SCHEDULING NOTE

Title: **BRIEFING ON THE STATUS OF SUBSEQUENT LICENSE RENEWAL PREPARATIONS (Public Meeting)**

Purpose: To provide the Commission with a discussion on the status of issues related to subsequent license renewal (SLR) applications and the staff preparedness to review an application.

Scheduled: **April 26, 2017**
9:00 a.m.

Duration: Approx. 3 hours

Location: Commissioners' Conference Room, 1st fl OWFN

Participants: **Presentation**

External Panel **60 mins.***

Richard Reister, Director, Light Water Reactor Sustainability Program, U.S. Department of Energy — 10 mins.*

Topic:
- Results of ongoing DOE research related to the technical basis for operating beyond 60 years

Sherry Bernhoft, Program Manager, Long Term Operations, Electric Power Research Institute — 10 mins.*

Topic:
- Results of ongoing industry research related to the technical basis for operating beyond 60 years

Jason Remer, Director, Plant Life Extension, Nuclear Energy Institute — 10 mins.*

Topic:
- Industry perspectives on SLR preparedness

Michael Gallagher, Vice President, License Renewal Projects, Exelon Generation Co., LLC, Peach Bottom Atomic Power Station, Units 2 and 3 — 10 mins.*

Topic:
- Peach Bottom SLR application

Paul Aitken, Manager, Second License Renewal, Dominion Resources, Surry Power Station, Units 1 and 2 — 10 mins.*

Topic:

- Surry SLR application

David Lochbaum, Director, Nuclear Safety Project, Union of Concerned Scientists — 10 mins.*

Topic:

- Views on Subsequent License Renewal.

Commission Q & A — **30 mins.**

Break — **5 mins.**

NRC Staff Panel — **40 mins.***

Victor McCree, Executive Director for Operations

Michele Evans, Deputy Director, Office of Nuclear Reactor Regulation (NRR)

George Wilson, Director, Division of License Renewal, NRR

Brian Thomas, Director, Division of Engineering, Office of Nuclear Regulatory Research

Allen Hiser, Senior Technical Advisor for License Renewal Aging Management, Division of License Renewal, NRR

Topics:

- Status of SLR guidance document development – significant changes
- Research related to SLR
- SLR process optimization

Commission Q & A — **30 mins.**

Discussion – Wrap-Up — **5 mins.**

*For presentation only and does not include time for Commission Q & A's

U.S. DEPARTMENT OF ENERGY | Nuclear Energy

NRC Commissioner Briefing

DOE Light Water Reactor Sustainability (LWRS) Program

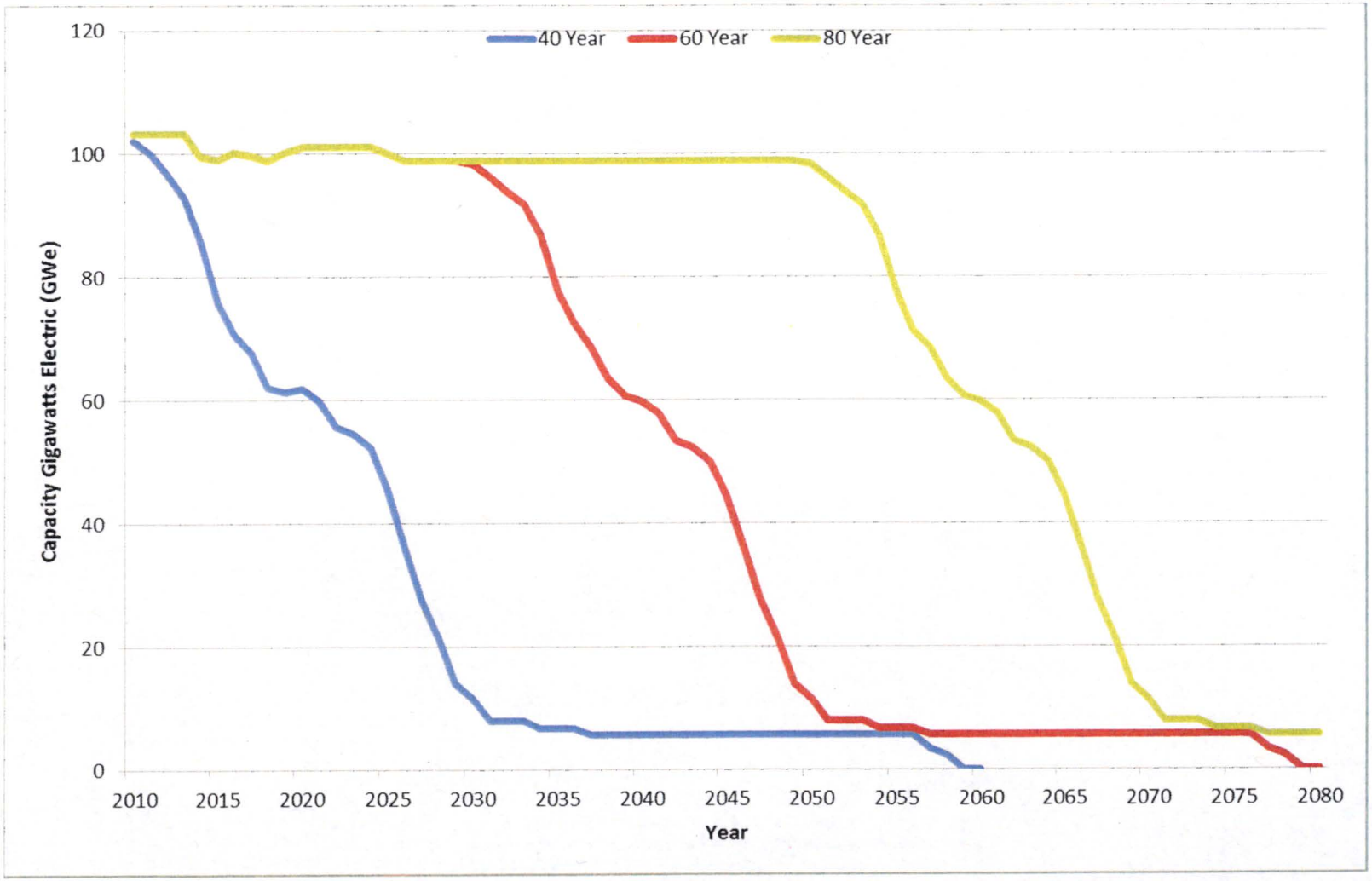
April 26, 2017

Richard Reister, Program Manager
Office of Nuclear Energy

U.S. DEPARTMENT OF ENERGY

Nuclear Energy

Projected Fleet Capacity



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LWRS Program

Objective:

- **Develop technologies and other solutions that can improve the reliability, sustain the safety, and extend the life of current reactors**

Four areas of research:

- **Materials Aging and Degradation**
- **Advanced Instrumentation, Information, and Control Systems Technologies**
- **Risk-Informed Safety Margin Characterization**
- **Reactor Safety Technologies**

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LWRS Program

DOE Role:

- Support national strategic interests in energy security, reliability and grid stability
- Address fundamental scientific questions to make progress on broadly applicable technology issues
- Reduce technical uncertainties and risks such that industry is willing to make the necessary long-term investments

Materials Research helps develop:

- High quality materials degradation data
- An understanding of the underlying mechanisms
- Mechanistic models
- Improved monitoring capabilities
- Mitigation techniques

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Materials Aging and Degradation

- **Expanded Materials Degradation Assessment (EMDA) (NUREG/CR-7153), a joint DOE/NRC sponsored effort published October 2014, captured status and knowledge gaps in the following four areas:**
  - Reactor Pressure Vessel (RPV) steels
  - Core internals and piping systems
  - Concrete civil structures
  - Electrical power and instrumentation and control (I&C) cables

- **Much progress has been made to fill knowledge gaps**
- **No generic technical show stoppers to long-term operation have been identified**
- **Research continues to improve understanding and reduce uncertainties**

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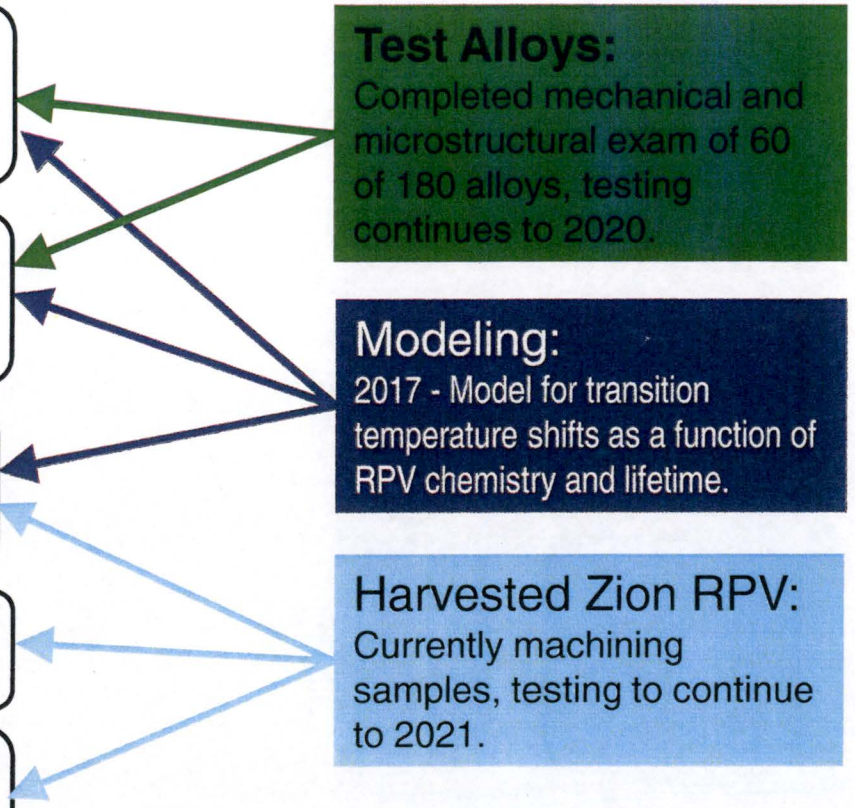
Reactor Pressure Vessels

Evaluation of risk for high fluence embrittlement and possible mitigation techniques through the mechanistic understanding the effects of.....

- Fluence, flux and influence of alloy chemistry on materials performance
- Radiation-induced effects and mitigation techniques
- Neutron attenuation and variation in through thickness properties
- Aging / irradiation behavior of weldments
- Bias in toughness values derived from pre-cracked Charpy specimens



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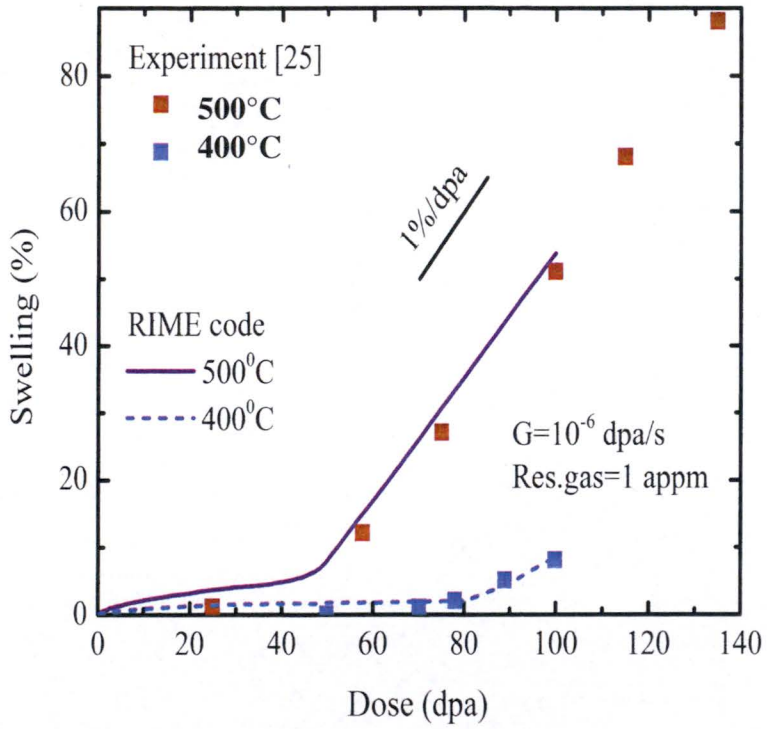
Core Internals

Research involves analysis and testing of core internal materials of both commercial and model alloys and includes service materials.

