August 1, 2008

MEMORANDUM TO: Timothy R. Lupold, Chief
Corrosion and Metallurgy Branch
Division of Engineering
Office of Nuclear Regulatory Research

FROM: Carol E. Moyer, Prog. Manager, Codes & Standards ***/RA/***
Corrosion and Metallurgy Branch
Division of Engineering
Office of Nuclear Regulatory Research

SUBJECT: SUMMARY OF MEETING BETWEEN THE NUCLEAR REGULATORY COMMISSION STAFF, INDUSTRY REPRESENTATIVES, AND ELECTRIC POWER RESEARCH INSTITUTE-MATERIALS RELIABILITY PROGRAM REPRESENTATIVES ON ALLOY 690/52/152 RESEARCH AND AREAS OF POSSIBLE COLLABORATION

On July 17-18, 2008 Nuclear Regulatory Commission (NRC) staff met with representatives of the Electric Power Research Institute (EPRI), General Electric (GE) Company, Westinghouse Electric Company, AREVA, Bechtel Bettis Atomic Power Laboratory (Bettis), Lockheed Martin Knolls Atomic Power Laboratory (KAPL), Massachusetts Institute of Technology, Dominion Engineering Inc., and other industry and utility representatives in a public meeting in Rockville, Maryland. A public meeting notice had been issued on July 2, 2008 and was posted on the NRC's external (public) web page (ADAMS Accession No. ML081840029). The notice included the meeting agenda, which was also available as a handout at the meeting. A list of meeting attendees is provided as an enclosure to this memorandum.

Summary:

The purpose of the meeting was to continue the communication begun in a public meeting held in May, 2008, related to Primary Water Stress Corrosion Cracking (PWSCC) of Alloy 690 and its weld metals, Alloys 52 and 152. The goals of this meeting were to exchange updates on ongoing testing of Alloy 690 and its associated weld metals, and to discuss opportunities to coordinate research on these materials, including plans to acquire test specimens for research. Several presentations were made to facilitate discussion. The presentation slides are enclosed.

The next PWSCC Expert Panel Meeting will be held in Los Angeles on November 12-14, 2008. The meeting will cover A690/52/152 issues and low temperature crack propagation (LTCP). Progress on the coordinated research activities will be discussed at the expert panel meeting as well.

After introductions and some opening comments by the meeting organizers, Mr. Kawaljit Ahluwalia, Electric Power Research Institute (EPRI), Dr. Robert Tregoning, NRC, and Carol Moyer, NRC, reviewed the status of action items from the May meeting. A table of action items is included in this summary.

Review of MRP A690 White Paper

Mr. Al Ahluwalia, the EPRI Materials Reliability Program (MRP) Project Manager, gave an update on the soon to be published report MRP-237, "Materials Reliability Program: Resistance of Alloys 690, 152 and 52 to Primary Water Stress Corrosion Cracking." The report describes the state of knowledge related to Alloy 690 and its weld metals, Alloy 52 and 152, based on research conducted within 2004–2007. There are some copyright issues to be worked out, but publication is expected shortly.

Best Practices for PWSCC Crack Growth Rate Testing

Dr. Peter Andresen, of GE's Global Research Center, reviewed discussions from the May meeting and afterward that culminated in a document on best practices for stress corrosion cracking (SCC) tests to measure crack growth (CGR) rate in Alloy 690 and similar materials. Experimental guidelines have been compiled by Dr. Andresen, Dr. Steven Bruemmer and Dr. Mychailo Toloczko of the Pacific Northwest National Laboratory (PNNL), and Dr. Bogdan Alexandreanu of Argonne National Laboratory (ANL). The guidelines were based on guidance compiled for the Alloy 182 Round Robin performed by members of the International Cooperative Group on Environmentally Assisted Cracking (ICG-EAC). Dr. Andresen also described the importance of careful experimental procedures in transitioning a crack from a transgranular fatigue pre-crack to an intergranular SCC crack. He gave examples of problems that can result from inadequate test management and common testing errors. Also, he presented examples of CGR data that had been produced by a variety of laboratories, including GE, ANL, and PNNL, with confirmatory data from KAPL and Bettis.

