# BIG DATA APPROACHES FOR NUCLEAR WASTE MANAGEMENT SYSTEMS

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MOTIVATION

- The United States has relied on nuclear power for over half a century.

- The spent nuclear fuel (SNF) produced by commercial nuclear reactors continues to accumulate at sites because no permanent repository is available. The U.S. Department of Energy (DOE) is responsible for the disposition of this SNF.

- Extensive data will be involved in every aspect of managing SNF and HLW, from radioactive shipments to developing the safety case for SNF and HLW disposition and demonstrating performance over the long term.

- Considering the thousands of years over which these materials must be managed, big data approaches offer continued safety and environmental protection during all phases of an integrated waste management system.

(http://www.energy.gov/ne/integrated-waste-management)
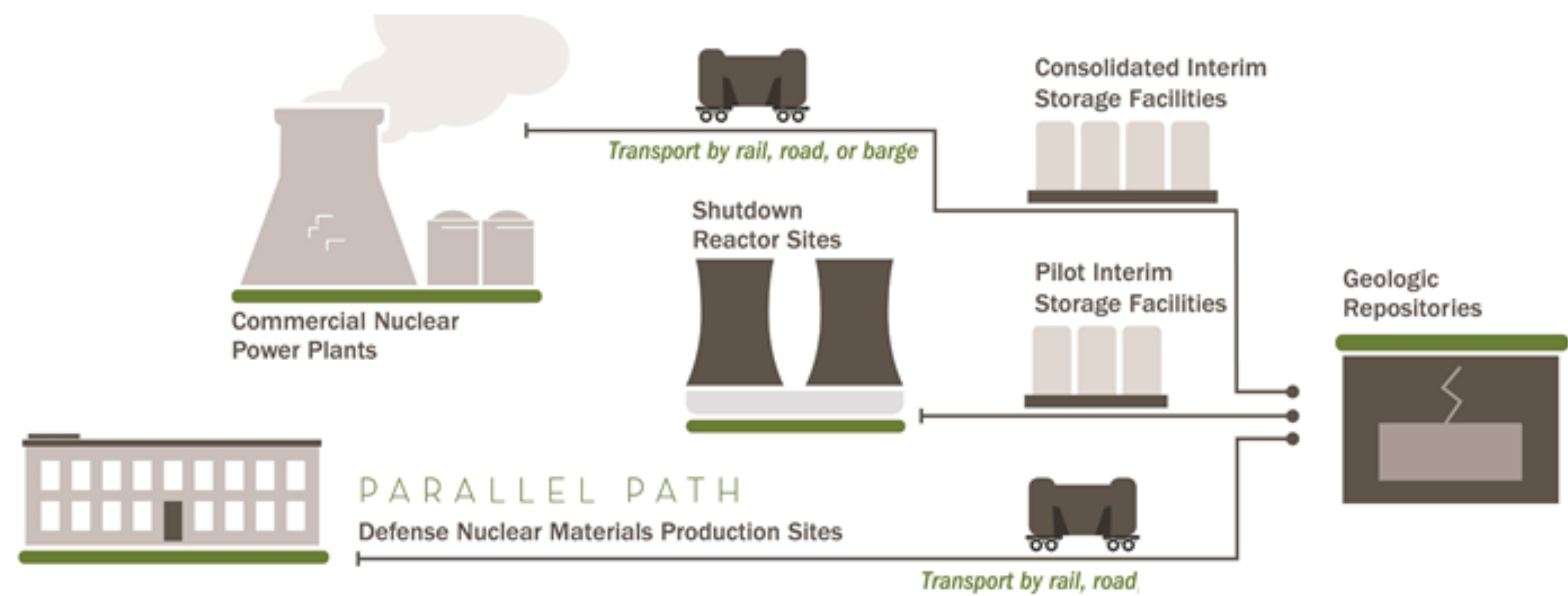
ACCOMPLISHMENTS

- Conducted a pilot data collection activity using the DOE 2016 Stakeholder Tool for Assessing Radioactive Transportation (START) that has been developed to assess routing options for radioactive shipments, which involves millions of data records.

- Identified the types of data considered in this tool alone, with an emphasis on data that will change over time – such as population numbers, accident rates, and the types and locations of facilities along rail routes.

- Searched recent literature to identify big data approaches and applications that could offer insights for managing the complex data that will be generated by nuclear waste management systems over the long term.

