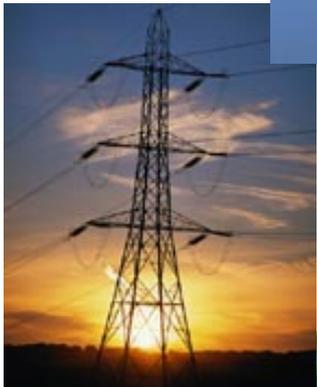


The logo for the Electric Power Research Institute (EPRI), consisting of the letters 'EPRI' in a stylized, blue, sans-serif font.

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## Implementation Status of Industry Change Management Plan for Materials Related R&D Committees under NEI 03-08

Mike Robinson  
Duke Power  
Materials/Aging APC



# Change Management Plan (CMP) – NEI 03-08

## Transition from MEOG/MTAG

- 2008 Assessment of Materials Initiative Implementation – Two Recommendations
  - Simplify oversight structure (completed)
    - Established an Executive Committee and Technical Committee from the Materials Action Plan Committee (APC) under EPRI
    - Executive Committee reports to Nuclear Power Council Executive Committee (NPC) of EPRI
  - Verify need for both MRP and PWROG Materials Subcommittee, MSC (completed)
    - Committees complement each other
    - PWROG actions involves operational aspects of issues (e.g., RCS Leakage Guidelines)

# NEI 03-08 Committee Transition Details

- Changes to EPRI APC Structure
  - Established Executive Chair for Materials and NDE APCs
    - Separate executive and technical committees with respective chairmen
  - Establishes specific ‘seats’ on Materials APC committees
    - Chairs– EPRI: BWRVIP, PWR Materials Management Program (PMMP), NDE APC, Primary Systems Corrosion Research (PSCR), Water Chemistry Committee (WCC), and PWROG
    - Executive and Technical chair of the PWROG MSC
    - At large members – PWROG utility members, utility members representing major nuclear fleets, other NPC members
    - INPO, NEI
  - Materials and NDE APC will have some responsibilities from NEI 03-08 that MEOG and MTAG had responsibility
    - E.g., review operational experience and factor it in decision making process

# CMP Schedule

- MEOG Approve CMP – July 22, 2009 (Complete)
- MEOG Chair Brief NSIAC – August 20, 2009 (Complete)
- Materials APC Chair Brief NPC Executive Committee – August 26, 2009, (Complete)
- Identify Executive Chairs for Materials and NDE APCs – September 15, 2009 (Complete)
- Transition Team Meet to Develop Details for Changes to Documentation – October 2009 (Complete)
- Obtain NPC EC Approval for Materials and NDE APC Chairs/Sponsors – November 15, 2009 (Complete)
- Sunset MEOG and MTAG – January 1, 2010 (Complete)
- Update NEI 03-08 and EPRI Nuclear Sector Operations Protocol – January 1, 2010 (Complete)
- Established separate executive and technical committees from Materials APC
- Update EPRI committee administrative procedures – by March 31, 2010 (in progress)
- Produce charters for Material APC committees-(in progress)
- First meeting of both committees occurred in January 2010

# Responsibilities of New Materials Committees

- Ensure industry funding is sufficient to address materials degradation issues
  - Follow established priorities of R&D as established by the Issue Management Table (IMT) and Materials Degradation Matrix (MDM) are followed
  - Coordinate R&D across various material committees
- Identify and deal with emerging issues in a proactive way
- Review operational experience, both domestic and foreign, to identify and operate on trends as needed
- Review established metrics measuring degree of success are acceptable
- Communicate needs and recommendations to NEI NSIAC and NPC Executive Committee
- Ensure Issue Programs (i.e., SGMP, BWRVIP, NDE and MRP) are effectively communicating with NRC



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## **EPRI Chemistry Program**

**David A Steininger**

**Director, Materials**

Nuclear Power Sector

NRC/Industry Management Meeting

June 2, 2010

# Chemistry SCOPE



**Steam Generator Management Program (SGMP)**  
**Balance of Plant Corrosion (Secondary System)**  
**Steam Turbines (Program 65)**

**Materials Reliability Program (MRP)**  
**Primary Systems Corrosion Research (PSCR)**

**BWRVIP**

Other  
 Chemical  
 Systems

Open and Closed  
 Cooling Water

**NEW!**

**B/C Reduction Guide**

Materials

Operations

**Water Chemistry Strategic Plan**

- Safety / Operations
- Materials
- Fuel Performance
- Dose Rates

Fuel

**Fuel Reliability Program**

**Water Chemistry**

Dose

**Radiation Management Program**

LLW

- Water Chemistry Guidelines
- Sourcebooks (Application Guides)
- ChemWorks™ Codes
- Technology Development

# BWR / PWR Monitoring and Assessment Programs

## 198 Participating Units

United States (104)

Europe (70)

<b>BWR Monitoring Reports</b>
Shutdown Chemistry and Dose Rates
Chemistry Summary
Chemistry Performance and Monitoring
Sampling Summary
Deep Bed Resins And Precoat Materials Report
IGSCC Mitigation Performance

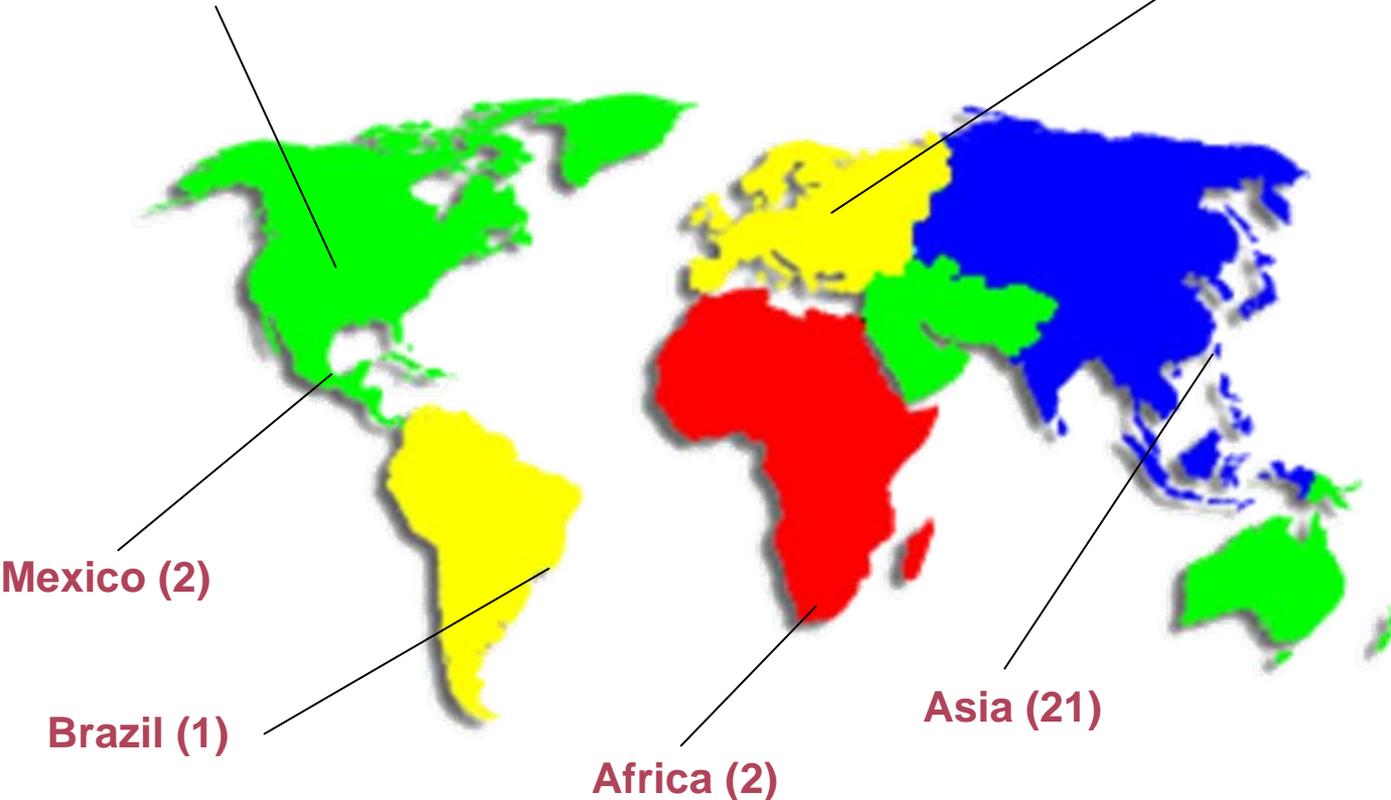
<b>PWR Monitoring Reports</b>
Primary Chemistry
Secondary Chemistry

Mexico (2)

Brazil (1)

Africa (2)

Asia (21)



# PWR Primary Chemistry Focus: Hydrogen and Zinc

EPRI (Chemistry, RM, FRP, MRP, SGMP)

EPRI (Chemistry, RM, FRP, MRP)

+  
PWROG

## Zinc

### Benefits:

- Reduce Plant Dose Rates
- Reduce general corrosion rates
- Delay PWSCC Initiation
- Slow crack growth in SG tubes

### Challenges:

- Benefit for “mature” cracks in thick components?
- Synergistic effect with H<sub>2</sub>?
- Concern for High Duty Fuel?

