PWR RP/ALARA ASSOCIATION

2017 Summer Meeting
Charleston, SC
June 21-23, 2017

PWR RP/ALARA ASSOCIATION

2017 Board of Directors

Chairman

2015-2017 Term

Dana Page (803-701-3596) dana.page@duke-energy.com – Catawba Nuclear Station

Vice-Chairman

2015-2017 Term

2017-2019 Term as Chairman

Steve Lisi (704-875-5124) stephen.lisi@duke-energy.com – McGuire Nuclear Station

Secretary

2015-2017 Term

John Cuffe (620-364-8831 x8080) jocuffe@wcnoc.com – Wolf Creek

Treasurer

2015-2017 Term

Kinsey Boehl (603-773-7638) kinsey.boehl@fpl.com – Seabrook

Steering Committee "At Large" Members

2015-2017 Term

Jeff Fontaine (724-462-3423) fontainej@firstenergycorp.com – Beaver Valley

Rick Rogers (805-545-3246) rwr2@pge.com – Diablo Canyon

Steering Committee "At Large" Members

2017-2019 Term

Joe Coughlin (815-417-2722) joseph.coughlin@exeloncorp.com – Braidwood

Michelle Williams (706-828-4236) miwillia@southernco.com – Vogtle

Past-Chairman / Advisor

2015-2017 Term

Steve Edelman (717-948-8516) steven.edelman@exeloncorp.com – Three Mile Island

**** Terms begin/end after the Summer Meeting of the year indicated ****

PWR RP/ALARA ASSOCIATION

Charleston, SC
June 21-23, 2017

MEETING BOOK INDEX

PWR RP/ALARA Association Meeting Agenda
Charleston, SC – June 2017

Tuesday, June 20

4:00 – 6:00 pm	Steering Board Members Pre-Meeting / Appetizers (Bridge View Suite)

Note To all the PWR RP ALARA Association Representatives:

This is to inform you that PWR RP/ALARA Association Meeting has been granted 1 Continuing Education Credit (CEC) per contact hour to a maximum of 20 CEC and assigned ID 2015-00-038. This credit applies to calendar years 2015-2018.

Please be advised that contact hours do not include meals or business meetings without technical content.

As credit was requested for all participants, this assignment will be posted to the AAHP website.

Wednesday, June 21

2:00 – 2:30 pm Meeting Registration – Carolina A Foyer

2:30 – 3:30 pm Opening Ceremonies & Introduction – Carolina B Ballroom

- Welcome – Opening Remarks (Dana Page)
- Safety Review – Building Escape Routes (Steve Lisi)
- Safety Message – (Steve Lisi)
- Introduction of NSA Representative – (Dana Page)
- Introductions of Board Members (Dana Page)
- Introduction of Association Members (All)
- Association Secretary Report (John Cuffe)
- Association Treasury Report (Kinsey Boehl)
- Establish Meeting Expectations/Review Agenda & Meeting Book Contents (Dana Page)
- Bench Mark Question Solicitation & High Interest Topic Sheets (Joe Coughlin)
- Nominations for Steering Board Members (Steve Lisi)
- Association By-Law Revision *Voting Action* (Steve Lisi)
- Introduction of "Host" Nuclear Plant Representative – (Dana Page - Catawba)

3:30 – 4:15 pm Presentation – EPRI Research in Support of Radiation Field Management during All Phases of Life of a Nuclear Reactor – (Dr. Carola A. Gregorich)

4:25 – 4:50 pm Steering Committee Meeting (Bridge View Suite)

5:00 – 6:30 pm Opening Reception & Vendor Displays – Carolina A Ballroom

Thursday, June 22

07:00 – 08:00 Breakfast with Vendors – Carolina A Ballroom

08:00 – 08:05 Meeting Overview (Dana Page)

08:05 – 08:10 Safety Message (Michelle Williams)

08:10 – 08:20 ALARA Association Group Picture

08:20 – 09:00 Presentation – Catawba Delay Coil Chemical Decon – (Ronald Russell – Catawba Radiation Protection General Supervisor)

09:00 – 10:00 Breakout Sessions by Plant Type (Document Successes & Challenges and a Golden Nugget)

- 2 Loop & 3 Loop Westinghouse (Jeff Fontaine)
- 4 Loop Westinghouse - will break out into 2 groups (Kinsey Boehl & John Cuffe)
- 4 Loop ICE (Steve Lisi & Dana Page)
- B & W, CE and Decommissioning Units (Steve Edelman)

10:00 – 10:20 **Break / Vendor Interface (Report to breakout rooms after break)**

10:20 – 11:40 Breakout Session by Plant Type (Document Successes & Challenges and a Golden Nugget)

- 2 Loop & 3 Loop Westinghouse (Jeff Fontaine)
- 4 Loop Westinghouse - will break out into 2 groups (Kinsey Boehl & John Cuffe)
- 4 Loop ICE (Steve Lisi & Dana Page)
- B & W, CE and Decommissioning Units (Steve Edelman)

11:40 - 11:50 **10 Minute Break (Report to Carolina B Ballroom)**

11:50 – 12:30 Vendor Presentations

12:30 – 1:30 **Lunch**

1:30 – 2:30 Presentation – INPO Update – (Tim Halliday)

2:30 – 2:50 **Break / Vendor Interface**

2:50 – 3:50 Vendor Presentations (Remaining vendors)

3:50 – 3:55 Vote for New Board Members

3:55 – 4:00 End of Day Comments / Adjourn Day 2

4:05 – 4:35 Steering Committee Meeting (Bridge View Suite)

5:00 – 6:30 Vendor Reception

Friday, June 23

08:00 – 09:00 Breakfast with Vendors – Carolina A Ballroom

09:00 – 09:03 Safety Message (Kinsey Boehl)

09:03 – 09:05	Voting Results for New Board Members (Kinsey Boehl)
09:05 – 10:35	Breakout Session Review (Successes, Challenges and Golden Nuggets) • 4 Loop Westinghouse (Kinsey Boehl & John Cuffe)
10:35 – 11:00	**Break / Vendor Interface**
11:00 – 12:00	Breakout Session Review (Successes, Challenges and Golden Nuggets) • 2 Loop & 3 Loop Westinghouse (Jeff Fontaine)
12:00 – 1:10	**Lunch / Passport Drawing**
1:10 – 2:10	Breakout Session Review (Successes, Challenges and Golden Nuggets) • 4 Loop ICE (Steve Lisi & Dana Page) • B & W, CE and Decommissioning Units (Steve Edelman)
2:10 – 2:20	**Break**
2:20 – 3:00	Round Table Discussions
3:00 – 3:05	Recognition
3:05 – 3:15	Closing Remarks and Update on 2018 Winter Meeting (Key West, FL) January 23-25, 2018

3:30 – 4:30	Steering Committee Post-Meeting (Bridge View Suite) • Opening Remarks • Welcome New Members • Review Meeting Critique Sheets • New Business

PWR RP/ALARA ASSOCIATION

Charleston, SC

June 21-23, 2017

MEETING NOTES

PWR RP/ALARA
ASSOCIATION

Optional
Name:______________________________
Utility: ____________________________

Summer 2017 Charleston, SC June 21-23, 2017

MEETING CRITIQUE

The goal is to meet your expectations regarding this meeting. Please help us by providing your comments and suggestions regarding the following:

Plant Status Reports:____

Technical Content: ____
____
____

Vendor Participation: ____
____

Meeting Format (Breakout Session vs. Presentation, etc.): ______________________
____
____

Facilities (Meeting Room, Hotel Facilities, Location, etc.): ______________________
____
____

Please list any topics you would like to see the Board address in the future. Also include specific recommendations relative to the suggested presentation format, where possible (e.g. breakout session, technology presentation, survey, etc.): __________________
____
____
____

Please provide suggestions for Board activities or actions which would help justify your company's continued participation in the PWR/ALARA Association: ______________
____
____
____

Other Comments: ____
____
____

Do you anticipate your plant being represented by you or another representative at the Winter 2018 Meeting in Key West, FL? _________ If not, why?
____
____

Return completed form to the Committee Secretary prior to the end of the meeting.

PWR RP/ALARA Association Meeting
June 21-23, 2017
Charleston, SC
Attendee List by Plant

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PWR RP/ALARA Association Meeting
June 21-23, 2017
Charleston, SC
Attendee List by Professional Association

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PWR RP/ALARA Committee Meeting
June 21-23, 2017
Charleston, SC
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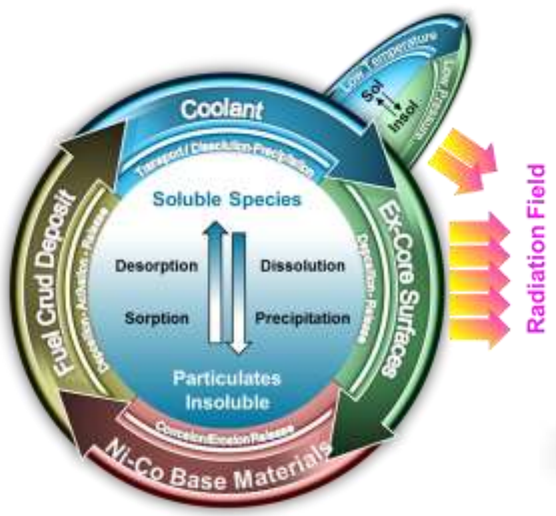
EPRI Research in Support of Radiation Field Management during All Phases of Life of a Nuclear Reactor

Carola Gregorich
EPRI Principal Technical Leader,
Radiation Safety – Source Term

PWR ALARA Meeting
Charleston, SC – June 21, 2017

A Plant's Source Term Cycle



Affects its Life Cycle and Needs Collaboration of all Disciplines

Optimizing Plant Radiation Field Performance Throughout Plant Life

New Plant
- Material selection
- Pre-filming applications
- Plant Modifications
  - Monitoring Infrastructure including Sampling
  - Purification
  - Permanent Shielding/Scaffolding
  - Remote Monitoring Capabilities

Startup
- Li/B/H_2/Zn
- Peroxide addition
- Close to operational chemistry

Adv. Nuclear Tech (ANT) Program

Power Operations
- Water Chemistry Guideline adherence
- Effective shutdowns
- Outage Decontaminations
- Outage Flushing

Water Chemistry & Radiation Safety Programs

End-of-Life Preparation
- When to stop applying some chemistries (Zn, H_2, etc.)
- Balancing cost with decommissioning impacts

Water Chem./ RadSafety Program

Decommissioning
- Final forced oxidation
- Extended soaks
- Aggressive flushing
- Full system decontamination

Decommissioning Program

New Plants

Water Chemistry for New Plants

Co-funded with EPRI Advanced Nuclear Technology Program

- Per NEI 03-08 and NEI 97-06, all US plants must follow applicable EPRI water chemistry guidelines
- Question: Are the existing guidelines applicable to new plant designs
  - Can the plants follow the Guidelines?
  - *Should* the plants follow the Guidelines?
  - What's missing from the Guidelines?

Goal: Ensure Existing Guidelines Fit The New Plant Designs

Project Scope and Timeline

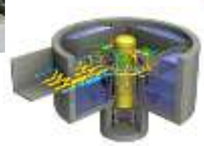
2010-2012 Gap Analysis of New Designs
- Compared Water Chemistry Guidelines to design documents
- Identified gaps that should be closed to operate plants

2012-2015 Resolve Technical Gaps
- White papers on closing identified gaps
  - Design differences
  - Technologies differences
  - Guidance gaps

2015-2016 Provide Guidance
- Water Chemistry GL for Advanced PWRs
- Water Chemistry GL for Advanced BWRs
- Guidance for HFT

2016+ Finalize Guidance, Collect and Analyze Data
- Incorporate Guidance through Revision Process
- Collect data on HFT

- Designs Evaluated in Project
  - Advanced PWRs
    - Westinghouse AP1000™
    - AREVA US EPR™
    - MNES/MHI US APWR
    - KHNP APR1400
  - Advanced BWRs
    - Toshiba ABWR
    - GE-Hitachi ESBWR



"Top Ten" Criteria to Support a Strong ALARA Program

1. **Create and foster strong interdisciplinary plant ALARA and Source Term platform to sustain low radiation fields**
2. **Avoid materials of high cobalt* content**
3. **Create corrosion-resistance stable surface**
4. Install permanent shielding and work platforms
5. Install infrastructure for and utilize remote monitoring
6. **Establish and maintain ALARA planning tools**
7. Ensure accessible and functioning sampling, monitoring, & operational stations
8. Automate and implement remote operations as much as feasible
9. Optimize coolant chemistry regime (hydrogen, platinum, zinc)
10. **Maximize coolant cleanup and component flushing capabilities**

*** Other dose & contamination contributing elements need to be managed, too, such as chromium, nickel, silver, & antimony**

Many more criteria were identified that support a strong ALARA program

Startup

Potential to impact radiation fields and corrosion products during plant life

Optimized Pre-Functional Chemistry Control - HFT

September 2016 Publication, 3002008296

- Primary purposes of Hot Functional Testing (HFT):
  - Demonstrate operability of plant systems
  - Satisfy regulatory requirements prior to operation

- Optimized chemistry control during HFT may improve long-term integrity and performance of plant systems
  - HFT is the first time plant systems are exposed to water at elevated temperature for an extended period of time (250-1000 hours)
  - Initial corrosion film characteristics may have a lasting effect film behavior, including corrosion and corrosion product release rates
    - Affects out-of-core radiation field development
    - Affects susceptibility to localized corrosion

Optimized Chemistry during HFT

Goals

1. Form a protective and stable passive film on plant surfaces
2. Removal of releasable corrosion products prior to operations to prevent subsequent activation

Factors influencing effectiveness beneficially:

- pH above 7.5
- Matching ECP operational conditions
- Matching dissolved hydrogen concentration
- Injecting zinc
- (forced oxygenation)

Unique opportunity to set stage for low radiation field life-time operations

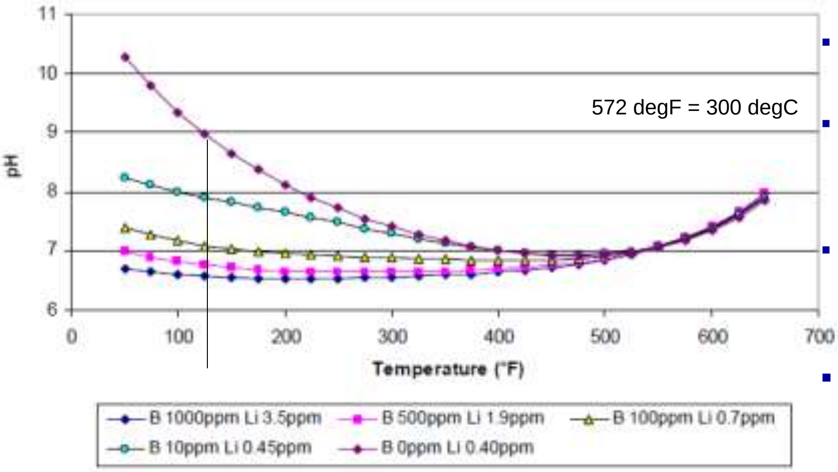
Power Operations

EOC Boron – A topic that keeps coming up

- Plant Operational Considerations
  - Cost – lost generation when boron is held > 0 ppm
  - Maintaining RCS pH target throughout the primary system with very low boron is challenging
  - Primary system dose rates
    - CVCS system responds different than primary system

Will be explored in more detail during PWR Primary Water Chemistry Guideline Revision

EOC Boron vs Maintaining pH in Main Primary Circuit vs Letdown

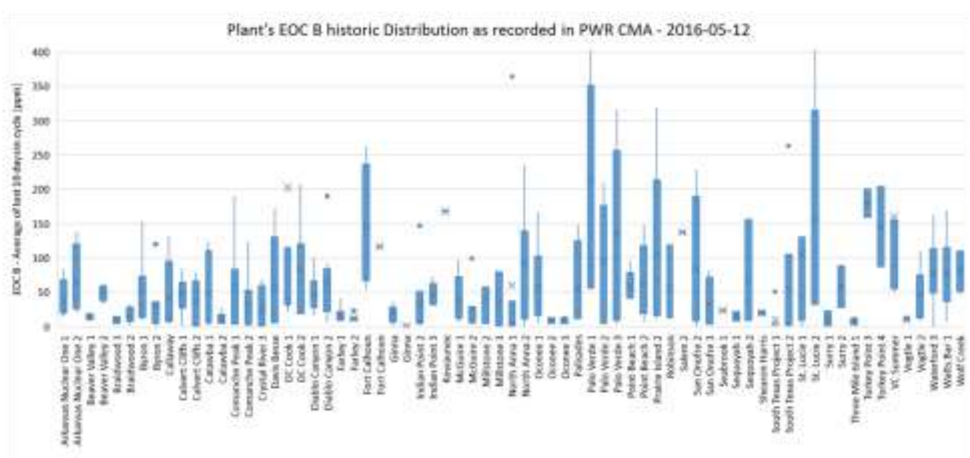


- More details in 1016767 (2008) "no significant effect … expected …but"
- B (10 ppm) – Li (0.45 ppm)
  - pH(300°C) is 7.2
  - pH(~50°C) is 7.95
- B (0 ppm) – Li (0.4 ppm)
  - pH(300°C) is 7.2
  - pH(~50°C) is 9
- **CVCS system tends to be**
  - **Mildly acidic at cycle start**
  - **Basic at end of cycle**

Dose rate reduction in the SGs and CVCS system have been reported by Exelon if EOC boron was kept above ~ 5 ppm

(3002000505 – *PWR Primary Water Chemistry Guideline*, 2014)

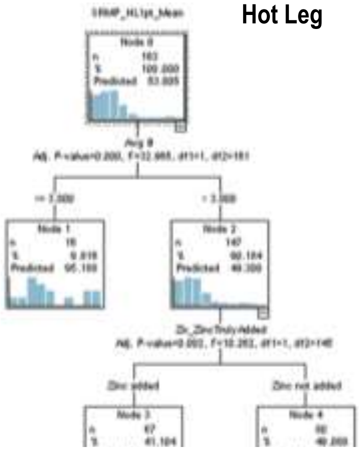
End-of-Cycle Boron – Plant Data



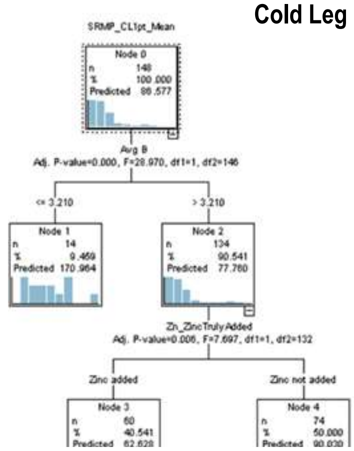
As defined as average over last 10-at-power-days, is seldom zero (0), and each plant has its own range of experiences.

