

### Agenda for May 9, 2012 Public Meeting

Time	Description	Presenters
0800 – 0815	Opening Remarks	B. Holian & M. Galloway
0815 – 0845	<ol style="list-style-type: none"> <li>1. Rules of Engagement (5 minutes)</li> <li>2. Purpose of meeting (10 minutes)               <ol style="list-style-type: none"> <li>a. Scope of discussion topics</li> <li>b. How the public can submit comments</li> <li>c. Provide plans of upcoming meeting</li> </ol> </li> <li>3. Overview of current license renewal process (15 minutes)</li> </ol>	L. Rakovan S. Sakai  S. Sakai
0845 – 0955	Comments on process for subsequent license renewal (10 minutes each) and panel discussion (30 minute discussion)	<ol style="list-style-type: none"> <li>1. D. Lochbaum</li> <li>2. M. Lampert</li> <li>3. R. Webster</li> <li>4. G. Young</li> </ol>
0955 – 1025	Open discussion on process (30 minute discussion)	All attendees
1025 – 1040	Break	
1040 – 1055	NRC Staff remarks on safety issues	B. Brady
1055 – 1155	Comments on safety issues for subsequent license renewal (10 minutes each)	<ol style="list-style-type: none"> <li>1. D. Lochbaum</li> <li>2. M. Lampert</li> <li>3. R. Webster</li> <li>4. S. Bernhoft</li> <li>5. R. Reister</li> <li>6. M. Fallin</li> </ol>
1155 – 1300	Lunch	
1300 – 1345	Continued – Panel discussion on safety issues for subsequent license renewal and (45 minute discussion)	<ol style="list-style-type: none"> <li>1. D. Lochbaum</li> <li>2. M. Lampert</li> <li>3. R. Webster</li> <li>4. S. Bernhoft</li> <li>5. R. Reister</li> <li>6. M. Fallin</li> </ol>
1345 – 1415	Open discussion on safety issues (30 minute discussion)	All attendees
1415 – 1430	Break	
1430 – 1445	NRC Staff remarks on environmental issues	J. Susco
1445 – 1555	Comments on environmental issues for subsequent license renewal (10 minutes each) and panel discussion (30 minute discussion)	<ol style="list-style-type: none"> <li>1. M. Lampert</li> <li>2. R. Webster</li> <li>3. S. Wilson</li> <li>4. R. Buckley</li> </ol>
1555 – 1625	Open discussion on environmental issues (30 minute discussion)	All attendees
1625 – 1655	Open discussion (30 minute discussion)	All attendees
1655 – 1700	Closing remarks	Y. Diaz



**U.S.NRC**

UNITED STATES NUCLEAR REGULATORY COMMISSION

*Protecting People and the Environment*

**Public Meeting on  
Subsequent License Renewal**

**May 9, 2012**

# Ground Rules

- Category 2 public meeting
- Respect all participants. We're not all going to have the same opinions about things.
- Please do not interrupt a speaker or speak when not using a microphone.
- Please speak clearly into the microphone. Your remarks are being transcribed.
- Please silence all cell phones.
- Please see me if you have questions or concerns regarding the conduct of this meeting.

# Purpose of Today's Meeting

- Receive comments for consideration for subsequent license renewals
- Topic areas
  - Process
  - Safety Issues
  - Environmental Issues



# Providing Comments

- At specified times during the meeting
- By email to:

[SLR.Resource@nrc.gov](mailto:SLR.Resource@nrc.gov)

– Comments received by May 25, 2012  
will be part of the meeting summary

- Future meetings

# Agenda

8:45AM – 10:25AM	Process
10:40AM – 11:55AM	Safety
11:55AM – 1:00PM	Lunch
1:00PM – 2:15PM	Safety (continued)
2:30PM – 4:25PM	Environmental
4:25PM – 4:55PM	Other Issues
5:00PM	Closing



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Process Discussion**

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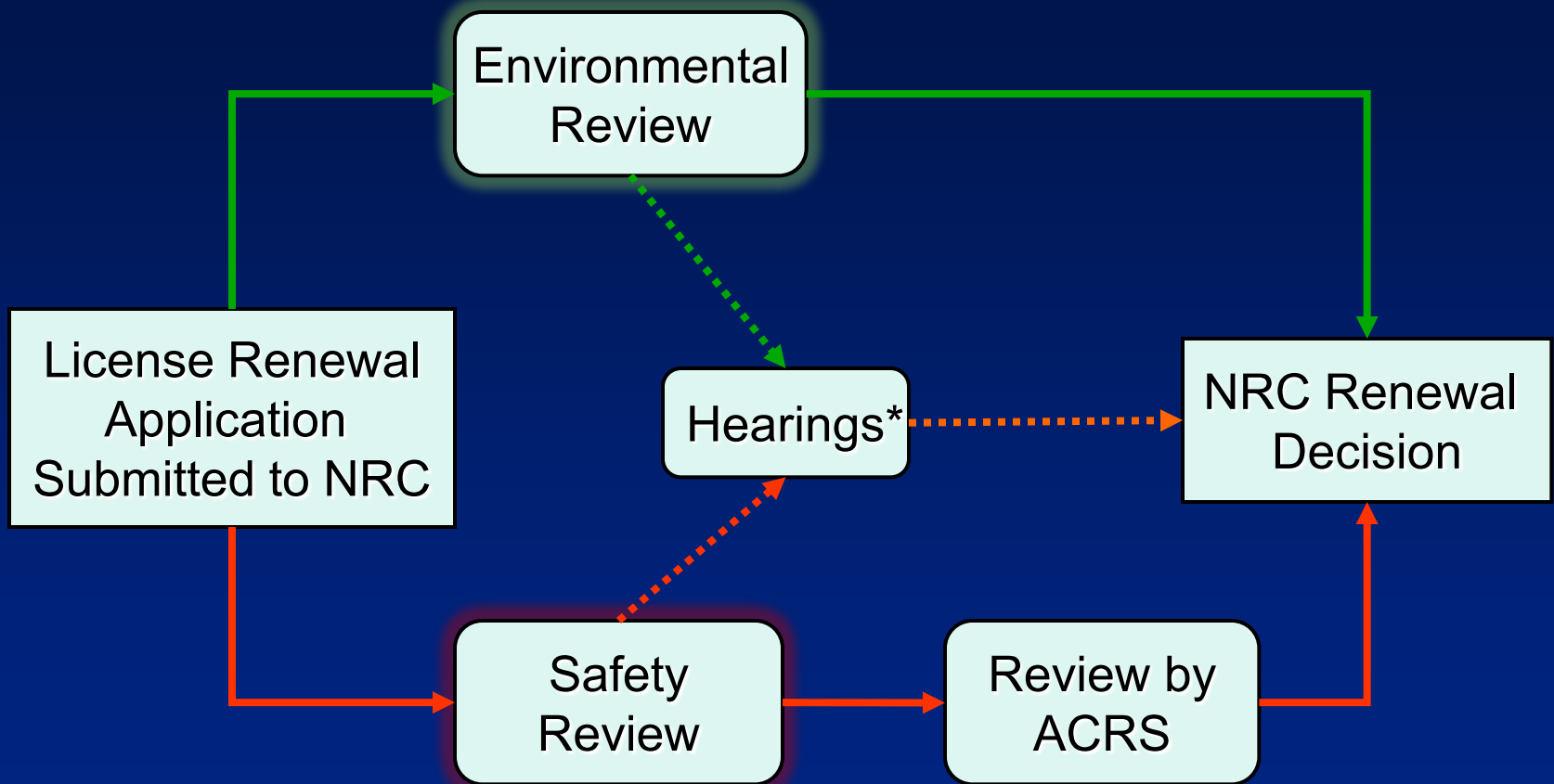
# Background