There was some discussion on how much crack advance was adequate. One suggestion was to test to ten times the crack length monitoring resolution, but this may require thousands of hours of testing to obtain 50 microns of cracking, for example. Dr. Andresen pointed out that crack growth rate data, rather than only crack initiation data, is necessary for flaw disposition curves. Very long CGR tests on material that is not particularly susceptible, however, may produce data that has no engineering significance. An alternative approach is to use CGR testing to screen for susceptible materials. An order of magnitude estimate of CGR can be determined within about 1000 hours of testing such that CGR tests can be completed in months, not years.

The draft experimental guidelines will be circulated informally among laboratories that have such testing capabilities, and comments will be solicited. The guidelines will be discussed further at the November meeting.

Base Metal PWSCC Issues and Strategies

Dr. Andresen discussed various metallurgical features and conditions that may increase susceptibility to PWSCC. One is compositional inhomogeneity, referred to as banding. Greater inhomogeneity has been observed in more highly-alloyed materials, thus, banding is more

pronounced in Alloy 690 than in Alloy 600. Improved melting techniques have led to reduced banding, but the issue may not receive adequate attention because material specifications for nuclear components may not prohibit banding. Dr. Andresen suggested that specifications should require multiple samples or an etched cross-section during production, to reduce this problem. While cold work accelerates SCC by about 10X, the acceleration may be as great as 100X in banded microstructures.

Another condition with a detrimental effect on base metal properties is residual strain resulting from nearby welds. The resulting strain may correspond to 20-30% cold work. Testing the mechanical properties of the base metal very close to the fusion line of a weld is difficult. Dr. Andresen estimated, and Dr. Young agreed, that about one third of such tests are likely to yield intended results (i.e., the crack following the fusion line), rather than the crack growing into the weld metal, etc. Orientation effects are pronounced for these materials. Whether the material has been strained in tension or compression, and how the strain was aligned with respect to the non-uniform microstructure, has a large effect on the CGR data. Dr. Young provided a reference to information about test procedures and results for ductility dip cracking, Welding Research Journal, Feb. 2008 – *"The Mechanism of Ductility Dip Cracking in Nickel-Chromium Alloys."*

For PWSCC laboratory test materials, the co-authors of the draft best practices document recommended that the following data be recorded: ingot melting practice, heat numbers, product form (e.g., bar, billet, or plate), thermal treatment, and crack orientation with respect to straining direction and microstructural inhomogeneity.

Chuck Marks, of Dominion Engineering (DEI), presented data and analysis on Alloy 690 replacement pressure boundary components that have been installed in U.S. nuclear plants. A draft report on this work was delivered to EPRI at the end of 2007. The goal of their work was to collect information on manufacturing processes, fabrication practices, and resulting plastic strains characteristic of these components. DEI also set out to determine the applicability of laboratory CGR data to the performance of replacement Alloy 690 components, through finite element modeling (FEM)

Although some data were presented on the manufacturing history for control rod drive mechanism (CRDM) nozzles, hot leg and cold leg piping, and pressurizer components, the study concentrated on CRDM nozzles. Their FEM results predicted base metal strain in the CRDM nozzles of up to 2.5%. There was some discussion on this, and others suggested that this value may be low by an order of magnitude. Mr. Marks noted that laboratory tests on Alloy 690 with more than 20% cold work are overly harsh, if his predicted strain levels are correct. He also listed additional information that could be sought for Alloy 690/52/152 components to extend this study. He noted that a particularly important variable is the extent of straightening permitted following welding or thermal treatment. Some relevant information may be withheld by component vendors, who consider the information proprietary.

