Advanced Nuclear Technology (ANT) Program

ANT APC Meeting

January 31-February 1, 2012
Advanced Nuclear Technology (ANT) Program

Introductions / Meeting Objectives / ANT Program Status

Gene Grechck, ANT APC Vice Chair
Jeff Hamel, EPRI Program Manager

San Diego, CA
January 31-February 1, 2012
Winter 2012 APC Meeting Primary Objectives

• Review and Discuss All Projects Completed in 2011
• Review and Discuss Active Projects Continuing into 2012
  – Approve 2012 Plan
• Review Prioritized 2012 Candidate Tasks
  – Approve 2012 Plan
• Review and Prioritize “NEW SET” of 2012 Candidate Tasks
  – Approve 2012 Plan

<table>
<thead>
<tr>
<th>TIME</th>
<th>TOPIC</th>
<th>SPEAKER</th>
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<tbody>
<tr>
<td>1:00 p.m.</td>
<td>Introduction/Meeting Objectives/ANT Program Status</td>
<td>Gene Grecheck, Dominion Jeff Hamel, EPRI</td>
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<tr>
<td>1:15 p.m.</td>
<td>Review all projects completed in 2011</td>
<td>EPRI ANT Staff</td>
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<tr>
<td>2:15 p.m.</td>
<td>Review all Active Projects Continuing into 2012</td>
<td>EPRI ANT Staff</td>
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<tr>
<td>4:30 p.m.</td>
<td>Discuss and Finalize 2012 Active Project List</td>
<td>All</td>
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<tr>
<td>5:30 p.m.</td>
<td>Adjourn / Dinner</td>
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## Agenda – Day 2 Morning – February 1st, 2012

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<thead>
<tr>
<th>TIME</th>
<th>TOPIC</th>
<th>SPEAKER</th>
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<tbody>
<tr>
<td>8:00 a.m.</td>
<td>2012 Candidate Tasks – Final Review</td>
<td>EPRI ANT Staff</td>
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<tr>
<td>10:00 a.m.</td>
<td>Break</td>
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<tr>
<td>10:30 a.m.</td>
<td>2012 Candidate Tasks – Discussion and Final Ranking</td>
<td>All</td>
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<tr>
<td>12:00 Noon</td>
<td>Lunch</td>
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# Agenda – Day 2 Afternoon – February 1st, 2012

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<thead>
<tr>
<th>TIME</th>
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<tbody>
<tr>
<td>1:00 p.m.</td>
<td>Financial Review and 2012 Proposed Project Funding Plan</td>
<td>Jeff Hamel, <em>EPRI</em></td>
</tr>
<tr>
<td>1:45 p.m.</td>
<td>Strategic Discussion – 2013 Program Focus</td>
<td>Jeff Hamel, <em>EPRI</em></td>
</tr>
<tr>
<td>2:00 p.m.</td>
<td>ANT / Bellefonte Collaboration</td>
<td>Dean Baker, TVA</td>
</tr>
<tr>
<td>2:30 p.m.</td>
<td>Meeting Action Items / Open Discussion / Upcoming Events</td>
<td>Jeff Hamel, <em>EPRI</em></td>
</tr>
<tr>
<td>3:00 p.m.</td>
<td>Adjourn</td>
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<tr>
<td>3:00 p.m.</td>
<td>ANT Member Only Feedback Session</td>
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ANT APC Advisory and Project Structure

- Chair & Vice Chair
  - Open
  - Gene Grecheck (Dom)

Executive Committee

APC Members (1 per member)

Integration Committee Members (IC)

Technical Advisory Group (TAG)

EPRI PMs/Staff

ANT Exec Sponsors

- Marilyn Kray (Exelon)
- Doug McComb (SNC)
- Plus Chair and Vice Chair

- Tom Mulford
- Jeffrey Hamel
- Ken Barry
- Letitia Midmore
- Alex Summe
- Matrixed SMEs *

* Subject Matter Experts
2012 ANT Operational Calendar

Winter APC Meeting (@NPC)
(San Diego: Jan 31 - Feb 1, 2012)
- Finalize budget for current CY
- Review status of ongoing R&D

Summer APC Meeting (@NPC)
(Atlanta: August 28-29, 2012)
- Review status of ongoing R&D
- Review new projects for next CY
  - Set priority list for next CY

Mid-Year Webcast
(June 14, 2012)
- Review status of ongoing work

End of Year Webcast
(Dec 6, 2012)
- Review status of ongoing work

Integration Committee (IC) Meetings New Task Development
(UK; Feb 16, 2012)
- Brainstorm needs of industry
- Discuss best us of ANT resources for next CY
(Seattle: May 21, 2012)
- Review DRAFT Task Proposals
  - Develop list for APC review
(Charlotte; March 21, 2012)
- Review DRAFT Task Proposals
  - Finalize list for APC review
(Washington, D.C.; August 8, 2012)
- Finalize DRAFT Task Proposals
  - Finalize list for APC review

Action Plan Committee (APC)
Integration Committee (IC)
Projected 2012 ANT Program Funding ($’s K)

Projected 2012 Total ANT Program Funding: $8,692K

- Utilities & Vendors: $4,925
- EPRI Leveraged Funds: $2,560
- EPRI Base: $922
- Other (External): $285
- DOE / NRC: $0

* Several joint projects under discussion
Current 2012 ANT Membership Breakdown
ANT – Aug. 2011 Customer Satisfaction Results

Overall Results

<p>| | |</p>
<table>
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<tr>
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<tbody>
<tr>
<td>Overall Performance</td>
<td>100%</td>
</tr>
<tr>
<td>Ease of Doing Business</td>
<td>100%</td>
</tr>
<tr>
<td>Technical Program Value</td>
<td>100%</td>
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Highlighted Weaknesses

<table>
<thead>
<tr>
<th></th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Support available to assist with using research results</td>
<td>69%</td>
</tr>
<tr>
<td>Proactive research planning (e.g., results ready when needed)</td>
<td>73%</td>
</tr>
<tr>
<td>Ease of understanding content of research results</td>
<td>80%</td>
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Focused Response -

- Increased IC engagement
- Quarterly updates for all projects
- Implementation of a Critical Industry Milestone for Candidate Tasks

More work to be done in 2012!
<table>
<thead>
<tr>
<th>Product ID</th>
<th>Product Name</th>
<th>Completion Date</th>
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</thead>
<tbody>
<tr>
<td>1022684</td>
<td>Elements of Pre-Operational and Operational Configuration Management for a New Nuclear Facility</td>
<td>4/30/2011</td>
</tr>
<tr>
<td>1023220</td>
<td>Alloy 690 Procurement Specification</td>
<td>6/30/2011</td>
</tr>
<tr>
<td>1023389</td>
<td>Evaluation of Seismic Hazards at Central and Eastern U.S. Nuclear Power Sites</td>
<td>7/1/2011</td>
</tr>
<tr>
<td>1023005</td>
<td>Startup Program and Technology Guideline</td>
<td>7/29/2011</td>
</tr>
<tr>
<td>1023502</td>
<td>Cybersecurity Procurement Benchmark</td>
<td>8/29/2011</td>
</tr>
<tr>
<td>1023622</td>
<td>1E Battery 80% Service Test</td>
<td>9/9/2011</td>
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## 2011 Published Reports (cont.)

<table>
<thead>
<tr>
<th>Product ID</th>
<th>Product Name</th>
<th>Completion Date</th>
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<tbody>
<tr>
<td>1022942</td>
<td>Data Conversion, Data Storage, and Records Management Study for NDE</td>
<td>9/27/2011</td>
</tr>
<tr>
<td>1022933</td>
<td>NDE Evaluation of Filmless Radiography</td>
<td>11/21/2011</td>
</tr>
<tr>
<td>1023004</td>
<td>Fire Protection Methods for HDPE Pipe</td>
<td>11/30/2011</td>
</tr>
<tr>
<td>1023010</td>
<td>Combinatorial Testing - Benchmark study report</td>
<td>11/30/2011</td>
</tr>
<tr>
<td>1023003</td>
<td>BWRVIA Assessment of the ABWR Design</td>
<td>12/23/2011</td>
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### 2011 Published Reports (cont.)

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<tr>
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<tbody>
<tr>
<td>1023006</td>
<td>Guidelines for Embedded Sensors in Concrete Structures</td>
<td>12/23/2011</td>
</tr>
<tr>
<td>1023007</td>
<td>Risk Informed Procurement - Test Cases for Various Designs</td>
<td>12/23/2011</td>
</tr>
<tr>
<td>1023008</td>
<td>Design Reliability Assurance Program (DRAP) Implementation Guidance and Template</td>
<td>12/23/2011</td>
</tr>
<tr>
<td>1023011</td>
<td>Human Factors Engineering (HFE) Training Course for New Plants</td>
<td>12/23/2011</td>
</tr>
<tr>
<td>1023012</td>
<td>Documentation of Environmental Assisted Fatigue (EAF) Knowledge Gaps</td>
<td>12/23/2011</td>
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EPRI’s ANT Program Website
http://www.epri.com/ant

Welcome, Jeffrey Hamel of Electric Power Research Institute (EPRI)

ANT > ANT
ANT | ANT Related Websites | ANT Products | ANT Active Projects

Member Log In

ANT Active Projects

ANT Products

Nuclear Program Overview
EPRI Nuclear Calendar
Related Web Sites (non-EPRI/affilate)

Advanced Nuclear Technology (ANT)

Overview
Siting, licensing, development, and deployment of new nuclear power plants are challenged by a host of technological, economic and regulatory concerns. Mitigating these concerns is critical to maintaining momentum along the nuclear development cycle.

EPRI's Advanced Nuclear Technology (ANT) Program focuses on developing the technologies and tools needed to deploy advanced nuclear plants in the near term, while pursuing research to support nuclear sustainability and growth in the long term, including the development of next-generation nuclear plants and integrated spent fuel management.