- NRC's Governing Statutes
  - Atomic Energy Act
  - National Environmental Policy Act (NEPA)
  
- NRC's Mission
  - Protect Public Health and Safety
  - Promote Common Defense and Security
  - Protect Environment

# Current License Renewal Process

- 10 CFR 54
  - Applications for renewed license may not be submitted more than 20 years prior to expiration of license
  - Allows for renewal for up to 20 years
- Safety review
- Environmental review

# License Renewal Process



# Review Milestones

**Application Received**

**Docketing and Sufficiency of Application**

**Notice of Opportunity for Hearing**

**Safety Milestones**

**Environmental Milestones**

**SER with Open Items**

**ACRS Subcommittee**

**Meeting**

**Final SER Issued**

**ACRS Full Committee**

**Meeting**

**Notice of Intent for  
Scoping**

**Scoping Meeting**

**Scoping Comments Due**

**Draft SEIS Issued**

**Draft SEIS Comments**

**Final SEIS Issued**

**Agency Decision**

10 CFR 54	Title 10 of the Code of Federal Regulations Part 54
ACRS	Advisory Committee on Reactor Safeguards
NEPA	National Environmental Policy Act
SER	Safety Evaluation Report
SEIS	Supplemental Environmental Impact Statement
SLR	Subsequent license renewal





## Union of Concerned Scientists

Citizens and Scientists for Environmental Solutions

### License Renewal Concerns

The following concerns were prepared for the NRC's public meeting scheduled for May 9, 2012, in Rockville, Maryland on potentially renewing reactor licenses to allow operation past 60 years. This meeting's agenda covered three areas: (1) license renewal process issues, (2) safety issues, and (3) environmental issues. UCS's concerns are presented below in these three categories. There are overlaps between Category 1 and the other two categories in that the primary reason for a process concern would be its associated implications for safety and/or the environment.

#### 1) License renewal process issues

- a) The process fails to apply revised license renewal standards adopted by the NRC to previously relicensed reactors (see ML12061A079 and the UCS letter dated 02/07/2012 it answered). Ginna and Point Beach are very similar reactors in terms of design and operating history. NRC relicensed Ginna on May 19, 2004, and Point Beach on December 23, 2005. In between, the NRC revised its license renewal standard review plan and generic aging lessons learned report. NRC required the Point Beach licensee to explicitly address its aging management program for Alloy 600 parts of the reactor coolant system – the NRC did not require that from the Ginna licensee. UCS believes NRC failed to properly apply either 10 CFR 50.100 (by failing to require Ginna to formally incorporate an Alloy 600 aging management program) or 10 CFR 50.109 (by requiring Point Beach to meet a requirement not necessary at Ginna). What if both plants fail to implement aging management programs for Alloy 600 components within the reactor coolant system? NRC has a regulatory hook at Point Beach that it lacks at Ginna.

***UCS Recommendation: NRC simply must abide by 10 CFR 50.100 and 10 CFR 50.109 by having ALL reactors conform with ALL safety requirements – not just reactors late in the license renewal queue.***

- b) The process fails to consider the effects from new regulations from which an aging reactor was grandfathered, exempted, or waived. For example, in the mid 1990s the NRC revised seismic hazard levels for new reactors if built in the central and eastern United States but did nothing about the 27 reactors already operating in this region. As a result, the proposed Unit 3 reactor at North Anna must be designed for significantly greater earthquake magnitude than the operating Unit 1 and 2 reactors. As another example, the NRC resolved USI A-43 by imposing different containment sump screen blockage criteria for new reactors without taking any action for reactors already operating. (See [http://www.ucsusa.org/assets/documents/nuclear\\_power/20031029-ucs-regulatory-malpractice.pdf](http://www.ucsusa.org/assets/documents/nuclear_power/20031029-ucs-regulatory-malpractice.pdf)). As yet another example, the NRC requires vendors of new

reactors to formally evaluate their designs for aircraft impacts – not so as to be immune from such threats, but to implement reasonable design changes to reduce vulnerabilities. But NRC did not require operating reactors to perform such evaluations (this example is linked to a concern under the Environmental Issues section regarding failure to formally evaluate the pros/cons of a new reactor design more resistant to aircraft hazards instead of continuing to operator the older reactors without such protection).

***UCS Recommendation: The license renewal process should formally evaluate all regulatory decisions where an operating reactor was grandfathered, waived, exempted, or otherwise not required to meet new and revised regulatory requirements to either confirm that such decisions remain justified for the extended license period or make appropriate fixes.***

- c) The process fails to properly value human lives in cost benefit analyses. According to an article in the New York Times (“As U.S. Agencies Put More Value on a Life, Businesses Fret,” Binyamin Appelbaum, February 16, 2011), the Office of Management and Budget warned federal agencies that using less than \$5 million per life would be difficult to justify, yet NRC uses a significantly lower value.

***UCS Recommendation: NRC must not undervalue human lives when performing and accepting cost benefit analyses.***

- d) The process fails to implement safety upgrades judged to be cost beneficial by the licensees. Many applicants for license renewal have identified cost beneficial safety upgrades that were not implemented (e.g., Dresden in ML041890266, Quad Cities in ML041880213, and Indian Point in ML11223A480).

