STURGIS Barge Decommissioning Project

U.S. Army Corps of Engineers
Baltimore District
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US Army Corps of Engineers
BUILDING STRONG®
Today’s Presentation

- History of the STURGIS
- Environmental Assessment
- Decommissioning
  - Waste Segregation
  - Safety Measures
  - Oversight
  - Milestones
- Questions
First Barge Mounted Nuclear Power Plant

- The former World War II Liberty Ship, SS Charles H. Cugle, was converted into a nuclear power plant in 1966.

- STURGIS was the first barge mounted nuclear plant to regularly supply power to a shore station.

- The STURGIS’ nuclear reactor, MH-1A, was used to generate electricity for military and civilian use in the Panama Canal from 1968-1976.
Typical Pressurized Water Reactor Operations
The STURGIS is a Historic Property

- The STURGIS is considered a historic property eligible for listing in the National Register of Historic Places.
- During decommissioning, the Corps will preserve items of historic interest, including an electronic repository of documents.
Fuel Removal and Long-term Storage

- In 1977, the STURGIS returned to Fort Belvoir where the nuclear fuel was removed, and the vessel was prepared for safe long-term storage.

- The STURGIS has been maintained in James River Reserve Fleet at Joint Base Langley-Eustis, VA since 1978.

- The Corps of Engineers has performed quarterly monitoring and periodic maintenance for the past 36 years.
Characterization Confirms Very Low Radiation Levels

- The vessel’s radiological and chemical contaminants were evaluated in 2001.
- The extensive characterization confirmed that radiation levels have decayed to safer working levels.
Characterization
Basic Types of Ionizing Radiation

- **Alpha (α)**: $^4_2\alpha^+$
- **Beta (β)**: $^0_{-1}\beta^-$
- **Gamma (γ)**: $^0_0\gamma$
- **Neutron (n)**: $^1_0n$

Materials:
- Paper
- Plastic
- Lead
- Concrete
Where Did the Radioactivity Come From?

Radiation is emitted

Neutron is emitted

Materials become radioactive (e.g. Ni-63 & Co-60)

Materials become stable
- Co-60 > Ni-60
- Ni-63 > Cu-63
STURGIS Primary Radionuclides

- Primary radionuclides are activation products
  - Co-60
  - Ni-63
- Most of the activity is in the form of radioactive metal in the reactor pressure vessel and the primary shield tank
  - Ni-63 emits low-energy beta radiation
  - Co-60 emits beta and gamma radiation
## Characteristics of the Important Radionuclides

<table>
<thead>
<tr>
<th>Radionuclide</th>
<th>Abbreviation</th>
<th>Half-life (years)</th>
<th>Radiation Emitted</th>
<th>Percent Abundance Dec 2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cobalt-60</td>
<td>Co-60</td>
<td>5.27</td>
<td>Beta/gamma</td>
<td>27.05 %</td>
</tr>
<tr>
<td>Nickel-63</td>
<td>Ni-63</td>
<td>100.1</td>
<td>Low-energy beta</td>
<td>72.46%</td>
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</table>
The Half-Life of a Radionuclide

- Half life is the time it takes for 1/2 of the atoms to decay.
- The half-life of Co-60 is 5.27 yrs.
- The half-life of Ni-63 is 100.1 yrs.
Radioactive Decay Since Shutdown

Co-60 gamma emitting isotope
Ni-63 low energy beta emitting isotope
Environmental Assessment
Four Coastal Cities Were Selected for the Assessment

- Galveston, TX
- Hampton Roads, VA
- Baltimore, MD, and
- Charleston, SC
Site Selection Was Based On:

- Proximity to the Corps of Engineers’ offices
- Proximity to waste disposal facilities, and
- Availability of shipyards and ship breaking operations.
An Environmental Assessment was Conducted in 2013

- The purpose of an environmental assessment is to determine the potential environmental impacts associated with each selected site.
The Environmental Assessment Considered:

- Ecology, including marine mammals, essential fish habitat, benthic communities and protected species
- Cultural resources, including preservation of historical documents
- Water, including bays, estuaries and wetlands
- Air quality, including towing and decommissioning activities
- Waste management, including hazardous and radioactive waste
The Bottom Line:
There are no significant impacts

- The environmental assessment concluded there are no significant environmental impacts, including impacts related to transportation.
Decommissioning
Primary Objectives

- Decommission, then dismantle the vessel.
- Remove radioactive material to permit the STURGIS to be released for unrestricted use.
- Segregate waste streams.
- Ensure wastes are disposed in licensed facilities.
- Recycle nonradioactive material.
- Terminate the Army Reactor Office permit.
Path Forward

- Inspect STURGIS prior to relocation.
- Conduct baseline radiological survey at Malin Shipyard prior to towing.
- Prepare STURGIS for towing to Malin Shipyard.
- Remove STURGIS' residual radiological and hazardous materials.
Path Forward

