS2 code was utilized to estimate offsite consequences. Plant-specific input to the code includes the source terms for each release category and the MPS3 reactor core radionuclide inventory (both discussed above), site-specific meteorological data, projected population distribution within a 80 km (50 mile) radius for the year 2040, and emergency evacuation modeling. This information is provided in Appendix G to the ER (Dominion, 2004a).

Dominion used site-specific meteorological data processed from hourly measurements for the 2000 calendar year as input to the MACCS2 code. The hourly data (wind direction, wind speed, and stability class) were collected from the onsite meteorological tower. Precipitation data were recorded at the Green Airport near Providence, Rhode Island, the closest weather station to Millstone. Morning and afternoon mixing height values were obtained from the National Climatic Data Center. The applicant also considered the impact on SAMA benefits of using meteorological data for 1998 and 1999. The results of these sensitivity cases showed that the benefits increased by an average of about five percent. The staff considers the use of the 2000 data in the base case to be reasonable.

The population distribution the applicant used as input to the MACCS2 analysis was estimated for the year 2040, based primarily on SECPOP90 (NRC 1997c). U.S. Census Bureau Year 2000 population data, projected to year 2040, was then used to update the SECPOP90 population data (Dominion 2004a). The staff questioned the difference between the use of SECPOP90 and SECPOP2000, and what the impact would be if the latter was used. In response, Dominion noted that the expected impact of using SECPOP2000 would be negligible since census data from 2000 was used to update the SECPOP90 file. The staff considers the methods and assumptions for estimating population reasonable and acceptable for purposes of the SAMA evaluation.

The emergency evacuation model was modeled as a single evacuation zone extending out 16 km (10 mi) from the plant. It was assumed that 100 percent of the population would move at an average speed of approximately 1.49 meters per second with a delayed start time of 7200 seconds from the offsite alarm reference time point (Dominion 2004a). Dominion performed sensitivity studies exploring the impact of the fraction of population that evacuates and the evacuation speed. The results demonstrated that the total dose and economic cost results are

insensitive to these parameters (Dominion 2004a). The staff concludes that the evacuation assumptions and analysis are reasonable and acceptable for the purposes of the SAMA evaluation.

Much of the site-specific economic data were provided from SECPOP90 (NRC 1997c) by specifying the data for counties surrounding the plant to a distance of 50 miles. The SECPOP90 input file was updated to 2001 using cost of living and other data from the Bureau of the Census and the Department of Agriculture (Dominion 2004). The agricultural economic data were updated using available data from the 1997 Census of Agriculture (USDA 1998).

The staff concludes that the methodology used by Dominion to estimate the offsite consequences for MPS3 provides an acceptable basis from which to proceed with an assessment of risk reduction potential for candidate SAMAs. Accordingly, the staff based its assessment of offsite risk on the CDF and offsite doses reported by Dominion.

I.3 Potential Plant Improvements

The process for identifying potential plant improvements, an evaluation of that process, and the improvements evaluated in detail by Dominion are discussed in this section.

I.3.1 Process for Identifying Potential Plant Improvements

Dominion's process for identifying potential plant improvements (SAMAs) consisted of the following elements:

- review of the most significant basic events from the MPS3 PRA Model, Rev. 4 (October 1999),
- review of items not already evaluated and/or implemented during the IPE and IPEEE,
- review of SAMA analyses submitted in support of original licensing and license renewal activities for other operating nuclear power plants, and
- review of other NRC and industry documentation discussing potential plant improvements.

Based on this process, an initial set of 185 candidate SAMAs was identified. In Phase 1 of the evaluation, Dominion performed a qualitative screening of the initial list of SAMAs and eliminated SAMAs from further consideration using the following criteria:

- the SAMA is not applicable at MPS3,

- the SAMA has already been implemented at MPS3, or the MPS3 design meets the intent of the SAMA, or
- the SAMA is related to a RCP seal vulnerability stemming from charging pump dependency on component cooling water (CCW). (MPS3 does not have this vulnerability because the charging pumps do not rely on CCW for RCP seal injection.)

Based on this screening, 133 SAMAs were eliminated leaving 52 for further evaluation. Of the SAMAs eliminated, 47 were eliminated because they were not applicable, 77 were eliminated because they already had been implemented, and 9 were eliminated because they were related to RCP seal vulnerability. A cost estimate was prepared for each of the 52 remaining candidates to focus on those that had a possibility of having a net positive benefit. To account for the potential impact of external events, the estimated benefits based on internal events of each SAMA were multiplied by a factor of 1.6 for all SAMAs except those related to ISLOCA and SGTR-initiated events.

The 52 SAMAs were evaluated and subsequently eliminated, as described in Sections I.4 and I.6.1 below.

I.3.2 Review of Dominion's Process

Dominion's efforts to identify potential SAMAs focused primarily on areas associated with internal initiating events. The initial list of SAMAs generally addressed the accident categories that are dominant CDF contributors or issues that tend to have a large impact on a number of accident sequences at MPS3.

The preliminary review of Dominion's SAMA identification process raised some concerns regarding the completeness of the set of SAMAs identified and the inclusion of plant-specific risk contributors. The staff requested additional information regarding the top 30 cut sets and certain sequences (NRC 2004). In response to the RAI, Dominion provided a listing of the top contributors to risk, the associated plant damage state, and a cross-reference between the top contributors to risk from a later version of the PRA and the SAMAs that addressed those risk contributors (Dominion 2004b).

