

# **MTAG ANNUAL REPORT TO MEOG**

**2007**

**April 2008**



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## **MTAG ANNUAL REPORT TO MEOG**

### **1 INTRODUCTION**

Appendix B of NEI 03-08, *Guideline for the Management of Materials Issues*, requires that the Materials Technical Advisory Group (MTAG) report to the Materials Executive Oversight Group (MEOG) annually on the industry's performance with respect to the Industry Initiative on the Management of Materials Issues. This document is the MTAG's 2007 Annual Report. The information contained herein was obtained from the Materials Issue Programs (IPs) annual work plans and from the 2007 activities of the MTAG.

The information contained in this report is as follows:

Section 2 – Industry Materials Activities for 2007

Section 3 – Materials Issues Funding

Section 4 – Alignment with NEI 03-08

Section 5 – Overview of Materials Strategic Direction for 2008

### **2 INDUSTRY MATERIALS ACTIVITIES IN 2007**

MTAG's goal for 2007 was to complete the transition from a startup mode, where it concentrated on setting expectations and facilitating materials IP communication and coordination, to its intended function of monitoring industry materials related activities. This goal was accomplished through the publication of revisions to NEI 03-08 and its Addenda which reflect a mature set of expectations and through the restructuring of the MTAG agenda to emphasize the discussion of recent materials operating experience. A more detailed assessment of MTAG's performance against its strategic direction is provided in section 5.

One of the most important developments in the materials issues in 2007 was the industry response to the pressurizer dissimilar metal weld indications found at Wolf Creek in October of 2006. Ultimately, the issue was successfully resolved in that no unplanned shutdowns were necessary to inspect the pressurizer dissimilar metal welds at other plants, but the importance of the issue and the stress its resolution placed on the industry dictated that the experience be evaluated to determine how similar occurrences could be managed better in the future. As a result, both the MTAG and the MRP completed lessons learned evaluations.

MTAG's self-assessment of the industry response to the Wolf Creek indications addressed two aspects:

1. Plant lessons learned in the areas of project management, inspections, mitigations and processing of relief requests.
2. Industry response to the emergent issues.

Item 1 is being addressed by a series of workshops on lessons learned from materials activities. The first two of these were held in January and August of 2007. NEI will continue to hold these workshops at least annually.

Item 2 was addressed by changes to the appropriate NEI 03-08 protocols that define expectations for strategically planning IP interface with the NRC and for assessment of emergent issues. The revised protocols were issued in May.

The MRP contracted an independent consultant to evaluate its response. The report identified recommended actions and current status as discussed below.

#### External to MRP

- Industry should ensure regular and periodic updates on the Materials Initiative focusing on active guidance and industry expectations associated with that guidance. This action is also important to educate personnel who have assumed positions with materials responsibilities since the time of the initial Materials Initiative training. NEI will organize a series of seminars on the Materials Initiative to complete this action.
- Materials initiative training should also be embedded in the INPO supervisory and manager training course.
- The roles and responsibilities of each materials related group should be reviewed for clarity and consistency.
- A standard process for submission/discussion of deviations with NRC should be developed. This action is being addressed by a revision to the Implementation Protocol which should be issued by the middle of 2008.
- Industry site metrics should be evaluated to determine if some metrics are driving individual corporate behavior at the expense of actions that are best for the industry as a whole.

#### Internal to MRP

- Improve engagement of the MRP Executive Sponsor in future meetings and planning.
- Develop a recommendation for streamlining the committee structures for MRP.
- Improve guidance for the processing of deviations to “Mandatory” and “Needed” guidelines. MRP has initiated the necessary guidance revision. In addition, MRP IIG and EC meetings now include a standing agenda item to review deviations from MRP guidance. Finally, utilities are reminded of guidance deadlines at periodic meetings of the MRP Technical Advisory Group each outage season. This is expected to minimize the need for deviations and alternative examinations.
- Ensure that the issue management table is being appropriately used to establish project and issue priorities. IMT priorities are now used to prioritize projects as part of the annual budget process.
- Develop training for each ITG project manager and chairperson.



- Improve MRP's field response by having resources available to analyze emergent results from the field.

## **2.1 STRATEGIC PLANNING**

Starting in the fall of 2003, the MTAG initiated the development of a high-level "road map" or strategic plan that identifies the highest priority materials challenges confronting the industry and the activities needed to address these challenges. The current version of this plan was published in April of 2007. The Strategic Plan is organized into two parts:

1. Integrated Materials Issues Strategic Plan (Strategic Plan)
2. Integrated Materials Management Work Plan (Annual Work Plan)

This division allows a controlled distribution of the Annual Work Plan in recognition of its sensitive topics, while allowing broad distribution of the Strategic Plan.

### **Strategic Plan**

The Strategic Plan outlines the industry's general philosophy for managing materials issues and identifies six strategic issues/areas requiring focused attention:

1. Nickel-based alloy stress corrosion cracking
2. NDE technology development and application
3. Impact of high fluence on BWR and PWR reactor internals
4. Performance of steam generator tubing
5. Nuclear fuel integrity
6. Impact of water chemistry on materials performance

The above issues remained the key strategic materials items in 2006 and 2007. However, responsibility for nuclear fuel integrity now falls under "Zero Defect Fuels Initiative". This issue will be removed from future revisions of the Strategic Plan.

One of the main objectives of the first MTAG meeting in 2008 will be to assess the need to revise the Strategic Plan and to subsequently recommend appropriate changes to MEOG by the middle of the year.

The Issues Management Table (IMT), which validates the key issues in the Strategic Plan, was finalized in 2007. It now includes a prioritized list of gaps with identified owners for each and is being used by the IPs to prioritize their annual work plans. The IMT is a living document, maintained by the MRP and SGMP for PWRs and the BWRVIP for BWRs. Changes to the IMT in 2007 are described in Section 2.4. The IMT's prioritized gaps are listed I Addendum 4.

## **Annual Work Plan**

The Annual Work Plan provides more information on the five strategic issues being addressed by the Materials Initiative, and summarizes the activities that each Issue Program intends to pursue in the upcoming year related to the strategic issues. The Annual Work Plan is updated annually to reflect progress in addressing the identified strategic issues. A list of major 2008 deliverables is provided in Addendum 2.

A summary of the 2007 IP activities on materials related issues is provided in this report. A list of major 2007 deliverables from each IP is provided in Addendum 1.

## **2.2 ESTABLISHING EXPECTATIONS FOR MATERIALS GUIDANCE**

An Addendum to NEI 03-08 was published in August 2005. This Addendum consists of 8 addenda:

- A. RCS Materials Degradation Management Program Guidelines
- B. Roadmap to Materials Program Guidance
- C. Integrated Materials Issues Strategic Plan
- D. Implementation Protocol
- E. Emergent Issues Protocol
- F. Materials Issues Performance Metrics
- G. Materials Issue Program Scope and Boundaries
- H. Self-Assessment Protocol

The Addendum was revised in May 2007 to reflect the evolution of activities related to the Materials Initiative. The major changes addressed:

- Movement of the Fuels Reliability Program from within the Materials Initiative to its own initiative, the “Zero Defect Fuels Initiative”.
- Refinement of expectations for justifying deviations from mandatory and needed industry guidance.
- Establishment of IP performance metrics.
- Improved guidance on the management of emergent issues.

Another revision to the Implementation Protocol will be completed in 2008 to capture the lessons learned from the industry activities in response to the Wolf Creek pressurizer dissimilar metal weld indications. This revision will add guidance on:

- Reporting of deviations to “Mandatory” and “Needed” elements to the NRC and
- Expectations for timeliness of deviation submittal to IPs

### **2.3 EXECUTIVE INTERACTIONS/MEETINGS WITH NRC MANAGEMENT**

Several meetings were held with NRC senior management during 2007, as listed below:

- MEOG members and affected CNOs held drop in visits with the NRC in 2007 to communicate the status of the Materials Initiative and to discuss industry activities in response to the Wolf Creek pressurizer dissimilar metal weld indications.
- The BWRVIP met with NRC management in March 2007. With new NRC management and new BWRVIP executives, the main objective of the meeting was to provide an overview of the BWRVIP. In addition, the BWRVIP executives provided an update on the Duane Arnold Dissimilar Metal weld cracking, and the BWRVIP response.
- During 2007, members of the NDE Program, Performance Demonstration Initiative (PDI) held meetings with representatives from the NRC in May and December. These meetings continue the regularly scheduled NRC/PDI meetings to discuss the status of the PDI program. (PDI is the industry wide initiative that through the NDE Program oversees implementation of the Performance Demonstration requirements within ASME Section XI, Appendix VIII). During these meetings PDI provided the NRC an update on the PDI program operations. PDI also reviewed with NRC staff any technical issues resulting from the qualification process. One of the main topics of interest from these meetings is that NRC expresses increasing interest in using the results from the practical trials carried out by PDI to develop flaw probability of detection (POD) statistics for dissimilar metal welds. Such an activity would require PDI to provide NRC and its contractors with access to the test specimen and test results that must remain controlled to protect the integrity of the qualification process. At the request of the PDI advisory committee, EPRI personnel met with representatives from the NRC and Pacific Northwest National Laboratories (PNNL) during July in Charlotte. The purpose of this meeting was to provide EPRI, NRC and PNNL the opportunity to develop a specification and protocol to maintain confidential test specimen information. Although progress was made in achieving this goal, the subject of using the results from PDI practical trials to develop POD remains open and will be revisited by the PDI during their 2008 meetings with the NRC.

In general these meetings effectively communicated that industry is still committed to the Materials Initiative; however, the NRC's perception of the strength of our commitment may have suffered due to what the NRC believes was a slow response to the implications of the pressurizer weld indications at Wolf Creek. It is important that the industry effectively implement the lessons learned from this event and demonstrate our continued commitment to the Materials Initiative by a proactive response to materials events in the future. A Commissioner's briefing on the Materials Initiative is scheduled for April 2008.

## **2.4 CHANGES TO THE ISSUES MANAGEMENT TABLE**

The Industry Strategic Plan discussed in 2.1 above identifies a multi-step process to manage materials degradation and aging issues.

The first step was the creation of a Materials Degradation Matrix (MDM) that identified possible degradation mechanisms for primary system pressure boundary materials. The MDM is maintained by the Primary Systems Corrosion Research (PSCR) organization in the EPRI Nuclear Power Sector. PSCR organized a meeting of a materials expert panel in May 2007 to begin the revision of the MDM. A draft of Revision 1 of the MDM was prepared and sent to the expert panel for review in the fourth quarter of 2007. The panel comments will be addressed in the first quarter of 2008 and MDM Revision 1 will be issued in the April 2008 timeframe.

The second step was the creation of the Issues Management Table (IMT). For primary system components that may be affected by materials degradation, the IMT assesses the consequences of failure and identifies gaps in inspection, mitigation, repair, and replacement guidance. The IMT prioritizes the gaps and identifies the IPs with primary responsibility for addressing the gaps. IPs are using the IMT in project planning to ensure that future work is designed to address or close the gaps. All IMT high priority gaps are being addressed. The PWR and BWR IMTs will be maintained by the MRP and BWRVIP respectively.

The following changes to the information in the MDM and IMT were noted in 2007:

Comparison of the MDM-Revision1 results with the 2004 MDM results reveals that overall there are fewer “blue” and “yellow” cells and a larger number of “green” cells. A blue cell color indicates that a lack of data currently exists to establish degradation mode applicability for the material service conditions whereas a yellow cell color signifies that ongoing R&D efforts are expected to resolve current uncertainties in degradation mode understanding in a reasonable, near-term time frame. A green cell color signifies that the degradation mode is well characterized for the material class and little or no additional research is needed. The MDM also contains “orange” cells. An orange cell signifies that there is insufficient ongoing R&D to resolve uncertainties in degradation mode understanding in a reasonable, near-term time frame. The number of orange cells has remained essentially unchanged since the 2004 version of the MDM – the number of new orange cells is roughly equal to the number that have moved to a yellow or green category.

The most significant source of new blue and orange cells relates either directly or indirectly to concerns regarding the possibility of reduced fracture resistance for materials exposed to the reactor coolant environment. Overall, the areas of greatest concern remain SCC of nickel alloys and stainless steels, fluence impact on SCC and the effect of reactor environment on fatigue, and fracture resistance.

The U.S. Nuclear Regulatory Commission recently completed a similar project (Proactive Materials Degradation Management or PMDA) to identify materials and components where future degradation may occur in specific light water reactor systems. The NRC process included the use of a phenomena identification and ranking table (PIRT) process to develop results based on the input of a panel of experts. The scope of components studied in the NRC PMDA included not only primary systems, but also secondary and tertiary support systems, if the latter were considered to have an important safety function. While the NRC PMDA cannot be directly compared with the EPRI MDM results due to differences in process, terminology and data structure, there are two broad comparisons that can be made. First, four of the eight experts involved in the NRC PMDA effort also served on the MDM-Revision1 Expert Panel. As a result, many of the issues reflected in the NRC PMDA are also reflected in the EPRI MDM. Second, all of the high susceptibility issues presented in the NRC PMDA conclusions section are reflected in the EPRI MDM, although in some cases there are differences in the relative importance placed on an issue or the manner in which the issue is presented. These comparisons indicate that the results of the NRC and EPRI efforts are similar.

## 2.5 DELIVERABLES WITH MANDATORY AND NEEDED IMPLEMENTATION RECOMMENDATIONS

The table below lists the documents published by the materials Issue Programs in 2007 that contained “mandatory” or “needed” elements as defined in the Implementation Protocol. The “Implementation” column in the table lists the highest implementation category identified in the document.

IP	Document ID	Document Title	Implementation
BWRVIP	BWRVIP-03, Rev. 10	Reactor Pressure Vessel and Internals Examination Guidelines	Needed
BWRVIP	BWRVIP-59-A	Evaluation of Crack Growth in BWR Nickel Base Austenitic Alloys in RPV Internals	Needed
BWRVIP	BWRVIP-80-A	Evaluation of Crack Growth in BWR Shroud Vertical Welds	Needed
BWRVIP	BWRVIP-168	Guidelines for Disposition of Inaccessible Core Spray Piping Welds in BWR Internals	Needed
BWRVIP	BWRVIP Letter 2007-260	Additional Information on BWR Dissimilar Metal Weld Examination Survey and July 19, 2007 NRC Meeting	Needed
BWRVIP	BWRVIP Letter 2007-367	Recommendations Regarding Dissimilar Metal Weld Examinations	Needed
BWRVIP	BWRVIP-180	Access Hole Cover Inspection and Flaw Evaluation Guidelines	Needed
BWRVIP	BWRVIP-181	Steam Dryer Repair Design Criteria	Needed
BWRVIP	BWRVIP-183	Top Guide Grid Beam Inspection and Flaw Evaluation Guidelines	Needed
SGMP	1013706	PWR Steam Generator Examination Guidelines, Revision 7	Needed
SGMP	1014986	PWR Primary Water Chemistry Guidelines - Vol 1 & 2, Revision 6	Mandatory
SGMP	1015482	SGMP Administrative Procedures, Rev 2	Needed
SGMP	1014983	SG In-Situ Pressure Test Guideline, Rev 3	Needed

IP	Document ID	Document Title	Implementation
MRP	MRP Letter 2007-013	MRP-132/146/170 Guidance Related to Heat Transfer Coefficients for Use in Stress Analysis	Needed
MRP	MRP Letter 2007-038	MRP-139 Interim Guidance on <4" Volumetric Exam Requirements (Mandatory Element)	Mandatory
MRP	MRP Letter 2007-039	MRP-139 Interim Guidance on Bare Metal Visual Exam Requirements (Mandatory Element)	Mandatory
PWROG MSC	WCAP-16423-NP	Standard Process and Methods for Calculating RCS Leak Rate for Pressurized Water Reactors	Needed
PWROG MSC	WCAP-16465-NP	Standard RCS Leakage Action Levels and Response Guidelines for Pressurized Water Reactors	Needed

The Primary System Corrosion Research, Primary System Water Chemistry Control and the NDE IPs did not deliver any documents in 2007 that had either “mandatory” or “needed” elements. These IPs conduct basic research and information development on materials degradation issues to address the high priority knowledge gaps identified in the MDM and the IMTs. The purpose of this work is to provide the technical basis for guidance provided by the other IPs.

A complete list of all the documents with “mandatory” and “needed” elements is maintained by NEI and posted on NEI’s Members Website. The most recent version of this list is included in Addendum 5.

## 2.6 MTAG CHANGES

Terry Garrett (VP Engineering, WCNOG) volunteered to be vice chairman of MTAG this year. This addition of the vice chairman position will ensure a smooth transition to the chairmanship when the chairman’s term ends. Mike Robinson will continue to chair the MTAG through 2008.

The MTAG added a number of at-large members in 2007. These new members are adding new insights and perspectives to MTAG’s discussions and indicate a healthy interest in the continued operation of our group.

In late 2007 the MEOG decided to accept NSSS vendor representatives as MTAG members. These members will further broaden MTAG’s experience base. The new members will participate in MTAG meetings beginning with the first meeting in 2008.

The current MTAG roster is provided in Addendum 6.

## 2.7 FIELD IMPLEMENTATION OF INDUSTRY GUIDANCE

IP observations regarding the implementation of their guidelines are provided in section 4 of this report. From a practical aspect, implementation has resulted in significant activity at the plants. A summary of some of the implementation activities completed in the field in response to our guidelines follows:

- SG Replacements

- During 2007, three PWRs replaced their steam generators.
- As of 12/31/2007 there are 39 units with replacement SGs fabricated with thermally treated Alloy 690 tubing, 17 units with thermally treated Alloy 600 tubing and 13 units with either Alloy 600 mill annealed or sensitized tubing.
- Two units have scheduled steam generator replacement in 2008.
- PWR RPV Head replacements:
  - **34** head replacements complete (includes 2 fall 2007 replacements)
  - **10** planned replacements between 2009 and 2012
- Pressurizer Dissimilar Metal Welds
  - **4** plants have replaced their pressurizers (non-susceptible welds).
  - **15** plants had no Alloy 600/82/182 welds on their pressurizers that are within the scope of MRP-139.
  - **45** plants have or soon will mitigate all Alloy 600/82/182 welds on their pressurizers that are within the scope of MRP-139.
    - **9** plants will complete the inspection or mitigation of all of the Alloy 600/82/182 welds on their pressurizers after December 31, 2007 during the spring 2008 outages.
  - **5** plants have inspected, but not mitigated, all of the Alloy 600/82/182 welds on their pressurizers that are within the scope of MRP-139.
- Bottom mounted instrument penetration inspections (data through the spring of 2007)
  - **68** plants have completed bare metal visual inspections (the other plant performed volumetric NDE).
  - **15** plants have completed volumetric inspections (823 nozzles inspected – some plants only inspected about 90% of their nozzles).
  - **1** plant has partially completed a volumetric inspection (28/50 nozzles).
  - **1** instance of degradation found to-date (STP).
- PWR Primary System Dissimilar Metal Butt Welds
  - Survey results from the spring have indicated that all utilities are currently progressing on project implementation to perform visual and volumetric inspections to comply with MRP-139 requirements.
  - **49** plants have provided some of the necessary data on their butt weld configurations to the NDE center.
- BWR Reactor Pressure Vessels
  - The BWR utilities continue to implement the guidance as set forth by the BWRVIP. This includes assessment, mitigation, inspection and repairs of BWR.
- PWR Reactor Pressure Vessels
  - Upper Core Barrel Bolt (UCBB) Inspections
    - **1** plant completed a UCBB inspection





### 3 MATERIALS ISSUES FUNDING

One of the intents of the Materials Initiative is to ensure that funds are available to address the existing materials issues and to “get ahead” of materials degradation so that the industry can adopt a proactive approach. Part of the increased funding necessary to accomplish this objective was obtained at the time the Materials Initiative was approved. All the remaining money in the Materials Initiative fund was awarded by the end of 2006, but not all the funded projects were complete. The status of projects funded under this assessment is described in section 3.2.

