



Radiation Management Program Update

Phung Tran

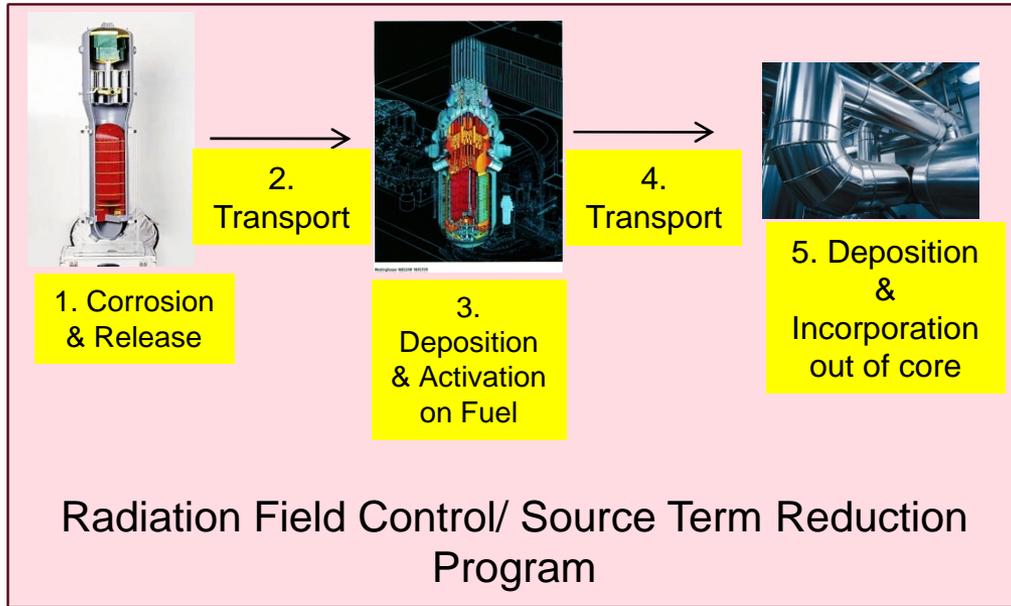
Senior Project Manager & Lead for RM Program

2012 International ISOE ALARA Symposium

January 9-11, 2012

Radiation Management Program Strategy

Overall strategy supports RP2020 goals!

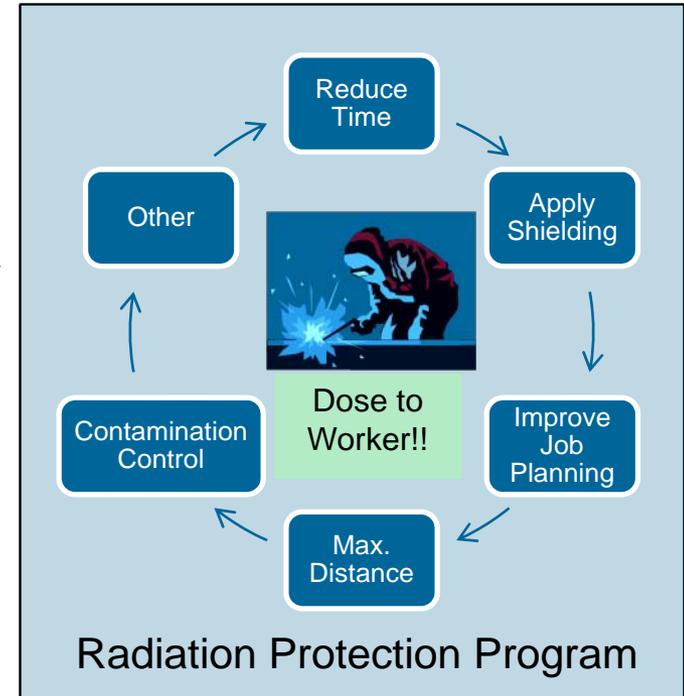


Highly coordinated with chemistry, fuel, and materials!!

