UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION II
245 PEACHTREE CENTER AVENUE NE, SUITE 1200
ATLANTA, GEORGIA 30303-1257

August 14, 2013

Mr. Kelly D. Trice
President and Chief Operating Officer
Shaw AREVA MOX Services
Savannah River Site
P.O. Box 7097
Aiken, SC 29804-7097

SUBJECT: MIXED OXIDE FUEL FABRICATION FACILITY- NRC INSPECTION REPORT NO. 70-3098/2013-002

Dear Mr. Trice:

During the period from April 1 through June 30, 2013, the U. S. Nuclear Regulatory Commission (NRC) completed inspections pertaining to the construction of the Mixed Oxide (MOX) Fuel Fabrication Facility (MFFF). The purpose of the inspections was to determine whether activities authorized by the construction authorization were conducted safely and in accordance with NRC requirements. The enclosed inspection report documents the inspection results. At the conclusion of the inspections, the findings were discussed with those members of your staff identified in the enclosed report.

The inspections examined activities conducted under your construction authorization as they relate to safety and compliance with the Commission's rules and regulations and with the conditions of your authorization. The inspectors reviewed selected procedures and records, observed activities, and interviewed personnel.

Should you have any questions concerning this letter, please contact us.

Sincerely,

/RA/

Deborah A. Seymour, Chief
Construction Projects Branch 1
Division of Construction Projects

Docket No. 70-3098
Construction Authorization No.: CAMOX-001

Enclosure:

NRC Inspection Report No. 70-3098/2013-002
w/attachment: Supplemental Information

cc w/encl: (See next page)

cc w/encl:

Mr. Scott Cannon, Federal Project Director
NA-262.1
P.O. Box A
Aiken, SC 29802

Mr. Sam Glenn, Deputy
Federal Project Director
NA-262.1
P.O. Box A
Aiken, SC 29802

Dr. Peter Winokur, Chairman
Defense Nuclear Facilities Safety Board
625 Indiana Ave., NW, Suite 700
Washington, DC 20004

Mr. Joseph Olencz, NNSA/HQ
1000 Independence Ave., SW
Washington, DC 20585

Ms. Susan Jenkins
Division of Radioactive Waste Management
Bureau of Health and Environmental Control
2600 Bull St.
Columbia, SC 29201

D. Silverman
Morgan, Lewis, and Bockius
1111 Penn. Ave., NW
Washington, DC 20004

G. Carroll
Nuclear Watch South
P.O. Box 8574
Atlanta, GA 30306

Ms. Diane Curran
Harmon, Curran, Spielburg and Eisenberg, LLP
1726 M St., NW, Suite 600
Washington, DC 20036

L. Zeller
Blue Ridge Environmental Defense League
P.O. Box 88
Glendale Springs, NC 28629

Mr. Dealis Gwyn, Licensing Manager
Shaw AREVA MOX Services
Savannah River Site
P.O. Box 7097
Aiken, SC 29804-7097

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Sincerely,

/RA/

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SIGNATURE	WBG via e-mail	MXS1 via e-mail	BJA1 via e-mail	TNF1 via e-mail	NDK1 via e-mail		
NAME	W. Gloersen	M. Shannon	B. Adkins	T. Fanelli	N. Karlovich		
DATE	08/12/2013	08/12/2013	08/13/2013	08/14/2013	08/14/2013		
E-MAIL COPY?	YES	YES	YES				

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Letter to Kelly Trice from Deborah Seymour dated August 14, 2013.

SUBJECT: MIXED OXIDE FUEL FABRICATION FACILITY- NRC INSPECTION REPORT NO. 70-3098/2013-002

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U.S. NUCLEAR REGULATORY COMMISSION

REGION II

Docket No.:	70-3098
Construction Authorization No.:	CAMOX-001
Report No.:	70-3098/2013-002
Applicant:	Shaw AREVA MOX Services
Location:	Savannah River Site Aiken, South Carolina
Inspection Dates:	April 1 – June 30, 2013
Inspectors:	M. Shannon, Senior Resident Inspector, Construction Projects Branch (CPB) 1, Division of Construction Projects (DCP), Region II (RII) B. Adkins, Resident Inspector, CPB1, DCP, RII L. Dumont, Construction Inspection Branch (CIB) 1, Division of Construction Inspection (DCI), RII T. Fanelli, Construction Inspector, CIB1, DCI, RII D. Harmon, Construction Inspector, CIB3, DCI, RII N. Karlovich, CIB1, DCI, RII J. Kent, CPB2, DCP, RII O. Lopez, Senior Reactor Inspector, Engineering Branch 2, Division of Reactor Safety (DRS), RII C. Smith-Standberry, CIB1, DCI, RII
Accompanying Personnel:	D. Seymour, Branch Chief, CPB1, DCP, RII W. Gloersen, Senior Construction Project Inspector, CPB1, DCP, RII
Approved by:	D. Seymour, Branch Chief, CPB1, DCP, RII

Enclosure

EXECUTIVE SUMMARY

Shaw AREVA MOX Services (MOX Services)
Mixed Oxide (MOX) Fuel Fabrication Facility (MFFF)
NRC Inspection Report (IR) Number (No.) 70-3098/2013-002

The scope of the inspections encompassed a review of various MFFF activities related to Quality Level (QL)-1 construction for conformance to U.S. Nuclear Regulatory Commission (NRC) regulations, the Construction Authorization Request (CAR), the MOX Project Quality Assurance Plan (MPQAP), applicable sections of the license application (LA) and applicable industry standards. This inspection included, as applicable, the following inspection attributes: special processes; test control; procurement; installation; control of materials, equipment, and services; design control; and software quality assurance.

The principle systems, structures and components (PSSCs) discussed in this inspection report included: PSSC-004, C2 Confinement System Passive Barrier; PSSC-005, C3 Confinement System; PSSC-009, Criticality Control; PSSC-023, Fluid Transport Systems; PSSC-024, Gloveboxes; PSSC-045, Process Safety Control Subsystem; and PSSC-048, Sintering Furnace.

Routine Resident Inspections

The inspectors routinely attended the applicant's construction plan-of-the-day meetings, reviewed the status of work packages (WPs) maintained at various work sites, conducted daily tours of work and material storage areas, observed installation of mechanical equipment, and reviewed various corrective action documents to assess the adequacy of MOX Services' corrective action program. Construction activities were performed in a safe and quality-related manner. No findings of significance were identified. (Section 2)

PSSC-004, C2 Confinement System Passive Barrier

The inspectors observed fabrication activities related to PSSC-004, C2 Confinement System Passive Barrier, as described in Table 5.6-1 of the MFFF CAR. The inspection attribute observed was special processes. The associated item relied on for safety (IROFS) component was supports associated with Medium Depressurization Exhaust (MDE) stainless steel ductwork. MOX Services implemented adequate oversight of special processes activities consistent with the regulatory requirements of the MPQAP, Section 9, Control of Special Processes. These special processes were adequately performed and met the LA requirements. No findings of significance were identified. (Section 3.a)

PSSC-005, C3 Confinement System

The inspectors observed fabrication activities related to PSSC-005 as described in Table 5.6-1 of the MFFF CAR. (Section 3.b)

- The inspection attribute observed was test control. The associated IROFS component was High Depressurization Exhaust (HDE) damper HDE*DMP0124B-01. The inspectors reviewed test procedures and reports to determine if MOX Services performed the required damper flow, frame leakage and cycling testing in accordance with the American Society of Mechanical Engineers (ASME) code requirements. No findings of significance were identified. (Section 3.b(1))