In subsequent discussion, the participants agreed that the material microstructure was critical information. There is a strong desire to know what kinds of materials are actually in plants. This can be difficult to obtain for installed components. Examination of samples by electron backscatter diffraction (EBSD) may be helpful. One person suggested that archive materials and components removed from service and now in use as test specimens in cooperative research programs may be useful for obtaining such information. Several participants agreed

that material specifications are likely to be considered proprietary, but that a researcher (or team) might be permitted to travel to a utility site and view available materials and documentation, rather than ask for documents to be submitted or shared. All utilities that have installed replacement reactor pressure vessel heads, for example, should have some archive material and some documentation on the manufacture of those components.

Discussion followed on how to test the PWSCC susceptibility of base metals in heat affected zones (HAZs) adjacent to welds. Dr. Tregoning proposed two approaches: testing HAZs in welded mockups and testing larger material specimens that simulate HAZ conditions (e.g., through cold work). Although testing larger specimens may be easier, and may alleviate concerns about aligning the crack plane exactly with the weld fusion line, there are uncertainties in how well the “abused” specimen simulates HAZ conditions. Conversely, a “worst case” mockup weld was viewed by many as being unrealistic and overly conservative. The need for consistent characterization was discussed. Dr. Alexandreanu presented results of microstructural analyses that he had performed on Alloy 690 specimens, showing changes in the shape and composition of carbides near the weld fusion line and for some distance away in the HAZ.

Dr. Young stated that his laboratory had tried various means of simulating HAZs, but found that the simplest and most representative approach was to make mockup welds. Some of these were simple bead-on-plate welds, which yielded HAZ material for laboratory tests. David Waskey reported that AREVA has made some test specimens by machining a narrow groove in an Alloy 690 plate and filling the groove with weld metal. Dr. Andresen advocated some of each kind of testing: both representative welds (and microstructures) and simplified specimens that could be well characterized.

Materials Supplier

To help the participants understand the processes involved in producing Alloy 690 components, Larry Paul of ThyssenKrupp VDM presented an overview of the corporation and its facilities for the production of nickel base alloys. He described the steps in manufacture of various product forms, including plate, bar, sheet, strip, and wire. Mr. Paul presented photographs of German and U.S. production facilities for vacuum melting, forging, rolling, wire drawing, and thermal treating. His company may be able to supply some test material for cooperative research.

The participants discussed what information should be solicited from holders of archive material to determine its suitability for PWSCC test specimens. A preliminary list was drafted, including composition, melt practice(s), product form, thermal treatment, cold work (after thermal treatment), weld repairs, metallography, grain size, and mechanical properties. Mr. Marks was asked to draft a list that could be circulated to this working group for comment.

Weld Heat Affected Zone (HAZ) Properties

The meeting participants discussed the properties of heat affected zones in Alloy 690 adjacent to welds. These properties should be reproduced (or simulated) in specimens for PWSCC tests. Discussion followed on how to test the PWSCC susceptibility of base metals in heat affected zones (HAZs) adjacent to welds. Dr. Tregoning proposed two approaches: testing HAZs in welded mockups and testing larger material specimens that simulate HAZ conditions (e.g., through cold work). Although testing larger specimens may be easier, and may alleviate

concerns about aligning the crack plane exactly with the weld fusion line, there are uncertainties about how well these specimens simulate actual HAZ conditions. Conversely, a “worst case” mockup weld was viewed by many as being unrealistic and overly conservative. The need for consistent characterization was discussed. Dr. Alexandreanu presented results of microstructural analyses that he had performed on Alloy 690 specimens, showing changes in the shape and composition of carbides from near the weld fusion line and from some distance away in the HAZ.

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There was agreement that researchers need to know the difference in properties between as-received material and as-installed material, such as Alloy 690 tube that has been installed in a reactor pressure vessel (RPV) head as part of a CRDM assembly. Dave Rudland of Engineering Mechanics Corporation of Columbus (EMCC) pointed out that he had been contracted by the NRC to document the CRDM J-groove weld procedure. Dave Waskey informed the group that, as of 2009, AREVA plans to perform all CRDM J-groove welds by an automated process, in order to better control tube tilt, heat input, etc. Although the details of the process are proprietary, he may be able to share general information about the process.