- Near-term Deployment of Advanced Light-water Reactors Supplemental Program Notice (pdf)
- ANT Program Overview (pdf)

What’s New
- New Plant Deployment Program Model (NPDPNI) Technical Summary
- EPRI Materials Management Matrix Project Technical Summary
- Utility Requirements Document Revision 9; Web Application and Technology Transfer—Web-Based URD Viewer Technical Summary
- Advanced Nuclear Technology (ANT) Margins and Monitoring Project Technical Summary

Contact Us
Action Items From August 2011 APC Meeting

- Concrete Placement Inspection Manual - make sure that rebar placement is included and make sure that the INPO experience and NRC Inspection guidelines are studied.  Working

- HDPE aging project - check to see if the BOPC projects can provide joint funds.  Complete

- Supplier Quality project - accelerate the project into 2012 only; pursue co-funding at EPRI (JUTG).  Complete

- Cyber Security project – provide a visible link between requirements to the original references.  Complete

- Spiral Wound HDPE for Circ Water project – make sure that the STP experience is understood before starting the project.  Working
Action Items From August 2011 APC Meeting

• Seismic Equipment Qualification- investigate leveraging with operating fleet. Complete

• Steam Generator Thermal Hydraulic Code project – split the 2012 budget into pre-specification and follow-on work. Complete

• Develop a detailed PIF for the three active projects that are requesting additional money for new scope items (Configuration Management, Design Software QA Methodology, and Stationary Battery project.) Complete

• Take the top 10 as above the line for 2012 and the 5 below the line tasks would be considered with the 5 below the line tasks from the May IC meeting. These will be ranked during the February 2012 meeting for final ranking for funding. Complete
Guidelines for Today / Tomorrow

• Ask questions; Get a good grasp of work underway in Active Projects
• Ask questions; Use “Protocol for Prioritizing” new projects as guide for areas to get better understanding of
• Engage with the EPRI Staff
• Engage with your fellow ANT Members
• Provide candid / constructive feedback to improve program
Advanced Nuclear Technology (ANT)

*Project Status Reports*
ANT Completed Projects
## Recent Activities

- Final Report Published – EPRI Report #1023008

## Final Deliverables

A guideline with industry consensus knowledge that can be incorporated into Owner/Operator DRAP Programs using the published templates and guidance.

## Application

EPRI Members will be able to incorporate industry consensus knowledge into their DRAP Program using the templates and guidance that will be published in the final report.
Recent Activities

- Survey prepared and sent to owners and vendors:
  - Identify buried lines expected to carry radioactive materials
  - Identify significant design parameters
  - 9 replies received
  - 3rd party assessment of responses
- Identified R&D, Code and regulatory changes that would be required to use double walled piping.

Final Deliverables

An evaluation, including technical and economic factors, on a plant specific and system specific basis of double wall versus other design options. Published in Technical Report #1023009.

Application

Required R&D and activities needed to effect Code and regulatory changes were identified for required funding. Buried tritiated lines where double-walled pipe offer advantages over other options will be identified to plant owners and new build vendors for implementation.
2011-12 BWRVIA Calculations for ABWR

Recent Activities
- BWRVIA input data for plant geometry has been completed
- Benchmarking data from hydrogen injection tests at TEPCO ABWR has been complied
- The model was modified to allow ABWR calculations
- Model calculations were performed
- Draft report was written and reviewed by STP
- Final report was completed Dec. 2011 (TR-1023003)

Final Deliverables
A final report was issued at the end of December 2011 summarizing the model inputs and calculation results.

Application
The results documented in the technical report can be applied to the current ABWR design and indicate the amount of hydrogen injection needed for ECP reduction and IGSCC mitigation of specific components in the ABWR design. Additional model calculations can be performed in the future if requested.
2010-12 HDPE for Above Ground Piping

**Recent Activities**

- Fire testing successful & complete:
  - Report published end of August 2011
  - Relatively small costs for added hose stream test - demonstrates proof of concept
- Seismic testing successful & complete:
  - Seismic modulus, damping, and vent & drain valves
  - Report published end of September 2011

**Final Deliverables**

- Project delivered 3 reports:
  - Evaluation of design methods for above ground HDPE piping (TR# 1021095)
  - Proof-of-concept fire testing (TR# 1023004)
  - Seismic testing (TR#1021095)
- Part of a bigger EPRI Project Portfolio to advance the use of HDPE in nuclear plants.

**Application**

Data from several of the tasks will be presented and reviewed with applicable ASME Code Committees for incorporation into the ASME Code. The data and test reports were made publically available for use and reference by the new build vendors, who were notified of their availability and distribution method. Plant designers will be able to evaluate HDPE for above ground use in future design applications.
The final deliverables associated with the MMM project were the APR1400 MMM report (1024568) and the consolidated gaps reports (1024567). These two reports complete a series of reports that provide material tables to inform owner/operations on long term operational success. The consolidated gaps reports will be used by the IC in 2012 to inform future research.

The results of the MMM project will have direct value to utilities who are pursuing a given design, as well as to the vendors responsible for a given design. The "Gaps and Opportunities" Section of the reports provide detailed "go do's" to improve overall materials performance of the design. In addition, the report provide a resource of value for reference by both senior and junior engineers as the design matures through licensing and into fabrication, construction and ultimately operations.
Recent Activities

- Developed the research plan for 2012 which has been reviewed by the ANT Integration Committee (IC)
- Proposed as a 2012 project to begin research on hooked bars (2012-O)

Final Deliverables

Develop a project roadmap that will detail the path to ACI acceptance of high strength rebar.

Application

The ANT APC will be able to evaluate and potentially fund future research that will enable the update of ACI 349 and 359 to allow high strength rebar in nuclear plant construction. The use of high strength rebar in certain new build concrete structures (such as basemats, containments and reactor buildings) will decrease the density of the rebar mat, decrease the likelihood of void formation (which is formed when the aggregate hangs up on dense rebar mats) and allow for the design of stronger structures.
2010-10 Embedded Sensors in Concrete

Recent Activities

• Published Final report (EPRI Report #1023006)
• The report provides an extensive compendium of sensor technology currently available and being researched.

Final Deliverables

Technical report on the use and benefits of embedded sensors in future power plants to allow for inspection to inaccessible structures and to facilitate frequent inspections for long term asset management.

Application

Because of the large number of structures surveyed in this project - the direct application will vary. The application of a part of these results can be immediate (commercially ready technology), while in other cases the application is more uncertain (developmental stage). The final report identified those technologies that are ready to deploy and specifically in what structures and for what reasons. The report also identifies technology gaps that require additional research.
Recent Activities

• Proposed ASME III Code Case was approved in December, 2011 (N-818)

Final Deliverables

Final product is an approved ASME III Code Case. An owner/vendor can adopt the Code Case (either through the Reg Guide or by petitioning the NRC for Code Case use). The owner/operator can then impose this contractually in their fabrication specifications for new construction to establish the basis for acceptance of construction related benign flaws in piping/component welds.

Application

The results of this project will be approved first as a Code Case and then incorporated into ASME Section III. The USNRC will need to approve the Code Case in a Reg Guide. An owner/vendor will adopt the Code Case (either through the Reg Guide or by petitioning the NRC for Code Case use). The owner/operator will then impose this contractually in their fabrication specifications for new construction to establish the basis for acceptance of construction related benign flaws in piping/component welds.

A project has been proposed for 2012/2013 to assist up to three utilities with getting approval and implementation.
2010-03 Plant Startup Guide

Recent Activities
- Published Final report, Startup Program Guideline – Lessons Learned (EPRI Report #1023005)
- Report includes:
  - Testing Procedures, Strategies, Techniques and Technologies
  - Integration of Construction and Startup Schedules
  - Startup and Operating Equipment Performance Data
  - Integrated Plant Testing and Turnover for Operation

Final Deliverables
The guideline provides covering lessons learned from previous startups for use by startup engineers and managers in the new build startups.

Application
The completed Startup Program and Technology Guideline can be used as a basis for developing site specific startup program requirements. Specifically, it can be used as a reference by startup personnel when developing preoperational programs, training and testing documents.
2010-04 EPRI Water Chemistry Guidelines

Recent Activities

- Technical reports on U.S. EPR and ESBWR published 12/23/2011
  - U.S. EPR Report: 1024499
  - ESBWR Report: 1023002

Final Deliverables

Technical Reports documenting the results of gap analysis between AP1000, ABWR, U.S. APWR, U.S. EPR, and ESBWR designs and EPRI Water Chemistry Guidelines.

Application

The results of this research identify future work to ensure that the EPRI Water Chemistry Guidelines are applicable to the new plant designs. Future work will be conducted to verify technical bases and revise the Guidelines as necessary so that new plants can implement them during startup and operation. The results of this work inform utility decisions related to operating water chemistry procedures and any related design modifications. Utilities can work with EPRI and new plant designers to ensure gaps identified during this research are addressed in order to implement design appropriate EPRI Water Chemistry Guidelines at the time of operation.
Recent Activities

- Technical report Published (EPRI Report #1022942)

Final Deliverables

A technical report documenting current regulatory requirements and potential solutions for storing NDE data.

Application

By having the NDE data in a digital format it will reduce paper use, film, and other hard copies that may require duplication after a certain number of years, as they degrade, thus it reduces costs and be environmentally friendly. Technically, having digital records in one location provides more efficient access, retrieval and organization. Reading data stored on various types of media may be difficult if the technology is no longer used, therefore having the data stored centrally on current media storage by the document control centers would retain and maintain useful access to the data.

