



## IAEA TECDOC 1954, *Occupational Radiation Protection During the Decommissioning of Nuclear Installations*



Overview of ORISE Independent Verification



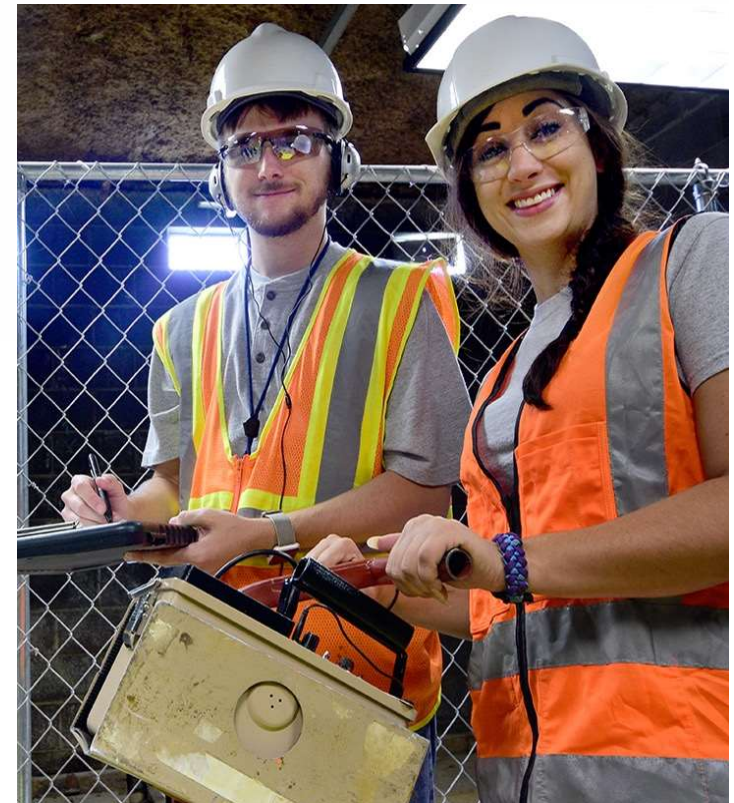
# ORISE Involvement in Decommissioning

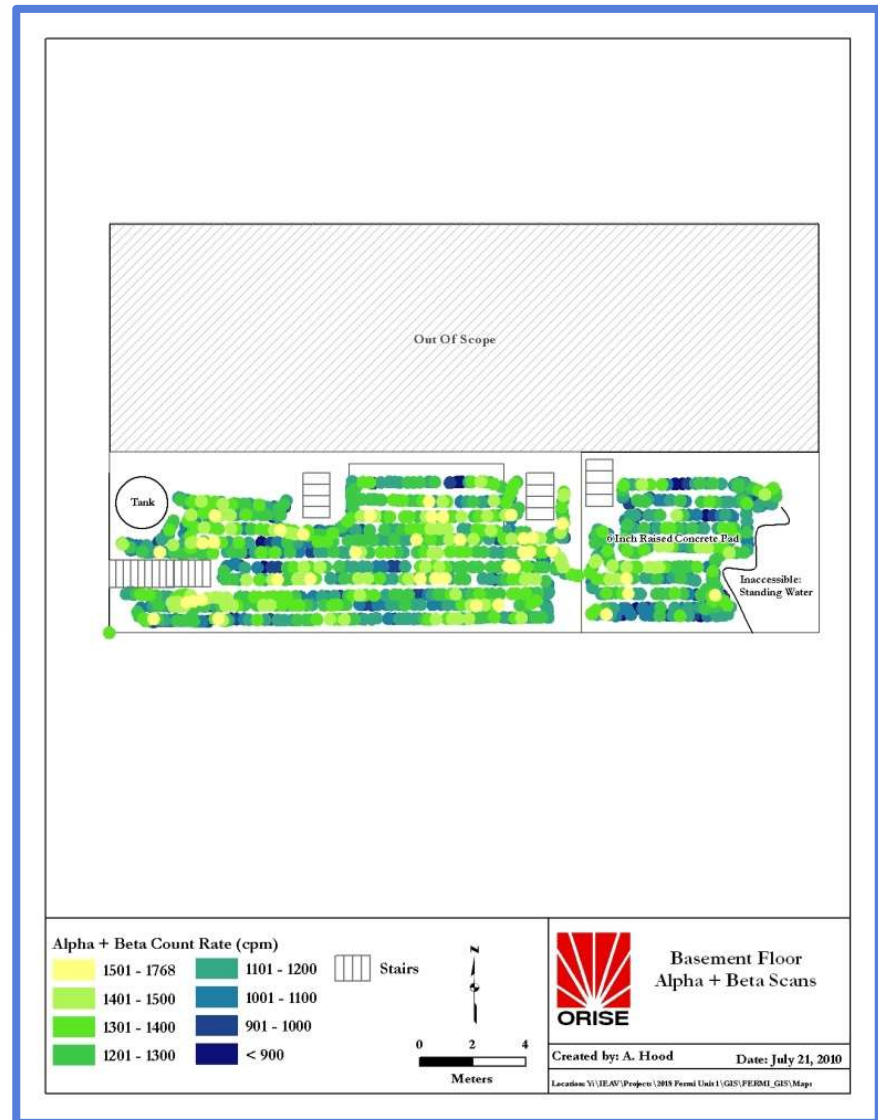
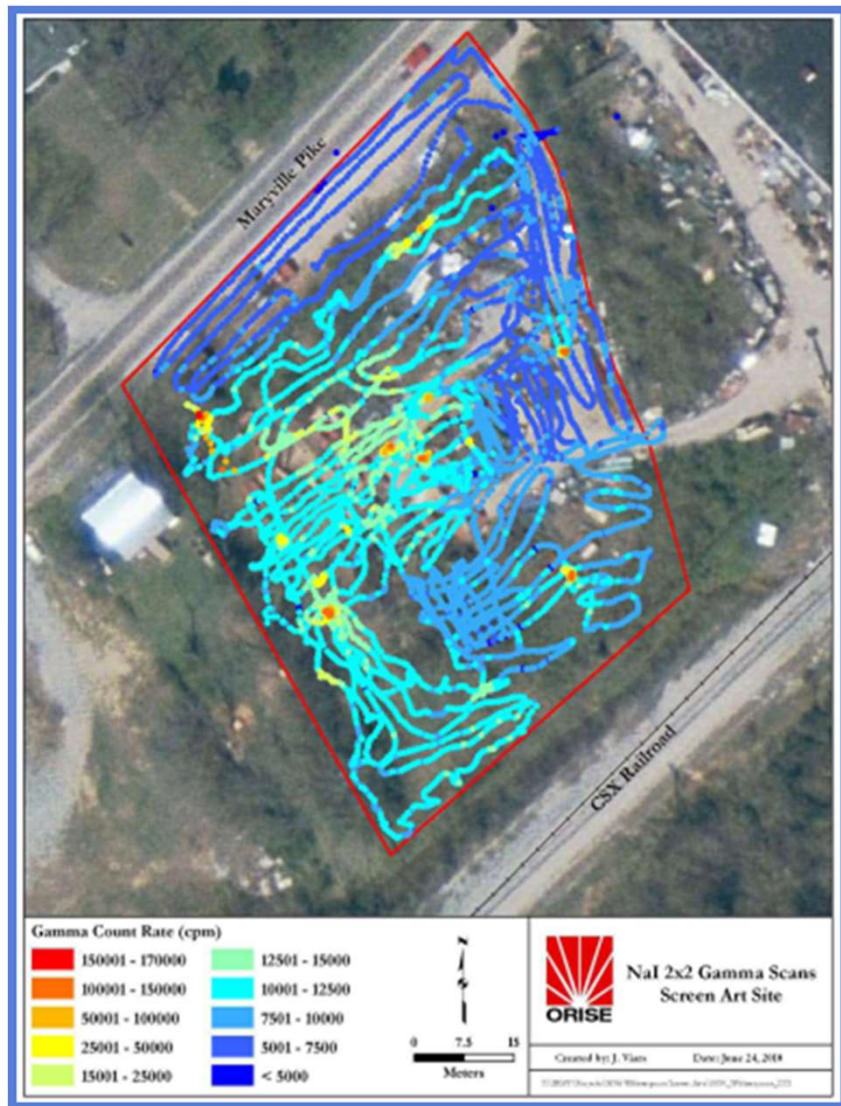
- ORISE serves as the independent verification contractor for the US Department of Energy, the US Nuclear Regulatory Commission, and other federal and state agencies
- ORISE does not perform remediation activities, nor has relationships with contractors performing cleanup
- Provide independent, unbiased assessment and verification of site conditions to inform the regulatory authority of whether the site meets the established release criteria

