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Reactor Decommissioning Process

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Overall Decommissioning Process

The process of removing a reactor facility safely from the operating mode to a permanent shutdown condition and reducing the residual radioactivity to a level that permits the release of the property for unrestricted use and termination of the license

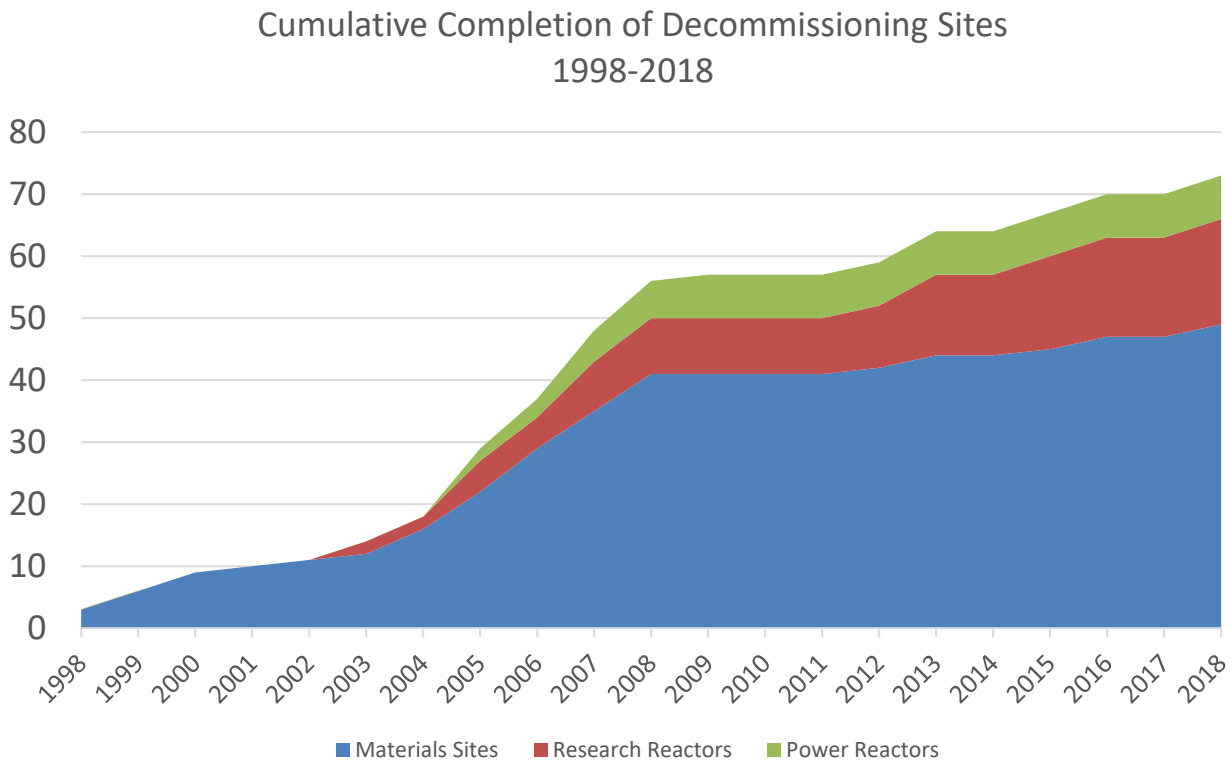
BEFORE

Maine Yankee

AFTER

Decommissioning Experience

- Current decommissioning regulations performance-based and risk-informed
- A total of 10 power reactor sites have completed decommissioning and had the reactor licenses terminated for unrestricted use



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License Termination Regulations

- **10 CFR 50.82 (Termination of license)**
  - Regulations for reactor decommissioning and license termination
- **10 CFR 20.1402 (Radiological criteria for unrestricted use)**
  - Total Effective Dose Equivalent (TEDE) 0.25 mSv/a and As Low As is Reasonably Achievable (ALARA)
- **10 CFR 20.1403 (Criteria for license termination under restricted conditions)**
  - 0.25 mSv/a TEDE and ALARA, with institutional controls in effect
  - Legally enforceable institutional controls
  - If institutional controls fail, doses do not exceed 1 mSv/a, or 5 mSv/a, under specific circumstances

Decommissioning Process Flow

Before Cleanup

- Licensee ceases operations and notifies NRC.
- Licensee submits post-shutdown decommissioning activities report (PSDAR) for NRC's information.
- Licensee waits 90 days before starting any major decommissioning activities.