***UCS Recommendation: NRC must either require safety upgrades deemed to be cost beneficial to be implemented or have its story ready following a nuclear plant disaster that could have been prevented or mitigated by the identified safety upgrade that was not implemented (i.e, be prepared to explain why a sea wall known to too short was not heightened until after the disaster).***

- e) The process allows “bait and switch” antics by licensees. Vermont Yankee is a classic example. The NRC staff, while reviewing the license renewal application, had reservations about the licensee’s manual calculations of thermal cycles. So, the licensee made License Renewal Commitment No. 6 to use a computerized method (FatiguePro) for this aging management task. The NRC renewed the license. And almost immediately, the licensee revised its commitment to use manual accounting methods instead of FatiguePro – in other words, to revert to the method expressly opposed by the NRC staff (see ML12079A031).

***UCS Recommendation: While licensees must retain the ability to revise commitments for appropriate reasons, the NRC's license renewal process simply cannot allow licensees to renege on their commitments and revert to practices considered inadequate by the NRC staff.***

- f) The license renewal process fails to properly and fully consider changes occurring outside the plant's fences. The issues typically covered in Chapter 2 of the Final Safety Analysis Reports are not formally evaluated to see if changes over the decades in populations, infrastructure, nearby airports and air traffic use, etc. adversely affect safety and environmental conclusions reached by NRC in originally licensing the plant.

***UCS Recommendation: The license renewal process should formally evaluate all the issues in FSAR Chapter 2 to either confirm that safety and environmental conclusions are still applicable or make appropriate fixes.***

## **2) Safety issues associated with license renewal**

- a) One-time inspections are not revisited to verify their continued applicability. In other words, what assurance exists that the results from a one-time inspection conducted at Year 39 remain valid in Year 74 of a twice-renewed operating license?

***UCS Recommendation: The license renewal process must either justify results from one-time inspections remaining valid over time or replace them with two-timing or three-time inspections.***

- b) "New" accidents are not being captured in design and licensing space. For example, Final Safety Analysis Report Chapter 15 typically considers the only accident involving irradiated fuel outside the reactor to be a fuel handling accident. Other accidents – such as loss of spent fuel pool water inventory, loss of spent fuel pool cooling, and criticality of irradiated fuel in the spent fuel pool – are not covered. The technical specifications for Browns Ferry Unit 1 (ML052780019) only requires water to be in the spent fuel pool when irradiated fuel is being moved (Tech Spec 3.7.6). If the water level is too low or entirely gone, Action A.1 only requires that movement of irradiated fuel be stopped. There's no requirement to put water back in the pool. Likewise, the BWR/4 standard technical specifications issued by the NRC last month (ML12104A192) only requires water in the spent fuel pool when irradiated fuel is being moved (Tech Spec 3.7.8). Similarly, the technical specifications do not require secondary containment, onsite power, offsite power, and many other safety features except when irradiated fuel is being moved. Fifty years ago when reactors were being contemplated, the guiding notion was that irradiated fuel would remain onsite for a handful of months after removal from the reactor core and then shipped offsite for reprocessing or disposal. With none of these options available, spent fuel pools were reroaked to maximize their storage capacity. But

the attendant accidents introduced by this significant philosophy change were not rolled into the applicable design and licensing bases. When regulatory decisions are made (including 10 CFR 50.59 evaluations), the incomplete design and licensing bases for spent fuel storage yield improperly derived answers.

***UCS Recommendation: NRC must use license renewals as opportunities to catch and correct safety oversights rather than to sustain continued overlooks. When safety frameworks change, as they have with respect to onsite residency periods for spent fuel, the license renewal process must formally determine whether the status quo still provides adequate protection.***

### **3) Environmental issues associated with license renewal**

- a) The license renewal process contradicts the initial licensing process with respect to National Environmental Policy Act (NEPA). In the past, “new” reactors had to incorporate cooling towers instead of using once-through cooling in order to satisfy NEPA. Classic examples include Artificial Island where the two older Salem reactors lack cooling towers and the single newer Hope Creek reactor has a cooling tower (as would Hope Creek Unit 2 if it had been finished) and upstate New York where the newer Nine Mile Point Unit 2 has a cooling tower while the older Nine Mile Point Unit 1 and FitzPatrick reactors do not. The initial licensing process caused “new” reactors to rely on cooling towers to minimize the impacts on the environment per NEPA. But the license renewal process fails to apply the same rigor and requirements when “old” reactors get to run for 20 or more years without cooling towers. If the “old” reactor was not relicensed and a “newer” reactor built to replace it, it would very likely require a cooling tower (e.g., North Anna Unit 3 will have a cooling tower if built while North Anna Units 1 and 2 lack cooling towers).

***UCS Recommendation: The NRC’s license renewal process must provide equal protection of the environment as its initial licensing process.***

- b) Evaluations of alternatives to relicensing a reactor fail to consider building and operating a new reactor. Advocates of Small Modular Reactors and other proposed reactor designs contend that they are so safe as to justify reducing or even eliminating the emergency planning zones (see ML12111A067). If so, would not a 21<sup>st</sup> century reactor likely fare better than a 60-plus 20<sup>th</sup> century reactor in a real alternatives analysis?

***UCS Recommendation: The formal evaluation of options to renewing the operating license of an aging nuclear reactor should also consider building and operating a new nuclear reactor instead.***

Prepared by:

David Lochbaum

Director, Nuclear Safety Project

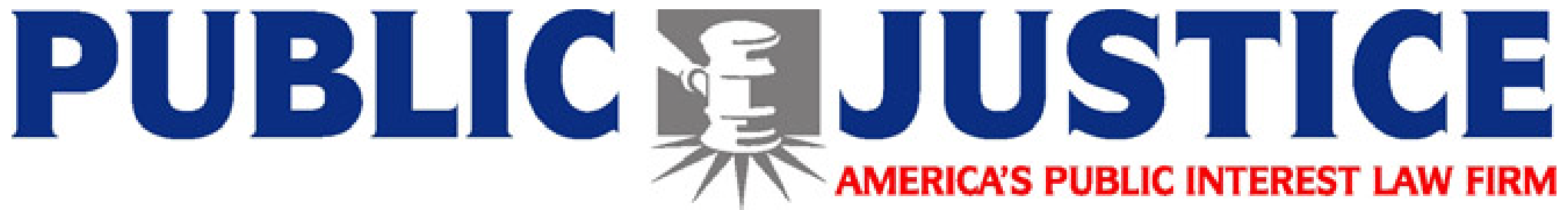
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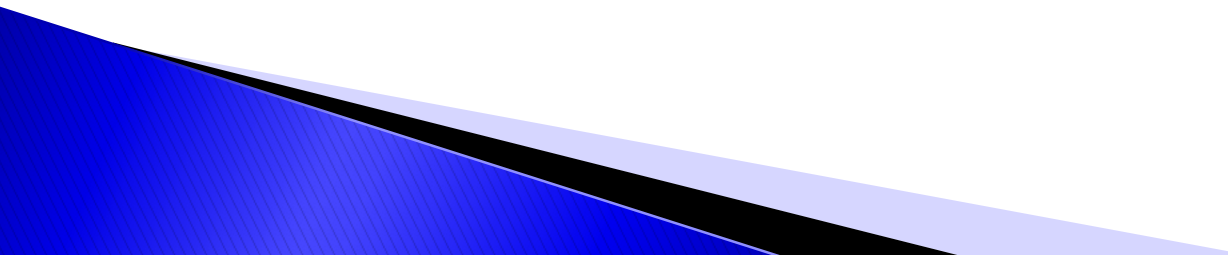