Exploring Reactor Loop Piping Dose Rate Data with Decision Tree Logic

Hot Leg



Cold Leg

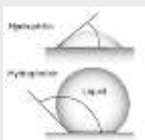


- **EOC boron should not be used as sole predictor – many other parameter influence as well**
  - **Further and more detailed studies are needed to provide clear guidance to industry**

Hydrophobic Coatings - Reduce Contamination/Worker Dose

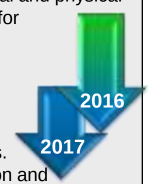
Key Research Question:

- Can commercial hydrophobic coatings assist in decontamination control and dose reduction?
  - Does their degradation introduce detrimental species?
  - What is their durability?
  - How effective are they?
- Can a standard qualification protocol be developed?
- What are reasonable criteria?



Project Approach:

1) Survey globally nuclear and non-nuclear industry – best practices and utilized hydrophobic coatings. Review chemical and physical surface modification treatments and technologies for
   a. Durability of hydrophobicity,
   b. Release of potential detrimental species,
   c. Compatibility with materials of construction.
2) Create a state-of-the-art knowledge base
3) Identify gaps and opportunities.
4) Conduct demonstration under plant-like conditions.
5) Develop criteria for plant demonstration, verification and validation.



Objective:

- Assess hydrophobic coatings effectiveness and durability
  - Evaluate formation/release of species detrimental to asset protection and fuel reliability
  - Develop criteria of performance acceptance

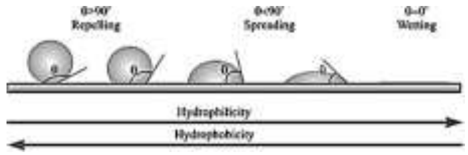
Value:

- ✓ Assist plants in coatings selection
- ✓ Improve contamination control – fewer PCEs and lower dose
- ✓ Saves cost – reduces
  - ✓ qualification testing
  - ✓ decontamination and contamination control efforts

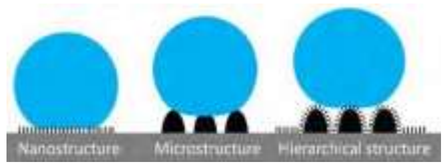
Particulate Surface Contamination Causes Radiation Fields & PCE's, i.e. Worker Dose

Hot Topic with Limitation

- Hydrophobicity is controlled by contact angle of liquid on the solid, which is influenced by:
  - Surface tension of liquid,
  - Surface energy of the solid, and
  - Their interaction



- A hydrophobic surface has a hierarchical structure, that is,
  a nanostructure and microstructure:



- Air (gas) must be trapped between the surface and the liquid droplet for the surface to be hydrophobic.

Hydrophobicity may reduce adhesion and/or incorporation of radioactive species but desired characteristics may not have long-term stability at operating conditions

What Gaps Exist in our Knowledge of Hydrophobic Coatings?

- Methods of application of the hydrophobic coating including surface preparation
- Durability of the hydrophobic coating
- Release of contaminants with potential detrimental impact on primary system components
- Compatibility with various substrate materials of construction
- Methods of coating removal if required

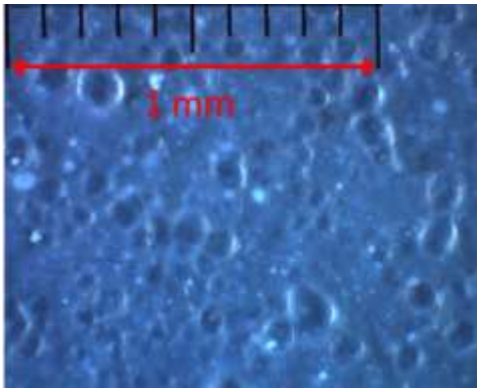
- No standards for
  - Testing the viability of current or future coatings
  - Identifying a 'degraded' condition
  - Testing chemical and mechanical properties

<u>Plant Implementation – How-to?</u>
- Coating qualification protocol
- Evaluation methods of coating performance and degradation in plant environment

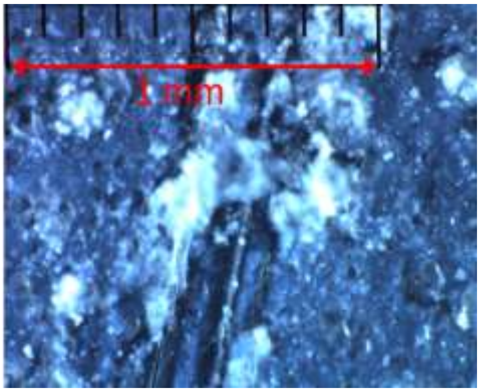
Testing Approach – testing is in progress

Phase	Description	Variables
1	Coating Application	• Substrate Preparation • Coating Adhesion • Application Method and Coverage
2	Chemical Durability	• Leachable Chlorides • Leachable Sulfate • TOC • Silica
3	Mechanical Durability	• Process Stream Fluid and Velocity • Abrasion Frequency • Method and Material of Abrasion
4	Coating Removal, Repair, and Re-application	• Chemical Used for Removal • Mechanical Method Used for Removal • Surface Preparation Prior to Re-application
5	Radiation Durability	• Type of Radiation • Strength of Radiation Field • Total Dose Exposure • Degradation Products Produced

Rust-oleum 220 grit, 360 gram weight

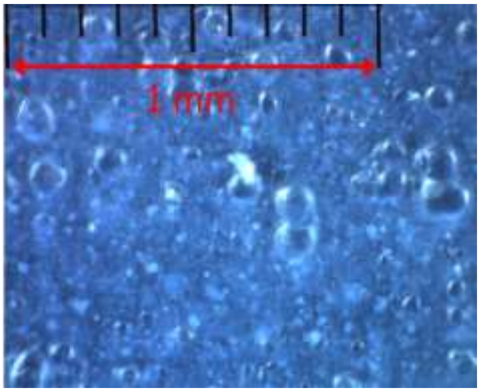


Center



Left of Center 8th pass

Rust-oleum 60 °C, 6 hour sample



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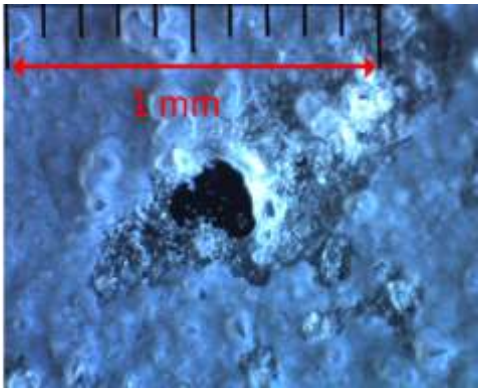


Bubbling after 72 hours (12 intervals)

Scratching After Water

Hydrophobic Coatings – Next Steps

- Finalize Testing
  - Identify elemental composition
  - Durability and performance testing
    - Under common conditions (chemistry and radiation)
    - Assessing
      - Initial releases of potential detrimental species
      - Releases of potential detrimental species over simulated lifetime
      - Lifetime of hydrophobic effectiveness

Webcast tentative 4th Qtr 2017

Final Report 2nd Qtr 2018

Plant Demonstration of At-Power Time-Sequence Gamma-Isotopic Monitoring

Why at-power time-sequence isotopic characterization?

- Real-time response to changes – not cycle snap-shots of typical outage measurements
- Real-time identification of
  - Contributor – ability to evaluate impact and to mitigate proactively
  - Magnitude on impact of radiation field
- Ability to identify in near real-time the cause of the radiation field response

Value & Benefits

are in the visualization & implementation of gained insights for optimization of

- ALARA and work planning
- Targeted source term reduction/mitigation
- Radiation field control
- Coolant chemistry regimes
- Online monitoring of coolant activated corrosion and fission products

Real-Time Isotopic Radiation Field Monitoring at Your Fingertip

Good Understanding Requires Good Measurements

Current gamma isotopic strategies in the industry

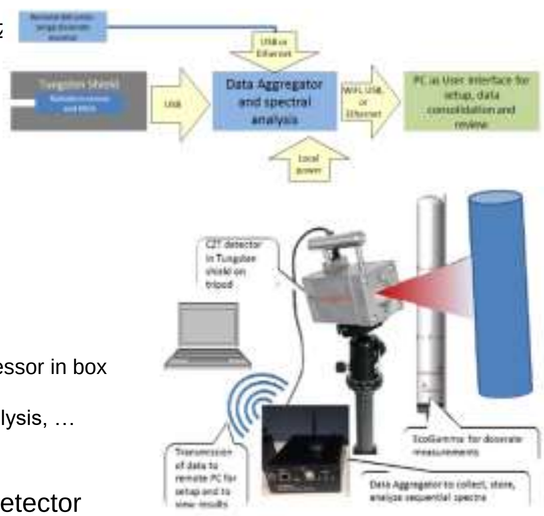
Method	Locations	NID quality	Activity quality	Deployment	Cost
Small CZTs in close geometry	Many, fixed locations	Marginal	Relative only [normally]	Easy	Low
Ge detectors in wide geometry	Several, flexible loc'ns	Excellent	Good, if proper calibration	Difficult heavy	High
Continuous on-line Ge measurements	Usually only one location	Excellent	Very good, well-defined geometry	Very difficult heavy, large	Very high

Objective is to understand radiation field generation – not visualize radiation fields.

Equipment in Current Feasibility Testing Phase

- Large CZT – 1000 mm^3
  - Better energy resolution [~2%] and peak shapes than small CZ
  - Large size has better efficiency, especially at high energy
- Easier deployment
  - Integrated MCA, allows smaller shield
  - Flexible tungsten shield and collimator set (~ 20 lbs)
  - ISOCS efficiency calibrations
  - New - Data Aggregator Box
    - Low power- USB or battery
    - Consolidates gamma spec and dose rate
    - PC used to set up and start - Then runs unattended
- Continuous spectrometry acquisition
  - One spectrum every pre-defined frequency, can be summed
  - Full data analysis package done on each spectrum from processor in box
  - Nuclide ID and Activity & spectrum stored
  - If PC connected, then use available software for trends, reanalysis, …

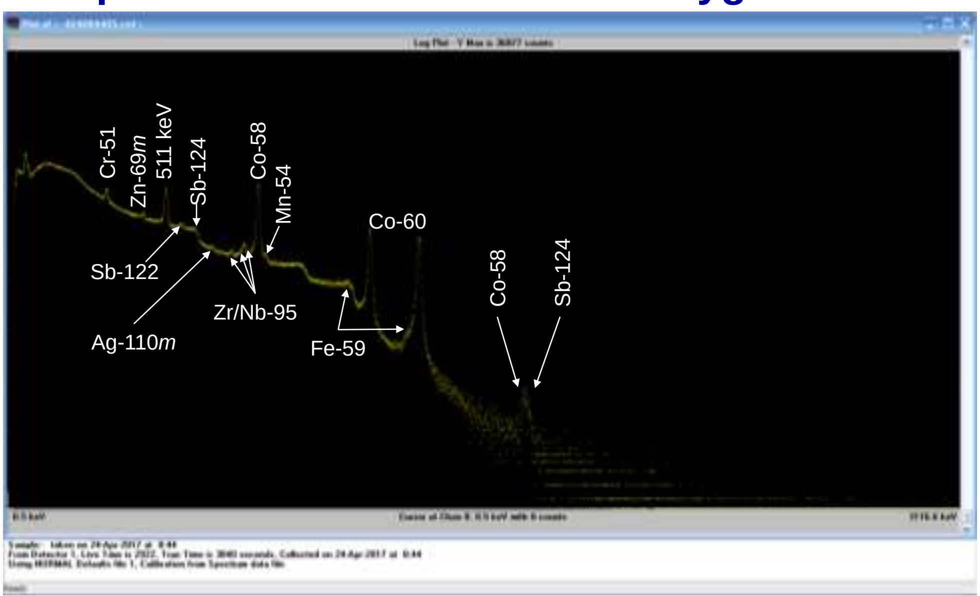
➢ Low cost –
about 4 units have similar cost of 1 shielded HPGe detector



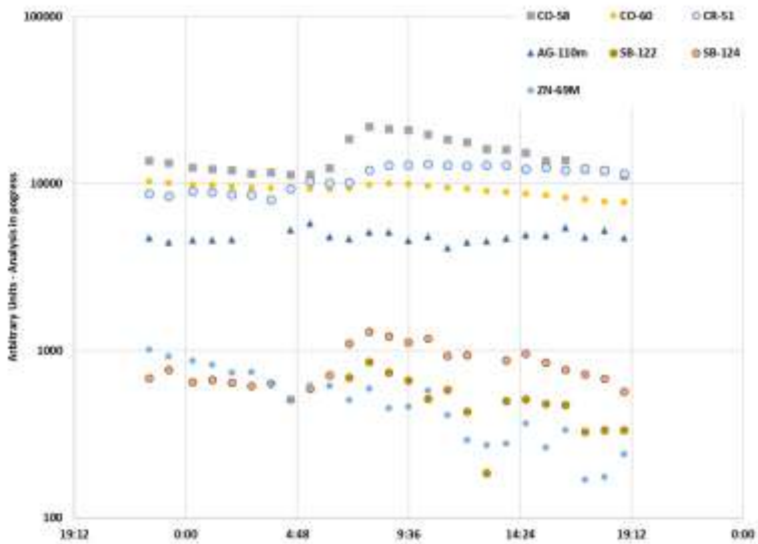
Feasibility Testing

- Lessons learned
  - Changes will happen – be ready to adapt
  - Instead of letdown heat exchanger - continuously flowing sample line was monitored
  - Power at a power plant is unreliable

Gamma Spectrum at Start of Forced Oxygenation



Data Collected – Not verified yet



Plant Demonstration of At-Power Time-Sequence Gamma-Isotopic Monitoring

Phase 2 – Plant Demonstration – proposed later 2017 or 2018

- Based on volunteer site to support
- Develop full-scale demonstration
  - Select multiple locations for measurements and verify suitability for deployment
    - Dynamic range, reliability of operation, …
    - Locations where transients are expected, and where useful information could be gathered
    - Identify changes needed for extended deployment
    - Work w/ plant to address
      - Any plant change/implementation processes
      - Accessibility to equipment

K. Kim

Remote Monitoring for Routine Surveys

- **Background:**
  - Member feedback suggests that developing a basis document for using remote monitoring equipment to reduce or eliminate certain types of routine surveys could significantly enhance efficiency.
- **Tasks:**
  - Review regulatory requirements and consensus standards.
  - Review current scope of routine surveys at nuclear power plants. Identify candidate surveys that may be replaced by RMT.
  - Review available radiation RMT technologies for their potential to replace or reduce the frequency of candidate surveys.
- **Collaboration:**
  - Working Group for utility/industry experiences, insights, perspectives, data, feedback.
  - RM/ST TSG Workshop Discussions
  - Coordination and collaboration with EPRI Plant Technology Project on Plant Monitoring
  - Potential cofounding from Advanced Nuclear Technology Group
- **Research Value:**
  - Answer the question of if, and when, remote monitoring can be used to reduce routine surveys
  - Improve radiation protection operational efficiency and reduce occupational exposures

Develop basis to reduce routine monitoring, increase efficiency, reduce dose

D. Cool

PCE Guidelines Update

- **Background:**
  - The EPRI Personal Contamination Event (PCE) Guideline Revision 1 in 2005.
  - Since then, there have been requests to assess action levels, measurement locations and further actions for facial and wound contamination.
  - Delivering the Nuclear Promise Initiative has resulted in additional focus on use of the guidelines (EB-16-03)
  - Revision 1.1 published December 2016 to address U.S. regulatory issue
- **Purpose:**
  - Revise the PCE Guidance to reflect operating experience, industry and regulatory feedback, lessons learned from Delivering the Nuclear Promise, and communication tools for low dose radiation effects.
- **Research Value:**
  - The PCE Guidelines are a key piece of implementing an effective and protective radiation protection program. A revision will provide members with guidance that is up to date, responds to industry and regulatory feedback, provides information on communication of risks, and is appropriately risk informed to ensure adequate protection.
  - Addition of low dose risk information will support use of the guidelines, and their communication with workers and family members.

D. Cool

Lens of the Eye Dosimetry and Shielding Factors of Protective Equipment

- **Background:**
  - No standard phantoms, dosimetry, or calibration protocols for lens dose equivalent
  - Various types of protective equipment such as safety glasses, face shields, and hoods
  - No methodology or quantification for determining protection factors is available
- **Purpose:**
  - Develop and document a consistent approach for testing/determining protection factors of typical PPE for protection of the lens of the eye
  - Provide a generic set of protection factors for use in planning and implementing radiation protection for lens of the eye.

- **Research Value:**
  - Consistent approach for testing of lens of the eye PPEs and for accreditation of dosimetry
  - Determination of factors for lens of the eye protection that can be used in a manner similar to the protection factors found in 10 CFR Part 20 for respiratory protection.
  - Informed consensus standards development, regulatory guidance and radiation protection practice, and provide mechanisms for ensuring compliance with requirements.

