



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

June 21, 2011

LICENSEE: STP NUCLEAR OPERATING COMPANY

FACILITY: SOUTH TEXAS PROJECT, UNITS 1 AND 2

SUBJECT: SUMMARY OF JUNE 2, 2011, PRE-LICENSING MEETING WITH STP NUCLEAR OPERATING COMPANY TO DISCUSS THE PROPOSED RISK-INFORMED APPROACH TO THE RESOLUTION OF GSI-191, "ASSESSMENT OF DEBRIS ACCUMULATION ON PWR SUMP PERFORMANCE" (TAC NOS. ME5358 AND ME5359)

On June 2, 2011, a public meeting was held between the U.S. Nuclear Regulatory Commission (NRC), and representatives of STP Nuclear Operating Company (STPNOC, the licensee), at NRC Headquarters, Two White Flint North, 11545 Rockville Pike, Rockville, MD. The meeting notice and agenda, dated May 16, 2011, is located at Agencywide Documents Access and Management System (ADAMS) Accession No. [ML111470652](#). The purpose of the meeting was to discuss the proposed risk-informed approach to the resolution of GSI-191, "Assessment of Debris Accumulation on PWR [pressurized-water reactor] Sump Performance." South Texas Project (STP) is the lead plant and STPNOC plans to submit a License Amendment Request (LAR) by May/June 2012. The licensee previously met the NRC staff on February 22, 2011, and provided an overall view of the proposed approach. The summary for the meeting on February 22, 2011, dated April 5, 2011, is located at ADAMS Accession No. [ML110770005](#). STPNOC and the NRC staff decided to have a series of meetings with the NRC staff to discuss the following individual key sub-topics in more detail.

- Risk Informed (RI) GSI-191 Closure Plan, Conceptual Flow Diagram, and Licensing Strategy
- Containment Building Computer-Aided Design (CAD) Model
- Probabilistic Risk Assessment (PRA) Modeling
- Loss-of-Coolant Accident (LOCA) Initiating Event Frequencies and Uncertainties
- Thermal Hydraulics and Downstream Effects
- Jet Plume Formation, Zone of Influence (ZOI), and Debris Generation
- Debris Transport and Sump Performance
- Uncertainty Quantification and In-Vessel Effects
- Additional sub-topics may be added as needed basis

The following topics were discussed during the meeting on June 2, 2011:

1. Risk Informed (RI) GSI-191 Closure Plan, Conceptual Flow Diagram, and Licensing Strategy
2. Containment Building Computer-Aided Design (CAD) Model
3. Probabilistic Risk Assessment (PRA) Modeling
4. Thermal Hydraulics and Downstream Effects
5. Loss-of-Coolant Accident (LOCA) Initiating Event Frequencies and Uncertainties

The licensee's presentation slides are located at ADAMS Accession No. [ML11157A010](#). A list of meeting attendees is provided in the Enclosure to this meeting summary.

Meeting Summary

Risk Informed (RI) GSI-191 Closure Plan, Conceptual Flow Diagram, and Licensing Strategy

The licensee presented the following:

- Flow chart representing overall process for defining inputs, developing models, performing the analysis, and analyzing and validating the results and analysis.
- Integrated closure plan showing the activities to be performed in 2011. The licensee plans to submit the LAR in May/June 2012.
- Graphical representation of the flow of data inputs and various calculation models. The NRC staff suggested that the licensee ensure that the model reflects how the uncertainties are being propagated.
- Licensing strategy, including the potential need for an exemption. The licensee debated if an exemption from the requirements of Title 10 of the *Code of Federal Regulations* (10 CFR), Section 50.46 will be required. However, the NRC staff was of the opinion that an exemption will be required. The licensee took an action to discuss it internally and there will be more discussion during the future meetings.