# Independent Environmental Assessment and Verification

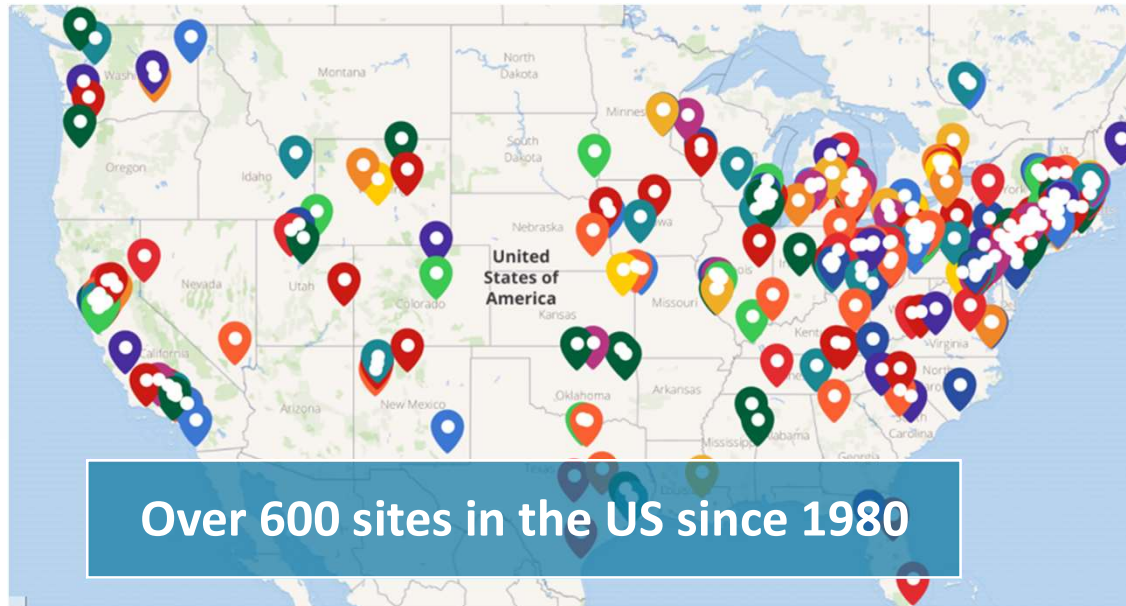
Providing DOE, NRC and other federal and state regulators with expertise through:

- MARSSIM and MARSAME methodologies
- Data Quality Objectives (DQO) process
- Statistical sampling and analysis plans
- Site surveys with GPS-enabled data collection
- Radiological Environmental and Analytical Laboratory (REAL)
- Defensible documentation