End-of-Life Preparation and Decommissioning

Rick Reid, EPRI Technical Executive
rreid@epri.com -

Considerations for Final Shutdown

- Carefully consider any changes to typical chemistry practices that affect source term
  - Zinc addition (BWRs and PWRs)
  - Forced oxidation (PWRs)
  - Hydrogen water chemistry (BWRs)
  - Online noble metal chemical addition (BWRs)
- Ensure documentation is available for all operational wastes
  - Ion exchange resins
  - Activated metal stored in the spent fuel pool
  - Hazardous and mixed wastes
- Ensure 50.75g file is up-to-date
- Assemble available radiological characterization data for systems, structures and components (SSCs), as well as for environmental areas
- Flush known hot spots, if practicable

May have an adverse effect on out-of-core dose rates

Miscellaneous Material Stored in Spent Fuel Pool

Bounding Analysis of RP Challenges
Maintenance Outages Compared to Decommissioning

Normal Maintenance Outage

- Generally stable and predictable radiological conditions
- Generally minimal potential for airborne contamination
- Generally similar tasks as conducted in past outages
- Experienced radiological work force
- Predictable and moderate collective and individual radiation exposure
- Short duration
- Minimal changes in plant configuration

Decommissioning

- Radiological conditions may change rapidly as components are dismantled and removed
- Higher potential for airborne due to cutting, material movement, decontamination, etc.
- Typically first-of-a-kind operations
- Typically increased numbers of untrained workers
- High collective and individual radiation exposure
- Long duration
- Substantial changes in plant configuration

Decommissioning requires a major change in RP practices

General Observations of RP Challenges during Decommissioning

- Components containing sometimes high levels of internal contamination will be cut open
  - Increases potential for personal contamination events
    - Average of 50 or more PCEs during first several years of active dismantlement
  - Increases potential for “fleas”
  - Substantial concern if alpha contamination present
    - Major issue at Connecticut Yankee and Humboldt Bay
- Substantial handling of highly activated/high dose rate components and components located in high dose areas
  - For example, steam generators, pressurizer, reactor components

Segmenting Upper Internals

Lay Down of Steam Generator prior to Chemical Decontamination

General Observations of RP Challenges during Decommissioning

- Concrete, insulation and coatings containing legacy contamination may require removal
  - Typically by mechanical decontamination
  - Potential airborne concern
  - Potential for hazardous material exposure (asbestos, polychlorinated biphenyls, lead)
  - Increased potential for mixed-waste generation
- Complex ALARA plans required for certain high risk tasks
  - For example, reactor component segmentation and removal
- Effective DAC may be much lower due to airborne alpha
  - 2.39 E-12 μCi/cc at Humboldt Bay versus 6.0 E-9 μCi/cc at operating plant (Diablo Canyon)

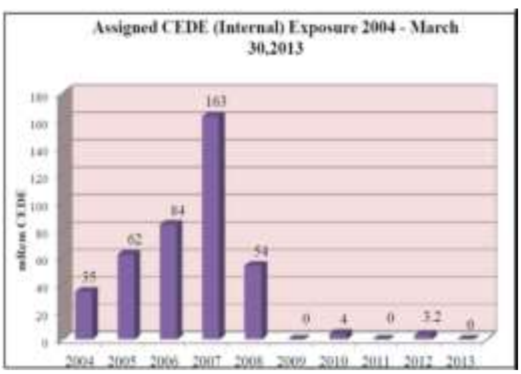
Concrete Decontamination by Shaving

Glove Box for Pipe Cutting

RP Experiences during Maine Yankee Decommissioning

- Thermal and mechanical cutting can create substantial airborne contamination
  - Levels observed from 0.3 to 2.0 DAC
  - May include hazardous materials (e.g., chromium)
- Cutting of piping results in constant shifting of high radiation area boundaries
- Removal of contaminated tanks located outside presents unique contamination control challenges
  - Reactor water storage tank contamination levels of 50,000 dpm/100cm^2
- Fewer experienced radworkers – requiring enhanced training, briefings and oversight
- Some Radiation Protection Program areas required upgrading because of alpha contamination
  - Additional RP personnel and equipment required
  - Alpha surveys and monitoring
    - Area-specific alpha to beta/gamma ratios enhance accuracy of continuous area monitors for identifying high airborne areas
    - Use of sensitive gamma detectors to identify low energy Am-241 gamma in lieu of alpha spectroscopy for transuranics

RP Experiences during Humboldt Bay Decommissioning



- Plant operated with failed fuel
- While during long shutdown period, much of the short-lived gamma activity decayed but high level of alpha activity remains
- Very low beta/gamma to alpha ratios (<50 to 1)
- Increasing trend for internal dose assignment prior to decommissioning (See Figure)

Humboldt Bay Success: Internal Dose Potential Greatly Reduced

- Radiological controls instituted at start of decommissioning:
  - Two barriers used for contaminated system removals (i.e., glove bags, HEPA ventilation, fixatives and/or respirators)
  - Incorporation of lessons learned
    - Use of lapel air samplers
    - Rinsing materials from pool
    - Capping, foam filling and fixatives in pipes
    - Mechanical cutting

System Automation for Reactor Internals Segmentation

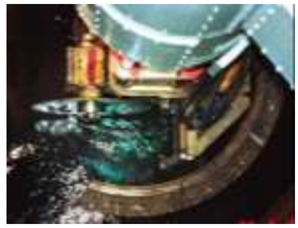
- Typically one of the most challenging nuclear power plant decommissioning tasks
  - Cutting of the various assemblies typically must be performed underwater to minimize exposures
  - High personal exposure, long project duration, and high total costs.
- Current work: conceptual development of system automation approach to reactor internals segmentation
  - Use of underwater laser cutting, automated indexing and waste handling
- 2018 to 2019: pilot scale, full scale and field testing of coordinated system
  - Assumes additional collaborative industrial partners can be confirmed to participate in these test programs
- **Research Value:** Identification of improved technology that results in a reduction in the time required to segment the reactor internals during decommissioning
  - The reactor internals project typically falls on the critical path of the decommissioning process and can take a year or longer in the field to complete

Equipment for Internals Segmentation At Jose Cabrera

Collaborative Decommissioning Technology Development

- Project Overview:
  - Collaboration with global organizations to advance development of new technologies for decommissioning tasks
  - Includes US DOE, CEA, NEA/OECD, Halden
  - SHARE collaborative under development through EURATOM
- 2017 work includes:
  - Demonstration of LaserSnake
  - Participation in the formation of the SHARE project
- Work proposed for 2018 includes:
  - With the DOE, demonstrate the ArcSaw cutting technology;
  - With the CEA and others, demonstrate underwater laser cutting technology; and
  - Demonstrate technologies of advanced radiological characterization
- Research Value:
  - Technologies identified or demonstrated help to reduce cost of decommissioning.
  - Schedule reduction can amount to cost benefit in range of $70k to $300k per day.
  - Leveraging and contributing to research and development efforts of global organizations

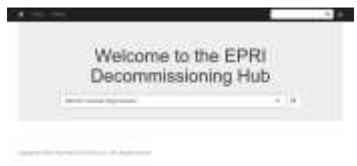
LaserSnake



ArcSaw

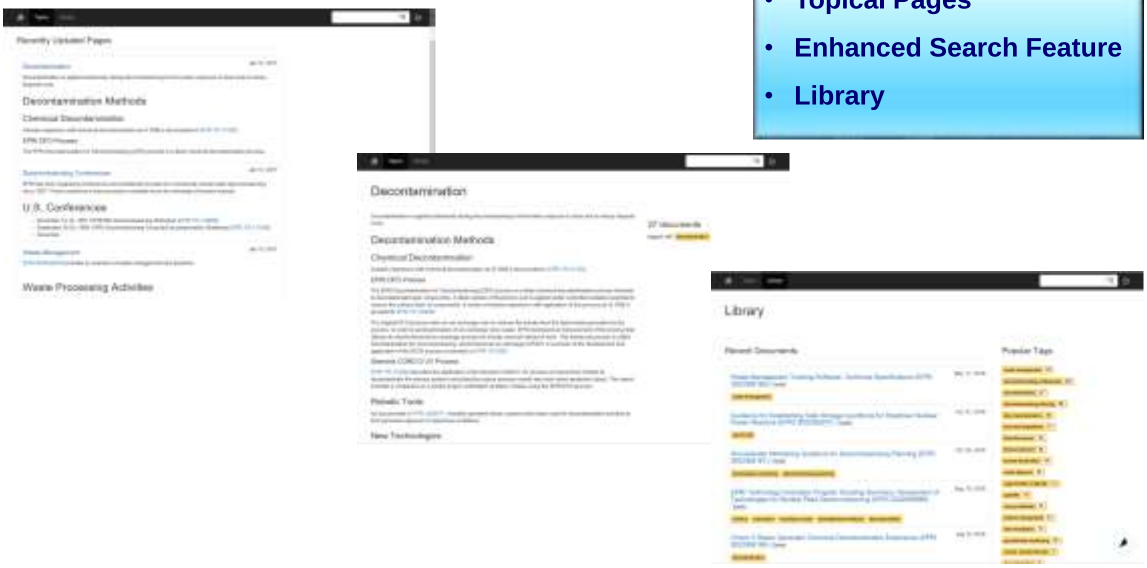
Online Decommissioning Database (Wiki)

- A wealth of experience is available from completed and ongoing decommissioning projects
- Experience largely captured in more than 30 EPRI reports
- There is a need for a searchable data base for decommissioning experience covering all areas (planning, execution, site characterization and release)
- Began development of Wiki-format database in 2016
  - Database roll out this year
  - Adding content in 2017 and additional functionality in 2018



Screenshots

- Topical Pages
- Enhanced Search Feature
- Library



Optimizing Plant Radiation Field Performance Throughout Plant Life

New Plant
- Material selection
- Pre-filming applications
- Plant Modifications
  - Monitoring Infrastructure including Sampling
  - Purification
  - Permanent Shielding/Scaffolding
  - Remote Monitoring Capabilities

Startup
- Li/B/H_2/Zn
- Peroxide addition
- Close to operational chemistry

Adv. Nuclear Tech (ANT) Program

Power Operations
- Water Chemistry Guideline adherence
- Effective shutdowns
- Outage Decontaminations
- Outage Flushing

Water Chemistry & Radiation Safety Programs

End-of-Life Preparation
- When to stop applying some chemistries (Zn, H_2, etc.)
- Balancing cost with decommissioning impacts

Water Chem./ RadSafety Program

Decommissioning
- Final forced oxidation
- Extended soaks
- Aggressive flushing
- Full system decontamination

Decommissioning Program

Together…Shaping the Future of Electricity

Documents Supporting New Builds

ID	Title
3002008028	ANT: Chemistry Control Guidance for Advanced Design Boiling Water Reactors (2016)
3002008295	ANT: Guidance for Chemistry Control in Advanced Pressurized Water Reactor Designs (2016)
3002008296	ANT: Optimum Hot Functional Chemistry Control Practices for Pressurized Water Reactors (2016)
3002008871	ANT: Review of Gaps and Issues Identified During Advanced Pressurized Water Reactor Design Chemistry Assessment (2016)
3002004709	ANT: PWR Primary Side Gas Management in Advanced Pressurized Water Reactors (2015)
3002004711	ANT: Chemistry Sampling Programs at Advanced Pressurized Water Reactors: AREVA US-EPR™ Design Westinghouse AP1000™ KHNP APR1400 MNES/MHI US-APWR (2015)
3002004710	ANT: Assessment of New Technologies for Water Chemistry Controls in Advanced Pressurized Water Reactor Designs (2015)
3002002922	ANT: Preliminary Guidance for Chemistry Control in Advanced Pressurized Water Reactor Designs (2014)
1026540	An Assessment of PWR Water Chemistry Control in Advanced Light Water Reactors: APR1400 (2012)
1024502	An Assessment of PWR Water Chemistry in Advanced Light Water Reactors: US-APWR (2012)
1024499	An Assessment of PWR Water Chemistry Control in Advanced Light Water Reactors: U.S. EPR™ (2011)
1021090	An Assessment of PWR Water Chemistry Control in Advanced Plants: AP1000™ (2011)
1023002	An Assessment of BWR Water Chemistry Control in Advanced Light Water Reactors: Economic Simplified Boiling Water Reactor (ESBWR) (2011)
1021091	An Assessment of BWR Water Chemistry Control in Advanced Plants: Advanced Boiling Water Reactor (2010)

Top EPRI Must Have's on CY/RP Bookshelves

Chemistry
3002002922 - ANT: Preliminary Guidance for Chemistry Control in Advanced Pressurized Water Reactor Designs
3002000505 - Pressurized Water Reactor Primary Water Chemistry Guidelines: Revision 7
3002002623 - BWRVIP-190 Revision 1: BWR Water Chemistry Guidelines
3002001796 - Boiling Water Reactor Zinc Addition Sourcebook
3002001942 - BWRVIP-225 Revision 1: BWR Shutdown and Startup Chemistry Experience and Application Sourcebook
1025316 - Pressurized Water Reactor Primary Zinc Application Sourcebook Revision 1
1021112 - Corrosion Product Transport during Boiling Water Reactor and Pressurized Water Reactor Startups

Radiation Safety/ALARA
3002005480 - Remote Monitoring Technology Guide for Radiation Protection: Field Implementation of Remote Monitoring
3002003165 - Guidance for Optimal Performance of Shielding Programs
3002000268 - Evaluating Indoor Location Tracking Systems in a Nuclear Facility: Experimentation with Different Techniques in an Industrial Environment
3002000032 - 3D Radiation Field Estimation Algorithm v1.0
1025309 - Dose Reduction Options for Refueling Tasks
1021101 - Evaluation of an Advanced Radiation Shielding Material for Permanent Installation at an Operating Nuclear Reactor
1021102 - Scaffold Program Optimization and Dose Reduction Guide

Source Term
1021103 - Cobalt Reduction Sourcebook
1003390 - Radiation Field Control Manual
3002005377 - LWR Ex-Core Surface Conditioning for Radiation Field Reduction
3002005479 - Reactor Cavity Decontamination Sourcebook
3002005484 - EPRI Plant Source Term Assessments--2015 Review
3002005481 - In-Plant Gamma Spectrometry: Isotopic Data Collection Experiences
3002003157 - EPRI BWR Radiation Level Assessment and Control (BRAC) Program: 2014 Revision
3002003155 - EPRI Pressurized Water Reactor Standard Radiation Monitoring Program: 2014 Revision
1025305 - Impacts of PWR Operational Events on Particulate Transport and Radiation Fields
1016766 - High Activity Crud Burst Impacts and Responses

Knowledge transfer and retention is key to sustainable ALARA

EPRI References - Decommissioning

- *Characterization and Management of Cutting Debris during Plant Dismantlement, 3002005410. (available to EPRI decommissioning program members)*
- *Proceedings: Decommissioning Decontamination, ALARA and Worker Safety Workshop*, 1000648 (publically available)
- *Alpha Monitoring and Control Guideline, Revision 2*, 3002000409 (publically available)
- *Nuclear Plant Decommissioning Lessons Learned*, 1021107 (available to EPRI decommissioning program members)

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Catawba Nuclear Station
Delay Coil Chemical Decon Projects

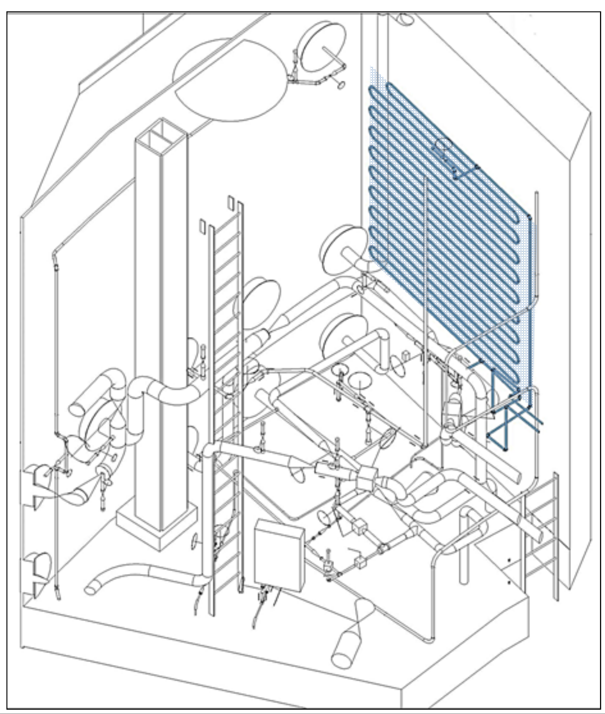
Catawba Units 1 & 2 are four-loop Westinghouse PWRs located in York, SC which is located ~15 miles south of Charlotte. Unit 1 has undergone steam generator replacement but Unit 2 is still operating with the original D5 steam generators. Unit 2 has a considerably higher source term than Unit 1. Unit 1 is an INPO Top Quartile plant while Unit 2 is in the Third Quartile.

Problem Description

- **C**atawba Nuclear Station Units 1 & 2 were constructed with a Hot Leg sample line Delay Coil to provide a forty second N^{16} decay.
- The Delay Coil was made of 167 feet of ½" stainless piping mounted to the wall over an area ~15' x 10'.
- ALARA estimated the coils contributed ~3 rem per outage.

Delay Coil Room

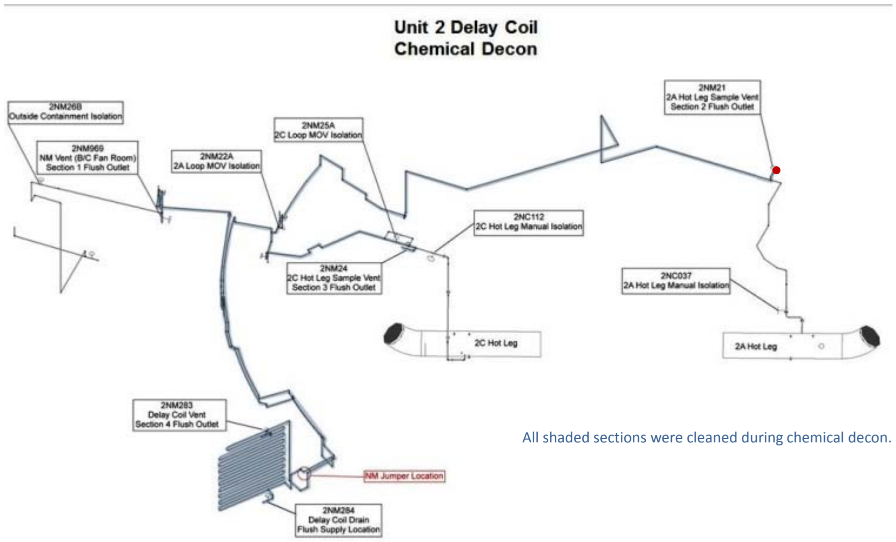
- High Traffic Area
- Significant scope each outage in area with Valves, hangers, Ops penetration testing, and scaffold work.
- The delay coil was the only significant dose contributor in the room.