# Relicensing Beyond 60 Years – Fact or Fiction?

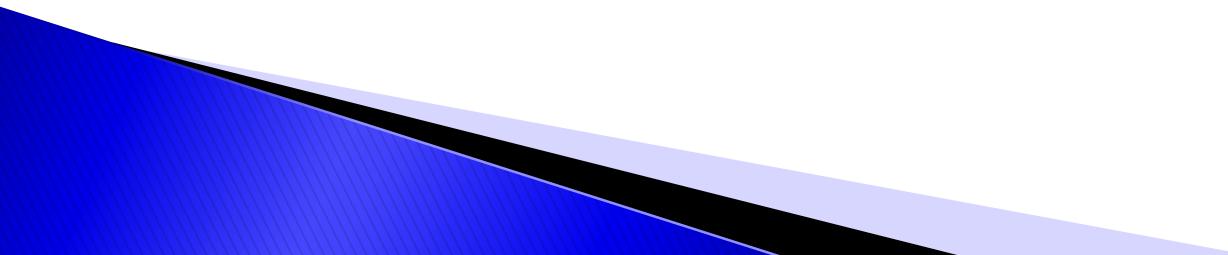
Richard Webster  
Environmental Enforcement Attorney

May 9, 2012

# Process Overview

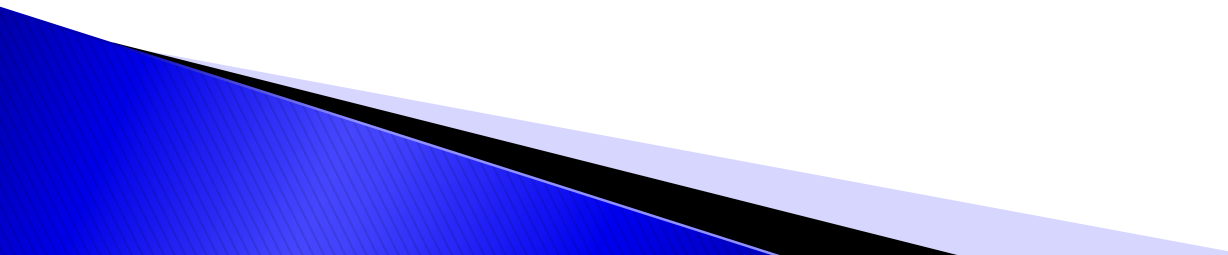
- Deadlines are way too early
  - Provide contentions after the FSEIS and SER
  - Freeze the application after the contentions are filed unless settlement is reached
  - Staff cannot be a party to safety contentions
- 

# Process Specifics

- Make it fish or foul. Either proper trial procedures or simple so that lay people can do it
  - Expedite hearing process by eliminating motion practice re: evidence admissibility and summary disposition
  - Provide cross-examination on request
  - Construe facts in favor of Intervenor
- 



# Require Mandatory Hearings

- Licensing Boards are effective, e.g. ESP proceedings
  - NRC Staff are not perfect
  - Needs detailed analysis that can't be done by the Commission itself
  - Should have mandatory hearings at ASLB for both initial licensing and relicensing
- 

# Questions and Contacts

- Questions now and by e-mail
- Richard Webster
- [rwebster@publicjustice.net](mailto:rwebster@publicjustice.net)
- 202 630 5708
- [www.publicjustice.net](http://www.publicjustice.net)



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**Public Meeting on  
Subsequent License Renewal  
Safety Panel Discussion**

**May 9, 2012**

# Introductory Remarks

- Safety review process for license renewal
- Areas of Interest for subsequent license renewal
- NRC activities for subsequent license renewal

# Safety Principles

- The ongoing regulatory process is adequate to ensure the safety of all currently operating plants
- The same plant operating rules apply during the renewal term
  - NRC applies additional conditions for aging management

- Safety review focus is on the effects of aging on:
  - Safety-related systems, structures, and components (SSCs)
  - Non safety-related SSCs which, if they failed, could affect safety-related SSC functions
  - SSCs relied upon for compliance with regulations for:
    - Fire protection
    - Environmental qualification
    - Pressurized thermal shock
    - Anticipated transients without scram
    - Station blackout

# Safety Review Focus

- All components that are in the scope of license renewal and are both passive and long-lived are subject to an aging management review
  - “Passive” structures and components (include such components as the reactor vessel, the steam generators, piping, component supports)
  - “Long-lived” components
- Excludes active and short-lived
- Safety review is to determine if aging effects will be effectively managed

- Safety review by NRC staff
  - Review application and supporting documentation
  - On-site audits
  - Issue Safety Evaluation Report
- On-site inspections by NRC staff
- Independent review by the Advisory Committee on Reactor Safeguards



# Areas of Interest

- Neutron embrittlement of the reactor pressure vessel at high fluences
- Concrete and containment performance after long-term radiation and high temperature exposure
- Environmental qualification, performance, and inservice testing of cables
- Known mechanisms that could become more active – incubation times, activation energies, late blooming phases
- Unknown aging phenomena

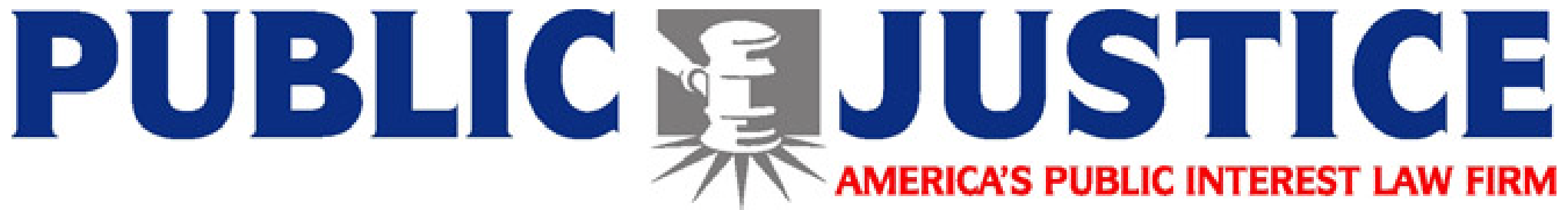
# Subsequent License Renewal

- NRC's ongoing efforts to address safety issues related to second 20-year license renewal
  - Evaluate the effectiveness of GALL Aging Management Programs (AMPs) – AMP Effectiveness Audits
  - Expanded materials degradation analysis (EMDA)
  - Workshops with industry and international colleagues
  - Relevant domestic and international operating experience