The staff noted that Dominion based the SAMA identification process on PRA Revision 4 (dated October 1999) and the SAMA quantification on an October 2002 update of the PRA (referred to as Revision 0). The staff questioned Dominion regarding the impact on the SAMA identification process if the later version of the PRA was used to identify potential SAMAs (NRC 2004). In response, Dominion reassessed the SAMA identification process considering the later PRA revision. The basic events not included in the initial Unit 3 PRA importance list were identified. Those events with a risk reduction worth greater than or equal to 1.005 from the more recent

PRA model were specifically evaluated. These events were compared to the SAMA list to determine which events were already addressed by a SAMA. Dominion determined that all of the additional basic events map to previously identified SAMAs. As a result, no new SAMAs were created (Dominion 2004c). Based on these additional assessments, Dominion concluded that the set of 185 SAMAs evaluated in the ER addresses the major contributors to CDF and offsite dose, and that the review of the top risk contributors does not reveal any new SAMAs.

The staff questioned Dominion regarding use of the second screening criterion (i.e., screening out a SAMA on the basis that it has already been implemented at MPS3) to eliminate SAMAs that were identified based on review of the PRA (NRC 2004). In response, Dominion provided qualitative or quantitative details on the plant-specific SAMAs that were screened using this criterion (SAMAs 159, 163, 165, 166, 167, 174, 181 and 185). None of these SAMAs were determined to be cost-beneficial based on this further evaluation.

The staff questioned Dominion about lower-cost alternatives to some of the SAMAs evaluated, including the use of portable battery chargers and a direct-drive diesel auxiliary feedwater (AFW) pump (NRC 2004). In response, Dominion identified several lower-cost alternatives, all of which are covered by an existing procedure or severe accident management guideline (SAMG), or could be instituted following evaluation and guidance by the Technical Support Center. This is discussed further in Section I.6.2.

The staff notes that the set of SAMAs submitted is not all inclusive, since additional, possibly even less expensive, design alternatives can always be postulated. However, the staff concludes that the benefits of any additional modifications are unlikely to exceed the benefits of the modifications evaluated and that the alternative improvements would not likely cost less than the least-expensive alternatives evaluated, when the subsidiary costs associated with maintenance, procedures, and training are considered.

The staff concludes that Dominion used a systematic and comprehensive process for identifying potential plant improvements for MPS3, and that the set of potential plant improvements identified by Dominion is reasonably comprehensive and therefore acceptable. This search included reviewing insights from the IPE and IPEEE and other plant-specific studies, reviewing plant improvements considered in previous SAMA analyses, and using the knowledge and experience of its PRA personnel. While explicit treatment of external events in the SAMA identification process was limited, it is recognized that the prior implementation of plant modifications for seismic and fire events and the absence of external event vulnerabilities reasonably justifies examining primarily the internal events risk results for this purpose.

I.4 Risk Reduction Potential of Plant Improvements

Dominion evaluated the risk-reduction potential of the 52 remaining SAMAs that were applicable to MPS3. A majority of the SAMA evaluations were performed in a bounding fashion in that the SAMA was assumed to completely eliminate the risk associated with the proposed enhancement. Such bounding calculations overestimate the benefit and are conservative.

Dominion estimated the potential benefits for each SAMA by generating a revised set of PDS frequencies. Using these revised frequencies, a revised Level 3 (dollars averted) calculation was performed. The benefit was calculated using the fault trees, event trees, and databases from Revision 0 of the MPS3 PRA. The assumptions made to evaluate the benefit were provided in response to an RAI (Dominion 2004b, 2004c). Table I-3 lists the assumptions considered to estimate the risk reduction for each of the evaluated SAMAs, the estimated risk reduction in terms of percent reduction in CDF and population dose, and the estimated total benefit (present value) of the averted risk (including the 1.6 multiplier to account for benefits in external events). The determination of the benefits for the various SAMAs is further discussed in Section I.6.

The staff has reviewed Dominion's bases for calculating the risk reduction for the various plant improvements and concludes that the rationale and assumptions for estimating risk reduction are reasonable and generally conservative (i.e., the estimated risk reduction is higher than what would actually be realized). Accordingly, the staff based its estimates of averted risk for the various SAMAs on Dominion's risk reduction estimates. The estimated risk reduction for several of the SAMAs was negligible or zero. In these instances, the SAMA either affects sequences or phenomena that do not contribute to risk at MPS3, or represents an ineffective plant improvement. As such, a minimal impact on risk is not unreasonable in those cases.

I.5 Cost Impacts of Candidate Plant Improvements

Dominion personnel experienced in estimating the cost of performing work at a nuclear plant estimated the costs of implementing the 52 candidate SAMAs. For some of the SAMAs considered, the cost estimates were sufficiently greater than the benefits calculated that it was not necessary to perform a detailed cost estimate. Cost estimates typically included procedures, engineering analysis, training, and documentation, in addition to any hardware.

The staff reviewed the bases for the applicant's cost estimates (presented in Section I.3 of Appendix G to the ER). For certain improvements, the staff also compared the cost estimates to estimates developed elsewhere for similar improvements, including estimates developed as part of other licensees' analyses of SAMAs for operating reactors and advanced light-water reactors. The cost estimates provided were in the form of ranges. For purposes of evaluating specific SAMAs, the staff selected the low end values from the range to represent the costs.

