

EPRI | ELECTRIC POWER
RESEARCH INSTITUTE

ANT Program Overview

June 22, 2009

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Advanced Nuclear Technology
Program

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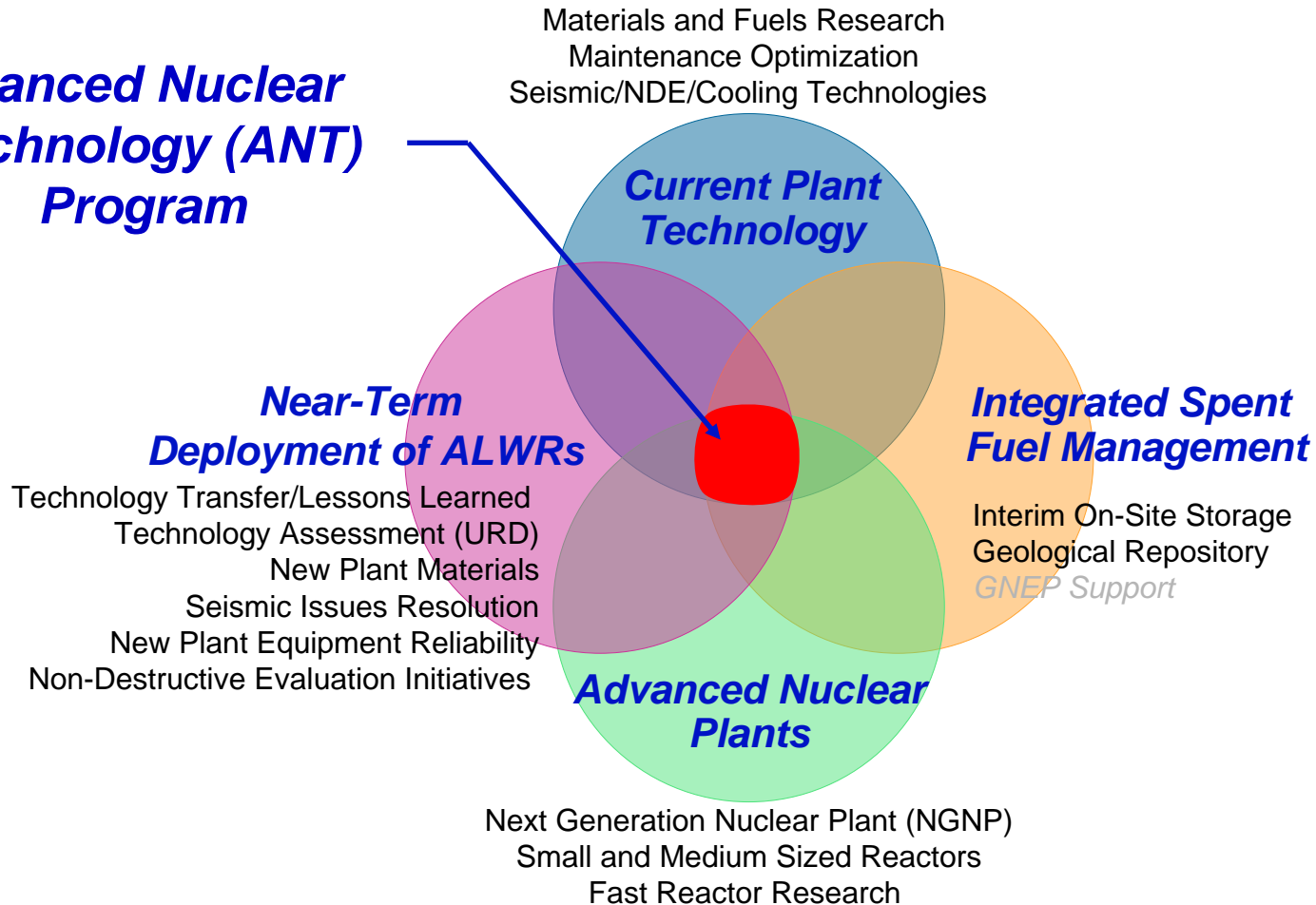
ANT Program Objectives