10 CFR	Title 10 of the <i>Code of Federal Regulations</i>
AMP	aging management program
EIS	Environmental Impact Statement
EMDA	Expanded materials degradation analysis
FSAR	Final Safety Analysis Report
GALL	Generic Aging Lessons Learned
SSCs	systems, structures, and components

# Current Licensing Basis

- NRC regulations contained in applicable parts of Title 10 of the *Code of Federal Regulations*
- NRC Orders
- Safety and environmental license conditions
- Technical specifications and environmental protection plans
- Exemptions
- Plant-specific design information, as documented in the most recent final safety analysis report (FSAR)
- NRC environmental reviews (EISs, supplements, and environmental assessments)
- The licensee's commitments remaining in effect safety evaluations or licensee event reports



# Relicensing Beyond 60 Years – Fact or Fiction?

Richard Webster  
Environmental Enforcement Attorney

May 9, 2012

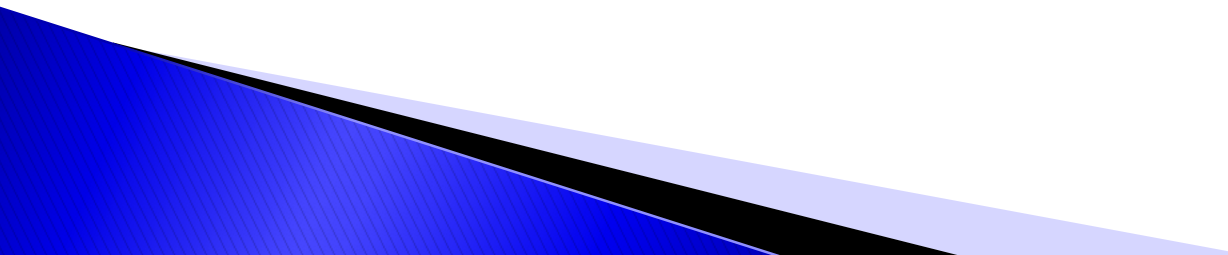
# Safety Issues – Life Beyond 60 May be Fiction

- UK had the oldest reactors but they are closing – Calder Hall – 47 years, Oldbury – 44 years, Wylfa – 41 years
- Oyster Creek – closing in after 50 years due to “a unique set of economic conditions and changing environmental regulations” including “need for continuing large capital expenditures.”
- Mark 1 and 2 BWRs – no life extension after Fukushima – containment is inadequate

# Further Renewal Should Not Be Faith-Based

- Compile operating experience data centrally – compare predicted vs. actual
- Far too early to consider further renewal, need at least 10 years of operating data
- Comprehensive review – not just aging management. E.g. seismic, evacuation, terrorism
- Compile CLB
- Integrate severe accident prevention and mitigation into the CLB
- Consider upgrades to the CLB

# Improve AMPS

- Verify configuration
  - Check knowledge and uncertainty of current state – consider spatial and temporal variability
  - Define margins and uncertainty in the knowledge of those margins
  - Define past aging rate/increase in fatigue and uncertainty
  - Require >95% certainty that margins are being maintained
  - Monitor larger areas or more often to reduce uncertainty
- 



# Questions and Contacts

- Questions now and by e-mail
- Richard Webster
- [rwebster@publicjustice.net](mailto:rwebster@publicjustice.net)
- 202 630 5708
- [www.publicjustice.net](http://www.publicjustice.net)



# Long Term Operations Program

**Sherry Bernhoft**

EPRI Program Manager, Long Term Operations

**NRC Public Meeting on SLR**

May 9, 2012

# Objectives



- ✓ Technical basis for ***decisions*** to operate through an extended lifetime
  - Supports **business case** for life extension and/or refurbishment
  - Supports **License Renewal** for “*Life beyond 60*” in U.S.
  - Results by 2014-2019
  
- ✓ Technology to ***manage*** plant assets throughout lifetime
  - Includes aging management, asset management, and risk management
  - Addresses safety, performance, and cost

# Approach

1. Maintain integrated **Strategic Program Plan** for R&D
2. Fund **R&D activities** using subject matter experts from EPRI programs
3. **Collaborate** and Coordinate: with U.S. DOE LWRS program, NRC-RES, NEI and internationally
4. Use **pilot studies** and **demonstration plants** to obtain data, perform inspections, validate methods.