The long term approach to addressing materials related items must be reflected in the annual IP Work Plans and budgets. IP budget expenditures and their trends are therefore important indicators of industry’s commitment in this area. Most IPs are transitioning from a “work the budget” to a “budget the work” philosophy to ensure that industry maintains the effort necessary to “get ahead” of materials degradation issues. Materials IP budget information is provided in section 3.1. Amounts for 2004 through 2007 are actual dollars spent. Amounts for 2008 are budgeted values.

#### 3.1 MATERIALS FUNDING – 2004 THROUGH 2007

##### MRP, NDE, AND PWROG MATERIALS INITIATIVE FUNDING AMOUNTS

IP	04 \$M	05 \$M	06 \$M	07 \$M	08 \$M	MEOG 04-06 \$M	MEOG 07
MTAG Strategic Plan							
B&WOG (Mat, RV, SG & NDE)							
EPRI BWRVIP							
EPRI Primary Systems Corrosion Research		Funding details removed					
EPRI FRP							
EPRI MRP							
EPRI NDE							
EPRI SGMP							
EPRI WCC							
PWROG Materials Subcommittee							
<b>Total</b>							

#### 3.2 COLLECTION AND ALLOCATION OF THE MATERIALS INITIATIVE FUNDING POOL

The Materials Initiative funding pool of \$60K/reactor/year for 2004 and 2005 was established with approval of the Materials Initiative. The total collected was \$12.36 million. At the direction of NSIAC, \$1 million of this total was reallocated to the Zero Defect Fuels Initiative in August of 2006. With concurrence of the MEOG and NSIAC as required, by the end of 2006 the

MTAG allocated all of these funds (\$11.36 million) to the projects listed in the table in Addendum 7 which also provides a status of the work to date.

A summary of the projects as of the end of 2007 follows. A detailed status of each of the projects that are still in progress can be found in the Quarterly Status Report.

### **Project Status**

- Work on 18 projects is complete. 6 projects are still in progress with completion scheduled in 2008. Three of the completed projects were stopped or transferred before their planned scope was finished. These are described below.
  - One NDE project, “*EMAT Development*”, did not prove feasible and approximately \$550K was returned to the Materials Initiative fund in 2006.
  - One task under the MRP project “*Fundamental research on PWSCC*” was cancelled. The purpose of this task was to study crack growth rates in a sample obtained from the VC Summer hot leg nozzle weld. The work was cancelled when a request for a budget change from the vendor was determined to increase the project cost beyond the value of its deliverable. Cancellation of this task returned approximately \$260K to the materials initiative fund.
  - One FRP project, “*Impact of BWR Water Chemistry on Fuel Performance*”, was moved under the Zero Defect Fuels Initiative.
- Brief summaries of the rest of the completed projects follows:
  - The NDE projects funded by the Materials Initiative enabled:
    - The design and fabrication of dissimilar metal weld samples with realistic rough and wavy surfaces to develop and validate NDE techniques
    - The development and application of ultrasonic phased array probes as a means of improving NDE results and inspection completion times
    - The development and application of innovative eddy current transducers for the examination of BMI J-welds and PWR dissimilar metal welds
    - The acceleration of research for eddy current NDE technologies to identify aging and incipient cracking in Alloy 600 and SS Type 340L/316 material
    - Proof of principle concepts and the development of a field-deployable system to examine dissimilar metal welds and other components having a rough or wavy surface
    - The feasibility of using NDE technologies for determining the loss of pre-load in reactor internal bolts
    - The acceleration of the development and demonstration of NDE capability for structural weld overlays applied to PWR dissimilar metal welds
  - The BWR VIP projects funded by the Materials Initiative enabled the BWRVIP to begin work on three of its highest prioritized material gaps, including:
    - Online Noble Chemistry (OLNC): These funds were used to start the demonstration of this new technology at KKM in Switzerland. This new technology addresses the mitigation effectiveness material gap, and is also financially beneficial as it decreases the application critical path time by 60 hours. The demonstration has been successful, and OLNC has now been used at three domestic BWRs.

- Fracture Toughness and Crack Growth in high fluence BWR materials: These two issues represent the highest priority material gaps within the BWRVIP. The MEOG funds have enabled the BWRVIP to obtain highly irradiated materials from existing plants and to start fracture toughness and crack growth tests. This project has continued with BWRVIP supplemental funding, and the plan is to complete the testing by the end of 2009. These tests will provide information on fracture toughness and crack growth rates in a BWR environment at fluence levels that have not been previously tested. This information will help provide guidance to the industry on how to manage their reactor internals as their accumulated fluence grows. This testing will also show how effective Hydrogen Water Chemistry will be at higher fluences.
- The MRP projects funded by the Materials Initiative enabled:
  - Evaluation of multiple surface stress improvement techniques to identify promising ones and performance of preliminary assessment of selected methods for detailed evaluation in an MRP project
  - Development work on partial weld overlay technology to introduce compressive stresses at the ID of butt welds. A subsequent MRP project for an optimized weld overlay technology has been completed and NRC approval is in final stages for field application in the fall of 2008.
  - Investigation of role of surface conditions on PWSCC initiation in Alloys 82/182. A follow up MRP project is evaluating alternate surface rejuvenation technologies to establish benefits in delaying PWSCC initiation in Alloy 182.
  - Design and fabrication of Alloy 600/82, 600/182, 690/52, and 690/152 welds to measure PWSCC growth rates in Alloy 600 and 690 heat affected zones (HAZ). A follow up MRP project to measure PWSCC growth rates in fabricated weld samples is currently underway
  - Proof-of-principle testing of low temperature crack propagation mechanism in nickel-based alloys at low-temperature shutdown conditions. A follow up MRP project is underway to complete evaluation of this degradation mechanism.
  - Detailed metallurgical examination and evaluation of CRDM nozzle samples from Davis Besse to understand morphology and chemistry of cracks and crack tips in the Alloy 600 base metal and in the Alloy 182 J-groove weld
- The SGMP projects funded by the Materials Initiative enabled:
  - The acceleration of the development of steam generator tube flaw specimens for use in eddy current and ultrasonic technique qualification
- The Corrosion Research projects funded by the Materials Initiative identified key gaps in knowledge and recommended experimental work for proactive management and mitigation of materials degradation caused by environmentally assisted cracking (EAC). The results from these two projects have been used by the EPRI Corrosion Research Program to identify, prioritize and sponsor additional experimental work on EAC that is in progress. The two projects are described below:
  - Status Review of Initiation of Environmentally Assisted Cracking and Short Crack Growth,( EPRI: 1011788) - This project reviewed current knowledge of

- environmentally assisted cracking (EAC) initiation and short crack growth in nickel base alloys, austenitic stainless steels and carbon and low alloy steels in LWR environments.
- Understanding the Interaction Between Localized Deformation in Materials and Environmentally Assisted Cracking (EPRI: 1011789) - This project developed an understanding of the interaction between localized mechanical deformation in reactor structural materials and their susceptibility to EAC in LWR environments.
- The PWROG Materials Subcommittee project funded by the Materials Initiative:
  - Developed information to determine the potential applicability of the failure of the heater sleeve assembly at the Braidwood Unit 1 pressurizer to the other pressurizer heater sleeve assemblies in the Westinghouse fleet
  - Demonstrated that multiple cycles of operation would be required to propagate flaws to the critical size required for pressurizer heater sleeve failure. The program will ultimately determine the need for periodic inspections to ensure that flaws are detected prior to reaching a size sufficient to cause heater sleeve failure or that leakage from flaws does not degrade the pressurizer bottom head (boric acid corrosion).
- The Water Chemistry Control project funded by the Materials Initiative demonstrated
  - That application of a chemical dispersant to the secondary system substantially improved the blowdown removal efficiency for iron, raising it from ~5% to approximately 45–50% without significant affect on SG thermal performance, steam flowrates, or secondary chemistry parameters

### **Project Milestones - 2007**

A summary of the milestones achieved in 2007 by the projects funded under the Materials Initiative follows:

#### **BWRVIP Projects**

- Crack growth in high fluence BWR materials
  - Interim technical report was published for Phase 1 in March 2006
  - Final report was published as BWRVIP-172 in June 2007

#### **MRP Projects**

- Stress Corrosion Cracking in Stainless Steel: PWR Primary Water Environments
  - Establishment of Knowledge-Base and Identification of Knowledge Gaps
    - Final report completed in 2007
  - Destructive Examination of Field Samples (Braidwood)
    - Project is on-going; project report will be issued in 2008.

#### **NDE projects**

- DMW qualifications with realistic crown conditions
  - Status - In Progress - Initial set of mockups completed during 2006. The remaining mockups are on hold pending design input from the UT of Dissimilar Metal Weld (DMW) with rough surfaces (See project below). The current project

plan is for the mockups to be manufactured during the 2<sup>nd</sup> quarter of 2008 and available for qualification activities during the 3<sup>rd</sup> quarter. Sufficient funds remain for building the remaining mockups.

- UT of Dissimilar Metal Weld (DMW) with rough surfaces
  - Status –In progress - Building on the successful completion of the initial work funded by MEOG during 2006, this additional work jointly funded by MEOG and EPRI Technology Innovation will deliver a qualified field deployable system. The project plan is to qualify the system through the PDI program during the 3<sup>rd</sup> quarter of 2008.
- Examination of RV Internals for Stress Relaxation (In-situ measurement of bolt pre-load)
  - Status - Complete December 2007 – “Assessment of Reactor Internal Bolts Loss of Pre-Load – Feasibility, EPRI Report 1016101.” This project looked at the feasibility of using ultrasonic measurements, vibration acoustics and impact as means of inferring stress relaxation in bolts. Of these methods, vibration acoustics was found to exhibit the best performance, clearly detecting the “loose” state while providing a measure for inferring the stress level. Based on these results and with input from MRP, the NDE Program plans to continue the research and development during 2008 as part of the NDE workplan.
- Inspection & Mitigation of Alloy 82-182 Butt Welds
  - Status – In progress – This project includes the manufacture of a large diameter preemptive weld overlay test specimen that is required for the 2008 NDE program research and development work to qualify examination procedures to examine large diameter pre-emptive weld overlays. As result of industry demand on the vendor selected to fabricate the test specimen overlay, the project is delayed and the test specimen is now expected to be complete to allow the NDE work to commence during the 2<sup>nd</sup> quarter of 2008.

#### PWROG MSC Projects:

- Short Term Operability Assessment and Inspection Recommendations of the Westinghouse Pressurizer Heater Assembly Failure at Braidwood Unit 1
  - Task 1, short term operability assessment and inspection recommendations, was completed November 13, 2006. Recommendations from short term assessment were consistent with Westinghouse NSAL 06-8.
  - Task 2 of the program, manufacturing design information, was completed in July 2007.
  - Tasks 3-5 are scheduled to be completed by June 2008.

#### Water Chemistry Control Program Projects:

- Mitigation of SG Fouling
  - Completed field trial at McGuire 2 - Results are very encouraging with blowdown iron removal efficiency significantly improved and a slight improvement in steam generator thermal performance.
  - Began development of final report.

### **3.3 IDENTIFIED FUNDING SHORTFALLS**

Some funding issues do exist as explained below. The additional funding will be sought through future yearly budget requests.

- For many years, a gap between inspection capability and regulatory requirements for the inspection of cast stainless steel has been overlooked in favor of more urgent issues. However, the inspection priority ranking for DM welds that include cast stainless steel and plant license renewal commitments have awakened the industry's consciousness concerning the NDE capability gaps and in-service inspection requirements for cast stainless steel piping welds. To fully understand the inspection gaps and to develop inspection strategies additional NDE research and development is needed. Fundamental to the NDE research and development is the need to manufacture full scale cast stainless steel test specimens that include controlled defect simulations. Current estimates are these test specimens alone are likely to cost many millions of dollars due to the lack of cast stainless material and flaw manufacturing capability. Additionally the NDE research and development is not likely to extend the funding necessary to close this most challenging and important inspection gap.

## **4 ALIGNMENT WITH NEI 03-08**

### **4.1 PERFORMANCE METRICS**

In 2007 the materials IPs implemented IP specific performance metrics. MTAG is reviewing results from the performance metrics during its monthly calls. MTAG offers the following general observations from the metrics results in 2007. Section 4.1.5 contains IP specific observations from their own metrics.

#### **4.1.1 Annual Funding**

Section 3.1 of this report presents specific budget amounts for each IP. Accounting for the consolidation of the B&W OG materials subcommittee and the removal of the FRP from the Materials Initiative in 2006, the funding trend shows an increase in the last 4 years [Funding information removed]. While the current level of funding remains adequate to continue the necessary research and development in the strategic plan, it is important to note that the competition for critical resources is impacting the costs for getting work tasks completed. Many of the resources that have been historically used to perform key IP tasks are now being used to support new plant activities. This not only affects the costs and budgets for the tasks but it also impacts the duration needed to complete important work.

The present funding trend at this time is judged to be adequate; however, significant new material discoveries from operating plant OE and the competition with new plant resources are expected to challenge and strain the abilities of the IPs to respond to and to complete currently funded work tasks.

#### **4.1.2 NRC Materials-Related Actions**

The main materials issue addressed in 2007 was the circumferential indications in the pressurizer dissimilar metal butt welds at Wolf Creek. Although this event did not result in a generic regulatory communication such as a generic letter, Orders were threatened that may have required all PWRs that had not already inspected or mitigated these locations, to accelerate their inspection/mitigation schedules. In early 2007 industry avoided the Orders by submitting commitments for inspection/mitigation of the applicable welds and enhanced RCS leakage monitoring. These commitments were formalized by the NRC by means of Confirmatory Action Letters issued to each plant that had not yet inspected or mitigated the A82/182 weld locations. On August 23, 2007, the NRC notified the nine PWR licensees that an accelerated schedule would not be required to address potential pressurizer pipe weld cracking, enabling the affected utilities to maintain their scheduled spring 2008 plant outages by demonstrating that the shutdowns were unnecessary.

The overall result of the Wolf Creek pressurizer weld indication issue is judged to be negative with respect to Materials Initiative expectations. Industry's response to the significance of this issue was slow and probably contributed to the NRC's reaction.

The MRP completed an internal study in 2007 to evaluate its response to the Wolf Creek event and to identify the reasons that led to the regulatory reaction. As a result, the MRP has modified its protocol in several areas to provide better response to field events in the future.

#### **4.1.3 Materials-Related Events**

There were 7 significant materials related events in 2007:

- **Wolf Creek Pressurizer Dissimilar Metal Weld Indications**  
During inspections performed in October of 2006 in accordance with industry guidance (MRP-139) Wolf Creek identified 5 circumferential indications in their pressurizer surge line, relief line and safety line. The indications were unusual in that they were entirely circumferential (no axial component), large in extent, and had large length-to-depth (aspect) ratios. NDE personnel judged the indications to be stress corrosion cracking based on faceting at the crack tips and apparent inner diameter surface connection. The indications were not sampled. Wolf Creek corrected the condition by full structural weld overlay. These indications resulted in significant effort by the industry to address implications on the rest of the PWR fleet. The following actions were taken:
  - Completed Advanced Finite Element Analysis for 9 plants to demonstrate a margin between through-wall leakage and pipe failure
  - Defined and funded a 2008 project to validate the weld residual stress modeling used in the advanced FEA project (done as a collaborative project with NRC)
  - Used the Advanced FEA models to define new probabilistic methods to determine low probability of pipe rupture on LBB approved lines with active degradation mechanisms present

Ultimately the industry showed that indications such as those seen at Wolf Creek would not grow to the point where they would cause structural failure of the pipe before they would leak and thereby provide sufficient time for safe shutdown. On this basis, the NRC decided to allow the plants that had not yet inspected or mitigated the dissimilar metal welds on their pressurizers to perform those activities during their planned refueling outages in the spring of 2008.

The Wolf Creek pressurizer weld issue was concluded in a manner acceptable to the industry, but the industry's performance throughout was not optimal and several lessons learned efforts were undertaken to determine how we might perform better in the future. The results of these lessons learned evaluations are presented in section 2.0 of this report.

- **Byron RPV Head Indications**  
In accordance with NRC Order A-03-009 requirements, volumetric ultrasonic (UT) inspections were performed on Byron Unit 2 reactor vessel head penetrations during the B2R13 outage in April 2007. The UT inspection identified a 0.52" long x 0.326" deep axial indication near the J-groove weld in control rod drive mechanism (CRDM) penetration 68. A subsequent dye penetrant (PT) examination revealed a small, rounded indication and an axial indication on the surface of the J-groove weld approximately 16.5 degrees from the downhill azimuth.



A boat sample was removed from Penetration 68 to determine the cause of the indications. The boat sample contained a portion of the axial indication, and also uncovered a subsurface linear defect that intersected the axial indication. However, the boat sample did not capture the rounded indication from the J-groove weld surface. The entire J-groove weld was overlayed with Alloy 82 per the Westinghouse Embedded Flaw technique.

The laboratory evaluations identified the surface axial indication as a combination of primary water stress corrosion cracking (PWSCC) and welding defects (i.e., lack of fusion and hot cracking) attributed to original manufacturing. The subsurface defect was identified as lack of fusion between the outer diameter (OD) of the tube and the J-groove weld. Within the boat sample, the cracking characteristics indicated the PWSCC initiated at a subsurface location on the tube OD, propagated in an axial/radial direction into the tube, and toward the wetted surface of the J-groove weld fillet leg.

The presence of PWSCC was not expected in Byron Unit 2, since this unit is categorized as a low susceptibility plant per the methodology of NRC Order EA-03-009. The premature initiation is attributed to wetting of the tube OD surface at the subsurface lack-of-fusion defect, which created a conducive crevice corrosion environment that allowed PWSCC to initiate in the high stress region of the J-groove weld. The surface-connected path for the lack-of-fusion defect was not contained in the boat sample but is attributed to the rounded surface indication that was not captured by the boat sample. A surface indication of this type and size would have been considered acceptable by the code of construction in place at the time of fabrication.

Byron Unit 2 is now categorized as a high susceptibility plant as the result of the discovery of PWSCC, and this unit is subject to the inspection requirements specified for the high susceptibility category. The finding at Byron Unit 2 does not affect the susceptibility status of other low susceptibility units. Exelon Nuclear met with the NRC in February 2008 to discuss plans to submit a relaxation request. The intent of the relaxation request would be to return to the low susceptibility category after conducting the full complement of high susceptibility inspections during the Fall 2008 refueling outage.