The goal is to develop physics based predictive models

- 2017 – Deliver Radiation Induce Microstructural Evolution (RIME) model for swelling
- 2017 – Complete an *integrated thermal and radiation* induced segregation model
- 2019 – Complete a predictive model for Irradiation-Assisted Stress Corrosion Cracking (IASCC)

These models can be used by industry to better predict, manage, and mitigate the degradation of core internals.



RIME code vs. experimental data

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Piping

Environmentally Assisted Fatigue

- Research has focused on experimental studies to develop a finite element based fatigue model that tracks key time-dependent properties for fatigue life based on LWR environmental conditions and plant operation history, rather than empirical methods using test data under non-relevant conditions.
- 2017 – Complete thermal fatigue models for a 508 Low Alloy Steel RPV and 316L alloy surge line pipe.

Thermal Aging of Cast Austenitic Stainless Steel (CASS) and Austenitic Stainless Steel Welds (ASSW)

- Research the effects of long-term thermal exposure on the service life of CASS and ASSW components.
- 2019 – Complete a validated predictive model.
- Future work – address synergistic effects of irradiation and thermal aged CASS materials.

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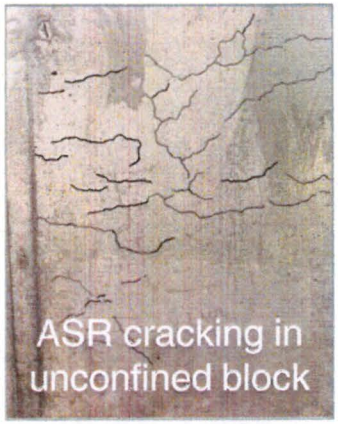
Concrete Civil Structures

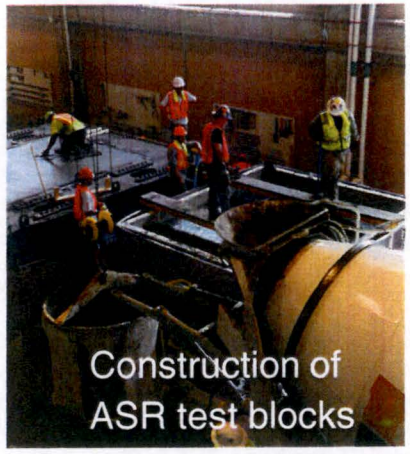
Conducting research on the fundamental behavior of the heavily reinforced concrete found in nuclear power plants under the influence of irradiation and Alkali-Silica Reaction (ASR)

- Irradiation studies on mineral analogues, aggregates and concrete, with data retained in a developed database
- Conducting experiments on ASRs influence on the structural significance to large reinforced structures
- 2020 – Complete a model tool to predict the impact of both irradiation and ASR on concrete structural performance.



ASR cracking in unconfined block

Based on research to date and initial evaluations, concrete structures appear to have significant safety margins during the 60-80 year time period.



Construction of ASR test blocks

Concrete NDE

- Improved existing NDE techniques by using advanced signal processing techniques.

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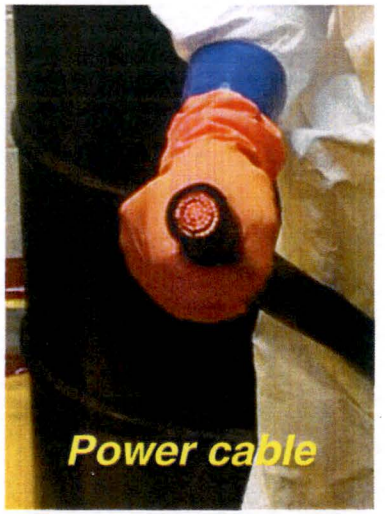
Power and I&C Cables

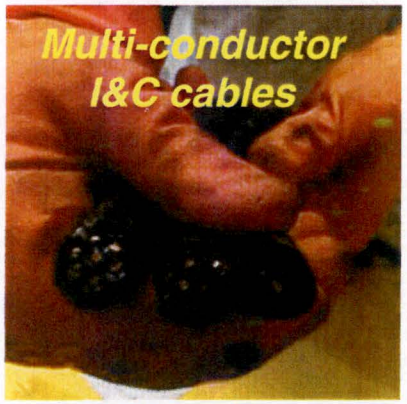
Understanding cable degradation mechanisms and the ability to predict remaining useful life will help plants better manage the aging of their cables

- Research is being conducted on the typical cable types found at plants
- Accelerated aging under combined temperature and irradiation conditions
- Electrical, chemical, and mechanical characterization is performed to establish aging trends and key factors for cable condition monitoring
- Also evaluating and developing promising Non-Destructive Evaluation (NDE) methods and technologies through collaboration with vendors and industry



Current model development

- 2019 – complete a predictive models for cable aging under combined thermal and irradiation conditions



We believe the aging of plant cable during the 60 to 80 year period of operation can be reasonably managed with appropriate monitoring programs.

Summary

- No generic technical show stoppers to long-term operation have been identified
- Supporting the development of improved monitoring techniques
- Inform industry Aging Management Programs

EPRI | ELECTRIC POWER RESEARCH INSTITUTE

EPRI Long Term Operations

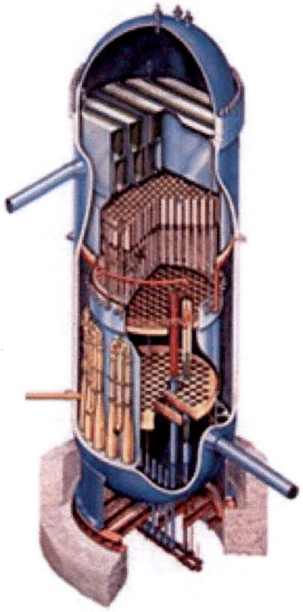
Research & Development for Aging Management

Sherry Bernhoft
EPRI Senior Program Manager

NRC Commissioner Briefing on SLR
April 26, 2017

Technical Basis for Aging Management

Assessment
- What to inspect and when
- Inspection options
- How to dispose any observed degradation



Inspection
- How to inspect
- What equipment and techniques are available
- What are the associated uncertainties
- What techniques need to be improved

Mitigation and Testing
- Prevent or reduced degradation
- Irradiated material testing
- Non-irradiated material testing

Technical Support
- Review of inspection results
- Guidelines review and maintenance

The technical basis for aging management is established, and incorporated in the aging management programs

Over 125 EPRI technical reports are referenced in the SLR GALL

EPRI's Approach

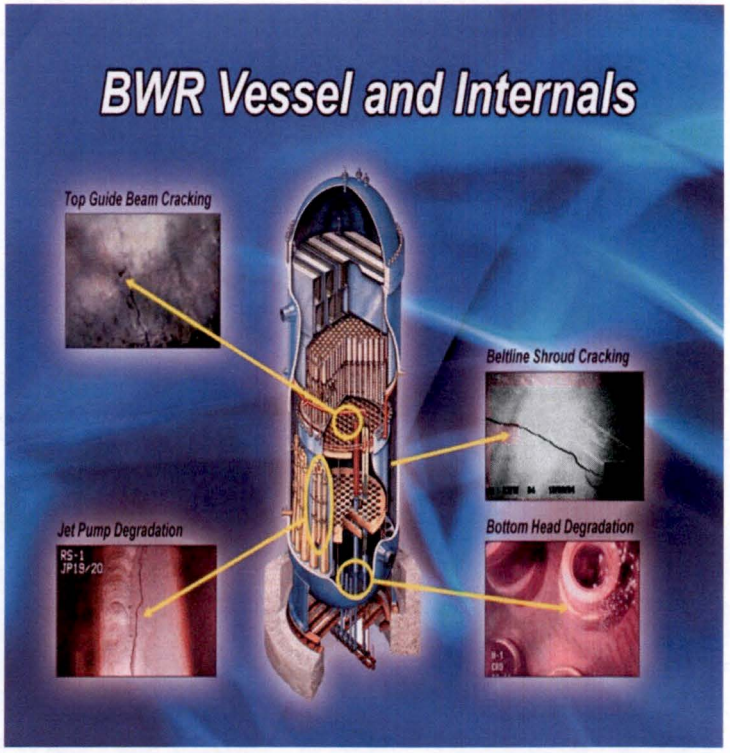
- Issue Management Programs
- Decades of aging management research
- Prioritized research plans
- Collaboration with US DOE, NRC Research and International partners
- NEI Initiative 03-08
- Lead plant support

Living Research Programs

Technical reports are updated based upon:

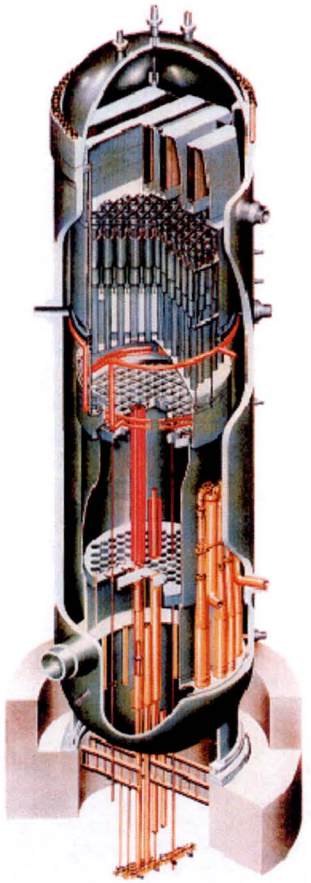
Four Key Technical Areas

- Reactor pressure vessel neutron embrittlement at high fluence
- Irradiated-assisted stress corrosion cracking of reactor vessel internals
- Concrete degradation
- Electrical cable qualification and condition assessment



Reactor Pressure Vessels (RPVs)

- Surveillance capsule are used to monitor fracture toughness of the RPV and nozzles due to irradiation and other potential degradation mechanism



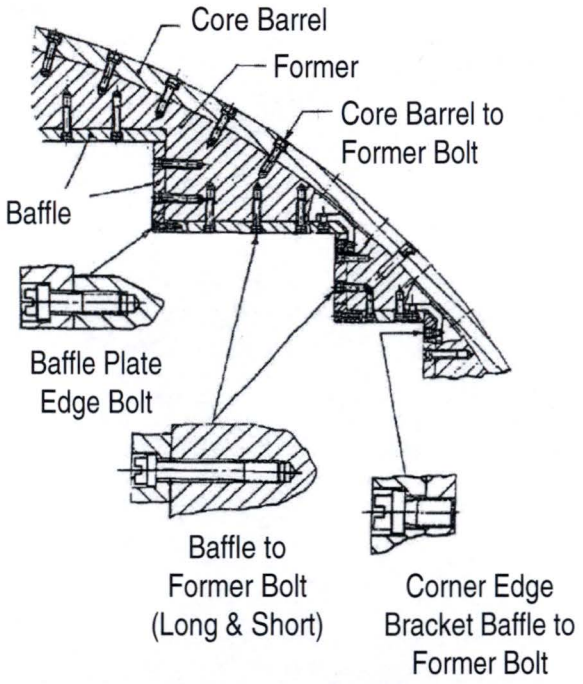
- PWRs – Programs to collect surveillance capsule data at higher fluences
  - Coordinated Surveillance Program
  - Supplemental Surveillance Program