History

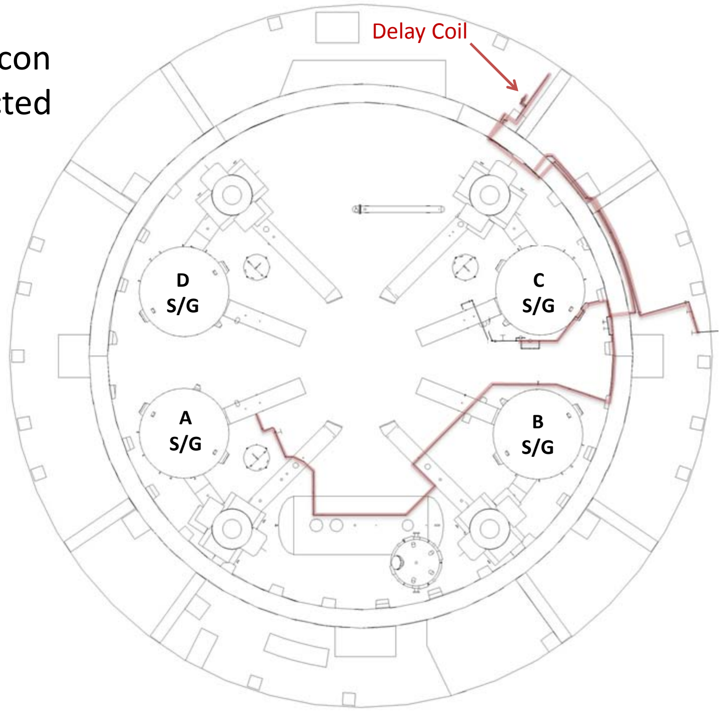
- Since operation the delay coils have been shielded each outage using typical 5’ blankets suspended from a shield frame.
- In 2010 the ALARA Long Range Plan identified the need to install permanent shielding supported by a steel frame.
- In 2012, INPO issued Catawba a Performance Deficiency due to the lack of progress with implement the delay coil shielding mod.
- Radiation Protection began questioning the need for the delay coils and performed dose rate studies and calculations that showed the coils could be safely abandoned.
- The shielding modification was revised to cut and cap the coils in place, allow the coils to decay a cycle and then cutout the delay coils.
- RP learned of a new chemical decon system Westinghouse was marketing for small systems. Catawba had previously used chemical decon successfully for the letdown piping in 2008.
- A new proposal was presented and approved by the ALARA Committee in 2015 to perform chemical decon and abandon the coils in place.

Chemical Decon Piping Impacted



All shaded sections were cleaned during chemical decon.

Chemical Decon Piping Impacted



Chemical Decon Planning Process

- For Unit 1 we had just 4 months to plan due to changing the project scope from deletion to chemical decon / abandonment.
- Once the contract was approved we had weekly conference calls with Westinghouse personnel. From the site we involved Operations, Engineering, planning, and outage scheduling.
- Westinghouse equipment and personnel arrived on site two days before shutdown. We were able to go through their equipment and stage for the equipment hatch opening.

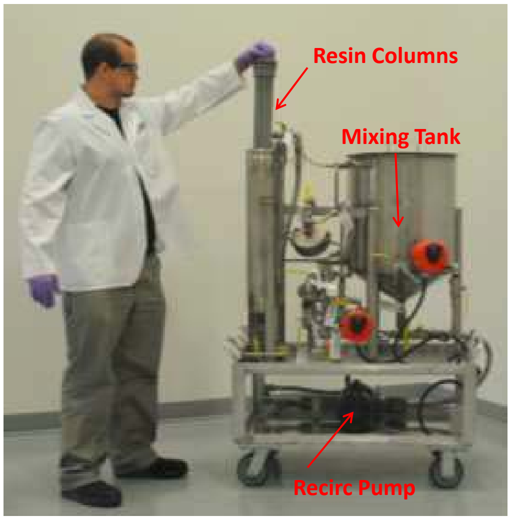
The Decon Process

- Westinghouse uses a Nitrox-E process with Potassium Permanganate and Nitric Acid.
- The Westinghouse decon skid is a compact design with a 3'x4' foot print and can be moved by hand. It has two filter cartridges, a mixing tank with heaters, and a recirculating pump. It is designed to clean small plant systems with capacities up to 100 gallons.
- Required Utilities: Instrument Air, Demin Water, 120 & 480 VAC.
- We chose to place the skid on the refuel floor and route the decon hoses through fire penetrations into lower containment where the piping is located. We routed ~400 feet of rubber hose. After the initial connections, all flow control was performed at the skid.
- The sample line piping layout covered ½ of the lower containment area. There was ~550 feet of NM piping cleaned with a total volume less than 10 gallons.

Westinghouse Mini-Skid

During the first project on Unit 1 we started changing resin columns out at 1 r/hr. We were quickly going through the supply and had to increase our criteria to 2 r/hr.

During the Unit 2 project we decided to increase the change-out criteria to 5 r/hr. Resin column changes were taking 2-3 mrem each



Lessons Learned

First Project on U-1

- We needed more heaters. Our containment air temp was ~60 degrees which made it difficult to heat the solution to 200º. Skid has 4 kw built in. We spent a lot of effort and dose trying to retain the heat. We eventually had to add a 10kw inline heater to achieve the required temperature.
- Had to utilize a supplemental diaphragm pump to get flow. We believe part of the problem was with the kerotest valves checking closed. Westinghouse had the diaphragm pump with the skid as a contingency.
- Need a heavy duty shield to store spent resin columns. We used a lead-lined 55 gal drum that did not provide sufficient shielding.
- We needed better tooling for changing the resin columns.
- The off-the-shelf shield frame for the skid was not high enough. We needed to customize the frame for the actual workers.
- We spent too much time on the first project gathering dose rate information to evaluate decon success. Based on those surveys we discovered all sections of the piping cleaned up equally and locating the highest dose rate at every location was not necessary.
- Cost 750 mrem to perform the Unit 1 decon.

Unit 1

Results

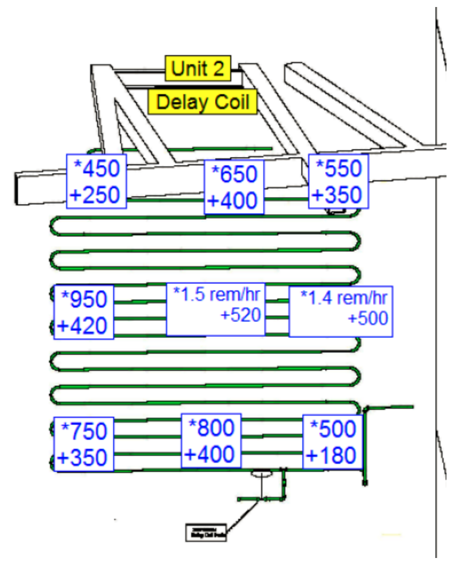
- Achieved 95% reduction in dose rates. 5 mrem/hr contact was the highest dose rate on delay coil following decon.
- All work associated with the abandonment jumper installation cost 60 mrem.
- We have nearly one year run time without the delay coil on U-1 and are very satisfied with the decision to abandon it. We expected to see small increases in chemistry sample dose rates and we did. A Hot Leg sample taken during post mod testing was 12 mr/hr on contact when taken and dropped to 10 mr/hr 1 minute later. The average dose rate on the effluent monitor increased from 3 mr/hr to 4 mr/hr.

Unit Two Delay Coil Project
Sept 10, 2016

- Same Scope as Unit One
- Implemented improvements from U-1 Project
  - Used 8500 lb shield to store spent resin columns
  - Improved tooling and extension poles for changing resin
  - Added portable heaters to delay coil room
  - Diverted Rx Bldg cool return air away from coils
  - Added stainless cables to resin columns to allow extension pole with hook to be used for change-outs.
  - Custom designed shielding after Westinghouse personnel arrived to provide input.

Unit 2 Delay Coils

- Much higher source term on Unit 2.
- U-2 still operating with original D5 S/Gs
- Dose rates 3-4 times higher than the previous U-1 coils.
- Dose rates up to 1.5 r/hr.

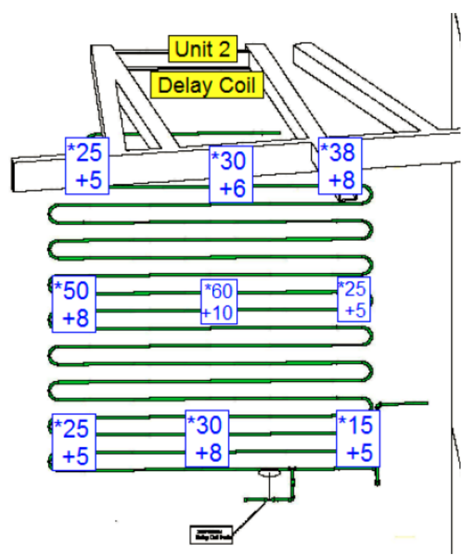


Decon Project

- Set-up took 1 shift to route hoses and install skid.
- Westinghouse provided a Chemist and a Project Manager. RP was responsible for routing hoses, making connections, and operating plant valves once Ops clearances were complete. The site provided material handling needs as well.
- Decon took 2-3 shifts. Unit 2 had a more stubborn crud layer that required 3 cycles.
- We had established a goal to get coils below 50 mrem/hr on contact.

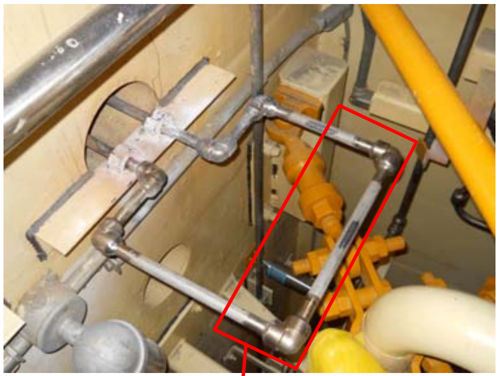
Final Results

- Achieved 96% reduction in dose rates.
- Although Unit 2 had higher dose rates, final dose to complete was 300 mrem less than Unit 1 project.
- Post mod surveys show deletion of coils had only a minor impact on sample line dose rates outside containment and minimal 10% or 1 mr/hr increase on Hot Leg samples.



The Final Product

After chemical decon, the delay coil was cut and capped to abandon it in place. The only remaining in-service portion of the sample line remaining in the area is a three foot section added to connect the delay coil inlet and outlet.

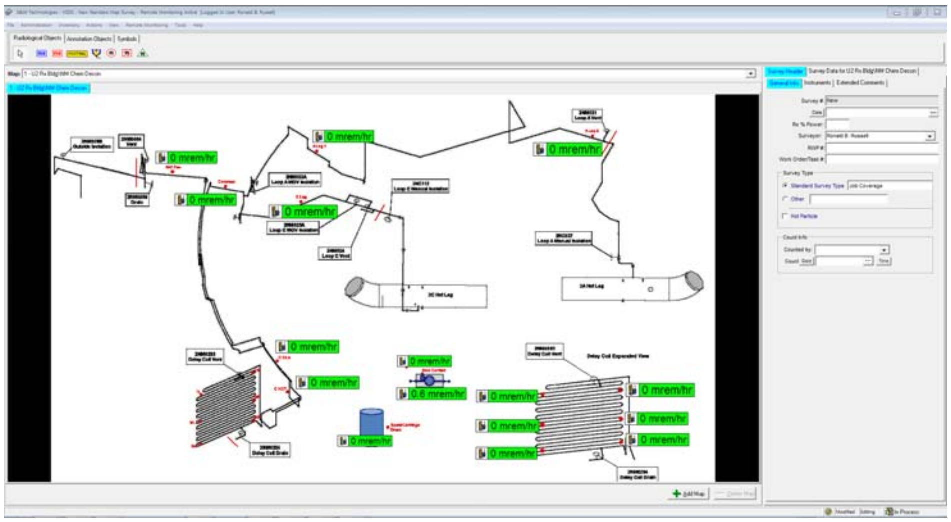


New Jumper to Bypass the Delay Coils

Overall Successes on U-2

- Higher building temperature (~10 degrees) allowed quicker heat-up for the 2nd project. We had spent ~200 mrem trying to overcome the cool temps during the 1st project.
- Having a heavy duty shield saved ~150 mrem during the Unit 2 project.
- Relied heavily on teledosimetry to track progress of cleaning, filter loading, and storage shield. We installed 15 dosimeters and provided Westinghouse personnel with a laptop at their workstation in containment. Used extension poles to hang dosimeters.
- Better Tooling and adding the stainless cables to the resin columns made changeouts much more efficient.

**Live Dose Rate Monitoring During Decon
Using DMC2000s & GEDDs**



Summary

- Catawba will save 2.5 – 3.0 rem each outage by performing chemical decon and abandoning the Delay Coils. This was one of the top two initiatives on the ALARA Long Range Plan.
- Chemical decon allowed us to cancel five Temp Shielding Requests during each outage when decon was performed. We expect recontamination of the sample lines but our goal was to clean and abandon the delay coils. We obtained a 96% reduction in dose rates through chemical decon.
- The chemical decon & abandonment versus deletion saved $150k in mod cost and dose savings just for implementation.
- The benefits received are beyond that of dose reduction and mod cost. We eliminated a safety concern, no future manpower expense to install shielding, and favorable evaluations when looking at CRE reduction efforts.

?

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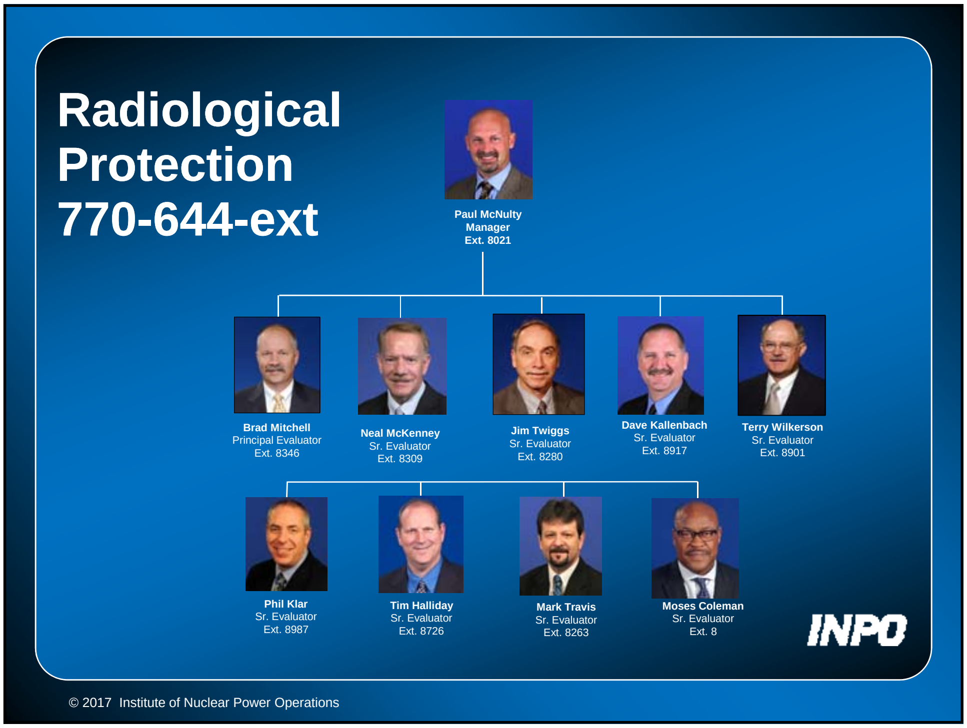
INPO Update

Tim Halliday
INPO Radiation Protection

Update Topics

- Industry Performance Summary:
  - U.S. Industry Performance
  - AFI Trends
  - Continuous Monitoring
- Operating Experience


