ENERGYSOLUTIONS

Role of Radioactive Waste Management in D&D

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Introduction to Energy*Solutions*

Acquisition and Integration of Companies to Support NPP D&D

ENVIROCARE of Utah, Inc.
(Bulk Class A LLW disposal/MW, Feb 2005)

SCIENTECH D&D Division
(D&D planning and Characterization, Sept 2005)

BNG AMERICA
(D&D Contractor/Big Rock Point, Feb 2006)

Duratek / HITTMAN TRANSPORT SERVICES, INC.
(Waste processing, large components, D&D logistics; liquid waste; B/C casks; transport services, disposal, June 2006)

NUKEM
(Casks, liquid waste, June 2007)

Studsvik
(Resin and exempt waste processing, March 2014)

MHF
(Rail logistics, containers, fleet management, March 2015)

WCS ANDREWS, TEXAS
(Class B/C disposal) (pending)




Energy*Solutions* – Provider of D&D Services

Extensive D&D Experience – U.S.

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Fort St. Vrain

Maine Yankee

Connecticut Yankee

Yankee Rowe

Big Rock Point

Rancho Seco

Zion (in progress)

La Crosse (in progress)

SONGS (in progress)

Internationally 15 Reactors Decommissioned – 12 are in USA

Extensive D&D Experience – U.K.

- Parent Body Organization (PBO) for the NDA for M&O of 22 Magnox reactors at 10 Sites
  - 4 operational (During Contract)
  - 18 defueling, D&D
- June 2007 to August 2014
- Extended generation of Wylfa and Oldbury units (critical funding for NDA)
- Restructured overall management from site centric approach
- Revised site baselines to incorporate D&D innovations
- Implemented workforce transition
- Implemented Project Management Rigor

Representative Prior D&D Projects

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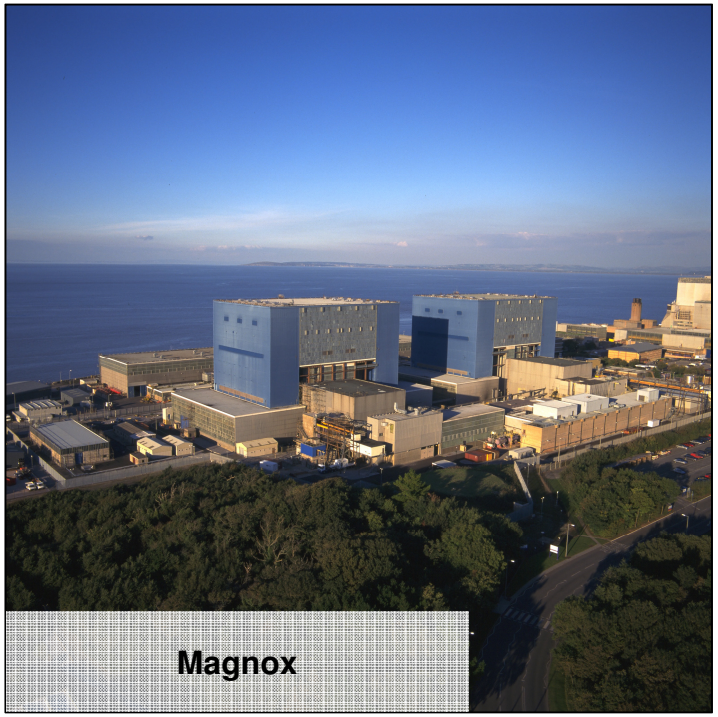
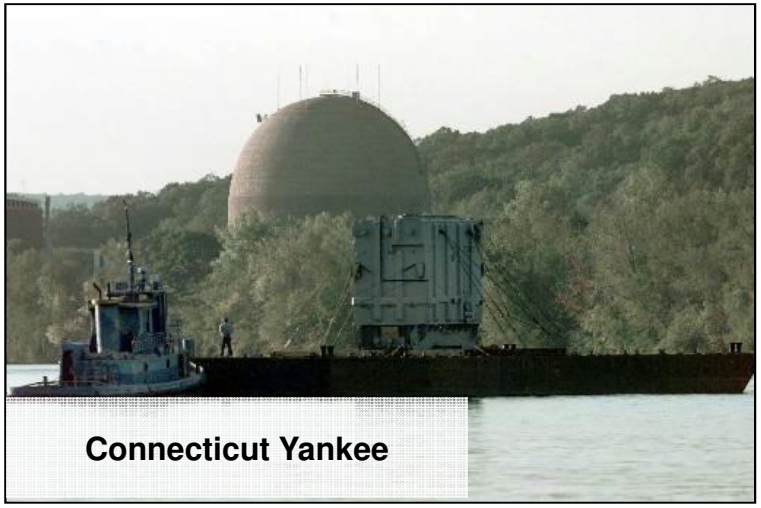
Big Rock Point