The NRC is planning to investigate the properties of Alloy 52M welds and weld overlays of 52M on Alloy 82/182, at ANL and PNNL. Mr. Rudland is planning tensile tests and FEM modeling of such welds. Dr. Andresen requested samples of welds for strain measurement by EBSD. Rich Jacko proposed to strain harden some weld samples before EBSD analysis, to obtain correlations among engineering strain, stress, microhardness, and EBSD results.

John Wilson of Exelon Corporation summarized three options discussed previously for conducting HAZ testing: 1) a realistic weld mockup, 2) a constrained but idealized weld, such as a narrow groove with planar fusion lines, and 3) single-parameter tests to address specific characteristics, such as cold work. Dr. Young described a weld specimen that his laboratory has used, consisting of a narrow groove, approximately 2 inches tall, that is used to assess hot cracking susceptibility. He will investigate whether a portion of a weld made with Alloy 52/152 in his laboratory could be shared with this group. Mr. Marks added that additional characterization of an actual or mockup weld would be needed, in order to understand the HAZ differences in the narrow groove weld. Characterization could include documenting the microstructure in detail, assessing chemical segregation near the weld, and mapping localized strains with EBSD. If a correlation could be established, many low-cost welds could be produced for testing. Existing mockups, particularly of CRDM nozzles, will be sought for characterization.

There was further discussion of single-effects testing. Dr. Andresen pointed out that this has been the bulk of his recent tests, directed toward understanding what is driving PWSCC cracking, and he advocated that some additional testing is necessary. Cold work, for example, is known to be an accelerant for PWSCC testing, but high levels (>20%) of cold work are not

well correlated with the properties of as-installed components. Dr. Andresen was asked to draft a matrix of variables for single-effects tests, in advance of the November meeting.

Weld Metal PWSCC Issues and Strategies

Dr. Andresen of GE presented some results of PWSCC tests on Alloy 52/152 welds. In general, these weld alloys have proven very resistant to PWSCC, with most observed crack growth rates less than 2×10^{-9} mm/s, which is typical for Alloy 690. The highest crack growth yet observed in Alloy 152, on the order of 5×10^{-8} mm/s, was reported by ANL. Dr. Andresen noted that it was a laboratory-prepared weld, but that the weld procedure and resulting weld do not appear to be inconsistent with a production weld. Dr. Alexandreanu noted that differences in test procedure compared with Dr. Andresen's, specifically in how the crack is transitioned from transgranular fatigue to intergranular SCC, may help explain the higher measured rates in the ANL test. Further tests and characterization are being planned on this heat of weld wire to better understand these results.

Dr. Andresen expressed a greater concern with weld cracking. Alloy 152 has been shown to be susceptible to weld hot cracks and ductility dip cracking. In Alloy 182, SCC cracks have been observed to nucleate from weld cracks. Some newer alloy compositions with 25% and 27% chromium contents that are being tested by KAPL show promise toward resisting weld cracking. The meeting participants agreed that testing of these compositions should continue. Mr. Waskey also noted that a 2.5%Nb, 4%Mo alloy, referred to as Alloy 52MSS, also shows promise. In later discussion, Dr. Young said that he intends to pursue testing of Alloy 52 variants (including 52i with 27% Cr), and will plan to share results with this group.

Dr. Young said that the PWSCC susceptibilities of weld metals appear to be related to the amount of grain boundary segregation, which can vary substantially among weld alloys. There was general agreement that more characterization of weld specimens should be carried out and reported. Again, the differences between mockups and idealized specimens need to be understood. The government contractor laboratories (ANL, PNNL, Bettis, KAPL) and GE were asked to summarize the weld characterization that has been done on tested specimens, and to identify and prioritize gaps in this information.