- Davis-Besse Hot Leg Weld Indication

An axial flaw was discovered in an A82/182 DM hot leg weld at Davis Besse during implementation of a structural weld overlay. MRP-139 and its technical basis documents identify axial as the most likely flaw orientation based on extensive stress analysis results and most field experience. These documents also state that the flaw will arrest upon encountering the base metal on both sides of the weld (LAS and SS) so the length of the flaw is physically limited. The conditions reported by the utility for the subject flaw are entirely consistent with these expectations. Similar flaws have been found previously in this generic location; however, the fact that flaws continue to be found while implementing this series of baseline exams of DM welds reinforces the importance to the fleet of the timely completion of this phase of MRP-139 implementation. MRP issued an information letter on this occurrence (MRP 2008-07)

- Catawba SG Tube Cracking

In October, 2007, axially oriented crack-like indications were detected just above the top of tubesheet in several tubes in a single steam generator at Catawba. These indications were detected on the hot leg side and originated from the secondary side of the tubing. This is the first reported instance of ODS-CC in the sludge pile above the expansion transition region in A600TT tubing. Generally, it is predicted that the first crack indications in A600TT tubing would occur at the expansion transition due to high stress risers at this location. Although the crack indications above this region were unexpected, additional inspection guidance was not necessary because the sludge pile is part of the inspection scope when inspecting the expansion transitions with rotating coil probes.

- B\*/H\* SG Alternate Repair Criteria

Several years ago, several utilities with A600TT tubing requested alternate repair criteria (ARC) to limit the extent of tubesheet inspections and permit crack indications deep within the SG tubesheet to remain in service. This ARC is commonly referred to as H\*B\*. Due to technical concerns, the NRC would only approve amendments for one cycle while the differences were resolved. As of the end of 2007, there were still technical issues remaining and the NRC was no longer willing to approve temporary amendments with the issues unresolved.

In an attempt to achieve a permanent resolution, the industry has assembled an independent, expert panel to review the issues and make recommendations. It is not expected that resolution will be achieved in time for spring 2008 inspections and may not be reached before the fall inspections either. As a means of addressing this issue prior to approval of the permanent ARC, the NRC proposed an interim ARC that requires a greater inspection distance than the previous one time H\*B\* amendments but would allow most cracks deep in the tubesheet to remain in service. Three affected plants with spring 2008 SG inspections were pursuing this interim ARC as of the end of 2007.

- Duane Arnold Recirculation Inlet Nozzle to Safe End Dissimilar Metal Weld Indications

During inspections performed in February 2007, Duane Arnold found two planar flaw indications in their recirculation inlet nozzle to safe end dissimilar metal weld. Both indications were circumferentially oriented and were located in the 182 weld metal. These welds were Category D welds per Generic Letter 88-01, which means they had susceptible material and no mechanical stress improvement. The following actions were taken by the BWRVIP:

- BWRVIP requested information from all BWRVIP utilities regarding the previous 10-years of DM weld inspection information
- BWRVIP provided interim recommendation that all utilities review all previous inspection data and experience for DM welds including potential impacts of weld configuration, effects of weld crowns on previous inspections and inspection methods used

NRC concluded that there was no safety significance and there would be no generic regulatory action for the BWRs. The BWRVIP promised to continue to work with PDI, EPRI, NDE Steering Committee, MRP, BWR and PWR industry experts, and the NRC to evaluate recent industry DM weld examination experiences and determine the appropriate actions for the future

- Hope Creek Reactor Recirculation Inlet Nozzle Indication

Following the BWRVIP's interim guidance, Hope Creek identified a suspect indication in a Generic Letter 88-01 Category C (IGSCC susceptible material with stress improvement) weld that was also in a Reactor Recirculation Inlet nozzle to safe-end weld with 182 weld metal. Hope Creek scheduled the weld for their upcoming Fall 2007 refueling outage and during the outage the flaw was determined to be over 13" long and approximately 90% through-wall. Hope Creek performed a weld-overlay repair.

Following this OE, the following additional actions were taken by the BWRVIP:

- The BWRVIP issued guidelines that require all BWRs to review the previous examination data for all Category D welds and Category C welds containing 182 material that is exposed to the BWR environment. For previous examinations that were not performed in accordance with ASME Section, Appendix VIII, Supplement 10 requirements, detailed data review guidance was provided with the intent that the data reviews identify welds that may contain suspect indications or for which the quality of the previous examination data is such (e.g., significant transducer lift-off) that the integrity of the weld is left in question. The data review was issued as NEI 03-08 "needed" guidance with "good practice" recommendations for plants to consider examination of any suspect welds in their next refueling outage.
- The BWRVIP formed a Dissimilar Metal (DM) Weld Focus Group to look at developing specific recommendations for actions to be taken based on the data review results and to evaluate whether any changes are necessary to current BWRVIP guidance for DM welds that is given in BWRVIP-75-A.

#### **4.1.4 Results of INPO Review Visits**

The purpose of INPO materials review visits is to perform on-site evaluations of plant activities against industry-developed guidelines and standards of excellence as specified in NEI-03-08. The visits supplement and complement the INPO evaluation process. Beneficial practices and recommendations for improvement are identified in a report sent to the site vice president. The recommendations for improvement are followed-up during the next scheduled plant evaluation to verify that appropriate actions are taken to addresses identified issues.

During 2007, INPO conducted seven BWR vessel and internals, seven steam generator, and seven PWR primary systems integrity review visits. Expert peer evaluators participate on the visits to ensure an in-depth technical review of program activities. In 2007, 65 utility peers participated in the review visits.

In addition to review visits, INPO personnel participate in key issue program activities, including the MTAG and MEOG meetings and phone calls. At appropriate issue program, MTAG, and MEOG meetings, INPO provides updates on the results of the review visits and also identifies

potential adverse trends based on review of operating experience. If needed, letters are sent to industry managers identifying adverse trends and recommended actions. All review visit beneficial practices and recommendations for improvement are compiled on the INPO Web page. Individual station programs can be improved more rapidly through benchmarking against the compiled review visit results. The BWRVIP, SGMP, and MRP have each begun reviewing the compiled results to identify any needed guideline improvement or generic implications.

Also during 2007, an individual from INPO participated in the self-assessments conducted by the SGMP.

The following observations resulted from the review visits.

#### BWR Vessel and Internals Review Visits

- In the seven visits conducted in the later part of 2007, considerable improvement was noted in implementation of BWRVIP guidelines. The number of inappropriate deviations (i.e., deviations that were not really required or deviations that were required but lacked technical rigor) had declined and management oversight of programs had improved. However, implementation of mitigation strategies and core shroud inspection and evaluation continued to be a challenge at some plants. In several instances, visual inspection quality needed improvement. Improvements are also needed in sharing operating experience with the industry at a lower threshold.
- In 2008, INPO plans to conduct about seven BWRVIP review visits. These visits will continue to focus on appropriate implementation of inspections, evaluations, and mitigation. Management involvement and oversight will also continue to be reviewed.

#### Steam Generator Review Visits Results Summary

- In general, steam generator management programs are effectively implemented. However, there are several examples of untimely implementation of new or revised guidance. In most of these cases, managers were unaware of the industry-specified due dates for implementation. A few problems have been identified in the implementation of the primary-to-secondary leakage guidelines. Stations with newer steam generators are particularly vulnerable to allowing fundamental program elements to decline. Loose parts continue to challenge the integrity of steam generator tubing.
- In 2008, INPO plans to conduct about seven steam generator review visits. In addition, efficiency will be gained by reviewing programs at multiple sites for the same utility during the same week.

#### Primary Systems Integrity Review Visits Results Summary

- Most programs and actions to address boric acid corrosion and Alloy 600 degradation are continuing to be refined. In particular, program aspects that require interface and handoffs between site organizations need additional improvement. INPO recommendations were more specific than in past years and mainly focused on program and process improvements to ensure solid performance in the future.

- In 2008, INPO plans to conduct about seven primary systems review visits. Although review of boric acid corrosion control program implementation will continue, more in-depth reviews and greater emphasis will be placed on Alloy 600 program implementation, including vendor oversight and resource and contingency planning.

#### **4.1.5 IP Observations from Performance Metrics**

##### **4.1.5.1 BWRVIP**

The BWRVIP performed well in 2007. All performance metrics were either white or green. In the area of Industry Program, there was one deviation found to be unacceptable. The utility was notified and the deviation disposition was resolved. The BWRVIP continues to monitor program implementation through INPO review visits. The industry implementation performance has improved, but on average, there were still about 5 actionable recommendations made to each plant.

##### **4.1.5.2 Corrosion Research**

The Primary Systems Corrosion Research (PSCR) performed well in 2007. Three of the four performance metrics (on-time delivery of products, budget management and utility attendance) were green. The fourth metric (“Was the program addressing key knowledge gaps in the MDM?”) was white. The committee felt that the program was not addressing some of the key knowledge gaps in the MDM, e.g., the effect of environment on fracture resistance. To address this issue, PSCR proposed a new project to the APWG in August 2007. The objective of this project is to conduct a scoping study to evaluate the effect of BWR and PWR environments on the fracture resistance of irradiated stainless steels and non-irradiated Ni-base alloys and to assess the need for additional work based on test results. The APWG approved the project which will start in 2009 and be completed in 2010.

##### **4.1.5.3 MRP**

In general, the MRP performed well in 2007 – all metrics were either white or green; however, the program is rated as red because of the number of allowable deviations related to MRP-139 taken by utilities. This result triggered a review of the metrics for deviations by the MRP IIG. The MRP developed a recovery plan for this metric. As a result, guidance on developing implementation schedules has been communicated to guidelines committees.

MRP also completed building the inspection database and its first survey of all the PWRs. This information will be compiled annually to assess the health of the PWR fleet.

Comments related to timeliness of industry IP response to the Wolf Creek UT indications have been communicated to the MRP and a review of industry actions were performed in 2007. The results of this review are presented in section 2.0.

#### **4.1.5.4 NDE**

During 2007, the NDE Action Plan Working Group (APWG) added a 5<sup>th</sup> Performance Metric, Satisfaction Surveys. This, along with the existing four (4) metrics, Strategic Planning, Program Performance, Operational Impact and Regulatory Interface are described in the NDE Administrative Procedure document, NDE-5. When all items were considered, the NDE program results showed that work plan process improvements, contributed to improving the Strategic Planning score by 1. This improvement offset a modest weakening to 1 from 0 in the regulatory interface score. As a result, the APWG reported to the EPRI Nuclear Power Council during the August 2007 meeting that the NDE program maintained a color coding of Green for 2007, illustrating acceptable performance. The NDE system of metrics will be reviewed again by the APWG during 2008.

#### **4.1.5.5 PWROG Materials Subcommittee**

The PWROG MSC key performance indicators for 2007 are summarized as follows:

- Approximately [Funding data removed] dollars was allocated and spent to support materials programs in 2007.
- Approximately 30 deliverables were completed in 2007. All programs were completed within budget and approximately 50% were finished on schedule. Delays in schedule were attributed to heavy work loads due to other industry events impacting Westinghouse and AREVA NP resources. Of the 15 deliverables that were late, 10 were late by 3 months or less.
- Approximately 76% of MSC products are currently being implemented at utility sites.
- Three deviations were reported and are in the process of being evaluated.
- No topical reports were submitted to the NRC for review and approval in 2007.
- Attendance at MSC meetings was approximately 87% in 2007. International participation is evident at all meetings.
- Two program deliverables in 2007 had mandatory or needed elements as defined by NEI 03-08. These were the RCS leak rate calculation and leakage action level guidelines; issued in 2006 and approved as “Needed” in June 2007.
- The PWROG first self-assessment was completed in June 2007 and results are documented in Section 4.2.5.

#### **4.1.5.6 Water Chemistry Control**

The Water Chemistry Control (WCC) Program has developed performance metrics that measure the following attributes:

- On-time delivery of planned projects
- Budget expenditures vs. plan
- Completion of major milestones

- Industry participation at key meetings

For the WCC, the first three metrics were green in 2007. With regard to the final metric, overall industry participation at key chemistry meetings was acceptable at > 90% (white). However, one BWR utility attended no meetings and one other BWR utility attended only one meeting.

#### **4.1.5.7 SGMP**

SGMP-developed performance metrics are based on its particular attributes, the recommendations of NEI 03-08 and its 2005 Self-Assessment. Three performance categories are defined and tracked:

- Operational Effect (Industry Equipment Performance)
- Industry Program Performance
- Strategic Planning and Issue Program Performance

The above three metrics consist of a total of 14 Indicators. The latest evaluation of SGMP metrics as of December 31, 2007 indicates the overall SGMP performance improved from “White” to “Green. Noteworthy items of SGMP metrics are given below:

- The indicator, NRC Correspondence, of the SGMP Metric Industry Program Performance shows no negative Generic Letters related to SGs. This was determined by monitoring of the NRC Website for the twelve months ending on December 31<sup>st</sup>.
- SGMP Metrics have criteria for primary to secondary leakage events and in-situ pressure tests. For the twelve months ending on December 31<sup>st</sup> there were no SG tube leakage events in excess of 5 GPD (green score) and only one unit had to perform a “required” in-situ pressure test (white score).
- The indicator for actionable recommendations per station visited during INPO SG review visits improved to 1.0 making this indicator green from its previous white status.
- The indicator for subcommittee attendance improved from yellow to white as the number of subcommittee meetings that failed to achieve quorums dropped from 5 to 2.
- The only yellow performance indicator was in the area of TAG member representation because one or more members missed two of the three meetings held in 2007.

## **4.2 ISSUE PROGRAM SELF-ASSESSMENTS AND NEI 03-08 ALIGNMENT**

The Issue Program Self-Assessment Protocol (Addendum H to NEI 03-08) requires that each IP perform a self-assessment at least once every two years. In 2007 three IPs completed their second self-assessments and the remaining IPs have plans to conduct their second self-assessments during 2008. The results of IP self-assessments and evaluations of their alignment with the Materials Initiative are summarized below.

#### **4.2.1 BWRVIP**

The BWRVIP Self-Assessment was performed in August 2006.

- The Self-Assessment team identified 8 strengths and 21 recommendations.
- Most recommendations addressed a lack of infrastructure to ensure continued success in the absence of the individuals that are currently in leadership roles with the BWRVIP.

The BWRVIP is addressing all the items identified in the Self-Assessment and will be scheduling a follow-up Self-Assessment in Fall 2008.

#### **4.2.2 Corrosion Research**

A team was formed to perform a self-assessment of the EPRI PSCR Program in 2007. The team completed the self-assessment during August-September in accordance with NEI 03-08 Addendum H. PSCR management committed to follow the recommendations and to report progress at the APWG/MTAG meeting.

- The self-assessment found that PSCR is an effective Issue Program (IP) for conducting research into reactor coolant system materials degradation issues.
- A comparison of the gaps identified in the BWR and PWR IMTs to work underway or planned in near future by the PSCR showed very good alignment.
- The team recommended that PSCR should develop a formal set of administrative procedures and charter envisioned by NEI 03-08 and should establish a process for strategic planning that is appropriate to its role.

These recommendations will be implemented in 2008.

#### **4.2.3 MRP**

Recommendations from 2006 self-assessment were fully incorporated in MRP's business practices. The first self-assessment of the MRP was compliance focused. A performance focused self-assessment will be completed in 2008.

#### **4.2.4 NDE**

The NDE Program carried out a follow up to 2006 NDE Program Self-Assessment. The objective of the follow up was to review actions taken by the NDE Program to the 13 recommendations resulting from the 2006 self-assessment. This subsequent report identified that further improvement was needed to satisfy a requirement to provide quarterly reports to project sponsors. The report also identified 10 of the original 13 recommendations were now closed and that the NDE Program had made many improvements through the introduction of administrative procedures. It was recommended that NDE Program Steering Committee members should review the administrative procedures on a regular basis. A team of volunteers from the NDE Program Steering Committee has been selected and plans are being made to be conduct the next NDE program self-assessment before August 2008.



#### **4.2.5 PWROG Materials Subcommittee**

The PWROG conducted its first Self-Assessment in June 2007. The PWROG MSC self-assessment found that the MSC continues to be an effective Issue Program for identification, review, resolution and follow of NSSS materials and inspection issues that are directly applicable to PWR NSSS units. Historically, the work products developed by the MSC have been used directly by utilities and ASME Code Groups and, in many cases, have been approved by the Nuclear Regulatory Commission. The PWROG and MSC have established procedures to comply with the NEI 03-08 protocol and execution of these procedures is underway. The key recommendations resulting from the self-assessment are:

- 1.) The PWROG EMG (Executive Management Group) and Management Committee participation with the MSC is required to resolve the issues that, in turn, will enhance the value of the MSC to the member utilities.
- 2.) The MSC/PWROG should formalize interaction between the PWROG and INPO regarding expectations by the PWROG regarding input to the INPO E&A site visits to support monitoring of the PWROG MSC recommendations.
- 3.) The MSC should develop with the industry IP's, i.e., MRP, SGMP, VIP, WCCP, NDE, Corrosion Research, more effective means to share information. This needs to include the ability to utilize and reference documents by other IP's when necessary to support work products.

The next planned Self-Assessment is in 2009.

#### **4.2.6 SGMP**

The SGMP performed a self-assessment in September 2007. SGMP is fully aligned with NEI 03-08. This alignment is depicted in the SGMP Annual Strategic Plan (Gray Book) as well as in the new revision of the SGMP Administrative Procedure. The self-assessment identified five strengths/good practices and fourteen recommendations that are being tracked for implementation.

##### **Strengths**

- Sharing of steam generating operating experience
- Development of issue program performance metrics
- Industry compliance with SGMP guidelines

##### **Good Practices**

- Guidance for handling guideline deviations
- Monthly IIG phone calls

##### **Recommendations**

- Link IMT Gaps to SGMP Strategic Plan
- Update IMT Gaps associated with SG Issues

- Develop a process to ensure implementation commitments are being met (survey)
- Revisit 2005 recommendation to evaluate interfaces between subcommittees and other EPRI groups
- Add IIG chair to PWROG email distribution, web access and consider attending meetings (info exchange)
- Perform lessons learned from revision process of Exam Guidelines
- Consider goal in admin procedure for length of revision process
- Consider development & distribution of safety culture survey (NEI 03-08 objective)
- Review IMT Gaps on annual basis as part of the Gray Book development
- Establish a protocol for responding to emergent issues
- Establish guidance for reporting emergent issues
- Address 2005 recommendation to develop methodology for evaluating alternative actions for regulatory issues
- Track disposition of each self-assessment recommendation & report progress to TAG
- Evaluate the level of quality control that should be used in future revisions of guideline documents

#### Enhancements

- During the OE review at SGMP subcommittee meetings, the IRGs/TSS should formally determine if any of the OE discussed warrants interim guidance
- To ensure deviation reviews are performed at the TAG meeting following posting, the SGMP should establish a standing agenda item for the SGMP subcommittee meetings

### **4.2.7 Water Chemistry Control (WCC) Program**

The Water Chemistry Control Program generally performs an assessment during the semi-annual Nuclear Power Council meetings in January and August of each year, as part of the overall NPC assessment process. The technical advisory committee ranks “overall performance”, “technical program value”, “value for the money”, and “ease of doing business”. Actions were identified for improving these areas and are tracked.