- The inspection attribute observed was procurement. The associated IROFS component was intermediate high efficiency particulate air (HEPA) filter HDE*FLU0142B. The inspectors reviewed the procurement specification for HEPA filter housings to determine if MOX Services adequately flowed down applicable technical and quality assurance (QA) requirements into the specification. No findings of significance were identified. (Section 3.b(2))

PSSC-023, Fluid Transport Systems

The inspectors reviewed welding and non-destructive examination (NDE) activities associated with PSSC-023 as described in Table 5.6-1 of the MFFF CAR. (Section 3.c)

- The inspection attribute observed was installation. The associated IROFS components were tanks KCD*TK7000, KCD*TK7500, KPA*TK5300, KDB*TK1500 and ASP 2329. Specifically, the inspectors performed a detailed review of the recently closed WPs for the above listed chemical processing tanks. A detailed review by the applicant identified several WP deficiencies. The applicant placed the WPs on administrative hold until the deficiencies could be identified and corrected. Inspector Follow-up Item (IFI) 70-3098-2013-001, Perform Additional Review of Closed Tank WPs, was documented to verify WP deficiencies were adequately identified and resolved. (Section 3.c(1))

- The inspection attribute observed was special processes. The associated IROFS component was dissimilar metal transition pieces used to weld stainless steel to zirconium and titanium. MOX Services implemented adequate oversight of special processes activities consistent with the regulatory requirements of the MPQAP, Section 9, Control of Special Processes. The special processes were adequately performed and met the MFFF LA requirements. No findings of significance were identified. (Section 3.c(2))

- The inspection attribute observed was special processes. The associated IROFS components were supports and piping in Room C-134 of the Aqueous Polishing Building (BAP). MOX Services implemented adequate oversight of special process activities consistent with the regulatory requirements of the MPQAP, Section 9, Control of Special Processes. These special processes were adequately performed and met the MFFF LA requirements. No findings of significance were identified. (Section 3.c(3))

- The inspection attribute observed was control of materials, equipment, and services. The associated IROFS component was zirconium piping. MOX Services implemented adequate oversight of handling, storage, and shipping activities consistent with the regulatory requirements of the MPQAP, Section 13, Handling, Storage, and Shipping. These activities were adequately performed and met the MFFF LA requirements. No findings of significance were identified. (Section 3.c(4))

PSSC-024, Gloveboxes

The inspectors observed construction activities related to PSSC-024 as described in Table 5.6-1 of the MFFF CAR. The inspection attribute observed was special processes. The associated IROFS component was the Scrap Pellet Storage (PSI) glovebox. MOX Services implemented adequate oversight of special process activities consistent with the regulatory requirements of the MPQAP, Section 9, Control of Special Processes. The special processes were adequately

performed and met the MFFF LA requirements. No findings of significance were identified. (Section 3.d)

PSSC-048, Sintering Furnace; PSSC-009, Criticality Control; and PSSC-045, Process Safety Control Subsystem

The inspectors observed construction activities related to PSSC-048, PSSC-009, and PSSC-045 as described in Table 5.6-1 of the MFFF CAR. The inspection attribute observed was software quality assurance.

The scope of the inspection focused on MOX Services software development program associated with principal PSSC-048, Sintering Furnace, safety programmable logic controllers (SPLC) identified as PFJ1ASPLC0001 and PFJ1BSPLC0001. The inspectors assessed the implementation of the PSSC construction authorization (CA) design basis required for the planning phase and the implementation of these plans for the requirements phase.

The inspectors concluded that two of the four areas assessed complied with the LA section 11.5.1.4, Design Basis for Codes and Standards for I&C IROFS: The MOX Services software configuration management plan (SCMP) (Section 3.e (1)(b)); and the MOX Services software quality assurance plan (SQAP) and implementing procedures. (Section 3.e (1)(c))

No findings of significance were identified.

Follow-up of Previously Identified Items

(Closed) Inspector Follow-up Item (IFI) 70-3098/2012-002-01, Review Pellet Handling Fire Door and Jar Storage Fire Lock Engineering Evaluation, was closed based on the conservatism (positive furnace pressure and unexposed side temperature limits) in the French fire door testing protocol and the robustness of the pellet handling fire doors. (Section 4.a)

(Closed) Unresolved Item (URI) 70-3098/2012-003-003, Assess Significance of Improperly Performed Licensing Evaluations was closed based on (1) fire modeling performed by the applicant demonstrating that a fire will not spread from the room of origin via the ductwork when it was assumed that an exhaust fire damper was open; (2) the ventilation system design that limits the available oxygen to support combustion, flashover and/or rapid temperature rise; and (3) the design of the ventilation ductwork which limits the introduction of hot gases from a fire. (Section 4.b)

REPORT DETAILS

1. Summary of Facility Status

During the period, the applicant (Shaw AREVA MOX Services (MOX Services)) continued construction activities of principle systems, structures and components (PSSCs). Construction activities continued related to Release 3A and 3B activities which included closure of temporary construction openings and finishing activities related to wall, ceiling and floor surfaces of the Mixed Oxide (MOX) Fuel Fabrication Facility (MFFF) Manufacturing Building (BMP), Aqueous Polishing Building (BAP), and the Shipping Receiving Building (BSR). Other construction activities included staging of process piping and installation of supports in the BAP, BSR, and BMP; installation of ventilation system ductwork and supports in the BAP, BSR, and BMP; installation of cable trays and cable tray supports in the BAP, BSR, and BMP; installation of cables and conduit in the BAP, BSR, and BMP; installation of fire doors and dampers in the BAP and BMP; and installation of pellet storage gloveboxes in the BMP. The applicant continued to receive, store, assemble, and test glove boxes and process equipment at the Process Assembly Facility (PAF).

2. Routine Resident Inspection Activities (Inspection Procedure (IP) 88130, Resident Inspection Program for On-Site Construction Activities at the Mixed Oxide Fuel Fabrication Facility; and IP 88110, Quality Assurance: Problem Identification, Resolution, and Corrective Action)

a. Scope and Observations

The inspectors routinely attended the applicant's construction plan-of-the-day meetings and engineering restraint meetings. The inspectors routinely held discussions with MOX Services design engineers, field engineers, quality assurance (QA) and quality control (QC) personnel, and subcontractor construction personnel in order to maintain current knowledge of construction activities and any problems or concerns.

The inspectors routinely reviewed the status of work packages (WPs) maintained at various work sites. The inspectors monitored the status of WP completion to verify construction personnel obtained proper authorizations to start work, monitor progress and to ensure WPs were kept up-to-date as tasks were completed.

The inspectors also observed proper communication in the work areas, observed that the work force was attentive, workers adhered to procedures, observed proper communication between supervisors and workers, observed that tanks containing various gasses were properly stored, and noted that hazardous materials were properly stored and/or properly controlled when in the field. The inspectors conducted daily tours of material storage and work areas to verify that materials and equipment were properly stored in accordance with QA requirements.

The inspectors routinely reviewed various corrective action documents. The review included non-conformance reports (NCRs), condition reports (CRs), root causes, and supplier deficiency reports (SDRs). The inspectors also reviewed the closure of selected NCRs and CRs. The inspectors noted that the applicant entered issues identified during self assessments into the corrective action system.

The inspectors routinely performed tours of the MFFF work areas to verify that MOX Services' staging of piping, installation of ductwork, and installation of glove-boxes and fire doors met regulatory commitments and procedural requirements.

