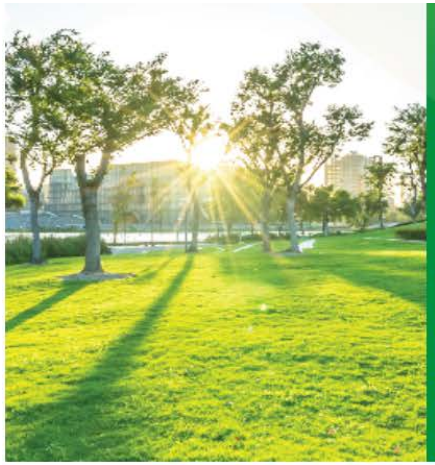
Constellation

Accessing U.S. Disposal Sites

Low Level Waste Forum

April 9, 2025

About Constellation



#1
producer of carbon-free energy in the U.S.

10%
of the nation's carbon-free electricity

32,400 MW
of capacity consisting of nuclear, wind, solar, natural gas and hydro, enough to power 15 million homes

215 TWh
of power served to Commercial customers

3/4
of Fortune 100 companies count on us for their energy needs

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Constellation's Nuclear Fleet

Limerick Generating Station

Pottstown, Pennsylvania

R.E. Ginna

Ontario, New York

Nine Mile Point

Oswego, New York

Calvert Cliffs

Lusby, Maryland

James A. FitzPatrick Nuclear Power Plant

Oswego, NY

Peach Bottom Atomic Power Station

Delta, Pennsylvania

Quad Cities Generating Station

Cordova, Illinois

LaSalle County Generating Station

Marseilles, Illinois

Dresden Generating Station

Morris, Illinois

Byron Generating Station

Byron, Illinois

Clinton Power Station

Clinton, Illinois

Braidwood Generating Station

Braceville, Illinois

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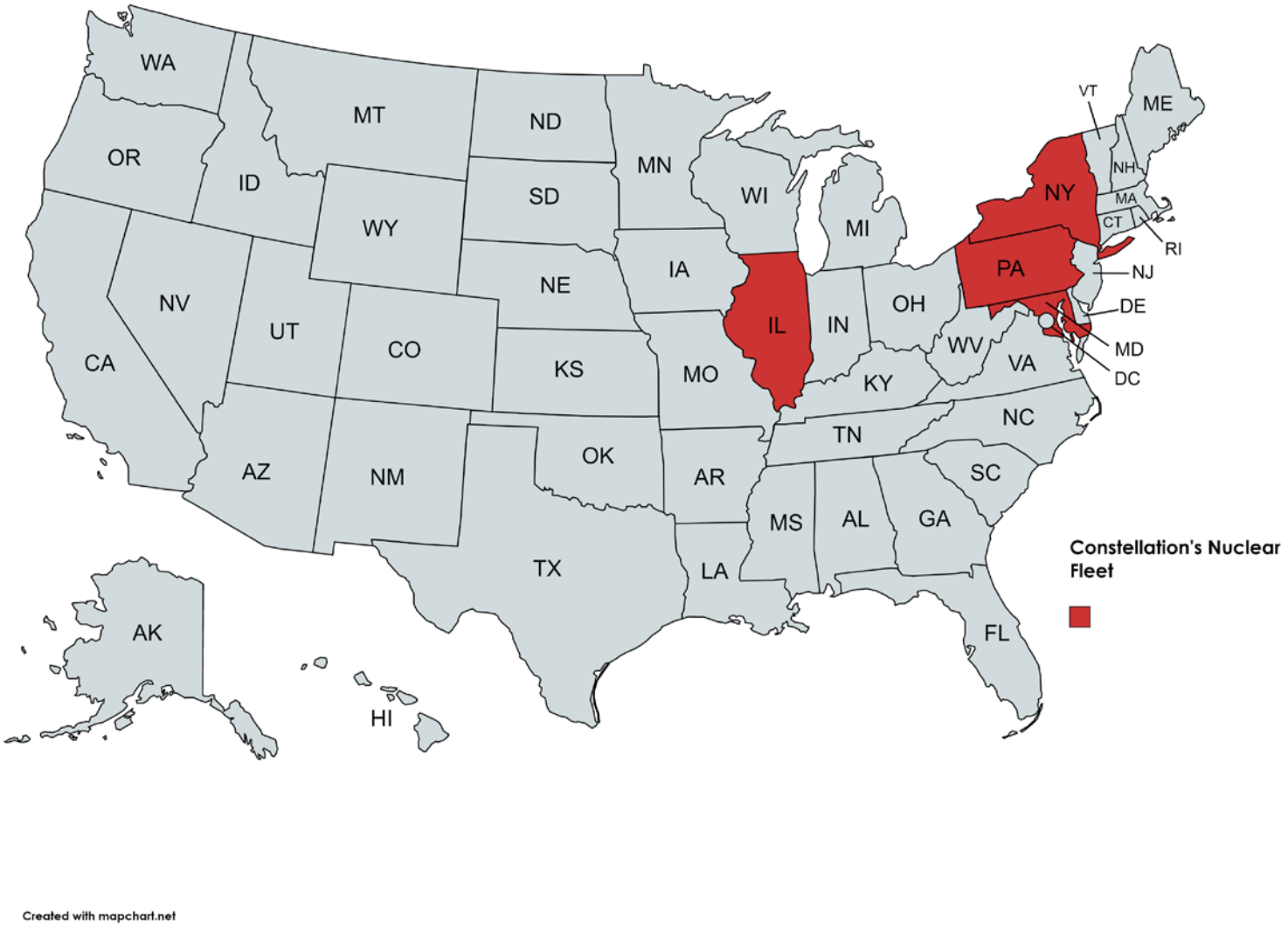
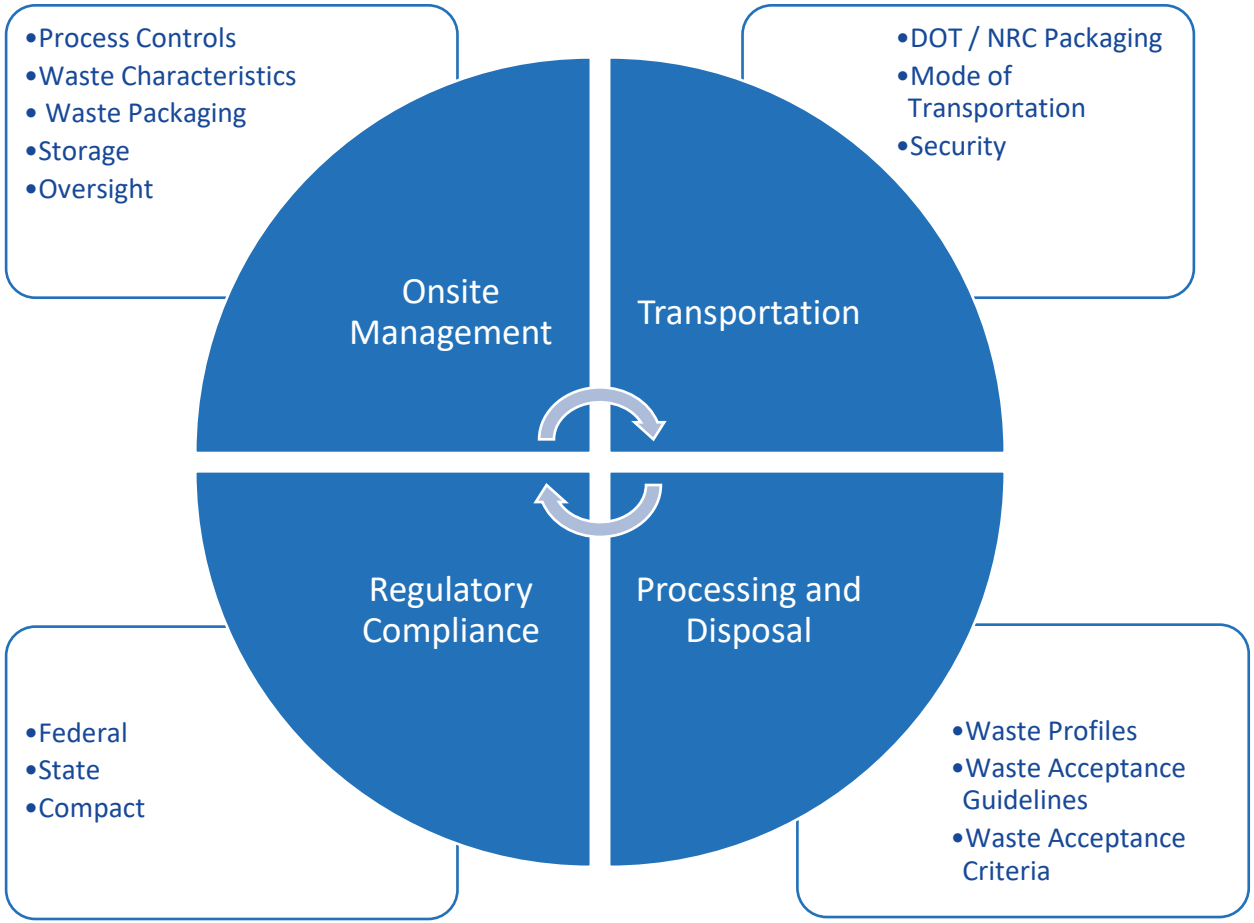