Table I-3. SAMA Cost-Benefit Screening Analysis for Millstone Power Station, Unit 3

SAMA	Assumptions	% Risk Reduction		Total Benefit ($)	Cost ($)
		CDF	Population Dose		
9 - Provide additional SW pump that can be connected to either SW header	Set failures of SW pumps and CCF of SW pumps to zero	8.5	9.6	164,800	10,000,000
10 - Create an independent RCP seal cooling system with dedicated diesel	Eliminate the need for RCP cooling from the fault tree	22.8	22.3	419,800	10,000,000
11 - Create an independent RCP seal cooling system without dedicated diesel	Same as SAMA #10	22.8	22.3	419,800	5,000,000
20/21 - Develop a new procedure for cross-tying either the CCW pumps or SW pumps (including analysis, validation, and training)	Changed fault tree from failure of one train to failure of one train of SW AND failure of the opposite train or failure of operator action to align the opposite train (prob. 0.10)	1.7	0.3	14,100	150,000
34 - Install a containment vent large enough to remove ATWS decay heat	Set failure of reactor protection system electrical components (except reactor trip breakers), CCF of reactor trip breakers, CCF of 10 or more control rods to insert, and CCF of 35 or more control rods to insert to zero	9.3	1.3	103,400	10,000,000
35 - Install a filtered containment vent to remove decay heat	Set CCF of recirculation air conditioning units to operate, misalignment of manual valve 3RHS*V43, loss of the recirculation spray system, CCF of motor-operated valves (MOV) 3SWP*MOV50A/B to close, and CCF of 3SWP*MOV71A/B to close to zero	5.8	6.4	110,800	12,000,000

Table I-3. SAMA Cost-Benefit Screening Analysis for Millstone Power Station, Unit 3

SAMA	Assumptions	% Risk Reduction		Total Benefit ($)	Cost ($)
		CDF	Population Dose		
36 - Install an unfiltered hardened containment vent	Same as SAMA #35	5.8	6.4	110,800	10,000,000
43 - Create a reactor cavity flooding system	Set release categories with intermediate and late containment failure and basemat failure to zero	<0.1	41.9	344,800	18,000,000
44 - Creating other options for reactor cavity flooding	Same as SAMA #43	<0.1	41.9	344,800	18,000,000
60 - Provide additional DC battery capability	Lengthen time for restoration of offsite power to become available to prolong DC battery life	2.2	2.6	42,800	600,000
61 - Use fuel cells instead of lead-acid batteries	Same as SAMA #60	2.2	2.6	42,800	3,000,000
63 - Improved bus cross tie ability	Changed fault tree from failure of one AC bus to failure of one AC bus AND failure of the opposite AC bus or failure of operator action to align the opposite AC bus (prob. 0.01)	27.8	17.9	429,600	2,000,000
64 - Alternate battery charging capability	Same as SAMA #60	2.2	2.6	42,800	5,000,000
67 - Create AC power cross tie capability across units	Create cross-tie logic (prob. 0.02) with the Millstone Power Station, Unit 2 (MPS2) emergency diesel generators (EDGs) in the fault tree	8.6	10.4	170,800	4,000,000
73 - Install gas turbine generators	Set failures of EDGs 'A' and 'B' and CCF of EDGs 'A' and 'B' to zero	29.9	24.2	500,100	8,000,000

Table I-3. SAMA Cost-Benefit Screening Analysis for Millstone Power Station, Unit 3

SAMA	Assumptions	% Risk Reduction		Total Benefit ($)	Cost ($)
		CDF	Population Dose		
75 - Create a river water backup for diesel cooling	Same as SAMA #76	0.7	0.5	11,100	750,000
76 - Use firewater as a backup for diesel cooling	Eliminate failures of SW supply to the EDGs from the fault tree	0.7	0.5	11,100	750,000
77 - Provide a connection to alternate offsite power source (the nearest dam)	Eliminate failures of LOOP from the fault tree	38.4	30.0	635,100	6,000,000
80 - Create an auto-loading of the SBO diesel	Set failure of the operator to correctly start and align the SBO diesel to zero	2.4	2.9	47,400	7,000,000
87 - Replace steam generators with new design	Eliminate the possibility of SGTR events from the fault tree	3.5	21.6	144,800	175,000,000
93 - Additional instrumentation and inspection to prevent ISLOCA sequences	Set the ISLOCA containment release category frequency to zero	0.8	17.4	83,600	9,000,000
94 - Increase frequency of valve leak testing	Same as SAMA #93	0.8	17.4	83,600	2,000,000
99 - Ensure all ISLOCA releases are scrubbed	Same as SAMA #93	0.8	17.4	83,600	4,000,000
100 - Add redundant and diverse limit switch to each containment isolation valve	Same as SAMA #93	0.8	17.4	83,600	18,000,000
112 - Proceduralize local manual operation of AFW when control power is lost	Set all recoveries of offsite power to zero	2.2	2.6	42,800	100,000

Table I-3. SAMA Cost-Benefit Screening Analysis for Millstone Power Station, Unit 3