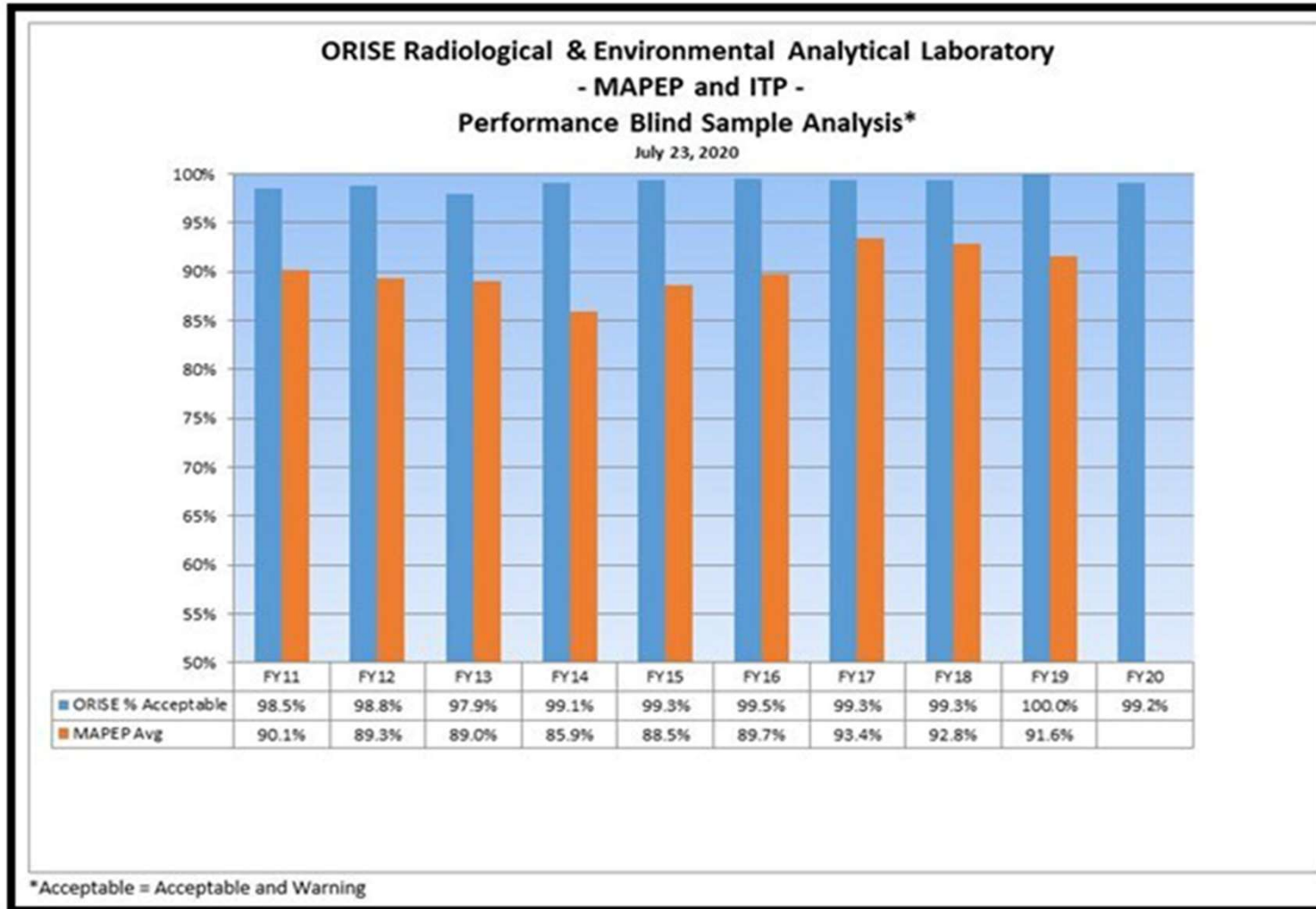
# History and Experience



“ There is no other lab in the country (environmental radiochemistry) that delivers high accuracy data on a consistent basis like REAL ”

— Senior Technical Manager, DOE Radiological and Environmental Sciences Laboratory