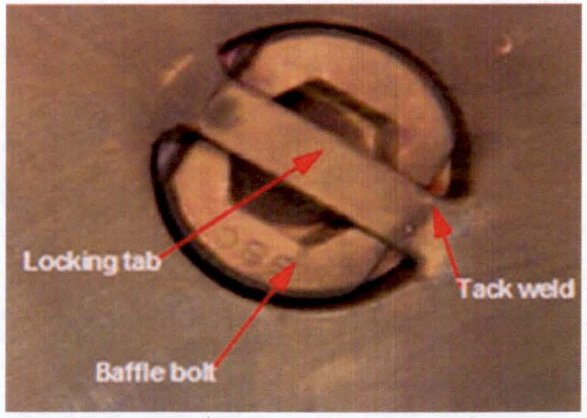
- BWRs – Integrated Surveillance Program
  - Extend for 80 years of operations

An established embrittlement trend correlations exist to predict RPV mechanical properties

Reactor Vessel Internals

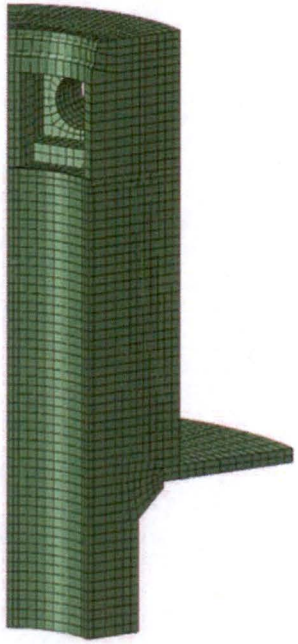
- Irradiation assisted stress corrosion cracking (IASCC) of internals materials due to increased neutron fluence and the operating environment
- EPRI BWR Vessel Internals Program and Materials Reliability Program (PWRs)
- Extensive work has been completed on IASCC initiation and crack growth rate models
- Harvested materials provide confirmation





Concrete Degradation

- Impacts on the structural integrity of concrete due to:
  - Alkali-Silica Reactions (ASR)
  - Irradiation and gamma heating
- EPRI is publishing a series of technical reports on ASR aging management
- Leveraging the irradiated concrete work completed at ORNL, developed a PWR biological shield wall model and published results



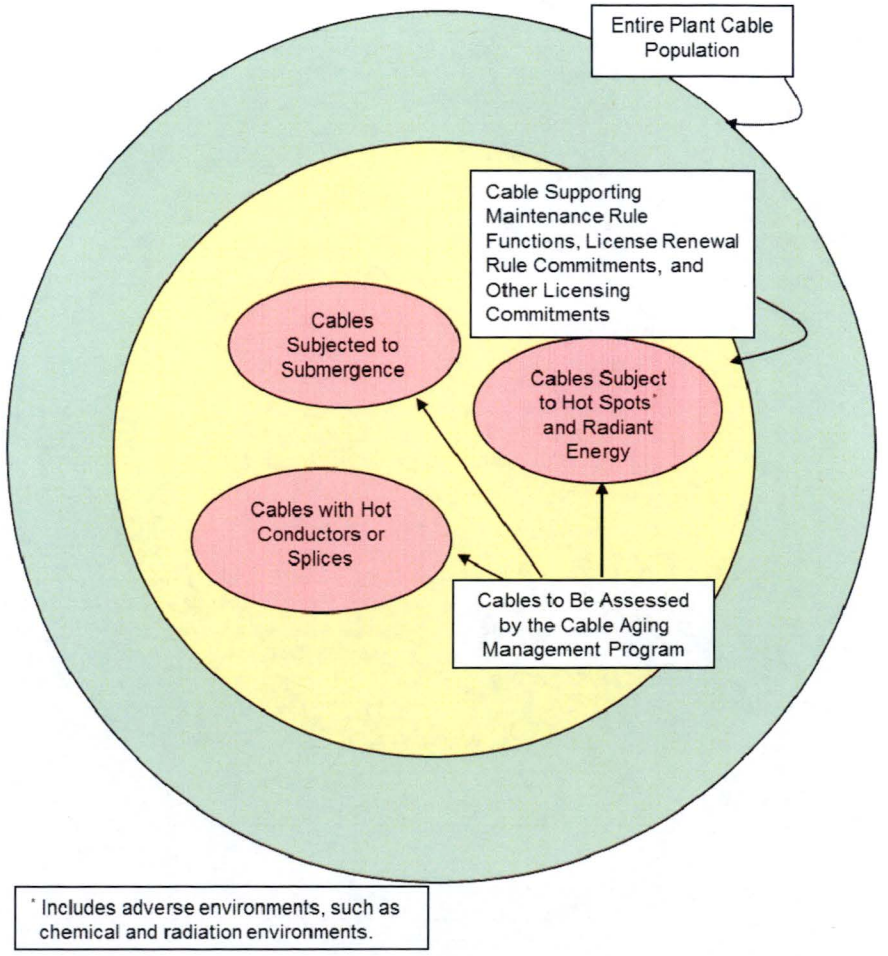
Modeling concrete structures exposed to high levels of radiation demonstrated safety margins exist

Developing aging management and evaluation programs for reactive aggregates

Electrical Cable Qualification and Condition Assessment

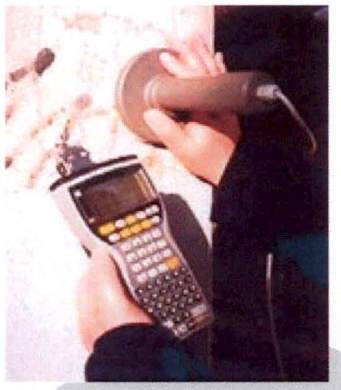
- Cable insulation materials age due to radiation, temperature and submergence
- EPRI aging management guidelines for low voltage and medium voltage cables
- Research continues to support asset management
  - Condition monitoring
  - Determine remaining useful life (RUL)

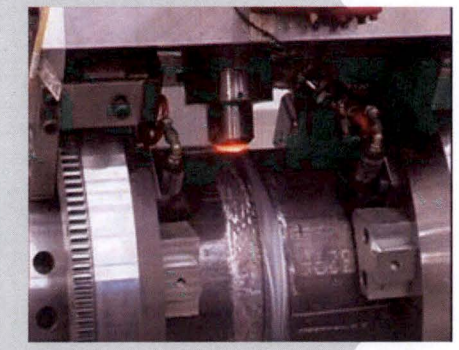
EPRI aging management – scoping methodology

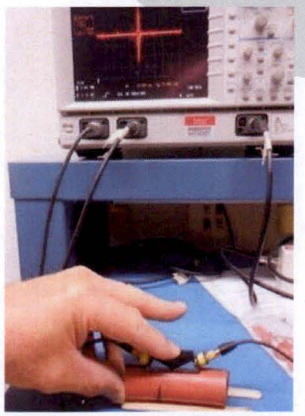


Summary

- Technical basis is established and in use for aging management
- Continuous improvements for aging management are based on research, inspections and operating experience
- Research results and technical reports are shared with the NRC staff
- Technical support for the leads plants







Together…Shaping the Future of Electricity

NRC Commissioner Briefing on Subsequent License Renewal

NRC White Flint One
Rockville, MD
April 26, 2017

S. Jason Remer
Director, Life Extension & New Technology
Nuclear Energy Institute

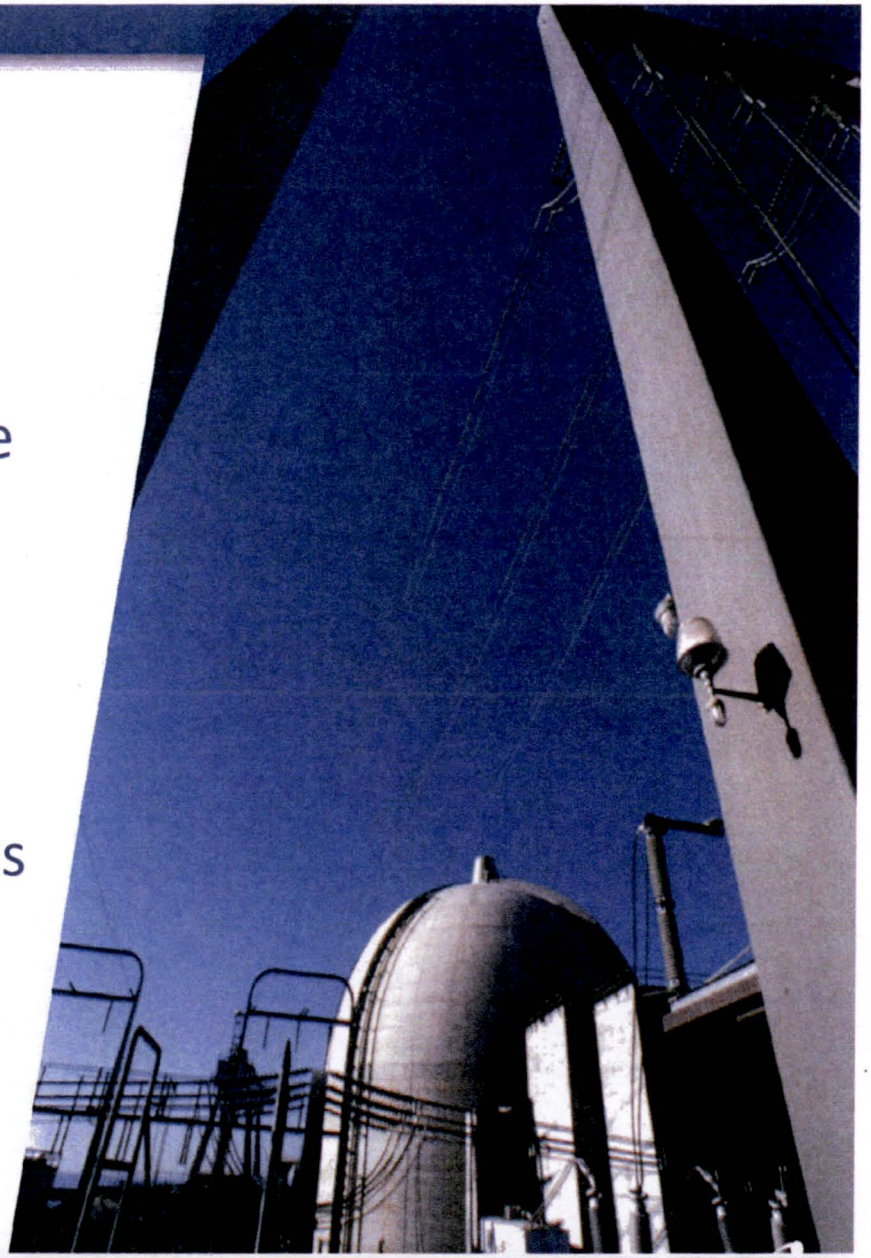
NEI
NUCLEAR ENERGY INSTITUTE
nuclear. clean air energy.