SAMA	Assumptions	% Risk Reduction		Total Benefit ($)	Cost ($)
		CDF	Population Dose		
113 - Provide portable generators to be hooked in to the turbine driven AFW train after battery depletion	Bounded by SAMA #112	1.9	2.3	38,400	5,000,000
120 - Create passive secondary side coolers	Eliminate failures of the AFW system from the fault tree	40.6	15.4	532,900	50,000,000
123 - Provide capability for diesel-driven, low pressure vessel makeup	Eliminate failures of the emergency core cooling system injection from the fault tree	19.7	22.9	396,000	7,500,000
124/125 - Provide an additional high pressure injection (HPSI) pump with independent diesel	Set failures of HPSI pumps and CCF of HPSI pumps to zero	3.5	1	42,800	10,000,000
138 - Create automatic swapover to recirculation on refueling water storage tank depletion	Set failure of operator to establish sump recirculation after a LOCA to zero	1.7	0.3	19,800	2,000,000
156 - Install secondary side guard pipes up to the main steam isolation valves (MSIVs)	Eliminate steam line break inside containment from the fault tree	13.4	22.5	335,700	10,000,000
160 - Install turbine-driven AFW pump	Set failures of the turbine-driven AFW pumps to zero	42.0	33.5	712,200	12,000,000
161 - Install SBO diesel	Set failures of the SBO diesel to zero	5.3	6.4	105,400	8,000,000
162 - Install charging system train	Set failures of charging pumps and CCF of charging pumps to zero	7.2	3.6	103,300	20,000,000
164 - Install safety injection train	Set failures of HPSI pumps and CCF of HPSI pumps to zero	3.5	1	42,800	20,000,000
168 - Automate feed and bleed	Set failures of operator to establish feed and bleed cooling to zero	28.8	21.5	480,800	1,000,000
169 - Improve boron injection reliability with new procedure and hardware	Eliminate failures of emergency boration from the fault tree	0	0	0	2,000,000
170 - Add another air-operated valve (AOV) to isolate SW	Set failures of MOVs 3SWP*MOV50A/B and 3SWP*MOV71A/B to close, CCF of 3SWP*MOV50A/B to close, and CCF of 3SWP*MOV71A/B to close to zero	7.1	8.9	143,800	2,000,000

Table I-3. SAMA Cost-Benefit Screening Analysis for Millstone Power Station, Unit 3

SAMA	Assumptions	% Risk Reduction		Total Benefit ($)	Cost ($)
		CDF	Population Dose		
171 - Install another containment recirculation system (RSS) parallel flow path	Same as SAMA #172	1.7	1.5	28,800	10,000,000
172 - Add a redundant train of RSS	Set failures of RSS pumps and CCF of RSS pumps to zero	1.7	1.5	28,800	20,000,000
173 - Add additional SW AOVs (air-to-close/air-to-open)	Same as SAMA #170	7.1	8.9	143,800	2,000,000
175 - Add a redundant DC bus	Set failures of vital 120 VDC buses 301A1 and 301B1 to zero	0.3	0.5	7,000	5,000,000
176 - Add a redundant charging pump	Set failures of the charging pumps and CCF of the charging pumps to zero	7.2	3.6	103,300	10,000,000
177 - Add a redundant block valve for the power-operated relief valve (PORV)	Eliminate failures of the PORVs to reseat from the fault tree	3.4	2.5	55,100	2,000,000
178 - Add redundant MSIVs	Eliminate failures of the MSIVs to close from the fault tree	0.8	0.2	10,000	5,000,000
179 - Add a redundant SW pump ventilation train	Eliminate failure of the SW train 'A' and train 'B' pump cubicle ventilation from the fault tree	2.1	1.7	34,700	1,000,000
180 - Add a redundant valve in series to isolate the steam line dumps to condenser	Eliminate failures of the steam dump valves to the condenser from the fault tree	4	0.5	44,300	5,000,000
182 - Add redundant AC bus	Changed fault tree from failure of one AC bus to failure of one AC bus AND failure of the opposite AC bus or failure of operator to align the opposite AC bus (prob. 0.01)	27.8	17.9	429,600	15,000,000
183 - Add redundant AFW flow path	Set CCF of the discharge and injection AFW check valves to open to zero	0.9	0.3	11,200	15,000,000
184 - Add redundant demineralized water storage tank (DWST)	Set failure of the DWST to zero	0.8	0.2	9,800	5,000,000

For some SAMAs, the costs appeared to be overestimated. Therefore, the staff asked the applicant to justify the costs for those SAMAs that had significant benefits (NRC 2004). In response to the staff's request, Dominion provided a discussion of the components and activities that were considered in estimating the costs of those SAMAs for which the benefit was determined to be $50,000 or more. The discussion included a description of the modification, if any procedure changes and training would be required, and if any new instrumentation and maintenance would be required (Dominion 2004b). The staff reviewed the costs and subsequent explanations and found them to be reasonable and generally consistent with estimates provided in support of other plants' analyses.

The staff concludes that the cost estimates provided by Dominion are sufficient and appropriate for use in the SAMA evaluation.

I.6 Cost-Benefit Comparison

Dominion's cost-benefit analysis and the staff's review are described in the following sections.

I.6.1 Dominion Evaluation

The methodology used by Dominion was based primarily on NRC's guidance for performing cost-benefit analysis, i.e., NUREG/BR-0184, *Regulatory Analysis Technical Evaluation Handbook* (NRC 1997b). The guidance involves determining the net value for each SAMA according to the following formula:

$$\text{Net Value} = (\text{APE} + \text{AOC} + \text{AOE} + \text{AOSC}) - \text{COE}$$

where,

APE = present value of averted public exposure ($)
AOC = present value of averted offsite property damage costs ($)
AOE = present value of averted occupational exposure costs ($)
AOSC = present value of averted onsite costs ($)
COE = cost of enhancement ($).

If the net value of a SAMA is negative, the cost of implementing the SAMA is larger than the benefit associated with the SAMA and it is not considered cost-beneficial. Dominion's derivation of each of the associated costs is summarized below.

Averted Public Exposure (APE) Costs

The APE costs were calculated using the following formula:

APE = Annual reduction in public exposure (Δperson-rem/year)
x monetary equivalent of unit dose ($2,000 per person-rem)
x present value conversion factor (10.76 based on a 20-year period with a 7-percent discount rate).