- 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

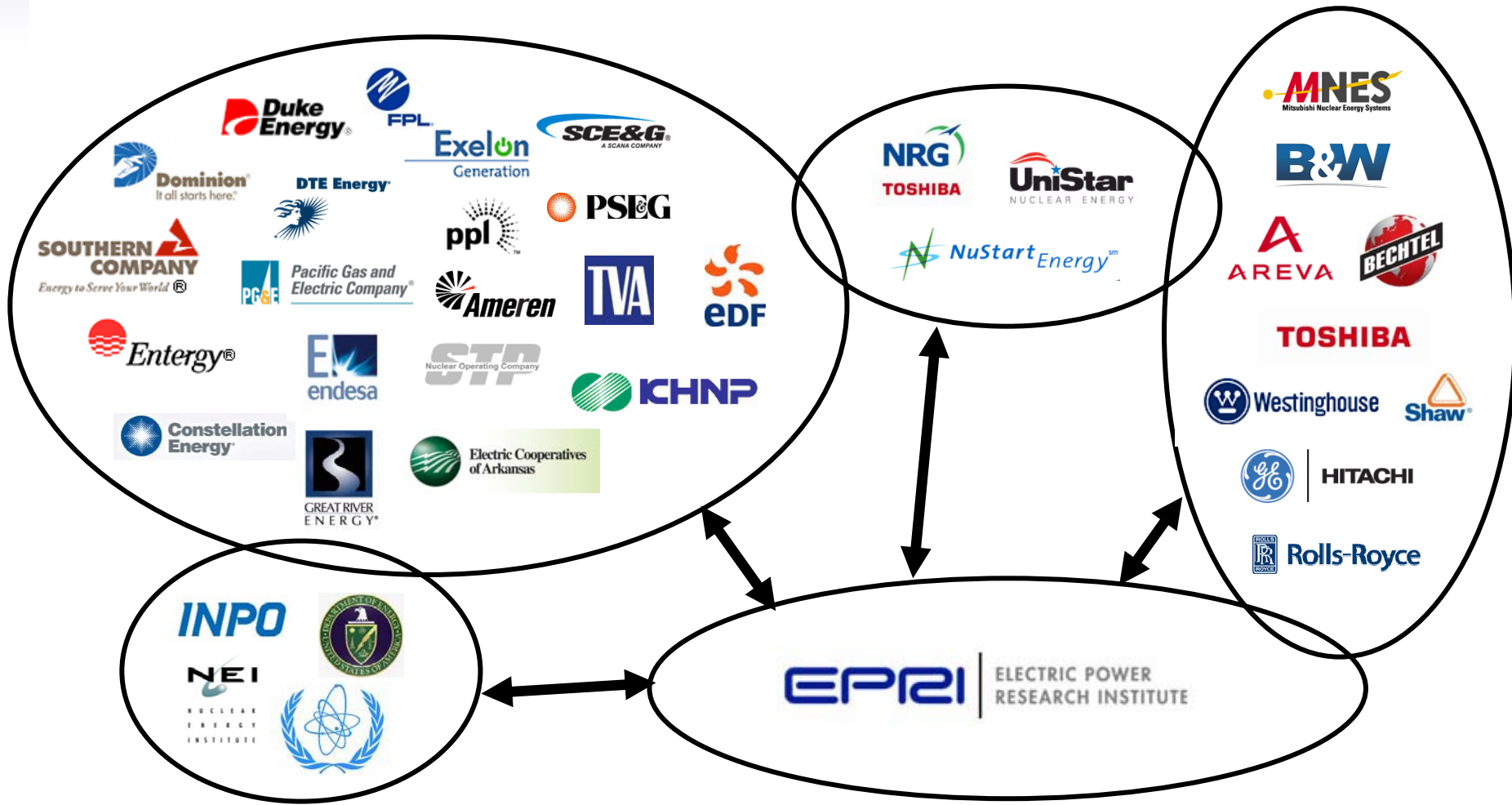


EPRI's Response ...The ANT Program

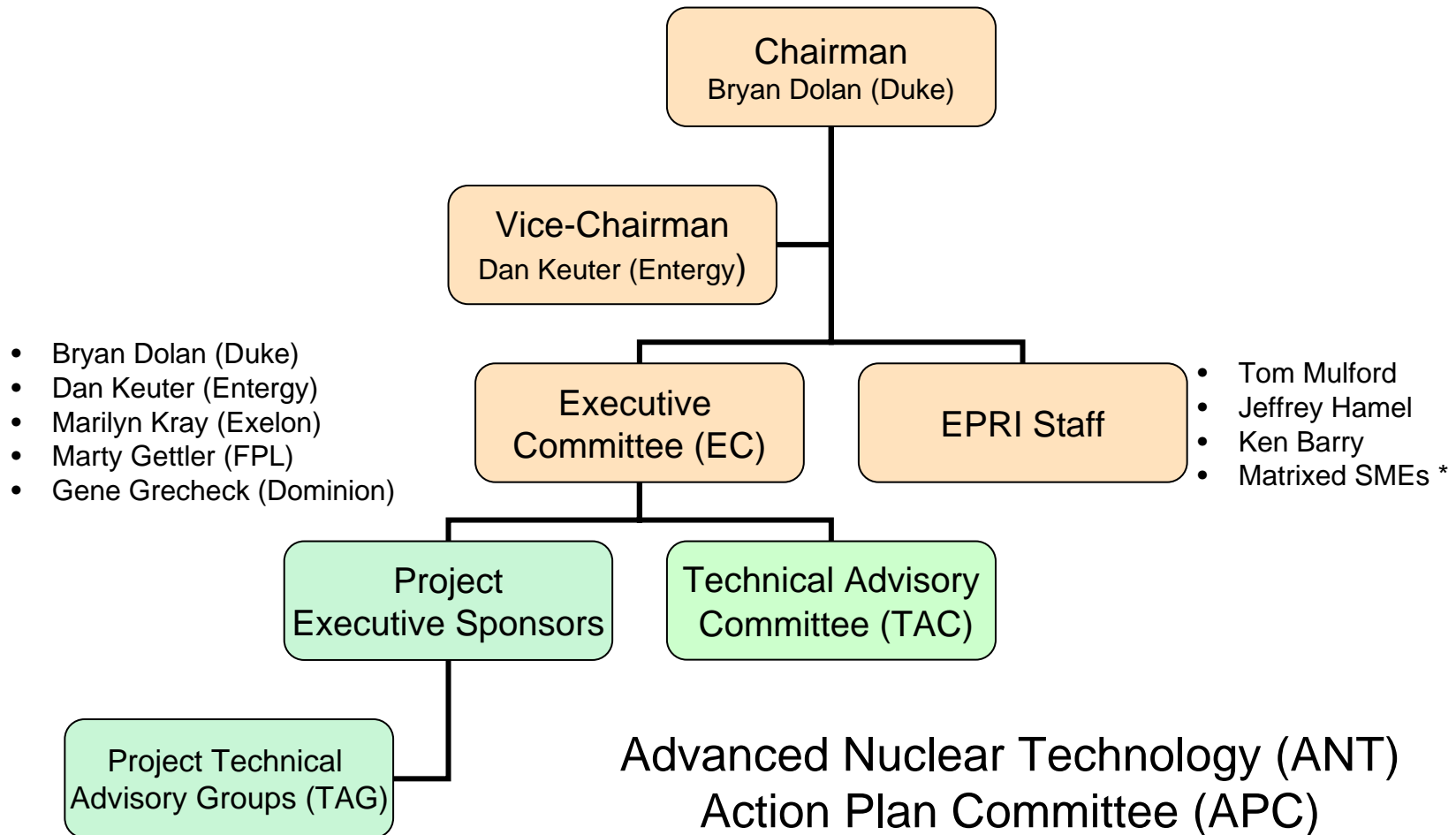
Advanced Nuclear Technology (ANT) Program



EPRI's ANT Program...Leveraging the Industry



ANT APC Organization Chart



* Subject Matter Experts

2009 ANT Operational Calendar

Standardized Pre-Meeting Communications:

Ongoing & proposed project templates sent to APC: ~30 days prior to APC meeting

Pre-meeting webcast held: ~20 days prior to APC meeting



Winter Meeting (@NPC)

(Long Beach: Jan 27-28, 2009)

- Finalize budget for current CY
- Review status of ongoing R&D



Spring /Summer Meeting

(Charlotte; May 13, 2009)

- Review status of new work initiated in CY
- Discuss projects and funding for next CY



Summer/Fall Meeting (@NPC)

(Chicago: August 25-26, 2009)