Magnox


Connecticut Yankee

D&D experience and lessons learned from Decommissioning projects

Big Rock Point - Successes & Lessons Learned

- 67-MWe BWR, 1998-2005
- Extensive planning and management of 6,000 D&D activities
- Reactor Vessel internals grouted and removed as one (1) 300-ton component
- Deployed on-site and off-site bulk waste assay systems to clear concrete debris for landfill disposal vs. radioactive waste disposal sites

Connecticut Yankee (Haddam Neck) - Successes & Lessons Learned

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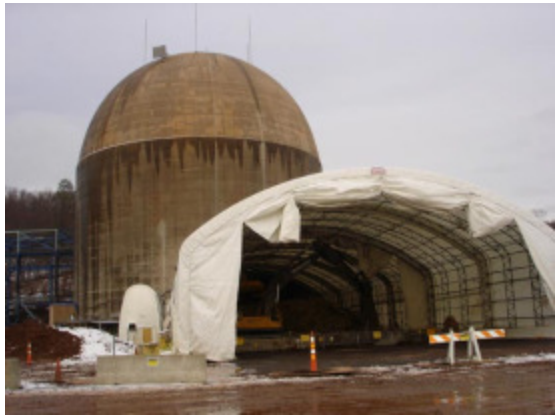
- 582-MWe PWR, 1997 -2007



- Tents and excavators used to reduce time, risk, and exposure to remove difficult to access components
- Poor characterization/planning
  - Insufficient plan/cost allocated for soil remediation
  - Subgrade not identified in characterization

- Abrasive water jet cutting of Reactor Vessel Internals
  - Difficulty capturing secondary waste
  - RVI metals harder than expected.

Magnox - Successes & Lessons Learned

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- Magnox Optimized Decommissioning Programme (MODP)
  - Shift focus and funds, accelerate decommissioning
  - Expected 34-year schedule reduction and $1.6B cost savings

- SMART Inventory software and process
  - Improved waste forecasting
  - Reduced assumed ILW inventory

- Lead and Learn Program
  - Applies best practices and lessons learned from one site to others to achieve cost reduction – don't learn same lesson twice
- Innovative Intermediate Level Waste (ILW) containers
  - "Ministores" – greater shielding/reduced in-container processing, reduced storage facility construction

Current D&D Projects

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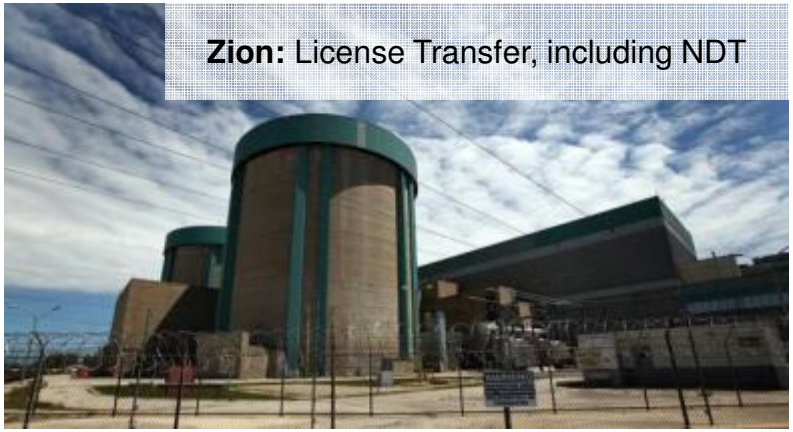