As stated in NUREG/BR-0184 (NRC 1997b), it is important to note that the monetary value of the public health risk after discounting does not represent the expected reduction in public health risk due to a single accident. Rather, it is the present value of a stream of potential losses extending over the remaining lifetime (in this case, the renewal period) of the facility. Thus, it reflects the expected annual loss due to a single accident, the possibility that such an accident could occur at any time over the renewal period, and the effect of discounting these potential future losses to present value. For the purposes of initial screening, Dominion calculated an APE of approximately $275,900 for the 20-year license renewal period, which assumes elimination of all severe accidents.

Averted Offsite Property Damage Costs (AOC)

The AOCs were calculated using the following formula:

AOC = Annual CDF reduction
x offsite economic costs associated with a severe accident (on a per-event basis)
x present value conversion factor.

For the purposes of initial screening, which assumes all severe accidents are eliminated, Dominion calculated an annual offsite economic risk of about $21,800 based on the Level 3 risk analysis. This results in a discounted value of approximately $234,700 for the 20-year license renewal period.

Averted Occupational Exposure (AOE) Costs

The AOE costs were calculated using the following formula:

AOE = Annual CDF reduction
x occupational exposure per core damage event
x monetary equivalent of unit dose
x present value conversion factor.

Dominion derived the values for averted occupational exposure from information provided in Section 5.7.3 of the regulatory analysis handbook (NRC 1997b). Best estimate values provided for immediate occupational dose (3300 person-rem) and long-term occupational dose (20,000 person-rem over a 10-year cleanup period) were used. The present value of these doses was calculated using the equations provided in the handbook in conjunction with a monetary equivalent of unit dose of $2,000 per person-rem, a real discount rate of 7 percent, and a time period of 20 years to represent the license renewal period. For the purposes of initial screening, which assumes all severe accidents are eliminated, Dominion calculated an AOE of approximately $11,000 for the 20-year license renewal period.

Averted Onsite Costs (AOSC)

Averted onsite costs (AOSC) include averted cleanup and decontamination costs and averted power replacement costs. Repair and refurbishment costs are considered for recoverable accidents only and not for severe accidents. Dominion derived the values for AOSC based on information provided in Section 5.7.6 of the regulatory analysis handbook (NRC 1997b).

Dominion divided this cost element into two parts — the Onsite Cleanup and Decontamination Cost, also commonly referred to as averted cleanup and decontamination costs, and the replacement power cost.

Averted cleanup and decontamination costs (ACC) were calculated using the following formula:

ACC = Annual CDF reduction
x present value of cleanup costs per core damage event
x present value conversion factor.

The total cost of cleanup and decontamination subsequent to a severe accident is estimated in the regulatory analysis handbook to be $1.5 billion (undiscounted). This value was converted to present costs over a 10-year cleanup period and integrated over the term of the proposed license extension. For the purposes of initial screening, which assumes all severe accidents are eliminated, Dominion calculated an ACC of approximately $334,400 for the 20-year license renewal period.

Long-term replacement power costs (RPC) were calculated using the following formula:

RPC = Annual CDF reduction
x present value of replacement power for a single event
x factor to account for remaining service years for which replacement power is required
x reactor power scaling factor

Dominion based its calculations on the value of 1154 megawatts electric (MW[e]). Therefore, Dominion applied power scaling factor of 1154 MW(e)/910 MW(e) to determine the replacement power cost. For the purposes of initial screening, which assumes all severe accidents are eliminated, Dominion calculated the RPC to be approximately $288,600.

Using the above equations, Dominion estimated the total present dollar value equivalent associated with completely eliminating severe accidents at MPS3 to be about $1,145,000.

Dominion's Results

The total benefit associated with each of the 52 SAMAs evaluated by Dominion is provided in Table I-3. These values were determined based on the above equations for the various averted costs together with the estimated annual reductions in CDF and population dose, and then increased by a multiplier of 1.6 to account for additional risk reduction in external events. The values for total benefit reported in Table I-3 include this multiplier. As a result, all SAMAs that were evaluated were eliminated because the cost was expected to exceed the estimated benefit.

In response to an RAI regarding the costs of SAMA 112 (proceduralize local manual operation of AFW when control power is lost), Dominion assessed the applicability/feasibility of a procedure for manual operation of the turbine-driven AFW (TDAFW) pump when control power is lost, similar to that in place at MPS2. Dominion stated that this SAMA would likely require a plant modification to provide the level indication that would be necessary during SBO, in addition to a new procedure. However, Dominion stated that if this SAMA can be accomplished via a SAMG, without a hardware modification, then the SAMA would be cost-beneficial and will be implemented prior to the period of extended operation (Dominion 2004b).

I.6.2 Review of Dominion's Cost-Benefit Evaluation

The cost-benefit analysis performed by Dominion was based primarily on NUREG/BR-0184 (NRC 1997b) and was conducted in a manner consistent with this guidance.

In order to account for uncertainties in the cost estimates, Dominion applied a factor of two margin in assessing whether SAMAs were cost-beneficial, i.e., a SAMA was considered to be cost-beneficial if the total benefit is within a factor of two of the estimated cost. The staff asked the applicant to consider the impact of uncertainty in the CDF (NRC 2004). In response, Dominion stated that CDF uncertainty calculations are not available in the current version of the Millstone PRA model. However, based on a review of recent SAMA analyses in support of license renewal, the 95th percentile CDF ranged from a factor of 2.0 to a factor of 6.4 greater than the mean CDF. Dominion stated that in order to provide conservatism, it compared the

cost to twice the calculated benefit. Dominion further indicated that most of the benefit calculations were performed in a bounding fashion, i.e., the SAMA is completely effective, and that such estimates would be substantially less if a more realistic analysis were performed for each SAMA (Dominion 2004b).