Another concern for weld properties testing is the dilution effects observed in dissimilar metal welds, including weld overlays. Mr. Waskey commented that weld overlays are the primary application for Alloy 52M now, and that dilution with Alloy 82, or with low alloy steel, produces a significantly different alloy. Others have tested the effects of such dilution. Dr. Young stated that KAPL has a safe-end mockup that may yield interesting specimens for SCC testing. He will investigate the possibility of obtaining samples for characterization and testing.

Mr. Jacko stated that nozzle to pipe welds in Westinghouse steam generator replacements used an Alloy 82/182 weld with an Alloy 152 seal weld until 1997. After that, the structural weld was made with Alloy 52/152. Mr. Jacko and Mr. Waskey were asked to summarize the dissimilar metal weld combinations in current use and near-term plans. Others were asked to check for available weld mockups, including weld qualification mockups, that might be used for characterization and/or testing.

Dr. Bruemmer returned to the topic of weld hot cracks. It is not fully understood whether hot cracks themselves accelerate PWSCC, or whether both hot cracks and high CGRs are associated with weld solidification segregation. He has some specimens with hot cracks from the Ringhals nuclear power plant. Al Csontos of the NRC stated that he would like to understand the size and distribution of hot cracks, as inputs for modeling by EMCC. Mr. Waskey said that AREVA has some statistical data on hot cracks in a severe screening test, but not in representative weld mockups.

Dr. Young provided an article on ductility dip cracking, published in the Welding Research Journal Supplement, February, 2008. Mr. Ahluwalia and Mr. Couch noted that several helpful articles were presented at an EPRI welding conference in June in Florida. Mr. Couch offered to check whether those articles could be distributed beyond EPRI members.

It was decided that a draft testing matrix is needed for PWSCC crack growth rate in welds, similar to the one that Dr. Andresen is writing for base metal HAZs. Dr. Bruemmer was asked to take the lead on developing the weld test matrix, with assistance from Dr. Alexandreanu, Dr. Paraventi, Dr. Young, and Dr. Andresen.

Material Bookkeeping / Storage / Distribution

As this working group begins to pursue cooperative research and testing, it is recognized that there may be a need for storage space for specimens. Mr. Ahluwalia said that EPRI is willing to take the lead on this effort, and offers some space at EPRI's Center for Nondestructive Evaluation (NDE) in Charlotte, NC. The NDE Center also has a system in place to catalog and track material. Another suggestion raised was to involve the Materials Aging Institute (MAI), a newly-formed organization. It currently has three members: EPRI, Electricite de France (EDF), and Tokyo Electric Power Company (TEPCO). Mr. Ahluwalia will look for ways to coordinate efforts with MAI and other potential international participants.

Next Steps

Dr. Tregoning acknowledged the progress made in this meeting, and said that we will need to have additional contact before the November meeting. He suggested that those with action items assigned should consider having conference calls, approximately monthly or even biweekly. Mr. Ahluwalia offered to set up a conference call in the last week of August. The draft test matrices should be completed by then. Also, he will advertise this cooperative work at a crack initiation meeting being planned for September in France. Dr. Tregoning expects that the draft test matrices will be presented and discussed at the November meeting, forming the foundation of the program plan for future work.

Action Items from May 2008 and Status

	ACTION	LEAD
1	November 12-14 Expert Panel Meeting in Los Angeles	A. Ahluwalia
	The meeting has been scheduled.	
2	Form Task Group to discuss initiation testing	P. Andresen