- Review work planned for next CY
- Allocate funding for next CY

Managers/Director Meeting New Task Identification

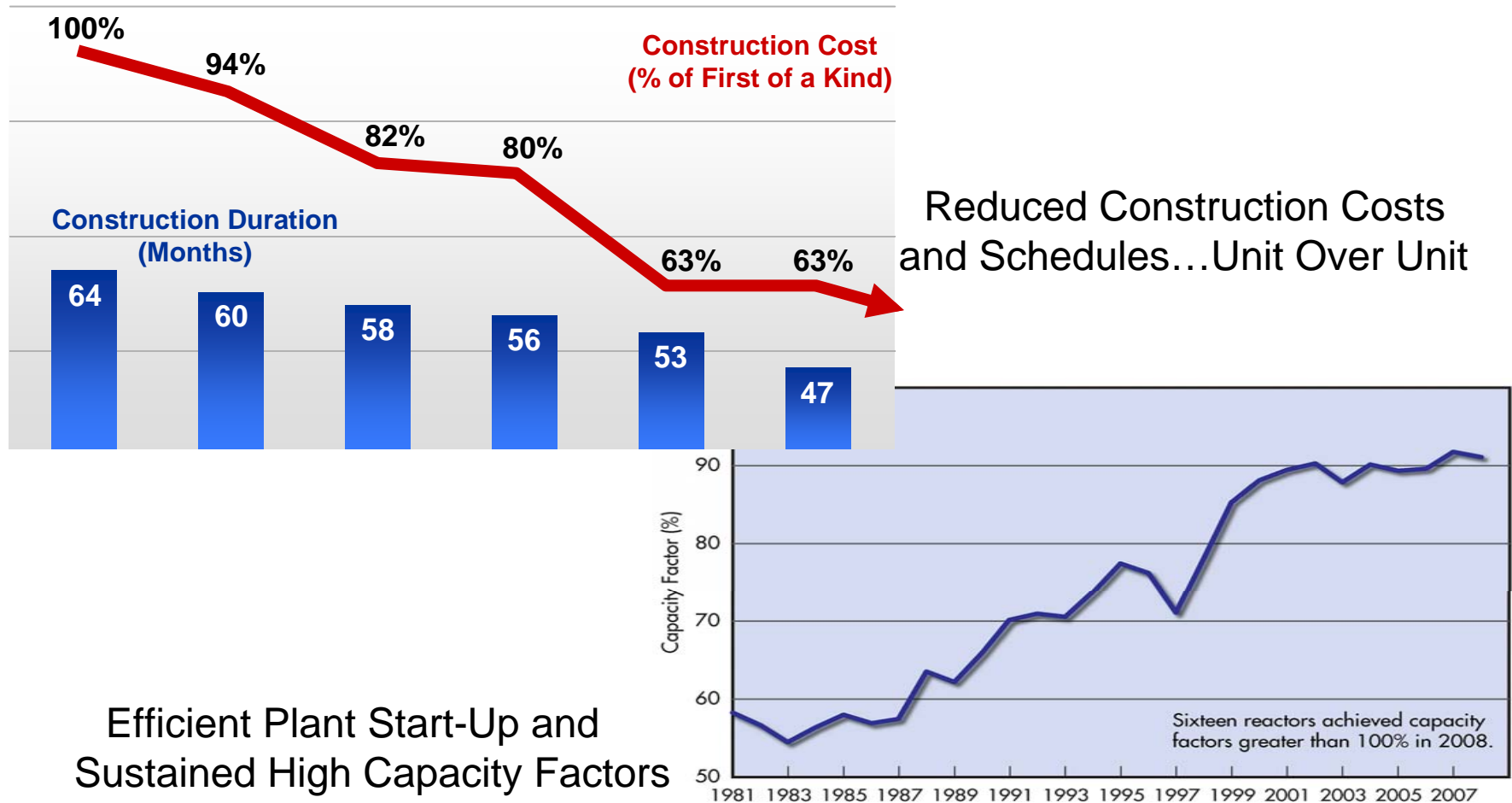
(Charlotte; March 31, 2009)

- Brainstorm needs of industry
- Discuss best use of ANT resources for next CY

Advanced Nuclear Technology

Program Value

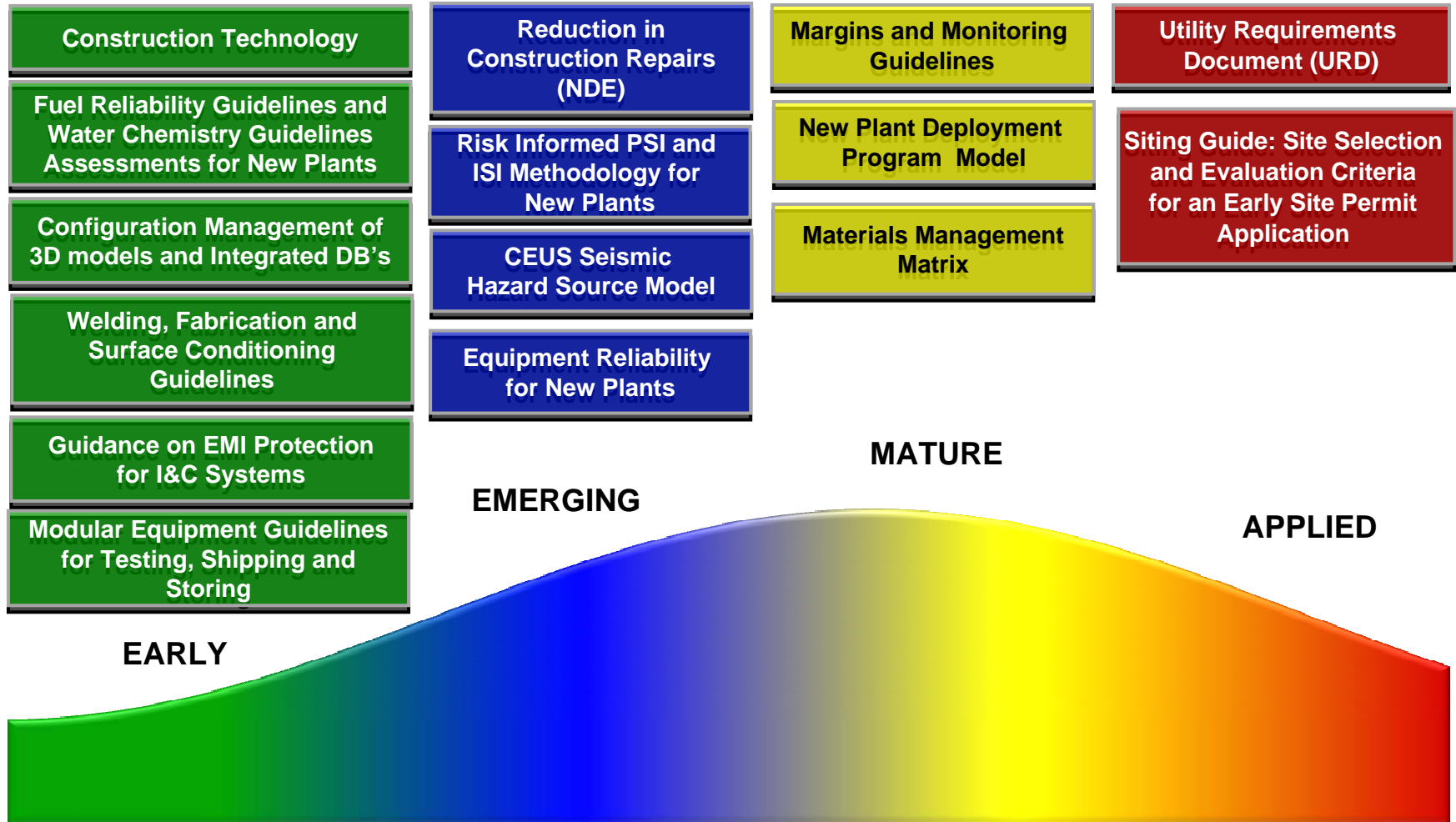
How Do We Achieve This Performance?