## Elevated H<sub>2</sub>

### Benefits:

- Slow crack growth rates

### Challenges:

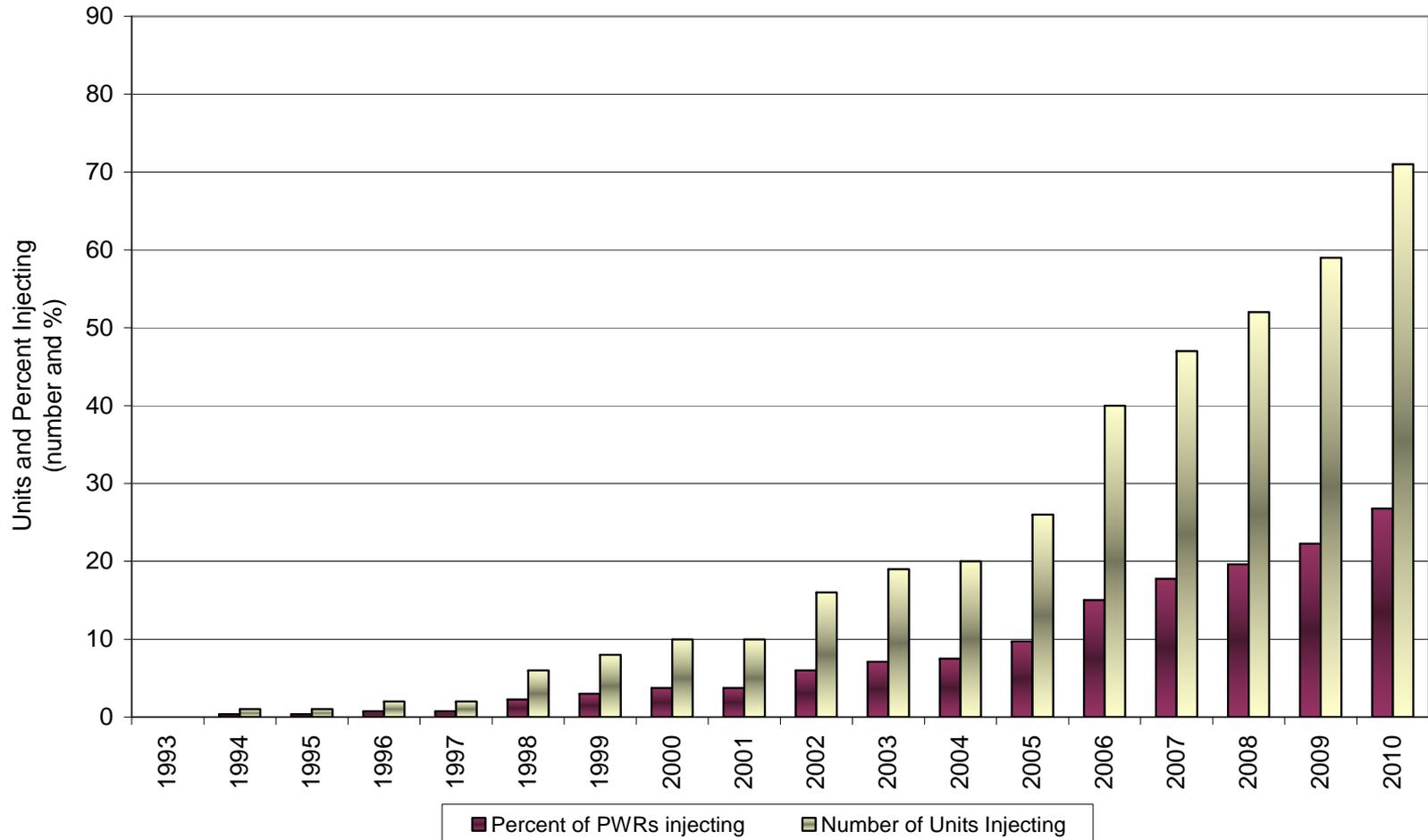
- Synergistic effect with Zinc?
- Affect on Fuel?
- Affect on Plant Operation?

PWR Zinc Sourcebook Revision

Evaluation for Elevated H<sub>2</sub> Operation

# Zinc Addition Worldwide

Worldwide PWR Zinc Injection  
Actual and Projected



# PWR Secondary Chemistry Focus: Dispersant Application (Chemistry and SGMP)

**2000 - 2006:** Qualification and **Short-term On-line Trial** at ANO-2  
Start NSSS Vendor Reviews for technical concurrence  
Qualification and **Long-term On-line Trial** at McGuire 2

**2005+:** Plant Specific Evaluations

**2007: Dispersant Application  
Sourcebook**  
*Planned Revision Starting in 2011*

**2007 - 2010:** NSSS Vendor Reviews –  
Concurrence for long-term use (LTU)

**2009:** Incorporation into the EPRI Secondary  
Water Chemistry Guidelines – Revision 7

**2009+:** Dispersant online application

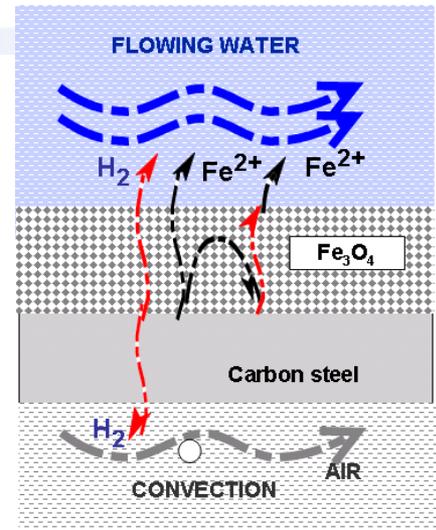
Byron 1 (April 2009)  
Braidwood 1 (Jan 2010)  
Byron 2 & Braidwood 2 (by 3Q 2010)  
STP (by 4Q 2010)

**2011:** Dispersant Application during SG Wet  
Layup (*several applications by Dec 2010*)

**2009:** Dispersant Application during  
Recirculation Cleanup at Startup  
*First application: Spring 2011*

# Minimization of Feedwater Iron Transport during Startup –2010 Key Project

- **Project is for BWRs and PWRs**
- Current approaches to minimizing transport needed
- Project will identify and evaluate:
  - Current sampling/analysis techniques during startup
  - Feedwater and condensate system layup
  - Flushing and cleanup during recirculation
  - Other areas...options for improving transport quantification (e.g. particle analyzers)
- **Benefits:**
  - For BWRs: reduced fuel deposits, generation of radioactive species, dose and radwaste
  - For PWR SGs: reduced tube fouling, crevice plugging, sludge buildup and need for chemical cleanings
  - INPO CEI impacts



# New Horizons

## Open and Closed Cooling Water Guidelines need Revision

- Inherited from Plant Support Engineering:
  - Service Water System Chemical Addition Guidelines (TR-106229, 1996)
  - Closed Cooling Water Guidelines (1007820, 2004)
- Review meeting held March 9-10, 2010
  - 9 Utility members, INPO, EPRI, consultants/vendors
  - Both Guidelines NEED Revision
    - Higher priority to Service Water System Chemical Addition Guidelines
      - Begin revision of Service Water System Chemical Addition Guidelines in 2010. Publish in 2012
    - Begin revision of Closed Cooling Water Guidelines in 2012



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## **EPRI Primary Systems Corrosion Research**