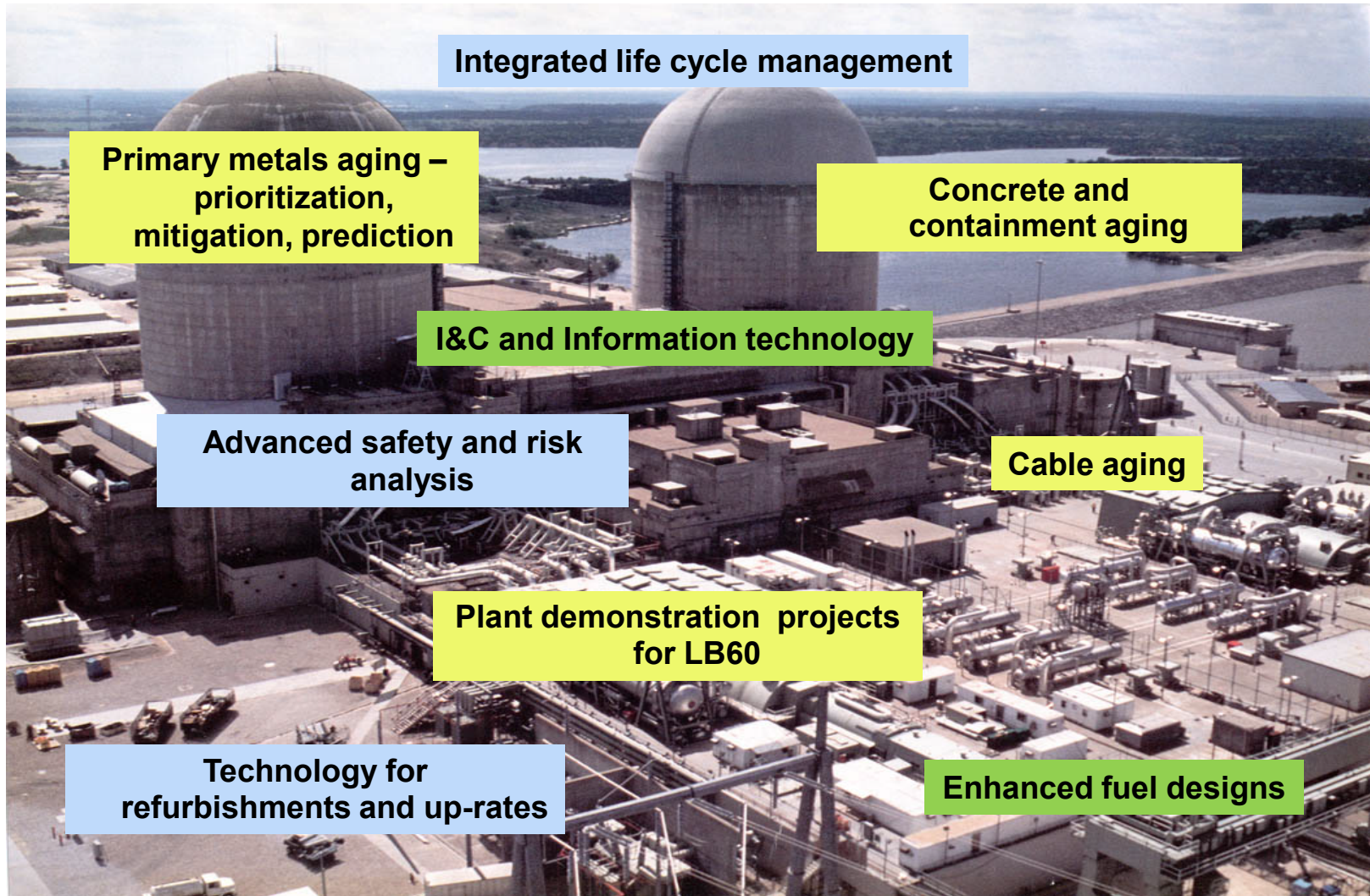
**Industry has advised on strategic planning, project selection, collaboration, and technical oversight**

# Aging, Modernization, and Enabling Technology

Aging

Modernization

Enabling Technology





# 2012 R&D Projects



## Primary System Metals Aging

- EAC crack initiation ***characterization*** and growth ***prediction***
- Reactor Internals degradation ***prediction*** and ***mitigation***
- Advanced ***welding*** of irradiated materials
- RPV embrittlement issues affecting ***lifetime***
- Mechanisms/locations ***important to 80 years*** of life

# 2012 R&D Projects (cont)



## Concrete and Containment Aging

- Reference manual of issues, pilot assessments, analysis tools, NDE methods, guidelines

## I&C and Information Technology (IIT)

- Pilot studies and requirements for ***advanced I&C and information systems*** including ***on-line monitoring***

## Advanced Fuel Analysis and Design for Existing Plants

- Development and deployment of ***SiC fuel cladding***

# 2012 R&D Projects (cont)



## Advance Safety Analysis

- ***Safety margins methods*** and ***analysis/simulation***
- ***PRA suite*** for configuration management, SDP, design improvements, operational and regulatory changes.

## Cable Aging

- Proactively address ***aging management of cables*** with improved understanding of aging mechanisms, testing and inspection methods and guidelines



# 2012 R&D Projects (cont)



## Life Cycle Management

- **Asset Management Process** for key SSCs – failure models, assessment process, modeling and optimization tools, pilot studies

## LTO Demo

- Ginna and NMP-1 **demo for LB60 decisions** – inspections and NDE methods for containment and reactor internals, reactor vessel data/analysis plan

## Aging Management Gap Assessment for SLR

- Proactively identify additional AMP mechanisms, locations, conditions, methods, and documentation. Prioritize R&D to address these needs.

# 2011 Deliverables

- **Concrete Structures** Aging Reference Manual
- An Optimization Approach for **Life Cycle Management** Applied to Large Power Transformers
- Comprehensive **Online Monitoring** and Diagnostic Approach for Nuclear Plant Equipment
- Pilot Application of an advanced method to evaluate the effect of plant changes on **Safety Margin**
- Demonstration of **Inspection Technology for Containment Aging** at Ginna and Nine Mile Point -1
- Economic Analysis and application of FALCON to Performance of **SiC Fuel Cladding** for Light Water Reactors

# Key Deliverables (2012 and early 2013)

- Primary Metals Knowledge Bases
- Containment Inspection Guidance for LB60
- Further Considerations of Vessel and Internals for LB60
- End-of-Life and ILCM Optimization Software
- Interim Report on RISMC: Method and Value to LTO
- Technical Update on Advance Welding
- LTO Issue Tracking Table and Supporting Basis Document

# Together...Shaping the Future of Electricity



U.S. DEPARTMENT OF  
**ENERGY**

**Nuclear Energy**

# **Light Water Reactor Sustainability (LWRS) Program**

**Richard Reister**

**Office of Light Water Reactor Technologies  
Office of Nuclear Energy  
U.S. Department of Energy**

**May 9, 2012**



## Nuclear Energy

### *Vision*

- Enable existing nuclear power plants to safely provide clean and affordable electricity beyond current license periods (beyond 60 years)

### *Program Goals*

- Develop fundamental scientific basis to allow continued long-term operation of existing LWRs
- Develop technical and operational improvements that contribute to long-term economic viability of existing nuclear power plants
- Research new technologies to address enhanced plant performance, economics, and safety

### *Scope*

- Materials Aging and Degradation
- Advanced Instrumentation and Controls
- Risk-Informed Safety Margin Characterization
- Advanced LWR Fuels