Containment Building Computer-Aided Design (CAD) Model

The licensee presented the main characteristics of the CAD model being prepared in support of the effort and explained the capabilities of the model. The NRC staff wanted to know the licensee plans to prepare separate CAD models for Units 1 and 2. The licensee indicated that configuration differences between Units 1 and 2 are so insignificant, that a separate model is not required and the model is being prepared based on Unit 1 design. The NRC staff also asked a number of questions to understand how the piping welds, hanger locations, and insulation is being incorporated in to the model.

PRA Modeling

The licensee presented an overview of status and direction of the PRA model in support of the proposed effort. The licensee presented the following key features of the new PRA model:

- Develop expanded LOCA event trees
- The current model does not explicitly address sump plugging phenomena, but the new model will depict detailed representation of the plugging phenomena
- The following logic changes will be incorporated in to the model:
 - Breakout sump blockage logic
 - Add logic to represent in-core "downstream" phenomena
 - Add logic to represent potential operational strategies
 - Differentiate LOCAs based on potential impacts due to sump blockage
 - The results of the detailed analysis and their insights to be incorporated and reflected by the PRA model

Thermal Hydraulics and Downstream Effects

The licensee explained that simulations of the reactor coolant system (RCS) thermo-hydraulic response by use of RELAP5-3D will be performed to determine:

- The main thermo-hydraulic parameters which are expected to affect the debris generation and transport inside the containment.
- The results of analysis will provide boundary conditions for the jet model development and estimate the effects of the debris deposition in the sump screen on the system response during accident requiring long-term cooling.
- Analysis will be performed for different break locations and sizes.
- Sensitivity analysis will also be performed for range of conditions requiring recirculation. Software DAKOTA coupled with RELAP5 will be used to perform the sensitivity analysis and uncertainty quantification.

The licensee indicated that the debris transport and deposition through downcomer, lower plenum, and reactor core will be investigated to determine the effects of the debris on the thermo-hydraulic response of the system (core and fuel temperature distribution) for downstream effects.

The licensee indicated that Computational Fluid Dynamics (CFD) codes will be used to predict the debris transport and deposition in the core and RELAP5-3D will be used to perform thermal hydraulics simulations of the reactor system

NRC staff was concerned with the use of CFD Code and suggested that results of the analytical results provided by the use of CFD Code should be validated against the results of actual testing. The licensee was receptive to the suggestion. The NRC staff also suggested that the

CFD model should have capability to evaluate the impact of non-conforming conditions discovered later. The licensee took an action to address the staff's suggestion.

Loss-of-Coolant Accident (LOCA) Initiating Event Frequencies and Uncertainties

The licensee defined the scope, technical approach, key inputs and outputs, interface with other GSI-191 tasks, and issues and strategies for resolution for this project.

The following key process features to determine LOCA initiating event frequencies and uncertainties were described:

- Incorporate insights from previous work on LOCA frequencies.
- Characterize LOCA initiating events and their frequencies with respect to specific component, materials, and dimensions, specific locations, range of break sizes, degradation mechanisms and mitigation effectiveness and other break characteristics.
- Quantify uncertainties (augmented by sensitivity studies).
- Utilize passive component reliability methods and data from RI-ISI technology.
- Utilize PIPExp database to help resolve uncertainties in failure rates.
- Utilize information from NUREG-1829 and NUREG/CR-5750 in optimal manner.
- Consider probabilistic fracture mechanics evaluations.
- Use of Bayes' method for uncertainty treatment developed during EPRI RI-ISI program.
- Use of Markov model to evaluate the impact of changes to inspection on pipe failure rates.
- Provide estimates of LOCA initiating event frequencies and uncertainties for PRA model (RISKMAN).
- Provide location specific conditional probability vs. break size information for debris formation/thermal hydraulics.
- Address technical issues such as impact of aging on LOCA frequencies, reconcile differences between STP LOCA results vs. NUREG-1829 and NUREG/CR-5750.

Action Items

The NRC and STPNOC staff agreed on the following actions before the next meeting.