	P. Andresen wrote an outline for testing guidelines. It will be distributed to the attendees of the meeting for comment.	
3	Draft best practices for crack growth rate testing	Lead: P. Andresen With: S. Bruemmer and B. Alexandreanu
	A document has been drafted and reviewed. It will be refined before the November meeting.	
4	Knowledge gaps ranking by EPRI-MRP (after 5/19 Meeting)	A. Ahluwalia
	The EPRI and NRC rankings were consistent.	
5	Inventory replacement material (May Technical Advisory Group Meeting)	L. Spain
	L. Spain sent a letter to utilities, requesting information by the end of July, 2008.	
6	Contact S. Keiser from Special Metals regarding weld metal compositions	D. Waskey
	D. Waskey and G. Young provided weld metal compositions.	
7	Determine which international distributers of weld wires are being used	A. Ahluwalia
	Special Metals and Sandvik/ThyssenKrupp were identified as the major producers.	
8	Find White Paper that specifies 24% Cr for PWSCC resistance	T. Lupold
	A report prepared by Structural Integrity Associates for Welding Services, Inc. in 2005 was identified.	
9	Send crack growth rate specimen geometries to EPRI's Repair and Replacement Application Center (RRAC)	P. Andresen
	Completed	
10	Send information on welding concerns and conditions that should be tested to P. Andresen, S. Bruemmer, and B. Alexandreanu	S. McCracken
	Working	
11	Extend date on Ni-based Alloy testing Addendum to the NRC-EPRI Memorandum of Understanding	R. Tregoning
	Working	
12	Contact other potential collaborators	A. Ahluwalia, R. Tregoning
	Several potential collaborators have been approached, with generally favorable responses. Organizations include metals producers, fabricators, laboratories, and regulators. R. Tregoning is drafting a project on Alloy 690 research within CSNI.	
13	Contact EPRI Steam Generator Management Program (SGMP) to get additional Alloy 690 information of interest	A. Ahluwalia
	A report (EPRI proprietary) has been prepared to document the "improvement factor" of Alloy 690 over Alloy 600. SGMP staff will	

	be invited to the November meeting.	
14	Check for additional Alloy 152 weld wire of the higher susceptibility heat that was tested at ANL	B. Alexandreanu
	Approximately 15 pounds of that heat are still in ANL inventory. A weld will be prepared from it in August. Remaining material may be available for evaluation.	
15	Contact international regulatory bodies for interest in collaboration	R. Tregoning
	Merged with Item 12.	

Action Items from July 2008

	ACTION	LEAD
16	Address LTCP and loss of toughness in water environment at Nov. '08 experts meeting.	R. Dyle
17	Check to see whether test material can be obtained as part of a current order at ThyssenKrupp VDM.	L. Paul
18	Develop final list of information for site access team to evaluate by refine preliminary list developed at meeting; send to Ahluwalia for distribution.	C. Marks
19	Conduct site visit at a utility to review CRDM fabrication documentation; determine pertinent information that may be available for working group (WG) use.	C. Marks
20	Locate EMCC reports of CRDM fabrication practices and determine availability for dissemination to working group.	R. Tregoning
21	Provide computed strain profiles for HAZ region in simulated J-groove weld and compare to EBSD results.	Rudland / Tregoning
22	Present characterization information on narrow-groove weld materials at November experts meeting. {Initial welding details provided during EPRI Welding repair conference in June 2008}	G. Young
23	Contact Bernie Rudell to determine availability of CDRM mock-up.	A. Ahluwalia
24	Send request to AREVA for making CRDM mock-ups available.	A. Ahluwalia
25	Contact vendors/manufacturers to request CRDM fabrication information.	C. Marks
26	Develop matrix of recommended single-effects tests for HAZ evaluation; circulate to WG members for review/comment.	P. Andresen
27	Identify what weld material characterization has been performed on previously tested specimens. Identify characterization gaps, and propose short-term activities to address gaps.	Bruemmer, Andresen, Alexandreanu, Young, Paraventi
28	Ask Special Metals about availability of previously-tested ANL 152 weld wire.	B. Alexandreanu
29	Look at possibility of providing narrow-groove weld material from KAPL.	G. Young
30	Transmit heat/lot # of ANL-tested Alloy 152 weld to R. Tregoning;	B. Alexandreanu