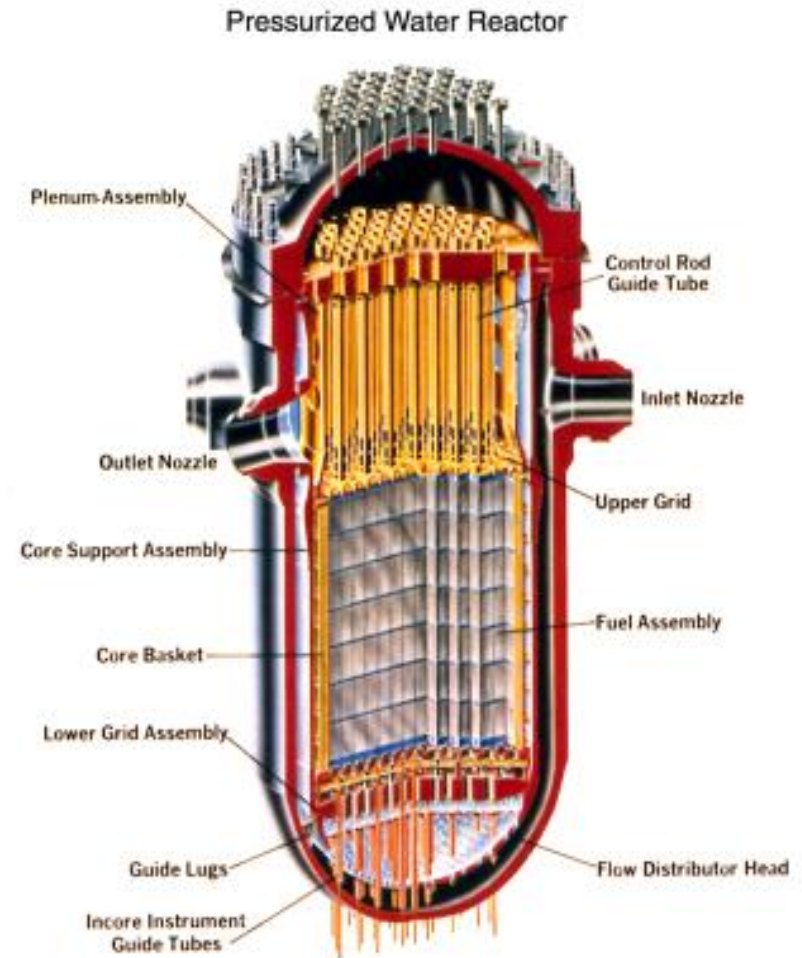




# Technical Focus Areas Summary

## ■ Nuclear Materials Aging and Degradation

- Develop scientific basis for understanding and predicting long-term environmental degradation behavior of materials in nuclear power plants
- Provide data and methods to assess performance of systems, structures, and components essential to safe and sustained nuclear power plant operations
- Help define operational limits and aging mitigation approaches for materials subject to long-term operating conditions

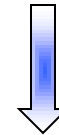






# Technical Focus Areas Summary

- **Advanced Instrumentation, Information, and Control Systems Technologies**
  - Address long-term aging and modernization of existing instrumentation and control technologies and develop and test new technologies
  - Establish a strategy to implement long-term modernization of I&C systems
  - Develop advanced condition monitoring technologies for reliable plant operation and develop means to detect and characterize aging degradation processes







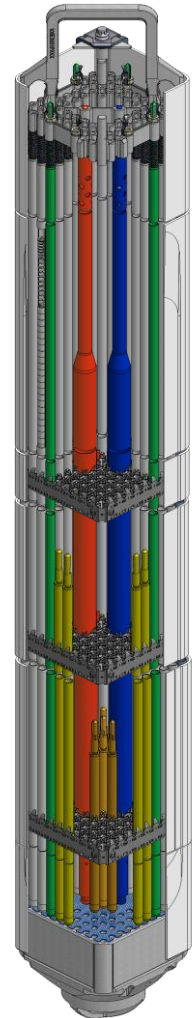
# Technical Focus Areas Summary

## ■ Risk-Informed Safety Margin Characterization:

- Develop a significantly improved safety analysis tool (RELAP-7) and a framework for applying RELAP-7 to analyze the safety margin of aging plants
- RELAP-7 is a “systems” code that will model the whole plant compared to existing codes that are focused on highly localized phenomena in great detail
- RELAP-7 will use advanced computational tools and techniques to simulate the behavior of aging plants in a way that provides more comprehensive safety insights and enables a more useful, risk-informed analysis of plant safety margin than can be done using existing tools.

## ■ Advanced LWR Nuclear Fuel

- Improve scientific basis for understanding and predicting fundamental nuclear fuel performance at existing nuclear power plants
- Develop high-performance, higher burn-up fuels with improved safety, cladding, integrity, and economics for existing LWR applications
- Investigate the potential for Silicon Carbide to replace Zirconium-based cladding and provide for a more accident tolerant fuel





# Light Water Reactor Sustainability – Federal Role

- National strategic interest in the long-term operation of existing plants
  - Supports climate change objectives
  - Supports energy security
  - Avoids higher cost to ratepayers for new plant replacements
- Industry also has an incentive, so cost-sharing is being employed through cooperative research activities with industry, primarily the Electric Power Research Institute (EPRI)
- Addresses fundamental scientific questions where private investment or capabilities are insufficient to make progress on broadly applicable technology issues for public benefit
- Government (DOE and its national laboratories) holds a large theoretical, computational, and experimental expertise in nuclear R&D that is not available within the industry
- Benefits will extend to the next generation of reactor technologies being deployed and still in development
- Federal program creates an environment (by reducing uncertainty and risk) that provides incentives for industry to make the investments required for power operation periods beyond 60 years

# Conclusion

- **LWRS is performing research to identify issues and develop the technical basis that supports industry efforts to relicense existing plants for long-term operation**
  - The existing fleet of nuclear power plants provide the majority of the Nation’s non-carbon emitting electrical generation
  - The continued operation of the existing fleet is in the National interest as a key strategy for meeting climate change and energy supply goals
  - Federal efforts are essential to stimulate and encourage industry efforts as well as to address the longer-term, high-risk research

# CENG

a joint venture of



Constellation  
Energy



EDF



## Industry Technical Considerations

### NRC Subsequent License Renewal (SLR) Meeting

5/9/2012

Michael Fallin  
Principal Engineer  
CENG Fleet Asset Management

# Industry Technical Research

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- Technical research for the Nuclear Industry conducted by:
  - DOE
  - EPRI
  - NRC
  - Each nuclear plant and utility in the country and in the world



# Industry Research Interfaces

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- Industry involved in all aspects of technical research/collaboration through their active participation in code committees, standards committees, professional organizations, technical conferences/workshops, task forces, working groups, etc., etc. that address all aspects of industry technical issues
  - LR and SLR are both the indirect and direct recipients of industry technical research/collaboration that occurs



# SLR Technical Considerations

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- The 1st Workshop on operation beyond 60 years was conducted in 2008 and was sponsored by DOE, NRC, EPRI, and NEI
- Subsequent to that meeting, NEI was tasked with the development of a list of potential technical issues for operation beyond 60 years – a new LR Working Group was formed to develop this list
  - The list was developed and submitted to DOE, the NRC, and EPRI for review and comment
  - The list was fully vetted and is currently being maintained & controlled by EPRI to keep track of the research being conducted for each issue