Radiological Protection 770-644-ext
Paul McNulty
Manager
Ext. 8021
Brad Mitchell
Principal Evaluator
Ext. 8346
Neal McKenney
Sr. Evaluator
Ext. 8309
Jim Twiggs
Sr. Evaluator
Ext. 8280
Dave Kallenbach
Sr. Evaluator
Ext. 8917
Terry Wilkerson
Sr. Evaluator
Ext. 8901
Phil Klar
Sr. Evaluator
Ext. 8987
Tim Halliday
Sr. Evaluator
Ext. 8726
Mark Travis
Sr. Evaluator
Ext. 8263
Moses Coleman
Sr. Evaluator
Ext. 8
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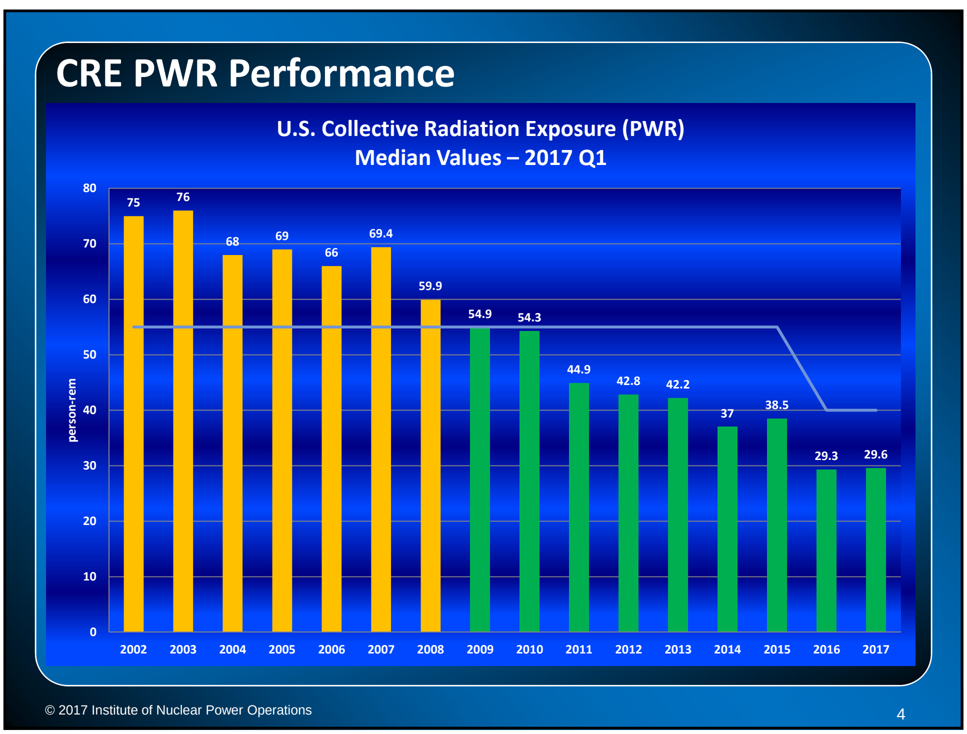
CRE PWR Performance
U.S. Collective Radiation Exposure (PWR)
Median Values – 2017 Q1
person-rem
0
10
20
30
40
50
60
70
80
2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017
75 76 68 69 66 69.4 59.9 54.9 54.3 44.9 42.8 42.2 37 38.5 29.3 29.6
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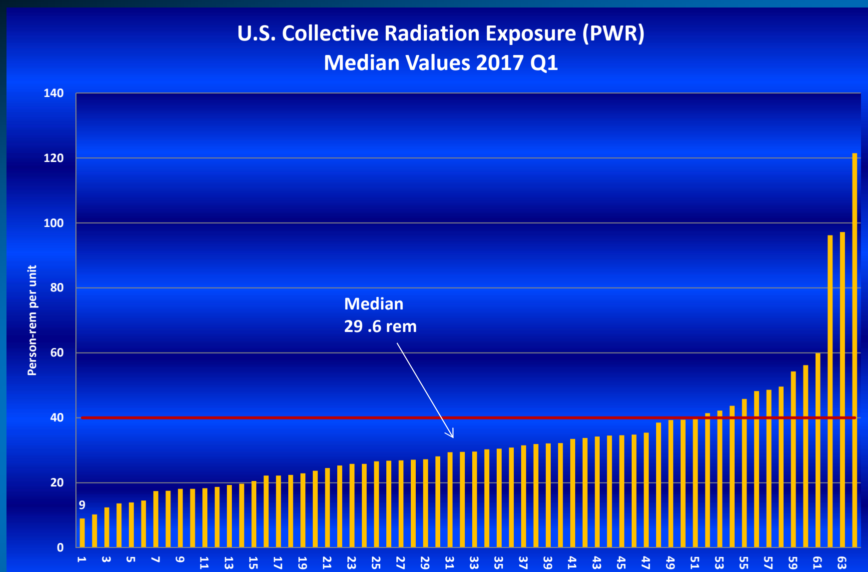
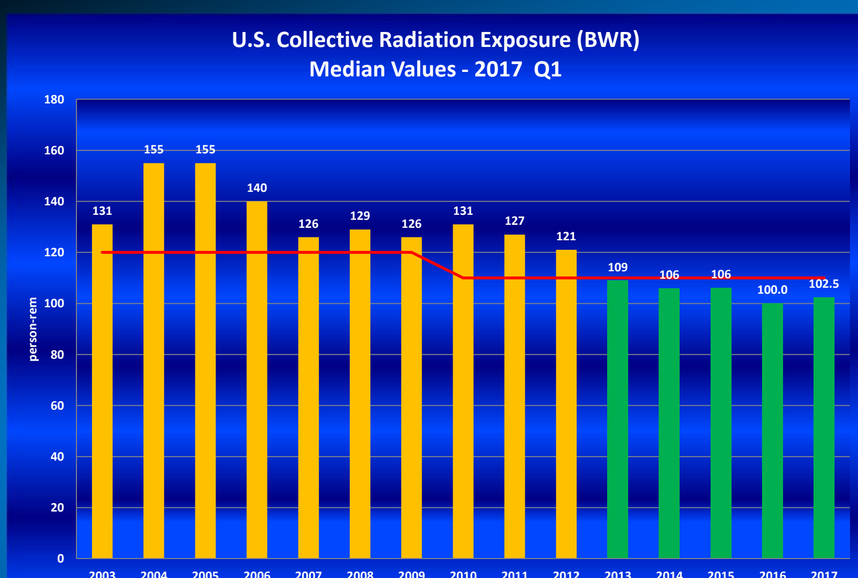
4

CRE PWR Performance



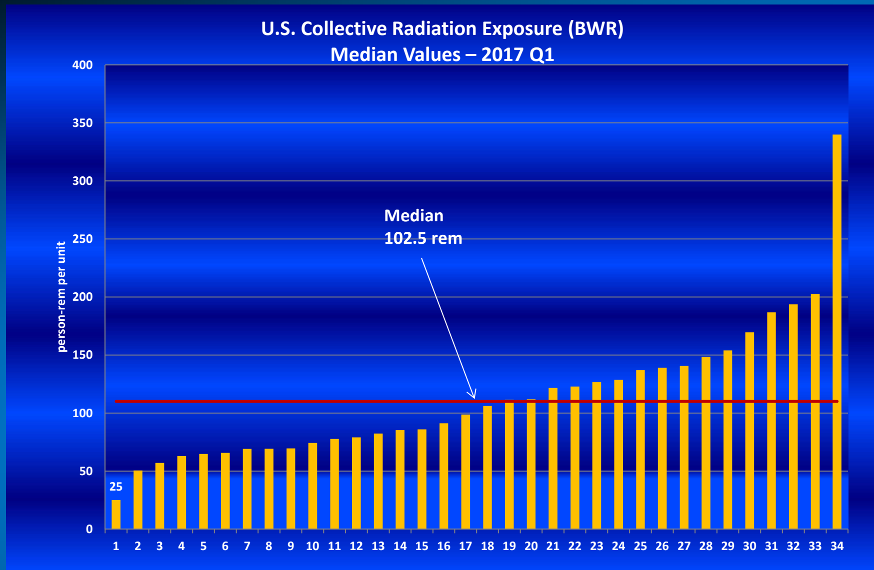
 5

CRE BWR Performance



 6

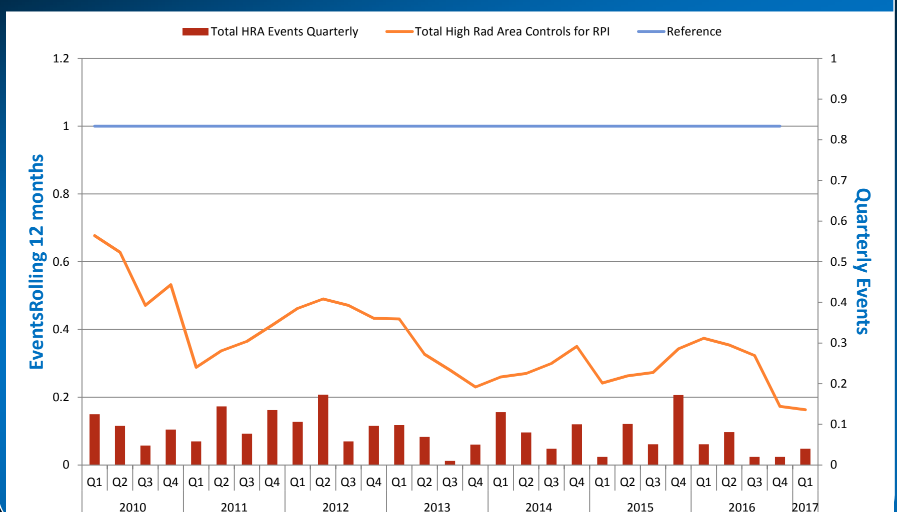
CRE Performance



 7

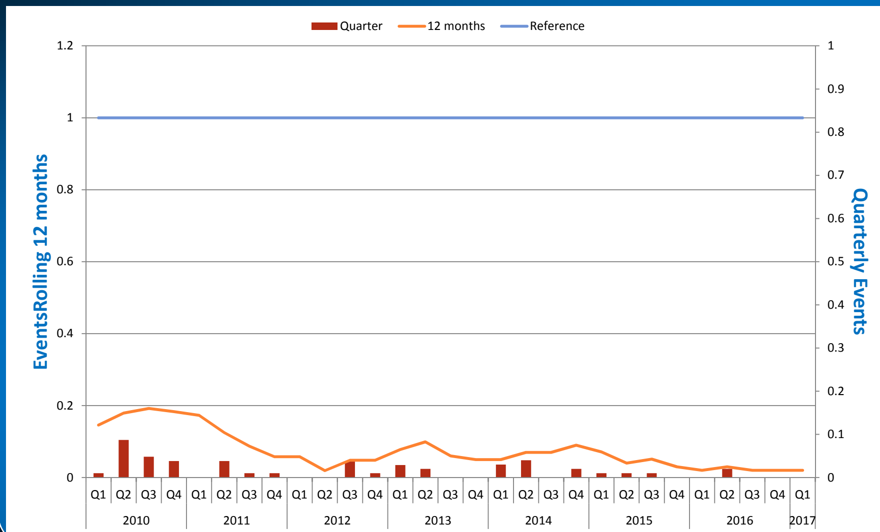
Industry Performance and Trends (PIC Data)

Total High Radiation Events

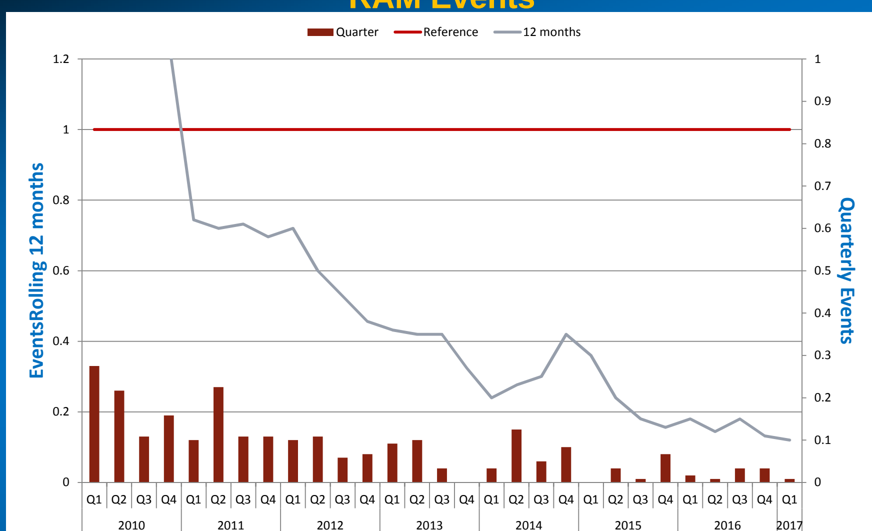


 8

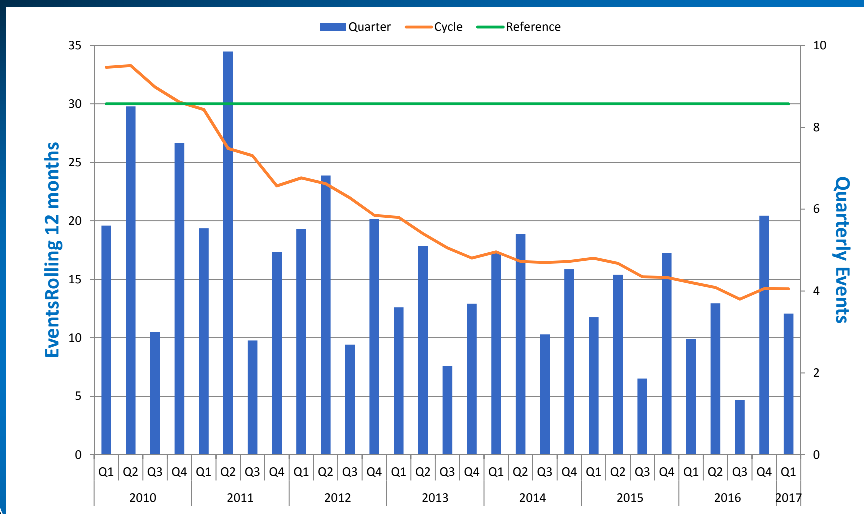
Industry Performance and Trends (PIC Data)
Unplanned Dose



Industry Performance and Trends (PIC Data)
RAM Events



Industry Performance and Trends (PIC Data) PCEs



11

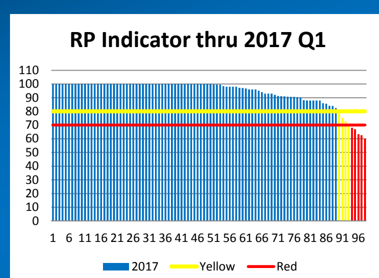
RP Performance Indicator Drivers

Performance Monitoring Drivers

- Collective radiation exposure
- High radiation area events

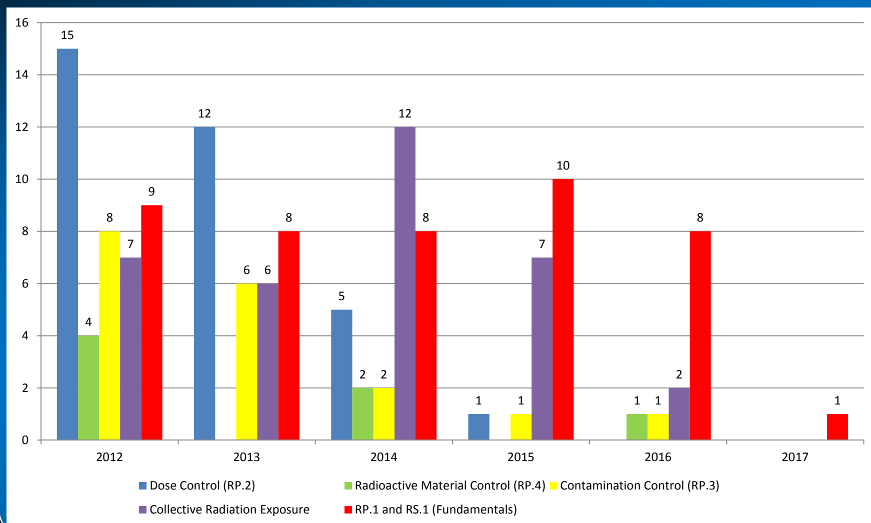
Drivers for <80 Points

- CRE (8 plants)
- CRE plus HRA Events (3 plants)
- Internal dose and HRA events (1)



12

RP and RS AFIs Through 1st Qtr 2017



12 Month AFIs

Fundamentals (RP.1, RS.1, NP.1)

- Radiation workers not following procedures for HRA and RAM controls
- Radiation protection technicians not applying fundamentals for HRAs
- RP Supervisor’s oversight of radiological work for changing radiological conditions
- Radiation protection not communicating radiological hazards
- Radiation protection technicians not following expectation for work plans
- Radiation protection technicians and supervisors not apply standards
- Radiation workers not monitoring and communicating radiological hazards

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2017 Fundamental AFIs Causes

Fundamentals (RP.1, RS.1)

- RP Supervisors and technicians do not correct deviations or rationalize deviations because of perceived low risk or low consequence
- Radiation workers deviate because of perceived low risk or low consequence.
- Contributing, supervisors, including radiation protection supervision, are not correcting or coaching to the standard.

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Continuous Monitoring

Point of Contacts

- Evaluator and RPM Interactions
- Difference between outage review visits and a continuous monitoring/PML outage visit
- Assistance

Effectiveness

- 2016 – Nine programs in decline
- 2017 – Five programs in decline

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Operating Experience

Working through dose alarms

- During movement of lifted core barrel, crane stopped. RP leaders authorized working through dose alarm. (150 mrem for one worker)
- While landing reactor head, problems with head guide pin alignment resulted in reaching 80% dose alarm setpoint. RP leaders authorized working through dose alarm. (more than 40 mrem per worker)

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Operating Experience (cont'd)

Outage Observations

- Use of flashing lights at LHRA
- Ladders or scaffold near LHRA fencing
- CFAMS/Peer RPM during outages
- Undocumented contamination surveys
- Water stations in contaminated areas
  - Contamination controls missing or unclear

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Operating Experience (cont'd)

12-013, INPO Consolidated Event System Reporting, January 2017

- *Unanticipated dose rate alarms with setpoints of 100 mrem/hr or greater*
  - Evaluations discovering unidentified performance issues
    - Workers entering unknown radiation fields
    - Planning shortfalls
    - Performance gaps in technician fundamentals
    - Stay time tracking shortfalls
    - Deviation from 'anticipated' dose rate alarm intent

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Document Hierarchy

Tier 1 – EXCELLENCE DOCUMENTS establish the standards that INPO members and participants are expected to meet. INPO evaluates station performance to the content of these documents.

Tier 2 - SUPPORTING and IMPLEMENTING DOCUMENTS are intended to provide information to assist INPO members and participants in the pursuit of excellence. While it is expected the intent of these documents be met, strict compliance is neither required nor desired.

Tier 3 – Nuclear Industry Standard Procedure (NISPs) – Good Practices

- Collaboratively developed by the industry under Efficiency Bulletin 17-01, *Portable Supplemental Radiation Protection Technician Training and Qualification*
- Captures details previously contained in 05-008
- Procedural format

.