**Robin Dyle, EPRI**

Technical Executive

Nuclear Power Sector

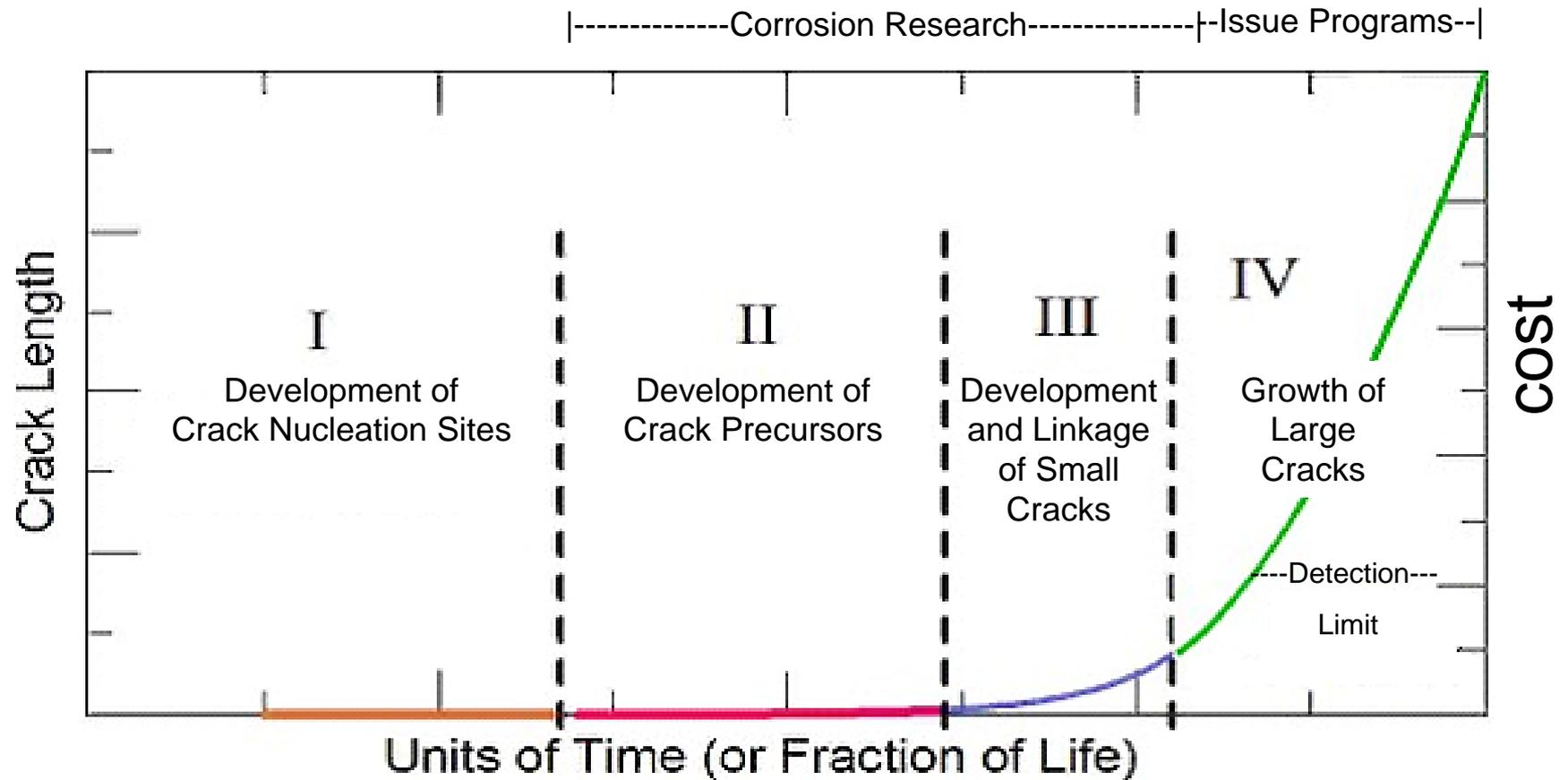
**Industry/NRC Executive Meeting on  
Materials Program**

June 2, 2010

# Primary Systems Corrosion Research Program: Background

- Goal:
  - *Develop a fundamental understanding of crack initiation and propagation processes leading to stress corrosion cracking and irradiation-assisted stress corrosion cracking in BWR and PWR materials*
  - *Develop robust predictive models based on a deeper technical understanding of material degradation*
  - *Apply this knowledge to improve the useful life and reliability of BWR and PWR primary system components*
- PSCR resources are leveraged by participation in international collaborative research programs

# Progression of Environmental Cracking Damage



**A large fraction of component life is spent in Stages I-III**

# EPRI Material Degradation Matrix: Industry Strategic Issues

- Environmental Effects on Fracture Resistance\*
- Environmental Effects on Fatigue Life
- SCC of Ni-Base Alloys\*
- SCC of Stainless Steels\*
- Effect of Fluence on SCC Susceptibility and SCC Crack Growth Rates\*

\*PSCR is addressing these issues on a fundamental level

NRC Proactive Material Degradation Assessment (PMDA) reached the same conclusions

# Material Degradation Matrix 2<sup>nd</sup> Revision:

- Focus on materials aging management for 60 to 80-year operation
- Cofunded by EPRI Long Term Operation (LTO) initiative
- A team of industry materials experts met on February 11-12, 2010 in EPRI/Palo Alto to revise the MDM
- MRP, BWRVIP and SGMP will use the MDM to update Issue Management Tables and to prioritize knowledge gaps

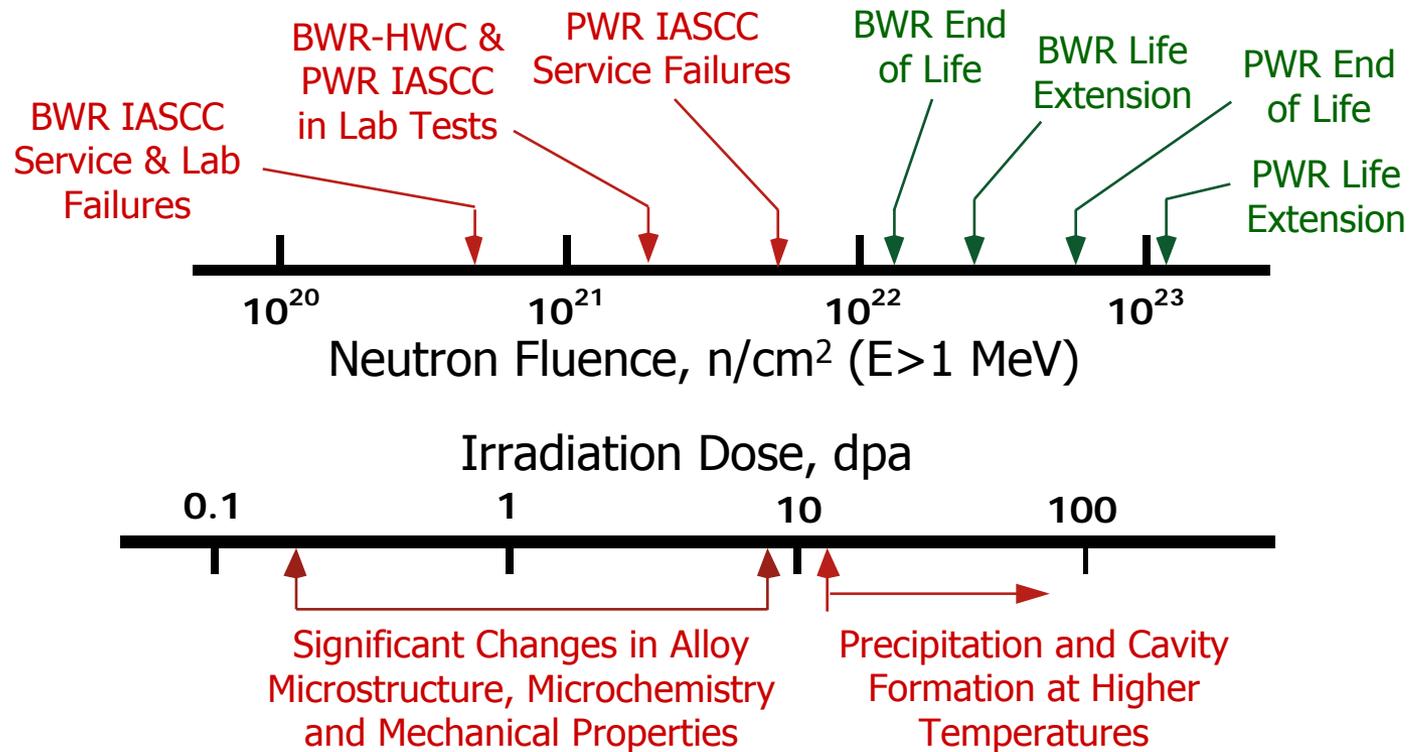
## Deliverable:

- Material Degradation Matrix 2<sup>nd</sup> Revision will be issued in mid-2010

# Cooperative IASCC Research Program (CIR)

- International research alliance managed by EPRI
  - Utilities (EDF, TEPCO, UNESA, Vattenfall, OKG)
  - Regulators (USNRC, SSM)
  - Research Organizations (CEA, VGB, SCK-CEN, IFE Halden)
  - Vendors (AREVA)
- Develop a mechanistic understanding of IASCC
- Derive predictive model of IASCC, if possible based on a mechanistic understanding
  - *Define role of material, fluence, flux, stress, stress intensity factor, chemistry, temperature in IASCC*
- Identify possible countermeasures to IASCC

# IASCC of Austenitic Stainless Steels in LWRs



Note :  $\sim 15$  dpa  $\equiv 10^{22}$   $n/cm^2$   $E \geq 1$  MeV (for PWR and BWR neutron spectra)

# CIR Program: Status

- Final overview report on the CIR Program will be reviewed by CIR technical experts and finalized in 2010
  - *Summarize results and conclusions*
  - *Identify remaining knowledge gaps and areas of future research*
- The final overview report and a comprehensive CD including all CIR II reports will be issued in 2010