Life Cycle of Radwaste



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Process Controls

- Federal Regulations require Nuclear Power Plants to have Process Control Program (PCP), which outline the administrative and operational controls for waste processing, process parameters and surveillance requirements.
  - Provides assurances that the low level radioactive waste is suitable for burial per state and federal regulations.
  - Encompasses the processing, sampling, analysis, packaging storage and shipment activities at nuclear power plants. Procedures are established to implement the requirements of the PCP.
  - Vendors providing services in support of PCP activities will be audited and approved prior to commencing work.
  - All changes to the PCP and supporting documents including vendor procedures must be approved by the Stations Senior Leaders.

Waste Characteristics

- US Nuclear Plants establishes waste streams that bins low level waste that are produced with similar radiological and physical characteristics together. Examples are spent resin from in plant demineralizers, dry active waste and contaminated oil.
- Constellation has a Fleet procedure outlining the management of waste streams which includes:
  - Required sampling frequency of waste streams and acceptance criteria for a valid sample to meet NRC requirements.
  - Trending of waste stream radioisotopes over a multiyear period to ensure they are representative of plant operation and to detect potential changes to the waste classification or required disposal packaging.
  - Plant radiochemistry data is evaluated on a periodic basis to monitor for changes in plant operation that could impact the waste streams radioisotopic characteristics. There are administrate goal that would trigger an evaluation by the technical staff and an administrative limit that would require resampling of the waste streams.
- The radiological and physical characteristics also influence the type of packaging selected.

Waste Packaging

- Waste Characteristics
  - Compatible with the physical and chemical characteristics.
  - Radiological characteristics are review to ensure compatibility with the appropriate DOT / NRC shipping container.
- Shipping Location
  - Packages being sent directly to burial are required to meet requires of 10CFR61 and burial site's WAC
  - Packages being sent vendor for processing does not need to meet burial requirements, however, are need to meet any requirements of the vendor.
- Common packages are HICs, liners, metal containers and drums.

Interim Onsite Storage

- Most LLRW gets placed into interim storage prior to offsite shipment.
  - Higher activity waste is typically stored to allow decay and availability of transportation packages.
  - DAW and other low activity waste streams sent to a processor are typically shipped shortly after generation.
- Storage facilities are designed and analyzed based upon NRC guidance in a Safety Analysis Report (SAR). It analyzes
  - Extreme environmental events such as seismic events and tornado.
  - 10 CFR 37 security requirements
  - 10 CFR 20 offsite dose requirements
- Size of storage facilities vary based upon site specific constraints and needs.