Additionally, WCC plans on a more comprehensive Self-Assessment in 2008, incorporating the lessons learned from the one completed by Corrosion Research in 2007.

### **4.3 ISSUE PROGRAM STRATEGIC PLANS**

All of the program’s have comprehensive strategic plans. A summary of IP strategic planning observations, including regulatory strategy, is provided below.

#### **4.3.1 BWRVIP**

The BWRVIP will continue to use the Issue Management Tables to prioritize the research funds.

Regulatory interface is a key strategic goal of the BWRVIP. The BWRVIP intends to maintain a good interface with the NRC through the following:

- Annual meeting between BWRVIP EOC and NRC technical staff
- Training for NRC staff at the GE reactor mockup in San Jose, CA
- Continued communication with NRC Research on ongoing work
- Monthly phone calls with NRC technical staff to discuss status of NRC reviews

In addition, the BWRVIP will continue to support INPO review visits at utility sights (approximately 8 per year) to ensure program implementation. BWRVIP and NEI are improving their alignment through NEI attendance at BWRVIP meetings.

#### **4.3.2 Corrosion Research**

The goal of the PSCR Program is to improve the useful life of BWR and PWR primary system components through a better technical understanding of crack initiation and early crack propagation processes leading to SCC and IASCC. Although these processes have a dominant effect on component lifetimes they are not well understood. The scope of work in PSCR includes developing a mechanistic understanding of key parameters (material, fluence, flux, temperature, chemistry and stress) that control IASCC initiation and growth as well as PWSCC in Ni-base alloys and stainless steels. This understanding will be used to identify and develop improved predictive models and mitigation approaches that can be transferred to the other Issues programs. The program resources will continue to be leveraged through participation in international collaborative research programs on material degradation such as the CIR Program managed by EPRI, a Japanese program on environmentally assisted cracking in LWR materials and close collaboration with EDF and TEPCO through the EDF Materials Aging Institute.

#### **4.3.3 MRP**

The mission of the EPRI MRP is to implement and maintain an industry wide research, development and deployment program focused on identifying and resolving selected existing and potential PWR pressure boundary materials issues outside of the SG for both original, extended operating licenses and new construction.

As part of this mission, EPRI will ensure safety and operational risk significance to promote long term reliable operation of the PWR fleet and conduct credible research and, where appropriate, make research results available to relevant governmental authorities as part of the regulatory process.

MRP has several areas of engagement with the NRC: Alloy 600 degradation, PTS rulemaking, environmental and thermal fatigue requirements, and reactor internals guidelines. Presently the MRP is mainly focusing on Alloy 600 degradation in dissimilar metal welds e.g., MRP-139 implementation including responding to the Wolf Creek event and inspection guidelines for vessel internals. MRP is also working in conjunction with NRC Research to define a probabilistic analysis method for addressing active degradation in LBB locations. This work will ultimately be used by NRR to modify the LBB regulation.

#### 4.3.4 NDE Program

Resulting from the direction provided by the APWG during the January 2007 advisory meetings, the strategic planning and workplan development processes for the NDE Program changed substantially in 2007. The changes introduced serve two primary objectives:

- Development and approval of the following-year workplan earlier in the calendar year. This allows better preparation for beginning execution of the approved projects promptly in January, and allows better coordination with other industry materials Issue Programs.
- Introduction of longer-term planning and tracking for strategic R&D issues.

Although introduced during the early part of 2007 the full impact of the changes will only be realized during 2008 and beyond when the NDE program has fully integrated the process and new timetable with other IPs. Leading up to this and as essential part of these changes, the APWG directed the NDE Product Group Steering Committee (the APWG's underlying technical advisory committee) during 2007 to conduct strategic planning and tracking in six specific areas of NDE development. In response the NDE program expanded from two existing technical Working Groups (Balance of Plant Heat Exchangers and Risk Informed ISI ) to eight (8) Working Groups. The six new Working Groups are:

- Remote Visual Working Group
  - Supports technology development and exploration of qualification for remote visual examination directed at detection of stress corrosion cracking
- Aging Plant NDE Working Group
  - Supports technology development in support of license renewal commitments and other aging issues
- PWR Stainless Steel Working Group
  - Investigates examination of cast austenitic stainless steels
  - Investigates NDE for stress corrosion cracking in stainless steels in PWRs
- NDE Workforce Working Group
  - Promotes an adequate, qualified workforce to meet the industry's needs for compliance with regulatory and industry guidance
- Filmless Radiography Working Group
  - Supports technology development and qualification of filmless RT
- Groundwater Protection Working Group
  - Plans and tracks NDE technology development in support of the industry's groundwater protection initiative

These Working Groups are tasked with project development, championing, and long-term planning for their respective areas. They already have made an improvement to the strategic planning process and during 2008 the NDE program will fully integrate their activities with other IPs.

#### **4.3.5 PWROG**

The PWR Owners Group (PWROG) Strategic Plan was developed to assure alignment of the PWROG on materials issues within the PWROG and the nuclear power industry. Moreover, the strategic plan is developed to provide a direction for the PWROG (Pressurized Water Reactor Owners Group) Materials Subcommittee (MSC) in their support of industry efforts to proactively identify and manage aging in nuclear plants.

In addition, the License Renewal requirements have mandated that effective aging management is required by the nuclear industry. The PWROG work, in collaboration with other industry groups, to resolve material issues and to provide leadership for the resolution of PWR fleet oriented material issues during the original and the extended operating license periods.

In addition to the activities presented in this strategic plan and in support of a significant industry initiative, an initial materials issue roadmap is being developed, i.e., roadmap on reactor vessel internals, to provide a guidance document for the PWROG MSC to plan and implement activities that are required to support the effective aging management of PWR reactor vessel internals aging management issues in collaboration with other industry groups.

This Strategic Plan provides the long term vision as well as the near and long-term goals/aspirations for the PWROG MSC. The initial set of “Action Plans” to execute the Strategic Plan is provided along with metrics that can be used to assess the future success of the MSC in its efforts to achieve the long term goals.

The benefits of a PWROG MSC Strategic Plan to the industry and PWROG utility members are several:

- Improve implementation of materials programs and eliminate duplication of effort.
- Improve plant reliability and performance (reduce down time because of emergent issues).
- Provide a continued means to work on programs generically, in cost-share programs, to help offset the cost.

#### **4.3.6 SGMP**

With safety as the primary objective, SGMP strategy is to address both the long term and short term issues. Efforts of the NDE Issue Resolution Group (IRG) and the Engineering and Regulatory (E&R) IRG are mainly concentrated on handling of current and near term tube integrity and associated regulatory issues, whereas longer term R&D efforts, particularly in the areas of automated NDE and chemistry effects and mitigations are conducted under TSS. SGMP continues to maintain a dialogue with the NRC through its Steam Generator Task Force and NEI on technical issues of regulatory concern. A matrix containing the list and status of issues related to inspection and integrity assessments forms the basis for the ongoing discussions with the NRC through conference calls and meetings. Significant among current issues under discussion are the safety significance of the channel head divider plate to tubesheet stub runner

weld and the impact of field indications of tube end seal weld cracking in steam generators with Alloy 600TT tubing on industry guidance.

#### **4.3.7 WCC Program**

The WCC Program has a four-year rolling strategic plan that is reviewed and updated, as needed, twice-yearly. Since Chemistry has strong interactions with each of the issue programs, the Materials Degradation APWG is the formal mechanism by which its strategic plan is aligned with the others, supported by the Issues Management Tables. In addition, the EPRI project managers coordinate work and activities on a more frequent basis.

Within the next few years, major activities will be focused on (1) increased zinc implementation in the primary circuit of PWRs for PWSCC mitigation and radiation field reduction; (2) application of dispersant in the secondary circuit of PWRs for significantly reducing steam generator fouling; (3) continued development and optimization of Noble Metal Chemical Application (including on-line application) for BWR IGSCC mitigation; and (4) evaluation and assessment of hydrogen optimization of the primary circuit of PWRs in recognition of MRP identified beneficial effects of higher hydrogen for PWSCC cracking mitigation and possible detrimental effects of Low Temperature Crack Propagation during shutdown and startup.

In addition, work will continue in monitoring and assessing chemistry performance for both the BWR and PWR fleets in support of technology evaluations, issue identification and development of improved guidance.

## **5 OVERVIEW OF MATERIALS MANAGEMENT AND STRATEGIC DIRECTION FOR 2007**

### **5.1 OVERVIEW OF MATERIALS MANAGEMENT**

#### **Performance Relative to Strategic Plan**

Overall, industry issue programs continue their alignment with NEI 03-08 requirements per the strategic plan. An important point to note is that as the MTAG and IPs mature in their relationship, opportunities for increased levels of consistency between the IPs continue to be identified. For example, in 2008 there are planned activities to further align the IPs to a common set of metrics and to reach agreement on a consistent process for deviations from industry mandated guidelines. Further, with the publication of the Issues Management Table (IMT) in 2007, all of the IP's are using the IMT to confirm gaps, to identify work tasks and project scope, and to prioritize their annual project plans. This IMT gap focus has resulted in the alignment of IP budgets and work plans to the gaps such that all high priority gaps are now being addressed. Existing performance metrics of all the IPs and results from these metrics are reviewed by the MTAG during periodic scheduled meetings and other interactions.

#### **Assessment of Issue Program Activities**

All Issue Programs are represented at the leadership level and are active participants in the MTAG. In addition, beginning in 2008, the MTAG will have involvement from the NSSS vendors which will bring new insights and perspectives to the team. Also the IPs continue to make progress on closing the key knowledge gaps that potentially could present the next series of materials degradation challenges to the US nuclear fleet. At the executive level, the IPs are judged to have the proper priorities and focus. The key areas being addressed by the IPs include:

- The understanding of the reactor coolant system environment on the performance of LWR materials, fracture toughness impact, and changes to materials properties
- Gaining the basic understandings of the material damage initiation processes and then the development of the predictive models and tools to identify the problematic issues before they manifest themselves in system or component failures
- Investigation and demonstration of effective mitigation methods whether mechanical or chemistry to preclude the materials degradation
- Development and implementation of appropriate Inspection and Evaluation guidelines for those susceptible materials and locations
- Continued development of improved NDE techniques and equipment

During 2007, the PWROG completed a change to its charter and is now believed to be in full alignment with NEI 03-08.

In the 2007 MTAG annual report several common themes were noted from earlier IP self-assessments. Several of these common themes are repeated in this year's annual report because it appears that these common issues are still open items and action plans are not yet fully developed to properly address these concerns. One theme that appeared in several of the self-assessments was the need for continued emphasis on participation and commitment of resources at the technical and leadership levels for the different IPs. Other items that are again repeated in this report that are considered noteworthy are:

- Both the MRP and the BWRVIP noted the need to focus on training of industry personnel so that the knowledge base accumulated in these programs is not lost as personnel changes, retirements, etc occur.
- Several self-assessments noted the importance of developing and maintaining administrative procedures and keeping them up to date. The procedures evolve over time from initial publication because of developing issues within the program. When issue responses are generic in nature, they need to be documented to maintain consistent application to similar issues in the future.
- The MRP assessment noted the need for a strong but workable interface between the working committees of the program and the industry's executive structure. The assessment noted that the communication within this interface should be enhanced so that industry approaches to issues of a regulatory nature that affect all MRP members are clearly understood and supported by all members. The assessment recommended that the communication with the executive members of these committees start early in the process for issues with regulatory significance.

### **Assessment of New Materials Issues (Significance, Response, Coordination, Gaps)**

Significant materials issues in 2007 included:

- The industry wide implementation of the MRP-139 Dissimilar Metal Weld Guideline has continued to identify issues with prior NDE of these welded joints along with new discoveries of cracking in the pressurizer and other primary system welds.
  - Wolf Creek Pressurizer Weld Indications: Although initially discovered in 2006, the results of the inspections continued well into 2007 and a re-emergence of the issue in early 2008 due to other NDE results from the St Lucie pressurizer nozzle welds. While the industry was eventually successful in addressing the impacts of these discoveries on the industry inspection and evaluation guidelines, these events reinforced the importance of adherence to the inspection guidelines, MRP-139, by the entire PWR fleet and the fact the regulator continues to be very concerned about the other Alloy 600 and dissimilar metal welds that remain in the plants.
  - Davis Besse Pressurizer Weld Indications: During full structural weld overlays (FSWO) of the decay heat drop line, near through wall indications were discovered in the welded joint. The initial weld passes from the FSWO are believed to have driven through the final remaining ligaments of the pipe wall and allowed water inside the line to intrude into the welding operation itself. Welding



was stopped and the plant outage plans and schedules were adjusted to account for this discovery. This line is common to the B&W fleet, operates at hot leg temperatures and was due for inspection per MRP-139 by the end of 2008. This discovery was communicated to the industry and other actions were taken to respond to this event.

- Hope Creek and Duane Arnold discovered significant indications in dissimilar metal welds (DMW). In both cases prior NDE had been unsuccessful in identifying these indications. In both situations, the joints received weld overlays and the units were returned successfully to operation. The issue with these discoveries relates to the probability of detection and the ability of NDE personnel to accurately interpret the NDE results. The BWRVIP was very successful in responding to these events and in working with the regulator. The BWRVIP has established a DMW focus group to monitor this issue.
- Byron Unit 2 RPV Nozzle Indication: During scheduled RPVCH inspection activities, an indication was discovered in one of the head penetration nozzle welds. This unit is a Westinghouse NSSS unit and is also in the NRC Low Susceptibility category due to being a cold head unit. This marks the first case of a cold head cracking event for the US fleet of cold head plants. Destructive examination of the removed boat sample indicated the presence of stress corrosion cracking originating in a manufacturing weld defect or lack of bond location.
- Several BWR units that have completed extended power uprates have later found issues with cracking in their steam dryers. Through extensive testing and analytical modeling it was determined that acoustic energy was creating additional fatigue type loadings that were previously unknown or expected. The BWRVIP and their consultants were able to develop an acoustic energy loading methodology to predict the magnitude of these fatigue loads to allow other modifications to be made to the steam dryers and other components potentially impacted by this energy source. NEI is organizing an Extended Power Uprate Task Force to develop a lessons learned document on power uprate issues for use by the BWR and PWR fleets.
- An issue that was initially discovered in an Edf PWR steam generator but has yet to be found in a US plant is cracking of the divider plate weld in the steam generator bowl. The issue of divider plate cracking was successfully answered when the issue arose during NRC review of the industry request for a permanent LAR to limit the inspection depth of steam generator tubes (B\*/H\*).
- During planned inspection of the Catawba Unit 2 steam generator (SG) tubes, a potential new degradation phenomenon was found on the cold leg side of the SG just above the roll transition region. Interpretation of ECT signals indicated the presence of crack like indications. These tubes were removed from service and the unit is currently planning for SG tube removal at its next scheduled outage if other signs of similar indications are found. The tubing material is Alloy 600 thermally treated and would be some of the first signs of cracking in this type of material in SGs.

## 5.2 STRATEGIC DIRECTION FOR 2008

Key initiatives and major focal points for both the industry and the IPs in 2008 in the materials degradation and aging arena are:

- **Maintaining the Priority of the Materials Initiative Philosophy:** This issue was identified in 2007 and remains a focus in 2008.
  - A self-assessment of the NEI 03-08, Materials Initiative is currently in the planning stages for 2008. This assessment will be the industry's first report card on just how well as an industry and as IPs we are doing at maintaining the momentum for the Materials Initiative. The results of the assessment should clarify what if any actions are necessary to keep the Initiative robust and proactive. The focus remains on looking ahead, sharing operating experience, and ensuring the proper funding for the IP projects along with utility technical and executive involvement.
  - In recognition of the extent of personnel changes since the time the Materials Initiative was approved, the MTAG plans to hold a Materials Initiative Seminar in 2008 to reinforce the intent and application of the Initiative across the industry.
- **Address the Highest Priority IMT Gaps:** The gaps from the IMT have been allocated to the IP best suited to close and manage the gap. Most of these gaps are multi-year projects and will require an ongoing predictable source of funds and support to close the gap.
- **Response to Emergent Issues and Regulatory Sensitivities:** Lessons learned from the past several years suggests these items need to continue to be a focus for 2008 and possibly beyond. Reinforcement of IP expectations and development of protocols for communicating important R&D results need further discussion and evaluation.
- **Obtaining and Using Foreign Experience and Related Research and Development:** The US industry continues to benefit from closer and more frequent interactions with foreign entities on materials issues and R&D. A key focus for 2008 is to continue to improve the relations and sharing opportunities between the various IPs and foreign counterparts.
- **Re-Affirming the Role of the MTAG:** In 2007 the MTAG moved forward in its role of providing oversight for the coordination and communications between the IPs. Opportunities still exist to improve and enhance the sharing, transferring, and coordination of project tasks, mutual R&D, resources sharing, etc. among the IPs. Opportunities also exist to increase the level of consistency between the IPs on a number of fronts. Achieving this higher level of consistency will be a focus for the coming year.
- **Implementation and Planning for New Industry Guidelines:** Several significant and very important new industry inspection and evaluation guidelines will be issued in 2008. These guidelines and timelines for implementation need to be vetted in different forums and with different audiences to ensure complete understanding. Examples include: RPV Internals I&E Guidelines; RPV Bottom Mounted Nozzle I&E Guideline; 10CFR50.61, PTS rulemaking; PWR Secondary Water Chemistry Guidelines; BWR Water Chemistry Guidelines.
- **License Renewal Phase 2: Life Beyond 60 Years:** Momentum is building for a second round of license renewal for those plants that are within a few years of entering into their

first extended or renewed period of operation. Considerable interest is coming from the NRC, the DOE, and others. Discussions thus far have focused on identifying the key technical challenges, materials degradations, process and procedural issues, time lines, R&D needs, and other possible barriers. The role of MTAG and MEOG in this effort needs to be established and communicated.



## ADDENDUM 1

### Major 2007 Deliverables

The major materials-related 2007 deliverables are listed in this Addendum, organized by materials IP.