Zion: License Transfer, including NDT

SONGS: Decommissioning General Contractor (Teamed with AECOM)

La Crosse: License Transfer, excluding Nuclear Decommissioning Trust (NDT)

D&D experience and lessons learned from previous corporate and industry projects

Zion - Successes & Lessons Learned

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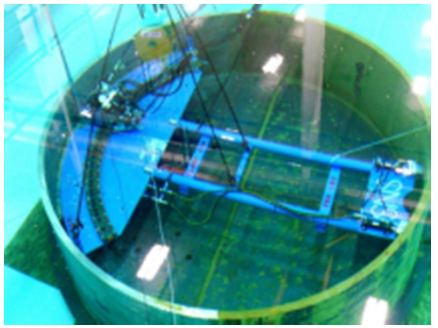
- 2,080 MWe-PWR (2 units), 2010 – 2020
- Decision responsibility with D&D / Waste Management Company
- Integration of waste management activities into overall D&D planning – WM drives plant segmentation and demolition
- Early issues with mechanical segmentation of RVI (Water clarity; tooling robustness - Resolved for 1st unit to benefit 2nd unit)
- Strong Project Management supported by integrated Project Controls (cost, schedule and risk monitoring and accountability program)
- Diamond wire cutting for components
- Flame cutting for Reactor Vessels



Zion D&D

- Energy*Solutions* acquired the Zion plant on September 1, 2010
  - 10 CFR 50 Licenses and Nuclear Decommissioning Trust (NDT) fund transferred from Exelon to Zion*Solutions*
- 10-Year Maximum Completion Schedule
  - 12-14 years earlier than Exelon's previous schedule
  - Physical work & Final Survey Completed in 7.5 years

	Exelon's Schedule	Zion*Solutions*' Schedule
D&D Planning Start	2013	2010
D&D Operations Start	~2015	2010
Site Restoration Complete	2032	~~2020~~ 2018

  - Completing within Budget (70% of original DCE)

La Crosse - Current Progress and Near-Term

- 50-MWe BWR, 1991 (SAFSTOR) – 2020~~20~~18
- License transfer to ES, May 2016; D&D accelerated
- Site characterization/LTP – Oct. 2014 – June 2016
- Asbestos abatement ongoing
- Reactor stack dismantled Q3 2016
- Near-term:
  - LTP approval by NRC – Q2 2017
  - Component removal complete – Q2 2017
  - Building demolition start - May 2017
  - Building demolition complete - Q4 2017

SONGS - Current Progress

- 2,254-MWe PWRs (2 units), 2013 – 2025
- December 2016 – Decommissioning General Contractor (DGC) contract awarded (AECOM/Energy*Solutions*)
- Demolition of several miscellaneous clean structures completed
- Decommissioning program, plans, and procedures in development
- D&D activities constrained until environmental permits are approved
- Client carries significantly more risk than Zion and La Crosse

U.S. D&D Experience (Slide 1)

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- Transition from operating to decommissioning is critical
- Decommissioning is a project, a complex “waste” project
  - End state conditions and waste disposal drive planning and execution
- Funding must be available and predictable
- Requirements are significantly reduced after spent fuel is removed
- Risk mitigation and baseline simplification increase probability of success
  - R&D and Innovative technologies increase Project Risks (Cost)
- Site / facility characterization represents major risk and opportunity
- Experienced and knowledgeable management oversight and engagement is critical

U.S. D&D Experience (Slide 2)