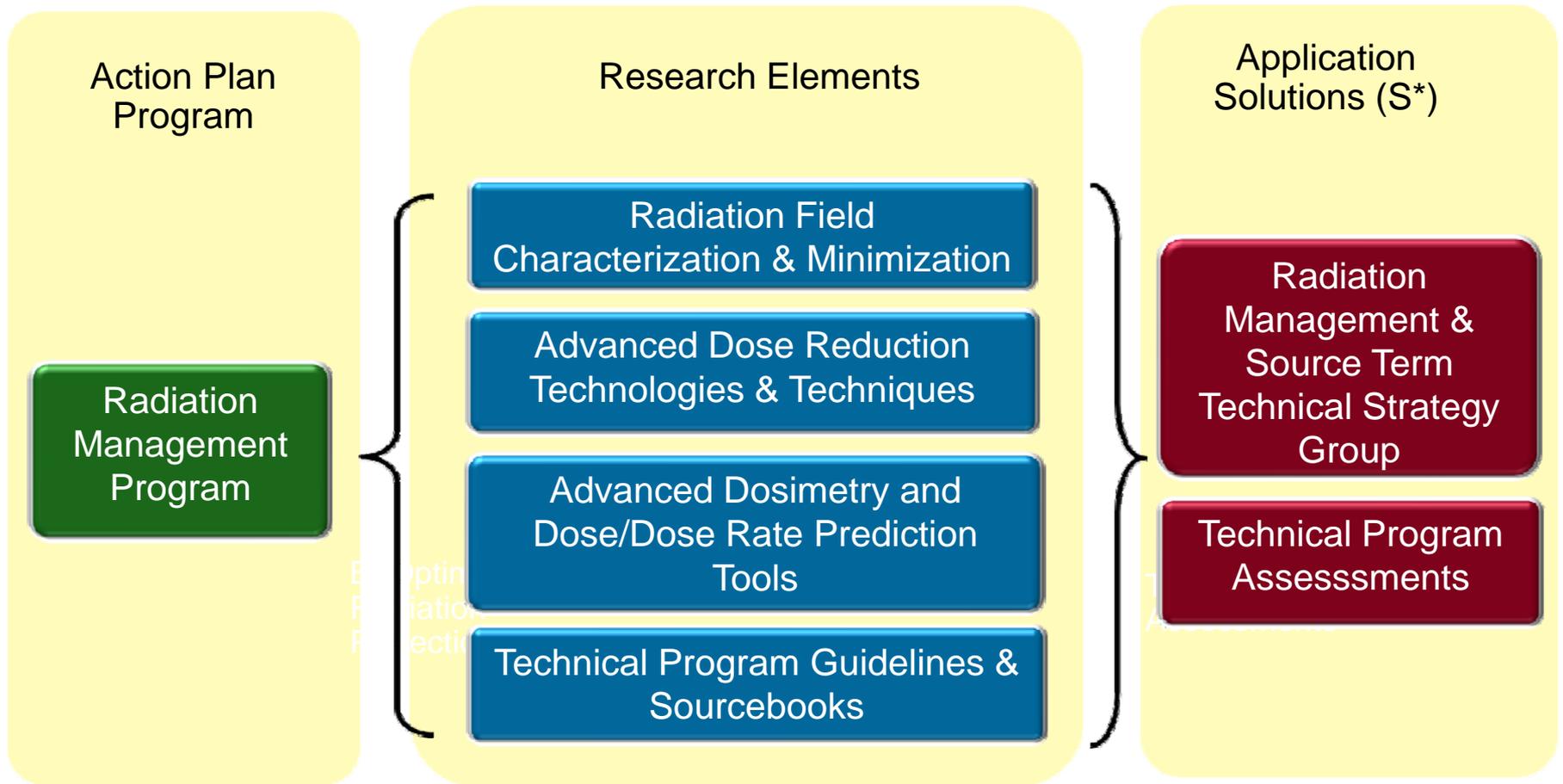
Additional Source Term Reduction Projects Sponsored in the Chemistry Program

(see Dan Wells' presentations)

Reduce Radiation Fields and
Reduce Contamination



Radiation Management Program Elements



* Self Directed Allocations (EPRI Member Dues Are Allocated to Specific Projects Based on Utility Interest)

Radiation Management Program Drivers and Goals

- Regulatory Drivers (NRC):
 - 10 CFR 20 and 10 CFR 50, Appendix I Update to Align with ICRP 103 Recommendations

Most Significant Change May Be in the Possible Reduction of Individual Dose Limits

Increased emphasis on managing individual dose!!