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Institute of Nuclear Power Operations

Questions & Comments

PWR RP/ALARA Association

PWR RP/ALARA ASSOCIATION

PLANT STATUS REPORT QUESTIONAIRE – SUMMER 2017

STATION: Arkansas Nuclear One UTILITY: Entergy

	NSSS	CYCLE #	CORE DUTY (H/L)	ON-LINE DOSE 2016 (Rem)	RWP man-hours	INPO QUARTILE	ONLINE PCE'S 2016
UNIT 1	B & W	27	High	5.010	118,244	4th	0
UNIT 2	CE	25	Medium	9.948	67,943	3rd	1
UNIT 3	N/A						Outage-38

	LAST REFUEL OUTAGE EXPOSURE ESTIMATE / ACTUAL	DURATION ESTIMATE / ACTUAL	WEIGHT OF LEAD INSTALLED	PCE's
UNIT 1	1R26-84.4 Rem/96.9 Rem	33 days 19 hrs/82 days 18 hrs	51,991 lbs	38 Level 1
UNIT 2	2R24-65.2 Rem/65.9 Rem*	30 days/55 days 3 hours	43,403	36 Level 1
UNIT 3				

	Yes	No	STEAM GENERATORS REPLACED	RX HEAD REPLACED
ZINC: 3.0 ppb YEAR 2017	[x]	[ ]	UNIT 1: Y [x] date 2005 N [ ]	Y [x] date 2005 N [ ]
ULTRASONIC FUEL CLEANING	[ ]	[x]	UNIT 2: Y [x] date 2000 N [ ]	Y [ ] date N [x]
REDUCED INVENTORY SHUTDOWN CHEMISTRY	[x]	[ ]	UNIT 3: Y [ ] date N [ ]	Y [ ] date N [ ]

SPECIALTY RESIN	TYPE OF RESIN: Macroporous USED DURING: S/D CLEANUP [ ] ONLINE
RCS FILTRATION MICRON SIZE: ON-LINE: 1.0	DURING SHUTDOWN CLEANUP: .2

CONSTANT MODIFIED pH	YES	NO	IF YES, RANGE: 6.49-6.86
PERM. SCAFFOLD	YES	NO	LOCATION: Perm. Scaffold Racks-Yes
PERM. SHIELDING	YES	NO	LOCATION: Auxilary Building

	LOWEST and HIGHEST CANISTER DOSE (Rem)	HIGHEST KW & BURNUP CASK	NUMBER OF CANISTERS	VENDOR	CANISTER TYPE
LAST DRY FUEL STORAGE CAMPAIGN	417 mrem/503 mrem	24.3 KW	8	Holtec	Upright Hi Storm

Additional information: * Unit 2 Refueling Outage 2R25 currently in progress. Scheduled for 62 days projected for 83 days. Original RWP Estimate is 78.2 Rem projected Exposure is 75.5 Rem.

Prepared By: Melody Gibson **Date:** 06/11/2017

Contact Info: mgibson@entergy.com 479/858/7679

PWR RP/ALARA Association

PLANT STATUS REPORT QUESTIONAIRE – SUMMER 2017

STATION: Beaver Valley Power Station UTILITY: First Energy

	NSSS	CYCLE #	CORE DUTY (H/L)	ON-LINE DOSE 2016 (Rem)	RWP man-hours	INPO QUARTILE	ONLINE PCE'S 2016
UNIT 1	West 3 Loop	25	H	423	67,332	N/A	3
UNIT 2	West 3 loop	20	H	0.161	72,774	N/A	2
UNIT 3							

	LAST REFUEL OUTAGE EXPOSURE ESTIMATE / ACTUAL	DURATION ESTIMATE / ACTUAL	WEIGHT OF LEAD INSTALLED	PCE's
UNIT 1	67,617/ 51,080 (SRD) 43,559 (DLR)	26/30	52,106	35
UNIT 2	63,731/57,979	32/29	77,385	4
UNIT 3				

	Yes	No	STEAM GENERATORS REPLACED	RX HEAD REPLACED
ZINC: *____ppb YEAR *______	☑	☐	UNIT 1: Y ■ date N ☐	Y ■ date N ☐
ULTRASONIC FUEL CLEANING	☐	☑	UNIT 2: Y ☐ date N ■	Y ☐ date N ■
REDUCED INVENTORY SHUTDOWN CHEMISTRY	☑	☐	UNIT 3: Y ☐ date N ☐	Y ☐ date N ☐

SPECIALTY RESIN ■	TYPE OF RESIN: PRC-01M	USED DURING: S/D CLEANUP ☐ ONLINE
RCS FILTRATION MICRON SIZE: ON-LINE: 1		DURING SHUTDOWN CLEANUP: 2

CONSTANT MODIFIED pH	YES ■	NO ☐	IF YES, RANGE: 7.1-7.2
PERM. SCAFFOLD	YES ■	NO ☐	LOCATION: RBC
PERM. SHIELDING	YES ☐	NO ■	LOCATION: N/A

	LOWEST and HIGHEST CANISTER DOSE (Rem)	HIGHEST KW & BURNUP CASK	NUMBER OF CANISTERS	VENDOR	CANISTER TYPE
LAST DRY FUEL STORAGE CAMPAIGN	425 and 570	27.8	4	Areva	NUHOMS®37PTH

Additional information: * Zinc addition:
Unit 1 Started in 2002 – target zinc is 15 ppb,
Unit 2 Started in 2010 - target zinc is 5 ppb

Prepared By: Jeff Fontaine **Date:** 6/1/17

Contact Info: fontainej@firstenergycorp.com

PWR RP/ALARA Association

PLANT STATUS REPORT QUESTIONAIRE – SUMMER 2017

STATION: Braidwood UTILITY: Exelon

	NSSS	CYCLE #	CORE DUTY (H/L)	ON-LINE DOSE 2016 (Rem)	RWP man-hours	INPO QUARTILE	ONLINE PCE'S 2016
UNIT 1	W	20	H	2.400 DLR		1st	4
UNIT 2	W	20	H	1.977 DLR		1st	0

	LAST REFUEL OUTAGE EXPOSURE ESTIMATE / ACTUAL	DURATION ESTIMATE / ACTUAL	WEIGHT OF LEAD INSTALLED	PCE's
UNIT 1	49.215 / 35.283 (DLR)	<25 / 30	102,000	14
UNIT 2	80.359 / 81.627	<26 / 25		17

	Yes	No	STEAM GENERATORS REPLACED	RX HEAD REPLACED
ZINC: ___5_ppb YEAR 2016	☒	☐	UNIT 1: Y ☒ 1998 N ☐	Y ☐ date N ☒
ULTRASONIC FUEL CLEANING	☐	☒	UNIT 2: Y ☐ date N ☒	Y ☐ date N ☒
REDUCED INVENTORY SHUTDOWN CHEMISTRY	☐	☒	UNIT 3: Y ☐ date N ☐	Y ☐ date N ☐
SPECIALTY RESIN ☒	PRC-01M, Macroporous, Orthoporous		USED DURING: S/D CLEANUP ☐	ONLINE ☒
RCS FILTRATION MICRON SIZE: ON-LINE:			DURING SHUTDOWN CLEANUP:	

CONSTANT MODIFIED pH	YES ☒	NO ☐	IF YES, RANGE:
PERM. SCAFFOLD	YES ☒	NO ☐	LOCATION: Various
PERM. SHIELDING	YES ☒	NO ☐	LOCATION: Various

LAST DRY FUEL STORAGE CAMPAIGN	LOWEST and HIGHEST CANISTER DOSE (Rem)	HIGHEST KW & BURNUP CASK	NUMBER OF CANISTERS	VENDOR	CANISTER TYPE
	0.064 / 0.154	23.6 kW	6	Holtec	Hi-Storm

Additional information: 2016 DCS total: 0.621 Rem. U1 RPVH Peening: 10.100 Rem. U2 RPVH Peening: 26.598 Rem. 2B RCP Motor/ Pump Rotating Assembly Replaced 11.534 Rem. U2 SG ASCA Completed with several issues with Hydrazine and ammonia. Maintaining RCS temperature at higher temperature for ASCA led to higher peak activity during Forced Oxidation. SG ECT Zephyr probes used successfully U1/U2.

Deposit Removal Process Step	SG-B (lbs)	SG-C (lbs)	SG-A (lbs)	SG-D (lbs)	TOTAL (lbs)
ASCA	752.4	789.9	702.3	900.2	3144.8
Sludge Lancing	106	84.5	69	76	335.5
Total	858.4	874.4	771.3	976.2	3480.3

Prepared By: Billie Miranda **Date: 6.16.17**

Contact Info: Billie.Miranda@Exeloncorp.com **815.417.2712**

PWR RP/ALARA Association

PLANT STATUS REPORT QUESTIONAIRE – SUMMER 2017

STATION: Byron UTILITY: Exelon

	NSSS	CYCLE #	CORE DUTY (H/L)	ON-LINE DOSE 2016 (Rem)	RWP man-hours	INPO QUARTILE	ONLINE PCE'S 2016
UNIT 1	Westinghouse	21	H	2.277	75,962	1	1
UNIT 2	Westinghouse	20	H	3.210	204,974	2	1
UNIT 3	N/A	N/A	N/A	N/A	N/A	N/A	N/A

	LAST REFUEL OUTAGE EXPOSURE ESTIMATE / ACTUAL	DURATION ESTIMATE / ACTUAL	WEIGHT OF LEAD INSTALLED	PCE's
UNIT 1	44 P-Rem / 40.741 P-Rem	26 days / 27 days	46,573 lbs.	3
UNIT 2	49.5 P-Rem / 48.528 P-Rem	26 days / 29 days	68,993 lbs.	11
UNIT 3	N/A	N/A	N/A	N/A

	Yes	No	STEAM GENERATORS REPLACED	RX HEAD REPLACED
ZINC: 16 **ppb YEAR** 2017	✔	☐	**UNIT 1: Y** ■ date 1997 N ☐	**Y** ☐ date **N** ■
ULTRASONIC FUEL CLEANING	☐	✔	**UNIT 2: Y** ☐ date N ■	**Y** ☐ date **N** ■
REDUCED INVENTORY SHUTDOWN CHEMISTRY	☐	✔	**UNIT 3: Y** ☐ date N ☐	**Y** ☐ date **N** ☐

SPECIALTY RESIN ■ **TYPE OF RESIN:** PRC-01M Overlay **USED DURING: S/D CLEANUP** ■ **ONLINE**

RCS FILTRATION MICRON SIZE: ON-LINE: 0.1 **DURING SHUTDOWN CLEANUP:** 1.0

CONSTANT MODIFIED pH	**YES** ■	**NO** ☐	**IF YES, RANGE:** 7.4
PERM. SCAFFOLD	**YES** ■	**NO** ☐	**LOCATION:** Unit 1 & 2 Containment and Aux Building
PERM. SHIELDING	**YES** ■	**NO** ☐	**LOCATION:** Aux Building

	LOWEST and HIGHEST CANISTER DOSE (Rem)	HIGHEST KW & BURNUP CASK	NUMBER OF CANISTERS	VENDOR	CANISTER TYPE
LAST DRY FUEL STORAGE CAMPAIGN	0.075 P-Rem / 0.158 P-Rem	23.56	6	Holtech	HI-STORM

Additional information: Completed DCS campaign for 610 mrem.

Prepared By: Scott Leach **Date:** 5/31/17

Contact Info: scott.leach@exeloncorp.com

PWR RP/ALARA Association

PWR RP/ALARA ASSOCIATION

PLANT STATUS REPORT QUESTIONAIRE – SUMMER 2017

STATION: Callaway Energy Center UTILITY: Ameren Missouri

	NSSS	CYCLE #	CORE DUTY (H/L)	ON-LINE DOSE 2016 (Rem)	RWP man-hours	INPO QUARTILE	ONLINE PCE'S 2016
UNIT 1	W-4	22	H	3128	157,344(incl RF)	2	5
UNIT 2							
UNIT 3							

	LAST REFUEL OUTAGE EXPOSURE ESTIMATE / ACTUAL	DURATION ESTIMATE / ACTUAL	WEIGHT OF LEAD INSTALLED	PCE's
UNIT 1	43822 mrem / 43100 mrem	<37 days / 38d 12h	~ 27,000 #	29
UNIT 2				
UNIT 3				

	Yes	No	STEAM GENERATORS REPLACED	RX HEAD REPLACED
ZINC: 10-12 ppb YEAR 2016	☑	☐	UNIT 1: Y ■ date 2007 N ☐	Y ■ date 201 N ☐
ULTRASONIC FUEL CLEANING	☑	☐	UNIT 2: Y ☐ date N ☐	Y ☐ date N ☐
REDUCED INVENTORY SHUTDOWN CHEMISTRY	☐	☑	UNIT 3: Y ☐ date N ☐	Y ☐ date N ☐

SPECIALTY RESIN	TYPE OF RESIN: IRN217 lithiated	USED DURING: S/D CLEANUP ■	ONLINE
RCS FILTRATION MICRON SIZE: ON-LINE: .05		DURING SHUTDOWN CLEANUP:	0.1

CONSTANT MODIFIED pH	YES	NO	IF YES, RANGE:
PERM. SCAFFOLD	YES	NO	LOCATION:
PERM. SHIELDING	YES	NO	LOCATION:

	LOWEST and HIGHEST CANISTER DOSE (Rem)	HIGHEST KW & BURNUP CASK	NUMBER OF CANISTERS	VENDOR	CANISTER TYPE
LAST DRY FUEL STORAGE CAMPAIGN	.276/.607	21kW	6	Holtec	MPC-37

Additional information:

Prepared By: TF Trent **Date:** 6/4/2017

Contact Info: In PWR Directory

PWR RP/ALARA Association

PLANT STATUS REPORT QUESTIONAIRE – SUMMER 2017

STATION: Catawba UTILITY: Duke Energy

	NSSS	CYCLE #	CORE DUTY (H/L)	ON-LINE DOSE 2016 (Rem)	RWP man-hours	INPO QUARTILE	ONLINE PCE'S 2016
UNIT 1	4 Loop Ice	24	H	2.495 (DLR)	245,241 hrs.	1	5
UNIT 2	4 Loop Ice	22	H	3.415 (DLR)	for both units	4	for both units
UNIT 3	NA	NA	NA	NA	NA	NA	NA

	LAST REFUEL OUTAGE EXPOSURE ESTIMATE / ACTUAL	DURATION ESTIMATE / ACTUAL	WEIGHT OF LEAD INSTALLED	PCE's
UNIT 1	29.218 / 25.340 (DLR)	24 days / 24.21 days	42,810	0
UNIT 2	64.234 / 71.187 (DLR)	27.91 / 28.8 days	57,440	8
UNIT 3	NA	NA	NA	NA

	Yes	No	STEAM GENERATORS REPLACED	RX HEAD REPLACED
ZINC: 10 ppb YEAR 2007	☑	☐	UNIT 1: Y ☒ date 1997 N ☐	Y ☐ date N ☒
ULTRASONIC FUEL CLEANING	☑	☐	UNIT 2: Y ☐ date N ☒	Y ☐ date N ☒
REDUCED INVENTORY SHUTDOWN CHEMISTRY	☐	☑	UNIT 3: Y ☐ date N ☐	Y ☐ date N ☐

SPECIALTY RESIN ☒	TYPE OF RESIN: Purolite	USED DURING: S/D CLEANUP ☒ ONLINE
RCS FILTRATION MICRON SIZE: ON-LINE:	0.1	DURING SHUTDOWN CLEANUP: 1

	YES	NO	
CONSTANT MODIFIED pH	YES ☒	NO ☐	IF YES, RANGE: * Constant - See Below
PERM. SCAFFOLD	YES ☒	NO ☐	LOCATION: Perm. scaffold frames for shielding in L/C
PERM. SHIELDING	YES ☒	NO ☐	LOCATION: Some perm. shielding in various areas

	LOWEST and HIGHEST CANISTER DOSE (Rem)	HIGHEST KW & BURNUP CASK	NUMBER OF CANISTERS	VENDOR	CANISTER TYPE
LAST DRY FUEL STORAGE CAMPAIGN	0.227 & 0.303 (DLR)**	2.995	4	NA	NAC-MagnaStor

Additional information: *Unit 1 is Constant Non-Elevated. Unit 2 is Constant Elevated (referenced to Tave). Refer to EPRI PWR Primary Chemistry Water Guidelines section 2.2 for definitions.
**Dry cask dose includes assigned neutron dose

Prepared By: Dana L Page **Date:** 6/6/17

Contact Info: dana.page@duke-energy.com (803) 701-3596

PWR RP/ALARA Association

PLANT STATUS REPORT QUESTIONAIRE – SUMMER 2017

STATION: DC Cook Nuclear UTILITY: American Electric Power

	NSSS	CYCLE #	CORE DUTY (H/L)	ON-LINE DOSE 2016 (Rem)	RWP man-hours	INPO QUARTILE	ONLINE PCE'S 2016
UNIT 1	Westinghouse	28	Low	5.496		2	8
UNIT 2	Westinghouse	24	Low			2	
UNIT 3							

	LAST REFUEL OUTAGE EXPOSURE ESTIMATE / ACTUAL	DURATION ESTIMATE / ACTUAL	WEIGHT OF LEAD INSTALLED	PCE's
UNIT 1	31.592 R/23.068 R (DLR)	26 days/36 days	35,000 lbs	20
UNIT 2	71.980 R/64.855 R (DLR)	75 days/89 days	39,500 lbs	48
UNIT 3				

	Yes	No	STEAM GENERATORS REPLACED	RX HEAD REPLACED
ZINC:_____ppb YEAR______	☐	☑	UNIT 1: Y ■ date 2000 N ☐	Y ■ date 2006 N ☐
ULTRASONIC FUEL CLEANING	☐	☑	UNIT 2: Y ■ date 1984 N ☐	Y ■ date 2007 N ☐
REDUCED INVENTORY SHUTDOWN CHEMISTRY	☐	☐	UNIT 3: Y ☐ date N ☐	Y ☐ date N ☐

SPECIALTY RESIN ■	TYPE OF RESIN: PRC-01m	USED DURING: S/D CLEANUP ☐ ONLINE
RCS FILTRATION MICRON SIZE: ON-LINE:		DURING SHUTDOWN CLEANUP:

CONSTANT MODIFIED pH	YES	NO	IF YES, RANGE: 7.3
PERM. SCAFFOLD	YES	NO	LOCATION:
PERM. SHIELDING	YES	NO	LOCATION: Shied wall 612" I/S CTMT

	LOWEST and HIGHEST CANISTER DOSE (Rem)	HIGHEST KW & BURNUP CASK	NUMBER OF CANISTERS	VENDOR	CANISTER TYPE
LAST DRY FUEL STORAGE CAMPAIGN	Lowest - 0.028 - cask #16 highest 0.248 cask #1	23.23 KW See attached graph	16	Holtec International	MPC-32 / HS-100

Additional information: Online dose is combined with DLR readings for both U1 and U2. Online PCEs for 2016 is also combined. Completed 205 baffle bolt replacements in Unit 2. Core flow modification in Unit 2 in spring 2018.