The staff questioned the approach of increasing the benefit (based on internal events) by 60 percent to account for external events (NRC 2004). In response to the RAI, Dominion stated that a multiplier of 1.6 was used because the external events analyses are not readily quantifiable (Dominion 2004b). The use of a multiplier on the benefits obtained from the internal events PRA to incorporate the impact of external events makes the implicit assumption that the consequences from external events sequences are the same as the consequences from internal events sequences. To demonstrate the robustness of the analysis, Dominion performed a sensitivity study that increased the assumed contribution from external events from 60 percent to 120 percent of the internal event benefits. The result was that the increased benefit exceeded the lower bound of the cost estimate range for only 2 SAMAs (112 and 168). Dominion stated that external events are dominated by LOOP and SBO (approximately 85 percent of the external events CDF comes from SBO). SAMA 168 (automate feed and bleed) would have no benefit for SBO sequences because feed and bleed cannot be achieved without power. Additionally, this SAMA could create additional means for a spurious power-operated relief valve opening or safety injection (a negative benefit). Therefore, Dominion concluded that the use of the 1.6 multiplier is acceptable. SAMA 112 is discussed further below.

Dominion assessed the impact of other factors on the analysis results, such as the contribution of external event initiators that were not explicitly included in the MPS2 risk profile, the use of a 3 percent discount rate as compared to the 7 percent discount rate used in the baseline calculations, as well as a 15-percent real discount rate (Dominion 2004a). These sensitivity cases resulted in an increase in the benefit calculation of about 30 percent or less. These analyses did not change Dominion's conclusion that none of the candidate SAMAs would be cost-beneficial except as noted above. In addition, Dominion performed sensitivity analyses that addressed assumptions made in other parts of the cost-benefit analysis, including meteorological data, source term, and evacuation. Dominion also considered the sensitivity to the impact of current and future fuel management practices. These sensitivity cases are generally bounded by the 3-percent discount rate sensitivity study.

The staff notes that accounting for each of these factors would tend to increase the benefit as compared to the baseline case analysis. However, the calculated benefits used in the baseline analysis are generally overestimated and, therefore, conservative. The staff concludes that the use of the factor of two to account for uncertainties, coupled with the fact that the calculated benefits are generally conservative, provides a reasonable treatment of uncertainties and is adequate for the SAMA evaluation.

The staff questioned Dominion about lower cost alternatives to some of the SAMAs evaluated, including the use of a direct-drive diesel AFW pump (NRC 2004). With regard to the specific lower-cost alternative involving a direct-drive diesel AFW pump, Dominion stated that the alternative would not be viable at MPS3 due to room and ventilation constraints as well as costs. Dominion further stated that MPS3 has a SAMG for using the diesel fire pump to provide water to the AFW system (Dominion 2004b).

Dominion also identified and evaluated several lower-cost alternatives to those considered in the ER. These included (1) installing an unfiltered hardened containment vent, (2) using existing systems to flood the reactor cavity, (3) creating a new SAMG to direct manual control of AFW, and (4) using the fire water system to fill the steam generators. Dominion concluded that three of the alternatives are covered by an existing procedure or SAMG, or could be instituted following evaluation and guidance by the Technical Support Center. The alternative involving creation of a new SAMG to direct manual control of the AFW pump is not currently covered by an existing procedure, but is related to SAMA 112.

SAMA 112 involves physical modifications to provide steam generator level indication in an SBO scenario, as well as the development of an emergency operating procedure that would direct the manual control of the TDAFW pump (Dominion 2004b). This SAMA was estimated to have a benefit of about $43,000 and an implementation cost of about $100,000. As such, it would not be cost-beneficial. As an alternative to SAMA 112, Dominion considered the development of a SAMG without the hardware modification. This improvement could be effective in a more limited number of sequences in which auxiliary feedwater control power is lost, but steam generator level indications are not. Development of a SAMG for manual control of the pump would involve engineering to determine the feasibility, creation of the new SAMG, field verification of the actual operation, and final SAMG production. Dominion estimated the cost of this alternative to be in the range of $50,000 to $60,000. The estimated benefit of this modification (after doubling to account for uncertainty) is greater than the expected cost; therefore, it is potentially cost-beneficial. As indicated in its RAI response, Dominion plans to complete its evaluation of this SAMA and, if it is cost-beneficial, will develop a SAMG addressing manual control of the
turbine-driven AFW pump prior to the period of extended operation (Dominion 2004b).

The staff concludes that, with the exception of one potentially cost-beneficial SAMA discussed above, the costs of the SAMAs would be higher than the associated benefits. This conclusion is supported by uncertainty assessment and sensitivity analyses and upheld despite a number of additional uncertainties and non-quantifiable factors in the calculations, summarized as follows:

- A factor of two was used to account for uncertainties. Even if a higher factor were considered to reflect a larger uncertainty in CDF, e.g., a factor of five, only one additional SAMA would be close to becoming cost-beneficial — SAMA 168. However, this SAMA is not expected to be cost-beneficial under more realistic assumptions regarding risk reduction and implementation costs.
- Sensitivity calculations were performed with respect to the discount rate (3 percent and 15 percent) and various MACCS2 parameters, including meteorological data, evacuation speed, evacuation delay time, and source terms. The results of these sensitivity studies showed that none of the risk benefits was increased by more than 40 percent. Since this is less than the margin between cost and benefit for the SAMAs considered, the uncertainties in these parameters would not alter the conclusions.