# IASCC Data Compilation and Analysis

- Objective:
  - Compile crack growth rate data on irradiated stainless steels being developed under several EPRI and international programs
  - Convene an Expert Panel to screen the available CGR data on irradiated materials using appropriate screening criteria and recommend crack growth disposition curves for BWRs and PWRs
- Scope:
  - Phase 1-Collect and compile results of crack growth tests from:
    - CIR-fast reactor irradiated materials
    - Halden-LWR irradiated materials & in-reactor tests
    - BWRVIP-BWR irradiated materials
    - MRP-PWR irradiated materials

# IASCC Data Compilation and Analysis (contd.)

- Scope (contd.):
  - Phase 2-Convene Expert Panel to screen the available data and recommend appropriate crack growth disposition curves
  - Prepare technical basis report
  - This work will be coordinated between PSCR, BWRVIP and MRP
- Benefit:
  - Crack growth disposition curves for reactor internals in BWRs and PWRs based on expert assessment of CGR data
  - Can be used to assess remaining life of irradiated components and to make sound run or replace decisions



## EPRI Materials Information Portal

**ENTER**

The EPRI Materials Information Portal (MIP) is an online collection of EPRI materials initiative related information and presently includes the EPRI Materials Degradation Matrix (MDM), Issue Management Tables (IMTs), and the Materials Handbook. The EPRI MIP is an EPRI materials tool provided to the authorized EPRI members only. However, the public can view the following key components in MIP:

- [Materials Degradation Matrix \(MDM\)](#)
- [PWR Issue Management Tables \(PWRIMT\)](#)
- [BWR Issue Management Tables \(BWRIMT\)](#)

For additional information, please contact [Tiangang Lian](#) at (650) 855-2405.

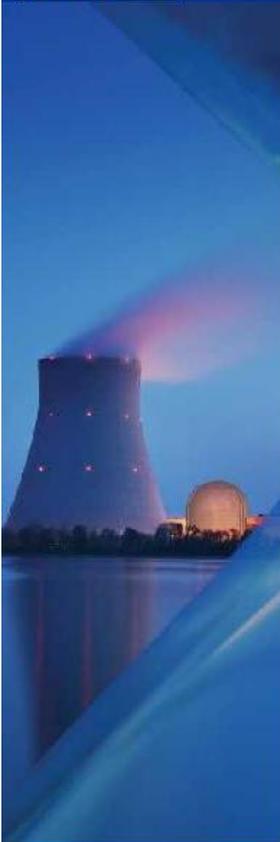
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## **Nondestructive Evaluation**

**Joe Donahue, Progress Energy**  
Chairman, NDE Action Plan Committee  
**Industry/NRC Executive Meeting on  
Materials Program**  
June 2, 2010