The inspectors conducted a tour of the welding filler metal storage and issue room to determine if filler metal was stored and controlled in accordance with the MOX Project Quality Assurance Plan (MPQAP). Specifically the inspectors determined if filler metal was properly labeled and organized for traceability, and if open shielded metal arc welding rods were kept in controlled ovens checked with calibrated measuring and testing equipment.

The inspectors conducted tours of material storage areas and warehouse facilities including the warehouse in Barnwell, South Carolina, to determine if MOX Services was properly storing equipment and materials in accordance with MPQAP storage requirements. Specifically, the inspectors assessed MOX Services compliance with project procedure (PP) 10-38, Storage and Control of Material.

The inspectors observed routine lifts conducted to position glove-boxes, and movement of equipment such as generators, pumps, temporary lighting, and toolboxes. The lifts were conducted in accordance with the applicant's procedures. Specifically, the inspectors verified that installations of supports and glove boxes were in accordance with applicable field drawings and met the general construction notes.

The inspectors observed installation of piping supports, ventilation supports, electrical conduit supports, and cable tray supports. The inspectors also observed placement of ventilation fan units, cable trays, electrical conduits, tanks, and electrical switchgear. The inspectors verified that the installations were in accordance with applicable installation work package guidance.

The inspectors performed various reviews of construction activities, which included walk downs with the field engineers, walk downs with QC personnel, reviews of WPs, and routine walk downs of the areas to verify adequate cleanliness.

b. Conclusions

The inspectors routinely attended the applicant's construction plan-of-the-day meetings, reviewed the status of WPs maintained at various work sites, conducted daily tours of work and material storage areas, observed installation of mechanical equipment, and reviewed various corrective action documents to assess the adequacy of the MOX Services' corrective action program. Observed construction activities were performed in a safe and quality-related manner. No findings of significance were identified.

3. PSSC Related Inspections

a. PSSC-004, C2 Confinement System Passive Barrier

(1) Attribute: Special Processes (IP 55100, Structural Welding General)

(a) Scope and Observations

The inspectors observed fabrication activities related to PSSC-004, C2 Confinement System Passive Barrier, as described in Table 5.6-1 of the MFFF Construction Authorization Request (CAR). The inspection attribute observed was special processes. The associated item relied on for safety (IROFS) component was supports associated with Medium Depressurization Exhaust (MDE) stainless steel ductwork. The inspectors selected weld number B195-MDE-D-M-0001-FW012-C0R0 as an inspection sample to determine if it met the requirements of the American Welding Society (AWS) D9.1, Sheet Metal Welding Code, and the MPQAP. Specifically, the inspectors observed the welding parameters to determine if they were implemented in accordance with the welding procedure. The inspectors also observed the base metal cleanliness and purging to determine if these parameters met the requirements of AWS D9.1 and the welding procedure. Additionally, the inspectors performed a visual examination of the completed weld to determine if it was welded and inspected in accordance with AWS D9.1.

(b) Conclusions

The inspectors observed fabrication activities related to PSSC-004, C2 Confinement System Passive Barrier, as described in Table 5.6-1 of the MFFF CAR. The inspection attribute observed was special processes. The associated IROFS component was supports associated with MDE stainless steel ductwork. MOX Services implemented adequate oversight of special processes activities consistent with the regulatory requirements of the MPQAP, Section 9, Control of Special Processes. These special processes were adequately performed and met the license application (LA) requirements. No findings of significance were identified.

b. PSSC-005, C3 Confinement System

(1) Attribute: Test Control (IP 88108, Control of Materials, Equipment, and Services)

(a) Scope and Observations

The inspectors reviewed the LA to determine the applicable codes and standards that MOX Services committed to with regards to leak testing of ventilation damper housings. Based on their review, the inspectors concluded that MOX Services committed to American Society of Mechanical Engineers (ASME) AG-1-1997, Code on Nuclear Air and Gas Treatment; and Energy Research Development Administration (ERDA) 76-21, Nuclear Air Cleaning Handbook, 2nd Edition. The inspectors reviewed MOX Services procurement specification DCS01-QGA-DS-SPE-V-15910-5, Dampers, to determine if MOX Services adequately flowed down fabrication and test requirements consistent with ASME AG-1-1997 and ERDA 76-21.

The inspectors selected damper HDE*DMP0124B-01 as an inspection sample. The inspectors verified that damper flow, frame leakage, and cycle testing was performed in

accordance with an approved test procedure. The inspectors reviewed Ruskin Test Procedure 111211DFH, Revision (Rev.) H, Balancing Damper AMS Flow Testing and Frame Leakage Testing, to determine if the test procedure contained adequate steps and acceptance criteria to perform the required ASME code testing. The inspectors verified that the test procedure adequately specified: (1) test objectives, (2) use of calibrated measuring and test equipment (M&TE), (3) requirements for suitable environmental conditions, (4) requirement to use only trained and qualified test personnel, (5) provisions for data collection, and (6) adequate test acceptance criteria. The inspectors reviewed completed vendor test reports to verify that test results were adequately documented and evaluated by a responsible authority. The inspectors reviewed records to determine if the instrumentation used was calibrated and controlled under the vendor's M&TE program. With regards to the flow testing, the inspectors reviewed records to determine if the testing was performed at an Air Movement and Control Association (AMCA) approved laboratory in accordance with AMCA Standard 500, Laboratory Methods of Testing Dampers for Rating. The inspectors reviewed completed test results to verify that the test requirements were satisfied.

(b) Conclusion

The inspectors observed fabrication activities related to PSSC-005, C3 Confinement System, as described in Table 5.6-1 of the MFFF CAR. The inspection attribute observed was test control. The associated IROFS component was High Depressurization Exhaust (HDE) damper HDE*DMP0124B-01. The inspectors reviewed completed vendor test procedures and reports to determine if MOX Services performed the required damper flow, frame leakage and cycling testing in accordance with the ASME code and ERDA 76-21. No findings of significance were identified.

(2) Attribute: Procurement (IP 88136, Mechanical Components)

(a) Scope and Observations

The inspectors reviewed DCS01-QGA-DS-SPE-V-10159-4, Procurement Specification HEPA Filter Housings, to determine if MOX Services properly flowed down the applicable technical and QA requirements from the LA with regards to design, fabrication, installation, and testing of high efficiency particulate air (HEPA) filter housings. The inspectors selected filter system housing HDE*FLU0142B as an inspection sample. The inspectors verified that the quality level (QL) of the specification was QL-1 IROFS. The inspectors verified that the seismic category (SC) of the filter housing was SC-1 with a seismic performance requirement (SPR) of B3 (maintain pressure boundary integrity) as specified in the in the Functional Classification List (DSC01-AAJ-DS-TRD-D-40122).

The inspectors verified that MOX Services invoked the applicable QA requirements for QL-1 items and services including a requirement for the supplier to have a documented QA program that meets Title10 Code of Federal Regulations (CFR) Part 50, Appendix B, and ASME Nuclear Quality Assurance (NQA) -1 1994, Quality Assurance Requirements for Nuclear Facility Applications, as revised by NQA-1a 1995. The inspectors verified that the specification required the supplier to flow down applicable QA requirements to sub-tier suppliers of QL-1 items and services. The inspectors reviewed the specification to determine if MOX Services included specific QA requirements including (1) right of access, (2) documentation submittals, (3) non-conformances, and (4) spare and

replacement parts. The inspectors reviewed changes to the procurement specification to determine if the changes were subject to the same degree of review as the original document.