Item	ID	Title/Description
<b>EPRI BWRVIP</b>		
Report	1013394	“TR-105696-R9 (BWRVIP-03) Revision 9: BWR Vessel and Internals Project, Reactor Pressure Vessel and Internals Examination Guidelines,” EPRI Technical Report, 1013394, December 2006.
Report	1014352	“BWRVIP-44-A: BWR Vessel and Internals Project, Underwater Repair of Nickel Alloy Reactor Vessel Internals,” EPRI Technical Report 1014352, August 2006.
Guideline	1014613	“BWRVIP-96-A: BWR Vessel and Internals Project, Sampling and Analysis Guidelines for Determining the Helium Content of Reactor Internals,” EPRI Technical Report 1014613, December 2006.
Report	1013396	“BWRVIP-100-A: BWR Vessel and Internals Project, Updated Assessment of the Fracture Toughness of Irradiated Stainless Steel for BWR Core Shrouds,” EORI Technical Report 1013396, August 2006.
Report	1011703	“BWRVIP-150: BWR Vessel and Internals Project, Report and NRC Correspondence DVD Version 12.2005,” EPRI DVD 1011703, March 2006.
Report	1011692	“BWRVIP-151: BWR Vessel and Internals Project, Technical Basis for Revision to BWRVIP Welding Guidelines (BWRVIP-97),” EPRI Technical Report 1011692, February 2006.
Report	1011697	“BWRVIP-152: BWR Vessel and Internals Project, NDE Development 2005,” EPRI Technical Report 1011697, March 2006.
Report	1011700	“BWRVIP-153: BWR Vessel and Internals Project, Crack Growth in High Fluence BWR Materials – Progress Report for 2005,” EPRI Technical Report 1011700, March 2006.
Report	1011701	“BWRVIP-154: BWR Vessel and Internals Project, Fracture Toughness in High Fluence BWR Materials – Progress Report for 2005,” EPRI Technical Report 1011701, March 2006.
Report	1013389	“BWRVIP-155: BWR Vessel and Internals Project, Evaluation of Thermal Fatigue Susceptibility in BWR Stagnant Branch Lines,” EPRI Technical Report 1013389, June 2006.
Guideline	1014993	“TR-105696-R9 (BWRVIP-03) Revision 10: BWR Vessel and Internals Project, Reactor Pressure Vessel and Internals Examination Guidelines,” EPRI Technical Report 1014993, December 2007.
Report	1014874	“BWRVIP-59-A: BWR Vessel and Internals Project, Evaluation of Crack Growth in BWR Nickel Base Austenitic Alloys in RPV Internals,” EPRI Technical Report 1014874, May 2007.
Report	1015457	“BWRVIP-80-A: BWR Vessel and Internals Project, Evaluation of Crack Growth in BWR Shroud Vertical Welds,” EPRI Technical Report 000000000001015457, October 2007.
Report	1015000	“BWRVIP-87, Revision 1: BWR Vessel and Internals Project, Testing and Evaluation of BWR Supplemental Surveillance Program Capsules D, G and H,” EPRI Technical Report 1015000, September 2007.

Item	ID	Title/Description
Report	1016123	“BWRVIP-108NP: BWR Vessel and Internals Project, Technical Basis for the Reduction of Inspection Requirements for the Boiling Water Reactor Nozzle-to-Vessel Shell Welds and Nozzle Blend Radii,” EPRI Technical Report 1016123, November 2007.
Report	1015001	“BWRVIP-111, Revision 1: BWR Vessel and Internals Project, Testing and Evaluation of BWR Supplemental Surveillance Program Capsules E, F and I,” EPRI Technical Report 1015001, September 2007.
Report	1013400	“BWRVIP-135, Revision 1: BWR Vessel and Internals Project, Integrated Surveillance Program (ISP) Data Source Book and Plant Evaluations,” EPRI Technical Report 1013400, June 2007.
Report	1013408	“BWRVIP-154, Revision 1: BWR Vessel and Internals Project, Fracture Toughness in High Fluence BWR Materials – Progress Report for 2005-2006,” EPRI Technical Report 1013408, June 2007.
Report	1013406	“BWRVIP-166: BWR Vessel and Internals Project, Report and NRC Correspondence DVD-ROM Version 12.2006,” EPRI DVD 1013406, March 2007.
Report	1014753	“BWRVIP-167: BWR Vessel and Internals Project, Boiling Water Reactor Issue Management Tables,” EPRI Technical Report 1014753, March 2007.
Guideline	1013390	“BWRVIP-168: BWR Vessel and Internals Project, Guidelines for Disposition of Inaccessible Core Spray Piping Welds in BWR Internals,” EPRI Technical Report 1013390, March 2007.
Report	1013399	“BWRVIP-169: BWR Vessel and Internals Project, Testing and Evaluation of BWR Supplemental Surveillance Program (SSP) Capsules A, B, and C,” EPRI Technical Report 1013399, March 2007.
Report	1013405	“BWRVIP-170: BWR Vessel and Internals Project, NDE Technique Development for BWR Applications,” EPRI Technical Report 1013405, March 2007.
Report	1014996	“BWRVIP-171: BWR Vessel and Internals Project, Evaluation of Effectiveness of On-Line NMCA on IGSCC: Results of the 2006 UT Examination of Core Shroud Indications in the OLNC Reference Plant,” EPRI Technical Report 1014996, June 2007.
Report	1013407	“BWRVIP-172: BWR Vessel and Internals Project, Crack Growth in High Fluence BWR Materials Crack Growth Rate Testing of Type 304L at 3.5 dpa,” EPRI Report 1013407, Final Report, May 2007.
Report	1014995	“BWRVIP-173: BWR Vessel and Internals Project, Evaluation of Chemistry Data for BWR Vessel Nozzle Forging Materials,” EPRI Report 1014995, May 2007.
Report	1014994	“BWRVIP-174: BWR Vessel and Internals Project, Review of BWR Core Shroud UT Re-Inspection Results for Plants Mitigated with NMCA and HWC,” EPRI Technical Report 1014994, September 2007.
Report	1014997	“BWRVIP-175: BWR Vessel and Internals Project, Evaluation of Noble Metal Deposition at the Online NMCA Reference Plant,” EPRI Technical Report 1014997, September 2007.
Report	1014999	“BWRVIP-176: BWR Vessel and Internals Project, BWR Shutdown Chemistry Experience Report and Application Guidelines,” EPRI Technical Report 1014999, November 2007
Report	1015468	“BWRVIP-177: BWR Vessel and Internals Project, Analysis of a Noble Metal Surface/Crack Deposition Monitoring Specimen, 2007 Update,” EPRI Technical Report 1015468
Report	1015504	“BWRVIP-178NP: BWR Vessel and Internals Project, Nonproprietary Report of Material Test Results from the BWR Integrated Surveillance Program (ISP),” EPRI Technical Report 1015504, October 2007.

Item	ID	Title/Description
Report	1015506	“BWRVIP-179: BWR Vessel and Internals Project, BWR Surveillance Data and Predictions of Radiation Embrittlement in BWR Vessel Steels, Assessment of Supplemental Surveillance Program Capsules,” EPRI Technical Report 1015506, August 2007.
Guideline	1013402	“BWRVIP-180: BWRVIP Vessel and Internals Project, Access Hole Cover Inspection and Flaw Evaluation Guidelines,” EPRI Technical Report 1013402, November 2007.
Report	1013403	“BWRVIP-181: BWR Vessel and Internals Project, Steam Dryer Repair Design Criteria, EPRI Technical Report 1013403, November 2007.
Guideline	1013401	“BWRVIP-183: BWR Vessel and Internals Project, Top Guide Grid Beam Inspection and Flaw Evaluation Guidelines,” EPRI Technical Report 1013401, December 2007.
<b><u>EPRI Primary Systems Corrosion Research</u></b>		
Report	1015176	CIR-II CD Version 07.09: Comprehensive Compilation of CIR II Research and Final Reports
Report	1014976	Crack Growth Testing of Fast Reactor Irradiated Commercial Stainless Steels in BWR and PWR Environments
Report	1014977	Predictions and Evaluation of Environmentally Assisted Cracking in LWR Structural Materials
Report	1015493	An Interim Review of the Cooperative Irradiation-Assisted Stress Corrosion Cracking Research (CIR) Program – Revision 1
<b><u>EPRI MRP</u></b>		
Report	1014728	Materials Reliability Program: Effects of Dissolved Hydrogen, Temperature, and Hydrogen Peroxide on the Fracture Resistance of Weld Metals 182, 52, and 152 (MRP-209)
Report	1015004	Materials Reliability Program: Testing the Resistance to Stress Corrosion Cracking of Alloy 690 and its Weld Metal in Supercritical Boron/Lithium/H <sub>2</sub> Solutions (MRP-225)
Report	1015006	Materials Reliability Program: Reactor Vessel Head Boric Acid Corrosion Testing (MRP-199)
Report	1015008	Materials Reliability Program: Effects of B/Li/pH on PWSCC Growth Rates in Ni-Base Alloys (MRP-217)
Report	1015012	Materials Reliability Program: Development of Alternate ASME Section XI Appendix G Methodology: Validation and Verification of FAVOR, v06.1 (MRP-226)
Report	1015013	Materials Reliability Program: PWR Internals Age-Related Material Properties, Degradation Mechanisms, Models, and Basis Data—State of Knowledge (MRP-211)
Report	1015014	Materials Reliability Program: Evaluation of Controlling Transient Ramp Times Using Piping Methodologies When Considering Environmental Fatigue (Fen) Effects (MRP-218)
Report	1015016	Materials Reliability Program: Experimental Program on the Effects of Surface Condition on Primary Water Stress Corrosion Cracking of Alloy 182 Welds (MRP-215)
Report	1015140	Nondestructive Evaluation: Program Description Update for Performance Demonstration of Pressurized Water Reactor Upper Head Penetration Examination
Report	1015288	Materials Reliability Program: Mitigation of PWSCC in Nickel-Base Alloys by Optimizing Hydrogen in the Primary Water (MRP-213)
Report	1015332	Materials Reliability Program: Characterization of Type 316 Cold Worked Stainless Steel Highly Irradiated Under PWR Operating Conditions (International IASCC Advisory Committee Phase 3 Program Final Report) (MRP-214)

Item	ID	Title/Description
Report	1015383	Materials Reliability Program: Advanced FEA Evaluation of Growth of Postulated Circumferential PWSCC Flaws in Pressurizer Nozzle Dissimilar Metal Welds (MRP-216)
Report	1015400	Materials Reliability Program: Advanced FEA Evaluation of Growth of Postulated Circumferential PWSCC Flaws in Pressurizer Nozzle Dissimilar Metal Welds (MRP-216, Rev. 1)
Report	1015427	Materials Reliability Program: Review of Stress Corrosion Cracking of Alloys 182 and 82 in PWR Primary Water Service (MRP-220)
Report		Materials Reliability Program: Development of Preemptive Weld Overlay (PWOL) for Alloy 600 PWSCC Mitigation (MRP-208)
Report	1015478	Materials Reliability Program: Corrosion Testing of Decommissioned PWR Core Internals Material Samples (MRP-222)
Report	1015479	Materials Reliability Program: Corrosion Testing of BOR-60 Irradiated Materials and Evaluation of the Effect of Fast Reactor Irradiation Versus PWR Irradiation on Material Properties (MRP-223)
Report	1015480	Materials Reliability Program: Analysis of IASCC Crack Initiation Constant Load Data for Irradiated Stainless Steels (MRP-224)
Report	1015540	Stress Corrosion Cracking of Stainless Steel Components in Primary Water Circuit Environments of Pressurized Water Reactors
Report	1016106	Materials Reliability Program: Fracture Toughness Evaluation of Highly Irradiated PWR Stainless Steel Reactor Internal Components (MRP-210)
Report	1016154	Materials Reliability Program: Constant Extension Rate Stress Corrosion Cracking Testing of Alloys 600 and 690 in Supercritical Water (MRP-233)
<b>EPRI NDE</b>		
Report	E226765	Transducers for DM and Overlay Application
Report	E226765	Transducers for DM and Overlay Application
Report	1014860	Nondestructive Evaluation: Ultrasonic Examination of Steam Generator Tube Training Guide
Report	1015051	ET Sensor Array for Difficult to Access Welds
Report	1015052	BWR Bottom Drain Line Inspection Technology
Report	1015053	NDE for Material Characterization
Report	1015133	Phased Array Examination of Complex Dissimilar Metal Welds
Report	1015134	Procedure for Manual Phased Array UT of Weld Overlays
Report	1015135	BMN Qualifications for MRP
Report	1015136	Dissimilar Metal Piping Weld Examination Guidance Volume #5
Report	1015137	Ultrasonic Phased Array Transducers for CDRM Housing Penetrations
Report	E226785	BMN Qualification Program Description
Report	1015140	MRP CRDM Qualification - Technical Update
Report	1015141	Status of Digital Radiography
Report	1015142	Evaluation of Filmless Radiography
Report	1015143	Comparison of Field Flaws with Manufactured Flaws - 2007 Update
Report	E226787	Evaluation of European Qualification Process - Remote Visual
Report	E226788	Design Vessel Head Penetration Mockups
Report	E226789	MRP CRDM Qualification-Develop QA plan
Report	E226790	MRP CRDM Qualification-Develop approach for personnel qualification
Report	1015144	ASME Code Activities – 2007



Item	ID	Title/Description
Report	1015145	Incorporate NDE enhancements into ASME Section XI
Report	1015146	RI-ISI Status, Extensions And Resolution Of Implementation Issues-2007
Report	1015147	Compilation of PINC Participation-2007
Report	1015148	Proposed Code Case Criteria for Technical Basis of WOL Indication Evaluation and Disposition Based on Advanced Technology Assessments
Report	1015149	RPV Plate Manual Phased Array Procedures -Add Omniscan
Report	1015150	Examiner Proficiency
Report	1015151	Containment Inspection Program Guide Update: ASME Section XI, Subsections IWE & IWL
Report	1015152	Application of Qualified Nozzle Inner Radius and Nozzle-to-Shell Weld UT Procedures Using EPRI Computer Models 2002-2006
Report	1015153	UT Coverage Calculation Validation via PDI Qualifications
Report	1014964	Eddy Current Examination Test Material
Report	1015154	Update NDE course materials (Level III visual / Level III ultrasonic method /Level III specific)
Report	E226791	Conduct of scheduled NDE training courses, exam sessions & HRD activities-2007
Report	E226792	PDI Program
Report	1015054	Guided Wave Ultrasonic Technology Applications for BOP HX Tubes & TSP Degradation
Report	1015138	LR Small Bore Evaluation - Develop Methodology for Identifying the Numbers and Locations for Inspections
Report	1015155	Existing Capability for Volumetric Exam of Small Bore Piping
Report	1015055	Enhanced Ferromagnetic Tubular Inspection Techniques for High Perf SS & Carbon Steel Tubes
Report	1015056	Examination of Large Diameter Buried Piping for Small Pit Detection
Report	1015156	Recommendations for Utility Applications of Guided Wave
Report	E226768	Guided Wave System
<b><u>EPRI SGMP</u></b>		
Software	1013366	Automated Eddy Current Data Analysis, Software Version 3.0
Tech Report	1013386	Automated Analysis of Rotating Probe Eddy Current Data
Tech Update	1013514	Automated Analysis of Array Probe Eddy Current Data
Tech Update	1013515	Automated Analysis Performance Demonstration Database
Tech Report	1014660	Effect of Bending Loads on Leakage Integrity of Steam Generator Tubes
Tech Report	1014756	Update on the Tools for Integrity Assessment Project
Tech Report	1014661	Impact of Non Pressure Loads on Leakage Integrity of Steam Generator Tubes
Guideline Report	1014983	Steam Generator In Situ Pressure Test Guidelines, Revision 3
Tech Update	1015123	Improved Leak Rate Modeling Interim Report
Tech Report	1014722	PWR Steam Generator Foreign Object Exclusion Systems
Tech Update	1013387	Thermal-Hydraulics and Studies of Foreign Objects in PWR Steam Generators
Tech Update	1014801	Steam Generator Management Program: PWR Steam Generator Tube Wear - Alloy 690/Supports and Alloy 690/Foreign Objects
Tech Report	1014981	Steam Generator Foreign Object Handbook
Tech Report	1015021	Dispersants for Tube Fouling Control, Volume 4: Long-Term Trial at McGuire Unit 2 - Implementation and Results (2005-2006)
Tech Report	1014987	Application of Raman Spectroscopy to Evaluate Lead Species Under PWR Secondary Chemistry Conditions
Guideline Report	1014986	PWR Primary Water Chemistry Guidelines - Vol 1 & 2, Revision 6
Tech Report	1014988	Pressurized Water Reactor Steam Generator Lay-up: Corrosion Evaluation

Item	ID	Title/Description
Tech Report	1014985	PWR Hideout Return Sourcebook
Tech Report	1014990	SCC Margins in Alloy 600TT and Alloy 690TT and Development of PbSCC Remedies
Tech Report	1014982	Divider Plate Cracking in Steam Generators, Results of Phase 1: Analysis of Primary Water Stress Corrosion Cracking and Mechanical Fatigue in the Alloy 600 Stub Runner to Divider Plate Weld Material
Database	1014956	SG Degradation Database, Ver. 5.4
Procedure	1015482	SGMP Admin Procedures, Rev 2
Proceedings	1015410	Proceedings of the 26th Steam Generator NDE Workshop, July 16-18, 2007, Big Sky, Montana
Guideline Report	1013706	PWR Steam Generator Examination Guidelines, Revision 7
Software	1014495	Performance Demonstration Database/Qualified Data Analyst (PDD/QDA) software, Version 4.0
Tech Sheets	various	Issued 45 New Examination Technique Specification Sheets (ETSS)
Tech Sheets	various	Revised 8 ETSSs
Tech Update	1014801	Steam Generator Management Program: PWR Steam Generator Tube Wear - Alloy 690/Supports and Alloy 690/Foreign Objects
Tech Report	1014981	Steam Generator Foreign Object Handbook
Tech Report	1015021	Dispersants for Tube Fouling Control, Volume 4: Long-Term Trial at McGuire Unit 2 - Implementation and Results (2005–2006)
Tech Report	1014987	Application of Raman Spectroscopy to Evaluate Lead Species Under PWR Secondary Chemistry Conditions
Guideline Report	1014986	PWR Primary Water Chemistry Guidelines - Vol 1 & 2, Revision 6
Tech Report	1014988	Pressurized Water Reactor Steam Generator Lay-up: Corrosion Evaluation
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Tech Report	1014990	SCC Margins in Alloy 600TT and Alloy 690TT and Development of PbSCC Remedies
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Database	1014956	SG Degradation Database, Ver. 5.4
Procedure	1015482	SGMP Admin Procedures, Rev 2
Proceedings	1015410	Proceedings of the 26th Steam Generator NDE Workshop, July 16-18, 2007, Big Sky, Montana
Guideline Report	1013706	PWR Steam Generator Examination Guidelines, Revision 7
Software	1014495	Performance Demonstration Database/Qualified Data Analyst (PDD/QDA) software, Version 4.0
Tech Sheets	various	Issued 45 New Examination Technique Specification Sheets (ETSS)
Tech Sheets	various	Revised 8 ETSSs
<b>EPRI Water Chemistry Control</b>		
Report	1014986	Pressurized Water Reactor Primary Water Chemistry Guidelines, Revision 6
Report	1015021	Dispersants for Tube Fouling Control – Volume 4: Long-Term Trial at McGuire Unit 2
Report	1015020	Dispersants for Tube Fouling Control – Volume 5: PWR Application Sourcebook
Report	1015017	Evaluation of Altering Hydrogen Concentrations for Mitigation of Primary Water Stress Corrosion Cracking
Report	1016206	Feasibility Study: Use of Hydrazine in BWRs for ECP Reduction During Startup