# REAL Acceptance Testing Results



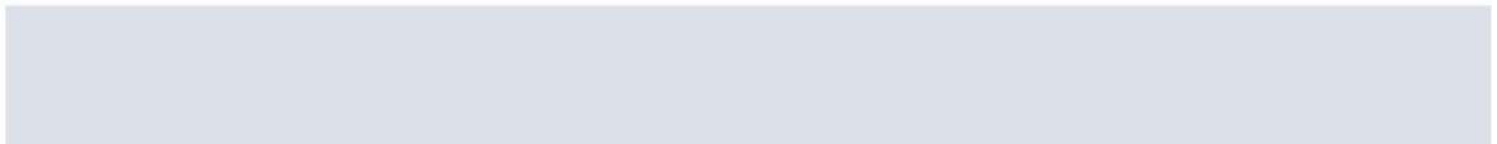
# Recommendations for a Graded Approach

Site Characteristics	Complexity	IV Approach
Surface Contamination Only	<ul style="list-style-type: none"> <li>•Extent of contamination well-defined</li> <li>•Contaminants easily detected and quantified (e.g, research reactor)</li> </ul>	<ul style="list-style-type: none"> <li>•Review of program and procedures</li> <li>•Limited judgmental field surveys</li> </ul>
Surface and Soil Contamination	<ul style="list-style-type: none"> <li>•Extent of contamination well-defined</li> <li>•Hard-to-detect nuclides may be present</li> <li>•Soil contamination present (e.g, waste processing facility)</li> </ul>	<ul style="list-style-type: none"> <li>•Review of program and procedures</li> <li>•In-process inspections</li> <li>•Limited field surveys/soil sampling (random and judgmental)</li> </ul>
Surface, Soil, and Groundwater Contamination	<ul style="list-style-type: none"> <li>•More extensive areas of contamination</li> <li>•Contamination has migrated to groundwater (e.g, power reactor)</li> </ul>	<ul style="list-style-type: none"> <li>•Review of program and procedures</li> <li>•In-process inspections</li> <li>•Field surveys/sampling (random and judgmental)</li> </ul>
Surface, Soil, and Groundwater Contamination	<ul style="list-style-type: none"> <li>•Complex site</li> <li>•Multiple contaminants</li> <li>•Presence of HTDN</li> <li>•Contamination has migrated to groundwater (e.g., weapons production facility)</li> </ul>	<ul style="list-style-type: none"> <li>•Review of program and procedures</li> <li>•In-process inspections</li> <li>•Extensive field surveys/sampling (random and judgmental)</li> </ul>



# Lessons Learned

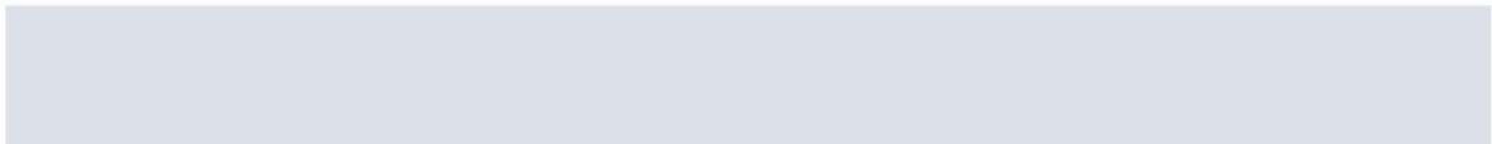
- **Early involvement of the IV contractor to minimize budget, integrate into schedule**
  - IV contractors can identify problems *before* errors are made
  - Document review (plans and reports) is an critical verification function
- Release criteria need to be clearly defined and developed early in the process
  - Need to understand when to start/stop remedial action in order to plan





# Lessons Learned (continued)

- In-process inspections are invaluable in the identifying field implementation issues
  - Site documents can be prepared by individuals that are not present during field operations—individuals need to see that data are collected properly and results represent actual conditions
- Evaluation of the site survey approach to ensure appropriate equipment and survey methods are utilized
  - The numbers do not tell the whole story