Today's Briefing

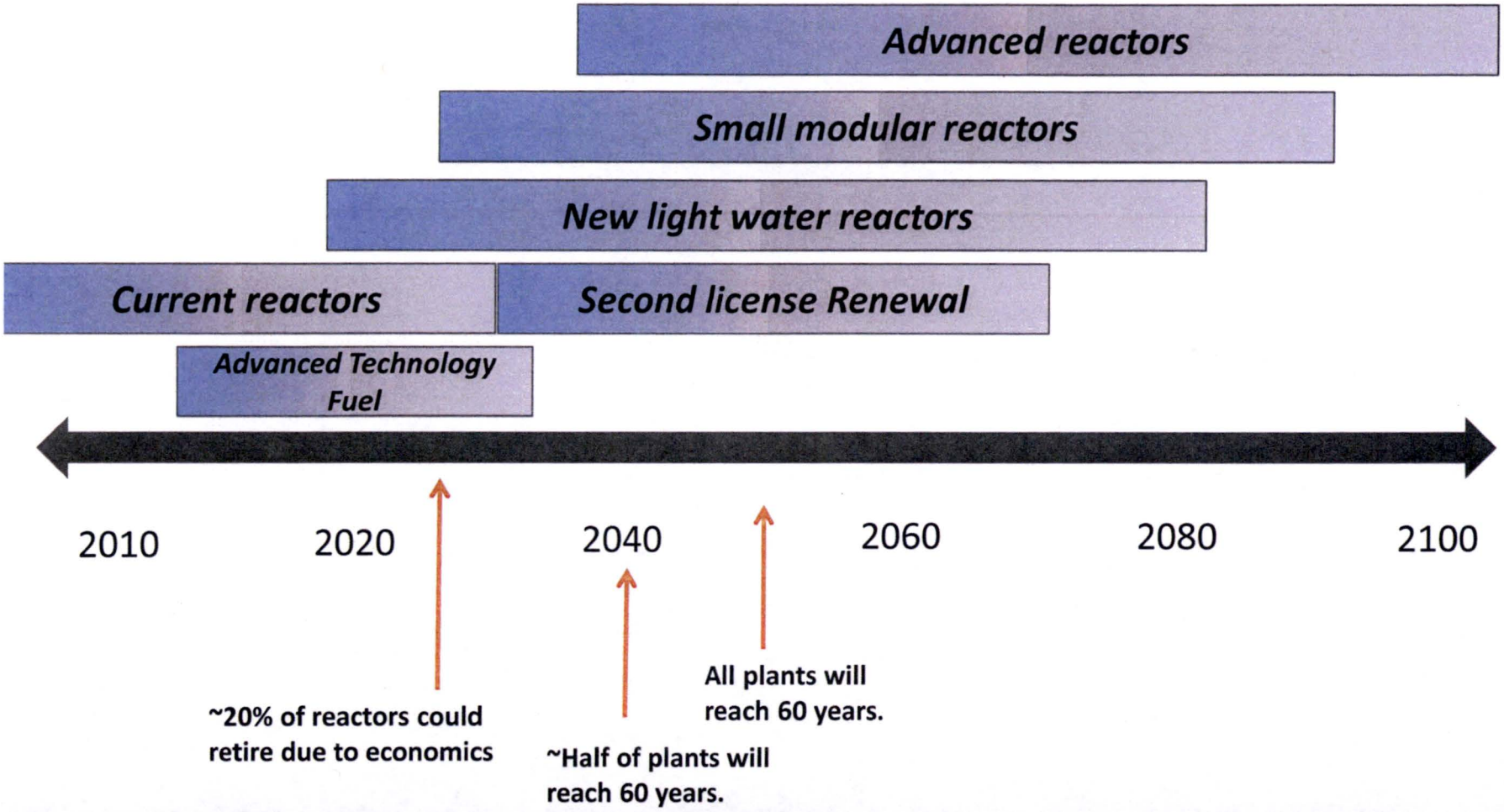
- Second License Renewal – Bridge to the Future
- Key Safety Principles Maintained
- Process Optimization
- Moving Forward

Nuclear Plants Are Critical Infrastructure

- U.S. has the largest and best-run fleet of nuclear power plants in the world
- Generate 20% of America's electricity overall; 62% of emissions-free electricity
- Like other infrastructure, nuclear plants provide tremendous benefits for nearly a century
- Nuclear energy needs to be included in any plan to rebuild America



Defining Our Future: A Logical Progression



Key Principles for License Renewal

- **Current regulatory process** is adequate to ensure that the licensing basis of all operating plants provides and maintains an **acceptable level of safety** so that operation will not be detrimental to public health and safety or common defense and security
- Each plant's licensing basis is required to be **maintained during any renewal term** in the **same manner and to the same extent** as during the original licensing term

Regulation is Sound

- 10 CFR Part 54 anticipates further rounds of License Renewal
- Existing regulatory processes ensure safe operation
  - 10 CFR 50, Appendix B
  - Aging Management Programs
  - Maintenance Rule
  - Reactor Oversight Process
  - Design basis is maintained
- Process proven through experience, **86** with renewed license, **42** reactor units in PEO (approx. 128 reactor years in PEO)
- Reliable, predictable process

Regulatory Guidance is Sound

- Significant Industry input to NRC as SLR GALL report was prepared over the last three years
  - Comprehensive industry comments submitted on the draft GALL in February, 2016
  - Industry participated in nine GALL-focused public meetings with NRC in 2016 to resolve industry comments
- Final SLR GALL Report provided for stakeholder review Feb. 8
- NEI/industry completed development of NEI 17-01 guidance for preparing a license renewal application and submitted for NRC endorsement in March
- Part 54 Environmental Review
  - Draft "*Model SLR New and Significant Assessment Approach for SAMA*" submitted to NRC to improve Environmental Review Process

SLR Research

- Research and data being collected at EPRI, DOE and other facilities in U.S. conclude there are no technical "show stoppers" for operation beyond 60 years
- NRC has participated in seven NEI organized SLR site visits since 2015
  - Salem/Hope Creek Station, Oak Ridge National Lab, EPRI, Pacific Northwest National Lab, AREVA, Westinghouse and University of Tennessee
  - Site tours and presentation focused on aging management programs for concrete, cables and metal

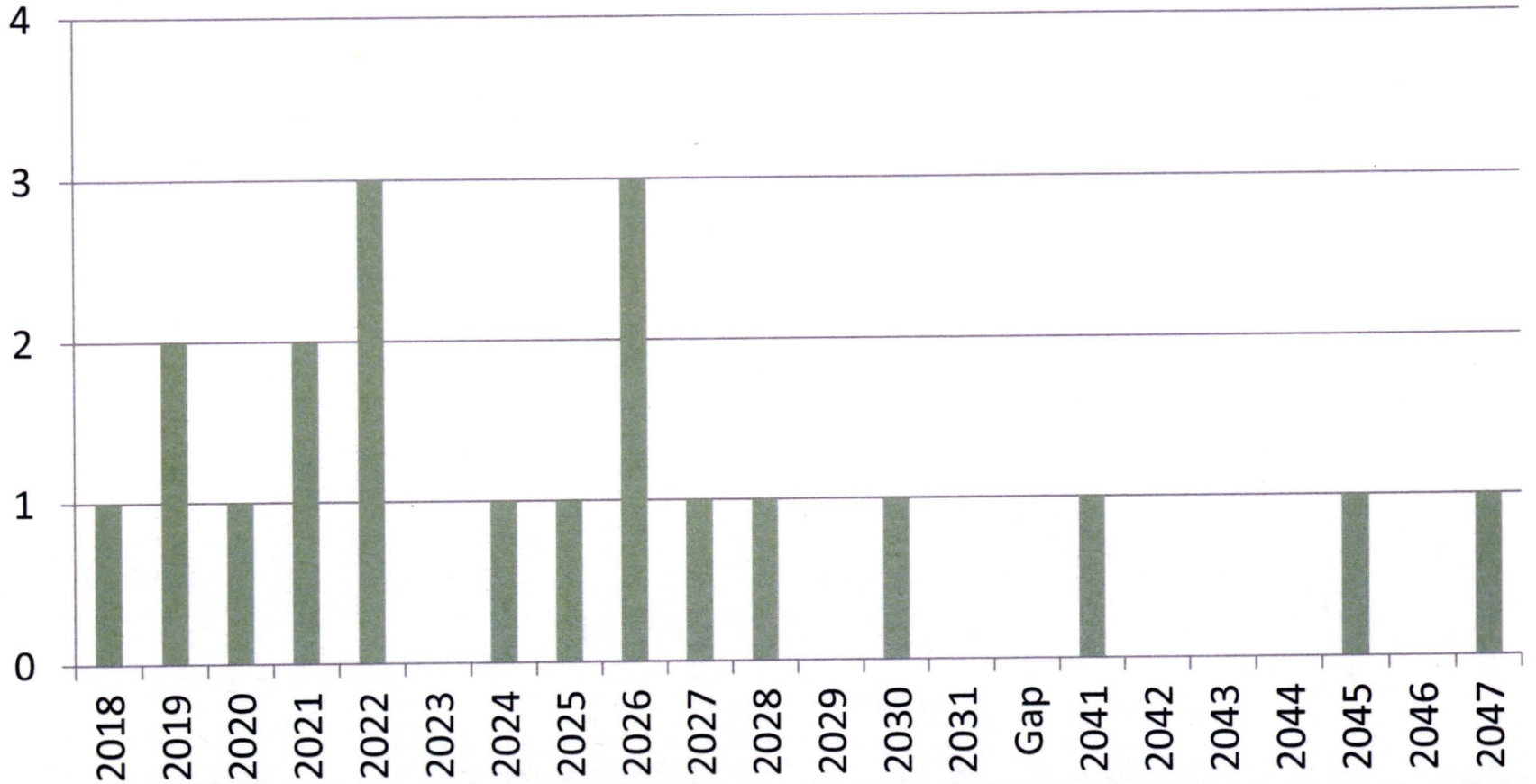
SLR Application Optimization

- Industry participated in three public meetings with NRC
- Commitment to 18-month safety and environmental application review
- Application of lessons learned from first round of License Renewal to improve application efficiency
  - Improved resource allocation and schedule coordination
  - Increased use of electronic communication tools
  - Elimination of redundancy - scoping meeting
  - Peer reviewed applications and RAI discipline
- Final meeting to address SLR application optimization on May 11

SLR Lead Plant Update

- Peach Bottom on track for BWR application submittal 3rd quarter 2018
- Surry Station on track for PWR application submittal 1st quarter 2019
- Industry aligned in commitment to dedicating resources needed for success of lead plant SLR applications
- Industry survey conducted in May 2016 to determine how many plants may take advantage of SLR in the future

Anticipated SLR Applications Per Year



Summary

- Technical data and research of aging management programs support SLR
- SLR GALL incorporates lessons learned from first round of license renewals
- NRC committed to optimizing application review process to accomplish an 18-month review
- Lead plants on track for 2018 and 2019 application submittals
- SLR applications must be of the highest quality to ensure 18-month NRC review goal can be met
- Plant safety is and will be maintained throughout licensed period

NRC Commissioner Briefing
Subsequent License Renewal
BWR Lead Plant
Peach Bottom Atomic Power Station 2 & 3

Michael P Gallagher
Vice President- License Renewal Projects
Exelon Generation
April 26, 2017

Exelon is well positioned to be a lead applicant

- ✓ Exelon has extensive aging management experience
  - 22 of 23 units have renewed operating licenses
  - 13 units are operating in PEO
- ✓ Exelon has held leadership positions and participates in NEI and EPRI initiatives preparing the industry for Subsequent License Renewal and Long Term Operations
- ✓ Exelon participated through NEI in providing comments to the staff on GALL-SLR
- ✓ Exelon will submit a high quality application that can support an 18 month staff review

Peach Bottom is BWR lead plant

- ✓ First Renewal Application submitted July 02, 2001
  - Approved May 7, 2003
  - Entered PEO 2013 Unit 2 & 2014 Unit 3
- ✓ Well run and maintained
  - 11 years without an automatic scram
  - Over $1.3 Billion in capital improvements 2012-2016
  - Achieved Extended Power Uprate on Both Units in 2015
  - Received 5th consecutive INPO Excellence Award
  - Named a "Top Plant" by POWER Magazine
- ✓ Community Commitment
  - Donated more than $416,000 to local non-profits and charities in our community in 2016