During Cleanup

- Licensee initiates cleanup activities, as described in the PSDAR.
- 60 years to complete the decommissioning
- Licensee submits license termination plan (LTP) for review 2 years before license termination. The plan outlines remaining decommissioning activities.
- NRC performs technical and environmental reviews of the licensee plan and documents the reviews in NRC safety and environmental reports. NRC approves LTP if it is acceptable.
- NRC conducts periodic inspections.
- Licensee completes cleanup activities.

After Cleanup

- Licensee conducts final status survey and submits report.
- NRC conducts confirmatory surveys and reviews licensee's report. NRC approves final status survey report and terminates license.

Decommissioning Options

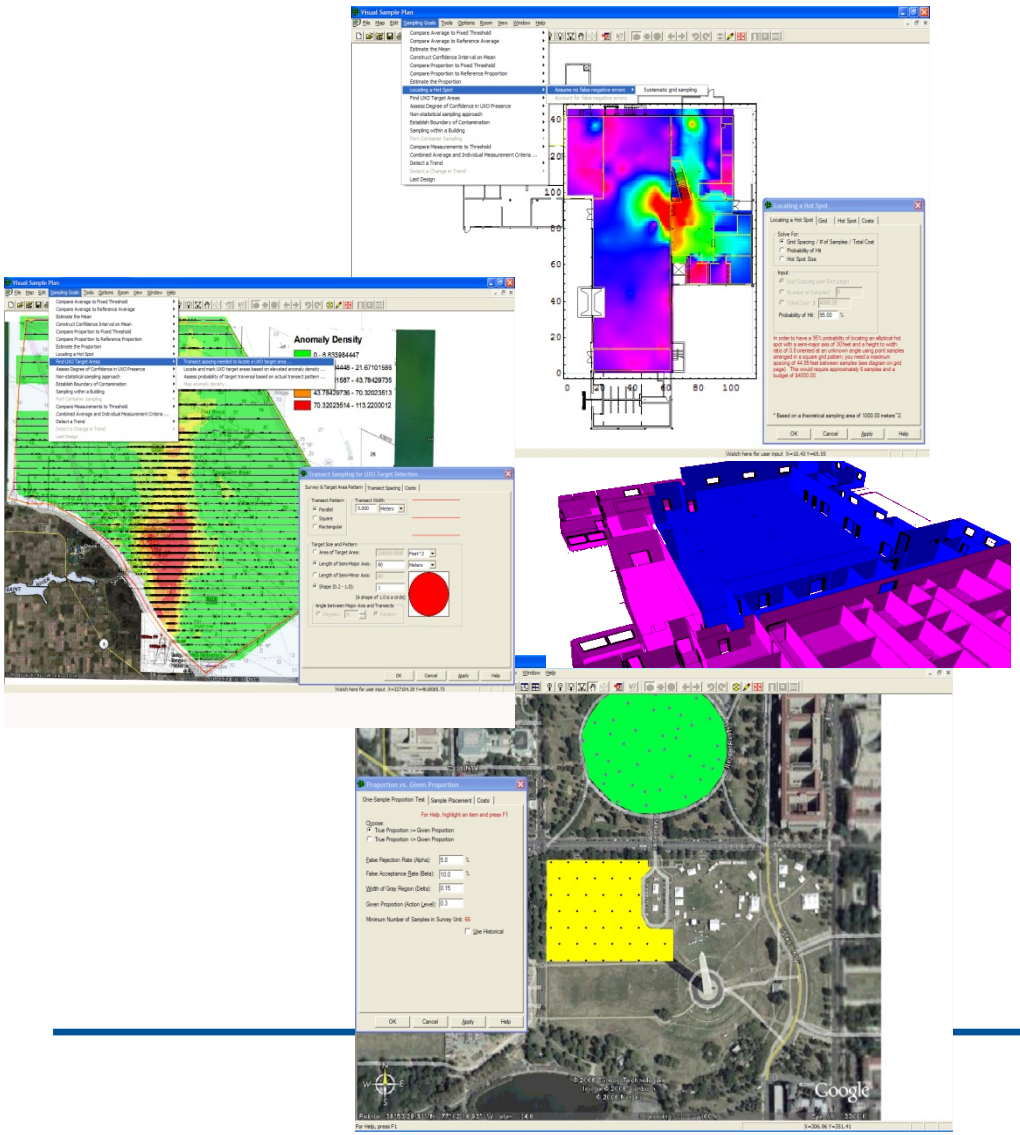
- **DECON** – Equipment, structures, etc., are removed or decontaminated to a level that permits unrestricted release