With regards to technical requirements, the inspectors verified that MOX Services flowed down the applicable codes and standards from the LA into the procurement specification. Specifically, the inspectors verified that the following codes and standards were invoked with regards to the design, fabrication, and testing of intermediate HEPA filter housings: (1) ASME AG-1-1997, Code on Nuclear Air and Gas Treatment, (2) ASME N509-1989 (R1996), Nuclear Power Plant Air-Cleaning Units and Components, and (3) ASME N510-1989 (R1995), Testing of Nuclear Air-Treatment Systems.

(b) Conclusion

The inspectors observed fabrication activities related to PSSC-05, C3 Confinement System, as described in Table 5.6-1 of the MFFF CAR. The inspection attribute observed was procurement. The associated IROFS component was intermediate HEPA filter HDE*FLU0142B. The inspectors reviewed the procurement specification for HEPA filter housings to determine if MOX Services adequately flowed down applicable technical and quality assurance requirements into the specification. No findings of significance were identified.

c. PSSC-023, Fluid Transport Systems

(1) Attribute: Installation (IP 88134, Piping Systems Relied on for Safety)

(a) Scope and Observations

The inspectors reviewed process tank installation work packages. The review included closed work packages for tanks KCD*TK7000, KCD*TK7500, KPA*TK5300, KDB*TK1500 and air separator tank (ASP) 2329. The inspectors observed that the applicant was in the process of reviewing the work packages as a result of previous NRC identified violations and various condition reports and non conformances generated by the applicant. The applicant identified several problems with the tank closure work packages. Because of these identified problems, the applicant placed all of the 61 tank closure work packages on administrative hold until the packages could be thoroughly reviewed and corrected. The inspectors noted that the tank installation packages were performed from 2009-2011, prior to the applicant's major revisions to the work package process. The inspectors concluded that additional detailed review would be necessary to verify that work package deficiencies were adequately resolved. Therefore, the review of tank work package closures is identified as Inspector Follow-up Item (IFI) 70-3098/2013-002-001, Review Process Tank Work Package Closures.

(b) Conclusion

The inspectors reviewed construction activities related to PSSC-023, Fluid Transport System, as described in Table 5.6-1 of the MFFF CAR. The inspection attribute observed was installation. The associated IROFS components were tanks KCD*TK7000, KCD*TK7500, KPA*TK5300, KDB*TK1500 and ASP 2329. Specifically, the inspectors performed a detailed review of the recently closed work packages for above listed chemical processing tanks. The detailed inspection by the applicant's

review team identified multiple work package deficiencies. The applicant placed all of the packages on administrative hold until the deficiencies could be identified and corrected. An IFI was documented to verify work package deficiencies were adequately identified and resolved.

(2) Attribute: Special Processes (IP 55100, Structural Welding General; IP 88143, Pipe Supports and Restraints)

(a) Scope and Observations

The inspectors reviewed documents associated with procurement of dissimilar metal transition pieces made by explosion and electron beam welding procured to DCS01-KKJ-DS-SPE-L-11557-2, Technical Specification for Explosion Welded Components. Specifically, the inspectors reviewed the following documents to determine if they met the requirements of the ASME B31.3, Process Piping, the procurement specification, and the MPQAP:

- Dynamic Materials Corporation (DMC) Clad Metal non-destructive examination (NDE) procedure, Straight Beam Ultrasonic Inspection for Transition Joints in Nuclear Service, 22032 Rev. D
- DMC Clad Metal explosion welding procedure, C7Z-C9C3-EXW-2 Preliminary, Rev. 0
- DMC Clad Metal explosion welding procedure, C0-C3-EXW-1 Preliminary, Rev. 0
- Ebtec Corporation electron beam welding procedure, W0208133, Rev. 1
- Ebtec Corporation electron beam welding procedure qualification record PQR-ZR-110, Rev. 1
- Rolls-Royce NDE procedure, Mass Spectrometer Helium Leak Test, SPP-241Q, Rev. 6
- Rolls-Royce NDE procedure, PT Visible Penetrant – Water Washable (Type II, Method A), SPP-202Q, Rev. 5
- Rolls-Royce NDE procedure, Hydrostatic Test, SPP-240Q, Rev. 5

(b) Conclusions

The inspectors observed welding and fabrication activities related to PSSC-023, Fluid Transport Systems, as described in Table 5.6-1 of the MFFF CAR. The inspection attribute observed was special processes and the associated IROFS components were dissimilar metal transition pieces. MOX Services implemented adequate oversight of special processes activities consistent with the regulatory requirements of the MPQAP, Section 9, Control of Special Processes. The special processes were adequately performed and met the LA requirements. No findings of significance were identified.

(3) Attribute: Special Processes (IP 55050, Nuclear Welding General; and IP 55100, Structural Welding General)

(a) Scope and Observations

The inspectors observed weld number DCS-DS-PLI-T-7174801-06 during tack welding to determine if it was welded in accordance with the ASME B31.3, Process Piping, and the MPQAP. The inspectors examined the filler metal used to determine if it was as prescribed in the welding procedure and that it was issued in accordance with the

MPQAP. The inspectors also observed the welding parameters to determine if they were within the limits of the welding procedure, and observed preheat and cleanliness to determine if they were adequate. Additionally, the inspectors reviewed the welder's qualification records and the radiographic film from his qualification test to verify that he was qualified in accordance with ASME B31.3.

The inspectors observed welding of weld FW-4 on structural support number C-134-175-D to determine if it was welded in accordance with AWS D9.1 and the MPQAP. Specifically, the inspectors examined the filler metal used to determine if it was as prescribed in the welding procedure and was issued in accordance with the MPQAP. The inspectors observed the fit-up, cleanliness and welding parameters to determine if they were in accordance with AWS D9.1 and the welding procedure. The inspectors also reviewed the work package to determine if the support was made in accordance with the drawing and that required QC inspections were completed.

(b) Conclusions

The inspectors observed welding and fabrication activities related to PSSC-023, Fluid Transport Systems, as described in Table 5.6-1 of the MFFF CAR. The inspection attribute observed was special processes. The associated IROFS components were supports and piping in Room C-134 of the BAP. MOX Services implemented adequate oversight of special process activities consistent with the regulatory requirements of the MPQAP, Section 9, Control of Special Processes. These special processes were adequately performed and met the LA requirements. No findings of significance were identified.

(4) Attribute: Control of Materials, Equipment, and Services (IP 88108, Control of Materials, Equipment, and Services)

(a) Scope and Observations

The inspectors inspected storage and documentation associated with zirconium piping heat number 849311. Specifically, the inspectors checked to see if it was stored in accordance with the MPQAP and visually met the procurement specification. Additionally, the inspectors reviewed the procurement specification, receipt inspection report, and receipt documents such as the certified material test report (CMTR), certificate of conformance (COC), and microstructure images to determine if it was procured and received in accordance with the MPQAP.