Constellation Low Level Waste Management Structure

- Constellation separates the management of High Level Waste (Spent Fuel) and Low Level Waste as the two types of waste require a vastly different processes to disposition.
- Constellation has standardized process for the Fleet for the management of liquid and solid radioactive waste management.
  - Constellation has a Fleet PCP that each site implements.
  - Creates consistency in our waste management that provides regulatory margin and efficiencies in packaging and transportation.
  - A standard set of liquid radwaste processing and solid radwaste generation parameters are monitored and trended monthly. This data is reported to Corporate who monitors the performance across the Fleet.
  - Standardized approach to waste packaging of common waste streams which ensures regulatory compliance and achieves cost savings for the Fleet.
  - There are Fleet procedures for the shipping of low level waste. This ensures that a consistent application of shipping packaging, marking and labeling.

DOT and NRC Transportation Packages

- It is essential for licensee to safely transport radioactive waste to processors and burial sites.
- Vendor supply the necessary packaging and support material to accomplish that task, however, it's upon the licensee to comply with regulations for their use.
- The DOT establishes the requirements for the transportation of radioactive including packaging in 49 CFR Subpart I.
  - Packaging categories include General Design, Industrial Packages, Type A and Fissile.
- The NRC establishes the requirements for the design, manufacture and transportation of NRC licensed packages in 10 CFR 71.

Modes of Transportation

Transportation Security

- Transporting radioactive material and waste creates a security risk that needs to be managed.
- 10 CFR 37 establishes the requirements for Category 1 and Category 2 shipments:
  - Categories based upon specific isotopes and activity.
  - Requires the licensee to preplan and coordinate shipments which include validate the license of receiving entity, coordinate shipment arrival, review security threat before and during shipment.
  - While in transit, 24/7 monitoring is required which includes periodic check in with the drivers
  - Requires investigations when shipments are late or lost and / or missing.

Accessing Burial Sites

- All burial sites have their own license requirements and site-specific processes for generators to follow to gain access, however, in general they are quite similar.
  - Generator Certification: A review of the generators waste management practices and procedures to determine if they process and package waste to the Waste Acceptance Criteria (WAC) and 10 CFR 61 requirements.
  - Waste Profiles: Waste Profiles are established for the different waste types being sent for burial. The waste profile documents how the radiological, physical and chemical characteristics of the waste meets the WAC requirements.
  - State Registration: States have a process where they review generators and issue permits to them. Typically, enforcement of violations are conducted by these agencies.
  - Compacts: Generators must follow the processes for exporting their waste from their compact and importing their waste into the burial site's compact. These requirements will vary based upon the compacts that the generator and burial are located.
  - Period reviews of these approvals are conducted at varying frequency.
- Prior to each shipment, a shipment notification is required to be made and approved. Each individual package being sent to burial is reviewed against the waste profile and WAC for compliance.

Accessing Waste Processors

- Accessing waste processors is a much simpler process.
  - Required to establish a waste profile with the processor:
    - Radiological characteristics
    - Physical and chemical characteristics
    - Transportation and packaging
    - Description of how the waste was generated.
  - Obtain State permits or license to transport waste if required.
- Prior to shipment, a shipment request form is submitted and is approved against the requirements in the waste acceptance guidelines (WAG).
- Generators must follow import and export requirements of the compacts.
- Once the waste is processed and packaged for burial, the generator must have access to a US disposal site for the waste to be shipped to.

Common Challenges that Utilities Encounter

- **Process Control**
  - Supplemental work force
  - Generational shift in workers
  - Unique projects
  - Plant modifications
  - Shipper proficiency
- **Transportation**
  - Equipment availability
  - Lack of innovation
  - Shortage of qualified drivers
- **Accessing Processors**
  - Limited number of vendors
  - Management of the DAW waste stream
  - Too reliant
- **Accessing Burial Sites**
  - Becoming too routine

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