This project's final report provides the guidance for utilities to utilize NDE Data in a digital format.
Recent Activities

• Three day HFE training class material revised based on feedback from October 2011 pilot class at SCANA and published December 2011
• Class material for HFE management class revised based on feedback from pilot class at August 2011 advisory meetings
• Computer based training (CBT) version of HFE management class nearing completion with delivery in first quarter 2012

Final Deliverables
This project will produce: three-day HFE training class material (1023011), training material and CBT for HFE management class (1024503), general introduction to HFE CBT (1024859) and assembled package containing all three products (1024860)

Application
The training material will:

a) help utilities establish a more formal HFE program required to address new plant needs and reduce the likelihood of future operator workarounds and human errors,

b) provide utility personnel to with a basic understanding of HFE, the relevant terminology and tools, the expectations of NRC staff in the HFE area, and the consequences of not adequately addressing HFE as an integral part of the utility design, operations and training processes

c) support utility staff in more informed discussions with vendors and with the regulator to help ensure that utility interests are properly addressed.
ANT Active Projects
2011-01 Environmental Assisted Fatigue (EAF)

**Recent Activities**
- NRC Addendum to the NRC was signed in November
- Published:
  - EAF Gap Analysis and Roadmap for Future Research: Gap Analysis (TR# 1023012)
  - Improved basis and Requirements for Break Location Postulation (TR# 1022873)
  - Stress-Based Fatigue Monitoring Methodology for Fatigue Monitoring of Class 1 Nuclear Components in a reactor Water Environment (TR# 1022876)
- Out for Review: Process and Technical Basis for Identifying EAF Limiting locations
- Held a public meeting with the NRC on January 5th to inform on related activities
- EAF Focus Group Panel is meeting February 2nd/3rd to prioritize the gaps, based on the ranking of the EAF Expert Panel, and provide input into the next revision to the roadmap

**Final Deliverables**
Consolidation of results and conclusions of environmentally assisted fatigue efforts globally with specific focus on the guidelines for application of RG 1.207.
The project objective is to develop a practical approach for comprehensively testing digital systems in order to establish assurance of adequate protection against software common-cause failure; a successful effort will allow simplification of overall I&C architectures, with corresponding reductions in licensing, operation and maintenance costs, and increased reliability.

Recent Activities

- Benchmark study report published in November (#1023010)
- Hybrid approach shows potential:
  - High-coverage testing + Design measures to facilitate testing
- TAG is recommending to the APC that the project focus on improving the prospects for regulatory approval of the approach before proceeding.

Recovery Plan

- 5.1% of project budget remains. Will be used in 2012.
- Quality Issue – Acceptance by NRC is uncertain. Next step is to hold technical discussions with NRC Research under EPRI/NRC MOU, and possibly present the approach to ACRS.

Action: Delay methodology development to focus on technical and regulatory viability

Final Deliverables

The project objective is to develop a practical approach for comprehensively testing digital systems in order to establish assurance of adequate protection against software common-cause failure; a successful effort will allow simplification of overall I&C architectures, with corresponding reductions in licensing, operation and maintenance costs, and increased reliability.
2011-06 Reduced Accident Source Term

Recent Activities

- Evaluating all assumptions on analysis
- Evaluating all variables in the Source Term determinations and asking if it is really a variable
- One possible area of savings in better determination of filter efficiencies.
- Project underway, will complete by 8/15/2012

Recovery Plan

- Waited until the Impaction Scientific Paper was complete before ramping up project in order to capture any lessons learned

Final Deliverables

A project roadmap that will support taking advantage of inventory reduction mechanisms.
This project will provide Members with information to efficiently assess seismic base isolation technologies and their application in new nuclear power plants. In addition, costs and benefits of base isolation technology will be explored in a practical manner.

Recent Activities

- A draft report has been prepared and is under review. Draft report reviews base isolation technology, benefits and operating experience.
- Discussions have been initiated with EdF and Eskom.
- Project is near complete – any ANT Members (vendors included) who wish to engage in the review are welcome.

Recovery Plan

- Closely monitor progress over next three months to ensure completion on schedule (June 2012).
2010-01 Alloy 690/52/152 PWSCC Research

Recent Activities

- Reviewed Alloy 690 PWSCC Degradation research progress with an international panel of experts at a meeting in Tampa on November 29-December 2, 2011.

- Conducting an update of Alloy 690/52/152 PWSCC knowledge gaps to assist in research planning.

- Completed an EPRI roadmap for Alloy 690 PWSCC Characterization research (08/2011)

Final Deliverables

Final products from this project consist of the following documents at the end of 2013:

- Technical Basis for Inspection Relief (Rev. 0)
- Alloy 690 Procurement/Fabrication/Installation Guidelines (Rev 1)
- Flaw Disposition Curves for Alloys 690/52/152 (Rev. 0)
Upon completion, this project will provide the industry and society with new inputs to calculate the attenuation of earthquake sources to a given site location. NGA-East will be coupled with CEUS SSC to perform probabilistic seismic hazard assessments (PSHAs).

Recent Activities

- Not an EPRI run project:
  - EPRI providing funding to PEER to execute the scope of NGA-East
- Workshop held in Oct 2011
- The first version of database of recorded ground motions in CENA completed
- Ground motion simulation teams started testing and are validating their simulation methodologies.
- Preliminary sensitivity analysis of PSHA to various parameters in CENA was carried out to identify the most influential parameters for GMPEs in CEUS.
  - Median stress parameter (stress drop), geometrical spreading and Q are most influential

Final Deliverables

Upon completion, this project will provide the industry and society with new inputs to calculate the attenuation of earthquake sources to a given site location. NGA-East will be coupled with CEUS SSC to perform probabilistic seismic hazard assessments (PSHAs.)
2008-04 CEUS Seismic Source Characterization

This project will provide the nuclear industry and society with a new seismic source characterization regional model for the Central and Eastern United States. The new model will be used as a basis for new plant licensing applications (PSHA calculations) and to support resolution of GI-199 for the operating plants in the region.
Central and Eastern United States Seismic Source Characterization for Nuclear Facilities

**CEUS SSC Project Description**

The Central and Eastern United States Seismic Source Characterization for Nuclear Facilities (CEUS SSC) Project was conducted from April 2008 to December 2011 to provide the nuclear industry a new, regional seismic source model for use in conducting probabilistic seismic hazard analyses (PSHAs) for nuclear facilities. PSHA is used as a method for accounting for uncertainty in seismic design and in calculating seismic risk. Unlike previous seismic hazard studies, the CEUS SSC Project was sponsored through an industry-government partnership. The study was conducted using the Senior Seismic Hazard Analysis Committee (SSHAC) Study Level 3 assessment process. The SSHAC process ensures consideration of the knowledge and uncertainties of the larger technical community within a robust and transparent framework. The objective of the CEUS SSC project was to develop an up-to-date seismic source characterization model for the CEUS that included:

- U.S. NRC
- EPRI

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2011-09 Statistical Qualification Requirements

**Schedule**
Schedule slipped but plans to make it up in 2012

**Finance**
On Budget
2012 Funding: $185K

**Quality**
Issues with NRC & Vendor engagement

### Recent Activities
- Three principal partners (EPRI, EXCEL, NRC) met informally during the recent ANS-UWG conference:
  - Presented a technical session
  - Privately held project discussions
- Excel project lead organized the required interfaces with ISA S67.04 working group, TSTF-493 working group, IEEE, & ASME
- Excel project lead was granted additional resources to support the project schedule

### Recovery Plan
- Slow start by supporting regulatory and technical organizations
- Contractor resource limitations – alternate approach being pursued
- Revised schedule of activities dictates heavier spending in 2012 in support of schedule
- Planned increase of spending rate due to additional resource availability and increased priorities by the supporting industry organizations

### Final Deliverables
A published EPRI Technical Report to specify the data quality requirements and suggested approaches for both manufactures and end users to assure compliance with regulatory qualification requirements. In addition, a revised TSTF-493 Option B, aiming for NRC approval, implementation guide to incorporate the combination of the graded approach and confidence interval evaluations.
2011-10 PDI Evaluation of Compatibility

Schedule
Slow start – need support from Vendors

Finance
Slow start

Quality
No Issues

Recent Activities

- **Westinghouse**: Conducted four meetings on AP1000 configurations. Initiated full scale project to fabricate mock-ups for RCP to expand current qualifications and address specific material issues (Funded by Westinghouse). Preparing proposal to design and fabricate additional mock-ups identified.
- **MHI**: Conducted three meetings with MHI. Initiated assessment project focused on RPV configurations (funded by MHI). Once RPV assessment is completed the scope will be expanded to cover additional components.
- **AREVA**: Conducted one day meeting and reviewed all major components.
- **GE**: In process of scheduling meeting to start assessment.
- **KEPCO**: In process of scheduling meeting to start assessment.

Recovery Plan

- Dynamics in industry has redirected some vendors priorities
- Meetings expected to be held with at least two more vendors prior to year end
- Meetings to be conducted with each of the remaining vendors

Final Deliverables

Initial contact made with each NSSS vendor in order to determine needs. If needed, initiate projects to assist them where necessary.
2010-02 Filmless Radiography Systems

Recent Activities

• Conducted a demonstration to a draft procedure in accordance with ASME Section V, Article 14 (8/10)

• ANT Dissimilar Metal Weld specimens with known volumetric weld flaws were selected for the demo

• RT data collected with a portable 6.0 MeV linear accelerator, a portable GE DXR250 imaging panel, and CRxFlex high resolution phosphor plates

• Specimens were mocked up into a simulated double wall exposure arrangement with detector side wire, hole, and duplex wire image quality indicators

• 2011 Status Report published (EPRI Report #1022933)

Final Deliverables

This project scope is to expedite the demonstration and implementation of filmless radiography as a viable inspection technique for in-service inspection and new construction. The results will help the utilities and the vendors address the technical gaps leading to an ASME Boiler and Pressure Vessel Code, Section V, Article 14 qualification for digital radiography.
2010-11 Risk Informed Procurement

**Schedule**
On Schedule

**Finance**
Table top meeting delayed spending
2012 Funding: $165K

**Quality**
No Issues

**Recent Activities**
- **March, 2011:** NRC Commissioners via SRM directed staff (SECY10-0121) to use existing risk-informed process for the new Build fleet but to conduct tabletop exercises to confirm existing guidance is adequate. This direction was expected in 2010
- **Summer /Fall 2011:** Supported 5 NRC/Industry tabletop exercises, as well as ACRS meetings
- Burden reduction identified for both active and passive New Build designs (see ML112290967)
- SECY to be issued Jan, 2012.

