Decommissioning Overview

October 13, 2021

LLRW Forum

US Approach Acquisition Model

- Permanent transfer of site US Nuclear Regulatory Commission (NRC) license from Utility to Holtec
- Transfer of all site property, assets, and liabilities
- Transfer in ownership of spent nuclear fuel (wet or dry)
- Transfer of “Phase 1” Decommissioning Organization
- Assumption of existing Decommissioning Trust Fund
  - NRC mandated mechanism of providing financial assurance for decommissioning. In US, Decommissioning Trust Funds are maintained by the Utility and overseen by USNRC and Internal Revenue Service (IRS)

Site ownership is an integral part of Holtec's long-term strategy

Holtec Decommissioning Strategy

Establish, Implement & Advance Industry Decommissioning

Fleet Approach

- Based on nuclear industry fleet model
- Drive lessons learned across sites
- Maximize standardization
- Drive technology innovation

Qualified and Experienced Personnel

- Existing Holtec nuclear-experienced personnel
- Additional nuclear plant experienced personnel
- Partner with SNC-Lavalin
- Integrate site organization at license transfer
- Industry vendors

Procedures & Processes

- Adopt NRC-approved site programs, processes and procedures
- Maintain compliance with site license & NRC regulations
- Maintain, protect & control spent nuclear fuel
- Ensure environmental & personnel protection

Holtec Decommissioning Organization

- Spent fuel management and nuclear services
- Spent fuel cask/storage vendor
- Permanently Shutdown Plant ownership

Provide resources and oversight to support the safe, compliant operation of the acquired sites

- Wholly-owned Holtec subsidiary

Licensed operator for all decommissioning sites in the Holtec fleet

- Jointly-owned company by Holtec/SNC-Lavalin
- Extensive decommissioning project experience

Decommissioning General Contractor (DGC) for the Holtec fleet

CDI Worldwide D&D Experience

Comprehensive Decommissioning International, LLC

- CDI was created in 2018 to provide the accelerated decommissioning of shuttered nuclear power plants
- It's a **joint venture** between **Holtec** and **SNC Lavalin**
- CDI's aims to completely decommission retired nuclear plants in less than eight (8) years leaving only spent fuel storage on site
- While we are a new name, we are backed by decades of decommissioning planning and execution experience
- We now have a backlog of $5Bn in the US – first nuclear site and license was transferred to Holtec on 1st July 2019
- We have launched CDI internationally to provide utilities outside the US with access to our technologies, capabilities and experience

CDI Worldwide D&D Experience

Holtec	SNC-Lavalin (Atkins)
▪ 30 years of safe spent nuclear fuel management ▪ Expertise in design/build on-site fuel storage installations ▪ SNF services supplied to over 116 nuclear units worldwide ▪ Innovative solutions for complex challenges ▪ Performs all dry storage implementation work with in-house resources	▪ Shared heritage of commercial facility D&D at Big Rock Point, Zion and Magnox ▪ Over 100 waste cleanup, D&D and government site remediation projects in the US & Canada ▪ Waste treatment technologies and new storage/disposal canisters at Fukushima ▪ Multiple power and research reactor decommissioning projects in Canada

CDI Worldwide D&D Experience

Holtec
• CDI is the Decommissioning General Contractor (DGC) responsible for all the work from end of operations to final site clearance. CDI is under contract to Holtec Decommissioning International, the NRC licensed site operator of Holtec owned US nuclear sites. • CDI currently has over 500 staff and 6 reactors under contract. • We employ all of the site staff and hire subcontractors. • Our contracts are “target cost” with incentives to reduce cost. • We have extensive experience in planning, scheduling, cost estimating, site characterization, licensing and end state definition for sites – critical work for Korea to ensure an optimized program. • We have extensive “lessons learned” in reactor segmentation, waste management and packaging and spent fuel removal. • We are expanding into Canada, Europe and Asia

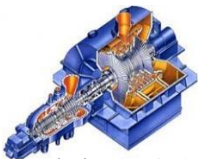
Accelerated Project Timelines

Start

+2 years

Reactor internals removed

+2 years



Steam turbine, generator and pressure systems removed

+2 years

Reactor building demolition

+1 year

U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

NRC site survey and license amendment to fuel storage only

Fuel moved to onsite interim storage area

Time is Money - Typical Accelerated D&D Process ~ 7 years

Building a Fleet

Oyster Creek Nuclear Generating Station

Fuel Transfer | D&D/SR | ISFSI Operations | LT | SR

2019 | 2021 | 2027 | 2033 | 2034 | 2035

Pilgrim Nuclear Power Station

Fuel Transfer | D&D/SR | ISFSI Operations | LT | SR

2019 | 2021 | 2027 | 2062 | 2063 | 2064

Indian Point Energy Center (3 units)