- **SAFSTOR** – Plant is placed in a safe, stable condition and maintained in this state until it is subsequently decontaminated to levels that permit unrestricted release

Decommissioning Business Models

- **Licensee Model - The operating reactor licensee maintains the license in decommissioning and performs the decommissioning.**
- **Decommissioning Contract Model - The operating reactor licensee maintains the license in decommissioning and manages a decommissioning contractor.**
- **Temporary License Transfer Model - The operating reactor licensee requests a transfer of the license to a decommissioning company for accelerated decommissioning. At completion of decommissioning, the license and property will be transferred back to the original licensee for spent fuel management.**
- **Permanent License Transfer Model - The operating reactor licensee requests a transfer of the license as part of an asset sale of the nuclear power plant, associated land, and spent fuel to a decommissioning company for accelerated decommissioning and spent fuel management.**

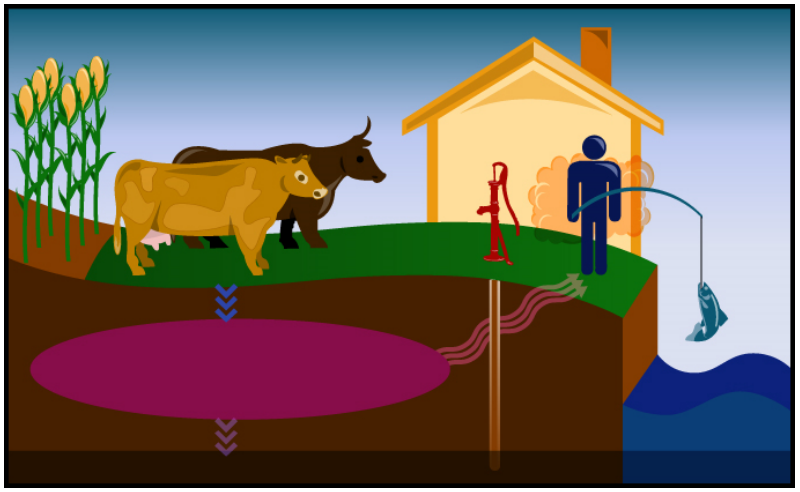
Visual Sample Plan



- Estimate or Compare Averages
- Compare Individual Sample Results Against Some Limit
- Do Transect or anomaly sampling/analysis for UXO
- Evaluate Trends over time
- Develop a geospatial contaminant concentration map
- Evaluate Well Placement Redundancies or Inadequacies
- Explore Correlation between multiple analytes
- Estimate or compare proportions
- Assess whether the boundary around an area is contaminant free
- Develop a targeted, purely judgmental sampling scheme
- Sampling Items

RESRAD Family of Codes

RESRAD is a computer code developed by Argonne National Laboratory to calculate radiation dose and lifetime cancer risk to an individual who is exposed to residual radioactivity



RESRAD calculates homogeneous soil guidelines (DCGL's) for each radionuclide specified by the user for the applicable exposure pathways

Additional Information

- NRC Backgrounder: Decommissioning of Nuclear Power Plants
  - https://www.nrc.gov/reading-rm/doc-collections/fact-sheets/decommissioning.html
- NRC YouTube Video on Decommissioning
  - https://www.youtube.com/watch?v=GifRku-N7_Q