(https://gis.inl.gov/start)

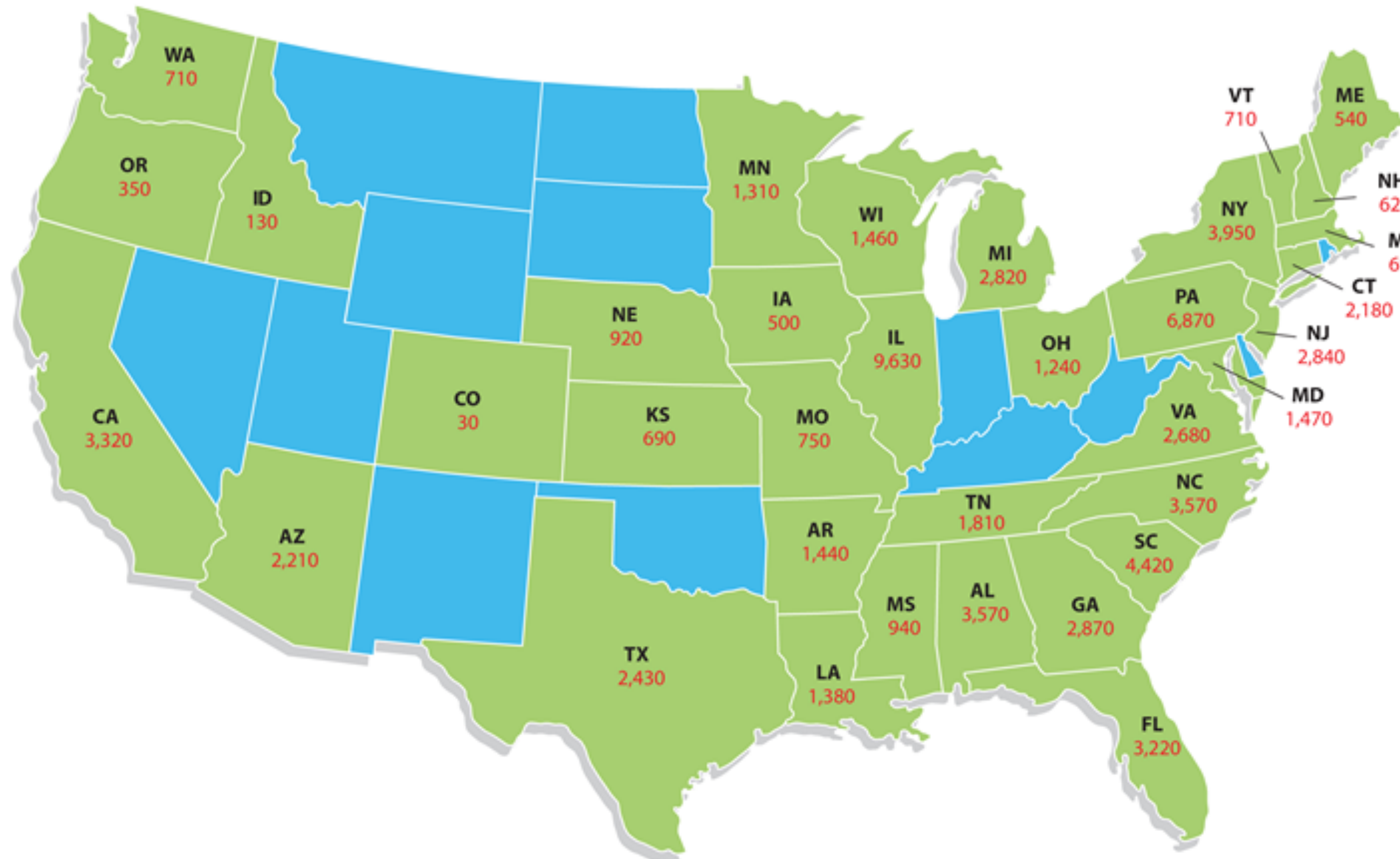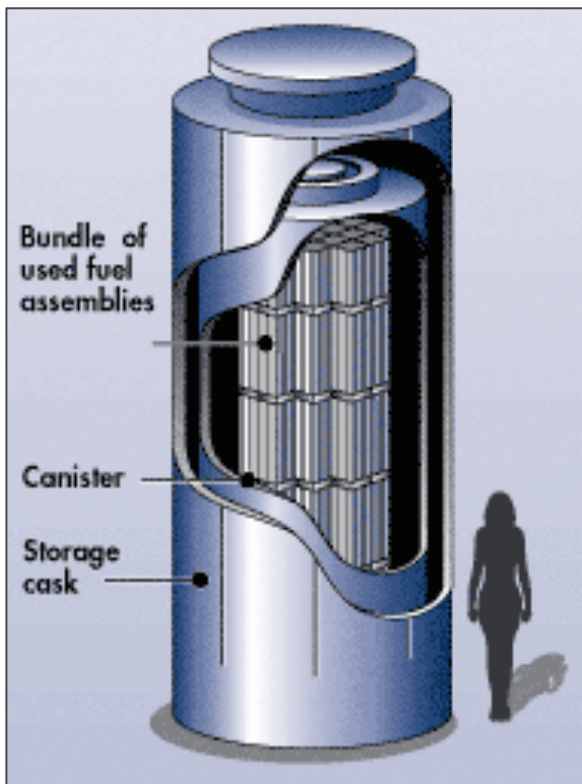http://www.mrscompany.com/2015/05/big-data-a-primer/