Fuel Transfer | D&D/SR | ISFSI Operations | LT | SR

2021 | 2024 | 2032 | 2060 | 2061 | 2062

Palisades Nuclear Generating Station

Fuel Transfer | D&D/SR | ISFSI Operations | LT | SR

2022 | 2024 | 2030 | 2068 | 2069 | 2070

▲ Holtec Ownership ▲ D&D Complete/NRC License Amended to ISFSI Only ▲ Site Restoration

Holtec Decommissioning Fleet

- Oyster Creek Nuclear Generation Station (July 2019)
  - 626 MW GE BWR 2 Mark 1 – ceased operations in September 2018
- Pilgrim Nuclear Power Station (Sept 2019)
  - 677 MW GE BWR 3 Mark 1 – ceased operations in May 2019
- Indian Point Energy Center[10] (3 Units) (June 2021)
  - (2)1020 MW Westinghouse 4 loop PWR – in 2020 / 2021
  - (1) 267 MW PWR unit shutdown in 1976
- Palisades Nuclear Generation Station (2022)
  - 805 MW Combustion Engineering 2 loop PWR – scheduled to shutdown in 2022

Decommissioning: Our Approach

- Used Fuel Management Strategy and Decommissioning are closely linked – Accelerated decommissioning in 8 years
  - Primary cost driver for systems and security is linked to defueling the spent fuel pool
  - Reduced defueling time directly results in reduced schedule and costs
- Potential for Holtec's Centralized Interim Storage facility to return land to green field status decades before a final repository is deployed
- Holtec will acquire all assets and liabilities as well as ownership of the irradiated fuel and the Standard Contract with the Department of Energy, and perform 100% of the fuel transfer to dry storage
- Holtec will be responsible for decommissioning, the Independent Spent Fuel Storage Installation, terminating the NRC licenses, and non-radiological site restoration.
- Through multiple plant acquisitions, a fleet approach has been established to implement & advance industry decommissioning
  - Improve safety, cost and efficiency
  - Fleet-based approach promotes sharing of lessons learned and good practices
  - Qualified and experienced personnel
  - Standardized Procedures & processes
  - By accelerating movement of spent fuel into dry cask storage and deploying state-of-the-art technologies, Holtec is well-equipped to decom. nuclear plants decades sooner than if utility owned

Oyster Creek Status

Status and Performance

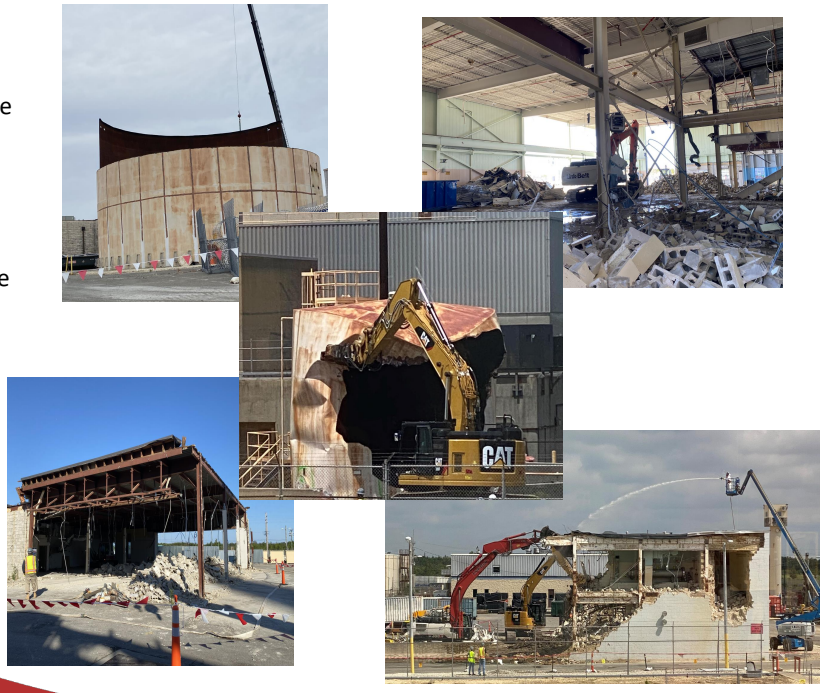
- Reactor was shutdown on Sept 17,2018
- Zirc fire period ended in June 2019
- Holtec acquisition in July 2019
- Pool to pad completed in May 2021
- Nuclear Security footprint reductions to ISFSI only August 1, 2021 (Reduced from 152 Acres down to 6 acres)
- GTCC (reactor segmentation) stored on ISFSI pad (4 canisters) August 2021
- Historical Site Assessment completed
- Non-radiological site characterization and remediation activities completed. Radiological characterization in progress
- Phase 2 Reactor Segmentation ongoing and ahead of schedule (end of 2021)