Prepared By: O. Juza/David W. Miller **Date:** 6/6/17

Contact Info: dwmiller2@aep.com 217 855 3238 / oijuza@aep.com 26

PWR RP/ALARA Association

PLANT STATUS REPORT QUESTIONAIRE – SUMMER 2017

STATION: Farley 1,2 UTILITY: Southern Nuclear

	NSSS	CYCLE #	CORE DUTY (H/L)	ON-LINE DOSE 2016 (Rem)	RWP man-hours	INPO QUARTILE	ONLINE PCE'S 2016
UNIT 1	Westinghouse	27		6.091		Top	2
UNIT 2	Westinghouse	24		5.213		Top	4
UNIT 3							

	LAST REFUEL OUTAGE EXPOSURE ESTIMATE / ACTUAL	DURATION ESTIMATE / ACTUAL	WEIGHT OF LEAD INSTALLED	PCE's
UNIT 1	32.080REM/29.719REM	22days/40days		6
UNIT 2	34.095REM/26.629REM	22days/32days		4
UNIT 3				

	Yes	No	STEAM GENERATORS REPLACED	RX HEAD REPLACED
ZINC: 15 ppb YEAR 1995	☑	☐	UNIT 1: Y ■ date 2000 N ☐	Y ■ date 2004 N ☐
ULTRASONIC FUEL CLEANING	☐	☑	UNIT 2: Y ■ date 2001 N ☐	Y ■ date 2005 N ☐
REDUCED INVENTORY SHUTDOWN CHEMISTRY	☑	☐	UNIT 3: Y ☐ date N ☐	Y ☐ date N ☐

SPECIALTY RESIN ■ TYPE OF RESIN: PRC-01 Gravex New -Purolite 160 and 5070	USED DURING: S/D CLEANUP ■ ONLINE
RCS FILTRATION MICRON SIZE: ON-LINE: .1micron	DURING SHUTDOWN CLEANUP: 1micron

CONSTANT MODIFIED pH	YES	NO	IF YES, RANGE: 7.2 elevated constant
PERM. SCAFFOLD	YES	NO	LOCATION:
PERM. SHIELDING	YES	NO	LOCATION:

	LOWEST and HIGHEST CANISTER DOSE (Rem)	HIGHEST KW & BURNUP CASK	NUMBER OF CANISTERS	VENDOR	CANISTER TYPE
LAST DRY FUEL STORAGE CAMPAIGN	116.2/161.1	21.9	8	Holtec	MPC 32 High storm 100-S overpack

Additional information:

Prepared By: Ray Bryant **Date:** 9-12-2017

Contact Info: raabryan@southernco.com

PWR RP/ALARA Association

PLANT STATUS REPORT QUESTIONAIRE – SUMMER 2017

STATION: H. B. Robinson UTILITY: Duke Energy Progress

	NSSS	CYCLE #	CORE DUTY (H/L)	ON-LINE DOSE 2016 (Rem)	RWP man-hours	INPO QUARTILE	ONLINE PCE'S 2016
UNIT 1							
UNIT 2	Westinghouse	30	L	3.704	10,718*	3rd	0
UNIT 3							

	LAST REFUEL OUTAGE EXPOSURE ESTIMATE / ACTUAL	DURATION ESTIMATE / ACTUAL	WEIGHT OF LEAD INSTALLED	PCE's
UNIT 1				
UNIT 2	56.1 REM / 52.663 REM	48 days / 42.04 days	approx. 10,000 lbs	3**
UNIT 3				

	Yes	No	STEAM GENERATORS REPLACED	RX HEAD REPLACED
ZINC: 5*** ppb YEAR 2013	☑	☐	UNIT 1: Y ☐ date N ☐	Y ☐ date N ☐
ULTRASONIC FUEL CLEANING	☐	☑	UNIT 2: Y ■ date 1984 N ☐	Y ■ date '05 N ☐
REDUCED INVENTORY SHUTDOWN CHEMISTRY	☐	☐	UNIT 3: Y ☐ date N ☐	Y ☐ date N ☐

SPECIALTY RESIN ■ TYPE OF RESIN: Macroporous	USED DURING: S/D CLEANUP ■ ONLINE
RCS FILTRATION MICRON SIZE: ON-LINE: 0.1	DURING SHUTDOWN CLEANUP: 1.0

CONSTANT MODIFIED pH	YES ■	NO ☐	IF YES, RANGE: 7.1
PERM. SCAFFOLD	YES ■	NO ☐	LOCATION: Containment - S/Gs (3), CVC vertical letdown line
PERM. SHIELDING	YES ■	NO ☐	LOCATION: Aux Bldg - Various, Containment - Seal Table Rm in-core detector storage

	LOWEST and HIGHEST CANISTER DOSE (Rem)	HIGHEST KW & BURNUP CASK	NUMBER OF CANISTERS	VENDOR	CANISTER TYPE
LAST DRY FUEL STORAGE CAMPAIGN	0.083 / 0.395	33.21	5	Transnuclear	NUHOMS-24P

Additional information:
* RWP man-hrs for dose > 0 mREM.
** All 3 PCEs were Level 1, i.e., < 5000 ncpm, distributed.
*** Zinc injection started August 2013 prior to RO-28 and running for 42 months. To date, 166 ppb-months (end of April 2017).

Prepared By: Wade Miller **Date:** 06/13/2017

Contact Info: wade.miller@duke-energy.com

PWR RP/ALARA Association

PLANT STATUS REPORT QUESTIONAIRE – SUMMER 2017

STATION: McGuire UTILITY: Duke Energy

	NSSS	CYCLE #	CORE DUTY (H/L)	ON-LINE DOSE 2016 (Rem)	RWP man-hours	INPO QUARTILE	ONLINE PCE'S 2016
UNIT 1	Westinghouse	EOC25	H	5.491	N/A	3	2
UNIT 2	Westinghouse	EOC24	H	4.570	N/A	4	1
UNIT 3	N/A	N/A	N/A	N/A	N/A	N/A	N/A

	LAST REFUEL OUTAGE EXPOSURE ESTIMATE / ACTUAL	DURATION ESTIMATE / ACTUAL	WEIGHT OF LEAD INSTALLED	PCE's
UNIT 1	56.640 / 58.2	25 / 29.1	50k	7
UNIT 2	56.505 / 67.742	22.54 / 23.78	59k	14
UNIT 3	N/A	N/A	N/A	N/A

	Yes	No	STEAM GENERATORS REPLACED	RX HEAD REPLACED
ZINC: 10 ppb YEAR 2006	☑	☐	UNIT 1: Y ■ date N ☐	Y ☐ date N ■
ULTRASONIC FUEL CLEANING	☑	☐	UNIT 2: Y ■ date N ☐	Y ☐ date N ■
REDUCED INVENTORY SHUTDOWN CHEMISTRY	☑	☐	UNIT 3: Y ☐ date N ☐	Y ☐ date N ☐

SPECIALTY RESIN ■ TYPE OF RESIN: Macroporous	USED DURING: S/D CLEANUP ■ ONLINE
RCS FILTRATION MICRON SIZE: ON-LINE: 0.1	DURING SHUTDOWN CLEANUP: 0.1

CONSTANT MODIFIED pH	YES ■	NO ☐	IF YES, RANGE: 7.2
PERM. SCAFFOLD	YES ■	NO ☐	LOCATION: Incore sump room
PERM. SHIELDING	YES ■	NO ☐	LOCATION: U-1 Letdown line, Auxiliary bldg.

	LOWEST and HIGHEST CANISTER DOSE (Rem)	HIGHEST KW & BURNUP CASK	NUMBER OF CANISTERS	VENDOR	CANISTER TYPE
LAST DRY FUEL STORAGE CAMPAIGN	0.241 / 0.436	29	5	NAC	Magnastor

Additional information: Dry cask dose includes assigned neutron dose

Prepared By: Stephen Lisi **Date:** 6/12/2017

Contact Info: stephen.lisi@duke-energy.com

PWR RP/ALARA Association

PLANT STATUS REPORT QUESTIONAIRE – SUMMER 2017

STATION: North Anna UTILITY: Dominion Energy

	NSSS	CYCLE #	CORE DUTY (H/L)	ON-LINE DOSE 2016 (Rem)	RWP man-hours	INPO QUARTILE	ONLINE PCE'S 2016
UNIT 1	W 3 Loop	26	H	3.380	51196	2nd	0
UNIT 2	W 3 Loop	25	H	4.780	52784	3rd	1
UNIT 3							

	LAST REFUEL OUTAGE EXPOSURE ESTIMATE / ACTUAL	DURATION ESTIMATE / ACTUAL	WEIGHT OF LEAD INSTALLED	PCE's
UNIT 1	57.276/45.321	34/36	47550	17
UNIT 2	68.069/26959	33/36	43030	15
UNIT 3				

	Yes	No	STEAM GENERATORS REPLACED	RX HEAD REPLACED
ZINC: 5 ppb YEAR 2014	☑	☐	UNIT 1: Y ■ date 1995 N ☐	Y ■ date 2003 N ☐
ULTRASONIC FUEL CLEANING	☐	☑	UNIT 2: Y ■ date 1996 N ☐	Y ■ date 2003 N ☐
REDUCED INVENTORY SHUTDOWN CHEMISTRY	☑	☐	UNIT 3: Y ☐ date N ☐	Y ☐ date N ☐

SPECIALTY RESIN ■ TYPE OF RESIN: ortoporous	USED DURING: S/D CLEANUP ■ ONLINE
RCS FILTRATION MICRON SIZE: ON-LINE: 0.1	DURING SHUTDOWN CLEANUP: 2.0

CONSTANT MODIFIED pH	YES ■	NO ☐	IF YES, RANGE: 7.0 to 7.4
PERM. SCAFFOLD	YES ■	NO ☐	LOCATION: Shield frames, loop room platforms inside containment
PERM. SHIELDING	YES ■	NO ☐	LOCATION: AB, Liquid Waste & CVCS systems

	LOWEST and HIGHEST CANISTER DOSE (Rem)	HIGHEST KW & BURNUP CASK	NUMBER OF CANISTERS	VENDOR	CANISTER TYPE
LAST DRY FUEL STORAGE CAMPAIGN	0.205 & 0.131	33.5/33.3	2	Transnuclear	Nuhoms

Additional information: Issues with last nuhoms campaign, station lowest is 0.076 rem for one cask load.

Prepared By: Kevin Licklider **Date:** 06-01-17

Contact Info: 540-894-2610

PWR RP/ALARA Association

PLANT STATUS REPORT QUESTIONAIRE – SUMMER 2017

STATION: Oconee UTILITY: Duke

	NSSS	CYCLE #	CORE DUTY (H/L)	ON-LINE DOSE 2016 (Rem)	RWP man-hours	INPO QUARTILE	ONLINE PCE'S 2016
UNIT 1	B&W	30	H	3.116	597,564	N/A	1
UNIT 2	B&W	28	H	1.621		N/A	
UNIT 3	B&W	29	H	2.770		N/A	

	LAST REFUEL OUTAGE EXPOSURE ESTIMATE / ACTUAL	DURATION ESTIMATE / ACTUAL	WEIGHT OF LEAD INSTALLED	PCE's
UNIT 1	30.2 / 19.9	/ 22		5
UNIT 2	63 / 55.1	/ 26		N/A
UNIT 3	40.8 / 33.1	/ 23		9

	Yes	No	STEAM GENERATORS REPLACED	RX HEAD REPLACED
ZINC: 5 ppb YEAR 2016	☑	☐	UNIT 1: Y ■ date '03 N ☐	Y ■ date '03 N ☐
ULTRASONIC FUEL CLEANING	☑	☐	UNIT 2: Y ■ date '04 N ☐	Y ■ date '04 N ☐
REDUCED INVENTORY SHUTDOWN CHEMISTRY	☑	☐	UNIT 3: Y ■ date '04 N ☐	Y ■ date '03 N ☐

SPECIALTY RESIN ■ TYPE OF RESIN: macroporous	USED DURING: S/D CLEANUP ■ ONLINE
RCS FILTRATION MICRON SIZE: ON-LINE: 0.1	DURING SHUTDOWN CLEANUP: 0.1; 0.45; 1

CONSTANT MODIFIED pH	YES	NO	IF YES, RANGE: Li .3 to .35 ppm
PERM. SCAFFOLD	YES	NO	LOCATION:
PERM. SHIELDING	YES	NO	LOCATION: Eq Drain hdr, resin lines, LD piping, GWD hdr

	LOWEST and HIGHEST CANISTER DOSE (Rem)	HIGHEST KW & BURNUP CASK	NUMBER OF CANISTERS	VENDOR	CANISTER TYPE
LAST DRY FUEL STORAGE CAMPAIGN	.357 / 470	22.19kW	3	Nuhoms	24 PHB

Additional information:

Prepared By: B. Meldrum **Date:** 6/12/17

Contact Info: william.meldrum@duke-energy.com

PWR RP/ALARA Association

PLANT STATUS REPORT QUESTIONAIRE – SUMMER 2017

STATION: Prairie Island UTILITY: Xcel Energy

	NSSS	CYCLE #	CORE DUTY (H/L)	ON-LINE DOSE 2016 (Rem)	RWP man-hours	INPO QUARTILE	ONLINE PCE'S 2016
UNIT 1	2LW	30	high	3.467			2
UNIT 2	2LW	29	high	4.764			2
UNIT 3							

	LAST REFUEL OUTAGE EXPOSURE ESTIMATE / ACTUAL	DURATION ESTIMATE / ACTUAL	WEIGHT OF LEAD INSTALLED	PCE's
UNIT 1	42/39.8	34/36		9
UNIT 2				
UNIT 3				

	Yes	No	STEAM GENERATORS REPLACED	RX HEAD REPLACED
ZINC:_____ppb YEAR______	☐	☑	UNIT 1: Y ■ date 2005 N ☐	Y☐ date N ☐
ULTRASONIC FUEL CLEANING	☐	☑	UNIT 2: Y ■ date 2013 N ☐	Y☐ date N ☐
REDUCED INVENTORY SHUTDOWN CHEMISTRY	☐	☑	UNIT 3: Y ☐ date N ☐	Y☐ date N ☐

SPECIALTY RESIN ■ TYPE OF RESIN: PRC-01	USED DURING: S/D CLEANUP ☐ ONLINE
RCS FILTRATION MICRON SIZE: ON-LINE:	DURING SHUTDOWN CLEANUP:

CONSTANT MODIFIED pH	YES	NO	IF YES, RANGE:
PERM. SCAFFOLD	YES	NO	LOCATION:
PERM. SHIELDING	YES	NO	LOCATION:

	LOWEST and HIGHEST CANISTER DOSE (Rem)	HIGHEST KW & BURNUP CASK	NUMBER OF CANISTERS	VENDOR	CANISTER TYPE
LAST DRY FUEL STORAGE CAMPAIGN	.339/.422		2	Transnuclear	TN-40HT

Additional information:

Prepared By: Dave Martin **Date:** 6/1/17

Contact Info: david.martin@xenuclear.com

PWR RP/ALARA Association

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PLANT STATUS REPORT QUESTIONAIRE – SUMMER 2017

STATION: Salem UTILITY: PSEG

	NSSS	CYCLE #	CORE DUTY (H/L)	ON-LINE DOSE 2016 (Rem)	RWP man-hours	INPO QUARTILE	ONLINE PCE'S 2016
UNIT 1		24		1.385	64,640	3	4
UNIT 2		22		2.355**	48,528	1	1
UNIT 3	N/A	N/A	N/A	N/A	N/A	N/A	N/A

	LAST REFUEL OUTAGE EXPOSURE ESTIMATE / ACTUAL	DURATION ESTIMATE / ACTUAL	WEIGHT OF LEAD INSTALLED	PCE's
UNIT 1	95 Rem / 94.111 Rem	~30 days / 108 days	6000	13
UNIT 2	59 Rem / 53.996 Rem	~51 days / 45 days	9800	2
UNIT 3	N/A	N/A	N/A	N/A

	Yes	No	STEAM GENERATORS REPLACED	RX HEAD REPLACED
ZINC: 7-13 **ppb** **YEAR** 2017	☑	☐	**UNIT 1: Y** ■ date 1996 N ☐	**Y** ■ date 2007 **N** ☐
ULTRASONIC FUEL CLEANING	☐	☑	**UNIT 2: Y** ■ date 2008 N ☐	**Y** ■ date 2008 **N** ☐
REDUCED INVENTORY SHUTDOWN CHEMISTRY	☐	☐	**UNIT 3: Y** ☐ date N ☐	**Y** ☐ date **N** ☐

SPECIALTY RESIN	**TYPE OF RESIN:** NO	**USED DURING: S/D CLEANUP** ☐ **ONLINE**
RCS FILTRATION MICRON SIZE: ON-LINE: 0.1		**DURING SHUTDOWN CLEANUP:**

CONSTANT MODIFIED pH	**YES**	**NO**	**IF YES, RANGE:**
PERM. SCAFFOLD	**YES**	**NO**	**LOCATION:**
PERM. SHIELDING	**YES**	**NO**	**LOCATION:** Intermediate Loops, Surge Line

	LOWEST and HIGHEST CANISTER DOSE (Rem)	HIGHEST KW & BURNUP CASK	NUMBER OF CANISTERS	VENDOR	CANISTER TYPE
LAST DRY FUEL STORAGE CAMPAIGN	Highest 0.273 Rem (24.17 kW) Lowest 0.193 Rem (26.77 kW)	26.77 kW	5	Holtec	HS100