	for circulation to the working group (WG)	
31	Check whether inlay samples are available for testing, property of Owners Group	R. Payne / D. Waskey
32	Take photos and dimensions of specimens from development samples for high deposition rate Alloy 52M welds. Provide to A. Ahluwalia, who will provide to WG.	D. Waskey
33	Summarize weld metal combinations, geometries for overlays, inlays, onlays, and repairs, in-service and proposed. Also, provide information on weld configurations planned for AREVA's new reactor application.	D. Waskey
34	Contact Peter King to ask whether they have available CRDM mockup for characterization/testing.	G. Young
35	Investigate possibility of supplying safe-end mockup material for SCC specimens; may have preexisting agreement with EPRI.	G. Young
36	Summarize fabrication geometry and configuration for replacement steam generator nozzle welds.	R. Jacko
37	Identify available mockups for characterization work from Westinghouse.	R. Jacko
38	Identify available mockups for characterization work from Welding Services, Inc. (WSI).	R. Dyle
39	Ask manufacturers whether they have available weld mockups for characterization work.	D. Couch
40	Ask for info. on evolution of weld composition changes and associated microstructural characterization for Alloy 52M from Special Metals.	A. Ahluwalia
41	Identify which papers within EPRI welding and repair conference are most valuable to the WG.	D Waskey / D. Couch
42	Investigate possible release of papers from EPRI welding and repair conference (June 2008) beyond EPRI members.	D. Couch
43	Develop draft test matrix for CGR in welds, by end of August	Lead: S. Bruemmer With: Alexandreanu, Paraventi, Young, Andresen, Jacko
44	Review prioritized knowledge gaps and determine target dates that technical information is needed to support implementation and/or NRC review	R. Tregoning / A. Ahluwalia
45	Schedule a conference call of the WG (possibly 8/26/08?).	A. Ahluwalia
46	Provide link to public meeting summary from this meeting to WG.	R. Tregoning
47	Augment Alloy 690 implementation table to include SG replacement applications, pressurizer replacement applications, and dissimilar metal weld mitigation applications.	C. Marks
48	Continue to advertise/solicit participation in WG through presentations at upcoming meetings (MAI meeting, Workshop on	A. Ahluwalia

	SCC initiation in France).	
49	Investigate possibility of getting mock-ups from power plants (e.g., Finnish plant) that are currently under construction internationally, possibly through nuclear steam supply system vendors.	D. Waskey

Enclosures:
1. List of Attendees
2. Presentations (8)

	SCC initiation in France).	
49	Investigate possibility of getting mock-ups from power plants (e.g., Finnish plant) that are currently under construction internationally, possibly through nuclear steam supply system vendors.	D. Waskey

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DATE	08/01/08	08/01/08	08/01/08

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List of Attendees

Name	Affiliation	Name	Affiliation
Robert Tregoning	NRC	Bogdan Alexandreanu	Argonne National Laboratory
Carol Moyer	NRC	Stephen Bruemmer	Pacific Northwest National Lab.
Tim Lupold	NRC	John Wilson	Exelon
Robert Hardies	NRC	Masamori Kanno	JNES
Michael Benson	NRC	Peter Andresen	GE Global Research Center
Mark EricksonKirk	NRC	Richard Jacko	Westinghouse Electric
Jeff Poehler	NRC	Chuck Marks	Dominion Engineering, Inc.
Jay Collins	NRC	Denise Paraventi	Bechtel Bettis, Inc.
Al Csontos	NRC	George Young	Lockheed Martin
Wallace Norris	NRC	Ronald Ballinger	MIT / Exponent
Kawaljit Ahluwalia	EPRI	Chris Cruz	Duke Energy
Tiangan Lian	EPRI	Dennis Weakland	First Energy (FENOC)
Dana Couch	EPRI	Robin Dyle	Southern Nuclear Co.
Dave Waskey	AREVA	David Rudland	Engineering Mechanics Corp. (EMCC)
Ron Payne	AREVA	Larry Paul	ThyssenKrupp VDM