Oyster Creek Dry Fuel Storage

- New World Record by Completing the most efficient Transfer of Plant's Spent Nuclear Fuel to Dry Storage (33 HI-STORM FW 32 months after plant shutdown).
- Loading of 33 cask in 21 weeks.
- Safely completed defueling project under budget and ahead of schedule in all major categories.
- Implementing a state-of-the-art Aging Management program to protect the legacy horizontal dry storage modules.

Oyster Creek by the Numbers

- Buildings removed (2 years ahead of schedule)
  - 12 building demolished. AOG (first radiologically contaminated) completed.
  - 4 buildings abated and air gapped, ready for Demo (New Radwaste, Boiler House, Chlorination/Condensate Transfer, Security Admin Building)
  - Numerous ancillary structures, transformers and tanks removed
- Rad Waste
  - 175,000 cubic feet weighing 6,618,891 pounds of waste – shipped offsite to WCS
  - 50,000 cubic feet stage for offsite disposal
  - Over 2,000,000 pounds decontaminated and recycled
  - 4 canisters of GTCC (ISFSI)
  - Over 2 million gallons of water processed
- Non-radiological waste
  - Demo debris released to Local Landfill – 1636 tons, 3,272,000 pounds
  - Recycled demo material ~ 975 tons, 1,950,000 pounds



Reactor Dismantling and Segmentation

- Holtec has used supply chain partners for reactor segmentation at Oyster Creek (and Pilgrim)
- Segmentation activities conducted in parallel to dry fuel activities
- Mechanical cutting
- Dryer Segmentation – 40 days
- Improved efficiency at Pilgrim
- 4 canisters of GTCC
- Improved efficiency at Pilgrim
- Segmentation to be completed by end of 2021
- Class B&C Reactor waste is stored in Holtec waste containers.

Oyster Creek Reactor Head Segmented

Oyster Creek Reactor Containment Shield Piece Cutting / Removal

Oyster Creek Drywell Head Segmentation

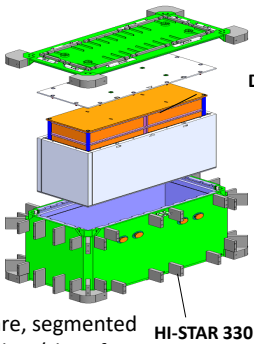
Low Level Waste Containers

- Holtec has designed, fabricated and fully qualified a U.S. 7A Type A Container to store and transport Low-Level waste to a disposal facility within the United States.
- Holtec's Type A waste box has an internal volume of 12m^3.
- Box wall shielding thicknesses can be adjusted to accommodate higher radiation levels => economies of handling, but customized as needed
- In the U.S., self-certification of these containers is approved internally with records to detail how containers meet applicable requirements and tests (dose limits, penetration testing, free fall drop, etc.)

- **Contents**
  - D&D Waste: Scrap metal, rubble and plastics.

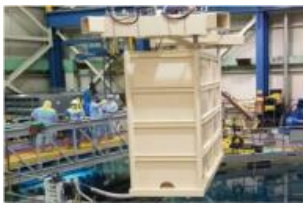
HI-STAR ATB1T Type B Transport Package for Non-Fuel Waste

- **Holtec has licensed the HI-STAR 330 Type B Package for Transport of High Activity Waste**
  - Cryogenic steel containment boundary
  - Remote Operated Lid Locking (hydraulic)
  - No Impact Limiters (simplified operations)
  - Internal tanks are already loaded with waste at Holtec sites, and are stored ready for offsite transport
- **Contents**
  - Designed for internal waste containers with different wall thickness for shielding various contents (T-100 7.7m3 and T-150 6.8m3)
  - Neutron activated metals and metal oxides, such as non-fuel hardware, segmented reactor internals, core supports, and other secondary debris (e.g., debris/chips from cutting operations).
  - Filters and resin waste solidified or packaged and dewatered in non-hermetic containers
- **HI-STAR 240 type B/C cask under design. Smaller version of HI-STAR 330 (Internal volume of 2 m3)**



Disposal Waste Liner stored within Liner Shield

HI-STAR 330 Transport Cask



Inner Cassette

Storage in Concrete Box until ready for Offsite Transport

Thank You!