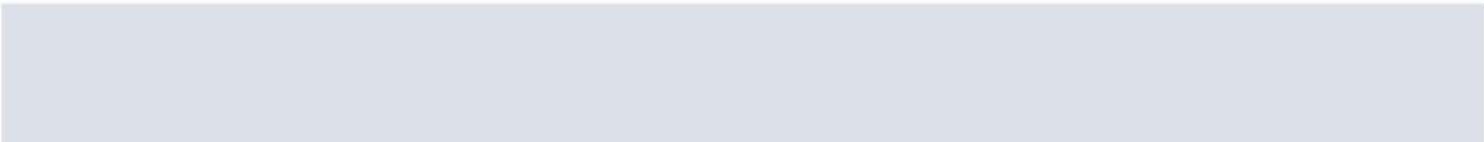
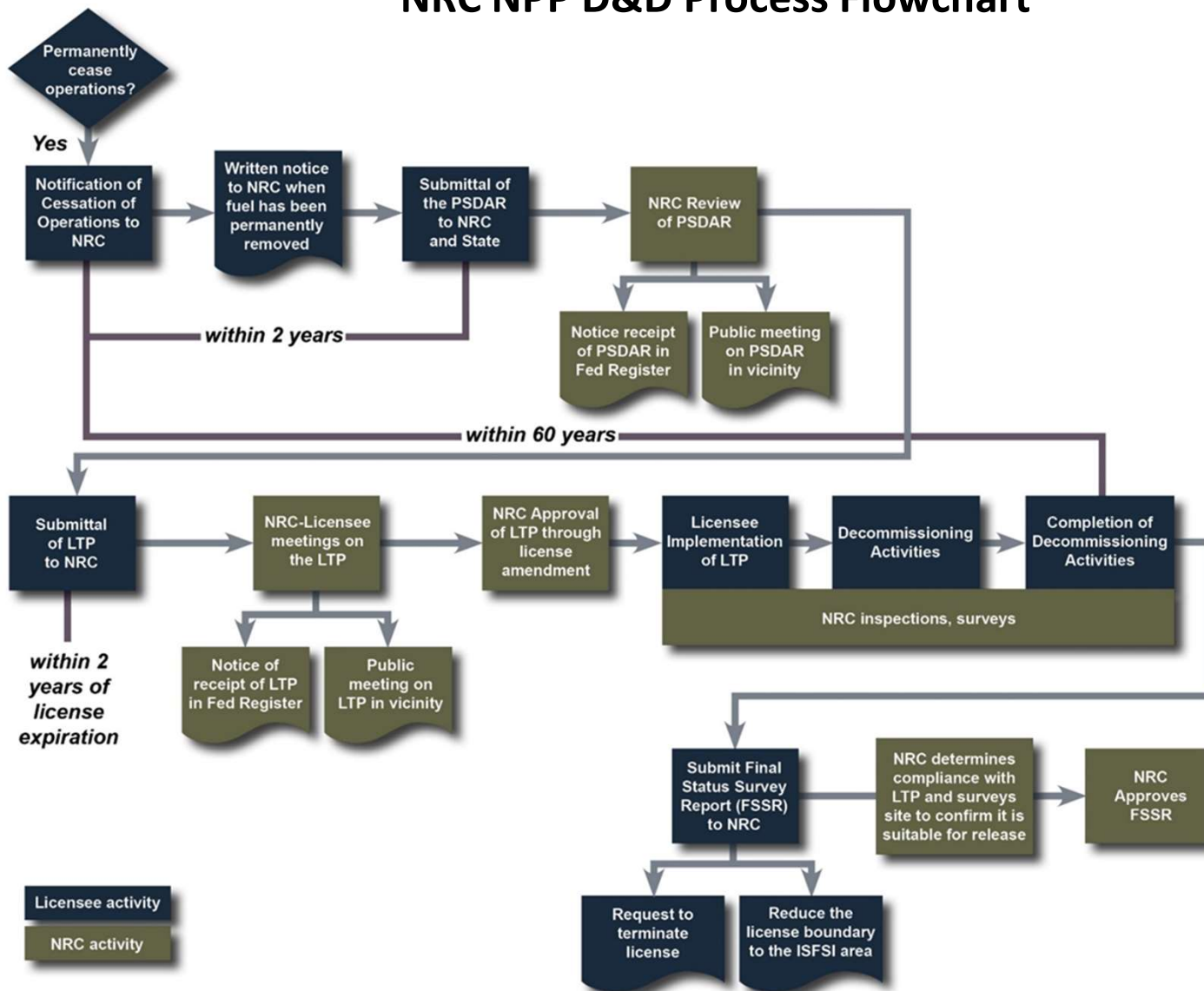


# ORISE Involvement in Occupational Exposure in Decommissioning

- ORISE provides support to the US DOE and NRC in the collection and analysis of occupational exposure
  - Produce the annual reports for both agencies
- Occupation dose is included in the annual report for NPPs that have ceased operation
- The reactors can go through various stages of decommissioning over time

