



EPRI | ELECTRIC POWER
RESEARCH INSTITUTE

EPRI Long Term Operation (LTO) Program

John Gaertner
EPRI Technical Executive

NRC Regulatory Information Conference
March 15, 2012

Objectives



- ✓ Technical basis for **decisions** to operate through an extended lifetime
 - Supports **business case** for life extension and/or refurbishment
 - Supports **Subsequent License Renewal** in U.S.
 - Results by **2014-2019**
- ✓ Technology to **manage** plant assets throughout lifetime
 - Includes aging management, asset management, and risk management
 - Addresses safety, performance, and cost

© 2012 Electric Power Research Institute, Inc. All rights reserved. 2

Industry Advise and Collaboration



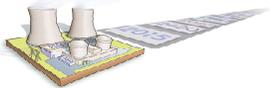
- **LTO Integration Committee reviews and advises on activities:**

Michael Gallagher , Chairman, Exelon VP License Renewal	Didier LeReverend , EDF
Mark Flaherty , CENG	Mike Robinson , Duke
Joe Mathew , OPPD	Garry Young , Entergy
Glen Schinzel , STARS	
- **LTO Technical Advisory Committee**
 - Open to all EPRI nuclear members world-wide
- **Coordination with NEI**

© 2012 Electric Power Research Institute, Inc. All rights reserved. 3

Criteria for Selecting LTO Activities

- ✓ **Technical basis for license renewal or life extension**
 - Investigates a potential "life limiting" issue
 - Enhances aging management
 - Improves life-cycle management
 - Identifies modernization and up-rate opportunity
 - Develops enabling technology (e.g., analysis methods)
- ✓ **Not addressed by another EPRI program**
- ✓ **Produces results by 2014 - 2019**
- ✓ **Collaborates with DOE, NRC-RES, member utilities**

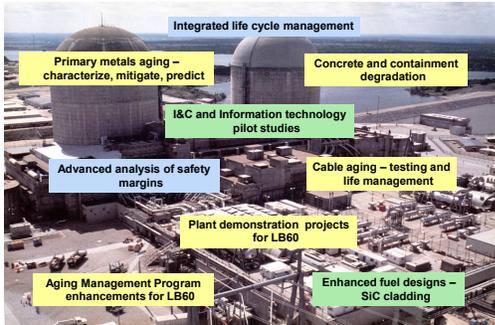


© 2012 Electric Power Research Institute, Inc. All rights reserved.

EPRI | ELECTRIC POWER RESEARCH INSTITUTE

Technical Areas for LTO R&D

Aging Management Modernization Enabling Technology



© 2012 Electric Power Research Institute, Inc. All rights reserved.

EPRI | ELECTRIC POWER RESEARCH INSTITUTE

What Questions can be answered by 2014 – 2019

- What are **Life Limiting concerns** for operation beyond 60 years?
- What are **Aging Management "deltas"** for Subsequent License Renewal?
- What **Life Cycle Management** data and methods can enhance high-performance long term operation?
- What plant **modernization opportunities** affect decisions to seek operation beyond 60 years?
- What **enabling technologies** can be available to support decisions to operate beyond 60 years?



© 2012 Electric Power Research Institute, Inc. All rights reserved.

EPRI | ELECTRIC POWER RESEARCH INSTITUTE

Life Limiting Issues (LLIs)

• What are Life Limiting concerns for operation beyond 60 years?

- Life-Limiting Issue Report (2010)
 - Conditions: internals, vessel, containment, other concrete, cables, high cost replacement items
 - Events: seismic, flooding, security requirements
 - Integrated obsolescence: requires integrated Life Cycle Management to end of life



Currently known LLIs are plant-specific.
Basis for plant assessments under development.

© 2012 Electric Power Research Institute, Inc. All rights reserved.

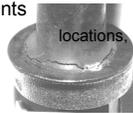
7

EPRI | ELECTRIC POWER RESEARCH INSTITUTE

Aging Management Results

• What are Aging Management Program “deltas” for Subsequent License Renewal?

- Aging Management Program enhancements
 - Proactively identify additional mechanisms, conditions, and methods.
- Degradation studies of internals, vessel, concrete/containment, cables, piping
- Ginna and NMP-1 Demonstrations for LB60 decisions
 - inspections and NDE methods for containment and reactor internals, reactor vessel data/analysis plan



Significant results in all areas 2013 – 2016.

© 2012 Electric Power Research Institute, Inc. All rights reserved.

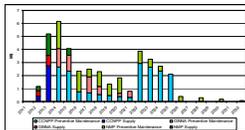
8

EPRI | ELECTRIC POWER RESEARCH INSTITUTE

Life Cycle Management (LCM) Data and Methods

• What Life Cycle Management data and methods can enhance high-performance long term operation?

- Integrated Life Cycle Management Project
 - Asset Management process for key SSCs – failure models, assessment process, modeling and optimization tools, and pilot studies



Data, methods, and software in 2013.
Living ILCM program to continue thereafter.

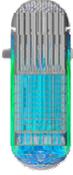
© 2012 Electric Power Research Institute, Inc. All rights reserved.

9

EPRI | ELECTRIC POWER RESEARCH INSTITUTE

Plant Modernization Opportunities

- **What new plant modernization opportunities can affect the decision to seek operation beyond 60 years?**
- Advanced Fuel Design for Existing Plants
 - Development and deployment of SiC fuel cladding
- I&C and Information Technology
 - Pilot studies and requirements for advance control rooms, technology for process improvement, integrated operations, outage control, on-line monitoring, etc.



**Advanced fuel rod/assembly tested in commercial reactor by 2021
I&C pilot studies and guidelines 2013 and beyond**

© 2012 Electric Power Research Institute, Inc. All rights reserved.

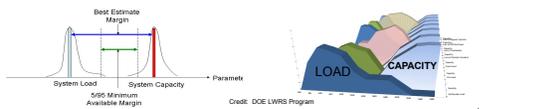
10

EPRI ELECTRIC POWER RESEARCH INSTITUTE

Enabling Technologies

- **What enabling technologies can be available for decisions to operate beyond 60 years?**
- Safety Analysis
 - Safety margins methods and analysis/simulation
 - Advanced PRA for configuration management, SDP, design improvements, operational and regulatory changes.

**Analysis methods available 2015.
Advanced methods in common usage 2020.**



© 2012 Electric Power Research Institute, Inc. All rights reserved.

11

EPRI ELECTRIC POWER RESEARCH INSTITUTE

Conclusions

- High performance, long term operation of existing nuclear plants is a critical strategic objective of the nuclear industry.
- The EPRI LTO Program is on track to meet industry needs for decisions on Long Term Operation and for Subsequent License Renewal.
- LTO efforts are well coordinated with other stakeholders: member utilities, NEI, DOE LWRS, NRC-RES.

© 2012 Electric Power Research Institute, Inc. All rights reserved.

12

EPRI ELECTRIC POWER RESEARCH INSTITUTE

Together...Shaping the Future of Electricity

© 2012 Electric Power Research Institute, Inc. All rights reserved.

13