Nuclear Power Council

Nuclear Power Council

Executive Committee

Action Plan Committee

NDE APC

Integration Committee

NDE IC

Technical Advisory Committee

Aging Plant NDE

BOP

PWR SS

Filmless Radiography

Groundwater Protection

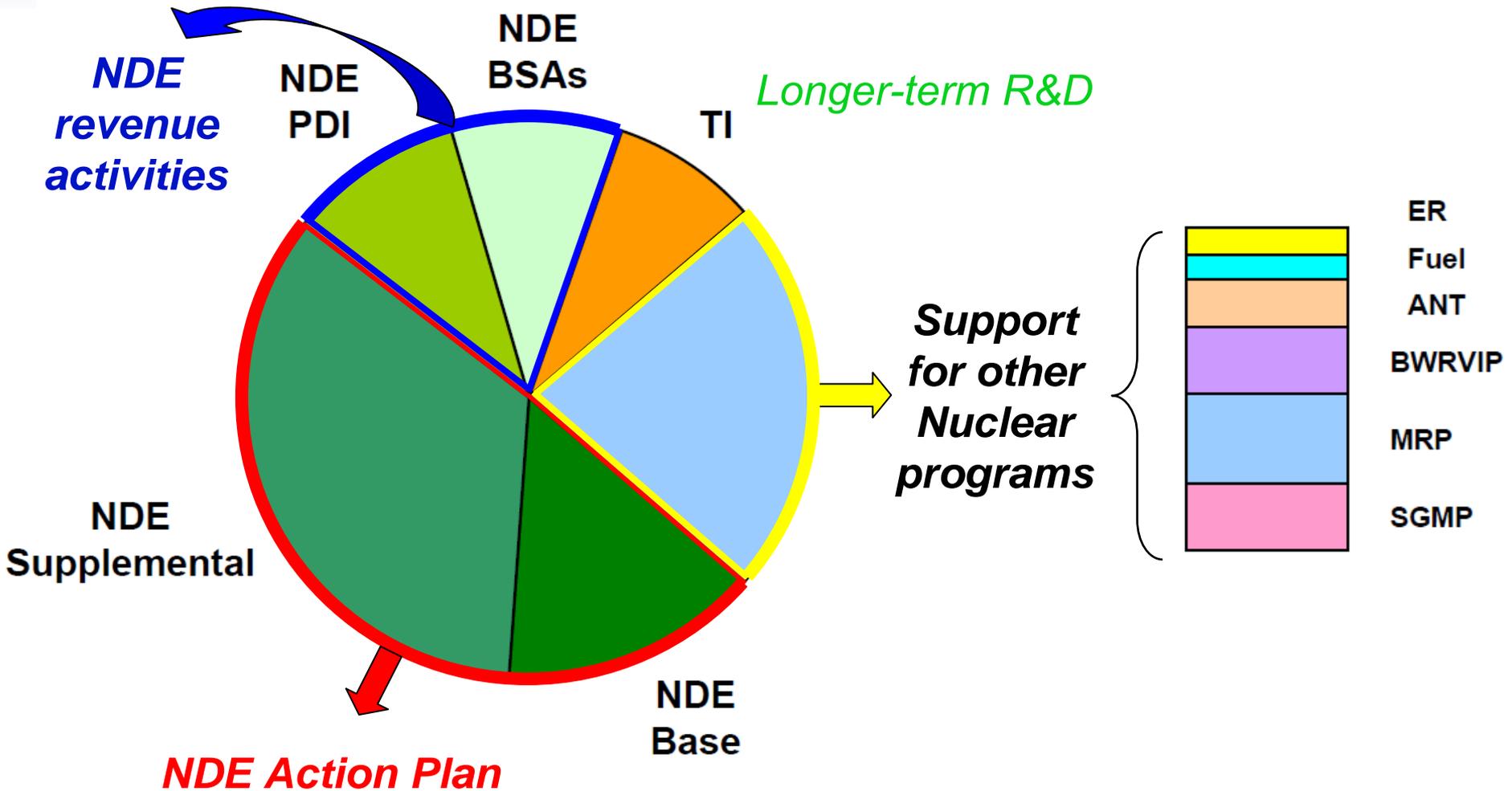
Remote Visual

Risk-Informed ISI

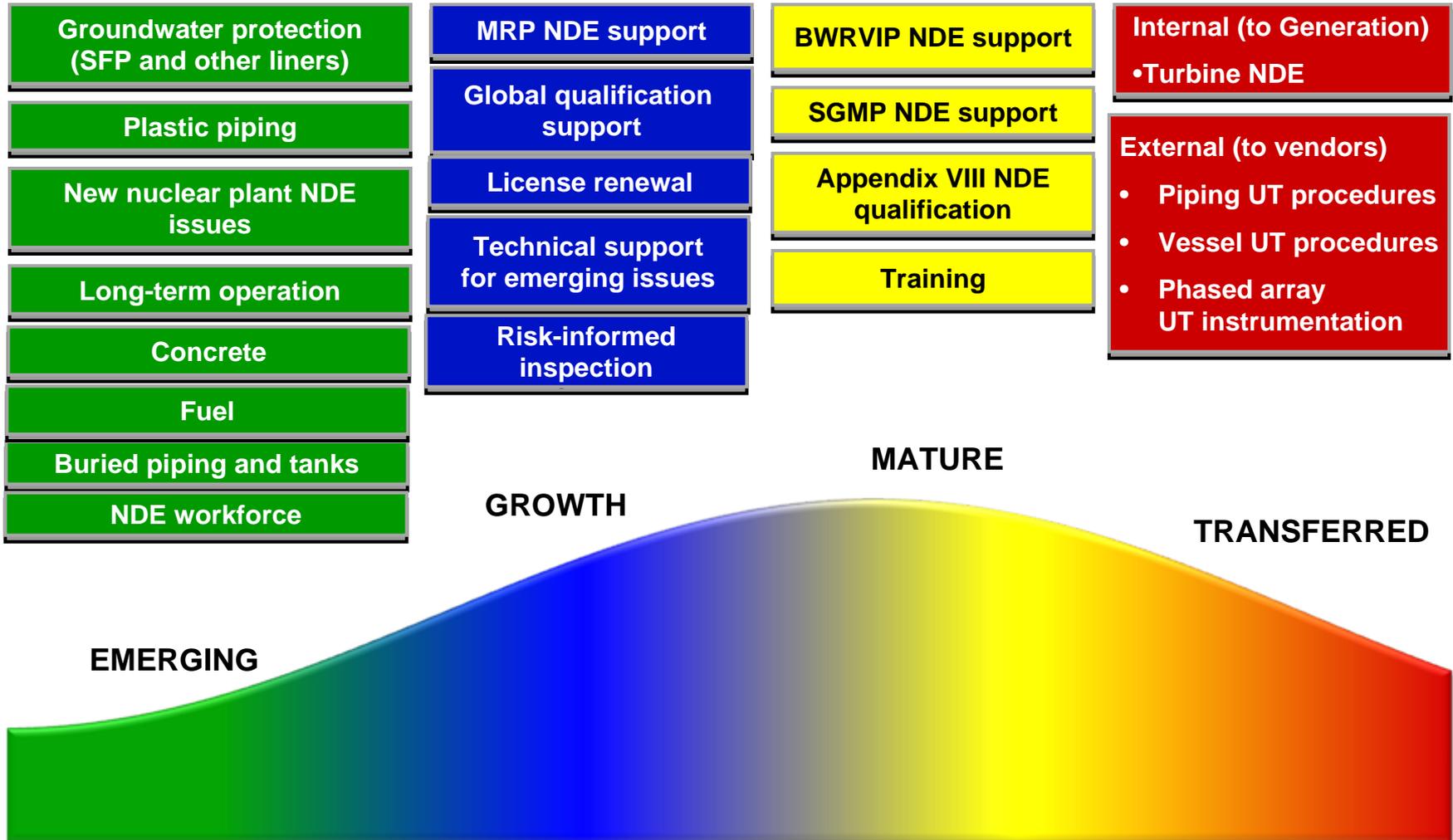
NDE Workforce

PDI

# EPRI NDE – four main activities



# Diversity of NDE Program mission



# Major deliverables 2010

- Dissimilar metal welds
  - Guidance on distinguishing embedded flaws
  - NDE guidance and OE, Volume 8
  - 3D laser mapping of surface contour
- Groundwater contamination
  - Buried piping and tanks  
NDE: report on state of the art
  - Liners of spent fuel pool, transfer canal, reactor cavity
- PWR RPV head penetrations
  - 2009 1<sup>st</sup> qualification; 2010 expect 4 more
  - Davis-Besse support, onsite and remote
  - Researching EM and laser methods for examining the weld surface
- Other
  - New plant components design for inspectability
  - HDPE piping inspection
  - Concrete degradation management and NDE
  - Cast stainless steel - low-frequency ultrasound

# Strategic items

- Capability of remote visual examination (VT)
  - RES and industry collaboration
  - Goal: assess reliability of remote VT as applied in the field
  - Planning a three-phase round robin study 2010-2012
  - Potential impact on examination of reactor vessel internals
- Embedded flaws
  - Qualified NDE can mis-identify embedded, benign flaws cracking (example: Calvert Cliffs, Jan 2010)
    - PDI qualification includes only cracking
  - EPRI is developing training materials and hands-on workshops to improve examiners' ability to distinguish embedded from relevant defects
    - Available now – hands-on UT workshop
    - Proposed 2011-13 – publish guidance for UT, RT, other methods

# Discussion



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# Boiling Water Reactor Vessel & Internals Project (BWRVIP)

**David Czufin, Exelon**

BWRVIP Executive Chairman

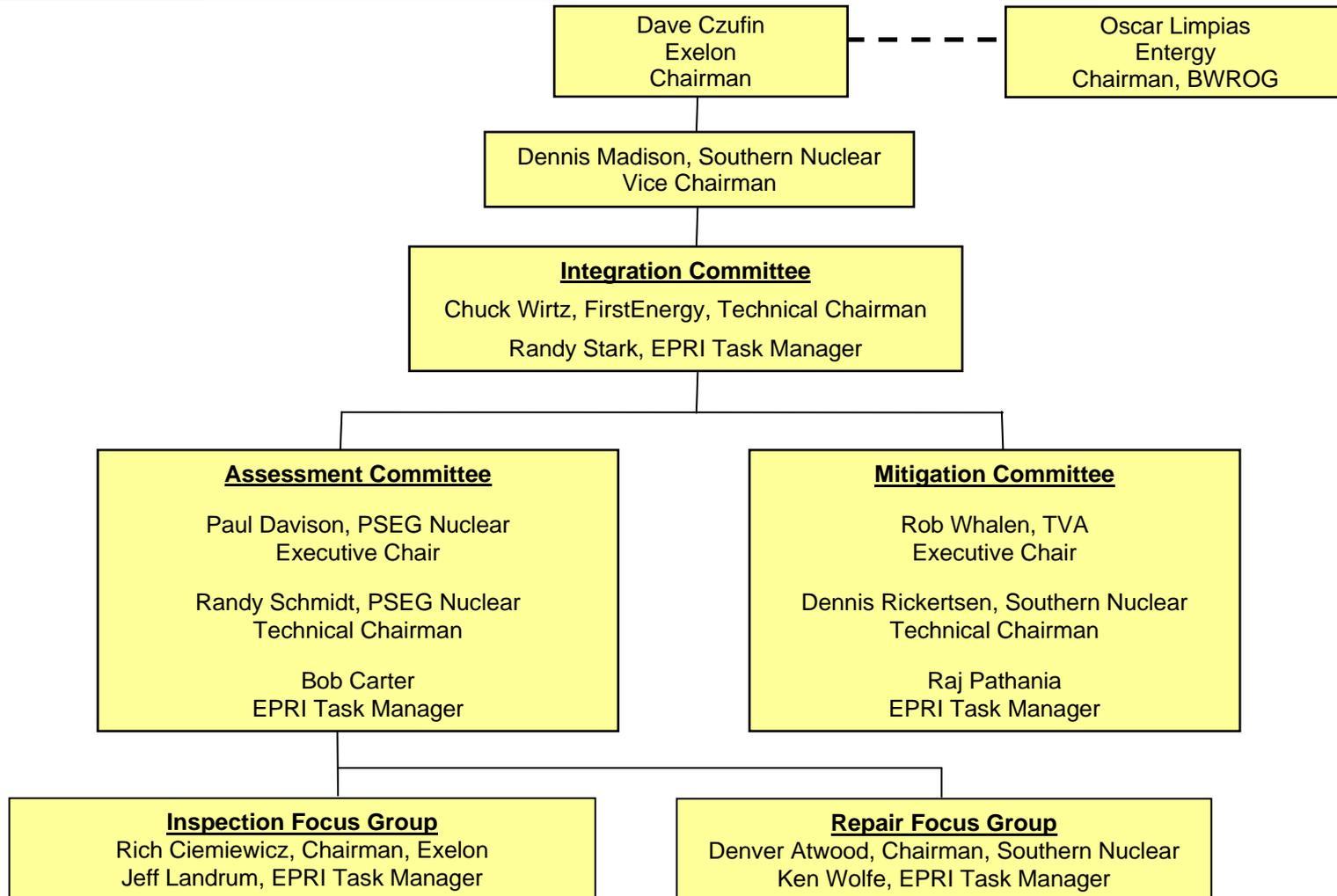
**Industry/NRC Executive Meeting on  
Materials Program**

June 2, 2010

# Presentation Outline

- BWRVIP Organization
- Technical Committee Responsibilities
- 2010 Major Tasks
  - Optimization of Inspection Frequencies
  - Testing of X-750
  - Irradiated Materials Welding
- BWRVIP and the Generic Aging Lessons Learned (GALL) Report Update
- Planned Report Submittals for 2010

# BWRVIP Organization



# Technical Committee Responsibilities

- Assessment -- What needs to be inspected, when it needs to be inspected, inspection options, how to disposition observed degradation
- Inspection -- How to inspect, what equipment and techniques are available, what are the associated uncertainties
- Repair/replace -- What repair/replacement techniques are available and what are the associated requirements that must be met
- Mitigation -- How can SCC degradation be prevented or reduced

# BWRVIP Major Tasks

- Crack Growth and Fracture Toughness in High Fluence BWR Materials
- Steam Dryer Loads Methodology Report
- Jet Pump Degradation Management
- Optimization of Inspection Frequencies
- Testing of X-750 Materials
- Welding of Highly Irradiated Materials
- Evaluation of Core Plate Bolts
- Online NMCA Demonstration Project
- Generic Safety Evaluation and Demonstration of Alternate Reductant Injection to Mitigate IGSCC at Low Temperatures

# Optimization of Inspection Frequencies

- BWRVIP intends to re-visit the I&E Guidelines and to optimize the inspection programs based on:
  - Latest field inspection data and fleet operating experience
  - SCC mitigation associated with HWC / NMCA
  - Current NDE capabilities
  - Component repairs
  - In-situ crack growth rate studies
  - Structural analyses

# Testing of X-750 Materials

- X-750 is a high strength alloy that is used extensively in BWR jet pump beams and repair hardware
  - Susceptible to IGSCC
- Industry knowledge gaps include both irradiated and non-irradiated material characterization
- Scope of work includes both non-irradiated material characterization studies as well as irradiated testing
- BWRVIP will work with Idaho National Lab (INL) to irradiate X-750 material to a fluence level applicable to end of life fluence of BWR X-750 materials
- This work will set the stage for other Materials Issue Programs to use INL for irradiation of materials