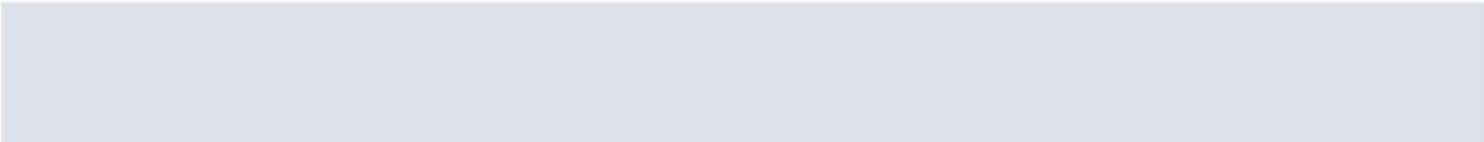


# NRC NPP D&D Process Flowchart

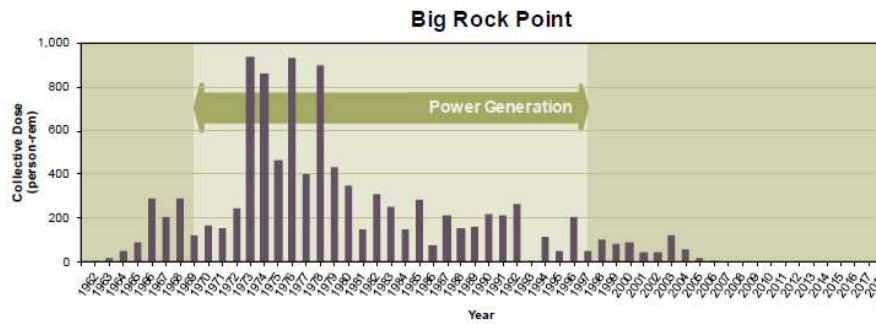


Plant Name	Date of First Commercial Operation	Ceased Operations	License Termination Plan Approved by NRC	PSDAR Submitted	Plant Status	Completion of Decommissioning
CRYSTAL RIVER 3	3/1977	2/2013	TBD	12/2013	SAFSTOR	2074
DRESDEN 1	8/1/1960	10/1978	TBD	6/1998	SAFSTOR	2036
FERMI 1	5/10/1963	9/1972	TBD	4/1998	SAFSTOR	2032
FORT CALHOUN	6/20/1974	10/2016	TBD	3/2017	SAFSTOR	2065
HUMBOLDT BAY 3	8/1/1963	7/1976	5/2016	2/1998	DECON	2019
INDIAN POINT 1	8/1962	10/1974	TBD	1/1996	SAFSTOR	2026
KEWAUNEE	6/1974	5/2013	TBD	2/2013	SAFSTOR	2073
LA CROSSE	11/1/1969	4/1987	TBD	5/1991	DECON	2019
MILLSTONE 1	3/1971	7/1998	TBD	6/1999	SAFSTOR	2056
OYSTER CREEK	12/1969	9/2018	TBD	6/2018	SAFSTOR	2078
PEACH BOTTOM 1	6/1/1967	10/1974	TBD	6/1998	SAFSTOR	2034
SAN ONOFRE 1	1/1/1968	11/1992	TBD	12/1998	SAFSTOR	2030
SAN ONOFRE 2	8/1983	6/2013	TBD	9/2014	DECON	2030
SAN ONOFRE 3	4/1984	6/2013	TBD	9/2014	DECON	2030
THREE MILE ISLAND 2	12/30/1978	3/1979	TBD	6/2013	Post-Defueling Monitored Storage	2036
VERMONT YANKEE	11/30/1972	12/2014	TBD	12/2014	SAFSTOR	2073
ZION 1	12/31/1973	2/1997	9/2018	2/2000	DECON	2020
ZION 2	9/17/1974	9/1996	9/2018	2/2000	DECON	2020
<b>DECOMMISSIONING COMPLETED</b>						
BIG ROCK POINT	3/29/1963	8/1997	TBD	9/1997	ISFSI only	2007
HADDAM NECK	1/1968	12/1996	TBD	8/1997	ISFSI only	2007
MAINE YANKEE	12/1972	12/1996	TBD	8/1997	ISFSI only	2005
RANCHO SECO	4/17/1975	6/1989	TBD	3/1997	ISFSI only	2009
TROJAN	5/20/1976	11/1992	2/2001	8/1995	ISFSI only	2004
YANKEE ROWE	7/1961	10/1991	TBD	-	ISFSI only	2007