(b) Conclusions

The inspectors observed storage activities related to PSSC-023, Fluid Transport Systems, as described in Table 5.6-1 of the MFFF CAR. The inspection attribute observed was control of materials, equipment, and services. The associated IROFS component was zirconium piping. MOX Services implemented adequate oversight of handling, storage, and shipping activities consistent with the regulatory requirements of the MPQAP, Section 13, Handling, Storage, and Shipping. These activities were adequately performed and met the LA requirements. No findings of significance were identified.

d. PSSC-24, Gloveboxes

(1) Attribute: Special Processes (IP 55100, Structural Welding General)

(a) Scope and Observations

The inspectors observed in process welding of weld number PSI-MG-PLI-M-01114-FW008-C0R0 during fit up and tack to determine if it was welded in accordance with AWS D9.1 and the MPQAP. The inspectors examined the filler metal used and associated documentation to determine if it was as prescribed in the welding procedure and was issued in accordance with the MPQAP. The inspectors also reviewed the work package to determine if QC personnel had inspected and signed off on the fit up. The inspectors reviewed the fit up to verify that it met the requirements of AWS D9.1. Additionally, the inspectors reviewed the welder's qualification records to determine if he was qualified in accordance with AWS D9.1.

(b) Conclusions

The inspectors observed welding and fabrication activities related to PSSC-024, Gloveboxes, as described in Table 5.6-1 of the MFFF CAR. The inspection attribute observed was special processes and the associated IROFS component was the Scrap Pellet Storage (PSI) glovebox. MOX Services implemented adequate oversight of special process activities consistent with the regulatory requirements of the MPQAP, Section 9, Control of Special Processes. These special processes were adequately performed and met the LA requirements. No findings of significance were identified.

e. PSSC-048, Sintering Furnace; PSSC-009, Criticality Control; and PSSC-045, Process Safety Control Subsystem

(1) Attribute: Software Quality Development (IP 88140, Instrumentation and Control Systems)

(a) Software Management of Lifecycle Activities and Software Verification and Validation

1) Scope and Observations

The inspectors reviewed the MOX Services Software Project Management Plan (SPMP), software life cycle plan (SLCP), and software verification and validation program including the plan (SVVP) to ensure that the plans complied with the LA design basis. The LA section 11.5.1.4, Design Basis for Codes and Standards for I&C IROFS, commits to the following Institute of Electrical and Electronics Engineers (IEEE) standards and Regulatory Guides (RG):

- IEEE 1074-1997, IEEE Standard for Developing Software Lifecycle Processes;
- RG 1.173, Developing Software Life Cycle Processes for Digital Computer Software Used in Safety Systems of Nuclear Power Plants;
- IEEE 1012-1998, IEEE Standard for Software Verification and Validation;
- RG 1.168, Verification, Validation, Reviews, and Audits for Digital Computer Software Used in Safety Systems of Nuclear Power Plants;

- IEEE 603-1998, IEEE Standard Criteria for Safety Systems for Nuclear Power Generating Stations;
- IEEE 730-1998, IEEE Standard for Software Quality Assurance Plans;
- IEEE 828-1998, IEEE Standard for Software Configuration Management Plans;
- IEEE 1042-1987, IEEE Guide to Software Configuration Management;
- RG 1.169, Configuration Management Plans for Digital Computer Software Used in Safety Systems of Nuclear Power Plants; and
- IEEE 1228-1994, IEEE Standard for Software Reviews.

The review assessed whether MOX Services management of the software development activities adequately ensured the appropriate quality of software development practices for software integrity level (SIL) 3 software including software configuration management, software quality assurance (SQA), and the appropriate level of independent software verification and validation (SV&V).

The inspectors also noted that MOX Services committed, in their LA and in Sections 5 and 6.2.1.2 of their SVVP, to a level of independence appropriate for SIL 3 as defined in Annex C of IEEE 1012-1998 and RG 1.168. Annex C of IEEE 1012-1998 requires for technical independence that the SV&V effort utilize personnel who are not involved in the development of the software. For managerial independence, it requires that the responsibility for the independent SV&V effort be vested in an organization separate from the development and program management organizations. For financial independence, it requires that control of the independent V&V budget be vested in an organization independent of the development organization. Regulatory Position 3 of RG 1.168, states, in part, that the independence of software V&V must be sufficient to ensure that the SV&V process is not compromised by schedule and resource demands that are placed on the design process, and that the independent V&V organization is responsible for the adequacy of the V&V tasks.

Section 5.1.1 of the SVVP indicated that the Software Design Group (SDG) performed primary oversight and control of the project including managing the financial aspect and schedule review process and included the primary lead, coordination and execution supervision of the development of all MFFF safety control system (SCS) contract deliverables with respect of the quality, cost, and schedule constraints. The inspectors identified that the SDG deputy manager participated in the development of the software SV&V phase summary reports acting as the management staff whose role was defined in Engineering Guide (EG)-231, Guide to Systematic Review Process, Rev. 1, Attachment A. The management staff (manager) role included activities such as assigning roles, ensuring experts were available for review, and that time and funding were allocated for review. The inspectors questioned whether or not the SDG control of the SV&V account and the SDG deputy manager role in the phase summary reports was consistent with the technical, managerial and financial independence requirements of the MOX Services design basis as specified in the LA design basis Section 11.5.1.4.

The inspector's interviews and review of the SPMP identified that the SDG implemented the management activities defined in the SPMP including management of SV&V activities. The SPMP Section 4.3 described the project roles and responsibilities, and assigned to the SDG, the duties as the software design authority and the project management duties, which included management of the SV&V effort. The SPMP Section 5.2.4 described the training requirements for the project's staff and identified the

SDG as responsible for training the SV&V staff. The inspectors could not identify in the SPMP Section 5.3.1 work activities assigned to an independent SV&V group. The inspectors noted that the MOX Services independent SV&V manager interviewed during the inspection was additionally assigned as the SCS qualification lead, which, per SPMP Section 5.3.3, is a QL-1 development role within the SDG.

The inspectors identified that the project document register in Table 13 of SPMP Section 7.4 described the responsibilities for planning documentation development and identified the SDG as the responsible organization for the contents of the SVVP. SVVP Section 5.4.1 described the management processes for SV&V and assigned SV&V process management to the SPMP, which the SDG implements. The inspectors identified that the SDG management excluded from the SV&V scope activities which were part of the minimum set of activities to be performed for SIL 3 software development as addressed in IEEE 1012-1998.

Section 6.6 of IEEE 603-1998 states that whenever applicable permissive conditions are not met, the safety system automatically prevented the activation of an operating bypass or initiated the appropriate safety function. As part of the same requirement, if an activated bypass is no longer permissible, the safety control system either automatically removed the active operating bypass, automatically restored the plant's conditions so the permissive was once again in place, or automatically initiated the appropriate safety functions

The inspectors reviewed a QL-1 design input document, DCS01 CCJ DS NTE C 28086, SPLC Authority Key Philosophy, Rev. 2, which contained a description of operating bypasses, or "inhibits" associated with the startup of the AP Process. The inspectors identified that, in contrast to the automatic actions required by 603, the inhibits would administratively controlled; require manual activation and deactivation; and not be automatic.

The inspectors noted two areas where MOX Services may not have been consistent with NRC requirements specified in the MQAP and LA. Specifically, the inspectors questioned whether or not MOX Services established independence that was sufficient to ensure that the V&V process would not be compromised by schedule and resource demands placed on the design process. Additionally, the inspectors questioned the appropriate implementation of functional requirements from IEEE 603-1998 and whether the functional requirements were adequately addressed by both the SDG and an independent software V&V group. The inspectors determined that further review was needed to assess the adequacy of the software independent V&V processes and the implementation of the functional requirements specified in IEEE 603-1998. The inspectors opened Unresolved Item (URI) 70-3098/2013-002-002, Review Implementation of Design Basis Requirements for Instrumentation and Control IROFS, to further evaluate this issue.