Item	ID	Title/Description
Report	1014602	MULTEQ: Equilibrium of an Electrolyte Solution with Vapor-Liquid Partitioning and Precipitation – The Database, Version 5.0
Software	1014960	PWR Secondary Water Chemistry Optimization Tool, Version 1.0 (CIRCE)
Software	1014959	ChemWorks ChemTools, Version 1.0
Software	1015182	SCW 2—7 – SMART ChemWorks Web Application, Version 2007
Software	1015525	Data Transfer Tool for ChemWorks, Version 4.0
Report	1015447	Proceedings: 2007 Condensate Polishing Workshop
Technical Update	1015127	Application of Capillary Electrophoresis for Detecting Low Level Ionic Impurities in BWR Reactor Coolant
Technical Update	1016102	Boiling Water Reactor Chemistry Performance Monitoring Update – 2007 Edition
Technical Update	1016243	Program on Technology Innovation: Crystal Habit Modifiers
Technical Update	1014714	Evaluation of Hollow Fiber Filtration for Condensate Polishing Application
Report	1014986	Pressurized Water Reactor Primary Water Chemistry Guidelines, Revision 6
<b>PWROG MSC</b>		
Letter Report	LTR-RRA-07-3	“McGuire Nuclear Station Piping Risk-Informed Inservice Inspection Peer Evaluation Report, Revision 0, LTR-RRA-07-3”, January 2007 (PA-MSC-0271)
Letter Report	LTR-PCAM-07-18	“V.C. Summer – PWROG PA-MSC-0233 – Task 2 Customer Deliverable - Primary Pressure Boundary Alloy 600/82/182 Fabrication Detail”, LTR-PCAM-07-18 (PA-MSC-0233)
Letter Report	LTR-PCAM-07-21	“Millstone Unit 3 – PWROG PA-MSC-0233 – Task 2 Customer Deliverable - Primary Pressure Boundary Alloy 600/82/182 Fabrication Detail”, LTR-PCAM-07-21 (PA-MSC-0233)
Report	AREVA NP Job 1012029	“Inventory of Eddy Current Ultrasonic Testing Specimens Updated December 2006”, AREVA NP Job 1012029 (PA-MSC-0239)
Letter Report	LTR-PCAM-07-22	“Millstone Unit 2 – PWROG PA-MSC-0233 – Task 2 Customer Deliverable - Primary Pressure Boundary Alloy 600/82/182 Fabrication Detail”, LTR-PCAM-07-22 (PA-MSC-0233)
Report	AREVA NP Job 1012028	“BWOG Common Degradation Assessment”, AREVA NP Job 1012028 (PA-MSC-0238)
Report	WCAP-16700-P WCAP-16711-P WCAP-16712-P	“Steam Generator Alternate Repair Criteria for Tube Portion Within the Tubesheet at Kori Unit 2, Unit 3 and YGN 1”, March 2007 (PA-MSC-0272)
Report	12-9048620-000	“Oconee Units 1-3 – PWROG PA-MSC-0233 – Task 2 Customer Deliverable – Fabrication Records of Miscellaneous Alloy 82/182 Dissimilar Metal Butt Welds”, 12-9048620-000 (PA-MSC-0233)
Report	AREVA-07-01305	“B&W RV Internals Structural Bolt Evaluations: Phase I”, AREVA-07-01305, PA-MSC-0350
Report	WDI-TJ-1020, Rev 0	Final Technical Justification Document WDI-TJ-1020, Rev 0, “Inspection of Westinghouse Pressurizer Heater Sleeve Couplings Utilizing Lamb Type Guided Waves”, May 2007, PA-MSC-0328
Letter Report	LTR-PCAM-07-40	“South Texas Unit 1 – PWROG PA-MSC-0233 – Task 2 Customer Deliverable – Pressurizer Safety, Relief, and Spray Nozzle Alloy 82/182 Fabrication Detail”, LTR-PCAM-07-40 (PA-MSC-0233)
Letter Report	LTR-PCAM-07-41	“Diablo Canyon Unit 2 – PWROG PA-MSC-0233 – Task 2 Customer Deliverable – Primary Pressure Boundary Alloy 600/82/182 Fabrication Detail for the Pressurizer Surge, Safety, Relief, and Spray Nozzles”, LTR-PCAM-07-41 (PA-MSC-0233)

Item	ID	Title/Description
Letter Report	LTR-PCAM-07-46	“Waterford Unit 3 – PWROG PA-MSC-0233 – Task 2 Customer Deliverable – Pressurizer Nozzle Fabrication Detail”, LTR-PCAM-07-46 (PA-MSC-0233)
Letter Report	LTR-PCAM-07-65	“Waterford Unit 3 – PWROG PA-MSC-0233 – Task 2 Customer Deliverable – Pressurizer Nozzle Fabrication Detail”, LTR-PCAM-07-65 (PA-MSC-0233)
Report	WCAP-16731-P	WCAP-16731-P, Rev 0 “Westinghouse Pressurizer Heater Assembly – Manufacturing Design Information”, Task 2 (PA-MSC-0316)
Report	ANP-2650	ANP-2650 “Updated Results for Request for Additional Information Regarding Reactor Pressure Vessel Integrity”, PA-MSC-0317
Report	WCAP-16820-P/NP	WCAP-16820-P/NP, Rev. 0, "Compilation of NRC RAI Responses Related to the Development of an Alternate Repair Criteria for Tube Joints in Westinghouse Model D5, F, 44F and 51F Steam Generators," Task 9, PWROG PA-MSC-0272, Rev 1, August 2007
Report	BAW-1543 (NP), Revision 4, Supplement 6-A	BAW-1543 (NP), Revision 4, Supplement 6-A “Supplement to the Master Integrated Reactor Vessel Surveillance Program”, PA-MSC-0230
Report	86-9058397-000	AREVA NP Final Calculation Report Number 86-9058397-000 “Fracture Mechanics Evaluation of B&W Design Core Flood Nozzle DM Welds”, PA-MSC-0314
Report	ANP-2656NP	ANP-2656NP “Guidelines for Maintaining and Monitoring the Environment in Stagnant RCS Attached Lines and Components” Task 2, PA-MSC-0202R1
Letter Report	LTR-PCAM-07-94	LTR-PCAM-07-94 “Inservice Inspection Survey Results Summary and Cost Benefit Assessment”, PA-MSC-0371
Letter Report	LTR-PCAM-07-99	“Waterford Unit 3 – PWROG PA-MSC-0233 – Task 2 Customer Deliverable – Primary Pressure Boundary Alloy 600/82/182 Fabrication Detail”, LTR-PCAM-07-99 (PA-MSC-0233)
Letter Report	47-9067985-000	Interim Root Cause Report 47-9067985-000 “Fuel-Baffle Plate Interaction at B&W Design Plants”, PA-MSC-0379, Revision 1
Letter Report	51-9063818-000	“Summary Regarding the Aging Temperature of the Thermally Aged Materials Located on the ANO-1 and Oconee-3 Heads”, Task 4 (PA-MSC-0230)

## ADDENDUM 2

### Planned Major 2008 Deliverables

The major materials-related deliverables planned for 2008 are listed in this Addendum, organized by materials IP.

Issue Program	Document Title	Subject	Scheduled Delivery
BWRVIP	BWRVIP Report and NRC Correspondence DVD Version 12.2007	Integration	3/31/2008
BWRVIP	BWRVIP Symposium 2007	Integration	3/31/2008
BWRVIP	Update to BWRVIP Issue Management Tables	Integration	6/30/2008
BWRVIP	Two-sided Inspection of Core Shroud Welds	Assessment	3/31/2008
BWRVIP	Guidance for Steam Dryer Integrity for Power Uprate	Assessment	1/31/2008
BWRVIP	Steam Dryer Loading Methodology	Assessment	9/30/2008
BWRVIP	Integrated Surveillance Program - BWRVIP-86-A, Revision 1	Assessment	10/1/2008
BWRVIP	Crack Growth in High Fluence BWR Material	Assessment	12/31/2008
BWRVIP	Fracture Toughness in High Fluence BWR Material	Assessment	12/31/2008
BWRVIP	Revision to Code Case N-730 to include ICMH	Assessment	10/1/2008
BWRVIP	Evaluation of Cast Austenitic Stainless Steel	Assessment	12/31/2008
BWRVIP	Disposition of Jet Pump Thermal Sleeve and LPCI Hidden Welds	Assessment	11/1/2008
BWRVIP	Inspection Coverage for BWR RPV Axial Welds	Assessment	10/1/2008
BWRVIP	Access Hole Cover Repair Design Criteria	Assessment	12/31/2008
BWRVIP	Revision to BWRVIP-97	Assessment	12/31/2008
BWRVIP	Revision to BWRVIP-03	Assessment	12/31/2008
BWRVIP	BWR Water Chemistry Guidelines - 2008 Revision	Mitigation	11/30/2008
BWRVIP	BWR Vessel and Internals Application (BWRVIA) V3.0 for Radiolysis and ECP Calculation	Mitigation	9/30/2008
BWRVIP	Generic Safety Evaluation - Chemical Injection for BWR Startup ECP Reduction	Mitigation	12/31/2008

<b>Issue Program</b>	<b>Document Title</b>	<b>Subject</b>	<b>Scheduled Delivery</b>
BWRVIP	Analysis of a Noble Metal Surface/Crack Deposition Monitoring Specimens-2008 Update	Mitigation	12/31/2008
BWRVIP	Evaluation of Zirconia Coatings to Mitigate IGSCC-Final Report	Mitigation	6/30/2008
BWRVIP	BWRVIP-14-A	Assessment	10/1/2008
BWRVIP	BWRVIP-34-A	Assessment	10/1/2008
Primary Systems Corrosion Research	Materials Degradation Matrix – Revision 1	Update of 2004 MDM	4/30/2008
Primary Systems Corrosion Research	Characterization of Surface Oxide Films in PWR Environments – Interim Report	PWSCC of LWR Materials	3/31/2008
Primary Systems Corrosion Research	Experimental Results of Interaction between Localized Deformation and EAC – Interim Report	Mechanistic understanding of early stages of material degradation processes	3/31/2008
Primary Systems Corrosion Research	Damage Processes Prior to Crack Initiation in Ni-Base Alloys – Interim Report	Mechanistic understanding of early stages of material degradation processes	12/31/2008
Primary Systems Corrosion Research	Experimental Results of EAC Initiation and Short Crack Growth – Interim Report	Mechanistic understanding of early stages of material degradation processes	3/31/2008
MRP	Technical Basis for Revision to ASME Code to Appendix G: Incorporate Risk Informed P-T Methodology	Fatigue	12/31/2008
MRP	Progress Report Through-Wall Neutron Attenuation of RPV Materials	RPV	12/31/2008
MRP	Inspection Survey Results (Rev. 1)	Inspection	12/31/2008
MRP	Materials Reliability Program: Laboratory Testing to Evaluate Mitigation of PWSCC Crack Growth Rate in Nickel-based Alloys by Optimization of Hydrogen in PWR Primary Water		12/24/2008
MRP	Materials Reliability Program: Laboratory Testing to Evaluate Mitigation of PWSCC Crack Growth Rate in Nickel-based Alloys by Injection of Zinc to PWR Primary Water		12/24/2008
MRP	Materials Reliability Program: Technical Basis for Preemptive Weld Overlays for Alloy 82/182 Butt Welds in PWRs (MRP-169) - Rev 1	Mitigation/Testing	12/24/2008

<b>Issue Program</b>	<b>Document Title</b>	<b>Subject</b>	<b>Scheduled Delivery</b>
MRP	Materials Reliability Program: Resistance of Alloys 690, 52 and 152 to Primary Water Stress Corrosion Cracking: Summary of findings from completed and ongoing test programs since 2004	Mitigation/Testing	5/31/2008
MRP	Materials Reliability Program: Laboratory Testing to Determine Resistance of Alloy 690/52/152 to SCC Crack Growth in Simulated PWR Primary Water	Mitigation/Testing	12/24/2008
MRP	Materials Reliability Program: Calculation of Crack Tip Stress Intensity Factors for Flaws in RPV Outlet Nozzle Butt Welds during Plant Cooldown and Comparison with Low Temperature Crack Propagation Fracture Resistance	Mitigation/Testing	12/31/2008
MRP	Materials Reliability Program: Laboratory Testing to Determine Crack Growth Rates in Heat Affected Zone of Welded Alloy 600 and 690 Materials	Mitigation/Testing	12/24/2008
MRP	Materials Reliability Program: Destructive Examination of the Stainless Steel Braidwood 1 Pressurizer Heater Sleeve	Mitigation/Testing	12/24/2008
MRP	Materials Reliability Program: PWR Internals Inspection and Evaluation Guidelines (MRP-227)	Assessment	12/31/2008
MRP	Materials Reliability Program: Functionality Analysis for B&W-Designed Representative PWR Internals (MRP-229)	Assessment	12/31/2008
MRP	Materials Reliability Program: Inspection Standard for Reactor Internals Components (MRP-228)	Inspection	12/30/2008
MRP	Master Curve Fracture Model (PERFECT)	RPV	12/31/2008
MRP	Material Reliability Program: Primary System Piping Butt Weld Inspection and Evaluation Guideline (MRP-139, Rev. 1)	Assessment	6/30/2008
MRP	Materials Reliability Program: Aging Management Strategies for B&W-Designed PWR Internals (MRP-231)	Assessment	12/31/2008
MRP	Materials Reliability Program: Aging Management Strategies for Westinghouse and Combustion Engineering PWR Internals (MRP-232)	Assessment	12/31/2008

<b>Issue Program</b>	<b>Document Title</b>	<b>Subject</b>	<b>Scheduled Delivery</b>
MRP	Materials Reliability Program: Functionality Analysis for Westinghouse & CE-Designed Representative PWR Internals (MRP-230)	Assessment	12/31/2008
MRP	Materials Reliability Program: Inspection Plan for Reactor Vessel Bottom Mounted Nozzles in U.S. PWR Plants (MRP-206)	Assessment	8/31/2008
MRP	Materials Reliability Program: PWR Alloy 690 Replacement Pressure Boundary Component Applications: Material Production and Component Fabrication and Installation Practices	Mitigation/Testing	12/24/2008
MRP	PTS (Report on input to NRR rulemaking and NUREG review)	Fatigue	12/31/2008
MRP	Leak Path Assessment for CRDM Examinations	Assessment	12/22/2008
MRP	Safety Evaluation for Boric Acid Wastage of PWR Reactor Vessel Bottom Heads Due to Bottom Mounted Nozzle Leakage (MRP-167)	Assessment	4/30/2008
MRP	xLPR - Project Report on Development of a New Approach to Demonstrating Extremely Low Probability of Rupture in Piping Systems (Note - Official title not yet formulated)	Assessment	12/31/2008
MRP	Materials Reliability Program: Laboratory Testing to Evaluate Mitigation of PWSCC Crack Growth Rate in Nickel-based Alloys by Optimization of Hydrogen in and Injecting Zinc to PWR Primary Water	Mitigation/Testing	12/24/2008
MRP	Reactor Internals Modeling and Functionality Analysis		12/31/2008
NDE	Buried Pipe Guided Wave Examination Best Practices	NDE Technology Evaluation	12/31/08
NDE	NDE for Socket Weld Assessment	LR Small Bore Inspection Capability	12/31/08
NDE	Dissimilar Metal Weld Examination in the Presence of Material Noise	Surface Examination of Nickel Alloy Welds	12/31/08
NDE	Phased Array Techniques for CRDM Housings	Phased Array Examination of CRDMs	12/31/08
NDE	Field trail for Large Diameter Piping and Small Pitting Detection	Condition Assessment of Buried Pipe	12/31/08
NDE	NDE Measurement of Internal Stress on IN 182 Plate Coupons	NDE for Materials Characterization	12/31/08



<b>Issue Program</b>	<b>Document Title</b>	<b>Subject</b>	<b>Scheduled Delivery</b>
NDE	Technology Development for Assessment of Bolt Stress Relaxation	Examination of RPV Internal Components	12/31/08
NDE	Fully characterized set of test samples	Vessel Head Penetration Mockups	12/31/08
NDE	Evaluations of CR & DR Systems-	Qualification of Filmless Radiography	12/31/08
NDE	Evaluation of Remote Visual Examination Methods	Evaluation of Remote Visual Examination Methods	12/31/08
NDE	Dissimilar Metal Piping Weld Exam Guidance-Volume 6	Alloy 600 Butt Weld Support	12/31/08
NDE	Proposed Code Case Criteria for Technical Basis of WOL Indication Evaluation and Disposition Based on Advanced Technology Assessments	Alloy 600 Butt Weld Support	12/31/08
NDE	Fully characterized set of test samples	Alloy 600 Butt Weld Support	12/31/08
NDE	Technical Update on the Effectiveness of Inlay Repairs	Weld Inlay Examination Capability	12/31/08
NDE	Procedure for Manual Phased Array UT of Weld Overlays	Manual Phased Array UT of Weld Overlays	12/31/08
NDE	Program Description Document - BMN Qualification	Program Description Document BMN Qualification	12/31/08
NDE	Tool Design and Construction for BWR Model 4 Plants	RPV Drain Line UT Tool Field	12/31/08
NDE	Guideline for Design of Inspectable Components for New Reactors-2008	Guideline for Design of Inspectable Components for New Reactors	12/31/08
NDE	RI-ISI Status, Extensions & Resolution of Implementation Issues – 2008	RI-ISI Status, Extensions & Resolution of Implementation Issues	12/31/08
NDE	Compilation of PINC Participation	Compilation of PINC Participation	12/31/08
NDE	Availability of Cast Stainless Steel	Examination of Cast Stainless Steel	12/31/08
NDE	Cast Stainless Steel - Evaluation Process	Examination of Cast Stainless Steel	12/31/08
NDE	NDE Application to Address Groundwater Contamination Issues	Aging Plants and License Renewal	12/31/08
NDE	Fast Track NDE Work Force Enhancement	NDE Workforce	12/31/08
NDE	ASME Section XI Development	NDE Technology	12/31/08
NDE	Ultrasonic Instrument Equivalency Demonstration through Technical Justification	NDE Technology	12/31/08
NDE	Conversion of RI-ISI programs to Code Case N716	RI-ISI Status, Extensions & Resolution of Implementation Issues	12/31/08
NDE	Selective Leaching	Aging Plants and License Renewal	12/31/08

<b>Issue Program</b>	<b>Document Title</b>	<b>Subject</b>	<b>Scheduled Delivery</b>
NDE	Plant-Specific Applications of Qualified Nozzle Inner Radius and Nozzle-to-Shell Weld UT Procedures Using EPRI Computer Models-2002-2007	Plant-Specific Applications of Qualified Nozzle Inner Radius and Nozzle-to-Shell Weld UT Procedures Using EPRI Computer Models	12/31/08
NDE	RPV Plate Manual Phased Array Procedures - Expand Qualification	Manual Phased Array Procedures for RPV Inspections	12/31/08
NDE	PDI Program Maintenance -2008	PDI Program Maintenance	12/31/08
NDE	HX Tube Support Plate Wastage Characterization Using Eddy Currant Tubes	HX Tube Support Plate Wastage Characterization	12/31/08
PWROG	CRDM TGSCC Industry Report Completion and Development of Best Practices Guidance for Stainless Steel Piping and Components (PA-MSC-0202)	Industry report and best practice guidance.	January 2008 For Industry Report and NP Version of Best Practice. P version of Best Practice later in 2008.
PWROG	Plant Applicability Evaluation and Operability Assessment of the Westinghouse Pressurizer Heater Assembly Failure at Braidwood Unit 1 to the Remaining Westinghouse Designed Pressurizers (PA-MSC-0316)	Report – plant applicability evaluation and operability assessment, inspection recommendations	April 2008
PWROG	Development of Stainless Steel Industry Roadmap (PA-MSC-0398)	Industry SS Roadmap	April 2008
PWROG	Thermal Sleeve Wear Evaluation for W Designed Plants (PA-MSC-0388)	Report – Thermal sleeve wear evaluation and inspection recommendations	March 2008
PWROG	MIRVP Specimen Final Resolution (PA-MSC-0374)	Letter Report – Charpy test results, shipment and storage documentation	June 2008
PWROG	B&W RV Internals Structural Bolt Evaluations: Phase II (PA-MSC-0350)	Report - detailed technical information to assist in inspection planning, contingency replacement planning, and analytical evaluations to support volumetric inspection of Babcock & Wilcox (B&W) nuclear power plant reactor vessel (RV) internals structural bolts	August 2008
PWROG	OTSG – Site Specific Performance Demonstration (SSPD) Database (PA-MSC-0322)	Updated Utility Hard Drives – Compilation of the different ECT defects associated with the B&W plant steam generators along with specific questions and appropriate answers from the site specific ECT guidelines	January 2008