**Recovery Plan**
- Under spent while awaiting outcome of the SRM, Tabletop exercises and ACRS meetings
- Ramped up second half on 2011 (e.g. completed test cases #1023007) based on positive outcome of tabletop exercise
- Technical Update addressed the vendor requirements still needed for LSS components. Plan to hold workshop, in 2012, to educate the industry.

**Final Deliverables**
A n updated methodology, with test cases, for the application of risk informed procurement to be used in COL applications. Such a methodology will support future O&M activities as it will be approved for the life of the plant.
2011-13 Concrete Void Detection and Sizing

Recent Activities

- The techniques researched are:
  - Acoustic: Performed at BAM (Germany)
  - Electric – Electromagnetic: performed at Georgia Tech (USA)
  - Gamma radiation: Currently being researched at Georgia Tech (USA)
- March testing scheduled with Westinghouse SC modules by BAM and EPRI
- Provisional Patent application

Final Deliverables

Evaluation of the most promising NDE technique to detect voids in fresh concrete (including parametric studies).
The final deliverable will be an advanced electromagnetic sensor technology that will allow inspection of high performance ferritic condenser tubing (Sea-Cure, 2205 duplex, and 439 SS), providing inspection coverage of areas not possible with the current technology.
This project is developing guidance and training materials on digital I&C issues with particular attention to new plants; a successful effort will help ANT members cost-effectively train personnel on key digital instrumentation and control technical and regulatory issues.
A white paper with verbal support by an ACRS member that the Impaction approach for a DF of 2 is acceptable. Reactor Vendors can then apply for the DF through normal channels with confidence the ACRS will not contest the request.

Recent Activities

- White Paper complete
- RWE test data has been evaluated and determined to not be applicable. Particle size tested is an order of magnitude smaller.
- Path forward could involve having RWE conduct testing with the correct particle size.

Recovery Plan

- Need to complete discussions with RWE to see if tests can be conducted.

Final Deliverables

A white paper with verbal support by an ACRS member that the Impaction approach for a DF of 2 is acceptable. Reactor Vendors can then apply for the DF through normal channels with confidence the ACRS will not contest the request.
2010-13 SACTI Model Update

An upgraded beta version of the existing archived EPRI software model SACTI, which assesses the environmental impact of cooling tower plumes, such as fogging, icing, and salt deposition, will be delivered by December 31, 2012.

**Schedule**
On track for 2013 Beta

**Finance**
2012 Funding: $80K

**Quality**
Some concerns with success of specific capabilities

**Recent Activities**
• EPRI staff conducted kick-off meeting with Bechtel following signing of contract (mid-Nov)
• Software review underway / update in progress
• Updated budget developed – additional $80K requested to complete beta version

**Recovery Plan**
• Frequent reviews with EPRI project team and software development team to ensure progress being made, per schedule.
• Initiate project TAG

**Action:** Engage engineering vendors who have and will be running the model for COLA/ESPs

**Final Deliverables**
An upgraded beta version of the existing archived EPRI software model SACTI, which assesses the environmental impact of cooling tower plumes, such as fogging, icing, and salt deposition, will be delivered by December 31, 2012.
## 2012 Active Tasks

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<th>Task Title</th>
<th>2012 Requested Funding ($’s K)</th>
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<td>Next-Generation Attenuation (NGA) Model for CEUS (NGA-East)</td>
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<td>Alloys 690/52/152 PWSCC Research for New Plants</td>
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<td>2010-02</td>
<td>Evaluation and Qualification of Filmless Radiography</td>
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<td>2010-06</td>
<td>Advanced NDE for Ferritic Stainless Steel Tubing</td>
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<td>2010-11</td>
<td>Methodology For Risk Informed Procurement</td>
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<td>2010-13</td>
<td>SACTI (Cooling Tower Impact Model)</td>
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<td>2011-01</td>
<td>Environmental Assisted Fatigue for New Plant Designs</td>
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<td>2011-02</td>
<td>Combinatorial Testing Methodology for New Plant Digital I&amp;C Designs</td>
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<td>2011-09</td>
<td>Methodology for Statistical Qual. Requirements of RG 1.105 R3</td>
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<td>2011-13</td>
<td>NDE Techniques for Fresh Concrete Void Detection and Sizing</td>
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ANT Additional Scope Projects
2011-04 QA Methodology for Design and Modeling Software

Ken Barry
2011-04 New Plant Design & Modeling Software

Recent Activities

• Industry review of Draft Benchmarking and Roadmap Report complete

• 2012 project scope and budget ready to go

• Another EPRI project is working on the report – “Guideline for the Utilization of Commercial Grade Computer Programs in Nuclear Safety-Related Applications - Commercial Grade Computer Program Dedication.”

➤ Plan to use this approach as part of the QA Methodology for qualifying the software.

Final Deliverables

To develop a QA Methodology and procedures for using design software as an O&M tool.
Project Objective and Scope

• Identify and prioritize owner-operator requirements for modeling software

• Develop requirements to support configuration management of owner-operator data

• Generate a list of likely critical characteristics for commercial grade dedication and likely compensatory actions required to commercial grade dedicate the software and the database contents
Project Value

- An industry standard approach to software and data quality for the 2D and 3D design and modeling software and other associated databases and software.

- The Industry Software Vendors could follow this methodology to qualify 2D and 3D design and modeling software and other associated databases and software for future releases.
Primary Outcome

• Once the QA Methodology is developed, EPRI Members can use the methodology to establish a quality program with their Design and Modeling Software for use in operational and maintenance activities.

2012 Requested Funding: $471
2009-08 Safety Related Stationary Battery Qualification

Ken Barry
The adoption of the 80% Service test into IEEE codes which will provide condition battery monitoring every outage and allow a much shorter qualification time period for future battery selections.

Recent Activities
• Test report in published September 30, 2011 (1023622)
• Contract ready to go with C&D Batteries using 2011 carry forward funds

Recovery Plan
• Slightly unfavorable test results
  ➢ The new maximum percent differences are 2.4% for the 72 hour tests and 1.1% for the 4 hour tests. The average percent differences are 1.4% for the 72 hour tests and 0.5% for the 4 hour tests.
• Have quotes from C&D and Enersys to conduct a more 72 hour tests

Final Deliverables
The adoption of the 80% Service test into IEEE codes which will provide condition battery monitoring every outage and allow a much shorter qualification time period for future battery selections.
2009-08 Safety Related Stationary Battery Qualification

Issue
• NLI Testing (GNB Batteries) on 72 hour discharges was within 2.4% of expected capacity calculations.
• Need further testing to increase confidence of the methodology
  – C&D Batteries
  – Enersys Batteries

Project Objective and Scope
• Conduct 72 Hour Testing on C&D and Enersys Batteries

Primary Outcome
• Acceptance of the 80% Service Test by IEEE 450
2009-08 Safety Related Stationary Battery Qualification

Project Value

• Additional discharge cycles during qualification could be eliminated thus reducing the qualification period for the 24 and 72 hour batteries from 3 years to 1 year.

• Only one consistent test would need to be performed throughout the service life of the battery.

• Capacity data would be available for trending every refueling outage. Presently this data is available every 4 to 6 years rather than every 1.5 to 2 years.

• For non-nuclear applications the proposed test could reduce the time required to test and recharge the batteries, thus saving time and money.

2012 Requested Funding: $57
Recent Activities

• Completed study to propose a long-term update & maintenance plan
• 13/15 revision packages reviewed by experts and incorporated into URD (working copy)
• Chapters converted from database to pdf (for future use)

Upcoming Activities

• Complete remaining 2 revision packages
• Convert remaining chapters from database to pdf
• Transition into URD overhaul

Final Deliverables

A revision to the ALWR URD will be published in April 2012, reflecting the changes the team is currently working through.
URD Update Project: The Problem

- In its current state, the usefulness of the URD is limited because:
  - Volume II, “Evolutionary Plants” not revised since 2008 (updates limited to Volume III, “Passive Plants”)
  - Some URD content is now historical because it was based on 1980’s vintage designs
  - Many requirements do not reflect the current state of knowledge (materials science, I&C)
  - Recent industry experience, R&D, and Regulatory changes are not addressed.

- Without maintenance, the URD will progressively become more out of date and less relevant over time
URD Update Project: Proposed Approach

• Approach update in a manner similar to FSAR maintenance

1. Consolidate & streamline content
2. Eliminate / annotate historical content
3. Address out of date requirements by technical area, starting with higher priority areas
4. Incorporate content by reference rather than through duplication
5. Recast requirements in performance-based language instead of design-based language

• Substantial effort given the size and scope of the URD (3,600+ pages addressing a wide range issues)
URD Update Project: Maintenance Considerations

• Once updated, resources must be allocated each year to ensure the content remains up to date and relevant.