2) Conclusions

The inspectors observed construction activities related to PSSC-048, Sintering Furnace; PSSC-009, Criticality Control; and PSSC-045, Process Safety Control Subsystem, as described in Table 5.6-1 of the MFFF CAR. The inspection attribute observed was software quality development. The inspectors opened URI 70-3098/2013-002-002, Review Implementation of Design Basis Requirements for Instrumentation and Control

IROFS, to further evaluate whether MOX Services established independence that was sufficient to meet the requirements addressed in there licensing basis and whether the software development organization, including software V&V, appropriate addressed the development and review of functional requirements.

(b) Software Configuration Management

1) Scope and Observations

The inspectors reviewed the MOX Services software configuration management plan (SCMP) to assess the compliance with the LA design basis Section 11.5.1.4, which includes IEEE 828-1998, RG 1.169, and IEEE 1042-1997. The inspectors interviewed MOX Services personnel associated with configuration management in order to assess whether the plan was adequately prepared and implemented. The inspectors assessed whether the SCMP specified the items to be placed under configuration control and that the configuration items for the agreed upon specifications and standards for the baseline development was established. The inspectors assessed whether the SCMP defined the roles and authority of the configuration control board and whether procedures existed to manage the change process including tracking, reporting, approval, and control of changes.

The inspectors reviewed engineering guides for configuration control and for establishing baselines (EG 234, Guide for Configuration Control, Rev 1; and EG 235, Guideline for Establishing Baselines, Rev. 0). The inspectors observed a meeting of the configuration control board, and reviewed planning and requirements phase baselines, references in the output documents of the requirement phase, and the indexes of the software record library to assess whether the control of the software configuration items was in accordance with the SCMP, implementing procedures, and IEEE 1042-1997. The inspectors reviewed design input documents and compared them to the baseline reports for the requirements phase in order to assess whether changes to the configuration items were adequately controlled, tracked, and used to develop the software requirements.

2) Conclusions

The inspectors determined that the MOX Services SCMP complied with the LA section 11.5.1.4, Design Basis for Codes and Standards for I&C IROFS. No findings of significance were identified.

c) Software Quality Assurance

1) Scope and Observations

The inspectors reviewed the MOX Services software quality assurance plan (SQAP) and implementing procedures to assess the compliance with the LA design basis Section 11.5.1.4, which included 10 CFR 50 Appendix B; NQA-1 1994 Subpart 2.7; IEEE 730-1998; IEEE 1028-1997, IEEE Standard for Software Reviews; and IEEE 1012-1998. The inspectors interviewed responsible MOX Services personnel and reviewed the SQAP to assess the SQAP's specification of software products that were applicable to the plan, including provisions for documenting and correcting problems, and listed

required documents. In addition, the inspectors assessed whether the SQAP addressed the following:

- QA tasks were listed and described,
- Life cycle development phases that would be subject to QA oversight were included,
- Required software documents and products were included,
- Provisions to assure that problems would be documented and corrected were included,
- Required reviews and audits were listed.

The inspectors noted that the SQAP divided SQA tasks between the independent SV&V and MOX Services QA groups. Additionally, the inspectors reviewed procedures associated with software reviews to verify that the processes used complied with the LA design basis requirements from IEEE 1028-1997. Additionally, the inspectors interviewed MOX Services personnel and reviewed samples of training records including qualification cards to assess whether SDG and independent SV&V personnel responsible for software design, software configuration management, and software verification and validation were qualified to perform the tasks associated with their responsibilities. The inspectors compared the training on each qualification card and training record with requirements from the SQAP, SCMP, and SVVP.

2) Conclusions

The inspectors determined that the MOX Services SQAP and implementing procedures complied with LA section 11.5.1.4, Design Basis for Codes and Standards for I&C IROFS. No findings of significance were identified.

4. Follow-up of Previously Identified Items

a. (Closed) IFI 70-3098/2012-002-001, Review Pellet Handling Fire Door and Jar Storage Fire Lock Engineering Evaluation

(1) Scope and Observations

The inspectors had determined that further review was necessary to determine the acceptability of crediting previous French fire door testing in lieu of performing additional testing prescribed by National Fire Protection Association (NFPA) 252. The inspectors reviewed engineering evaluation DCS01-ASI-DS-NTE-R-10413-0, Pellet Handling Fire Door and Jar Storage Fire Lock, Rev. 0. The inspectors also compared the requirements of NFPA 252 and the French fire door testing protocol to determine if there were significance differences in the tests. Finally, the inspectors walked down a pellet handling door and reviewed the fire hazard analysis to assess the potential fire loading that the doors could be exposed to.

(2) Conclusions

IFI 70-3098/2012-002-00, Review Pellet Handling Fire Door and Jar Storage Fire Lock Engineering Evaluation, was closed based on the conservatism (positive furnace pressure and unexposed side temperature limits) in the French fire door testing protocol and the robustness of the pellet handling fire doors.

b. (Closed) Unresolved Item (URI) 70-3098/2012-003-003, Assess Significance of Improperly Performed Licensing Evaluations

(1) Scope and Observations

The inspectors had determined that a licensing evaluation should have been performed prior to a fire damper change being implemented. The inspectors also had determined that further review by NRC staff was necessary to determine the technical significance and to determine if the change was reportable to the NRC in the form of a LA amendment request. The inspectors reviewed the requirements of (Underwriter's Laboratory) UL 555 and the following fire calculations:

- DCS01-ASI-DS-CAL-R-10475-0, Fire Damper - Fire Propagation Analysis, Rev. 0
- DCS01-ASI-DS-CAL-R-10552-0, Fire Induced Room Pressure Analysis, Rev. 3
- DCS01-ASI-DS-CAL-R-10128C, Peak Fire Temperature Modeling Calculation, Rev. 0
- DCS01-ASI-DS-NTE-R-10353-1, Fire Propagation Evaluation, Rev. 1.

The inspectors also discussed with applicant staff the design of the fire protection and ventilation systems, and expected fire loading and burning rates of combustible/flammable materials.

(2) Conclusions

URI 70-3098/2012-003-003, Assess Significance of Improperly Performed Licensing Evaluations was closed based on (1) fire modeling performed by the applicant demonstrating that a fire will not spread from the room of origin via the ductwork when it was assumed that an exhaust fire damper was open; (2) the ventilation system design that limits the available oxygen to support combustion, flashover and/or rapid temperature rise; and (3) the design of the ventilation ductwork which limits the introduction of hot gases from a fire.

5. Exit Interviews

The inspection scope and results were summarized throughout this reporting period, by regional inspectors on April 26, 2013, and by the resident inspectors on July 1, 2013. During a teleconference on July 31, 2013, the applicant expressed dissenting views concerning a potential finding pertaining to whether or not sufficient organizational independence between the software verification and validation group and the software design group was established and whether or not the SPLC Authority Key Philosophy document met the requirements of Section 6.6 in IEEE 603-1998. The inspectors acknowledged the applicant's dissenting views. Although proprietary documents and processes may have been reviewed during this inspection, the proprietary nature of these documents or processes was not included in this report.