- Industry Performance Drivers (INPO):
 - New INPO cumulative radiation exposure (CRE) dose goals (cycle median) by the end of 2015:
 - PWR: 55 person-Rem
 - BWR: 110 person-Rem
 - Eliminate/Reduce High Radiation Areas
 - Reduce Contaminated Areas
 - Reduce Personal Contamination Events (PCEs)

Radiation Protection Focus



Reduce Time Spent in Field

- Improve Job Planning: 3D ALARA Planning Prototype (2010-2013)
- Improve Worker Efficiency: Refueling Dose Reduction (2011-2012)



Maximize Distance

- Advancing Remote Monitoring & Location Tracking (2011+)
- Robotics for Cavity Decontamination (w/EdF)- 2012+



Improved Shielding

- Advanced Temporary Shielding (2011 demo at Calvert Cliffs)
- Permanent Shielding



More Accurate Dosimetry

- EDE (external) Using Latest Science from ICRP-103 (2011+)



Radiation Protection Program Optimization

- Alpha (2012-2013), PCE, RAM Control Guidelines
- RMT Field Implementation Guide, Scaffolding Guide

Deliverables from 2011 R&D

1023020

- PWR Standard Radiation Monitoring Program Summary, 6/2011

1023019

- Technical Considerations for NRC/National Academy Proposed Study of Cancer Risks in Populations Living near Nuclear Facilities- EXECUTIVE SUMMARY, 6/2011

1024677

- Technical Considerations for the NRC/ NAS Proposed Study of Cancer Risks in Populations Living Near Nuclear Facilities– FINAL REPORT, 11/2011

1023018

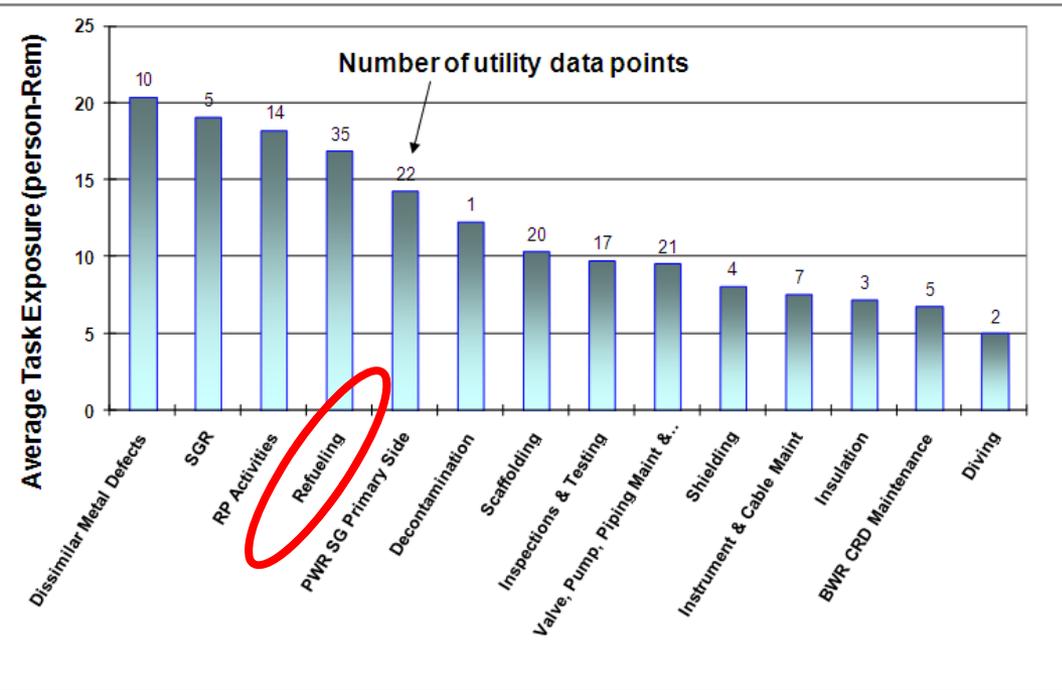
- Field Testing of Location Tracking Technologies For Radiation Management- Interim Report, 12/2011