Additional information: Baffle Bolt repairs on Unit 1 affected quartile status; Best Dry Cask Canister 134 mr for 25.02 kW; **1.157 Rem was for the DCS Campaign

Prepared By: Linda Doll **Date:** June 7, 2017

Contact Info: 856-339-2057

PWR RP/ALARA Association

PLANT STATUS REPORT QUESTIONAIRE – SUMMER 2017

STATION: Seabrook Station UTILITY: NextEra Energy

	NSSS	CYCLE #	CORE DUTY (H/L)	ON-LINE DOSE 2016 (Rem)	RWP man-hours	INPO QUARTILE	ONLINE PCE'S 2016
UNIT 1	Westinghouse	19	H	2.963	73,225	1	0
UNIT 2							
UNIT 3							

	LAST REFUEL OUTAGE EXPOSURE ESTIMATE / ACTUAL	DURATION ESTIMATE / ACTUAL	WEIGHT OF LEAD INSTALLED	PCE's
UNIT 1	OR18 36.400/33.682	25/30	60,000	1
UNIT 2				
UNIT 3				

	Yes	No	STEAM GENERATORS REPLACED	RX HEAD REPLACED
ZINC:_____ppb YEAR 2015	☐	☐	UNIT 1: Y ☐ date N ■	Y ☐ date N ■
ULTRASONIC FUEL CLEANING	☑	☐	UNIT 2: Y ☐ date N ☐	Y ☐ date N ☐
REDUCED INVENTORY SHUTDOWN CHEMISTRY	☑	☐	UNIT 3: Y ☐ date N ☐	Y ☐ date N ☐

SPECIALTY RESIN ■	TYPE OF RESIN: Macroporus	USED DURING: S/D CLEANUP ■ ONLINE
RCS FILTRATION MICRON SIZE: ON-LINE: 0.1		DURING SHUTDOWN CLEANUP: 1

CONSTANT MODIFIED pH	YES	NO	IF YES, RANGE:
PERM. SCAFFOLD	YES	NO	LOCATION:
PERM. SHIELDING	YES	NO	LOCATION:

	LOWEST and HIGHEST CANISTER DOSE (Rem)	HIGHEST KW & BURNUP CASK	NUMBER OF CANISTERS	VENDOR	CANISTER TYPE
LAST DRY FUEL STORAGE CAMPAIGN	0.132:0.051	30.8kW:48.0GWD/MTU	8	NUHOMS	HD-32PTH

Additional information:

Prepared By: K. Boehl **Date:** 6/16/17

Contact Info: 603-773-7638 Kinsey.Boehl@NEE.com

PWR RP/ALARA Association

PLANT STATUS REPORT QUESTIONAIRE – SUMMER 2017

STATION: Harris Plant UTILITY: Duke Energy

	NSSS	CYCLE #	CORE DUTY (H/L)	ON-LINE DOSE 2016 (Rem)	RWP man-hours	INPO QUARTILE	ONLINE PCE'S 2016
UNIT 1	Westinghouse	20	H	1.024	362,891	2nd/22.3R	2
UNIT 2							
UNIT 3							

	LAST REFUEL OUTAGE EXPOSURE ESTIMATE / ACTUAL	DURATION ESTIMATE / ACTUAL	WEIGHT OF LEAD INSTALLED	PCE's
UNIT 1	53.598/42.851	26/34.3	NA	14
UNIT 2				
UNIT 3				

	Yes	No	STEAM GENERATORS REPLACED	RX HEAD REPLACED
ZINC:_____ppb YEAR______	☐	☑	UNIT 1: Y ■ date 2001 N ☐	Y☐ date N ■
ULTRASONIC FUEL CLEANING	☐	☑	UNIT 2: Y ☐ date N ☐	Y☐ date N☐
REDUCED INVENTORY SHUTDOWN CHEMISTRY	☐	☑	UNIT 3: Y ☐ date N ☐	Y☐ date N ☐

SPECIALTY RESIN ■	TYPE OF RESIN: Macroporous Anion/Silica	USED DURING: S/D CLEANUP ■ ONLINE
RCS FILTRATION MICRON SIZE: ON-LINE: 5		DURING SHUTDOWN CLEANUP: 5

CONSTANT MODIFIED pH	YES ■	NO ☐	IF YES, RANGE: 7.2
PERM. SCAFFOLD	YES ■	NO ☐	LOCATION: In Containment Including large SS storage containers
PERM. SHIELDING	YES ■	NO ☐	LOCATION: In Containment Including large storage containers, none Installed except permanent shielding on letdown line

	LOWEST and HIGHEST CANISTER DOSE (Rem)	HIGHEST KW & BURNUP CASK	NUMBER OF CANISTERS	VENDOR	CANISTER TYPE
LAST DRY FUEL STORAGE CAMPAIGN	NA				

Additional information: The preliminary radiological dose received for the outage was 51.484 rem (ED) compared to a revised dose goal of 48.891 rem (TLD). The original dose goal was 30.0 rem (TLD). The goal was revised based on the discovery of flaws in the reactor head that required repair. The non-head repair ED dose was 30.013 Rem against a goal of 32.095 Rem (ED). The projected TLD final read is expected to be 43.761 based on a 15% correlation factor. The revised final dose projection including the Reactor Head repair was 53.598 Rem with actual dose 42.851 Rem. The Reactor Head repair dose was a result of repairing four nozzles. The Reactor Head dose projection was 20.693 Rem with an actual of 21.471 Rem. During the repair there was approximately 4.5 rem of emergent dose due to equipment reliability issues or crew HU errors. Although there was this much emergent dose, the total dose for head repair per nozzle was less than historical dose for head repair per nozzle.

Prepared By: Mike Seabock **Date:** 6/15/17

Contact Info: mike.seabock@duke-energy.com 919-362-2808

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PLANT STATUS REPORT QUESTIONAIRE – SUMMER 2017

STATION: Three Mile Island UTILITY: Exelon

	NSSS	CYCLE #	CORE DUTY (H/L)	ON-LINE DOSE 2016 (Rem)	RWP man-hours	INPO QUARTILE	ONLINE PCE'S 2016
UNIT 1	B&W	21	L	5.827		4	1
UNIT 2							
UNIT 3							

	LAST REFUEL OUTAGE EXPOSURE ESTIMATE / ACTUAL	DURATION ESTIMATE / ACTUAL	WEIGHT OF LEAD INSTALLED	PCE's
UNIT 1	109 /164.175	24/25	~20k	9
UNIT 2				
UNIT 3				

	Yes	No	STEAM GENERATORS REPLACED	RX HEAD REPLACED
ZINC:_____ppb YEAR______	☑	☐	**UNIT 1:** Y ☑ date N ☐	Y ☑ date N ☐
ULTRASONIC FUEL CLEANING	☐	☑	**UNIT 2:** Y ☐ date N ☐	Y ☐ date N ☐
REDUCED INVENTORY SHUTDOWN CHEMISTRY	☐	☑	**UNIT 3:** Y ☐ date N ☐	Y ☐ date N ☐

SPECIALTY RESIN ☑	**TYPE OF RESIN:** Macroporous	**USED DURING: S/D CLEANUP** ☑ **ONLINE**
RCS FILTRATION MICRON SIZE: ON-LINE: 0.1		**DURING SHUTDOWN CLEANUP:** 3

CONSTANT MODIFIED pH	YES	NO	**IF YES, RANGE:**
PERM. SCAFFOLD	YES	NO	**LOCATION:** T1R22 (2017) Rx Bldg at base of both OTSGs
PERM. SHIELDING	YES	NO	**LOCATION:** Aux/FH Buildings

	LOWEST and HIGHEST CANISTER DOSE (Rem)	HIGHEST KW & BURNUP CASK	NUMBER OF CANISTERS	VENDOR	CANISTER TYPE
LAST DRY FUEL STORAGE CAMPAIGN	NA	NA	NA	NA	NA

Additional information: Additional information: Changing back to Reduced Inventory Shutdown in Fall 2017 (T1R22) from Pressurized Shutdown (RCP running in 2015 T1R21).

Prepared By: Steve Edelman **Date:** 6/12/2017

Contact Info: Steven.Edelman@Exeloncorp.com

PWR RP/ALARA Association

PLANT STATUS REPORT QUESTIONAIRE – SUMMER 2017

STATION: Tukey Point Nuclear UTILITY: Florida Power & Light

	NSSS	CYCLE #	CORE DUTY (H/L)	ON-LINE DOSE 2016 (Rem)	RWP man-hours	INPO QUARTILE	ONLINE PCE'S 2016
UNIT 1	Westinghouse	29	H	1.819	118511	1st	4
UNIT 2	Westinghouse	29	H	3.353	118511	4th	7
UNIT 3							

	LAST REFUEL OUTAGE EXPOSURE ESTIMATE / ACTUAL	DURATION ESTIMATE / ACTUAL	WEIGHT OF LEAD INSTALLED	PCE's
UNIT 1	81.000 / 71.335 DAD	28 / 39	12,500 lbs.	31
UNIT 2	83.000 / 71.126 DLR	28 / 31	18,750 lbs.	55
UNIT 3				

	Yes	No	STEAM GENERATORS REPLACED	RX HEAD REPLACED
ZINC:_____ppb YEAR______	☐	☑	UNIT 1: Y ■ date 80 N ☐	Y ■ date 04 N ☐
ULTRASONIC FUEL CLEANING	☑	☐	UNIT 2: Y ■ date 81 N ☐	Y ■ date 05 N ☐
REDUCED INVENTORY SHUTDOWN CHEMISTRY	☑	☐	UNIT 3: Y ☐ date N ☐	Y ☐ date N ☐

SPECIALTY RESIN ■ TYPE OF RESIN: low chloride resin	USED DURING: S/D CLEANUP ■ ONLINE
RCS FILTRATION MICRON SIZE: ON-LINE: 0.1 micron	DURING SHUTDOWN CLEANUP: Yes

CONSTANT MODIFIED pH	YES ■	NO ☐	IF YES, RANGE: 7.15 - 7.25
PERM. SCAFFOLD Frames/Platforms	YES ■	NO ☐	LOCATION: Unit 3&4 RCP Cubicles / Under Rx in Rx Sump
PERM. SHIELDING	YES ☐	NO ■	LOCATION:

	LOWEST and HIGHEST CANISTER DOSE (Rem)	HIGHEST KW & BURNUP CASK	NUMBER OF CANISTERS	VENDOR	CANISTER TYPE
LAST DRY FUEL STORAGE CAMPAIGN	32 mRem / 613 mRem	29	18	Transnulcear	NUHOMS TN32PT

Additional information: Extended Power Up-rate occurred in 2011-2012.

Prepared By: Duane Hutchinson **Date:** 6/16/17

Contact Info: duane.hutchinson@fpl.com 305.878.0447

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PLANT STATUS REPORT QUESTIONAIRE – SUMMER 2017

STATION: Southern Nuclear Company UTILITY: Vogtle Units 1 & 2

	NSSS	CYCLE #	CORE DUTY (H/L)	ON-LINE DOSE 2016 (Rem)	RWP man-hours	INPO QUARTILE	ONLINE PCE'S 2016
UNIT 1	Westinghouse 4-loop	21	H	3.278 Rem	62,421.065	N/A	0
UNIT 2	Westinghouse 4-loop	19	H	3.144 Rem	67,519.565	N/A	1
UNIT 3	N/A	N/A	N/A	N/A	N/A	N/A	N/A

	LAST REFUEL OUTAGE EXPOSURE ESTIMATE / ACTUAL	DURATION ESTIMATE / ACTUAL	WEIGHT OF LEAD INSTALLED	PCE's
UNIT 1	46 Rem (Original Goal) / 56.165 Rem (ED)	22 days 1 hour / 23 days 14 hours	Approx. 51,573 lbs.	6
UNIT 2	50.692 Rem (Original Goal) / 60.243 Rem (ED)	23 days 10 hours / 22 days 1 hour	Approx. 34,953 lbs.	6
UNIT 3	N/A	N/A	N/A	N/A

	Yes	No	STEAM GENERATORS REPLACED	RX HEAD REPLACED
ZINC: 5-20 ppb YEAR Since Aug 2004	☑	☐	UNIT 1: Y ☐ date N/A N ■	Y ☐ date N/A N ■
ULTRASONIC FUEL CLEANING	☑	☐	UNIT 2: Y ☐ date N/A N ■	Y ☐ date N/A N ■
REDUCED INVENTORY SHUTDOWN CHEMISTRY	☑	☐	UNIT 3: Y ☐ date N/A N ☐	Y ☐ date N/A N ☐

SPECIALTY RESIN ■	TYPE OF RESIN: Purolite Macroporous	USED DURING: S/D CLEANUP ■ ONLINE
RCS FILTRATION MICRON SIZE: ON-LINE: 1.0 then 0.05		DURING SHUTDOWN CLEANUP: 2.0

CONSTANT MODIFIED pH	YES ■	NO ☐	IF YES, RANGE: Elevated modified pH of 7.2 to 7.4
PERM. SCAFFOLD	YES ■	NO ☐	LOCATION: Letdown flow orifice, cavity drain mod
PERM. SHIELDING	YES ☐	NO ■	LOCATION: N/A

	LOWEST and HIGHEST CANISTER DOSE (Rem)	HIGHEST KW & BURNUP CASK	NUMBER OF CANISTERS	VENDOR	CANISTER TYPE
LAST DRY FUEL STORAGE CAMPAIGN	97.9 mrem / 206.3 mrem	19.53 kw	10	Holtec	M-32

Additional information: During U1 outage, UT results on Loop 4 SI line showed axial cracks located on the pipe downstream of the SI to RCS pipe nozzle. A weld overlay was performed resulting in 6.1 Rem of additional dose to the outage.

Prepared By: Abby Fields / Michelle Wil **Date:** 05/31/17

Contact Info: miwillia@southernco.com

PWR RP/ALARA Association

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PLANT STATUS REPORT QUESTIONAIRE – SUMMER 2017

STATION: Wolf Creek UTILITY: Wolf creek

	NSSS	CYCLE #	CORE DUTY (H/L)	ON-LINE DOSE 2016 (Rem)	RWP man-hours	INPO QUARTILE	ONLINE PCE'S 2016
UNIT 1	Westinghouse	22		4.442		4	0
UNIT 2							
UNIT 3							

	LAST REFUEL OUTAGE EXPOSURE ESTIMATE / ACTUAL	DURATION ESTIMATE / ACTUAL	WEIGHT OF LEAD INSTALLED	PCE's
UNIT 1	104/93.276	55/65	40000 lbs	2
UNIT 2				
UNIT 3				

	Yes	No	STEAM GENERATORS REPLACED	RX HEAD REPLACED
ZINC: ____ppb YEAR______	☐	☑	UNIT 1: Y ☐ date N ■	Y ☐ date N ■
ULTRASONIC FUEL CLEANING	☐	☑	UNIT 2: Y ☐ date N ☐	Y ☐ date N ☐
REDUCED INVENTORY SHUTDOWN CHEMISTRY	☐	☑	UNIT 3: Y ☐ date N ☐	Y ☐ date N ☐

SPECIALTY RESIN ■	TYPE OF RESIN: PRC01M	USED DURING: S/D CLEANUP ■ ONLINE ☐
RCS FILTRATION MICRON SIZE: ON-LINE:		DURING SHUTDOWN CLEANUP:

CONSTANT MODIFIED pH	YES ☐	NO ■	IF YES, RANGE:
PERM. SCAFFOLD	YES ☐	NO ■	LOCATION:
PERM. SHIELDING	YES ■	NO ☐	LOCATION: Letdown HX

	LOWEST and HIGHEST CANISTER DOSE (Rem)	HIGHEST KW & BURNUP CASK	NUMBER OF CANISTERS	VENDOR	CANISTER TYPE
LAST DRY FUEL STORAGE CAMPAIGN	N\A				

Additional information: Our last outage, we had a CRDM leak that forced us to shutdown early and accounted for an additional 15 Rem of exposure

Prepared By: John Cuffe **Date:** 6/13/2017

Contact Info: jocuffe@wcnoc.com

HIGH INTEREST TOPIC AND QUESTIONNAIRE

PWR ALARA Association   Charleston, SC   June 21-23, 2017

Topic:

Contact (Name)	Plant	NSSS	Comments
	Ginna	2LW	
	Kewaunee	2LW	
	Point Beach 1,2	2LW	
	Prairie Island 1,2	2LW	
	Ringhals 2,3,4	2LW 3LW	
	Beaver Valley 1,2	3LW	
	Farley 1,2	3LW	
	Harris	3LW	
	North Anna 1,2	3LW	
	Robinson	3LW	
	Surry 1,2	3LW	
	Turkey Point 1,2	3LW	
	VC Summer	3LW	
	Braidwood 1,2	4LW	
	Byron 1,2	4LW	
	Callaway	4LW	
	Catawba 1,2	4LW	
	Comanche Peak 1,2	4LW	
	Cook 1,2	4LW	
	Diablo Canyon 1,2	4LW	
	Indian Point 2,3	4LW	
	McGuire 1,2	4LW	
	Salem 1,2	4LW	

Return completed form to the Committee Secretary prior to the end of the meeting so that it may be included in the meeting report.

HIGH INTEREST TOPIC AND QUESTIONNAIRE

PWR ALARA Association   Charleston, SC   June 21-23, 2017

Topic:

Contact (Name)	Plant	NSSS	Comments
	Seabrook	4LW	
	Sequoyah 1,2	4LW	
	Sizewell B	4LW	
	South Texas 1,2	4LW	
	Vogtle 1,2	4LW	
	Watts Bar	4LW	
	Wolf Creek	4LW	
	Millstone 3,2	4LW, CE	
	Calvert Cliffs	CE	
	Ft. Calhoun	CE	
	Palisades	CE	
	Palo Verde 1,2,3	CE	
	San Onofre 2,3	CE	
	St.Lucie 1,2	CE	
	Waterford	CE	
	ANO 2,1	CE, B&W	
	Crystal River	B&W	
	Davis Besse	B&W	
	Oconee 1,2,3	B&W	
	TMI	B&W	
	Areva		
	EDF		
	Westing-house		

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