SUPPLEMENTAL INFORMATION

1. PARTIAL LIST OF PERSONS CONTACTED

MOX Services

G. Bell, Software Design Manager
J. Burnette, Chemical and Mechanical Engineering Manager
M. Gober, Vice President Engineering
D. Gwyn, Licensing Manager
D. Ivey, Quality Assurance Manager
R. Justice, Quality Assurance Corrective Action Manager
D. Kehoe, Quality Assurance Engineer
S. Marr, Executive Vice President and Deputy Project Manager
S. Murphy, Construction Manager
E. Najmola, Vice President of Construction
T. Nash, Independent Verification and Validation (IV&V) Manager
S. Osuntokun, IV&V Manager
J. Peregoy, Quality Control Manager
E. Radford, Regulatory Compliance
K. Trice, President and Chief Operating Officer
R. Whitley, Vice President Project Assurance
J. Keklak, Regulatory Compliance Manager

2. INSPECTION PROCEDURES (IPs) USED

IP 55050	Nuclear Welding General Inspection Procedure
IP 55100	Structural Welding General Inspection Procedure
IP 88108	Control of Materials, Equipment, and Services
IP 88110	Quality Assurance: Problem Identification, Resolution, and Corrective Action
IP 88130	Resident Inspection Program For On-Site Construction Activities at the Mixed-Oxide Fuel Fabrication Facility
IP 88134	Piping Systems Relied on for Safety
IP 88136	Mechanical Components
IP 88140	Instrumentation and Control Systems
IP 88143	Pipe Supports and Restaints

3. LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED

Item Number	Status	Description
Inspector Follow-up Item (IFI) 70-3098/2013-002-001	Opened	Perform Additional Review of Closed Tank Work Packages (Section 3.c(1))
Unresolved Item (URI) 70-3098/2013-002-002	Opened	Review Implementation of Design Basis Requirements for Instrumentation and Control IROFS (Section 3.e(1)a))

IFI 70-3098/2012-002-001	Closed	Review Pellet Handling Fire Door and Jar Storage Fire Lock Engineering Evaluation (Section 4.a)
URI 70-3098/2012-003-003	Closed	Assess Significance of Improperly Performed Licensing Evaluations (Section 4.b)

4. LIST OF ACRONYMS USED

AMCA	Air Movement and Control Association
ASME	American Society of Mechanical Engineers
ASP	Air Separator Tank
AWS	American Welding Society
BAP	Aqueous Polishing Building
BMP	MOX Process Building
BSR	Shipping and Receiving Building
CA	Construction Authorization
CAR	Construction Authorization Request
CFR	Code of Federal Regulations
CIB1, 3	Construction Inspection Branch 1 or 3
CMTR	Certified Material Test Report
COC	Certificate of Conformance
CPB1, 2	Construction Projects Branch 1 or 2
CR	Condition Report
DCI	Division of Construction Inspection
DCP	Division of Construction Projects
DMC	Dynamic Materials Corporation
ECR	Engineering Change Request
EG	Engineering Guide
ERDA	Energy Research Development Administration
HDE	High Depressurization Exhaust
HEPA	High Efficiency Particulate Air
I&C	Instrumentation and Control
IEEE	Institute of Electrical and Electronics Engineers
IFI	Inspector Follow-up Item
IP	Inspection Procedure
IR	Inspection Report
IROFS	Items Relied on for Safety
IV&V	Independent Verification and Validation
LA	License Application
M&TE	Measuring and Test Equipment
MDE	Medium Depressurization Exhaust
MFFF	MOX Fuel Fabrication Facility
MOX	Mixed Oxide
MOX Services	Shaw AREVA MOX Services
MPQAP	MOX Project Quality Assurance Plan
NCR	Non-conformance Report
NCV	Non-cited Violation
NDE	Nondestructive Examination
NFPA	National Fire Protection Association

No.	Number
NRC	Nuclear Regulatory Commission
NQA-1	Quality Assurance Requirements for Nuclear Facilities Applications
PAF	Process Assembly Facility
PP	Project Procedure
PSI	Scrap Pellet Storage Glovebox
PSSC(s)	Principle System(s), Structure(s), and Component(s)
PUDC	Process Unit Design and Commissioning
QA	Quality Assurance
QC	Quality Control
QL	Quality Level
QL-1	Quality Level 1
RII	Region II
Rev.	Revision
RG	Regulatory Guide
SC	Seismic Category
SCMP	Software Configuration Management Plan
SDG	Software Design Group
SDR	Supplier Deficiency Report
SIL	Software Integrity Level
SLCP	Software Life Cycle Plan
SPLC	Safety Programmable Logic Controller
SPMP	Software Project Management Plan
SPR	Seismic Performance Requirement
SQA	Software Quality Assurance
SQAP	Software Quality Assurance Plan
SV&V	Software Verification and Validation
SVVP	Software Verification and Validation Plan
UL	Underwriter's Laboratory
URI	Unresolved Item
V&V	Verification and Validation
WP	Work Package

5. LIST OF PSSCs REVIEWED

PSSC-004	C2 Confinement System Passive Barrier
PSSC-005	C3 Confinement System
PSSC-009	Criticality Control
PSSC-023	Fluid Transport Systems
PSSC-024	Gloveboxes
PSSC-045	Process Safety Control Subsystem
PSSC-048	Sintering Furnace

6. RECORDS AND DOCUMENTS REVIEWED

Condition Reports

CR-13-204, MFFF SCS Software V&V Independence
CR-13-206, SPLC Inhibit and Uninhibit of AP process Systems
CR-13-207, Error in EG235A forms for PFJ1 Train A and PFJ1 Train B

CR-13-147, SDG Software Developer V&V Training Documentation dated March 27, 2013
CR-13-150, ECR-001157 revised ECR-009745 dated March 27, 2013
CR-13-190, MFFF SCS Software Baseline dated April 1, 2013
CR-13-191, MFFF SCS Incomplete Management V&V Tasks dated April 15, 2013
CR-13-111, MPQAP - Not assigned to offsite personnel dated March 27, 2013
CR-13-137, Procedural Compliance dated March 26, 2013

MOX Services Software Documents

DCS01-CCJ-EW-SPE-N-36002, Safety PLC General Operating Principles, Rev. 5
DCS01-CCJ-EW-SPE-C-36007, Technical Specification for Safety Programmable Logic Controllers, Rev. 4 - Updates to DCS01-CCJ-EW-SPE-C-36007 included:
(ECR-011946, Rev. 0, ECR-013444, Rev. 0, ECR-014461, Rev. 0, ECR-015358, Rev. 0, ECR-016416, Rev. 0, ECR-016868, Rev. 0, ECR-016946, Rev. 0, ECR-020825, Rev. 0)
DCS01-CCJ-CG-NTE-C-02467, Pellet process area – Safety requirements for pellet units controllers, Rev. 1 - Update to DCS01-CCJ-CG-NTE-C-02467 included: (ECR-001157, Rev. 1, ECR-008286, Rev. 0, ECR-009745, Rev. 0, ECR-011991, Rev. 0, ECR-014894, Rev. 0)
DCS01 CCJ DS NTE C 28086, SPLC Authority Key Philosophy, Rev. 2
PP8-6D, ISAS Evaluation, Rev. 0
ADF 1009, Technical Specification for Safety Programmable Logic Controllers, October 9, 2006

MOX Services Software Plans

DCS01 CCJ EW NTE C 36017, Software Life Cycle Process, Rev. 1
DCS01 CCJ EW NTE C 36018, Software Project Management Plan, Rev. 3
DCS01 AAJ EW PGC Q 36021, Software Configuration Management Plan DCS01 AAJ EW PGC Q 36021, Rev. 2
DCS01 CCJ EW PAQ Q 36019, Software Quality Assurance Plan, Rev. 3
DCS01 AAJ EW PPE Q 36020, Software Verification and Validation Plan, Rev. 2
DCS01 JSM EW PAQ H 36022, System- Software Safety Plan, Rev. 0