Efficient Plant Start-Up and Sustained High Capacity Factors

Advanced Nuclear Technology

Project Portfolio



Note: Industry operating experience contributes to ongoing improvements and updates to certain mature and applied products.

2008 ANT New Plant Deployment Projects

Project ID#	Project Title	EPRI Project Manager	Executive Sponsor
2008-01	NDE Risk-Informed PSI & ISI Methodology	Pat O'Regan	Joe Turnage (CEG)
2008-02	New Plant Procurement Specifications	Marc Tannenbaum	Gene Grecheck (DOM)
2008-03	New Plant Welding and Fabrication Guidelines	Steve McCracken / Eric Willis	Jack Bailey (TVA)
2008-04	CEUS Seismic Sources Characterization (SSC) Project	Jeffrey Hamel	Doug McComb (SNC)
2008-05	Materials Management Matrix (MMM) for ESBWR, AP1000, ABWR, EPR and APWR	Jeffrey Hamel	Steve Blossom (STP)
2008-06	NDE and Reduction of Repairs in Nuclear Construction (ASME Sect III)	Steve Swilley	Dave Lewis (PSEG)
2008-07	Equipment Reliability for New Plants	Leonard Loflin	Scott Bond (AmerenUE)

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2009-01	Achieving New Nuclear Virtual Plant Configuration Management	Ken Barry	Doug McComb (Southern)
2009-02	Modular Equipment Testing, Shipping and Storage - Benchmarking and Guidelines	Ken Barry	Brad Stokes (SCE&G)
2009-03	Water Chemistry Source Book for New Plants	Keith Fruzzetti	TBD
2009-04	Guidance on EMI Protection for Instrumentation and Control Systems	Joe Naser	Doug McComb (Southern)
2009-05	EPRI Fuel Reliability Guidelines – Implications for New Plants	Kurt Edsinger	Brad Stokes (SCE&G)
2009-07	Next-Generation Attenuation (NGA) Model for Central and Eastern United States (NGA-East)	Jeffrey Hamel	Doug McComb (Southern)
2009-08	Safety Related Stationary Battery Qualification	Wayne Johnson	Doug McComb (Southern)
2009-09	EUR/URD Comparison Project	Jeffrey Hamel	Pablo Lopez (ENDESA)

Risk-Informed PSI and ISI Methodology

Project Description

- Develop a RI-PSI and RI-ISI methodology for new construction
 - Take advantage of lessons learned from existing plants
 - Take advantage of new plant designs (e.g., similar/identical construction)
 - Assess need for augmented programs (e.g., FAC, LC)
 - Conduct test cases (how many designs, how many systems?)
 - Regulatory approval strategy

Value

- Reduced PSI and ISI costs
 - examination, scaffolding, insulation removal/re-installation, outage impact, worker exposure, radwaste
 - RI-ISI experience (60-90% reductions)
- Impact on construction schedule
 - fewer inspections, fewer false calls / innocuous indications, less rework, reduction in workforce needs