- All parts and contents of STURGIS and the MH-1A reactor will be disposed as
  - Clean (recycled/land filled) [Estimated ~90%]
    - The shipbreaking is planned to be completed in Brownsville, TX
  - Radioactive [Estimated ~8%]
  - Hazardous [Estimated ~2%]
  - Mixed waste (Radioactive and hazardous/asbestos/universal) [Estimated <1%]
Towing Route

**Point-of-Origin:** Joint Base Langley-Eustis, VA, James River Reserve Fleet

**Point-of-Decommissioning:** Malin International Shipyard and Drydock, Inc., Galveston, TX

~1,750 NAUTICAL MILES DISTANCE TRAVELED

460 FEET LENGTH OVERALL

65 FEET BEAM

15 FEET DRAFT

9,400 TONS DISPLACED WATER WHEN AFLOAT
WHERE DOES IT ALL GO?

REMOVAL OF NON-RADIOLOGICALLY CONTAMINATED MATERIAL & EQUIPMENT (M&E) WILL BE RECYCLED
- Overwhelming majority of M&E fall into this category
- Spare parts, secrets, manual tools
- Control room consoles
- Electrical distribution equipment
- Pipe and valves
- Crew furnishings
- Clean vessel

REMOVAL OF RADIOACTIVE WASTE TO A LICENSED DISPOSAL FACILITY
- Radiologically activated
  - Reactor Pressure Vessel (RPV)
  - Reactor components
  - Nearby metals
- Radiologically contaminated
  - Primary reaction system equipment
  - Liquid waste management system

REMOVAL OF NON-RADIOLOGICALLY CONTAMINATED HAZARDOUS WASTE FORMS
- Asbestos insulation, floor tiles, mastics, etc.
- Lubrication oils
- Diesel residues from emergency generator
- Cleaning materials
- Universal waste
Risk Reduction and Safety

- The potential risks from radiation sources may result from
  - Internal exposures, or
  - External exposures

- Different control methods are used depending on the type of exposure
Risk Reduction and Safety

- **External radiation protection**
  - Establishing a security perimeter to control access
  - Using shielding on components that have higher exposure rates
  - Minimizing the time any of the higher exposure rate components are not shielded
  - Using 3-D laser mapping to facilitate planning

- **Internal radiation protection**
  - Conduct activities in a contained area of the barge using proven industry standards
  - Use contamination control methods such as glove bags, foaming, and fixatives
  - Control air flow and emissions using HEPA filtration units
Hurricane Plan

- A detailed hurricane plan will be prepared:
  - Double tie the STURGIS in place and make sure it is water tight.
  - STURGIS will be left in the shipyard to ride out the storm.
  - Consistent with what Malin Shipyard has done before during previous hurricanes.
Project Team and Schedule
Contract Award

- March 2014, award of $34.6M to CB&I to complete the STURGIS decommissioning in Galveston

- Award was based on best value considering technical approach, management, past performance, and cost factors.
Project Team

- Members of the project and oversight team include:
  - Professional Engineers
  - Certified Health Physicists (Radiation Safety)
  - Environmental Scientists
  - Regulatory Specialists
  - Safety Specialists
  - Qualified Technicians
Highly Skilled and Experienced Contractor Team

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<th>CB&amp;I Prime Contractor</th>
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<td>Quality Assurance</td>
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<td>Safety and Health</td>
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<td>Radiological Program</td>
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<td>Project Controls</td>
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<td>Contract Management</td>
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<td>Radiological Controls</td>
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<td>Waste Certifications</td>
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<td>Waste Transport</td>
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<td>Waste Disposal</td>
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<td>Regulatory Support</td>
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<td>Towing Plan</td>
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<td>Naval Architect</td>
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<td>Pierside Operations</td>
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<td>Decommissioning Facility</td>
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<td>Shipyard Labor</td>
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<td>Drydock (Submersible Barge)</td>
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<td>Ship Breaking, Recycling, and Vessel Disposal</td>
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Federal Oversight

- U.S. Army Corps of Engineers will provide quality assurance over the contractor and their quality control program
- Corps of Engineers National Environmental Center of Expertise
- Army Reactor Office and Reactor Council
- Oak Ridge Associated Universities – Independent Review
State Oversight

- **Texas Commission on Environmental Quality**
  - Disposal of Low level Radioactive Waste
  - Remediation of Asbestos Containing Materials

- **Texas Department of State Health Services**
  - Release of materials
  - Materials in transport
  - Licensing Asbestos workers
STURGIS Schedule

- Tow STURGIS in April 2015
- Begin decommissioning in May 2015
- Decommissioning will take 14-18 months
QUESTIONS?

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