Procedures

PP9-3, Design Control, Rev. 20, ICN 01
EG 231, Guide to Systematic Review Process, Rev. 1
EG 233, Guide for Writing Software Requirements and Design Descriptions, Rev. 1
EG 234, Guide for Configuration Control, Rev 1
EG 235, Guideline for Establishing Baselines, Rev. 0
EG 236, Guide for Software Testing Methods, Rev. 1
EG 237, Guide to Software Verification and Validation Methods, Rev. 2
EG 238, Guide for Software Hazards and Risk Analysis, Rev. 0
PP1-05, Review of Documents, Rev. 3
PP01-11, Action Tracking Process, Rev. 1
PP2-08, Organization, Rev. 1
PP3-04, Records Management, Rev. 7
PP3-06, Corrective Action Process, Rev. 15
PP3-07, Audits, Rev. 7

PP3-11, Assessments, Rev. 9
PP6-11, Planning, Scheduling, and Budgeting, Rev. 0
PP6-13, Performance Measurement, Rev. 0
PP7-02, Project Correspondence, Rev. 4
PP7-26, Accounting Data Accumulation, Rev. 0
PP8-06, Licensing Basis Configuration Management, Rev. 10
PP9-08, Technical Documents, Rev.11
PP9-01, SSC Quality Levels & Marking Design Documents, Rev. 13
PP9-08, Technical Documents, Rev. 11
PP9-27, Technical Acquisition Strategy & Evaluation of Digital Equipment with Embedded Software for IROFS Applications, Rev. 1
PP11-58, Rev. 3, Weld Filler Material Control
DMC Clad Metal 22032, Rev. D, Straight Beam Ultrasonic Inspection for Transition Joints in Nuclear Service
DMC Clad Metal C7Z-C9C3-EXW-2 Preliminary, Rev. 0
DMC Clad Metal C0-C3-EXW-1 Preliminary, Rev. 0
Ebtec Corporation W0208133, Rev. 1
Rolls-Royce SPP-241Q, Rev. 6, Mass Spectrometer Helium Leak Test
Rolls-Royce SPP-202Q, Rev. 5, PT Visible Penetrant – Water Washable (Type II, Method A)
Rolls-Royce SPP-240Q, Rev. 5 Hydrostatic Test

Training Records

DCS01-ATR-EW-TMN-C36000-0, Qualification Card for MFFF Safety Control Systems, Developer/QL-1 Safety Control Systems V&V Engineer, Rev. 0
Student Training History, Required Reading History, MOX Learning Management System as of April 16, 2013

Configuration Management

ARR 987, MOX Software Configuration Management Plan (SCMP) not being followed
775460-1-803, NNJ1 Master Configuration List, Rev. 19

Regulatory Guides

RG1.168, Verification, Validation, Reviews, and Audits for Digital Computer Software Used in Safety Systems of Nuclear Power Plants
RG1.169, Configuration Management Plans for Digital Computer Software Used in Safety Systems of Nuclear Power Plants
RG1.170, Software Test Documentation for Digital Computer Software Used in Safety Systems of Nuclear Power Plants
RG1.172, Software Requirements Specifications for Digital Computer Software Used in Safety Systems of Nuclear Power Plants
RG1.173, Developing Software Life Cycle Processes for Digital Computer Software Used in Safety Systems of Nuclear Power Plants

IEEE Standards

IEEE 603-1998, IEEE Standard Criteria for Safety Systems for Nuclear Power Generating Stations
IEEE 730-1998, IEEE Standard for Software Quality Assurance Plans

IEEE 828-1998, IEEE Standard for Software Configuration Management Plans
IEEE 1012-1998, IEEE Standard for Software Verification and Validation
IEEE 1028-1997, IEEE Standard for Software Reviews
IEEE 1042-1987, IEEE Guide to Software Configuration Management
IEEE 1074-1997, IEEE Standard for Developing Software Lifecycle Processes
IEEE 1228-1994, IEEE Standard for Software Safety Plans
IEEE 379-1994, IEEE Standard Application of the Single-Failure Criterion to Nuclear Power Generating Station Safety Systems
IEEE 352-1987, IEEE Guide for General Principles of Reliability Analysis of Nuclear Power Generating Station Safety Systems
IEEE 7-4.3.2-1993, IEEE Standard Criteria for Digital Computers in Safety Systems of

ASME Codes and Standards

ASME AG-1-1997, Code on Nuclear Air and Gas Treatment
ASME N509-1989 (R1996), Nuclear Power Plant Air-Cleaning Units and Components
ASME N510-1989 (R1995), Testing of Nuclear Air-Treatment Systems

ERDA Standards

ERDA 76-21, Nuclear Air Cleaning Handbook, 2nd Edition

Specifications

DCS01-KKJ-DS-NTE-L-16282-1, Rev. 1, Welded Equipment and Piping General Specification for Zirconium F60702 Materials
DCS01-QGA-DS-SPE-V-10159-4, HEPA Filter Housings
DCS01-AAJ-DS-DOB-V-40106-3, Basis of Design for Heating, Ventilating, and Air Conditioning Systems
DCS01-QGA-DS-SPE-V-15910-5, Procurement Specification Dampers

Calculations

DCS01-ZMS-DS-CAL-M-C134-PS-00175-1, Rev. 1, Qualification of Support C134-PS-00175-1

Drawings

C134-PS-00175 Rev. 1

Welder Qualification Records

ID S065
ID P126

Reports & Records

RT report CRT-MOX-WQ-1012
Receipt Inspection Report QC-RIR-13-44047
CMTR zirconium pipe heat 849311

Ebtec Corporation procedure qualification record PQR-ZR-110 Rev. 1
QC-RIR13-43246

Miscellaneous Documents

SRF# 0007, Software Records File, Index of Content, PFJ001A Safety Programmable Logic Controller, Rev. 1
SRF# 0007, Software Records File, Index of Content, PFJ001A Safety Programmable Logic Controller, Rev. 0
SRF# 0007, Software Records File, Index of Content, PFJ001A Safety Programmable Logic Controller, Rev. 2
SRF# 0014, Software Records File, Index of Content, MFFF Safety Control System, Rev. 0
SRF# 0007, Software Records File, Change Log, PFJ001A Safety Programmable Logic Controller, Rev. 4
SRF# 0014, Software Records File, Change Log, PFJ001A Safety Programmable Logic Controller, Rev. 2
CR# 0008, Software Records File, Change Request, PFJ001A Safety Programmable Logic Controller, Rev. 0
SRF#00027, BVR PFJ001A, Build Version Report Safety Programmable Logic Controller, Rev. 0000
SRF#00027, BVR PFJ001A, Build Version Report Safety Programmable Logic Controller, Rev. 0001
DCR 10-0419, Optimizing SPLCs for MFFF Operations, Rev. 1
DCR 12-0514, Removal of SPLC Override Key from MFFF Design, Rev. 0
SCCB 87, SCCB Notes, dated January 8, 2013
SCCB 88, SCCB Notes, dated February 14, 2013
SCCB 89, SCCB Notes, dated March 12, 2013
SCCB 90, SCCB notes, dated April 25, 2013
BVR 008, PFJ001B Safety Programmable Logic Controller, Rev. 0001, 17-APR-13
DCS01 ATR EW TMN C 36000 Qualification Card for MFFF Safety Control Systems Developer/ QL-1 Control System V&V Engineer, Rev. 0
Ruskin Report No. EGS-TR-927701-408