Materials Management Matrix

Project Description

- The MMMs provide a systematic process for assessing critical materials related information for each of the components in the ASME Class 1 systems for each NSSS design.
- The MMM will provide
 - a status of materials R&D as it applies to the new units
 - an ordered risk ranking to assess R&D priorities
 - identification of proactive mitigation opportunities for the various design, fabrication, construction and operations phases

Value

- The MMMs will assist in proactively managing material-related issues which have been shown to significantly affect operating costs in existing reactor designs.
- Comprehensive consideration of these issues during the design and licensing phase will help ensure that new plants are economically competitive over their operating life.

New Plant Welding and Fabrication Guidelines



Project Description

- Operating experience (OE) shows that the majority of material failures occur in or near welds; Multiple welding & fabrication gaps have been identified in the Materials Management Matrix (MMM) project
- Development of an assessment tool to consider:
 - Consider the effect of welding and fabrication in both BWR and PWR reactor environments
 - Evaluate all of the materials used to fabricate and construct the two different LWR designs; B's and P's
 - Correlate the influence of welding and fabrication processes and practices on degradation mechanisms and the effect of residual stress mitigation

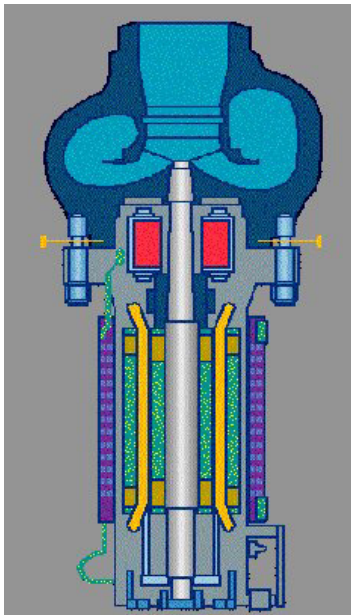
Value

- Provide a vehicle for facilitating an improved systematic understanding of the influence of welding and fabrication processes on materials performance
- Facilitate collection, organization and presentation of expert opinions regarding the value and effectiveness of welding and fabrication processes as related to materials performance

Equipment Reliability (ER) for New Plants

Project Description

- The New Plant subgroup within the industry ER Working Group (INPO/EPRI sponsored) created the following project expectations
 - Procurement, Design, and Construction & Startup needs detailed as concise guidance that can be easily incorporated into specifications and procedures



Value

- Owner's expectations for Equipment Reliability are detailed and become part of the project plans
- The foundations for an effective ER Program have been established (effective ER foundation and program - allows high capacity factors and contained O&M cost)
- The cost to put in place the operating phase ER Program will be reduced

EPRI's ANT Program Website

<http://www.epri.com/ant>

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

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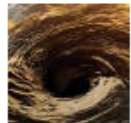
[Nuclear Program Overview](#)

[EPRI Nuclear Calendar](#)

[Related Web Sites](#)
(non-EPRI affiliated)



[In Pursuit of a Nuclear Renaissance: EPRI Journal Summer 2007](#) (pdf)



[Running Dry...At The Power Plant: EPRI Journal Summer 2007](#) (pdf)



[EPRI Utility Requirements Document, Revision 9](#)

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 \(NPDP\) 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](#)



Lungmen RPV

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Preguntas, Críticas, Sugerencias...



Back Up Material

Advanced Nuclear Technology Program

2009 Pricing

	Announced Intentions to Pursue New Plant Licensing/Construction	Evaluating New Nuclear
<u>Utility Level 1: Current Plant Operators</u>	\$275K (EPRI Nuclear Power Sector Member) \$375 (Non-EPRI Nuclear Power Sector Member)	\$100K (EPRI Nuclear Power Sector Member) \$200K (Non-EPRI Nuclear Power Sector Member)
<u>Utility Level 2: Current Non-Operators</u>	\$375K	\$50K*
Vendor Access	\$50K*	

* Non-Governing Members

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2008-07	Equipment Reliability for New Plants	Leonard Loflin	Scott Bond (AmerenUE)
2008-08	Margins and Monitoring Project Phase III*	Tom Turek	Bryan Dolan (Duke)
2008-09	URD Update, Revision 10*	Jeffrey Hamel	Marilyn Kray (Exelon)

* Projects completed in 2008

New Plant Common Commodity Specification

Project Description

- Identify & Develop Standard specifications for construction commodity items
 - Rebar, pipe, tube, fasteners, cable, etc.
 - Select appropriate grades / specifications
 - Basic Technical and QA Requirements