Maintenance includes:

1. Periodic reference reviews to assess URD impact (EPRI reports, Codes & Standards, OE)

2. Routine communication with users and subject matter experts to identify and address key URD revision needs

2012 Requested Funding: $71k
2009-01 Data Centric Configuration Management

Ken Barry
2009-01 New Nuclear Configuration Management

Schedule
On Schedule

Finance
On Budget

Quality
No Issues

Recent Activities

• Publication of “Elements of Pre-Operational and Operational Configuration Management for a New Nuclear Facility” (1022684) – industry standard for new build CM program development

• Kicked off the NIRMA New Nuclear Plant Information Management initiative

• PIN/PIM Generic Data Model structure developed

Final Deliverables

Guidelines, Pilots and Training materials for the development and successful implementation of a Information Handover Plan and Configuration Management program for new build projects.
Project Objective and Scope

• Further PIM Development
  – Continue to Add Plant Equipment Objects and Attributes
  – Develop the Standard Handover Framework for Docs and Data
  – Develop the Standard CM Taxonomies for Known Requirements that all US NNPPs Must Comply With - NRC GDCs and Reg. Guides, NQA1, ASME

• Expand the PIM Model Infrastructure to Allow the User to:
  – Download a Data Structures (blank forms). Forms Can Be Populated with Their Data Values and Would Retain Information that Links Back to the EPRI PIM Model Data Structure.
  – Modifiable Forms to Add User Specific Information not Contained in PIM

**2012 Requested Funding:** $267
PIM Model – Dynamic Radial Diagram – Developing Use Cases for the PIM
PIM Model – Dynamic CM Taxonomy View – Developing Use Cases for the PIM

Selected Object….
PIM Model – Margin Monitoring – Developing Use Cases for the PIM

Ongoing IST Trend

ITAAC Result

Actual Capability

Design Margin

Full Qualification
(Design Basis Value in DCD)

Analytical Margin

Ultimate Capability

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</table>
CM Implementation

Project Objective and Scope

• Use the CM Guide (1022684) and the EPRI/NIRMA generated CM Program/Plan Checklist as a benchmark for a new build CM program development.

Project Value

• This effort should provide valuable validation of the documents and feedback lessons learned.

• In addition to establishing the new build CM Program, the project should also obtain information that can assist existing plants to improve their CM Programs using the documents.

2012 Requested Funding: $30
Primary Outcome

• **Owner/Operators and EPCs** - In current systems and for procurement of future systems, The Owner/Operator and EPCs will use the developed and verified information standards, data models and structures to improve the procurement process and operational management of the plant’s informational resources for implementation of a world class CM program.

• **Software Vendors** - Software Vendors will use the developed guidance to improve and standardize their products for future releases to incorporate data standards and best practice CM operability in their CM related software.
<table>
<thead>
<tr>
<th>Task ID#</th>
<th>Task Title</th>
<th>2012 Additional Requests ($’s K)</th>
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<td>2009-08</td>
<td>Safety Related Stationary Batteries</td>
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<td>2011-03</td>
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Together…Shaping the Future of Electricity
ANT Action Plan Committee (APC) Meeting
Day 2

ANT 2012 Candidate Task Review
## Future Spending

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2012-G Water Chemistry Guidelines for Advanced Light Water Reactors

Keith Fruzzetti
Karen Kim
Issue

• No industry approved guidance for water chemistry for hot functional testing, startup, and early operations currently exists

• EPRI’s gap analyses have identified significant differences and knowledge gaps between ALWR designs and EPRI Water Chemistry Guidelines

• Differences and knowledge gaps need to be addressed and applicable EPRI Water Chemistry Guidelines developed to support startup
Project Objective and Scope

• 10 year strategy is outlined in detailed project roadmap.

• 2012 Tasks Include:
  – Complete gap analysis of the KEPCO APR1400
  – Develop guidance for hot functional testing and initial startup, primary side gas management, liquid and gaseous sampling plans
  – Initiate investigations related to impacts of "novel technologies" on water chemistry operations (e.g. EBA)
Step 1: Gap Analysis & Collect International Data and Experiences

Step 2: Conduct R&D to close gaps and developed Rev. 0 of Guidelines to SUPPORT STARTUP of plants.

Step 3: Conduct R&D to collect startup and early operations information to develop Rev. 1 of Guidelines to SUPPORT OPERATIONS of plants.

Step 4: Roll ALWR Guidelines into normal, operating Guidelines process.
2012-G Water Chemistry Guidelines for Advanced Light Water Reactors

**Project Value**

- Application of industry consensus and optimized water chemistry controls for enhanced material and equipment reliability; improved fuel performance; and minimize radioactive source term production in ALWRs
- In the U.S. implementation of these guidelines is required by industry initiatives for protection of materials reliability including steam generators
- International utilities use the EPRI Guidelines as the basis of their strategic water chemistry plans
Primary Outcome

• EPRI will conduct research on the unique aspects of water chemistry control in ALWRs and collect related international experiences to address identified gaps necessary for development of EPRI Water Chemistry Guidelines optimized for hot function testing, startup, and operation of ALWRs.

2012 Requested Funding: $300K
Leveraged Funding: $425K
2012-B Concrete Placement Inspection Guidelines

Ken Barry
Maria Guimaraes
2012-B Concrete Placement Inspection Guidelines

Issue

• Skill sets that were common during the construction of the existing fleet are now becoming difficult to find. This is true in the quality inspection of concrete placements for safety and non-safety related structures.

• There is a need for simple and concise guidelines on quality control of new pours addressed to engineers on site, since owners/operators will ultimately be responsible for the quality of the concrete placement.

• This project will combine and strengthen other ANT current projects on inspection and quality control of fresh concrete.
Project Objective and Scope
This project will consist of gathering information on quality control of new concrete pours.

• Phase I – Review of the state-of-the-art for evaluating the acceptability of concrete, particularly for new types of concrete placed in large constructions.

• Phase II – Review state-of-the-art in inspection procedures and methods, identifying acceptance criteria. Major knowledge gaps will be identified

• Phase III - Develop a concise guideline document on the quality control of new pours
2012-B Concrete Placement Inspection Guidelines

Project Value

• Provide quick training and assurance that inspections are consistent across the fleet.

• Enhance synergy with other industry programs and agencies also involved in the quality control of new and emergent concrete materials.

• Site engineers will be aware of the tools available to inspect fresh concrete if something goes wrong.

Primary Outcome

• The project will collect best practices and common quality issues for concrete placement into a concise guide for utility engineers

2012 Requested Funding: $90K
2012-Q Digital Cyber-Security Procurement Specifications

Letitia Midmore
2012-Q Digital Cyber-Security Procurement Specifications

Issue

• Current procurement specifications for procuring digital equipment and systems lack specificity to ensure that the product purchased will meet standards (NEI 08-09 Rev. 6 or NERC Critical Infrastructure Protection standards)

• Recent experience has shown that utilities and suppliers have failed to properly address these requirements specifically and early in projects causing costly re-work down the line.

• Furthermore, it has been identified that the new regulations and guidance do not explicitly cover supplier product development life cycle cyber-security requirements.

• There are also security controls regarding supply chain protection that must be specified as part of utility and supplier purchase specifications.
2012-Q Digital Cyber-Security Procurement Specifications

Project Objective and Scope

• EPRI will develop a procurement methodology and minimum standard procurement specification clauses for digital system cyber-security requirements for the electricity industry.

• Deliverables include: identification of commonalities in digital systems uses, minimum standard procurement specification clauses including an understanding of how these clauses relate to the different codes/standards and regulations, a guideline and draft plant procedure for use of the clauses, worked specification examples, and CBTs.

• A key aspect of this project is that vendors understand that the purpose is not to create any EXTRA security requirements for them; rather the focus is on ensuring that they meet already existing security requirements.

• This project will ultimately save them time & money by streamlining the procurement process across the utilities.
2012-Q Digital Cyber-Security Procurement Specifications

Project Value
- It links system components to the many different sector specific codes/standards/regulations, opening up markets for vendors and sub-supplier
- Creates a minimum starting point for utilities and vendors to cover cyber-security issues during the procurement process
- As these minimum requirements get pushed down the supply chain, certain quality level can be achieved

Primary Outcome
- Methodology & draft procedure for specifying cyber-security requirements for plant digital systems, includes worked examples.

2012 Requested Funding: $100K
Leverage Funding: $185K
Issue

• Recent industry experience indicates that the next generation of nuclear new build projects will likely encounter significant quality issues.

• In some instances, experienced suppliers (with NQA-1 programs) experienced quality breakdowns when their nuclear programs were put into broad scale use on large orders.

• With the extensive supply chain needs of new nuclear construction projects, similar supplier quality issues may result in critical path schedule impacts on future new build projects.
2012-D Supplier Quality Performance Manual

Project Objective and Scope

• Prepare a Supplier Quality Performance Manual and associated training tools
• Facilitate workshops for nuclear equipment suppliers using the manual and training tools

Project Value

• Materials and workshops are available to help nuclear equipment suppliers get prepared to effectively implement the nuclear quality requirements on large scope orders.

Primary Outcome

• Develop a Supplier Quality Performance Manual and associated training tools to be used directly by the EPCs, Utilities, and suppliers.

2012 Requested Funding: $250K
2012-A HDPE Pipe Aging Degradation Mechanisms

Alex Summe
2012-A HDPE Pipe Aging Degradation Mechanisms

**Issue**

Industry lacks the necessary information and standards needed to understand HDPE pipe long-term failure modes and how this material ages in power facilities.

- Research how service-life is impacted:
  - Specific chemicals (biocides)
  - Operating conditions (elevated Ts & Ps)
2012-A HDPE Pipe Aging Degradation Mechanisms

Project Objective and Scope

• Evaluate service conditions for long-term application in Raw Water Systems
  – Biocides & other injected chemicals
  – Develop generic system parameters for representative Aging Model

• Explore other possible knowledge gaps
  – UV exposure
  – Radiation exposure
## Preliminary Results

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**Years**

- Green > 80
- 30 < Yellow < 80
- Red < 30

**216 systems**

- 15% Yellow
- 1% Red
2012-A HDPE Pipe Aging Degradation Mechanisms

Project Value

• Advantages over metallic and concrete pipe
  – Service-life, maintenance, & cost
  – Owner/Operators need the necessary information to optimize the use of HDPE and minimize the risk of HDPE failure

Primary Outcome

• Final report evaluating long term use of HDPE in nuclear systems
• Recommendations on areas of future research

2012 Requested Funding: $160K
2012-O High Strength Reinforced Rebar

Ken Barry
Maria Guimareas
2012-O High Strength Reinforced Rebar

Issue

• The use of higher strength rebar in the design and construction of safety related concrete structures will result in a decrease in reinforcement congestion which is the main cause of void problems during concrete placement, but it is not allowed in ACI 349 nor 359

Project Objective and Scope

• The objective of this project is to perform the necessary research on hooked bars to modify the ACI codes 349 and 359 so that high strength rebar can be used in safety related structures.