TBD

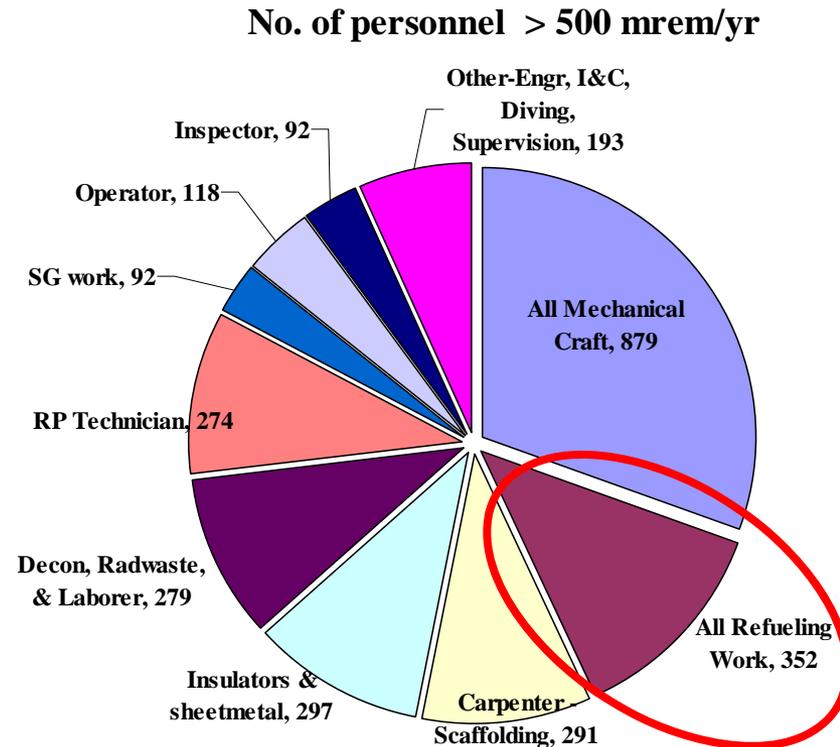
- Effects of Particulate on Shutdown Dose Rates, 03/12

Evaluation of High Dose Jobs and High Dose Workers in Preparation for 2 Rem Limit (1021100)

Average Task Exposure for High Collective Dose Tasks



Number of Individuals Exceeding 500 mrem/yr by Trade



Refueling is a major repetitive task that merits more focused industry dose reduction efforts.

Refueling Dose Reduction Project (2011-2012)

- Identify task-specific radiation fields and sources
 - Capture and analyze detailed site refueling task data from Case Study Sites (**Comanche Peak, Dresden**)
 - Specific activities (time-motion), radiation fields, radiation sources and reactor-specific challenges
- Identify and document opportunities for improvement (via alternate technique or technology)
 - Using information from host site and OE from Work Group
 - Work Group: chemistry, RP, ALARA, outage management, refuel vendor

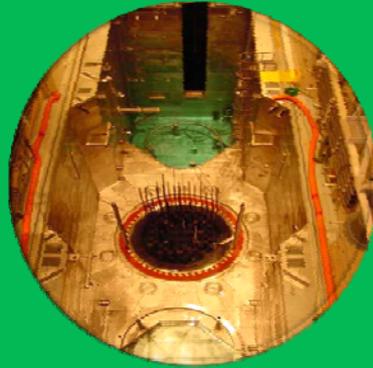
**Develop Model Process for Minimizing Worker Dose from
from Refueling Specific Activities**

Analysis of PWR Refueling Case Study: Sources of Worker Exposure and Worker Inefficiencies