Value

- Focus capabilities of supplier base on what we need most to support new builds
- Promote consistency in plant design and construction
- Promote economic efficiencies achieved through aggregate demand
- Prevent dilution of suppliers' capabilities
 - Preclude degradation of ability to support one or several large customers on a concurrent basis
- Promote long-term savings via lower inventory & standardized replacement items

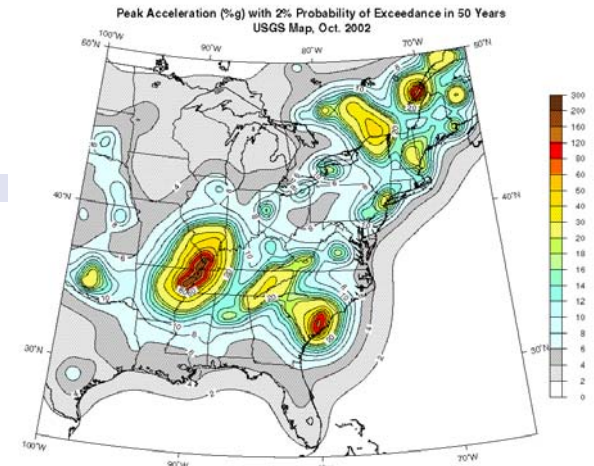
CEUS Seismic Sources Characterization Project

Project Description

- EPRI-SOG (1989) seismic source characterizations are being challenged by NRC staff, its consultants or interveners during the hearing process
- Each proposed site must perform a new seismic hazard evaluation (~\$1M/site over 12-18 mos. for existing sites – no consensus)

Value

- Provides a consistent, stable basis for site-specific PSHA that has been vetted by the NRC
- Provides licensing stability during the three-year NRC review
- Allows utilities to optimize selection of sites in the CEUS for future nuclear units
- Provides important information for members who may have to respond to NRC Generic Issue 199 (GI-199)



NDE and Reduction of Repairs in Nuclear Construction

Project Description

- Eliminate unnecessary repairs during construction (Influence ASME Code Section III)
- Promote inspectable component and weld configurations
 - Influence plant design and construction, apply lessons learned, utilize risk informed approach
- Establish and operate UT qualification programs
 - Provide assurance of accurate and reliable construction inspections

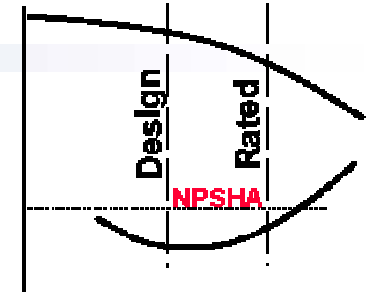
Value

- Elimination of unnecessary weld repairs
- Reduced susceptibility to in-service degradation
- Reduced costs of ISI compliance during plant operation
- Regulatory acceptance of fitness-for-service philosophy
 - Cost savings and elimination of delays during construction

Design Margins and Performance Monitoring

Project Description

- Identify and document approximately 200 margin or specification related issues for the following large capital investment component types that are either important to power production, and/or defense in depth
 - Pumps, Motors, Heat Exchangers, Transformers, Main Turbine, Generator/Exciter, Standby Diesel Generators, MOVs, AOVs, Chillers, Iso-Phase BUS System Components, Check Valves, etc.



Value

- Increases component margin
- Supports the expected design life of the equipment by identifying potential problematic areas
- Allows the monitoring and trending of equipment and/or system condition resulting in prompt system acceptance during commissioning

Utilities Requirements Document, Rev. 10



Project Description

- URD Revision 10 includes targeted technical updates to the following key areas:
 - Instrumentation and Control, Seismic Analysis and Design, Structural Design, Service Water System
- Revision 10 also includes updates to Volume 3 - Evolutionary Plants chapters in the following key technical areas:
 - Materials, Radwaste, Water Chemistry, Electrical Cabling, Environmental Qualification, Spent Fuel and Reliability of Equipment

Value

- The URD is a valuable product for EPRI member utilities to be used as part of:
 - The procurement specification for the new nuclear plants
 - Evaluation of new nuclear plants (comparison of design versus URD requirements)
 - As guidelines in the construction, operation, and maintenance of existing and new nuclear plants.

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Achieving New Nuclear “Virtual” Plant Configuration Management

Project Description

- Task 1 – Form a technical advisory group and develop an industry path forward on Configuration Management and the 3-D model.
- Task 2 –Review existing FIATECH’s AEX XML equipment schemas identified as applicable (within the set of critical components) and modify fields to be new nuclear plant specific.
- Task 3 –Use *Capital Facilities Information Handover Guide* (NIST IR7259) and *General Buildings Information Handover Guide* (NIST IR7417) as a basis guidelines for the development of a new nuclear plant specific *Information Handover* guide by benchmarking the handover practices and guidelines from other industries and international nuclear.