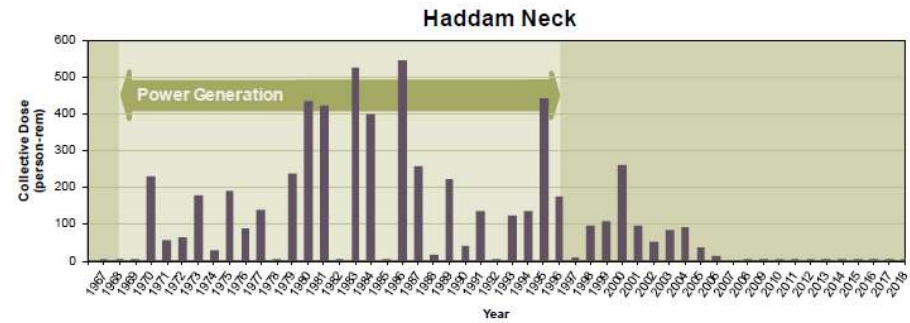
As of 2018 report.



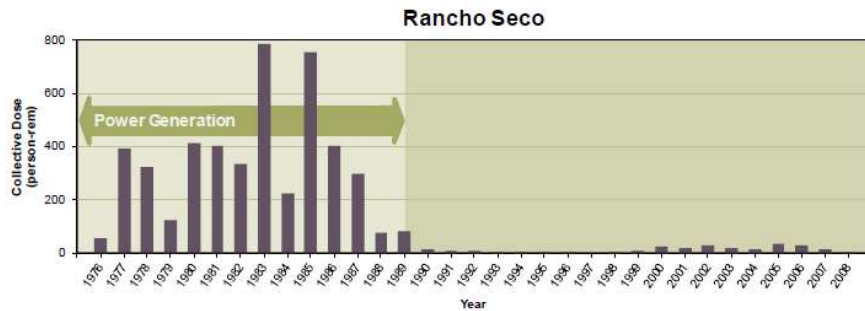
# Variety of Post Shutdown Occupational Exposures



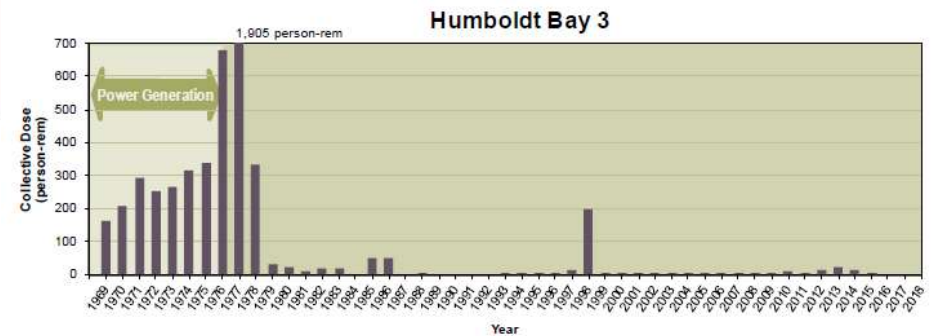
All fuel transferred to ISFSI by 2003.



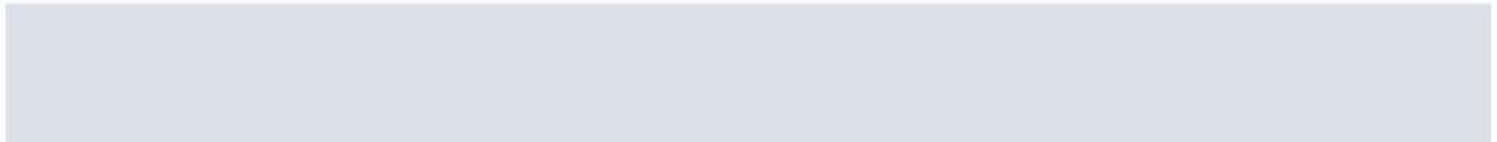
All fuel transferred to ISFSI by 2005.



Spent fuel transferred in 2002, completed decommissioning in 2009.



Incremental decomm started in 1997.



*Thank you for your time.*

Derek Hagemeyer

ORISE IEAV Director

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