<b>Issue Program</b>	<b>Document Title</b>	<b>Subject</b>	<b>Scheduled Delivery</b>
PWROG	RPV Surveillance Program for Extended Operating Period (PA-MS-0324)	Preparation of a roadmap of codes, standards and regulations that apply specifically to PWR surveillance programs and in general to reactor vessel integrity.	April 2008
PWROG	RV Primary Nozzle Weld Inlay PDI Equivalency Testing and Process Qualification (PA-MS-0298)	Letter Report - PDI equivalency testing	January 2008 for Task 1
PWROG	RV ISI Extension Program (MUHP 5097-99, Task 2059)	Report – NRC approved topical report that extends the RV ISI interval from 10 to 20 years	March 2008
PWROG	Testing of CASS Material for Thermal/Irradiation Embrittlement	Report - Documentation of the testing performed on the available CASS materials to generate technical data in support of an industry response.	February 2008
SGMP	Technical Report - Divider Plate Cracking in Steam Generators: Phase II Results		Dec-08
SGMP	Technical Report - Steam Generator Tubing Outside Diameter Stress Corrosion Cracking at Tube Support Plates Database for Alternate Repair Limits, Addendum 7		Dec-08
SGMP	Software - Model Assisted POD		Dec-08
SGMP	Software package updates and customer support		Dec-08
SGMP	Develop web based QDA/PDD application		Dec-08
SGMP	Rapid response to provide staff time and other technical support of limited scope from the EPRI NDE Center to SGMP members		Dec-08
SGMP	SG NDE Workshop and its proceedings		Dec-08
SGMP	Document technique performance and maintenance of existing techniques		Dec-08
SGMP	Maintenance of the QA program for ETSS information		Dec-08
SGMP	Maintenance of the SGMP content on EPRIQ.com		Dec-08
SGMP	Technical Report - Data union validation		Dec-08
SGMP	Technical Report - Phased array UT applicability for divider plate PWSCC		Dec-08

<b>Issue Program</b>	<b>Document Title</b>	<b>Subject</b>	<b>Scheduled Delivery</b>
SGMP	Technical Report - Wear coefficients for alloy 690 and stainless steel tube support plate material		Mar-08
SGMP	Technical Report - Thermal-Hydraulics and Studies of Foreign Objects in a PWR Steam Generator		Mar-08
SGMP	Technical Report - Wear coefficients for Alloy 690 / Foreign Objects and for Alloy 600 MA / Carbon Steel Support Material		Dec-08
SGMP	Steam Generator Degradation Database, Version 5.5		Dec-08
SGMP	Steam Generator Degradation Database Progress Report, Revision 16		Dec-08
SGMP	Letter - TSS Committee recommendations on the need to revise EPRI Primary to Secondary Leak (PSL) Guidelines, Rev 3		May-08
SGMP	Technical Report - Technical Bases Evaluation of Chemistry Effects on SCC Behavior of Different Steam Generator Tube Alloys		Dec-08
SGMP	Technical Report - PWR Secondary Water Chemistry Guidelines, Revision 7 (Collaboration with WCC)		Dec-08
SGMP	Technical Update - Lead Identification, Control, and Removal Collaboration		Dec-08
SGMP	Technical Report - Zinc Effects on Steam Generator PWSCC		Dec-08
SGMP	Technical Report - An Evaluation of Time Dependent Leak rates in Degraded Steam Generator Tubing		Dec-08
SGMP	Technical Report - Report on the qualification of the AutoArray software on the X-Probe AAPDD		Mar-08
SGMP	Software - AutoAnalysis, Ver 4.0		Mar-08
SGMP	Report on the qualification of the AutoRPC software on the Rotating Probe AAPDD		Mar-08
SGMP	Technical Update - Development of Standardized Process for Determining Examination Technique Equivalency		Mar-08

<b>Issue Program</b>	<b>Document Title</b>	<b>Subject</b>	<b>Scheduled Delivery</b>
WCC	PWR Secondary Water Chemistry Guidelines – Revision 7 (with SGMP)		Dec 2008
WCC	Assessment of PWR Fuel Crud Reaction Kinetics during Shutdown		Dec 2008
WCC	PWR Monitoring and Assessment		Dec 2008
WCC	ChemWorks ChemTools, Version 2.0		Dec 2008
WCC	BWR Water Chemistry Guidelines – 2008 Revision (with BWRVIP)		Dec 2008
WCC	Capillary Electrophoresis for BWR Anion Analysis		Sep 2008
WCC	Impact of Hydrazine, Oxygen and Temperature on Electrochemical Potential of Alloys 600 and 690, Stainless Steel 304 and 316 and Carbon Steel at PWR Startup Conditions		Sep 2008



## **ADDENDUM 3**

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## ADDENDUM 4

### Issues Management Table Gap Identification

O=open;      W=working;      C=closed

#### Assessment ITG Gaps

RANK	GAP ID NO.	GAP DESCRIPTION	STATUS (O, W, C)
1	<u>I&amp;E-06</u>	I&E Guidelines: Reactor Internals	W
4	<u>I&amp;E-04</u>	I&E Guidelines: Bottom Mounted Nozzles	W
10	<u>AS-13</u>	Thermal & Irradiation Embrittlement: Synergistic Effects on CASS & SS Welds - Internals	O
16	<u>AS-14</u>	Fluence Impact on SCC of Stainless Steels	W
18	<u>AS-17</u>	High Cycle Fatigue - Internals	O
19	<u>I&amp;E-05</u>	I&E Guidelines: Alloy 600 "Orphan" Locations	C
23	<u>AS-19</u>	PWSCC Management: Ni-Alloy Reactor Internals	O
25	<u>AS-18</u>	Baffle Bolting Assessment	W
26	<u>AS-28</u>	Neutron Embrittlement of Nozzle Forgings and Upper Shell Course	O
28	<u>AS-16</u>	Fatigue Environmental Effects: Reactor Internals	O
31	<u>AS-15</u>	Assess Void Swelling & Stress Relaxation Significance: PWR Reactor Internals	W
40	<u>AS-05</u>	Fluence Spectra Effects: C&LAS	W
45	<u>AS-04</u>	Irradiation Embrittlement: Clad LAS	W
49	<u>DM-04</u>	Irradiation Effects: Nickel Alloys (Reactor Internals)	O
52	<u>DM-03</u>	IASCC: Vessel Welds and Cladding	W
55	<u>DM-05</u>	Thermal Embrittlement: Alloy 600MA and Alloy 690TT	

#### Inspection ITG Gaps

RANK	GAP ID NO.	GAP DESCRIPTION	STATUS (O, W, C)
2	<u>I&amp;E-01</u>	NDE Technology: Dissimilar Metal (DM) Butt Welds	W
7	<u>I&amp;E-02</u>	NDE Qualification Program: Ni-Alloy Penetrations	W
8	<u>I&amp;E-11</u>	NDE Accessibility: Reactor Internals	W
12	<u>I&amp;E-12</u>	NDE Capability: CASS Piping	W
20	<u>I&amp;E-07</u>	UT Demonstration: Baffle Bolting	W
21	<u>I&amp;E-03</u>	NDE Capability: J-Groove Weld Locations	W
32	<u>I&amp;E-09</u>	NDE Capability: Void Swelling (Identification & Characterization)	O
33	<u>I&amp;E-08</u>	NDE Capability: Baffle Former Assembly IASCC	W
43	<u>I&amp;E-10</u>	NDE Capability: CRGT Support Pins	O

## BWRVIP Gaps

RANK	GAP ID NO.	GAP DESCRIPTION	STATUS (O,W,C)
1	<u>I&amp;E-07</u>	NDE Capability: RPV Drain Line	W
2	<u>AS-09</u>	Assess Impact of High Fluence & NMCA / HWC on Crack Growth Rates	W
3	<u>AS-10</u>	Assess the impact of NMCA and HWC on SCC Crack Growth Rates	W
4	<u>AS-17</u>	Evaluate Hidden Weld Locations (Thermal Sleeves)	W
5	<u>AS-18</u>	Jet Pump Degradation Management	W
6	<u>RG-04</u>	Integrated Surveillance Program (ISP) Maintenance	W
7	<u>MT-01</u>	Development of Alternative Mitigation Technologies	W
8	<u>MT-03</u>	High Fluence Effect on HWC & NMCA	W
9	<u>MT-06</u>	NMCA Durability & Long Term Effectiveness	W
10	<u>MT-02</u>	Demonstrate Improved ECP Model	W
11	<u>I&amp;E-02</u>	NDE Capability: Hidden Locations (Thermal Sleeves & Piping)	O
12	<u>AS-21</u>	Assess Adequacy of FAC Modeling for RPV Drain Line	W
13	<u>MT-04</u>	On-Line NMCA	W
14	<u>RR-04</u>	Steam Dryer Repair Design Criteria	C
15	<u>DM-02</u>	SCC of "Resistant" SS	O
16	<u>RG-03</u>	Assess Top Guide Inspection Requirements	W
17	<u>AS-03</u>	Alternate ASME Section XI Appendix G Methodology	W
18	<u>AS-07</u>	Environmental Fatigue Issues: Pressure Boundary Components	W
19	<u>MT-05</u>	Startup & Shutdown Chemistry	W
20	<u>AS-01</u>	RAMA Code Validation	W
21	<u>I&amp;E-05</u>	NDE Capability: Appendix VIII Compliance	O
22	<u>AS-15</u>	High Cycle Fatigue: Reactor Internals	O
23	<u>RR-02</u>	Develop Welding Processes for Repair of Irradiated Material	W
24	<u>AS-06</u>	Neutron Embrittlement of Nozzle Forgings	C
25	<u>I&amp;E-03</u>	NDE Capability: Shroud Support Locations	O
26	<u>DM-04</u>	NMCA Plant Corrosion Products	C
27	<u>I&amp;E-01</u>	NDE Capability: Core Plate Rim Hold Down Bolts	W
28	<u>I&amp;E-04</u>	I&E Guidance: AHCs	C
29	<u>AS-02</u>	NDE Coverage: RPV Axial Welds	W
30	<u>AS-14</u>	Fatigue Environmental Effects: Reactor Internals	O
31	<u>AS-12</u>	Thermal & Irradiation Embrittlement: Synergistic Effects (on CASS BWR Reactor Internals)	W
32	<u>I&amp;E-06</u>	NDE Capability: CASS Piping	O
33	<u>RR-01</u>	Roll / Expansion Repair Technique Approval	C
34	<u>AS-19</u>	In-Vessel Fastener Loosening	O
35	<u>AS-23</u>	Mechanical (Vibratory) Fatigue: Small Bore Piping	O
36	<u>AS-05</u>	Fluence Spectra Effects: C&LAS	O
37	<u>DM-01</u>	Environmentally Assisted Cracking: LAS	W
37	<u>RG-02</u>	Thermal Embrittlement of CASS Piping	O
39	<u>AS-04</u>	Embrittlement: C&LAS	O

Rank	Gap ID	LOW PRIORITY GAPS	Status (O,W,C)
40	<u>AS-13</u>	High Fluence Impact: Nickel-Base Alloys	O
41	<u>AS-22</u>	High Cycle Fatigue - Piping Locations	W
42	<u>DM-03</u>	Low Temperature Crack Propagation	O
43	<u>RR-03</u>	Access Hole Cover Repair Design Criteria	W
44	<u>AS-11</u>	Assess Fast Reactor Data Applicability to BWR Environment	O
45	<u>DM-05</u>	Thermal Embrittlement of Nickel Alloys	O
46	<u>AS-20</u>	Assess Non-Safety Locations	O
47	<u>AS-08</u>	High Cycle Fatigue: RPV Locations	O
48	<u>RG-01</u>	IGSCC of Small Bore Piping (SBP)	O
49	<u>AS-16</u>	Loose Parts Assessment	O
50	<u>AS-25</u>	TGSCC of Cladding via H Embrittlement Mechanism	O
51	<u>AS-24</u>	Corrosion of C&LAS Piping Locations	O

### Mitigation/Testing ITG Gaps

RANK	GAP ID NO.	GAP DESCRIPTION	STATUS (O, W, C)
3	<u>MT-01</u>	PWSCC Mitigation: Environmental Controls	W
9	<u>MT-03</u>	PWSCC Mitigation: Stress Improvement (SI) of Butt Welds	W
14	<u>AS-11</u>	Assess PWSCC CGRs for Alloys 82, 182, 132, 52, and 152.	W
15	<u>AS-09</u>	PWSCC: Stainless Steels (Exposed to Primary Water)	W
22	<u>AS-01</u>	Boric Acid Corrosion: C&LAS	W
24	<u>AS-12</u>	PWSCC Factors of Improvement (FOIs): "Resistant" Ni-Alloys	W
27	<u>MT-02</u>	PWSCC Mitigation: Stress Improvement (SI) of Alloy 600 Penetrations	W
50	<u>DM-02</u>	Low Temperature Crack Propagation	W
53	<u>DM-01</u>	Environmentally Assisted Cracking: LAS	O

### Technical Support Committee Gaps

RANK	GAP ID NO.	GAP DESCRIPTION	STATUS (O, W, C)
5	<u>AS-07</u>	Vibration Fatigue: Small Bore Piping	O
6	<u>AS-02</u>	Environmental Fatigue Issues: Press. Bdry. Components	W
11	<u>AS-27</u>	Develop Alternative ASME Section XI Appendix G Methodology	W
29	<u>AS-08</u>	Fatigue Effects: Mixing	O
34	<u>AS-29</u>	Assess High Cycle Fatigue Potential for RPV Safety Injection and Core Flood Line Locations	O
40	<u>AS-06</u>	Pressurized Thermal Shock (PTS) Re-Evaluation	W
46	<u>AS-03</u>	Thermal Fatigue: Vessel Streaming	W
57	<u>RG-01</u>	Small Bore Piping (SBP): License Renewal Assessment	W

### PWROG Materials Subcommittee Gaps

<b>RANK</b>	<b>GAP ID NO.</b>	<b>GAP DESCRIPTION</b>	<b>STATUS (O, W, C)</b>
3	<u>MT-01</u>	PWSCC Mitigation: Environmental Controls	O
9	<u>MT-03</u>	PWSCC Mitigation: Stress Improvement (SI) of Butt Welds	O
15	<u>AS-09</u>	PWSCC: Stainless Steels (Exposed to Primary Water)	W
20	<u>I&amp;E-07</u>	UT Demonstration: Baffle Bolting	O
25	<u>AS-18</u>	Baffle Bolting Assessment	O
40	<u>AS-05</u>	Fluence Spectra Effects: C&LAS	O
57	<u>RG-01</u>	Small Bore Piping (SBP): License Renewal Assessment	O



## **ADDENDUM 5**

### **Materials Initiative “Mandatory” and “Needed” Documents**

Materials Issue Program (IP) guidance on various aspects of materials management is found in documents and letters issued by the IPs and incorporated within the Materials Initiative. The following tables are a “Roadmap” that point to the IP documents that contain detailed information. Each of the Materials IPs is listed below along with their documents that either define the “Mandatory” and “Needed” guidance for their issues or themselves serve as a roadmap to more detailed requirements in sub-tier documents. The documents listed below must be used to identify the actual requirements.

Documents listed under the table heading “Documents Incorporated Within the Materials Initiative” were published prior to approval of the Materials Initiative, but have been accepted under the Initiative and carry its commitment. Although elements within these guidelines may not be classified as “Mandatory” or “Needed”, meeting the intent of these documents is expected.

Documents listed under the table heading “Documents Approved Under the Materials Initiative” have been published since the Materials Initiative was approved and carry a “Mandatory” or “Needed” classification as defined in the Implementation Protocol (Addendum D to NEI 03-08).

Justification for deviating from the intent of “Mandatory” or “Needed” elements in “Documents Approved Under the Materials Initiative” or from the intent of “Documents Incorporated Within the Materials Initiative” must follow the requirements described in the Implementation Protocol (Addendum D to NEI 03-08) or similar requirements as defined by the IP responsible for the guideline. In accordance with the Implementation Protocol, all deviation justifications must be transmitted to the IP responsible for the associated guideline.

The following list is accurate as of the date of this report. An up-to-date list of IP documents that are governed by the Materials Initiative is maintained by NEI.