Refueling High Dose Subtasks

- Rx Vessel Disassembly
- Rx Head Set
- Rx Vessel Reassembly
- Cavity Decon



Sources of Worker Exposure for High Dose Subtasks

- Activity Traps in Reactor Head and Reactor Internals
- Activity and Debris in Transfer Canal
- Cavity Water (general impact to refueling)



Worker Inefficiencies

- Visual inspections of head set could be performed with remote/alternate alignment technology
- Use of multiple workers for stud removal
- Shielding & insulation removal/installation manually intensive
- Cavity decontamination manually intensive

High Dose Tasks, Sources, and Worker Inefficiencies May Vary by Plant and by Outage

Efficient Component Removal and Installation

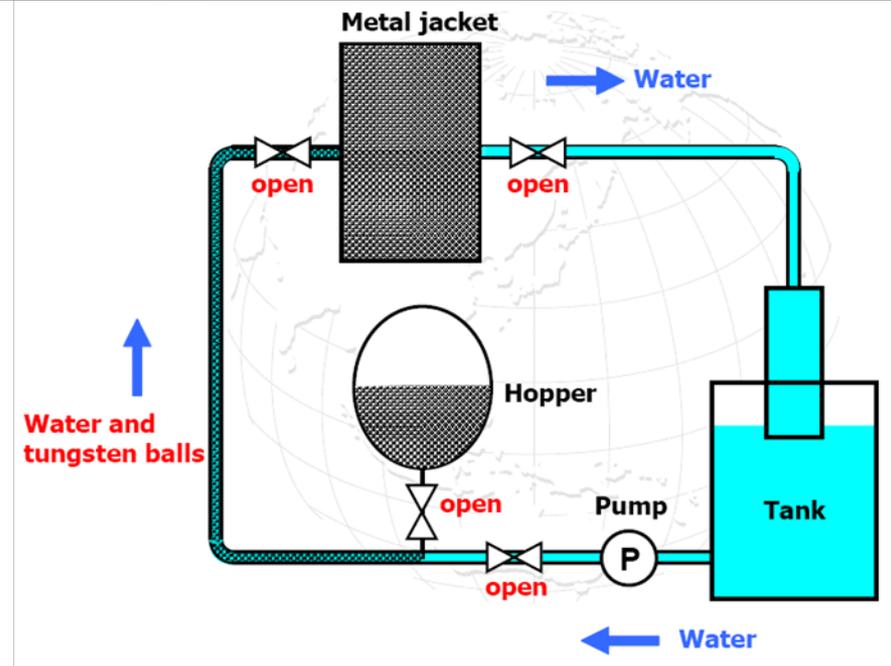
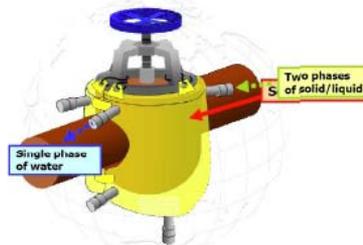
- ***Component Removal and Installation: Hydraulic Nuts (HydraNuts) Bolt Tensioning System***
 - Potential benefits from application of this technology for PWR vessel head work include:
 - **Reduction in critical path time** for both removal and reinstallation (e.g. full tension within 2 hours of the last stud being fitted thereby reducing time in radiation field)
 - **Reduction in the # of personnel** required to complete the closure
 - **Return on investment can be achieved in 2 outages**
 - Currently working with Comanche Peak to get more quantitative benefits of their reactor head experience with this technology



Advanced Shielding Applications

Remote Tungsten Charging System (Pilot at Calvert Cliffs)

- Lead-free shielding system
- Uses water to remotely charge application-specific forms (jackets) with tungsten balls
- Light-weight jackets
 - Installed on component
 - Custom designs for individual applications
 - Standard geometries (e.g., walls)
- Designed for easy removal and installation with a minimal number of parts



Items to Address:

FME – tungsten control

Leaving canister /metal jacket in target location at power

Dose for support and canister installation vs. traditional temporary applications