NRC Staff Actions

Provide feedback to STPNOC so that the agenda focus for the next meeting can be directed toward the resolution of issues. The NRC staff plans to provide input in the area of LOCA initiating event frequencies and uncertainties.

STPNOC Actions

- Produce an example component LOCA frequency calculation for the NRC staff's review.
- The CFD needs to be revised to show that the LOCA frequencies have a path to the PRA as well as CASA Grande Physics models. STP will update and enhance the slide prior to the next teleconference.
- Provide feedback to the NRC staff regarding STPNOC's approach towards deciding whether the chemical effects will be handled as a separate technical area and/or a separate top event in the PRA.
- STPNOC will compare the CFD model being used for downstream effects against the PWR Owner's Group testing.

No Public Meeting Feedback Forms were received for this meeting.

Please direct any inquiries to me at (301) 415-3016, or Balwant.Singal@nrc.gov.

Sincerely,

 FOR

Balwant K. Singal, Senior Project Manager
Plant Licensing Branch IV
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket Nos. 50-498 and 50-499

Enclosure:
List of Attendees

cc w/encl: Distribution via Listserv

LIST OF ATTENDEES
JUNE 2, 2011, PRE-LICENSING MEETING
RISK-INFORMED APPROACH TO RESOLUTION OF GSI-191 ISSUE
STP NUCLEAR OPERATING COMPANY
SOUTH TEXAS PROJECT, UNITS 1 AND 2
DOCKET NOS. 50-498 AND 50-499

NAME	TITLE	ORGANIZATION
Tim Sande**	Principle Mechanical Engineer	Alion Science and Technology
Dave Midlik	Reg. Affairs Coordinator	Southern Nuclear
Stewart Bailey	Branch Chief	NRC/NRR/DSS/SSIB
Steve Smith	Reactor Systems Engineer	NRC/NRR/DSS/SSIB
Stephen Dismore	Senior Reliability Risk Analyst	NRC/NRR/DRA/APLA
Paul Klein	Senior Materials Engineer	NRC/NRR/DCI/CSGB
Nan Gilles	Technical Advisor for Reactors, Commissioner George Apostolakis	NRC/OCM
Dan O' Neal	Reliability Risk Engineer	NRC/NRR/DRA/APLA
John Burke	Senior Engineer	NRC/RES/DE/MEEB
Donnie Harrison	Branch Chief	NRC/NRR/DRA/APLA
Jana Bergman	-	Scientech
Balwant K. Singal	Senior Project Manager	NRC/NRR/DORL
Ravi Grover	Project manager	NRC/NRR/DORL
Charles Bowman	General Manager, Nuclear Safety Assurance	STPNOC
Steve Blossom	Project Manager, Special Projects	STPNOC
Bruce Letellier**	Technical Staff	Los Alamos National Lab
Jamie Paul	Licensing	STPNOC
Ernie Kee	Risk Management	STPNOC
Karl Fleming**	President	KNF Consulting Services
Rick Grantom	Manager Risk Project	STPNOC
Yassin Hassa**	Professor	Texas A&M University
Rodlfo Vaghetto	Phd Student	Texas A&M University
John Tsao	Senior Materials Engineer	NRC/NRR/DCI/CPNB
David H. Johnson	Vice President	ABS Consulting
Ralph Architzel	Senior Reactor Engineer	NRC/NRR/DSS/SSIB
Blake Purnell	Project Manager	NRC/NRR/DPR/PGCB
Ervin Geiger	Reactor System Engineer	NRC/NRR/DSS/SSIB
Bruce Lin	Mechanical Engineer	NRC/RES/DE/MEEB
John Lehning	Reactor Engineer	NRC/NRR/DSS/SNPB
Michael Golay	President	MGI