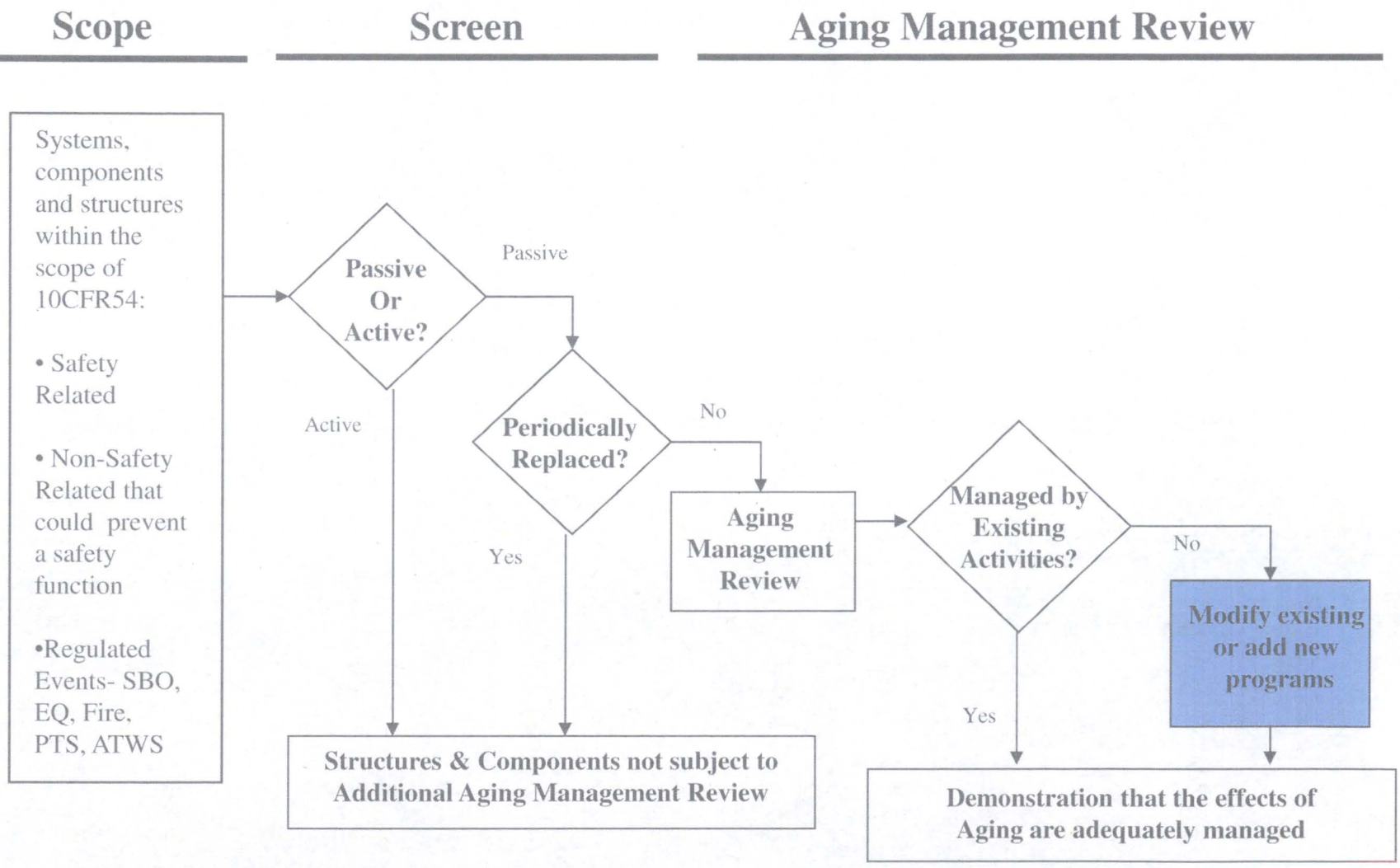
Approach to Subsequent License Renewal

- ✓ **Part 51 Environmental Review: utilize guidance in NUREG 1437 (GEIS), NUREG 1555 (SRP) and Reg Guide Supplement 1**

- ✓ **Part 54 Safety Review: utilize guidance in NUREG 2191 (GALL-SLR) and NUREG 2192 (SRP)**
  - **54.21(a) Integrated Plant Assessment**
  - **54.21(c) TLAA Evaluation**
  - **Aging Management Programs**

Aging Management Programs are implemented to ensure that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the Current Licensing Basis for the period of extended operation.

Part 54 Application Integrated Plant Assessment



48 Anticipated Aging Management Programs

Mechanical		Structural
XI.M1 ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	XI.M27 Fire Water System	XI.S1 ASME Section XI, Subsection IWE
XI.M2 Water Chemistry	XI.M29 Outdoor and Large Atmospheric Metallic Tanks	XI.S3 ASME Section XI, Subsection IWF
XI.M3 Reactor Head Closure Stud Bolting	XI.M30 Fuel Oil Chemistry	XI.S4 10 CFR Part 50, Appendix J
XI.M4 BWR Vessel ID Attachment Welds	XI.M31 Reactor Vessel Material Surveillance	XI.S5 Masonry Walls
XI.M7 BWR Stress Corrosion Cracking	XI.M32 One-Time Inspection	XI.S6 Structures Monitoring
XI.M8 BWR Penetrations	XI.M33 Selective Leaching	XI.S7 Inspection of Water-Control Structures Associated with Nuclear Power Plants
XI.M9 BWR Vessel Internals	XI.M35 ASME Code Class 1 Small-Bore Piping	XI.S8 Protective Coating Monitoring and Maintenance
XI.M.12 Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS)	XI.M36 External Surfaces Monitoring of Mechanical Components	**Electrical**
XI.M17 Flow-Accelerated Corrosion	XI.M38 Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components	XI.E1 Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements
XI.M18 Bolting Integrity	XI.M39 Lubricating Oil Analysis	XI.E2 Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits
XI.M20 Open-Cycle Cooling Water System	XI.M40 Monitoring of Neutron-Absorbing Materials Other than Boraflex	XI.E3A Electrical Insulation for Inaccessible Medium Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements
XI.M21A Closed Treated Water Systems	XI.M41 Buried and Underground Piping and Tanks	XI.E3B Electrical Insulation for Inaccessible Instrumentation and Control Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements
XI.M23 Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems	XI.M42 Internal Coatings/Linings for in scope Piping, Piping Components, Heat Exchangers, and Tanks	XI.E3C Electrical Insulation for Inaccessible Low Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements
XI.M24 Compressed Air Monitoring	X.M1 Fatigue Monitoring	XI.E4 Metal Enclosed Bus
XI.M25 BWR Reactor Water Cleanup System	X.M2 Neutron Fluence Monitoring	XI.E5 Fuse Holders
XI.M26 Fire Protection	**Plant Specific**	XI.E6 Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements
	Wooden Pole Program	X.E1 Environmental Qualification of Electric Components

Summary

✓The GALL-SLR and GEIS guidance is comprehensive, clear and has been developed based on learnings from first license renewal, research and operating experience

✓The Peach Bottom SLR application will be consistent to GALL-SLR and GEIS to the greatest extent possible

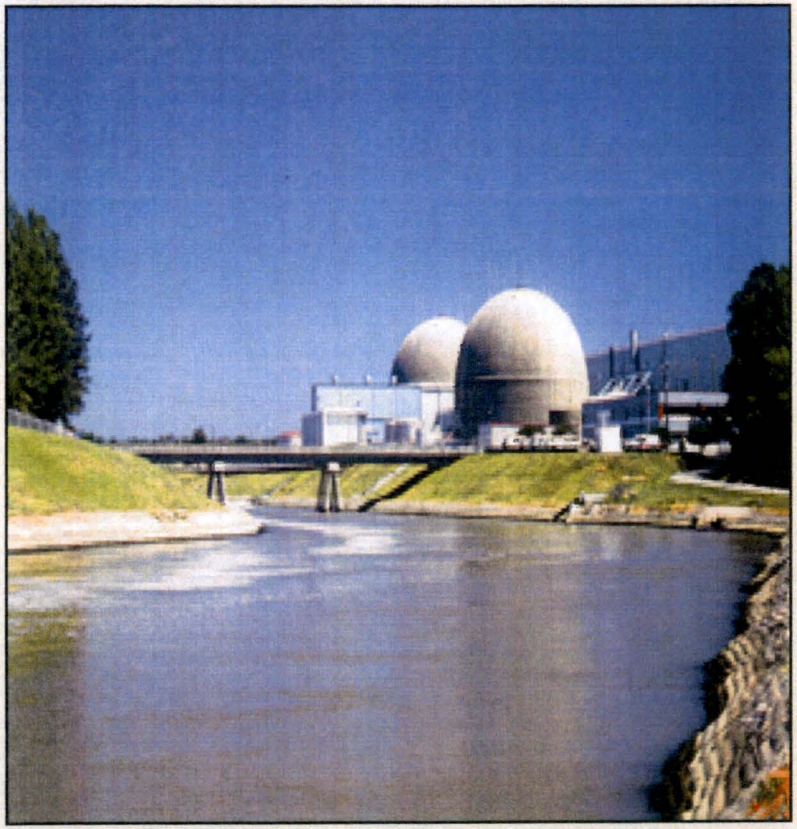
✓Exelon will submit a high quality application that can support an 18 month staff review

✓The Peach Bottom SLR application development is on track for submittal in 3rd quarter 2018

Subsequent License Renewal
Surry Power Station

Paul Aitken
Engineering Manager-SLR
April 26, 2017

Surry Power Station – Lead Plant



- Two Westinghouse 3-loop PWRs
- Net Capacity: Each unit is 838 MW (net) => 1676 MW
- Capital Improvements ~ $1B since previous LRA

	Orig. (OL)	40 Years	60 Years	80 Years
Unit 1	1972	2012	2032	2052
Unit 2	1973	2013	2033	2053

Lifetime Generation over 460,000,000 MWhrs

Dominion

Dominion Assessment

Surry Power Station

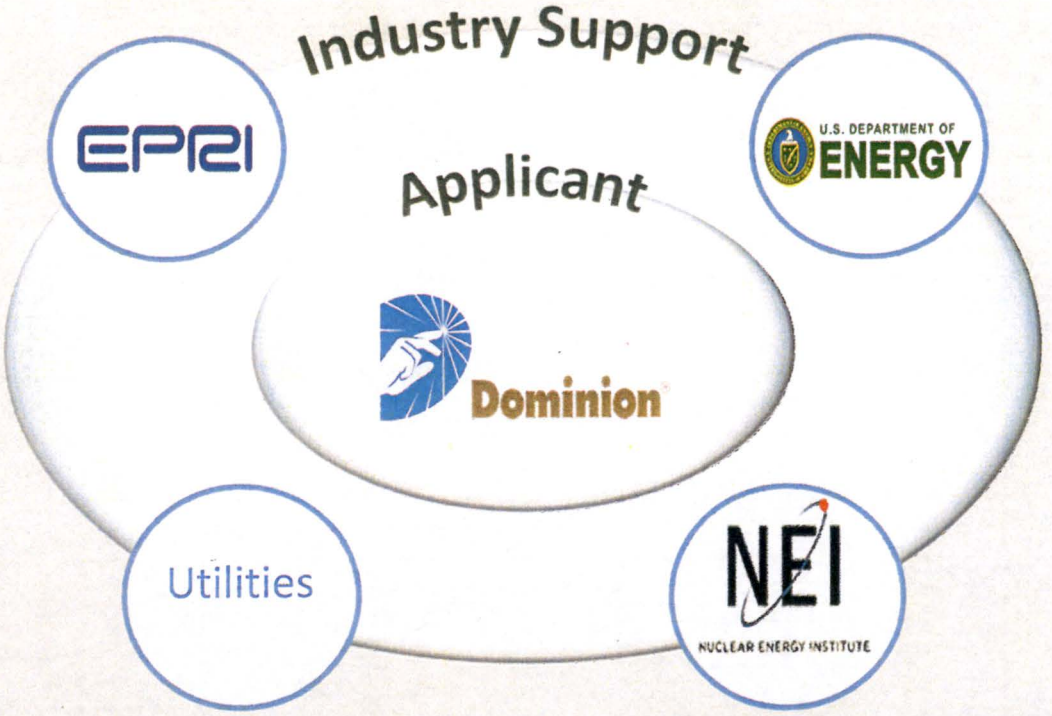
- First station in fleet to reach 60 years (2032/2033)
- Makes sense for Dominion, employees, stakeholders and customers
- Political landscape is supportive
- NRC notified of intent to apply for SLR (Nov-15)