I.7 Conclusions

Dominion compiled a list of 185 SAMA candidates using the SAMA analyses as submitted in support of licensing activities for other nuclear power plants, NRC and industry documents discussing potential plant improvements, plant-specific insights from the MPS3 PRA model. A qualitative screening removed SAMA candidates that (1) were not applicable at MPS3 due to design differences, (2) had already been implemented at MPS3, or (3) were related to RCP seal vulnerability. A total of 133 SAMAs were eliminated, leaving 52 for further evaluation.

For the remaining SAMA candidates, a more detailed design and cost estimate were developed as shown in Table G-3. The cost-benefit analyses showed that none of the SAMA candidates was potentially cost-beneficial. Upon completion of a 3-percent discount rate sensitivity study, as well as other sensitivity studies, no additional SAMA candidates were determined to be potentially cost-beneficial. To account for uncertainties, Dominion compared the cost of the SAMA with twice the calculated benefit. As a result, no additional SAMAs were cost-beneficial.

The staff reviewed the Dominion analysis and concluded that the methods used and the implementation of those methods was sound. The treatment of SAMA benefits and costs, the generally large negative net benefits, and the inherently small baseline risks support the general conclusion that the SAMA evaluations performed by Dominion are reasonable and sufficient for the license renewal submittal. The unavailability of an external event PRA model precluded a quantitative evaluation of SAMAs specifically aimed at reducing risk of external event initiators; however, improvements that have been realized as a result of the IPEEE process and the inclusion of a multiplier to account for external events would minimize the likelihood of identifying cost-beneficial enhancements in this area.

Based on its review of the Dominion SAMA analysis, the staff concurs that none of the candidate SAMAs are cost-beneficial, except for SAMA 112 — proceduralize local manual operation of AFW when control power is lost. This is based on conservative treatment of costs and benefits. This conclusion is consistent with the low residual level of risk indicated in the MPS3 PRA and the fact that MPS3 has already implemented many of plant improvements identified from the IPE and IPEEE processes. Although SAMA 112 may be cost-beneficial if it can be implemented via procedural enhancements, this SAMA does not relate to adequately managing the effects of aging during the period of extended operation. Therefore, it need not be implemented as part of the license renewal pursuant to 10 CFR Part 54.

I.8 References

10 CFR Part 54. Code of Federal Regulations, Title 10, *Energy*, Part 54, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants."

Dominion Nuclear Connecticut, Inc. (Dominion). 2004a. *Applicant's Environmental Report–Operating License Renewal Stage, Millstone Power Station, Units 2 and 3.* Dominion Nuclear Connecticut, Inc., Richmond, Virginia. January 2004.

Dominion Nuclear Connecticut, Inc. (Dominion). 2004b. Letter from Leslie N. Hartz, Dominion, to United States Nuclear Regulatory Commission Document Control Desk. Subject: Dominion Nuclear Connecticut, Inc., Millstone Power Sation, Units 2 and 3, Response to Request for Additional Information, License Renewal Applications. (August 13, 2004).

Dominion Nuclear Connecticut, Inc. (Dominion). 2004c. Email from Richard J. Gallagher, Dominion, to Richard Emch, NRC. Subject: Clarification of RAI Responses. (September 16, 2004).

Northeast Nuclear Energy Company (NNECO). 1983. *Millstone Unit 3 Probabilistic Safety Study.* August 1983.

Northeast Nuclear Energy Company (NNECO). 1990. Letter from E. J. Mroczka, NNECO, to U.S. Nuclear Regulatory Commission Document Control Desk. Subject: Millstone Nuclear Power Station Unit No. 3, Response to Generic Letter 88-20, Individual Plant Examination for Severe Accident Vulnerabilities, Summary Report Submittal. (August 31, 1990).

Northeast Nuclear Energy Company (NNECO). 1991. Letter from J. F. Opeka, NNECO, to U.S. Nuclear Regulatory Commission Document Control Desk. Subject: Millstone Nuclear Power Station, Unit Nos. 1, 2 and 3, Response to Generic Letter 88-20 Supplement 4, Revised

Response to Generic Letter 88-20 Supplement 1, Individual Plant Examinations (IPE) for Severe Accident Vulnerabilities. (December 23, 1991).

U.S. Nuclear Regulatory Commission (NRC). 1985a. NUREG-1152, *Millstone 3 Risk Evaluation Report, An Overall Review and Evaluation of the Millstone Unit 3 Probabilistic Safety Study*, Washington, D.C.

U.S. Nuclear Regulatory Commission (NRC). 1985b. NUREG/CR-4142, *A Review of the Millstone Probabilistic Safety Study*, Washington, D.C.

U.S. Nuclear Regulatory Commission (NRC). 1985c. NUREG/CR-4143, *Review and Evaluation of the Millstone Unit 3 Probabilistic Safety Study, Containment Failure Modes, Radiological Source-Terms and Offsite Consequences*, Washington, D.C.

U.S. Nuclear Regulatory Commission (NRC). 1988. Generic Letter 88-20, "Individual Plant Examination for Severe Accident Vulnerabilities." November 23, 1988.

U.S. Nuclear Regulatory Commission (NRC). 1990. NUREG-1150, *Severe Accident Risks: An Assessment for Five U.S. Nuclear Power Plants*, Washington, D.C.

