The Lifecycle of the ODCM During Decommissioning

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Radiation Safety & Control Services, Inc.

NPP Decommissioning's

- Completed or >50%
  - **Saxton**
  - **Big Rock Point**
  - **Trojan**
  - **Ft St Vrain**
  - **Connecticut Yankee**
  - **Maine Yankee**
  - **Yankee Rowe**
  - Humboldt Bay
  - Rancho Seco
  - Zion
  - LaCrosse
  - Fermi 1

Done

- Recent Announcements
  - **Pilgrim**
  - **Oyster Creek**
  - **Fitzpatrick**
  - Vermont Yankee
  - San Onofre
  - Crystal River
  - Kewaunee
  - Many pending decisions

Operating

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The ODCM During D&D

- Effluents
  - Noble Gas
  - I-131
- Monitoring Points
- Alarm Set Points
- Technical Bases
- Risk-Based ODCM

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NPP Decommissioning Phases

Decommissioning Milestones[1]	ODCM Change
A. Cease Operations – Fuel in Reactor	
B. Fuel Transfer from Reactor to Spent Fuel Pool Complete	Phase 1
C. Spent Fuel Island Modifications Complete	
D. Primary System Chemical Decontamination Complete	
E. Reactor Vessel Internals Segmentation and Packaging Complete	
F. Alternate Waste Water Processing Systems Installed	Phase II
G. Independent Spent Fuel Storage Installation (ISFSI) Complete/Start Fuel Transfer to Dry Cask Storage	
H. Fuel Transfer to ISFSI Complete	Phase III
I. Cold and Dark Conditions Established for Commodity Removal	
J. Major Component Removal Complete	
K. Commodity Removals for Building Release Surveys or Demolition Complete	Phase IV
L. Building Remediation for License Termination or Demolition Complete	
M. Building/Structure Demolitions and Underground Commodities Removal Complete	
N. Facility Remediation Complete	
O. Radioactive, Hazardous Demolition Waste Shipments Complete	
P. Final Status Survey and Environmental Closure Complete	Phase V
Q. License Termination Complete (except for ISFSI)	

[1] From EPRI 101922, "Program Change Management During Nuclear Power Plant Decommissioning"

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ODCM Changes and D&D Phases

- Phase 1 - Fuel Transfer from Reactor to Spent Fuel Pool Complete
- Phase II - Alternate Waste Water Processing Systems Installed
- Phase III - Fuel Transfer to ISFSI Complete
- Phase IV - Commodity Removals for Building Release Surveys or Demolition Complete
- Phase V - Final Status Survey and Environmental Closure Complete (only ISFSI remains)

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Phase 1 Changes:
Fuel Transfer to Spent Fuel Pool

- Eliminate operational Iodine and Xenon doses
  - Steam Jet Air Ejector
  - AOG/Stack
  - REMP Impact
  - Equations Terms and Definitions
  - Calibration for Kr-85 v. Xe-133?
- Direct Radiation from N-16 and Other Sources
- Circ Water Pumps terminated. Reduced Dilution for Liquid Discharges

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Phase 1 ODCM Impacts

- ~5 to 10 Technical Support Initiatives
  - Re-Analyze D&D Accident Source Terms
    - Eliminate short lived and low significance nuclides
    - Reduce REMP Monitoring using Pathway Justifications
- Tech Spec Changes
- ~60 to 70 ODCM Changes, i.e.
  - Met Tower Discontinued
    - Average X/Qs & D/Qs?
  - Delete Milk and Iodine REMP Sampling
  - Reduce continuous monitoring instrumentation
  - Kr-85

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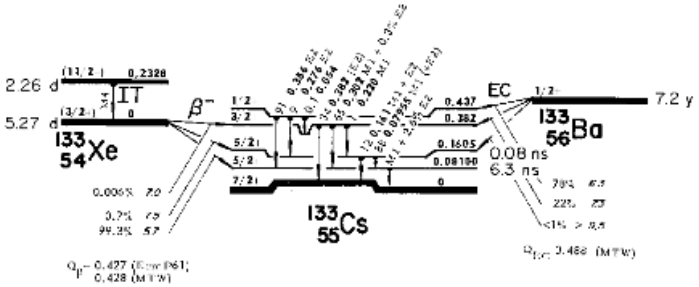
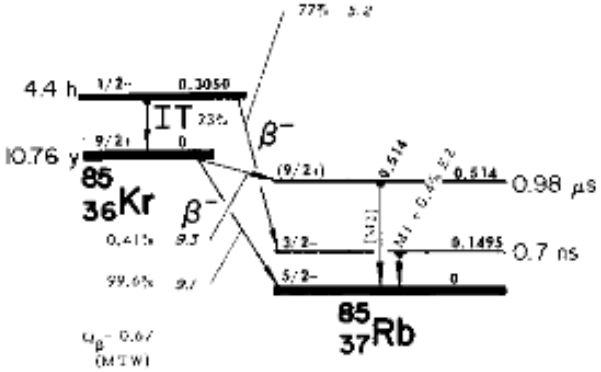
Phase 1 Kr-85 Impacts