Dominion Experience

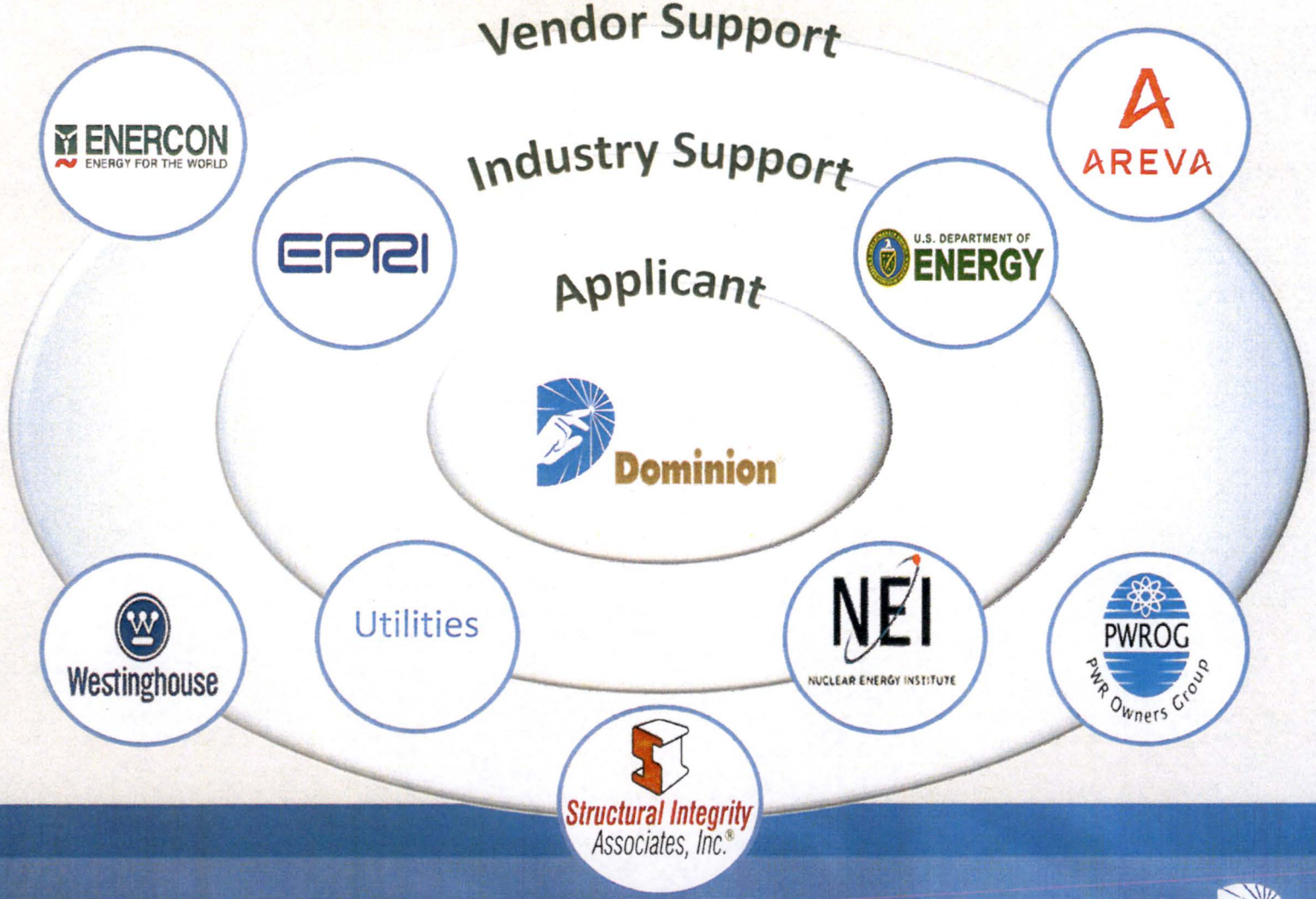
- Highly experienced team involved in previous Dominion and industry LR applications
- Team members engaged in various SLR industry groups
- Extensive experience with the evolution of GALL/SRP (NUREG-1800/1801) for first renewals
- Direct involvement in GALL SLR review and SLR industry guidance development
- Coordinated GALL-SLR issue resolution

SLR – Circles of Support

SLR – Circles of Support



SLR – Circles of Support



Dominion

Dominion SLR Application

- Will be a continuum from the first industry LR applications
- Will meet the expected standards established with the most recent industry LR applications
- Expected to be high degree of consistency with GALL-SLR
- AMPs will effectively manage the effects of aging to provide reasonable assurance for SLR period
- Quality will support an 18 month NRC review schedule

Dominion SLR – 47 AMPs

Mechanical

- XI.M1 ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD
- XI.M2 Water Chemistry
- XI.M3 Reactor Head Closure Stud Bolting
- XI.M10 Boric Acid Corrosion
- XI.M11b Cracking of Nickel-alloy Components and Loss of Material Due to Boric Acid-induced Corrosion in Reactor Coolant Pressure Boundary Components
- XI.M12 Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS)
- XI.M16A PWR Vessel Internals
- XI.M17 Flow-Accelerated Corrosion
- XI.M18 Bolting Integrity
- XI.M19 Steam Generators
- XI.M20 Open-Cycle Cooling Water System
- XI.M21A Closed Treated Water Systems
- XI.M23 Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems
- XI.M24 Compressed Air Monitoring
- XI.M26 Fire Protection
- XI.M27 Fire Water System
- XI.M29 Outdoor and Large Atmospheric Metallic Tanks
- XI.M30 Fuel Oil Chemistry
- XI.M31 Reactor Vessel Material Surveillance
- XI.M32 One-Time Inspection
- XI.M33 Selective Leaching
- XI.M35 ASME Code Class 1 Small-Bore Piping
- XI.M36 External Surfaces Monitoring of Mechanical Components
- XI.M37 Flux Thimble Tube Inspection
- XI.M38 Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components
- XI.M39 Lubricating Oil Analysis
- XI.M41 Buried and Underground Piping and Tanks
- XI.M42 Internal Coatings/Linings for in scope Piping, Piping Components, Heat Exchangers, and Tanks

TLAA

- X.M1 Fatigue Monitoring
- X.M2 Neutron Fluence Monitoring
- X.E1 Environmental Qualification of Electric Components

Structural

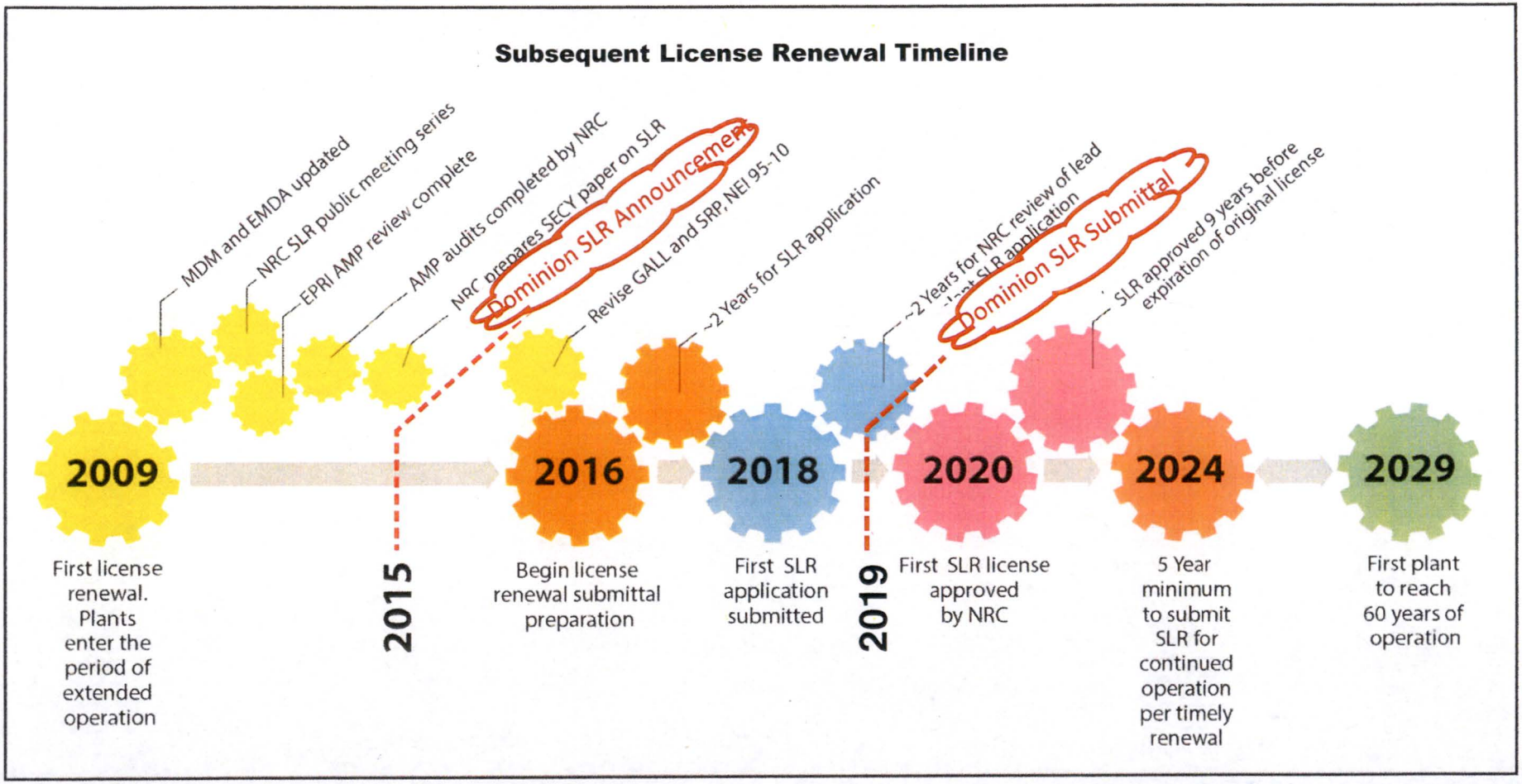
- XI.S1 ASME Section XI, Subsection IWE
- XI.S2 ASME, Section XI, Subsection IWL
- XI.S3 ASME Section XI, Subsection IWF
- XI.S4 10 CFR Part 50, Appendix J
- XI.S5 Masonry Walls
- XI.S6 Structures Monitoring
- XI.S7 Inspection of Water-Control Structures Associated with Nuclear Power Plants
- XI.S8 Protective Coating Monitoring and Maintenance

Electrical

- XI.E1 Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements
- XI.E2 Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits
- XI.E3A Electrical Insulation for Inaccessible Medium Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements
- XI.E3B Electrical Insulation for Inaccessible Instrumentation and Control Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements
- XI.E3C Electrical Insulation for Inaccessible Low Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements
- XI.E4 Metal Enclosed Bus
- XI.E6 Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements
- XI.E7 High Voltage Insulators

Dominion

NEI Roadmap –SLR Timeline



Dominion

Summary

- NRC Staff has encouraged stakeholder review and input during GALL SLR/SRP development
- Dominion is engaged and integrated with the development of GALL-SLR and industry guidance
- Dominion team is experienced with LR/SLR and requirements
- Dominion will submit a high quality application to support an 18 month NRC review
- Surry Project Team is on schedule for a 1st quarter 2019 submittal

Union of Concerned Scientists

Subsequent License Renewal

David Lochbaum
Director, Nuclear Safety Project
www.ucsusa.org

April 26, 2017

Issues

1) One-time SAMA evaluations

2) Safety by queue position

3) Public engagement

4) Knowledge management

Preface

Neither license renewal nor subsequent license renewal is inherently unsafe.