• This project will coordinate with Kansas University Transportation Research Institute, the Concrete Reinforcing Steel Institute, and the Charles Pankow Foundation.
2012-O High Strength Reinforced Rebar

**Project Value**
- Use of high strength rebar will reduce rebar density and decrease the probability of voids during placement.
- The main limitations to the use of high strength rebar will be overcome by modifying ACI codes that control safety related concrete placement.
- Industry research more efficient through coordination.

**Primary Outcome**
- This project will focus on ACI code changes to allow high strength rebar in nuclear safety related construction. The final step of an owner relief request or NRC endorsement will require other actions not included in this project.

**2012 Requested Funding: $110K**
2012-P Pilot Project - Implementation of ASME Section III Code Case – Reduction of NDE Weld Repairs

Steve McCracken
2012-P Pilot Project - Implementation of ASME Section III Code Case – Reduction of NDE Weld Repairs

**Issue**
- Assist utilities with ASME Section III Code Case on “Use of an Analytical Evaluation Approach for Acceptance of Full Penetration Butt Welds in Lieu of Weld Repair”
  - Regulatory acceptance
  - Implementation

**Project Objective and Scope**
- Develop technical guidance
- Assist Utilities with gaining regulatory acceptance
- Resolve RAI’s
2012-P Pilot Project - Implementation of ASME Section III Code Case – Reduction of NDE Weld Repairs

**Project Value**
- Cost and schedule reductions during construction
- Benefit to LTO via reduction of in-service induced SCC

**Primary Outcome**
- Technology transfer of Code Case to field use and utility benefit

**2012 Requested Funding:** $80K
2012-R Seismic Equipment Qualification (EQ) Assessment

Jeff Hamel
Bob Kassawara
Charles Mengers
2012-R Seismic Equipment Qualification (EQ) Assessment

Issue

• An increase in seismic hazard could be one result of the pending CEUS SSC project
• It is uncertain whether or not the laboratories test equipment and or the equipment they are qualifying will be able to withstand an increased loading

Project Objective and Scope

• Comprehensively scope out the existing seismic test facilities to understand limitations
• Explore new qualification alternatives for high frequency content of the hazards
• Understand what equipment is of greatest concern / risk for an increase in hazard
2012-R Seismic Equipment Qualification (EQ) Assessment

**Project Value**
- Be prepared to respond in a timely manner to a potential increase in seismic hazard, should that become a reality.

**Primary Outcome**
- This project will provide utilities and vendors with better information to allow them to plan accordingly for seismic EQ.

**2012 Requested Funding:** $84K
2012-I 10CFR50.69 Application and Pilot Plant Submittal

Patrick O’Regan
Letitia Midmore
Issue

• NRC approved rule (i.e. 10CFR50.69) allows for many “nuclear special” treatment requirements (e.g. QA per Part50 Appendix B) to be eliminated if a risk-informed classification approach is used

• No New Build plant has moved forward with a 10CFR50.69 application. Reasons include:
  – which parts of the PRA need to be met to satisfy 10CFR50.69 requirements,
  – what level of technical rigor is required for those parts
  – how to treat those parts of the PRA that cannot be met at the DCD, COL and pre-operational stages (e.g. operating data, plant walkdowns).
**Project Objective and Scope**

- Phase 1 (Methodology and Technical Basis Development)
  - Identification of those portions of the PRA needed to support categorization of active functions
  - Identify how to treat and technical rigor for those parts of the PRA that cannot be met at pre-operational stages
  - Test cases to confirm categorization methodology works for the New Build fleet
  - Identify interfaces and interaction with the pressure boundary function and related project (2011-11)
  - Conduct complete categorization (i.e. active and passive functions) for test cases systems
  - Coordinate with operating fleet 10CFR50.69 pilot plant (Vogtle Units 1 and 2).
2012-I 10CFR50.69 Application and Pilot Plant Submittal

Project Objective and Scope

- Phase 2 (New Build Pilot Plant Support)
  - Identify pilot plant(s)
  - Train pilot plant staff on categorization methodology
  - Support plant exercising of categorization of methodology
  - Maintain interactions with NRC
2012-I 10CFR50.69 Application and Pilot Plant Submittal

Project Value

• Experience to date is that ~ 75% of safety related SSCs could be categorized as low safety significant (operating fleet, active and passive New Build designs)

• Capital costs saving up ~ 100M

• O&M cost savings ~ 1M per year

• Significant positive construction impact

Primary Outcome

• The ultimate goal is to have a methodology and technical basis document that will support a pilot plant submittal that can be used as a template for other industry submittals.

2012 Requested Funding: $150K
2012-C Generic Latent Debris Sampling Methods

Jeff Hamel
2012-C Generic Latent Debris Sampling Methods

Issue

- Latent debris has been conservatively calculated for operating PWRs
- The fiber content in latent debris can result in a significant amount for certain scenarios

Project Objective and Scope

- Understand ACTUAL fiber %s in the latent debris being observed today
- Develop an alternative methodology for calculating (repeatedly) the latent debris (esp. fiber) loads prior to containment close out
2012-C Generic Latent Debris Sampling Methods

Project Value
• Provide new PWRs with a potentially reduced latent debris load, providing more margin

Primary Outcome
• Provide an acceptable methodology than can be pursued for endorsement / licensing

2012 Requested Funding: $256K
## 2012 Candidate Tasks – Initial Prioritization

<table>
<thead>
<tr>
<th>Candidate Task ID#</th>
<th>Candidate Task Title</th>
<th>2012 Requested Funding</th>
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<tr>
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<td>Water Chemistry Guidelines for Advanced Light Water Reactors</td>
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<td>Pilot Project - Implementation of ASME Section III Code Case</td>
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<td>2012-R</td>
<td>Seismic Equipment Qualification (EQ) Assessment</td>
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<td><strong>Total</strong></td>
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2012-F Alloy 690TT Steam Generator Tubing Specification Handbook

Ryan Wolfe
Issue

- The current specification used to procure Alloy 690TT steam generator tubing was published in 1999 and is outdated.
- Utilities and NSSS vendors could use updated guidance for cost-effective decision making.
- Tubing manufacturers want updated guidance that considers modern tubing production techniques.
Project Objective and Scope

• This project will provide an up-to-date specification handbook for procurement of Alloy 690TT steam generator tubing.

• To accomplish this objective, the revision committee will include utilities, tubing vendors, and NSSS suppliers.

• Revisions will incorporate operational experience from current plants as well as manufacturing experience resulting from individual meetings with tubing vendors.
2012-F Alloy 690TT Steam Generator Tubing Specification Handbook

Project Value

• This project will facilitate standardization by removing the burden placed on individual utilities of resolving the differences between old specification requirements and current manufacturing capability.

• Tubing for a steam generators will be optimized with regards to cost, corrosion resistance and non-destructive evaluation requirements.

Primary Outcome

• Specifications for Alloy 690TT tubing in new steam generators will be more cost effective for utilities and will incorporate recent advancements in manufacturing capability from tubing vendors.

2012 Requested Funding: $245K
2012-K Feasibility Evaluation of Glass Reinforced Spiral Wound HDPE for Circ Water Piping

Alex Summe
2012-K Feasibility Eval. of Glass Reinforced Spiral Wound HDPE for Circ Water Piping

Issue

• Originally rolled carbon steel plate or pre-stressed concrete cylinder pipe (PCCP) - Costly & Problematic

• Carbon Steel
  – Cathodic protection system: design, install, inspect, & maintain, + power loss
  – OD coating, ID lining
  – Water treatment System, oxidation

• PCCP
  – Inspections, maintenance, and repairs

• Very heavy weight
2012-K Feasibility Eval. of Glass Reinforced Spiral Wound HDPE for Circ Water Piping

Project Objective and Scope
• Feasibility study
• Roadmap to code approval & plant application.

Project Value
• Significant cost savings
• Less inspection & maintenance

Primary Outcome
• Final report with roadmap for future research & steps for approval nuclear power plant.

2012 Requested Funding: $135K
2012-E Collaborative Manufacturing Development with Nuclear AMRC

Jeff Hamel
Nuclear AMRC: University Partnership

Iconic NAMRC building with capability to manufacture large items. Training and qualification incorporating best manufacturing practice and latest research mainly in pre-production phase.

Distributed research labs with capability to test in nuclear environments. Incorporating ‘proof of concept’ manufacturing research and analytical facilities.
The Nuclear AMRC Key Members

FOUNDER MEMBERS:

ROLLS ROYCE
AREVA
corus
SHEFFIELD FORGEMASTERS INTERNATIONAL
Westinghouse

SUPPORTED BY:

BIS
EDF ENERGY
Northwest Regional Development Agency
Nuclear AMRC Under Construction
2012-E Collaborative Manufacturing Development with Nuclear AMRC

Issue

• The UK is in process of building out a new Nuclear Advanced Manufacturing Research Centre (NAMRC).

• The global nuclear industry needs to provide input to the NAMRC as they develop their plans and possibly influence equipment selection

Project Objective and Scope

• Conduct two workshops to exchange ideas and collaborate on the industry needs for advanced manufacturing

• Document findings in final report with potential projects for future collaboration
2012-E Collaborative Manufacturing Development with Nuclear AMRC

Project Value
• Leverage ongoing work and $50m of funding being provided by other parties

Primary Outcome
• This project will result in well aligned advanced manufacturing research plans between the NAMRC and EPRI.