- Monitor Efficiency/Re-Calibration
- Setpoint Methods
- Setpoint Examples
- Total Body or Skin?
- Represent 10 to 20 ODCM Changes





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Phase II Changes

Modular Alternate Waste Water Processing Systems

- May be driven by “Cold and Dark”
  - Supports system removals
- Source Terms
  - SFP
  - Reactor Cavity
  - Tank/Torus Inventories
  - Groundwater (Intrusion)
  - Minor “others”
- System Configurations
  - Disposable resin beds
  - Particulate filters
  - Permanent/temporary tanks and pumps

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Phase II ODCM Impacts

- Changes To Reflect New System And Remove Installed Systems
- Dilution Flow Rates
- Dose Calculation Methods
- Setpoint Calculations

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Augmented Water Processing

- Underwater Filtration
  - Reactor Cavity
  - SFP
- Temporary Tanks
  - Limited by activity level based on liquid waste handling incident
- Impact on ODCM

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Phase III Changes

All Fuel Transfer to ISFSI Complete

- Noble Gas (Kr-85) Considerations
- Installed Plant Ventilation Removed
  - Monitors Removed
  - No Elevated Releases
  - Monitored HEPA Discharges to Env.
  - Qualitative Sampling at Openings
    - Possible more sampled locations
    - Dynamically changing?

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Phase III ODCM Impacts

- ~30 to 40 ODCM Changes
  - Delete Noble Gas Limits and Calculations (liq, gas)
  - Abandon Noble Gas Monitoring (Hi, Med, Lo)
  - Evaluate ISFSI Direct Dose
    - Neutron and Gamma Direct Measurements
    - Monte-Carlo Calculations (MCNP)
    - Institute Direct Measurements (TLDs) for ISFSI
  - Remove Met Tower if Not Done in Phase 1
  - Release Only Consider Particulates, H-3 and C-14

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Neg Pres and Gaseous Effluents

- Plant Ventilation Maintained
  - Large Component Removal
  - RCS and Highly Contaminated Component and Piping Removals
- Interior demolition of SSCs
  - Qualitative air sampling at openings
  - Transition to Modular HEPA Discharges to Env provide neg pressure
  - Weekly samples, mixing boxes, pito tubes, shrouded tubes
- Solely Modular HEPAs when Plant Stack removed

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Interior Demo and SSC Removals

- CY RWST Tank Farm In Tent Neg Pressure Provided by Opening to Aux Bld
- Opening qualitative air sample changed out weekly

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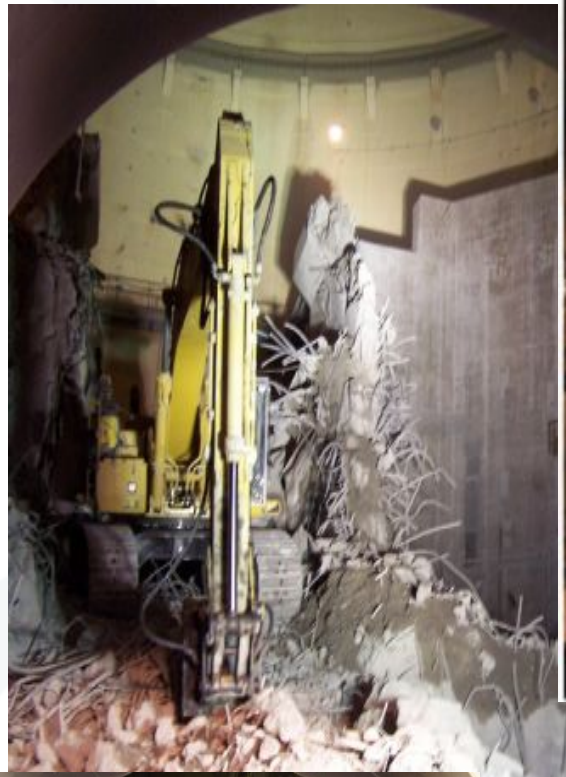
Interior Demolition