Value

- Develop the tools and industry standards to support implementation of CM in a 3D plant and advance Data Interoperability

Modular Equipment Testing, Shipping and Storage - Benchmarking and Guidelines

Project Description

- Select and benchmark international nuclear and two other industries that will provide insight and critical characteristics that they use to control equipment modularization.
- Define the applicability to modularization in the nuclear industry. This will define the extent to which equipment modules can be tested. Guidelines for testing will be provided. Consideration will be made of system testing that will be required once installation is complete.
- Define cautions and likely limitations that should be placed on shipping, storage, and installation of modules. This task will define the requirements for the equipment once it is installed in the final system and will define the potential restrictions that will be placed on vibration and environment during shipping and storage.

Value

- To establish a predictable approach for addressing licensing concerns for satellite component (module) fabrication and installation

Guidance on EMI Protection for Instrumentation and Control Systems

Project Description

- This effort will continue EPRI's EMI work, developing guidance on how to protect sensitive equipment as higher frequency digital components and communications equipment come into widespread use in the industry, and specifically addressing new plant concerns, including issues such as:
 - How to determine exclusion zones for wireless equipment
 - Guidance on EMI for the designers
 - Determining compliance with regulatory guidance
 - Interfacing with NRC to develop and review new regulatory guidance

Value

- The project will produce the needed guidance on EMI for new plants, provide the underlying technical basis, and work to make the licensing environment more stable and predictable. More specific benefits will include:
 - Use of standards already applied in other industries
 - Guidance on how to address new concerns, e.g., wireless communications and cell phones
 - Practical and cost-effective qualification test methods

EPRI Fuel Reliability Guidelines Assessment

Implications for New Plants

Project Description

- New plants will also follow some form of fuel reliability guidance and, while it is too early to begin developing that guidance, it is a good opportunity to assess the new plant implications for the guidance being applied to the current fleet. In particular, it is proposed that a small study be undertaken to address the following:
 - Review new plant fuel and system design features that could impact fuel reliability
 - Review current fuel reliability guidance and summarize any new plant fuel reliability concerns
 - Identify new plant fuel reliability areas that could benefit from further study prior to new plant operation

Value

- This project will provide the industry a proactive assessment of the new EPRI fuel reliability guides to understand any unique items of concern for the new plant designs.

Next-Generation Attenuation (NGA) Model Development for CEUS (NGA-East)

Project Description:

- NRC stated the goals of the project: 1) increase the accuracy of Probabilistic Seismic Hazard Assessments in the CEUS, 2) properly capture and understand uncertainty by separating and capturing aleatory and epistemic uncertainty, 3) increase acceptance and stability because ground motion equations provide the greatest source of uncertainty, and 4) create a common and transparent database.
- The project team (NRC, DOE, PEER, USGS) have asked EPRI to participate, on behalf of the commercial nuclear industry, and serve on the joint management committee, along with NRC, DOE and PEER.

Value

- The NGA-East project is expected to yield the NEW standard by which all future license applications will be expected to utilize within six months from when the new models publish.
- It is in EPRI member's best interest to ensure the NGA-East work is done in a manner that will be acceptable to the industry when it publishes in 2013.

Safety Related Stationary Battery Qualification

Project Description

- EPRI Utility Requirements Document (URD) states that Advanced Light Water Reactors (ALWRs) shall utilize passive safety systems to mitigate design basis events up to 72 hours in duration
 - Passive systems must rely upon stored energy, e.g., batteries
- Passive plants (AP1000, ESBWR) require batteries that are qualified to a 72 hour duty cycle
- IEEE 535 standard for battery qualification (endorsed by RG 1.158) did not cover duty cycles beyond 8 hours
- IEEE 535 only covers Vented Lead Acid (VLA or flooded) batteries – Valve Regulated Lead Acid (VRLA) batteries are not addressed

Value

- Providing a industry solution to a first-of-a-kind technical challenge for passive plants
- Reducing risk through a collaborative approach

EUR / URD Comparison Project



Project Description

- Update the European Utility Requirements (EUR) and EPRI Utility Requirements Document (URD) comparison carried out in 1997, and which main result was the Topical Report N°5 “European Utility Requirements and EPRI-Utility Requirements Document Comparison, Topical Report 5. Summary of major findings. Rev B.” (1/22/1997).
- The works of the EUR-URD comparison update (abbreviates as EUR-URD update) will be performed by the EUR-URD Coordination Group
- The EUR utilities represented and responsible for the production of EUR-URD update works and results are: Vattenfall, E.ON, Edf, British Energy, Tractebel and ENDESA.

Value

- Provide assurance to organizations utilize either set of requirements that we understand where the differences lie and we can support the rational behind those differences
- Reducing risk through a collaborative approach