Enclosure

NAME	TITLE	ORGANIZATION
Robert Tregoning*	Senior Technical Advisor	NRC/RES/DE
Jeff Weyhmler*	Engineer III	Palisades
Brian Brogan*	Senior Staff Engineer	Palisades
Bill Beckius*	Project Engineer	Palisades
Paul Stevenson*	-	Westinghouse Electric

* Attended the meeting via teleconference

** Represented STPNOC

Abbreviations:

- NRC – U.S. Nuclear Regulatory Commission
- NRR – Office of Nuclear Reactor Regulation
- SSIB – Safety Issues Resolution Branch
- DORL – Division of Operating Reactor Licensing
- DSS – Division of Safety Systems
- STPNOC – STP Nuclear Operating Company
- DRA – Division of Risk Assessment
- APLA – PRA Licensing Branch
- DCI – Division of Component Integrity
- CSGB – Steam Generator Tube Integrity and Chemical Engineering Branch
- CPNB – Piping and NDE Branch
- DPR – Division of Policy and Rulemaking
- PGCB – Generic Communications and Power Uprate Branch
- RES – Office of Nuclear Regulatory Research
- DE – Division of Engineering
- MEEB – Mechanical and Electrical Engineering Branch
- OCM – The Commission

STPNOC Actions

- Produce an example component LOCA frequency calculation for the NRC staff's review.
- The CFD needs to be revised to show that the LOCA frequencies have a path to the PRA as well as CASA Grande Physics models. STP will update and enhance the slide prior to the next teleconference.
- Provide feedback to the NRC staff regarding STPNOC's approach towards deciding whether the chemical effects will be handled as a separate technical area and/or a separate top event in the PRA.
- STPNOC will compare the CFD model being used for downstream effects against the PWR Owner's Group testing.

No Public Meeting Feedback Forms were received for this meeting.

Please direct any inquiries to me at (301) 415-3016, or Balwant.Singal@nrc.gov.

Sincerely,

/RA by Lynnea Wilkins for/

Balwant K. Singal, Senior Project Manager
 Plant Licensing Branch IV
 Division of Operating Reactor Licensing
 Office of Nuclear Reactor Regulation

Docket Nos. 50-498 and 50-499

Enclosure:
List of Attendees

cc w/encl: Distribution via Listserv

DISTRIBUTION:

PUBLIC	RidsNrrDorLp4 Resource	DO'Neal, NRR/DRA/APLA
LPLIV r/f	RidsNrrPMSouthTexas Resource	PKlein, NRR/DCI/CSGB
RidsAcrsAcnw_MailCTR Resource	RidsNrrLAJBurkhardt Resource	NGilles, OCM/GA
RidsNrrDssSsib Resource	RidsOgcRp Resource	JBurke, RES/DE/MEEB
RidsNrrDraApla Resource	RidsRgn4MailCenter Resource	BLin, RES/DE/MEEB
RidsNrrDssSnpb Resource	CSteger, NRR	RTregoning, RES/DE
RidsNrrDssSsib Resource	SBush-Goddard, EDO RIV	RGrover, NRR/DORL
RidsNrrDciCpnb Resource	SSmith, NRR/DSS/SSIB	JTsao, NRR/DCI/CPNB
RidsNrrDciCsgb Resource	EGeiger, NRR/DSS/SSIB	BPurnell, NRR/DPR/PGCB
RidsNrrDprPgcb Resource	RArchitzel, NRR/DSS/SSIB	JLehning, NRR/DSS/SSIB
RidsResDe Resource	SDismore, NRR/DRA/APLA	

ADAMS Accession No. ML111640160

OFFICE	NRR/LPL4/PM	NRR/LPL4/LA	NRR/DSS/SSIB/BC	NRR/DRA/APLA/BC	NRR/LPL4/BC	NRR/LPL4/PM
NAME	BSingal	JBurkhardt	SBailey	DHarrison	MMarkley	BSingal (LWilkins for)
DATE	6/13/11	6/13/11	6/14/11	6/14/11	6/20/11	6/21/11