- As High Airborne SSCs removed
- Interior demolition occurs removing vent ducts, walls, floors lesser contaminated items
- Negative pressure eff monitoring still required



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High Airborne SSCs During Interior Demo

- Sometimes inaccessible, high contam, high dose rate items are removed as part of interior demo
- Negative Pressure Gas Eff Monitoring Required
- Photo is CY Spent Resin Tank In Tank Farm Tent

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Polar Crane Drop MY

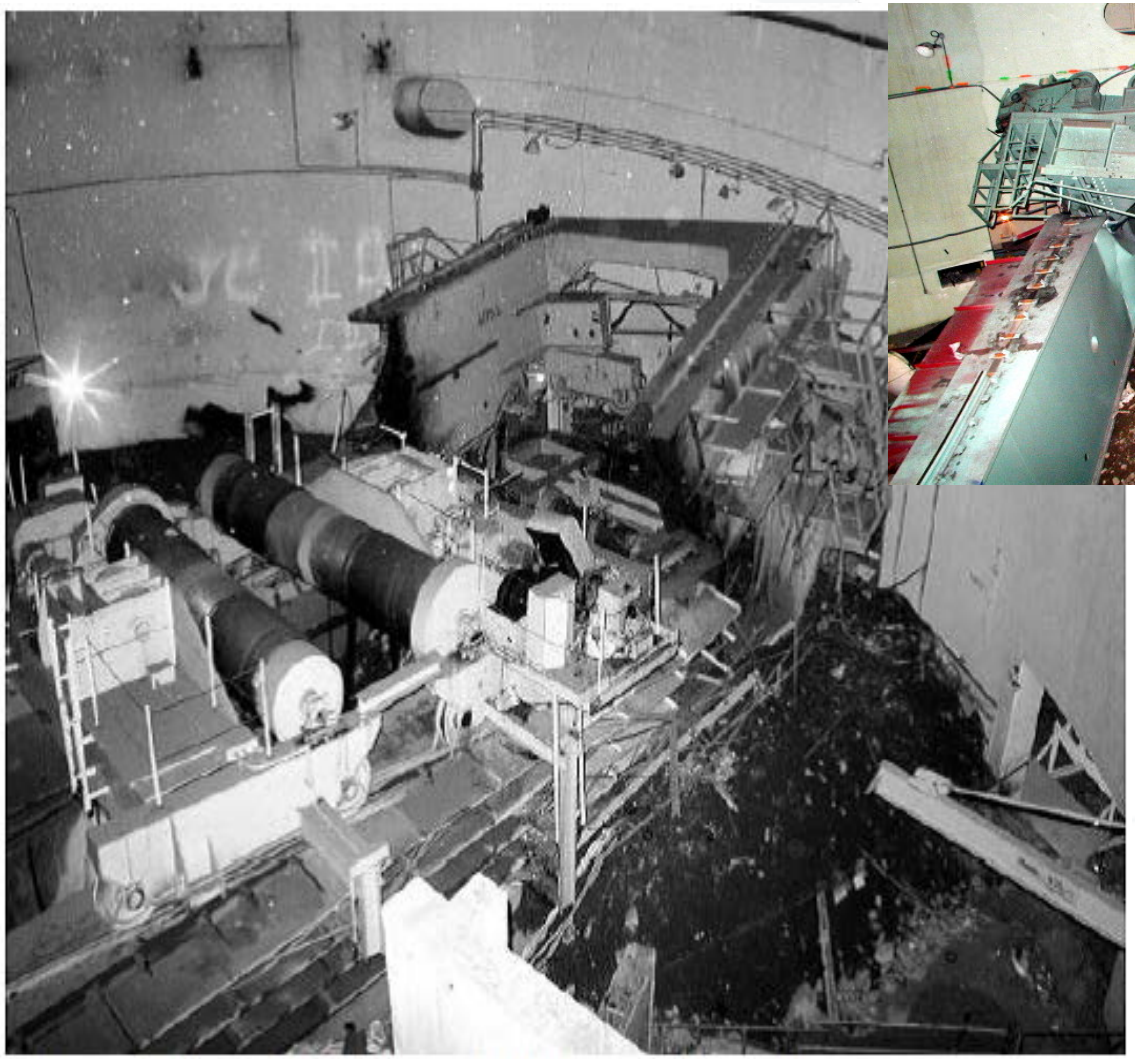

Figure 7-8 Maine Yankee Polar Crane After Explosive Segmentation

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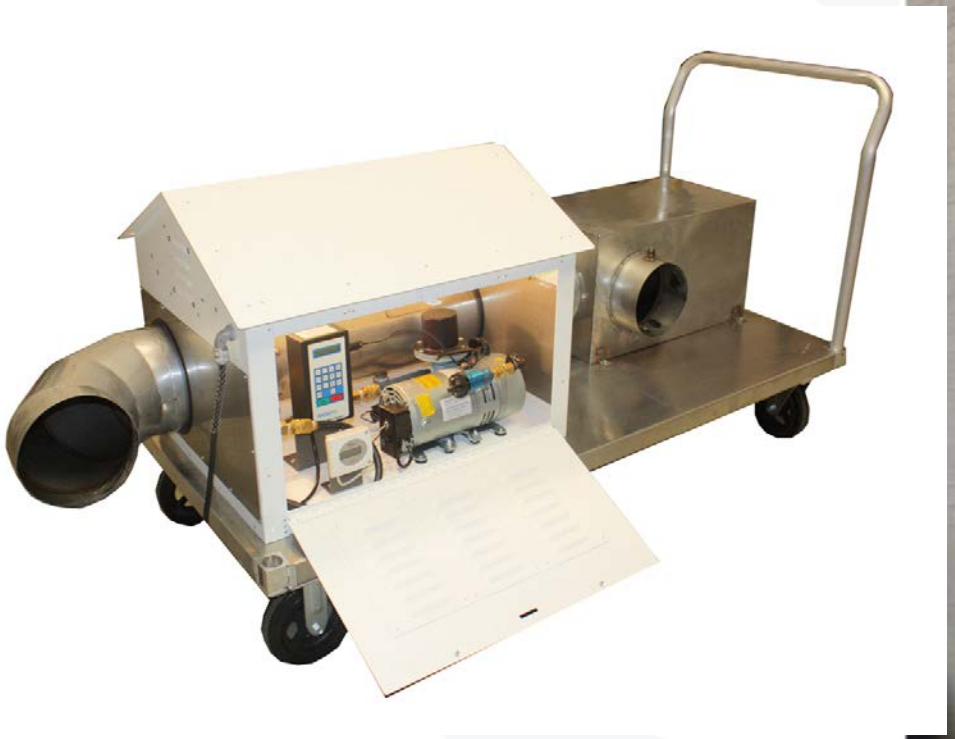
Modular HEPAs and Torits



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Access Openings

- Qualitative Air Samples at Openings
- Conservative ODCM method to estimate releases and offsite doses from positive results

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Phase IV ODCM Changes

Major Component/Commodity Removal Complete for Building Release Surveys or Demolition Complete

- Building Negative Pressures No Longer Needed
- Liquid and Gaseous Monitoring by Grab Samples Only
- Site Boundary Sentinel Air Sampling
- Liquid RW Sampling and Processing
  - Abandoned
  - Replaced by Construction and/or Storm Water processing equipment
    - Groundwater Intrusion

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Open Air Demo Prep

- Interior demo complete
- Survey to Open Air Demo Limits
- Key is to remediate to levels that prevent Contaminated Area controls during open air demo

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Open Air Demo

Figure 7-10 Maine Yankee Containment Ready for Demolition

- **Sentinel Air Samplers at Site Boundary**
- **Negative Pressure not required due to minor source terms**

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Phase IV Changes

- Technical Support Initiatives
  - Effluent Pathways
  - Temp Ventilation
  - Sentinel Air Sampling
  - Eliminate
    - Continuous Liquid Eff. Monitoring
    - Vegetation Sampling
- ~20 to 30 ODCM Changes
  - Mostly Reductions
    - Effluent Monitoring
    - Environmental Sampling

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Phase V

Final Status Survey and Environmental Closure Complete

- Waste Shipments Complete
- Site Boundaries Re-Defined (ISFSI Only)
- Study/Monitoring to show compliance with 40CFR190 Limits
- Only Direct Monitoring Performed
  - Close to ISFSI “footprint”
- ~25 to 30 Changes