U.S. Nuclear Regulatory Commission (NRC). 1991. NUREG-1407, *Procedural and Submittal Guidance for the Individual Plant Examination of External Events (IPEEE) for Severe Accident Vulnerabilities*, Washington, D.C.

U.S. Nuclear Regulatory Commission (NRC). 1992. Letter from Vernon L. Rooney, U.S. NRC, to John F. Opeka, NNECO. Subject: Staff Evaluation of Millstone 3 Individual Plant Examination (IPE) - Internal Events, GL 88-20 (TAC NO. M74434). (May 5, 1992).

U.S. Nuclear Regulatory Commission. 1996. NUREG-1437, *Generic Environmental Impact Statement for License Renewal of Nuclear Plants*, Washington, D.C.

U.S. Nuclear Regulatory Commission (NRC). 1997a. NUREG-1560, *Individual Plant Examination Program: Perspectives on Reactor Safety and Plant Performance*, Washington, D.C.

U.S. Nuclear Regulatory Commission (NRC). 1997b. NUREG/BR-0184, *Regulatory Analysis Technical Evaluation Handbook*, Washington, D.C.

U.S. Nuclear Regulatory Commission (NRC). 1997c. NUREG/CR-6525, *SECPOP90: Sector Population, Land Fraction, and Economic Estimation Program*, Washington, D.C.

U.S. Nuclear Regulatory Commission (NRC). 1998. Letter from James W. Andersen, NRC, to Martin L. Bowling, Jr., NNECO. Subject: Millstone Nuclear Power Station, Unit No. 3 – Individual Plant Examination of External Events (TAC NO. M83643). (May 26, 1998).

U.S. Nuclear Regulatory Commission (NRC). 2004. Letter from Richard L. Emch, Jr., NRC, to David A. Christian, Dominion. Subject: Request for Additional Information (RAI) Regarding Severe Accident Mitigation Alternatives for the Millstone Power Station, Units 2 and 3 (TAC NOS. MC1827 and MC1828). (June 22, 2004).

U.S. Department of Agriculture (USDA). 1998. 1997 Census of Agriculture, National Agriculture Statistics Service, 1998.

NRC FORM 335
(9-2004)
NRCMD 3.7

U.S. NUCLEAR REGULATORY COMMISSION

BIBLIOGRAPHIC DATA SHEET

(See instructions on the reverse)

1. REPORT NUMBER
(Assigned by NRC, Add Vol., Supp., Rev., and Addendum Numbers, if any.)

NUREG-1437, Supplement 22

2. TITLE AND SUBTITLE

Generic Environmental Impact Statement for License Renewal of Nuclear Plants (GEIS)
Supplement 22
Regarding Millstone Power Station, Units 2 and 3
Final Report

3. DATE REPORT PUBLISHED

MONTH	YEAR
July	2005

4. FIN OR GRANT NUMBER

5. AUTHOR(S)

6. TYPE OF REPORT

Technical

7. PERIOD COVERED *(Inclusive Dates)*

8. PERFORMING ORGANIZATION - NAME AND ADDRESS *(If NRC, provide Division, Office or Region, U.S. Nuclear Regulatory Commission, and mailing address; if contractor, provide name and mailing address.)*

Division of Regulatory Improvement Programs
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

9. SPONSORING ORGANIZATION - NAME AND ADDRESS *(If NRC, type "Same as above"; if contractor, provide NRC Division, Office or Region, U.S. Nuclear Regulatory Commission, and mailing address.)*

Same as 8 above

10. SUPPLEMENTARY NOTES

Docket Numbers 50-336, 50-423

11. ABSTRACT *(200 words or less)*

This final supplemental environmental impact statement (SEIS) has been prepared in response to an application submitted to the NRC by Dominion Nuclear Connecticut, Inc. (Dominion) to renew the operating license for Millstone Power Station, Units 2 and 3 (Millstone) for an additional 20 years under 10 CFR Part 54. The final SEIS includes the NRC staff's analysis that considers and weighs the environmental impacts of the proposed action, the environmental impacts of alternatives to the proposed action, and mitigation measures available for reducing or avoiding adverse impacts. It also includes the staff's recommendation regarding the proposed action.

The NRC staff's recommendation is that the Commission determine that the adverse environmental impacts of license renewal for Millstone are not so great that preserving the option of license renewal for energy-planning decisionmakers would be unreasonable. This recommendation is based on (1) the analysis and findings in the GEIS; (2) the Environmental Report submitted by Dominion; (3) consultation with Federal, State, and local agencies; (4) the staff's own independent review; and (5) the staff's consideration of public comments.

12. KEY WORDS/DESCRIPTORS *(List words or phrases that will assist researchers in locating the report.)*

Millstone Power Station, Units 2 and 3
Millstone
Final Supplement to the Generic Environmental Impact Statement
FSEIS
National Environmental Policy Act
NEPA
License Renewal
GEIS

13. AVAILABILITY STATEMENT

unlimited

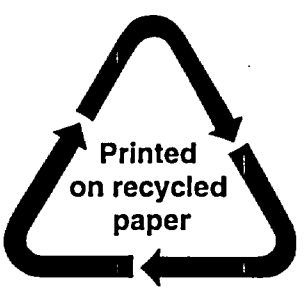
14. SECURITY CLASSIFICATION

(This Page)
unclassified

(This Report)
unclassified

15. NUMBER OF PAGES

16. PRICE



Federal Recycling Program

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, DC 20555-0001

OFFICIAL BUSINESS