# Welding of Highly Irradiated Materials

- BWRVIP has developed predictive models for constructing “good” welds at given locations based on fluence levels, helium content, heat input, etc.
- Based on these models, it was recognized that there was a gap in the currently available welding technologies
  - Nothing available that could deliver the lower heat inputs needed
- BWRVIP approved 2010 task to establish and test essential variables using laser welding technology
  - The result would be a specification showing how these key essential variables (weld head, bead size, feed rate, position, etc) influence the heat inputs needed to construct “good” welds

# BWRVIP and the Generic Aging Lessons Learned (GALL) Update

- The GALL report relies heavily on BWRVIP guidelines as effective Aging Management Programs (AMPs) for BWR reactor vessel and internals
  - 14 Inspection and Evaluation guidelines (I&EGs) are referenced in draft R2 of the GALL
  - Many other supporting guidelines such as repair, crack growth rate, and water chemistry reports also referenced in the GALL
- BWRVIP reports are updated to address new data or operating experience, thus the BWRVIP's position is that flexibility should be built into the GALL
  - Reference to I&EGs and other reports that are submitted to the NRC for approval should state, "or latest NRC approved revision"
  - Although not submitted for review and approval, allowance for use of the latest version of the water chemistry guidelines should also be made

# Expected Near Term Submittals

- BWRVIP-76-A (core shroud I&E guidelines)
- BWRVIP-158-A (flaw proximity rules)
- BWRVIP-181-A (steam dryer repair design criteria)
- BWRVIP-182-A (guidance for demonstration of steam dryer integrity for power uprate)
- BWRVIP-217 (access hole cover repair design criteria)
- BWRVIP-234 (thermal aging and neutron embrittlement evaluation of cast austenitic stainless steels)



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# Steam Generator Management Program

**John Meyer**

SGMP Executive Sponsor

**Industry/NRC Executive Meeting on  
Materials Program**

June 2, 2010

# Presentation Outline

- Steam Generator Task Force Overview
- NRC Open Technical Issues
- H\* Alternate Repair Criteria
- Divider Plate Cracking
- Summary

# SGTF Overview

- Purpose
  - Maintain open communication between the industry and the NRC staff
- SGTF and NRC typically meet twice per year
  - Facilitated by NEI
  - SGTF Membership
    - SGMP Integration Committee Members
    - Utility Participants
    - NSSS Vendors
    - EPRI SGMP Staff
  - Standing agenda items
    - Status of open technical issues
    - Upcoming changes to industry guidelines
    - Recent operating experience
    - NRC feedback

# SGTF Overview

- 2010 Meeting Dates
  - February 2010
  - August 2010
- NRC interactions with the SGTF have been valuable
  - NRC informed of industry projects
  - Industry becomes aware of NRC issues
  - SGTF expertise allows some issues to be immediately closed during the meeting
  - Some long-term research can be co-funded between SGMP and NRC, such as work at ANL

# NRC Open Technical Issues

NRC Technical Issue	Industry Response
Need for eddy current testing technique essential variable tolerance for generically qualified techniques	SGMP project will be complete in 2010 to provide methodology for evaluating site-specific system performance
Divider plate cracking	SGMP project is complete and final report will be published 2010 that provides the basis that a fully degraded divider plate is not a safety concern.
The effect of eddy current noise on probability of detection and sizing of indications	SGMP has published protocol and procedures and software specification for noise monitoring. Vendors have been developing software for automated noise monitoring Pilot projects are being funded through SGMP to demonstrate the capabilities of the software
Onset of fatigue cracking in throughwall steam generator defects	SGMP project to perform tests to determine the onset of fatigue cracking. NRC/ANL/SGMP working together on this project
Qualification of techniques to detect foreign objects	An SGMP project was completed in 2010 to provide eddy current data analysis guidance for detection of foreign objects

# NRC Open Technical Issues

NRC Technical Issue	Industry Response
<p><b>Tube fouling</b></p>	<p><b>SGMP is funding projects in 2010 to better understand how existing plant measurements can be used to evaluate the level of fouling, to develop a model to predict the level of fouling over time, and to develop a dynamic analysis tool for prediction of the level of fouling that may result in operational issues.</b></p>
<p><b>Performance standards for tube integrity assessments</b></p>	<p><b>SGTF presented industry position that current performance standards are adequate. Staff will review the documentation and this will be discussed at a future meeting</b></p>
<p><b>Screening criteria for Alloy 600TT tubing</b></p>	<p><b>SGMP conducted a survey of Alloy 600TT inspection results and the use of the 2004 screening criteria. These results and previous screening recommendations are under review by SGMP.</b></p>
<p><b>In Situ Pressure Test Screening</b></p>	<p><b>SGMP is reviewing the latest Vogtle tube pull results and field eddy current results to determine if current in situ pressure test screening should be adjusted.</b></p>

# H\* Alternate Repair Criteria

- There are significant conservatisms in the H\* methodology
  - Actual condition of tube ends will never be as degraded as assumed by H\* methodology
- Both NRC and Industry management have vested interest in closure
  - There is no qualified eddy current inspection technique for detection of stress corrosion cracking in tube end welds
  - Cracks in tube end welds may not be service-induced
  - H\* is a conservative alternative to plugging tubes with tube end indications
  - Plants continue to obtain one-cycle amendments
  - We need to identify a path to timely resolution

# H\* Alternate Repair Criteria

- ANL has been involved with the H\* review process since 2008 and has found no technical errors with the Westinghouse assessments
  - ANL has substantiated the quality of Westinghouse analyses to date
- The process of involving ANL has impacted cost and schedule
- The industry is concerned that we are not reaching final closure

# Divider Plate Cracking

- SGMP research is complete and concludes that a completely degraded divider plate to stub runner weld is not a safety concern during normal or accident conditions
- NRC recently identified the following divider plate issue during license renewal review process
  - Although these SG divider plate cracks may not have a significant safety impact in and of themselves, such cracks could impact adjacent items, such as the tubesheet and the channel head, if they propagate to the boundary with these items.
    - For the tubesheet, PWSCC cracks in the divider plate could propagate to the tubesheet cladding with possible consequences to the integrity of the tube/tubesheet welds.
    - For the channel head, the PWSCC cracks in the divider plate could propagate to the SG triple point and potentially affect the pressure boundary of the SG channel head.
- **The industry is currently reviewing options for addressing this issue**

# Summary

- The SGTf interaction with the NRC is working well
- The industry is seeking timely resolution of the H\* issue
- Review of the new divider plate issue is underway