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Conclusions

- ODCM Change "Roadmap" Can Be Pre-Established for D&D
- Each Phase Change May Require 4 to 6 Months to Prepare and Implement
- Other Documents/Evaluations
  - USAR or DSAR
  - 50.59 Safety Evaluations
  - Tech Spec Changes
  - Technical Support Documents
- Changes Follow Risk Reductions
  - Source Terms
  - Energy of Release

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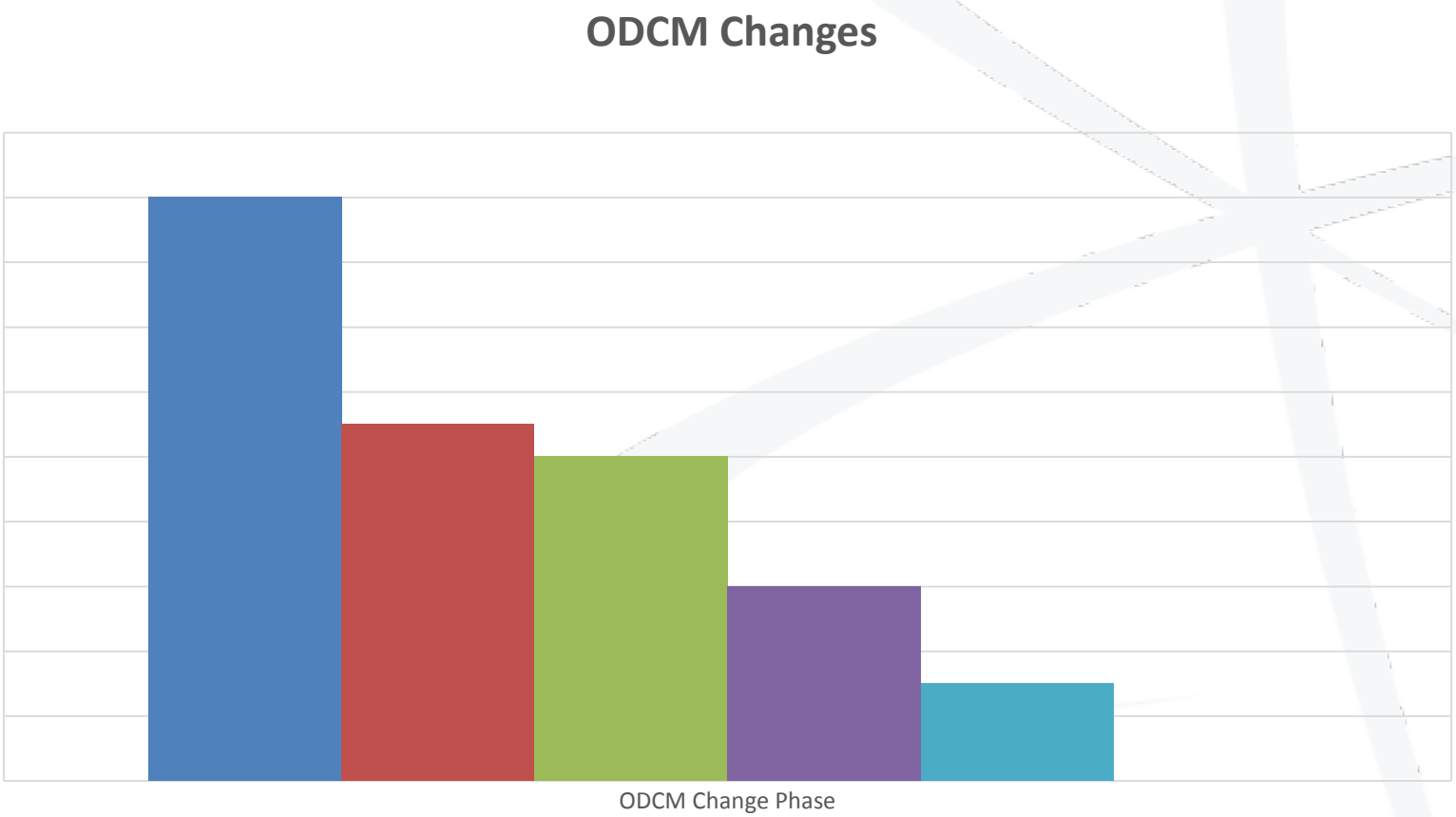
Questions?



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