- Strong project management, project controls and task planning/tracking necessary
  - D&D Project is different to Construction project no manual for experience
  - Must include ability to manage uncertainty
- Regulator / regulations aligned with operations need to be changed for D&D
  - Graded approach based on risk (Nuclear, Radiological, Industrial)
  - Don't confuse regulation with requirements adopted to comply with regulation
  - Regular communication to develop trust – NRC transition from exceptions
- Utility/contractor "Roles and Responsibilities" key
  - D&D Project Management must be responsible for project decision making
- Stakeholder involvement (media/local community/government officials etc)
  - Early and often, open honest communication
  - No surprises
  - Barnwell SC community experience – funding education

Energy*Solutions* Experience in Japan

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- JNFL (IHI)
  - Vitrification Technology
  - Support (Rokkasho)
- TEPCO (Toshiba / MKC)
  - Fuel Bunker Processing Equipment (Fukushima Daini)
  - ALPS Water Processing (Fukushima Daiichi)
- JAPCO (Japan Atomic Power Company)
  - D&D Collaboration NPP D&D (Tsuruga-1)
- NDF (Nuclear Damage-Compensation D&D Facilitation Corp)
  - Waste Management Guidelines (Fukushima Daiichi)

Equipment, Materials, Services and Technology Transfer

Energy*Solutions Approach* - Partner with Local Industry

What do we see?