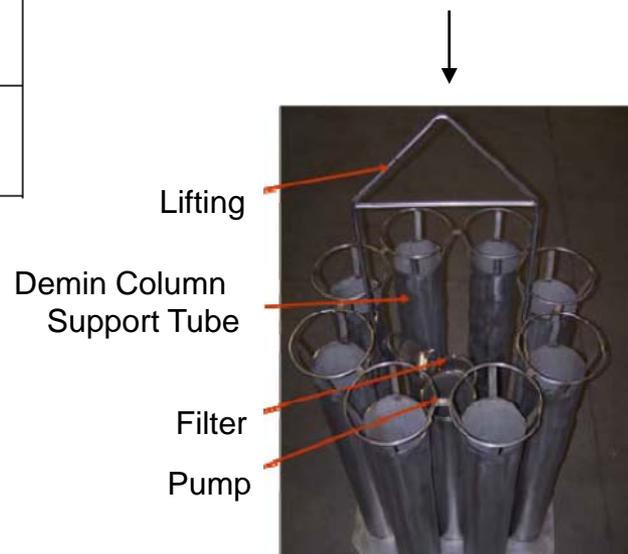
Underwater Demineralizer Systems for Reactor Cavity

- **Activity Removal from Liquid:**
 - **Underwater Demineralizer System** (used in BWRs, PWR design)

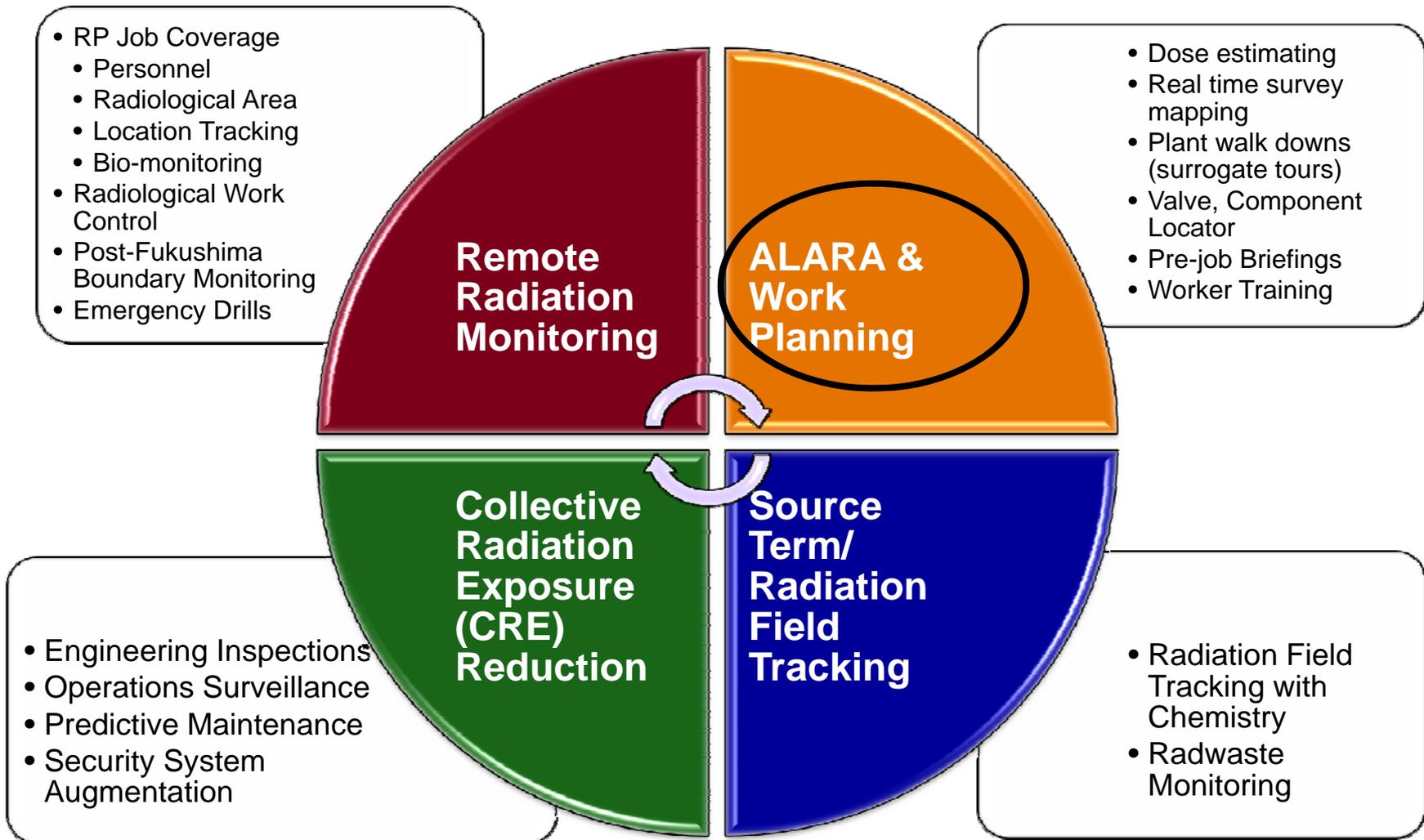
Activity	Estimated EDR mR/Hr	Estimated RWP Hours	Estimated Exposure ManRem	Actual EDR mR/Hr	Actual RWP Hours	Actual Exposure ManRem
Reactor Disassembly / Assembly	2.5	4750	11.875	1.74	6861	11.91
Rx Cavity Drain-Down Decontamination	16	150	2.4	11.1	35	0.394