## Materials Initiative “Mandatory” and “Needed” Documents

### 1. Materials Initiative Documents

Doc Number	Rev	MRP Doc Title	Date	Implementation Level	Comments
Documents Incorporated Within the Materials Initiative					
None					
Documents Approved Under the Materials Initiative					
NEI 03-08	1	Guideline for the Management of Materials Issues	April 2007	Mandatory	Documentation of the Materials Initiative
NEI 03-08 Addendum A	1	RCS Materials Management Program Guidelines	April 2007	Needed	

### 2. EPRI Materials Reliability Project (MRP)

Doc Number	Rev	MRP Doc Title	Date	Implementation Level	Comments
Documents Incorporated Within the Materials Initiative					
None					
Documents Approved Under the Materials Initiative					
MRP 2006-23		Management of Thermal Fatigue in Normally Stagnant Non-Isolable Reactor Coolant System Branch Lines	Aug 11, 2006	Needed	
MRP 2004-05		Needed Action for Visual Inspection of Alloy 600/82/182 Butt Welds and Good Practice Recommendations for Weld Joint Configurations	Apr 2, 2004	Needed	Letter
MRP-126	0	Generic Guidance for an Alloy 600 Management Plan	Aug 2004	Mandatory	
MRP-139		Primary System Piping Butt Welds Inspection and Evaluation Guideline	July 2005	Mandatory	

### Materials Initiative “Mandatory” and “Needed” Documents

Doc Number	Rev	MRP Doc Title	Date	Implementation Level	Comments
MRP-146	0	Management of Thermal Fatigue in Normally Stagnant Non-Isolable Reactor Coolant System Branch Lines	June 2005	Needed	
MRP 2007-013		MRP-132/146/170 Guidance Related to Heat Transfer Coefficients for Use in Stress Analysis	April 2, 2007	Needed	Letter
MRP 2007-038		MRP-139 Interim Guidance on <4” Volumetric Exam Requirements (Mandatory Element)	Nov 1, 2007	Mandatory	Letter
MRP 2007-039		MRP-139 Interim Guidance on Bare Metal Visual Exam Requirements (Mandatory Element)	Nov 1, 2007	Mandatory	Letter
MRP 2007-043		MRP-132/146/170 Supplemental Guidance Status and “Needed” Interim Guidance	Feb 6, 2008	Needed	Letter

### 3. EPRI BWR Vessel Improvement Project (BWRVIP)

Doc Number	Rev	BWRVIP Doc Title	Date	Implementation Level	Comments
Documents Incorporated Within the Materials Initiative					
BWRVIP-94	1	BWR Vessels and Internals Project, Program Implementation Guide	Dec 2005	Mandatory	Overall program guidance
BWRVIP-18-A		BWR Core Spray Internals Inspection and Flaw Evaluation Guidelines	Feb 2005	Needed	I&E Guideline
BWRVIP-25		BWR Core Plate Inspection and Flaw Evaluation Guidelines	Dec 1996	Needed	I&E Guideline
BWRVIP-26-A		BWR Top Guide Inspection and Flaw Evaluation Guidelines	Nov 2004	Needed	I&E Guideline
BWRVIP-27-A		BWR Standby Liquid Control System/Core Plate ΔP Inspection and Flaw Evaluation Guidelines	Aug 2003	Needed	I&E Guideline

### Materials Initiative “Mandatory” and “Needed” Documents

Doc Number	Rev	BWRVIP Doc Title	Date	Implementation Level	Comments
BWRVIP-38		BWR Shroud Support Inspection and Flaw Evaluation Guidelines	Sep 1997	Needed	I&E Guideline
BWRVIP-41	1	BWR Jet Pump Assembly Inspection and Flaw Evaluation Guidelines	2005	Needed	I&E Guideline
BWRVIP-42-A		BWR Vessel and Internals Project, LPCI Coupling Inspection and Flaw Evaluation Guidelines	Feb 2005	Needed	I&E Guideline
BWRVIP-47-A		BWR Lower Plenum Inspection and Flaw Evaluation Guidelines	Nov 2004	Needed	I&E Guideline
BWRVIP-48-A		BWR Vessel and Internals Project, Vessel ID Attachment Weld Inspection and Flaw Evaluation Guidelines	Nov 2004	Needed	I&E Guideline
BWRVIP-49-A		BWR Vessel and Internals Project, Instrument Penetration Inspection and Flaw Evaluation Guidelines	Mar 2002	Needed	I&E Guideline
BWRVIP-74-A		BWR Reactor Pressure Vessel Inspection and Flaw Evaluation Guidelines for License Renewal	Jun 2003	Needed	I&E Guideline (license renewal only)
BWRVIP-76		BWR Core Shroud Inspection and Flaw Evaluation Guidelines	Nov 1999	Needed	I&E Guideline
<del>BWRVIP-104</del>		<del>BWR Vessel and Internals Project, Evaluation and Recommendations to Address Shroud Support Cracking in BWRs</del>	<del>Sep 2002</del>	<del>Needed</del>	Withdrawn
BWRVIP-138		BWR Vessel and Internals Project, Updated Jet Pump Beam Inspection and Flaw Evaluation Guidelines	Dec 2004	Needed	I&E Guideline
BWRVIP-139		BWR Vessel and Internals Project, Steam Dryer Inspection and Flaw Evaluation Guidelines	2005	Needed	I&E Guideline
BWRVIP-02 - A	2	BWR Core Shroud Repair Design Criteria	2005	Needed	Repair Design Guidelines
BWRVIP-04-A		BWR Vessel and Internals Project, Guide for Format and Content of Core Shroud Repair Design Submittals	Apr 2002	Needed	Repair Design Guidelines

**Materials Initiative “Mandatory” and “Needed” Documents**

<b>Doc Number</b>	<b>Rev</b>	<b>BWRVIP Doc Title</b>	<b>Date</b>	<b>Implementation Level</b>	<b>Comments</b>
BWRVIP-16-A		BWR Vessel and Internals Project, Internal Core Spray Piping and Sparger Replacement Design Criteria	2005	Needed	Repair Design Guidelines
BWRVIP-19-A		BWR Vessel and Internals Project, Internal Core Spray Piping and Sparger Repair Design Criteria	2005	Needed	Repair Design Guidelines
BWRVIP-50-A		BWR Vessel and Internals Project, Top Guide/Core Plate Repair Design Criteria	2005	Needed	Repair Design Guidelines
BWRVIP-51-A		BWR Vessel and Internals Project, Jet Pump Repair Design Criteria	2005	Needed	Repair Design Guidelines
BWRVIP-52-A		BWR Vessel and Internals Project, Shroud Support and Vessel Bracket Repair Design Criteria	2005	Needed	Repair Design Guidelines
BWRVIP-53-A		BWR Vessel and Internals Project, Standby Liquid Control Line Repair Design Criteria	2005	Needed	Repair Design Guidelines
BWRVIP-55-A		BWR Vessel and Internals Project, Lower Plenum Repair Design Criteria	2005	Needed	Repair Design Guidelines
BWRVIP-56-A		BWR Vessel and Internals Project, LPCI Coupling Repair Design Criteria	2005	Needed	Repair Design Guidelines
BWRVIP-57-A		BWR Vessel and Internals Project, Instrument Penetrations Repair Design Criteria	2005	Needed	Repair Design Guidelines
BWRVIP-58-A		BWR Vessel and Internals Project, CRD Internal Access Weld Repair	2005	Needed	Repair Design Guidelines
BWRVIP-84		BWR Vessel and Internals Project, Guidelines for Selection and Use of Materials for Repairs to BWR Internal Components	Oct 2000	Needed	Repair Design Guidelines
BWRVIP-95-A		BWR Vessel and Internals Project, Guide for Format and Content of BWRVIP Repair Design Submittals	2005	Needed	Repair Design Guidelines
BWRVIP-97		BWR Vessel and Internals Project, Guidelines for Performing Weld Repairs to Irradiated BWR Internals	Nov 2001	Needed	Repair Design Guidelines

### Materials Initiative “Mandatory” and “Needed” Documents

Doc Number	Rev	BWRVIP Doc Title	Date	Implementation Level	Comments
BWRVIP-03	8	BWR Vessel and Internals Project, Reactor Pressure Vessel and Internals Examination Guidelines	2005	Needed	Supporting Documents
BWRVIP-14		BWR Vessel and Internals Project, Evaluation of Crack Growth in BWR Stainless Steel RPV Internals	Mar 1996	Needed	Supporting Documents
BWRVIP-59		BWR Vessel and Internals Project, Evaluation of Crack Growth in BWR Nickel Base Austenitic Alloys in RPV Internals	Dec 1998	Needed	Supporting Documents
BWRVIP-60-A		BWR Vessel and Internals Project, Evaluation of Stress Corrosion Crack Growth in Low Alloy Steel Vessel Materials in the BWR Environment	Jun 2003	Needed	Supporting Documents
BWRVIP-62		BWR Vessel and Internals Project, Technical Basis for Inspection Relief for BWR Internal Components with Hydrogen Injection	Dec 1998	Needed	Supporting Documents
BWRVIP-80		BWR Vessel and Internals Project, Evaluation of Crack Growth in BWR Shroud Vertical Welds	May 2000	Needed	Supporting Documents
BWRVIP-99		BWR Vessel and Internals Project, Crack Growth Rates in Irradiated Stainless Steels in BWR Internal Components	Dec 2001	Needed	Supporting Documents
BWRVIP-100-A		BWR Vessel and Internals Project, Updated Assessment of the Fracture Toughness of Irradiated Stainless Steel for BWR Core Shrouds	Aug 2006	Needed	Supporting Documents
BWRVIP-130		BWR Water Chemistry Guidelines – 2004 Revision	Oct 2004	Mandatory	Supporting Documents
Documents Approved Under the Materials Initiative					
2006-112		BWRVIP Recommendation to Inspect Core Shroud Tie Rod Repairs	Mar 29, 2006	Needed	Letter
2006-345		BWRVIP 'BWR Mitigation Performance Indicator	July 19, 2006	Needed	Letter

**Materials Initiative “Mandatory” and “Needed” Documents**

Doc Number	Rev	BWRVIP Doc Title	Date	Implementation Level	Comments
2006-488		Interim Review of the BWR Water Chemistry Guidelines - 2004 Revision	Nov 15, 2006	Needed	Letter
BWRVIP-139		BWR Vessel and Internals Project, Steam Dryer Inspection and Flaw Evaluation Guidelines	Apr 2005	Needed	
BWRVIP-159		BWR Vessel and Internals Project, HWC/NMCA Experience Report and Application Guidelines	Nov 2006	Needed	
2006-112		BWRVIP Recommendation to Inspect Core Shroud Tie Rod Repairs	Mar 29, 2006	Needed	Letter
2006-220		BWRVIP Recommendation to Inspect Core Shroud Tie Rod Repairs	Apr 3, 2006	Needed	Letter
2006-288		BWRVIP Recommendation to Inspect Core Shroud Tie Rod Repairs	May 30, 2006	Needed	Letter
2006-345		BWR Mitigation Performance Indicator	Jul 19, 2006	Needed	Letter
2006-488		Interim Review of the BWR Water Chemistry Guidelines – 2004 Revision	Nov 15, 2006	Needed	Letter
BWRVIP-168		BWR Vessel and Internals Project, Guidelines for Disposition of Inaccessible Core Spray Piping Welds in BWR Internals	Mar 2007	Needed	
2007-367		Recommendations Regarding Dissimilar Metal Weld Examinations (Includes Needed Requirement per NEI 03-08)	Dec 4, 2007	Needed	Letter

**4. EPRI Steam Generator Management Project (SGMP)**

Doc Number	Rev	SGMP Doc Title	Date	Implementation Level	Comments
Documents Incorporated Within the Materials Initiative					
	5				

### Materials Initiative “Mandatory” and “Needed” Documents

Doc Number	Rev	SGMP Doc Title	Date	Implementation Level	Comments
Documents Approved Under the Materials Initiative					
1008224	6	PWR Secondary Water Chemistry Guidelines	Dec 2004	Mandatory	
1008219	3	PWR Primary to Secondary Leak Guidelines	Dec 2004	Mandatory	
NEI 97-06	2	Steam Generator Program Guidelines	August 2005	Mandatory	
1012987	2	Steam Generator Integrity Assessment Guidelines	July 2006	Mandatory	
SGMP-IG-06-01	n/a	Interim Guidance to the Steam Generator Degradation Specific Flaw Handbook	October 26, 2006	Needed	To be implemented with Rev 2 of IA G/L
SGMP-IG-06-02	n/a	Interim Guidance Regarding Minimum Feedwater Hydrazine Concentration for Plants with Once-Through Steam Generators	October 27, 2006	Needed	Effective immediately
SGMP-IG-07-01	n/a	Interim Guidance Regarding EPRI Steam Generator Integrity Assessment Guidelines, Revision 2	April 23, 2007	Needed	Implement w/in 6 or 9 months
1014983	3	EPRI Steam Generator In Situ Pressure Test Guidelines	August 2007	Mandatory	Implement w/in 6 or 9 months
1015482	2	Steam Generator Management Program Administrative Procedure	September 2007	Needed	Implement w/in 3 or 6 months
1013706	7	Pressurized Water Reactor Steam Generator Examination Guidelines	October 2007	Mandatory	Implement by 9/1/2008
1014986	6	Pressurized Water Reactor Primary Water Chemistry Guidelines	December 2007	Mandatory	



**Materials Initiative “Mandatory” and “Needed” Documents**

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**5. EPRI Water Chemistry Control Program**

Doc Number	Rev	Water Chem Doc Title	Date	Implementation Level	Comments
None					

**6. EPRI Non-Destructive Examination Program (NDE)**

Doc Number	Rev	NDE Doc Title	Date	Implementation Level	Comments
None					

**7. EPRI Corrosion Research**

Doc Number	Rev	Corr Research Doc Title	Date	Implementation Level	Comments
None					

## Materials Initiative “Mandatory” and “Needed” Documents

### 8. PWR Owners Group

Doc Number	Rev	WOG Doc Title	Date	Implementation Level	Comments
Documents Incorporated Within the Materials Initiative					
WOG 04-189	N/A	WOG CE Fleet Pressurizer Heater Sleeve Inspection Commitments	Apr 8, 2004	N/A	Letter
Documents Approved Under the Materials Initiative					
WCAP-15988-NP	1	Generic Guidance for an Effective Boric Acid Inspection Program for Pressurized Water Reactors	Feb 2005	Mandatory	
WCAP-16423-NP	0	Standard Process and Methods for Calculating RCS Leak Rate for Pressurized Water Reactors	Sep 2006	Needed	Approved as “Needed” on June 7, 2007
WCAP-16465-NP	0	Standard RCS Leakage Action Levels and Response Guidelines for Pressurized Water Reactors	Sep 2006	Needed	Approved as “Needed” on June 7, 2007
FANP-05-1135	0	Bottom Mounted Nozzle Inspection Guidance	Apr 2005	Mandatory	
51-5030027-01	1	Evaluation of RV Internals Bolting for the B&WOG	May 2005	Needed	
51-50033700-01	1	CRDM Life Extension Action Plan	Dec 2002	Needed	

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## ADDENDUM 7

### Collection and Allocation of the Materials Initiative Funding Pool

IP	Project	Budget	Status
BWRVIP	On line noble metal chemical application	Removed funding	All work <b>completed</b> and final reports issued 9/05 <ul style="list-style-type: none"> <li>“BWRVIP-143: BWRVIP Vessel and Internals Project, On-Line Noble Metal Chemical Application Generic Technical Safety Evaluation,” EPRI Technical Report 1011698, June 2005.</li> <li>“BWRVIP-144: BWR Vessel and Internals Project, Description and Installation on In-Reactor Noble Metal Surface/Crack Deposition Monitoring Device,” EPRI Technical Report 1011707, August 2005.</li> </ul>
BWRVIP	Fracture toughness in high fluence BWR materials	Removed funding	MIF portion of work <b>completed</b> 12/05 Project to continue with BWRVIP funding Interim report on MIF portion of work published in March 2006. “BWRVIP-154 Fracture Toughness in High Fluence BWR Materials – Progress Report for 2005”.
BWRVIP	Crack growth in high fluence BWR matls	Removed funding	MIF portion of work completed 9/06 Project to continue with BWRVIP funding Interim report published in March 2006. “BWRVIP-153 Crack Growth in High Fluence BWR Materials – Progress Report for 2005.
Chem Con	Mitigation of SG fouling	Removed funding	This project is a field-trial and schedule has been driven by plant availability Trial was completed in late 2006. Final report was published in June 2007. Follow-on work being funded by Water Chemistry Control Program. Completion of NSSS vendor reviews for long-term use is funded through SGMP
Corr Res	Initiation of EAC and growth of short cracks	Removed funding	All MIF-funded work <b>completed</b> in 2005 – final report published 12/05 Follow-on work is being funded by EPRI Corrosion Research Program
Corr Res	Interaction between local deformation and EAC	Removed funding	MIF-funded portion of work <b>completed</b> in 2005 – final report published 12/05 Follow-on work is being funded by EPRI Corrosion Research Program
FRP	Impact of BWR water chemistry on fuel performance	Removed funding	<ul style="list-style-type: none"> <li>This project was transferred to the Zero Defect Fuels Initiative</li> </ul>
Corr Res	Completion of MDM for PWR components	Removed funding	Scope expanded from \$200K to \$350K to develop information ‘portal’ concept All work <b>completed</b> in 05, final portal development transferred to EPRI Corrosion Research Program
MRP	Completion of IMT for PWR components	Removed funding	Initiative funding work <b>completed</b> in fall of 2005 Additional MRP funding of ~\$700K added PWR IMT scheduled for initial completion in April 2006 (prioritization of gaps remain to be done).
MRP	Fundamental research	Removed	Initiative funding work <b>completed</b>

IP	Project	Budget	Status
	on PWSCC*	funding	
MRP	Managing PWSCC in A82/182 butt welds	Removed funding	Technical work <u>complete</u> . Final report issued.
MRP	IGSCC of SS Piping in a PWR Environment	Removed funding	Technical Report summarizing field events and laboratory data has been completed. Destructive examination work on the Braidwood sample is on-going and will be completed in 2008.
NDE	EMAT development	Removed funding	After preliminary feasibility studies it has been determined that this technology is not worth pursuing further at this time. This project is considered <u>complete</u> for the purposes of MIF funding status. Approximately \$550K returned to the MIF.
NDE	UT of DMW with rough surfaces	Removed funding	This is a three phase project with phases one and two to be covered by this original scope. Phases one and two <u>complete</u> ; phase 3 has been funded using 2007 MEOG funds.
NDE	UT phased array of DMW	Removed funding	All work <u>completed</u> . Qualification(s) successful and final report issued 12/05.
NDE	DMW quals with realistic crown conditions	Removed funding	Several weld specimens have been fabricated and are now available. Additional samples will be fabricated as other NDE projects identify promising techniques for examining DM welds and as appropriate weld configurations are identified. Detailed status of this project is provided in the Quarterly MIF Status Report.
NDE	UT transducer research	Removed funding	Ten new probe designs have been fabricated and successfully used in the field; additional prototypes have been qualified and are ready for deployment. Project is <u>complete</u> .
NDE	Surface exam of nickel alloy welds	Removed funding	All work successfully <u>completed</u> in 2005. Three advanced ECT methods were successfully demonstrated for augmenting weld inspections.
NDE	NDE technology and measurement of SCC	Removed funding	All work <u>complete</u> – report published 2/06. Feasibility of early detection and characterization of SCC susceptibility proved.
NDE	Issues for Overlays on Alloy 82/182 Butt Welds	Removed funding	Specimen designed and fabricated. Experienced a delay due to welding contractor commitments to Fall 2007 overlays in the field. NDE Program has approved \$191k in 2008 budget to complete this work.
NDE	In-situ Measurement of Bolt Pre-load	Removed funding	Complete. Vibration acoustic method and impact method found to be feasible. Technique development funded for 2008 by NDE Program
NDE	Development and Qualification of a Fieldable System for UT of Rough or Wavy DM Welds	Removed funding	Augmented by ~600k EPRI Technology Innovation funds. Instrument development to be complete mid-February 2008. Completion (including qualification) targeted for September 2008. Development is progressing well but there is still considerable technical risk; when we reach the qualification step, we will know
PWROG	Plant Applicability Evaluation and Operability Assessment of the W Pressurizer Heater Assembly	Removed funding	The program is broken down into 6 tasks.  <b><u>Task 1: Short Term Operability Assessment and Inspection Recommendations</u></b> - Funded by the PWROG and is complete. Final letter report sent out on 11/10/2006 under OG-06-369. ( <b>Complete</b> )



IP	Project	Budget	Status
	Failure at Braidwood Unit 1		<p><b><u>Task 2: Manufacturing Design Information</u></b> – Final WCAP sent out under OG-07-351. <b>(Complete)</b></p> <p>The other 4 major tasks are in progress with a revised end date of 4/30/08. The other 4 major tasks are as follows:</p> <p><u>Task 3: Operability and Risk Assessments</u></p> <p><u>Task 4: Crevice Chemistry and Operating Parameters</u></p> <p><u>Task 5: Inspection Recommendations</u></p> <p><u>Task 6: NRC Interactions</u></p>
SGMP	Crack samples for NDE qualifications	Removed funding	<p>SGMP has contributed additional funding to this project. Specimen fabrication is complete. SGMP funding will be used to issue a report. MIF funds were fully expended by 12/07.</p>