Improperly maintained and operated reactors can get into trouble in less than 40 years.

Properly maintained and operated reactors can avoid trouble beyond 40 years.

One-time SAMA evaluations

Severe accident mitigating alternative (SAMA) evaluations are required with initial license renewal application, unless already done for another reason, and are not required to be re-done for subsequent license renewal.

One-time SAMA evaluations

SAMA evaluations are good ideas for ALL license renewals:

- safety innovations may have emerged during the past two decades
- populations may have changed during the past two decades
- costs just may have changed during the past two decades

One-time SAMA evaluations

07-13-1999: NEI submits PRM seeking to delete the requirement for SAMA with license renewal applications

02-13-2001: NRC denied the PRM (ML010450132) citing its need to consider "new and significant information"

One-time SAMA evaluations

"In the case of license renewal, it is the Commission's responsibility under NEPA to consider all environmental impacts stemming from its decision to allow the continued operation of the entire plant for an additional 20 years."

66 FR 10836 February 20, 2001

Safety by queue position

05-19-2004 NRC relicensed Ginna

09-30-2005 GALL/SRP Rev. 1 issued

12-23-2005 NRC relicensed Point Beach

Point Beach had to develop an Alloy 600 aging management program (AMP) before NRC relicensed it.

Ginna was relicensed without an Alloy 600 AMP being required.

§50.100 is black and white:

"A license, permit, or standard design approval under parts 50 or 52 of this chapter may be revoked, suspended, or modified, in whole or in part, ... because of conditions revealed by the application or statement of fact of any report, record, inspection, or other means which would warrant the Commission to refuse to grant a license, permit, or approval on an original application ..."

NRC is cheating somebody

If the increased safety measures in GALL/SRP Rev. 1 are truly needed to assure safety (as §50.109 requires), then the people living around Ginna got cheated.

If the increased safety measures are NOT needed, then the shareholders and ratepayers of Point Beach got cheated.

So, whom did you all cheat?

NRC is cheating many

05-08-1995 10 CFR 50.54 issued

6 operating licenses renewed

07-31-2001 GALL/SRP Rev. 0 issued

29 operating licenses renewed

09-30-2005 GALL/SRP Rev. 1 issued

26 operating licenses renewed

12-31-2010 GALL/SRP Rev. 2 issued

27 operating licenses renewed

Safety by queue position

Position in line must not continue to determine which reactor has what safety measures and what owner pays which costs.

50.100 and 50.109 collectively must result in owners paying the same for renewed licenses and in communities receiving the same protections.

Public engagement

By memo dated 09-12-2016, the NRC staff addressed public comments about subsequent license renewal during meetings it conducted May 9, November 1, November 13, and November 14, 2012 (ML16194A222).

I attended the May 5th 2012 meeting. My issues are addressed in Enclosure 3 to the 2016 memo.

Public engagement

The NRC staff responded to my "safety by queue position" concern thusly:

"Reactors that ... wish to renew their licenses for 60-80 years of operation will most likely follow the guidance in the updated GALL and SRP when they prepare their applications but are not required to do so. Any applicant has the option to address the requirements through other means. In such cases, the staff will review the information and make a safety determination. In the end, all licensees must meet NRC regulations and demonstrate the ability to operate their plants safely during the SLR period."

Public engagement

If raising license renewal standards was justified, NRC met 50.109 for Point Beach but violated 5.100 for Ginna.

If raising standards was unjustified, NRC violated 50.109 for Point Beach but met 50.100 for Ginna.

Atomic Abe might have said "you can't meet all the regulations all the time this way."

Public engagement?

05-09-2012 SLR public meeting
11-01-2012 SLR public meeting
11-13-2012 SLR public meeting
11-14-2012 SLR public meeting

01-31-2014 SLR SECY-04-0016
05-08-2014 SLR Briefing
08-29-2014 SRM SECY-04-0016

09-12-2016 Staff memo resolving comments made during 2012 meetings

Knowledge management

Knowledge management

CHAPTER 4

UCS applauded NRC for undertaking knowledge management efforts a decade earlier.

Knowledge management

Newer reactors have voluminous UFSARs and associated design and licensing bases information.

Older reactors have skimpier UFSARs and associated design and licensing bases information.

And regulations and regulatory bases today are different from the AEC and early NRC days.

Knowledge management

Byron/Braidwood EDO appeal and numerous TIAs in recent years testify to the difficulties in trying to make safety decisions today using decades-old, often detail-lite design and licensing documents.

Knowledge management

Will a 50.59 reviewer in 2060 really be able to ensure a proposed modification doesn't undermine safety margins established in the 1970s?

Will NRC inspectors accept that scantily explained 1970s methods conform with 2060 expectations?

U.S.NRC

United States Nuclear Regulatory Commission

Protecting People and the Environment

Briefing on the Status of Subsequent License Renewal Preparations

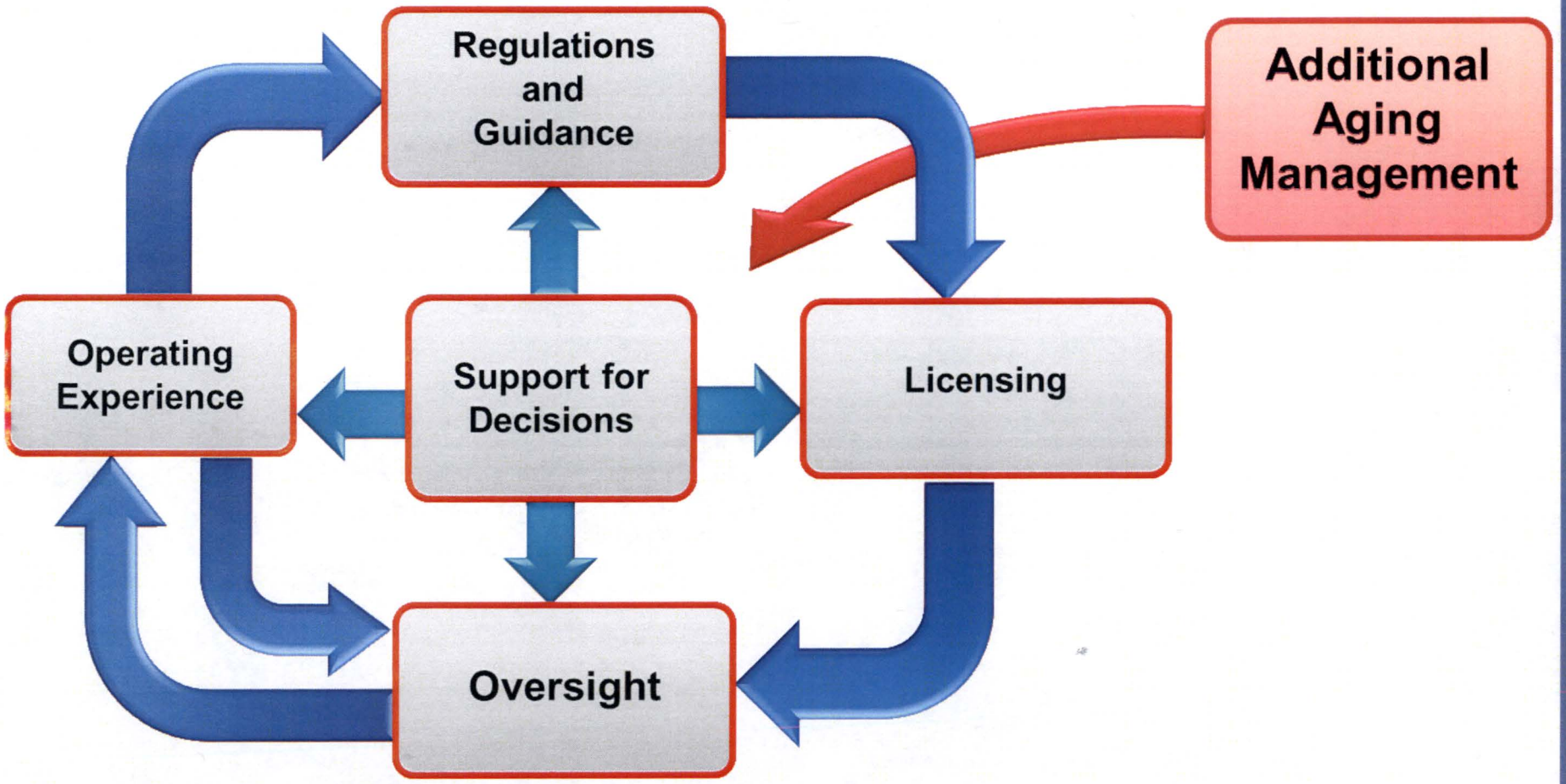
Commission Meeting with NRC and Industry

April 26, 2017

Agenda

- Introduction and Key Messages
- Understanding the Regulatory Framework for Subsequent License Renewal (SLR)
- Status of SLR Guidance Documents
- Overview of SLR Process Optimization
- Summary of Changes in SLR Guidance
- Status of Confirmatory Research Activities

Existing Regulatory Processes Are the Framework of License Renewal



Regulations and Processes Ensure Safe Operation

- License renewal regulations ensure passive, long-lived structures and components perform intended functions
- License renewal application review includes environmental and safety reviews, audits and inspections
- Continuous verification of safety through reviews and Reactor Oversight Process

License Renewal Framework Adequate for SLR

- The principles of license renewal continue to be effective for SLR
- Additional focus on the adequacy of aging management programs (AMPs) and activities for the subsequent period of extended operation

Staff is Finalizing Regulatory Guidance for SLR

- In December 2015, draft SLR guidance documents issued for public comment
- In 2016, staff held nine public meetings and addressed public comments
- In April 2017, Advisory Committee on Reactor Safeguards full committee meeting completed
- Final SLR guidance to be issued July 2017

SLR Applications Expected in the Near Future

- Peach Bottom Atomic Power Station
  - SLR application expected mid-2018
- Surry Power Station
  - SLR application expected early 2019
- Letters of intent useful in helping NRC prepare for anticipated submittals

Staff is Optimizing SLR Application Reviews

- Identified modifications to optimize review of SLR application. New approach includes:
  - Increasing the use of portals, telecommunications
  - Early development of safety evaluation report and environmental impact statement
  - Streamlining on-site audits
  - Eliminating redundant inspections
- Optimized review of high quality SLR application with no contentions could be completed in 18 months

Four Key Technical Issues for Operation Beyond 60 Years

- Reactor pressure vessel neutron embrittlement at high fluence
- Irradiation-assisted stress corrosion cracking (IASCC) of reactor internals and primary system components
- Concrete and containment degradation
- Electrical cable qualification and condition assessment