Results of underwater demineralizer use at Nine Mile Point to reduce soluble activity in reactor cavity

Tri Nuclear System designed for Seabrook



Remote Monitoring Technology Usage



3D ALARA Work Planning Prototype

Phase 1: EPRI Dose Calc.
Module (alpha)

2010

Phase 2: Integration with
Vendor Simulation Tools

2011

Phase 3: Field Demo at
NPP

2012

Integrate w/Location
Tracking System

...

Objective:

- Work with FIATECH and 3D Technology Providers to develop the **next generation** ALARA and work planning tool.

Description:

- Leverage and adapt advanced 3D technologies from other industries to **enhance work planning** and provide more **accurate dose estimation**.

Results to Date:

- Beta version of EPRI dose rate algorithm, 3 vendor prototypes have been developed using EPRI algorithm, pilot test using Kewaunee data (ongoing)

Benefits:

- **Partially automate dose estimation process** and allows for quick updates to dose estimates based on changing conditions
- **Develop “What-if” scenarios** to identify radiation field reduction opportunities and optimize work activities to reduce dose

NRC/NAS Cancer Study in Populations Living Around Nuclear Facilities

NAS Phase 1 Committee:

- ✓ 19 Expert Committee Formed in January 2011
- ✓ Held Public Meetings in Washington D.C., Chicago, Atlanta, and Los Angeles to Collect Data and Stakeholder Input
- ❑ Phase 1 Report Scheduled to be Publicly Released February 2012- 60 Day Commenting Period
- ❑ NRC to Review Stakeholder Comments and NAS Report to Determine Next Steps

EPRI Actions:

- ✓ Formed Expert Committee in November 2010
- ✓ Published Executive Summary of study recommendations in June 2011
- ✓ Presented recommendations to NAS July 2011 (Los Angeles)
- ✓ Published Final Report of recommendations November 2011
- ❑ Formal comments on Phase 1 Report
- ❑ Submit recommendations to Journal for publication

Summary of Key Considerations

- Epidemiological studies based on small dose relative to annual background and medical exposures will increase the difficulty of providing a definitive answer on cancer risks in population living near nuclear facilities.
- Close coordination of dosimetric efforts with epidemiologic efforts are needed:
 - Estimate actual dose instead of using surrogates (e.g. distance)
 - Public dose estimates reported for regulatory compliance often do not represent actual dose to any real population; instead, Committee should develop a comprehensive and consistent exposure assessment methodology for dose evaluation
- Plan and conduct an analytical study (perhaps a case-control design) regarding childhood cancer with special attention given to leukemia and non-Hodgkins lymphoma in children under age 5.
- Develop risk communication plan during Phase 1 to explain study challenges and expectations for how results will be used.