2012 Requested Funding: $144
2012-J New Steam Generator Thermal-Hydraulics Code: TRITON

Heather Feldman
2012-J New Steam Generator Thermal-Hydraulics Code: Triton

Issue

• Comprehensive steam generator thermal-hydraulic predictions are used to evaluate complex degradation mechanisms and to design next generation steam generators for long service lives

• For more than 25 years, ATHOS/SGAP software (EPRI Product 1016564) has been used to model thermal-hydraulics in steam generators

• ATHOS/SGAP can no longer meet this need
  – Capabilities to analyze modern steam generators
  – Accuracy of thermal-hydraulic predictions
Project Objective and Scope

- Objective: To develop a verified and validated next generation steam generator thermal-hydraulics code
- Scope: Triton will be developed by tailoring an existing commercial computational fluid dynamics (CFD) software package for the steam generator industry.
Tasks and Schedule

Requirements Document

Functional Specification

Alpha Ver 1.0

Beta Ver 1.0

Beta Ver 1.1

Release Ver 1.0

Release Ver 1.1


Experimental Tests for Additional Validation

Mid-March Kick Off Meeting

Mid-August ANT Decision Point
2012-J New Steam Generator Thermal-Hydraulics Code: Triton

Project Value

• Standardization
  – Triton will enable a single software to be used by the industry for steam generator thermal-hydraulics calculations

Primary Outcome

• Vendors and engineering organizations will use the new code to design steam generators, and to support utilities in the assessment of off-design and unexpected operating conditions, the prediction of foreign object wear, and the qualification of tube repairs.

2012 Requested Funding: $105K (Phase 1)
2012-S Application of Fiber Reinforced Concrete in Nuclear Power Plants

Ken Barry
Maria Guimareas
2012-S Application of Fiber Reinforced Concrete in Nuclear Power Plants

Issue

• Fiber Reinforced Concrete can lower water permeability and increase surface durability. But its use is very limited and will need research to achieve code acceptance

Project Objective and Scope

• This is an exploratory project to:
  – determine the extent of applicable research that has been conducted on the potential application of fiber reinforced concrete in nuclear power plant applications.
  – work with the industry to coordinate existing research and work with ACI 349 to develop a roadmap for additional research
2012-S Application of Fiber Reinforced Concrete in Nuclear Power Plants

**Project Value**

- Improve impact resistance of the concrete
- Fibers change concrete from a strain-softening behavior into strain-hardening behavior - which can have significant benefits in design basis seismic events
- Decrease the likelihood of water degradation of concrete used in wet environments.

**Primary Outcome**

- The purpose of this project is to understand the current gaps in research and experience and to determine what activities will be needed to get Fiber Reinforced Concrete use approved by the ACI codes for nuclear application.

**2012 Requested Funding: $50K**
2011-D Guidelines for Crediting Self Testing and Monitoring to Extend Tech Spec Surveillances

**Issue**

- New plant digital design provides automated testing capabilities (monitoring) of control and protection logic functions that are required to be tested manually under current surveillance requirements.
- New plant operators are seeking the rapid deployment of surveillance extensions based on the utilization of automated testing and monitoring capabilities.

**Project Objective and Scope**

- Task 1 - Develop a pre-staged approved basis and methodology to fast track the extension and/or elimination of I&C related surveillance frequencies based on the application of monitoring capabilities applied from either internal or external automated processes. The pre-approved basis (licensing change) would be implemented as soon as possible after initial plant operation and the availability of operational data to support the pre-approved implementation process.
- Task 2- Develop a functional specification of data management requirements needed to support the application of SSC monitoring capabilities provided from existing or new monitoring programs.
2011-D Guidelines for Crediting Self Testing and Monitoring to Extend Tech Spec Surveillances

**Project Value**

- The conversion of surveillances performed manually by plant technical staff to an automated process will eliminate a wide range of I&C maintenance activities that are considered high risk due to the active interfacing with the plant protection and control system.
- The reliability and performance optimization of plant assets has been demonstrated to be highly correlated to real time performance monitoring.

**Primary Outcome**

- EPRI Members could use the approved basis to prepare licensing changes for approval prior to plant start-up allowing implementation of the pre-approved changes in surveillance schedules as dictated by acceptable operating data.

**2012 Requested Funding:** $196K  
**Leveraged Funding:** $50K

Ken Barry
Liz Sisk

**Issue**

- Some advanced reactor designs utilize passive heat exchangers.
- In some applications the heat exchanger is located in a stagnate pool of borated water and there is no normal flow through the tubes.
- The long term stability of the fouling factors that have been assumed in the design analysis for this heat exchanger needs to be evaluated.

**Project Objective and Scope**

- For the passive heat exchangers, the following approach is recommended to develop performance assessment guidelines:
  - Verify performance under new conditions and identification of thermal margins under limiting conditions of operation. This may include recommendations for performance testing prior to installation.
  - Review industry experience and identify degradation mechanisms
  - Review testing and inspection options and identify limits. This includes pressure drop tests (without heat load), quasi-steady heat transfer tests, single tube test device, inspection methods, etc.
  - Develop guidelines document for performance assessment with industry peer review.

Project Value
• Ensure that the passive heat exchangers will perform their function for the life of the plant
• There is typically only one of these heat exchangers in the system and it's proper operation is critical for the safe shutdown of the reactor in an accident condition

Primary Outcome
• EPRI Members will be able to use the guidance from this report to establish a program that will ensure the ability to measure performance of their passive heat exchanger during the life of the plant.

2012 Requested Funding: $120K
2012-II  Assessment of Low Level Waste Management Technologies and Strategies for Advanced Light Water Reactors

Karen Kim
2012-II  Assessment of Low Level Waste Management Technologies and Strategies for Advanced Light Water Reactors

Issue

• Evaluations of low level radwaste management technologies and strategies for the Westinghouse AP1000 and GEH ESBWR have been conducted to ensure that they are in line with current industry standards.

• This assessment needs to be conducted for other completed advanced light water reactors designs.

Project Objective and Scope

• EPRI will assess the low level radwaste management technologies and strategies of the GEH/Toshiba ABWR, Areva US-EPR™, MNES/MHI US-APWR, and KOPEC APR1400 as described in design documents.

• These designs will be assessed against operating fleet best practices, advanced technologies, and the recommendations contained in the EPRI Utilities Requirement Document (Revision 10).
2012-II Assessment of Low Level Waste Management Technologies and Strategies for Advanced Light Water Reactors

Project Value

• Low level waste management technologies and strategies have advanced significantly over the past two decades leading to more efficient liquid radwaste processing, minimization of solid waste volumes, and cost savings.

• This project will leverage considerable efforts and lessons learned from the operating fleet to enhance radwaste system technologies and strategies in new nuclear power plants.

Primary Outcome

• NSSS vendors, architect engineers, and utilities can use the research results to assist in implementation of advanced radwaste system technologies and strategies in the equipment acquisition, construction, and startup of these new plants.

2012 Requested Funding: $60K

Source: EPRI RadBench™
2011-B EPRI Groundwater Protection Guidelines for New Nuclear Power Plants

Karen Kim
2011-B EPRI Groundwater Protection Guidelines for New Nuclear Power Plants

Issue

• The Regulation: 10 CFR 20.1406 “Minimization of Contamination” – minimize contamination, minimize radwaste, facilitate decommissioning by design and operation

• The Industry Initiative: NEI 08-08 “Generic FSAR Template Guidance for Life-Cycle Minimization of Contamination”

• The Technical Guidance: The EPRI Groundwater Protection Guidelines for Nuclear Power Plants (1015118) - applies to operations of nuclear power plants

• The Gap: A gap exists for technical guidance for pre-construction and pre-operational tasks of a groundwater protection program.

Project Objective and Scope

• Develop technical guidance for pre-construction and pre-operation groundwater protection program tasks.

• Convene EPRI Groundwater Guidelines Committee (include Design Centered Working Groups) to support development of new plant addendum

• Work with NEI to present addendum to Guidelines to the NRC as an industry approach for complying with 10 CFR 20.1406.
Project Value

- **Operational Experience**: Lack of knowledge of the as-built conditions have led to delays in response to groundwater contamination events.
  - Leads to decreased stakeholder confidence in nuclear power plant operation and increased costs related to investigations.
- **Benefit**: Understanding and preparing for any potential leaks or spills during construction will allow nuclear power plant operator to quickly identify and address any leaks or spills during operation.
  - Understand site hydrogeology, location of SSCs, placement of monitoring wells and other leak detection technology, enhancement of procedures, etc.
  - Timely leak detection and response will increase stakeholder confidence that utilities are protecting public and environmental health and safety.

Primary Outcome

- An addendum of the EPRI Groundwater Protection Guidelines (1015118) for the for new plants to comply with 10 CFR 20.1406 and NEI 08-08.

**2012 Requested Funding**: $85K  
**Leveraged Funding**: $18K
2012-CC  ALARA and Radiation Management
Review of ALWR

Daniel Wells, PhD
ALARA and Radiation Management
Review of ALWR

**Issue**
- Unpublished evaluations of GEH ESBWR and Westinghouse AP1000™ plants are on the shelf from 2007
  - Previous evaluations need to be updated and published
- Evaluations of other ALWRs need to be initiated

**Project Objective**
- Update evaluations of the GEH ESBWR and Westinghouse AP1000™ designs
  - NSSS review could be leveraged
- Provide assessments of the other ALWR designs
Radiation Management and ALARA Review

Identify ALARA strategies and technological opportunities that will reduce worker dose from startup and throughout the life of plant

- Example technologies that are impossible or may be cost prohibitive after construction
  - Remote monitoring and data transmission infrastructure
  - Clean up system optimization
  - Control of radiologically significant areas
  - Permanent and temporary shielding
  - Surface preconditioning/pretreatment
Remote Monitoring Technology

Reducing Dose

- Reduces Dose
  - Workers and Field Technicians
- Improves Job Planning
- Improves the use of limited resources
Infrastructure for Remote Monitoring Technology

Operating Plant Experience

• Installation Requires Extensive Engineering Evaluations
  – Containment penetrations
    – Example Engineering Cost ~ $1.2M
  – Cable separation
  – Cable runs
  – Temporary vs. dedicated field power supply
  – Wireless systems required radio frequency interference evaluations

Post-Construction Mod for RMT Entire System ~ $50M
Bulk of Cost are Engineering
Tubing Material and Electropolishing
Reduced Radiation Fields

Dose rate reductions with EPRI SCrP application to SG diaphragm

Dose rate reductions with SG tubesheet electropolishing

Technologies must be applied before installation

2012-CC ALARA and Radiation Management
Review of ALWR

**Project Value**
Identify ALARA strategies and technological opportunities that will reduce worker dose from startup and throughout the life of plant

**Primary Outcome**
- NSSS vendors, architect engineers, and utilities can use the research results
  - Assist in implementation of advanced radiation protection strategies and technologies in the design, equipment acquisition, construction, and startup of these new plants.