# SLR Technical Considerations

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- There is nothing magical or of specific concern for operation beyond 60 years – many other industries, including non-nuclear power utilities, have plants that have safely and economically operated beyond 60 years
- From the EPRI maintained Industry Technical Issues List, there are NO generic technical showstoppers for operation beyond 60 years





# SLR Technical Considerations

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- Each nuclear power plant in the industry supplies a significant fraction of ‘research’ that is done – it is the ‘real time,’ ongoing data that is collected as operating experience (OE) through the daily operation of our plants
- Plants that are in their Periods of Extended Operation (PEOs), in particular, continuously acquire aging management related data through the implementation, administration, and ongoing evaluation of each plant program credited for 10 CFR 54 aging management (AM)
  - Already >17 reactor years of collective OE beyond 40 years of operation for industry Aging Management Programs (AMPs)



# SLR Technical Considerations

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- Results of AM activities are captured in our Work Management Systems and our Corrective Action Programs
- These results and OE are shared through our industry NEI LR Task Force and all of its Working Groups (WGs)
  - Mechanical Working Group
  - Electrical Working Group
  - Civil/Structural Working Group
  - Implementation Working Group
  - Subsequent License Renewal Working Group



# SLR Technical Considerations

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- The LRTF and its WGs interact and work with DOE, EPRI, NSSS vendors, industry technical consultants, and the NRC to address AMP activity results and technical issues that arise to improve AM activity techniques and methodologies
  - As a result of these efforts, there have been significant improvements in AM techniques and methodologies since the onset of LR in the early 2000s
  - There are ongoing industry collaborations between stakeholders for forward-looking research for operation beyond 60 years



# Summary

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- In summary, nuclear utilities and all industry stakeholders are working together more closely and in a more integrated manner than ever before to address technical challenges for continued operation of our plants and, in particular, we are looking for those that could potentially challenge operation beyond 60 years if not evaluated and resolved before they become operational challenges





**U.S.NRC**

UNITED STATES NUCLEAR REGULATORY COMMISSION

*Protecting People and the Environment*

**Public Meeting on  
Subsequent License Renewal**

**Environmental Discussion**

**May 9, 2012**

- National Environmental Policy Act (NEPA)
  - Informs Federal decision making
  - Public disclosure of environmental impacts and other considerations
- NRC's Environmental Regulations
  - 10 CFR Part 51
- Staff prepares an Environmental Impact Statement (EIS)

# Environmental Impact Statement

## Staff Evaluates Impacts to Resources

- Ecological Resources
- Water Resources
- Air and Noise
- Historic and Cultural Resources
- Human Health
- Land Use
- Socioeconomic Issues
- Geology and Soils



# Current Environmental Review Process

- Notice of Intent
- Scoping period\*
- Coordination with States, tribes, etc.
- Site audit
- Requests for additional information
- Draft SEIS\*
- Final SEIS

\*Include public comment periods and meetings

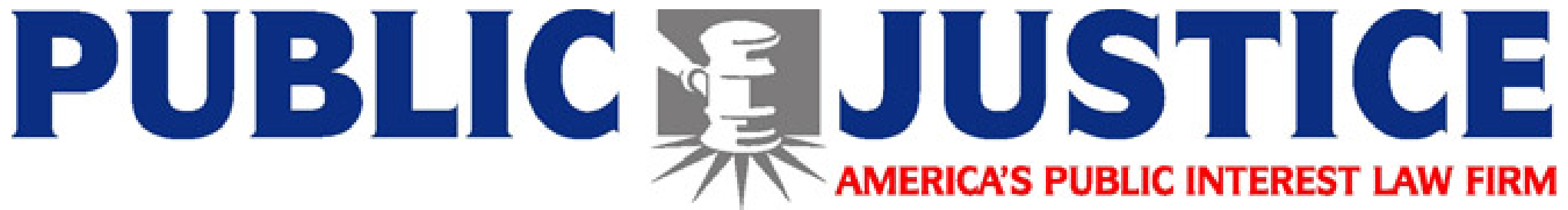


# Environmental Review Process for SLR

- Starting point for SLR environmental review will be the current process
  - 10 CFR 51.53 states that evaluation of SAMAs must be performed if not previously considered
- Applicant environmental reports should build on first license renewal work
  - Focus should be on incremental effects

# Acronyms

10 CFR	Title 10 of the <i>Code of Federal Regulations</i>
EIS	Environmental Impact Statement
GEIS	Generic Environmental Impact Statement
NEPA	National Environmental Policy Act
SAMA	Severe Accident Mitigation Alternative
SEIS	Supplemental Environmental Impact Statement
SLR	Subsequent license renewal



# Relicensing Beyond 60 Years – Fact or Fiction?

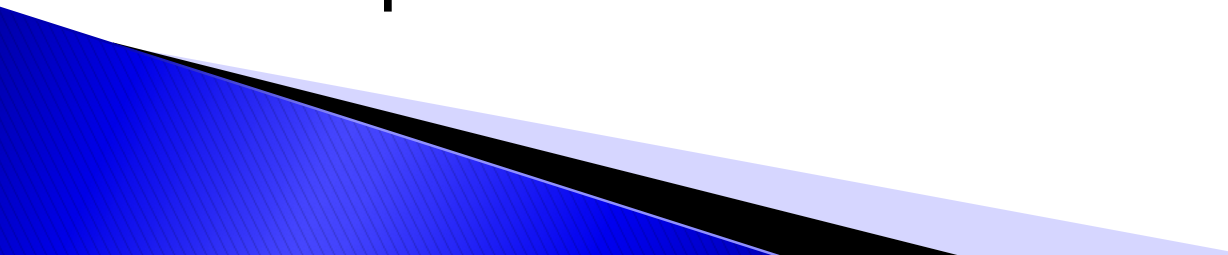
Richard Webster  
Environmental Enforcement Attorney

May 9, 2012

# Environmental Issues

- ▶ SAMA must Blast off from Planet NRC and enter reality
- ▶ Environmental contamination must be valued
  - NYC real estate alone was worth \$1.8 billion in 2006
  - Fukushima compensation estimated at \$20 to \$50 billion
- ▶ Need to consider spent fuel pool accidents as well as core damage
- ▶ Severe accident frequency assumptions must be based on real data = 10 times higher than current
- ▶ Indirect impacts on humans must be included in the analysis

# More Environmental Issues

- ▶ Require BAT for cooling – at least closed cycle
  - ▶ Check that the GEIS is up to date and really bounds the site-specific impacts
  - ▶ Reanalyze generic issues where necessary
  - ▶ Improve environmental justice analysis – can't just exclude emergency planning for EJ populations
  - ▶ Ensure EIS presentation is neutral – e.g. don't compare renewal to a coal plant
- 

# Questions and Contacts

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