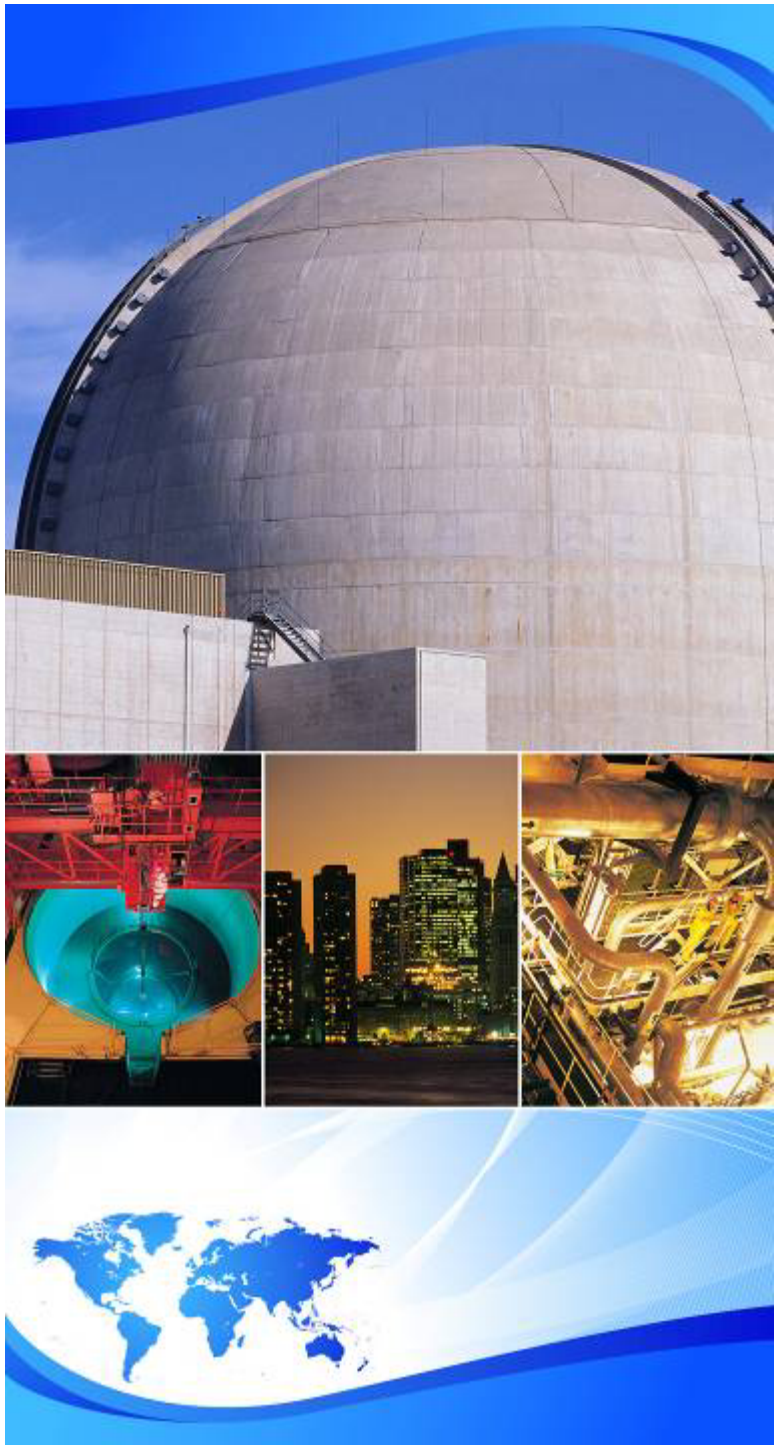
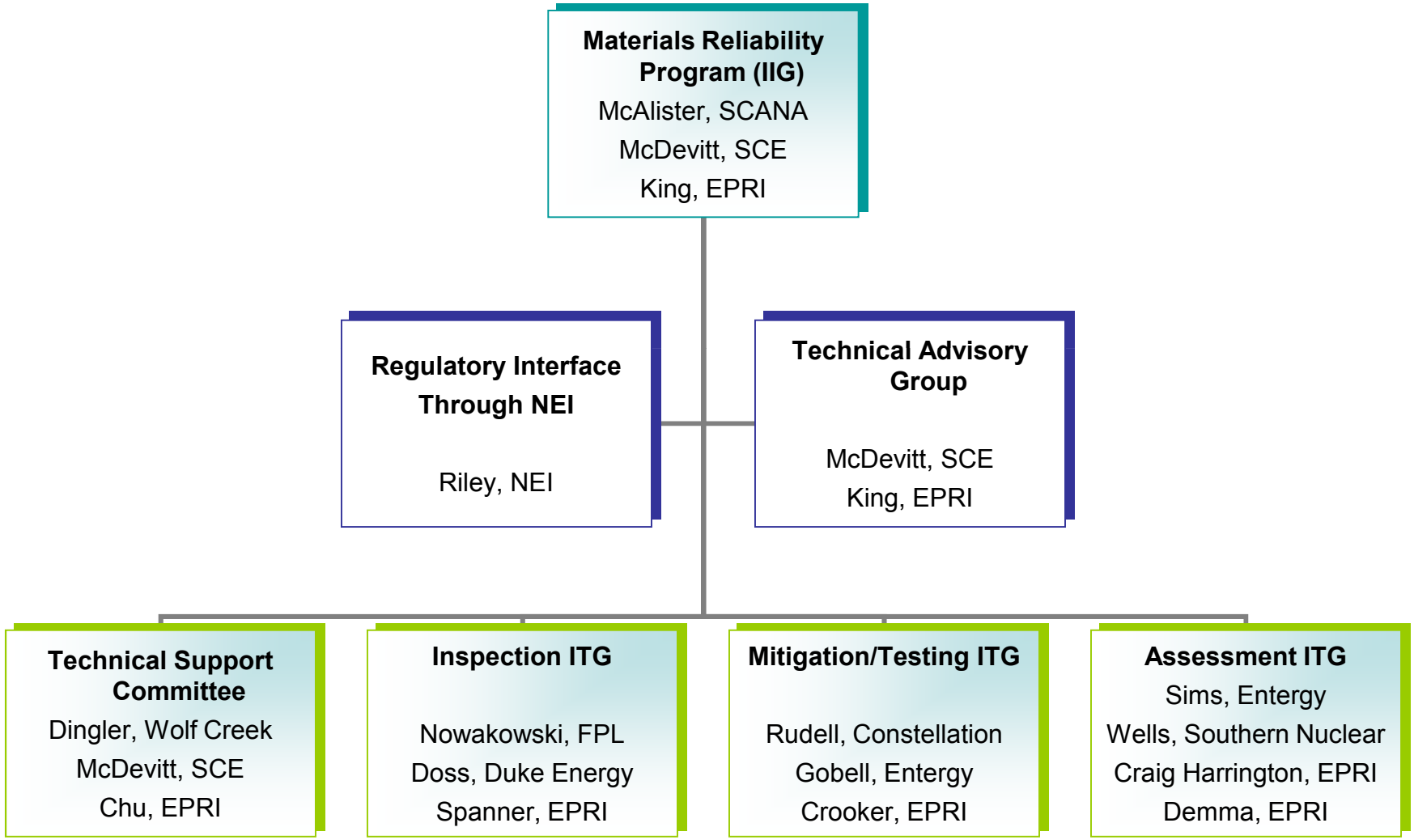