SLR Guidance Documents Enable Consistent Reviews of Applications

- Generic Aging Lessons Learned for SLR (GALL-SLR) Report (NUREG-2191)
  - Contains generic aging effects to be managed and appropriate AMPs
- Standard Review Plan for the Review of SLR Applications for Nuclear Power Plants (SRP-SLR) (NUREG-2192)
  - Contains guidance to NRC safety reviewers of the SLR application

Development of SLR Guidance Involved Rigorous Staff Review

- Technical sources used for SLR guidance
  - Expanded Materials Degradation Assessment
  - AMP effectiveness audits at plants in the period of extended operation
  - Relevant domestic and international operating experience
  - External stakeholder, staff comments

Refinements to Current Guidance to Support 80 Years of Operation

- New GALL-SLR Report AMPs
  - Fluence Monitoring
  - High Voltage Insulators
- Modified approach to aging management for reactor vessel internals
- Modifications to Reactor Vessel Material Surveillance AMP

Changes Include Revisions to Electrical and Structural AMPs

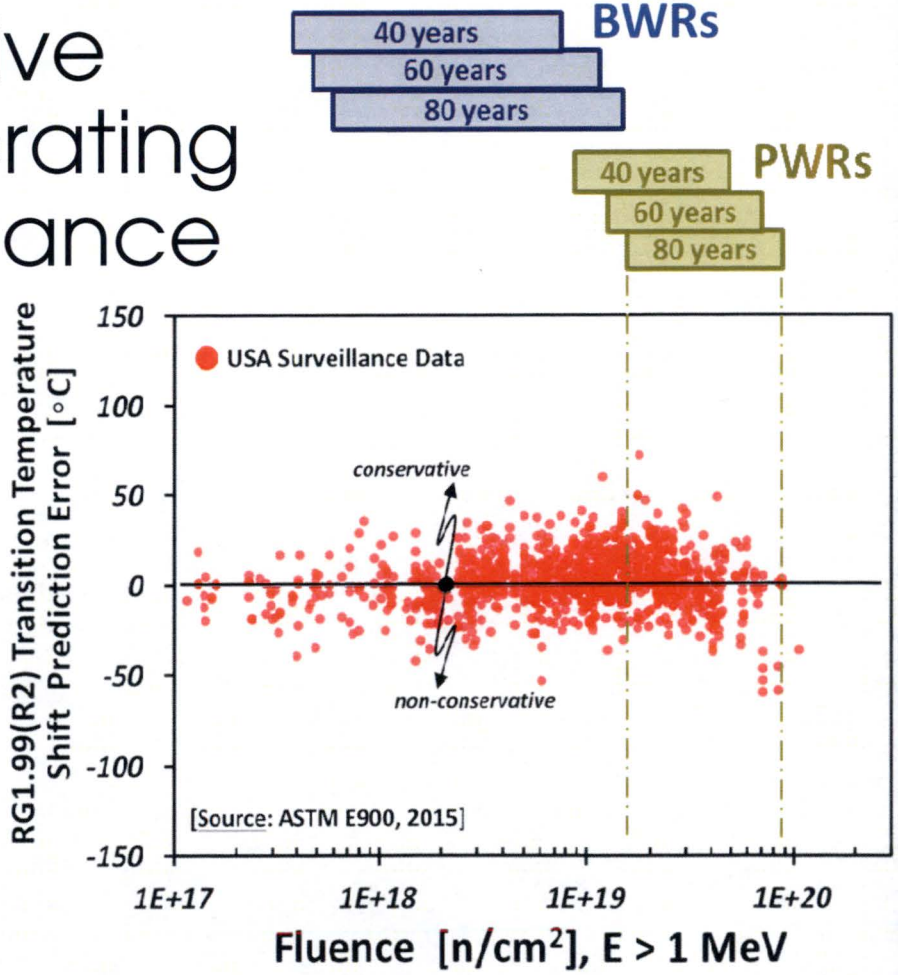
- Expanded Electrical Insulation of Cables AMP from one AMP to three AMPs to address aging of submerged cables at different voltages
- Aging management of concrete
  - Updated for alkali-silica reaction (ASR)
  - Added further evaluation for irradiation of concrete

NRC is Prepared to Review SLR Applications

- GALL-SLR Report AMPs address technical issues
- Plant-specific approaches for a few technical issues
- Applicant's responsibility to evaluate technical issues, develop acceptable aging management methods

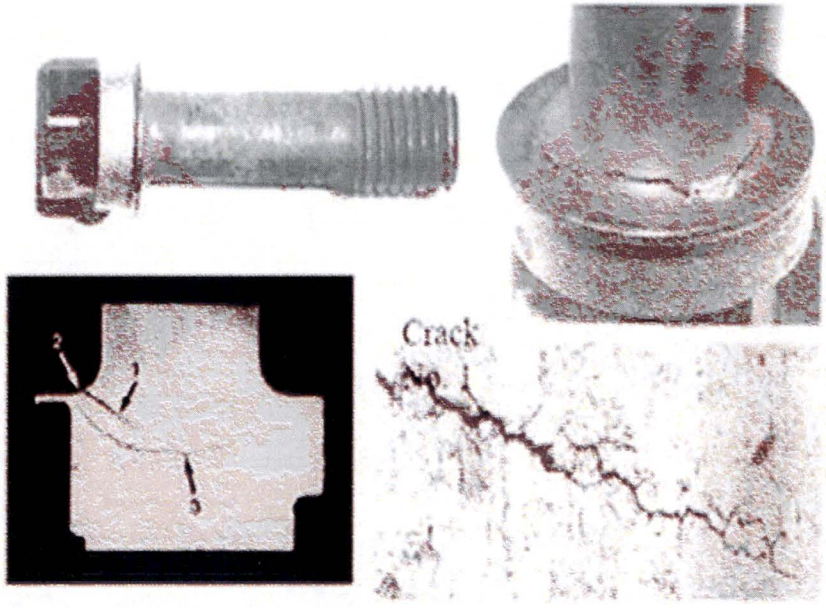
Staff is Ensuring Reactor Pressure Vessel Integrity

- Confirming predictive methods using operating experience (surveillance data)
- Assessing embrittlement at higher fluence levels



Staff is Assessing Effects of Irradiation-Assisted Degradation of Internals

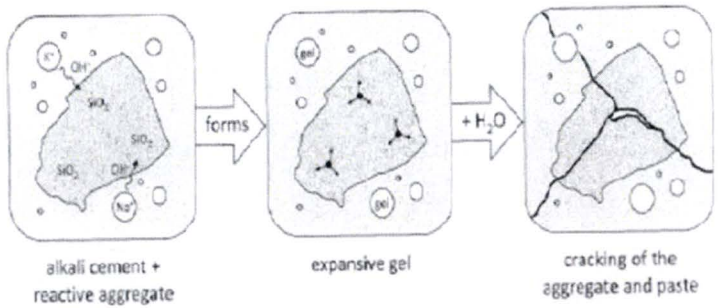
- Evaluating impacts of IASCC, loss of fracture toughness, and void swelling
- Testing materials at higher irradiation levels

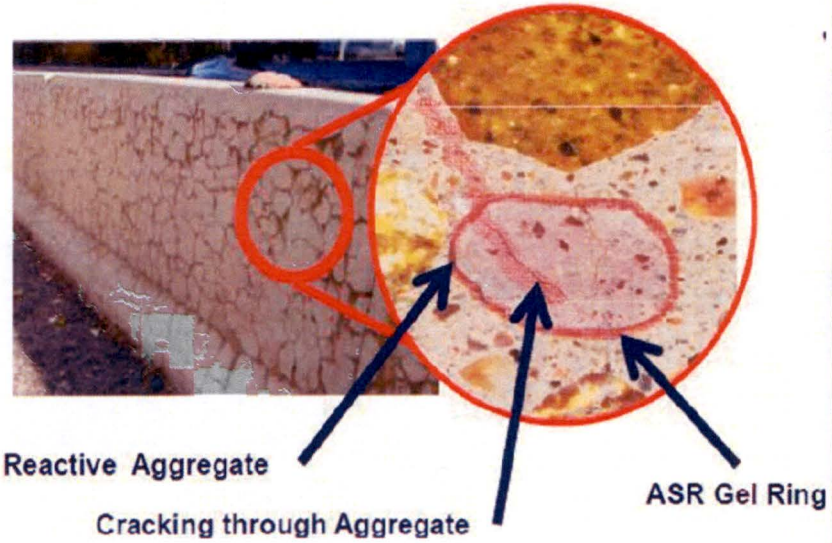


Cracking in a PWR baffle bolt

Staff is Assessing Concrete Degradation

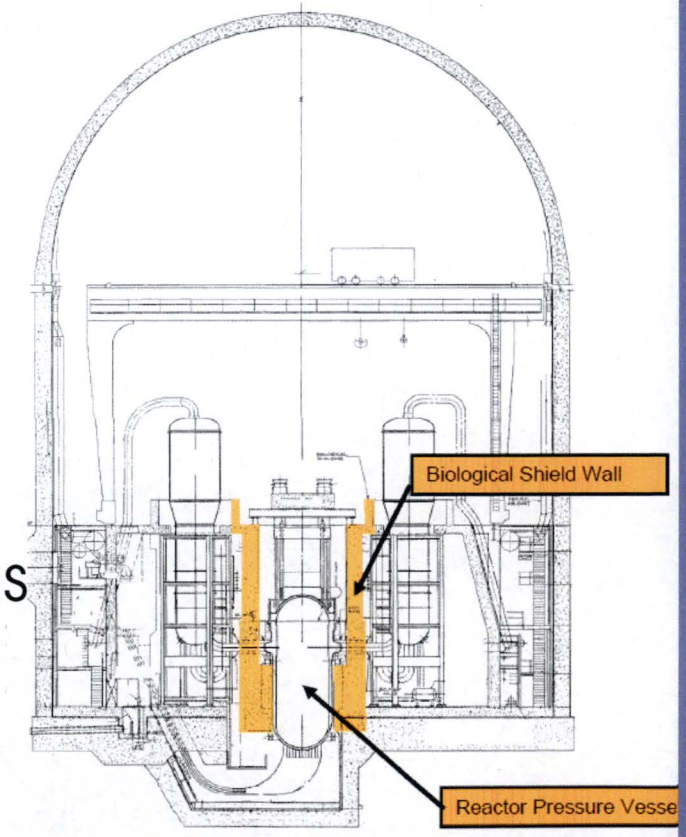
- Evaluating effects of ASR on structural performance of concrete
- Confirming structural integrity





Staff is Confirming Structural Concrete Integrity

- Evaluating effects of irradiation on concrete structures
  - Confirming DOE concrete irradiation damage and EPRI concrete structural performance results
  - Assessing EPRI's evaluation of susceptible plant configurations
  - Assessing neutron fluence and gamma dose on structural bio-shield concrete



Staff is Confirming Adequacy of Cable Condition Assessment Techniques

- Evaluating synergistic effects of gamma radiation and thermal exposure in low voltage cables

Thermal aging of jacketed cables

- Confirming assessment of medium voltage cable submergence qualification

NRC Demonstrating Readiness to Accept and Review SLR Applications

- License renewal framework is basis for SLR
- Extensive stakeholder engagement continues
- Confirmatory research ongoing for technical issues
- NRC ready to accept and review SLR applications

Acronyms

- AMP: Aging Management Program
- ASR: Alkali-Silica Reaction
- DOE: Department of Energy
- EPRI: Electric Power Research Institute
- GALL-SLR: Generic Aging Lessons Learned for Subsequent License Renewal
- IASCC: Irradiation-Assisted Stress Corrosion Cracking
- SLR: Subsequent License Renewal
- SRP-SLR: Standard Review Plan for the Review of Subsequent License Renewal Applications for Nuclear Power Plants