EPRI Low Dose Committee (expanded)

Principal Investigators:

- **Antone Brooks, PhD*** – Washington State University Tri-cities (retired professor), specialist in health effects of internal emitters, former investigator for DOE Low Dose
- **Larry Dauer, PhD** – Memorial Sloan-Kettering Cancer Center, specialist in medical health physics and nuclear power effluents
- **Helen Grogan, PhD*** – Cascade Scientific, Inc, specialist in environmental dosimetry and risk assessment
- **Clark Heath, MD** – Formerly with CDC and ACS, specialist in chronic disease epidemiology
- **David Hoel, PhD*** - Medical University of South Carolina, specialist in epidemiology and risk assessments
- **William Morgan, PhD** – Pacific Northwest Lab, **ICRP Subcommittee 1 Chairman**, specialist in radiation biology
- **William Wendland, P.E.*** – CN Associates (formerly Director of Engineering at American Nuclear Insurers), specialist in nuclear power plant effluents
- **Phung Tran, MHS*** - EPRI Project Manager

***Presented at NAS public meeting**

Low Dose Radiation Risk Workshop

Transfer knowledge of basic scientific advances to radiation protection community inform protective practices and improve communication of risks.

Tentative Topics:

- Basics of Epidemiology and other investigative techniques
- Updated Science on Radiation Health Effects
 - Radiation Biology
 - Radiation Epidemiology
- Discussion of how science informs policy decisions

4th Quarter 2012

Alpha Guideline Update (2012-2013)

EPRI Alpha Guidelines

Major Industry Events

INPO Alpha Session
at RP Workshop

Revise EPRI Alpha
Guidelines

2005-2006

2009-2010

2011

2012-2013

Objective:

- Update Alpha Guidelines to reflect current industry experiences, challenges, and needs

Description:

- Re-evaluate existing guidance
- Update industry standards to include additional guidance:
 - Work planning based on alpha level
 - Standardize collection and analysis of bioassay to support accurate internal dose assessments
 - Include sample of calculations based on updated dosimetry values for international members

Benefits:

- Standardized industry protocol based on sound technical basis, best practices, and industry consensus.

Project Schedule

- Utility Committee Member Nominations Due January 13th
 - Member for each Utility needed
- Webcasts and Meeting Schedule:
 - ❑ January 23rd 2012 @ 10 a.m. Eastern time – Kick off Webcast
 - ❑ April 5th 2012 @ 10 a.m. – Technical Webcast
 - ❑ April 24th & 25th 2012 – 1st Committee Meeting, EPRI office in Charlotte
 - ❑ July 26th 2012 @ 10 a.m. Eastern time– Technical Webcast
 - ❑ August 9th & 10th 2012 – 2nd Committee Meeting, Boston (after NEI RP Forum- coordinating with Ellen)
 - ❑ December 11th 2012 @ 10 a.m. Eastern time – Technical Webcast
 - ❑ February 12th & 13th 2013 – Final (as needed) Committee Meeting

Radiation Management/Source Term Technical Strategy Group – 2011 Scope

✓ Technical Webcasts

- #1: May 26, 2011 (10 AM EST)
- #2: June 9, 2011, (10 AM EST)
- #3: December 2, 2011 (12 PM EST)

✓ Benchmarking Activities and Reports

- Benchmarking of PWR Shutdown Releases
- Scoping Study to Expand SRMP/BRAC
- Begin Industry 5 Year Vision for Remote Monitoring Technology

✓ Workshops

- Shielding and Scaffolding Workshop- July 6-8, 2011 in Charlotte, NC
- Remote Monitoring Technology Workshop, September 13-14, 2011, Waterford
- Source Term Reduction Workshop, Dec. 6-8, 2011, Palo Alto, CA

✓ TSG Collaboration Website

<http://membercenter.epri.com/collaboration/E238454/Default.aspx>

Three Year Members*:
Constellation
DTE
EdF
Exelon
FENOC
KHNP
Luminant
PSEG
Southern
TVA
Xcel

* One assessment at one plant site/unit during three year membership period

One Year Members:
AEP
Eletrobras
OPPD
SCE

Additional New Members in 2012:
Entergy (3 Yr)
Palo Verde (3 Yr)
FPL (1 Yr)

Together...Shaping the Future of Electricity