# Industry Executive - NRC Management Meeting Materials Programs

## PWROG Materials Subcommittee Overview

Terry Garrett, Vice President Engineering, Wolf Creek  
PWROG Executive Sponsor

June 2, 2010

# NRC/Industry Executive Management Meeting

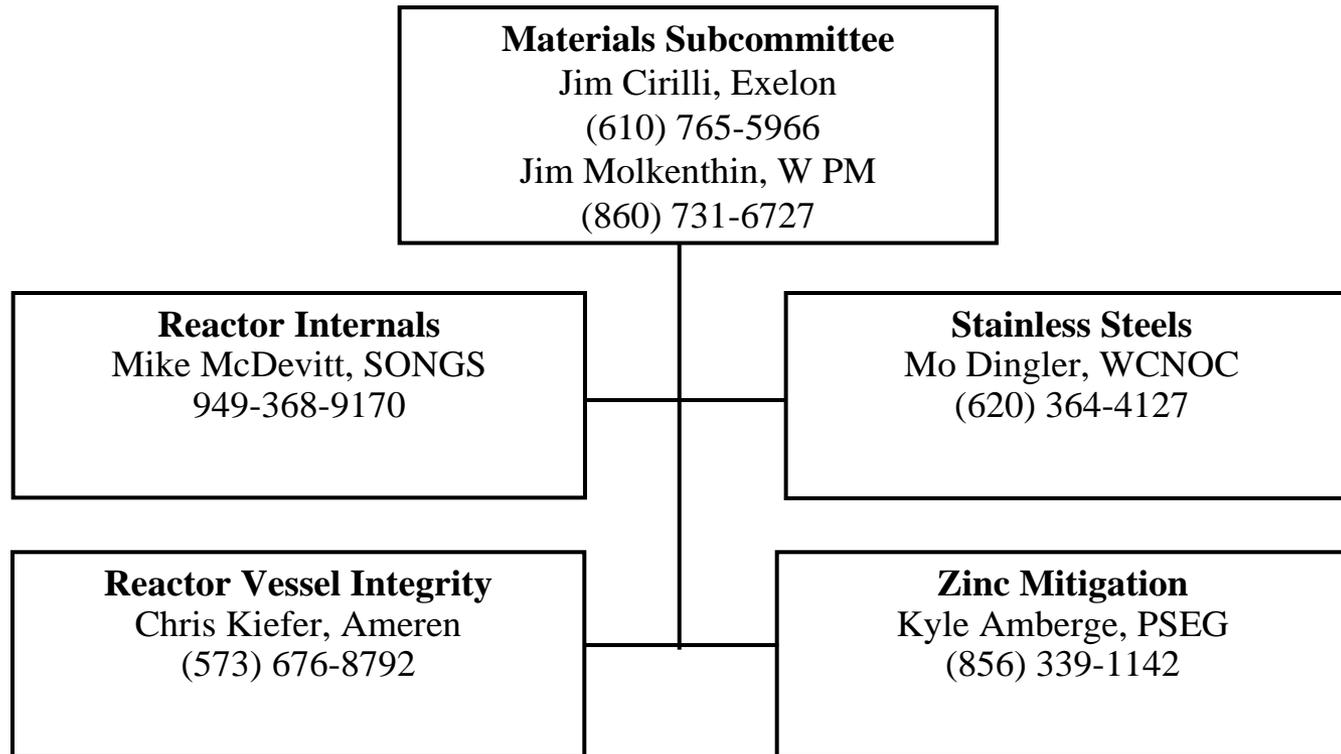
## PWR Owners Group MSC Topics

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- Core Team Strategic Focus Areas & Coordination with MRP
- MSC Key Deliverables of 2009
- MSC Key Technical Programs for 2010 - 2011
- MSC – NRC Interactions
- Key Contacts

# NRC/Industry Executive Management Meeting

## Core Teams Strategic Focus Areas & Coordination with MRP



# NRC/Industry Executive Management Meeting

## PWROG Key Deliverables of 2009

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### PWROG focus has been on operational & implementation issues support for its membership

- PWR Reactor Internals Inspections Programs
  - Guide Card Wear Pilot Inspections in Westinghouse Plants
  - Generic Acceptance Criteria Methodology to Support MRP-227 Inspections (WCAP-17096)
- Flaw Evaluation Handbooks to Support MRP-139 Examinations of Cold Leg Locations
  - CE Design RCP Suction and Discharge, and Safety Injection Nozzle Dissimilar Metal Welds (WCAP-16925-P & WCAP-17128-NP)
  - B&W Design RCP Suction and Discharge, and HPI Dissimilar Metal Welds (AREVA report No. 86-9114013-000/001)
- RPV ISI Interval Extension from 10- to 20-Years (PA-MS-C-0120)
  - 14 submittals prepared in 2009

# NRC/Industry Executive Management Meeting

## PWROG MSC Key Technical Programs for 2010 - 2011

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**The MSC currently has 20 active Project Authorizations.**

### **Key 2010 - 2011 RPV Integrity Programs:**

- Development of Implementation Plan for Coordinated Surveillance Capsule Program (PA-MS-C-0553)
- RV ISI Interval Extension – Continue with additional Plant-Specific Submittals (PA-MS-C-0120)
- ISI Interval Extension from 10- to 20-Years for Non-Alloy 82/182 RPV Nozzle Welds (PA-MS-C-0440) – *consistent with RV ISI Interval Extension project*

### **Key 2010 - 2011 Stainless Steel Degradation Program**

- Stress Corrosion Cracking of Stainless Steel Strategic Planning (PA-MS-C-0474)
  - ✓ PWROG MSC has overall lead for this issue

### **Key 2010 - 2011 Alloy 600 Program**

- PWSCC Crack Initiation Testing of Farley 2 Alloy 600 CRDM Penetrations; Phase 4 Testing (PA-MS-C-0257)

# NRC/Industry Executive Management Meeting

## PWROG MSC Key Technical Programs for 2010 - 2011

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### Key 2010 - 2011 Reactor Internals Programs:

- Westinghouse Upper Internals Guide Tube Card Wear - Fleet-Wide Operational Projections and Contingencies (PA-MS-0688)
- Review of B&W PWR Internals Fabrication Records for MRP-227 AMP (PA-MS-0573)
- RV Internals Baseline Information to Support AMP's [W; CE] (PA-MS-0572)
- Reactor Internals Operating Experience Review, Risk Ranking & Response Planning (PA-MS-0568)

*✓ These programs are designed to support utility implementation of MRP-227.*

# NRC/Industry Executive Management Meeting

## MSC – NRC Interactions Summary

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- PWROG MSC Interactions with the NRC have been valuable
  - NRC informed about PWROG projects
  - PWROG becomes aware of NRC issues
  - Benefits to both PWROG members and NRC
  - Facilitates utility submittals and NRC reviews
- ✓ Significantly contributed to success of RPV ISI Interval Extension from 10 to 20 years
- ✓ Having similar discussions for complimentary program to extend ISI Interval for non-Alloy 82/182 RPV nozzle welds
- ✓ Interactions are facilitating incorporation of Flaw Evaluation work for MRP-139 Alloy 82/182 Cold Leg DM Welds (Reactor Coolant Pumps) into ASME Code

# NRC/Industry Executive Management Meeting

## PWR Owners Group MSC Key Contacts

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## Materials Reliability Program (MRP)

**David Czufin, Exelon**  
MRP Executive Sponsor

**Industry/NRC Executive Meeting on  
Materials Program**

June 2, 2010

**Materials Reliability Program (IIG)**

McAlister, SCANA  
McDevitt, SCE  
King, EPRI

**Regulatory Interface Through NEI**

Riley, NEI

**Technical Advisory Group**

McDevitt, SCE  
King, EPRI

**Technical Support Committee**

Dingler, Wolf Creek  
McDevitt, SCE  
Chu, EPRI

**Inspection ITG**

Nowakowski, FPL  
Doss, Duke Energy  
Spanner, EPRI

**Mitigation/Testing ITG**

Rudell, Constellation  
Gobell, Entergy  
Crooker, EPRI

**Assessment ITG**

Sims, Entergy  
Wells, Southern Nuclear  
Craig Harrington, EPRI  
Demma, EPRI

# MRP Membership



- 31 Organizations representing 169 PWR's
  - International 100 PWR's
  - USA 69 PWR's



**Taiwan power company**

**Hokkaido Electric Power Co., Inc.**

# 2010/2011 MRP Projects

- Stress Corrosion Cracking (SCC) of nickel-based alloys
  - Mitigation of alloys 600/82/182
  - Quantify SCC superiority of alloys 690/52/152
  - better understanding of weld residual stress and the impacts thereof
- Irradiation Assisted Stress Corrosion Cracking (IASCC)
- I&E guidelines (e.g. Dissimilar Metal Butt Welds, Bottom Mounted Nozzles, Reactor Internals)
- SCC of stainless steel
- Low Alloy Steel corrosion (upper and bottom Reactor Pressure Vessel Heads)
- Non-Destructive Examination (NDE) qualifications (e.g. CRDM, RI standards)
- Fatigue degradation management
- Extremely Low Probability of Rupture Protocols (xLPR)

More than 50 projects defined and funded for 2010

# MRP Guidelines Status

Guideline Title	ITG/ TSC	NEI 03- 08 <sup>li</sup>	MRP Rpt #	Current Rev #	G/L Report #	Last Pub. Date	Next G/L Review Date	Next G/L Rev Pub Date <sup>lii</sup>
Mitigation of Thermal Fatigue in Unisolable Piping Connected to PWR Reactor Coolant Systems	TSC	GP <sup>liii</sup>	29	0	1001017	Dec. 2000	2010	2010 <sup>liiv</sup>
Thermal Fatigue Monitoring Guidelines	TSC	GP ii	32	0	1001016	April 2001	2009	2010
Computer-Based NDE Training for Thermal Fatigue Cracking	TSC	GP ii	36	1	1016935	Nov. 2008	2010	2011
Guidelines for Addressing Fatigue Environmental Effects in a License Renewal Application	TSC	GP	47	1	1012017	Sept. 2005	2009	2011
Generic Guidance for Alloy 600 Management	AST	Man.	126	0	1009561	Nov 2004	2010	2011
Primary System Piping Butt Welds Inspection and Evaluation Guidelines	AST	Man.	139	1	1015009	Dec. 2008	<i>2010</i>	2011
MRP-139, Revision 1 Interim Guidance on Reconciliation of BMV Requirements with Code Case N-722	AST	Man.	2009-031	0	N/A	Mar 2009	2010	N/A
Management of Thermal Fatigue in Normally Stagnant Non-Isolable Reactor Coolant System Branch Lines	TSC	Need	146	0	1011955 <sup>lv</sup>	June 2005	2009	2010
Management of Thermal Fatigue in Normally Stagnant Non-Isolable Reactor Coolant System Branch Lines – Supplemental Guidance	TSC	Need	146S	0	1018330	Jan. 2009	2009 <sup>lvii</sup>	2011
Integrated Fatigue Management Guideline	TSC	GP	148	0	1012018	April 2005	2009	2011
Thermal Fatigue Monitoring Guideline	TSC	GP	149	0	1011957	April 2005	2009	2011
Assessment of RHR Mixing Tee Thermal Fatigue in PWR Plants	TSC	GP	192	1 <sup>lviii</sup>	1018395	Dec. 2008	2010	2011
PWR Internals Inspection and Evaluation Guidelines (MRP-227)	AST	Man.	227	0	1016596	Jan. 2009	2010	2010
Inspection Standard for PWR Internals (MRP-228). EPRI, Palo Alto, CA: 2009.	INSP	Need	228	0	1016609	July 2009	2011	2012