ELECTRIC POWER RESEARCH INSTITUTE

Materials Reliability Program Overview

NRC Workshop
May 25-26, 2010

Terry McAlister
SCANA
Chair, Materials Reliability Program



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MRP Membership

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

Taiwan power company

Hokkaido Electric Power Co., Inc.

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EPRI ELECTRIC POWER RESEARCH INSTITUTE

MRP Strategic Plan

- Develop fundamental understanding of degradation mechanisms and identify materials (and locations) of high susceptibility
- Conduct generic operability and safety assessments for susceptible locations
- Develop Inspection and Evaluation (I&E) guidelines for identified locations
- Evaluate available mitigation options and, if necessary develop additional options.
- Evaluate repair/replace options, where necessary
- Monitor, evaluate and feedback plant Operating Experience
- Facilitate regulatory acceptance and support licensees on plant-specific applications
- Annual budget ~$14M

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MRP Strategic Plan: Current Issues/Activities

- 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

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MRP Strategic Plan: Other Work

- Long Term Operation: life beyond 60 years
  - Significant DOE/EPRI initiative
- New plants
  - EPRI Advanced Nuclear technology (ANT) group
- MRP in unique position to contribute to both opportunities (materials research and operating experience)

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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

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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 and Westinghouse
  - Characterization and crack testing of irradiated stainless steel from retired Zorita plant
- Materials Aging Institute
  - Comprehensive materials test program run by EDF

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MRP Guidelines Status

Guideline Title	ITG/ TSC	NEI 03-08[i]	MRP Rpt #	Current Rev #	G/L Report #	Last Pub. Date	Next G/L Review Date	Next G/L Rev Pub Date[ii]
Mitigation of Thermal Fatigue in Unisolable Piping Connected to PWR Reactor Coolant Systems	TSC	GP [iii]	29	0	1001017	Dec. 2000	2010	2010[iv]
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	*2010*	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[v]	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[vi]	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[vii]	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

MRP-2010 Conference and Exhibition

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

More Information in the January 2009 MRP Newsletter

We look forward to seeing you in Colorado Springs !

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