D&D is a Waste Management Strategy

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US PWR

JAPAN PWR

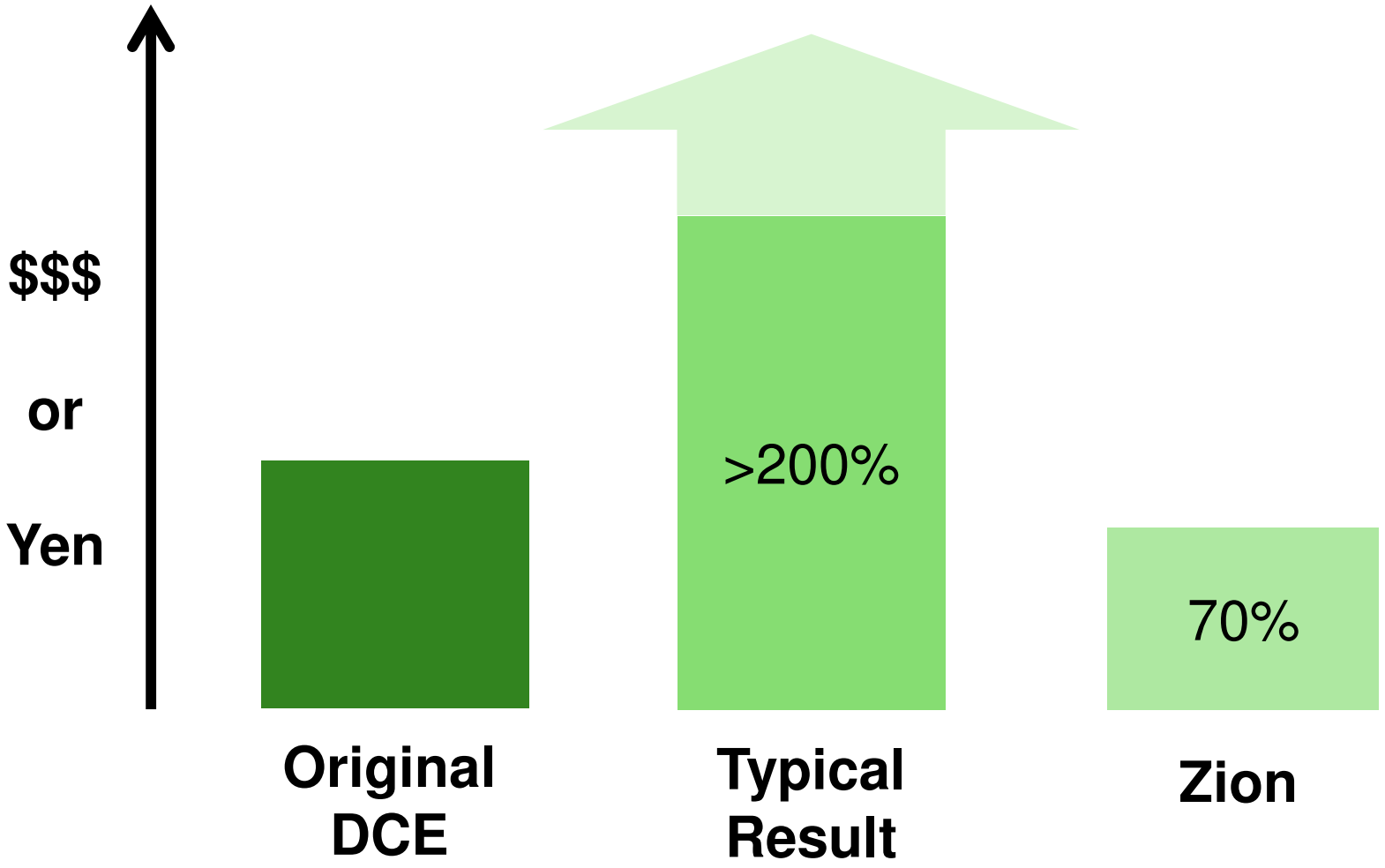
US BWR

JAPAN BWR

UK Magnox

JAPAN Magnox

D&D Cost Experience



D&D Focus

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Safety

Compliance

Non-Negotiable

Cost

Strategic Priorities

Schedule / Waste Management

Working with Japan Atomic Power Company (JAPC)

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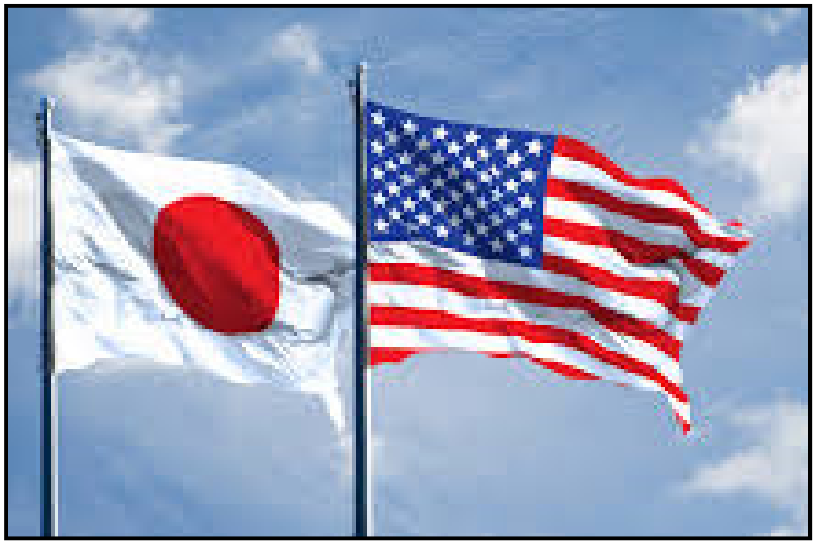
- Collaborative Study
- D&D Baseline Development / Planning
- Worker Exchange / Mentoring – Zion and Tsuruga-1
- Demonstration of International Partnership



Experiences are transferable to Japan

Key Constraints in Japan

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- Spent Fuel Disposition
- D&D Waste Disposal
- Funding
- Operations/Engineering versus D&D

D&D is not a Technology Issue

Conclusion

- US experience is **transferable** to Japan
- Successful D&D drivers:
  - **Safety/Compliance**
  - **Effective** waste management strategy
  - **Accelerated** schedules
  - **End State** defined
- Repeating lessons learned **increases** costs
- Past experience **reduces** risk and costs

D&D without experience – what cost?