- Submitted an abstract for the 2017 American Nuclear Society International High-Level Radioactive Waste Management Conference
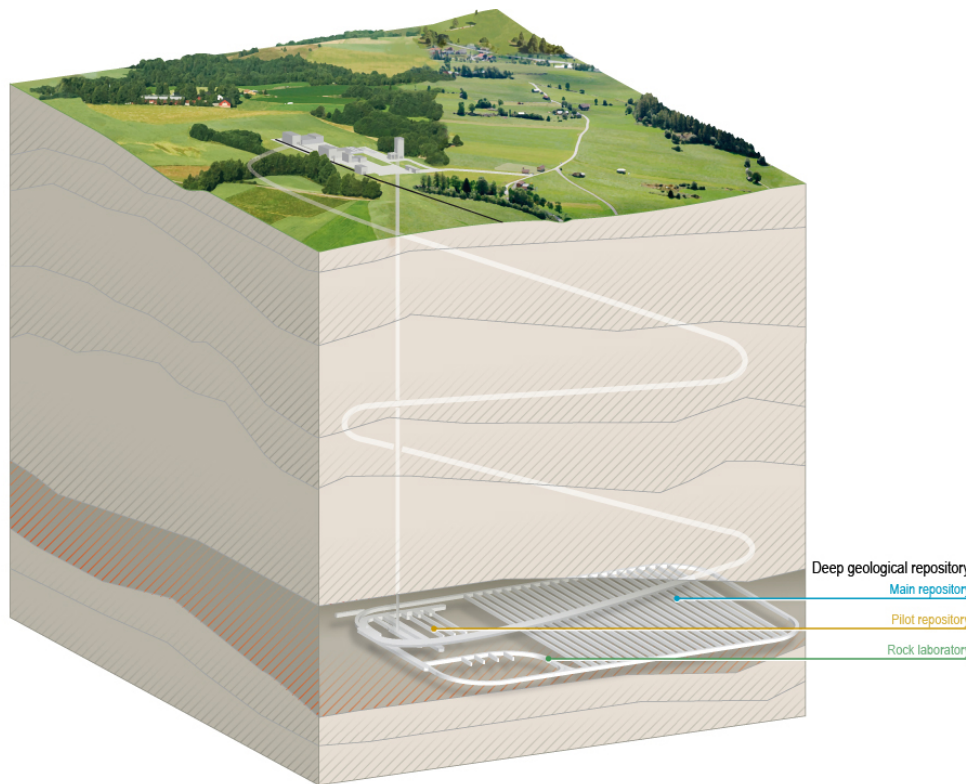
Used Nuclear Fuel in Storage
(Metric Tons, end of 2014)

(http://nuclearfoundation.org/events_files/04302015_FNS_UFM_Slides.pdf)

(http://www.nrc.gov/waste/spent-fuel-storage/diagram-typical-dry-cask-system.html)

(https://goo.gl/VDehqB)

IMPACT

- Big data approaches are rapidly evolving and are being used in a wide variety of applications to substantially improve data management and interpretation.

- These methodologies can be applied to address data challenges across all aspects of an integrated nuclear waste management system-- ranging from evaluating routing options for transporting SNF to characterizing environmental conditions and monitoring the effectiveness of containment systems into the long term.

FUTURE DIRECTIONS

- Explore potential big data applications in industry and open data collection (citizen science projects), and consider its role in planning for consent-based siting of nuclear waste management facilities

- Identify high-throughput software applications that might be considered in future DOE data management activities.

- Explore rapid parallel acquisition of experimental data to support research and development (R&D) efforts, such as to simulate and assess containment integrity over decades to thousands of years.