# PWR Internals Inspection & Evaluation Guidelines (MRP-227)

- Purpose
  - Support license renewal commitments
  - Support RI aging management thru end of plant life
- Identifies
  - Components to be inspected
  - Timing of Inspections
  - Inspection standards
    - Complementary document (MRP-228)
- Submitted for SE review January 2009

# MRP-227 Status (cont'd)

- NRC Identified Some Concerns with Review - April 2010
  - Level of detail provided to get to Section 4 Tables
- Documents have been provided – Summer 09
  - No 'detailed' presentation
- 'Core' Team working to resolve
  - Conference call with NRC – 5/21/2010
  - Meeting with NRC – June 8-9
- NRC waiting to issue RAI 4<sup>th</sup> Set
  - June 8 meeting will determine how we proceed

# I&E Guidelines Recommendations

## Primary

- Susceptible location expected to experience degradation first

## Expansion

- Components less susceptible to degradation
- Potential pool of components for enlarging or expanding inspections

## Existing Programs

- Components for which existing industry programs are capable of managing those effects

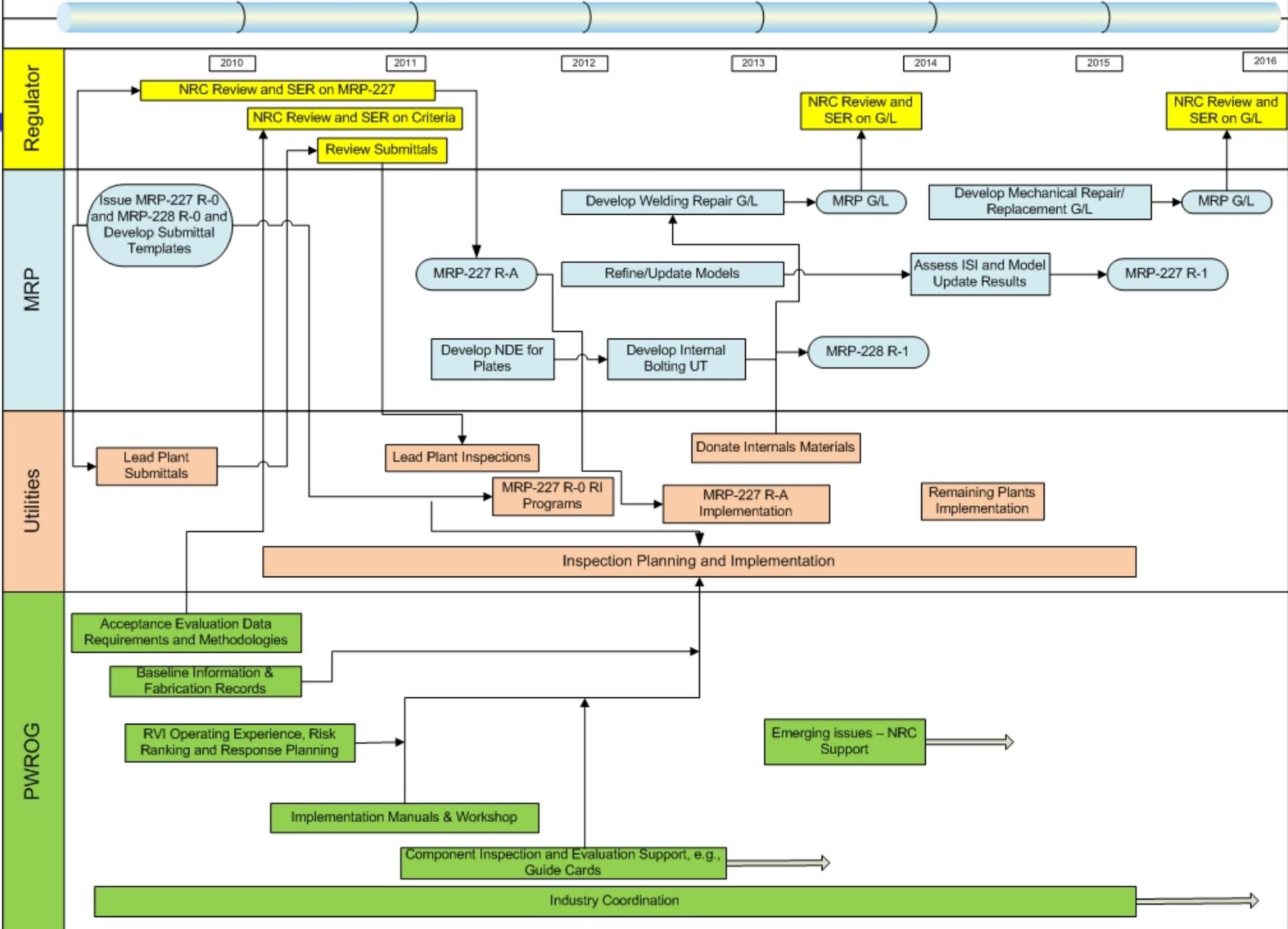
## No Additional Measures

- No concerns
- No inspections requires

# PWR License Renewal Lead Plants

- 14 plants: original licenses expire prior to 2014
- 4 plants: planning some scope of 'Primary' examinations by end of 2011
- 6 more plants: planning some scope of 'Primary' examinations by the end of 2013

# Reactor Internals Management Roadmap



# Leveraging Funding and Collaboration

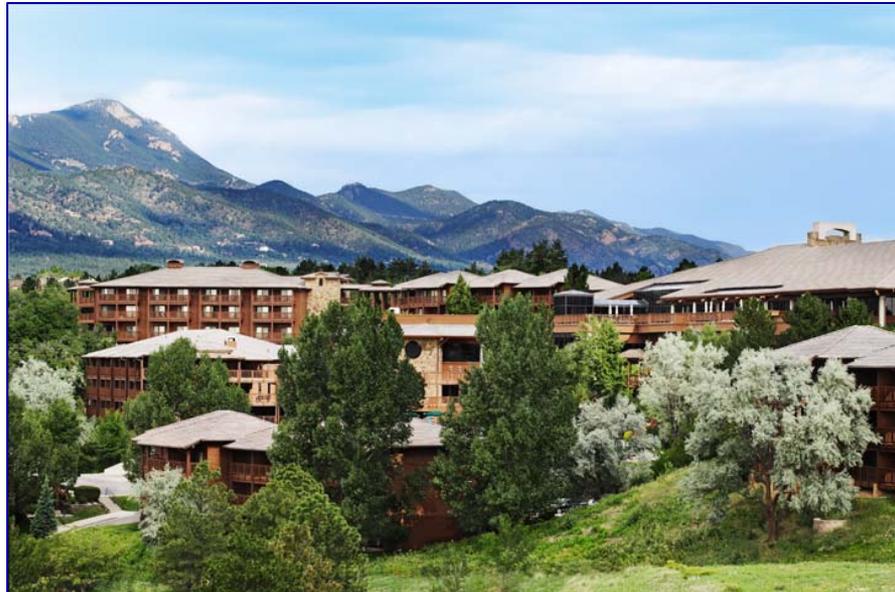
- Leverage funding across IPs (BWRVIP and ANT)
- All Reactor Internals projects (IASCC, Halden, Gondole)
- Stainless steel SCC research with MAI/EDF & PWROG
- Alloy 690 CGR testing with EPRI/UNESA
- Alloy A690 international collaboration for long-term leveraging on A690/52/152 research
- xLPR (with NRC RES)
- Weld residual stresses (NRC RES)
- Chemical Mitigation (PWROG, FRP, Chemistry)
- Peening with Hitachi, Toshiba and MHI
- Low K testing with Studsvik and AREVA

# International Programs

- GONDOLE Project
  - Led by CEA; participants include EDF, MRP, AREVA and Tractebel
  - Study of irradiation effects (void swelling) on stainless steel
- IASCC Phase 4 Project
  - participants include MRP, Vattenfall, Tractebel, NOK, Kansai, Hokkaido, JAPC, Kyushu and Shikoku, MHI NRC, and Westinghouse
  - Characterization and crack testing of irradiated stainless steel from retired Zorita plant
- Materials Aging Institute
  - Comprehensive materials test program run by EDF

# MRP-2010 Conference and Exhibition

**Materials Reliability in PWR Nuclear Power Plants**  
**June 28 – July 1, 2010**  
**Cheyenne Mountain Resort**  
**Colorado Springs, Colorado, USA**



***We look forward to seeing you in Colorado Springs !***

# EPRI MRP Team

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# Conclusion

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## Discussion