**2012 Requested Funding:** $95K
# 2012 Candidate Tasks

<table>
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<th>Candidate Task Title</th>
<th>2012 Candidate Task Requests ($s K)</th>
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<td>ALARA and Radiation Management Review of ALWR</td>
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Advanced Nuclear Technology (ANT)

Financial Review

Jeffrey Hamel
Program Manager
Projected 2012 ANT Program Funding ($’s K)

Projected 2012 Total ANT Program Funding: $8,692K

* Several joint projects under discussion

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2012 ANT Membership Forecast

Expected 2012 Membership... $4.925M

Possible Upside....
## 2012 ANT Program Budget

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Note: not shown are pass threw funds such as DOE, TI, etc.
2012 ANT Program Budget Scenario

Assumes Budget Scenario on Previous Slide

- $2,184 Available to Fund NEW Projects
- $3,663 Estimated Active Projects / ANT Commitments

2012 ANT Program Budget Scenario
# 2012 Active Tasks

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<td>Achieving New Nuclear Virtual Plant Configuration Management - Data Model</td>
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<td>2009-01b</td>
<td>Achieving New Nuclear Virtual Plant Configuration Management - CM Implementation</td>
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<td>Next-Generation Attenuation (NGA) Model for CEUS (NGA-East)</td>
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<td>Evaluation and Qualification of Filmless Radiography</td>
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<td>Advanced NDE for Ferritic Stainless Steel Tubing</td>
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<td>High Strength Reinforced Rebar</td>
<td>$110</td>
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<td>2012-P</td>
<td>Pilot Project - Implementation of ASME Section III Code Case</td>
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<td>2012-R</td>
<td>Seismic Equipment Qualification (EQ) Assessment</td>
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<td>2012-I</td>
<td>10CFR50.69 Application and Pilot Plant Submittal</td>
<td>$150</td>
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<td>2012-C</td>
<td>Generic Latent Debris Sampling Methods</td>
<td>$256</td>
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<td>2012-F</td>
<td>Alloy 690TT Steam Generator Tubing Specification Handbook</td>
<td>$245</td>
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<td>2012-K</td>
<td>Feasibility Evaluation of Glass Reinforced Spiral Wound HDPE for Circ Water Piping</td>
<td>$135</td>
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<td>2012-E</td>
<td>Collaborative Manufacturing Development with Nuclear AMRC</td>
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<td>2012-J</td>
<td>New Steam Generator Thermal-Hydraulics Code</td>
<td>$105</td>
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<td>2012-S</td>
<td>Application of Fiber Reinforced Concrete in Nuclear Power Plants</td>
<td>$50</td>
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<td>2011-D</td>
<td>Guidelines for Crediting Self Testing and Monitoring to Extend Tech Spec Surveillances</td>
<td>$196</td>
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<td>2012-II</td>
<td>Assessment of Low Level Waste Management Technologies and Strategies for Advanced Nuclear Power Plants</td>
<td>$60</td>
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<td>2011-B</td>
<td>EPRI Groundwater Protection Guidelines for New Nuclear Power Plants</td>
<td>$85</td>
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<td>2012-CC</td>
<td>ALARA and Radiation Management Review of ALWR</td>
<td>$95</td>
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Total $1,580 $1,163
Advanced Nuclear Technology (ANT) Program

Strategic Discussion 2013
Program Focus
Advanced Nuclear Technology (ANT) Program

TVA-EPRI Collaboration

Bellefonte Nuclear Plant
TVA-EPRI Collaboration
Bellefonte Nuclear Plant

Presented by Dean Baker
TVA - Bellefonte
Steam Generator Project Manager
dcbaker@tva.gov  (269) 574-8789

January 31, 2012
## Nuclear Projects at TVA

<table>
<thead>
<tr>
<th>Under Construction</th>
<th>Engineering/Licensing</th>
<th>Studies</th>
</tr>
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<tbody>
<tr>
<td>Watts Bar 2</td>
<td>Bellefonte 1</td>
<td>Future Nuclear</td>
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</tbody>
</table>

### Expected in-service

<table>
<thead>
<tr>
<th>Watts Bar 2</th>
<th>Medium term</th>
<th>Long term</th>
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<tbody>
<tr>
<td>Megawatts</td>
<td>1,180</td>
<td>1,260</td>
</tr>
</tbody>
</table>
Bellefonte History

- Project placed on-hold in 1988, with intent that it would restart “soon.”
- Unit 1 reached 90% project completion when project stopped.
- With “investment recovery,” Unit 1 estimated to be about 50% complete.
Value of Existing Asset

- Electrical
- Piping
- Valves
- Rebar/Steel
- Concrete
- Site
- Infrastructure/Cooling Towers

Embedded value versus new construction
Bellefonte Project Status

- Project approved by TVA Board in August 2011

Project staffing:
- ~650 on site
- ~400 across nation

Initial engineering walk downs & design scope

Regulatory framework development (Part 50)

Establish contracts for long-lead components

Site facilities renovated and expanded
Bellefonte Design Philosophy

Improvements in safety margins over original design, meeting industry requirements for new reactor designs

Modern Control Room design
- Digital I&C Systems
- Analog capability for safety system operation

State of the art design for
- Steam generators
- Main condenser
- Main turbine
- Fuel

External Events Capability
- Flooding
- Tornado/Wind
- Seismic Cat I Bldg
- SBO Coping

Overall approach to design
- For piping, cabling – utilize existing assets provided testing demonstrates acceptability
- For active components – replace or refurbish
Bellefonte Technical Challenges

Design Reconstitution and Verification

Configuration Management

Testing and Acceptance Criteria to justify acceptance of installed equipment

- Cabling
- Buried Piping
- Concrete
- Seismic CEUS

280+ Dissimilar Metal Welds Requiring Mitigation
EPRI’s Advanced Nuclear Technology (ANT) Program

Program Objectives

• New nuclear power plants must overcome a number of regulatory, economic, technical, and social challenges prior to becoming a reality

• Program efforts focused around:
  – Facilitating standardization across the new fleet
  – Transferring technology to new plant designs
  – Ensuring top plant performance from start of operations
  – Reduce overall deployment risk and uncertainty
  – Supporting development of advanced nuclear plants and associated strategic initiatives
The TVA-EPRI Approach

➢ TVA’s One Voice

• Taking advantage of existing structure and relationships

• Pairing with existing TVA advisory team

• Pre-post meeting alignment discussions

➢ Focused Technology Transfer

• Specific Accountability Assigned

• Targeted technical meetings to communicate and address tough technical issues

• Executive Review and Oversight to assure alignment
Collaborative Results so far

- **Quarterly Technical Meetings**
  - NDE, PE, ANT, Materials, Chem, WRTC

- **On-Site Tours**
  - Understand how to efficiently engage with Bellefonte project
  - Identify potential for sharing materials with EPRI for R&D

- **Identification of Existing R&D**
  - Over 50 EPRI R&D Products with direct applicability to challenges at Bellefonte identified to date

- **Commitment to Future R&D**
  - Configuration Management
  - Start Up Lessons Learned
  - Chemistry Passivation Lessons Learned
  - NRC Construction Oversight Processes
  - NDE Code Case on Alternative weld acceptance criteria
Future Opportunities

➢ Material Availability
  • “Aged” and non-irradiated material potentially available for transfer
  • Applications to LTO, WRBC, Materials, BPIG etc.

➢ Potential for new R&D for the industry benefit
  • Cable Aging and Testing
  • Buried Piping Aging and Testing
  • Digital I&C Control Room Technical Bases
  • Component aging and Life-Cycle Management
The Conclusion

- Alignment of goals

- Collaboration to help TVA be successful while providing useful research to the nuclear industry.

- Opportunity to capture lessons learned and transfer technology.
QUESTIONS?

TVA – Bellefonte Project
Advanced Nuclear Technology (ANT) Program

Action Items
Advanced Nuclear Technology (ANT) Program

Upcoming Events
ANT Meetings February – March

NAMRC / EPRI Workshop
February 14th
Sheffield, UK

European Integration Committee
February 15th
Sheffield, UK

EPRI-NIRMA New Plant Working Group
March 13th
Charlotte, NC

Configuration Management Technical Advisory Group Annual Meeting
March 13th – March 14th
Charlotte, NC

Supplier Quality Manual
March 20th
Charlotte, NC

Integration Committee – 2013 Project Creation
March 21st
Charlotte, NC

690TT – Kick-off Meeting with Utility Committee
March 22nd
(Location TBD)

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ANT Meetings April – September

**NAMRC / EPRI Workshop**
April
EPRI (Location TBD)

**Integration Committee – 2013 Project Prioritization**
May 23rd
Palo Alto, CA

**International BWR/PWR Reactor Materials Conference & Exhibition**
July 16th – July 20th
Washington DC

**Ant Action Plan Committee & Nuclear Power Council**
August 27th – 30th
Atlanta, GA

**Integration Committee – 2013 Project Finalization**
August 8th
Washington DC

**690TT – Tubing Vendors**
August 31st
(Location TBD)

**690TT – Consultation with Steam Generator Fabricators & Vendors**
September 30th
(Location TBD)
Together…Shaping the Future of Electricity