Pilgrim Nuclear Power Station Independent Spent Fuel Storage Installation (ISFSI) Siting

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Introductions

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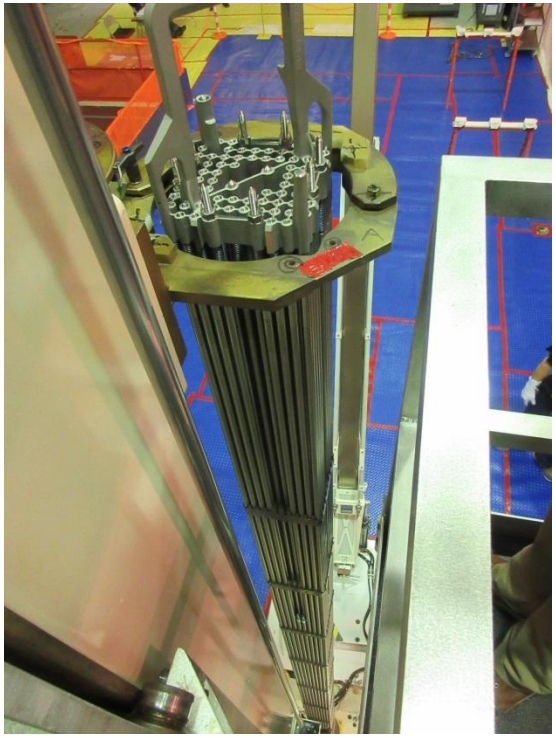
Pilgrim Dry Fuel Storage - Background

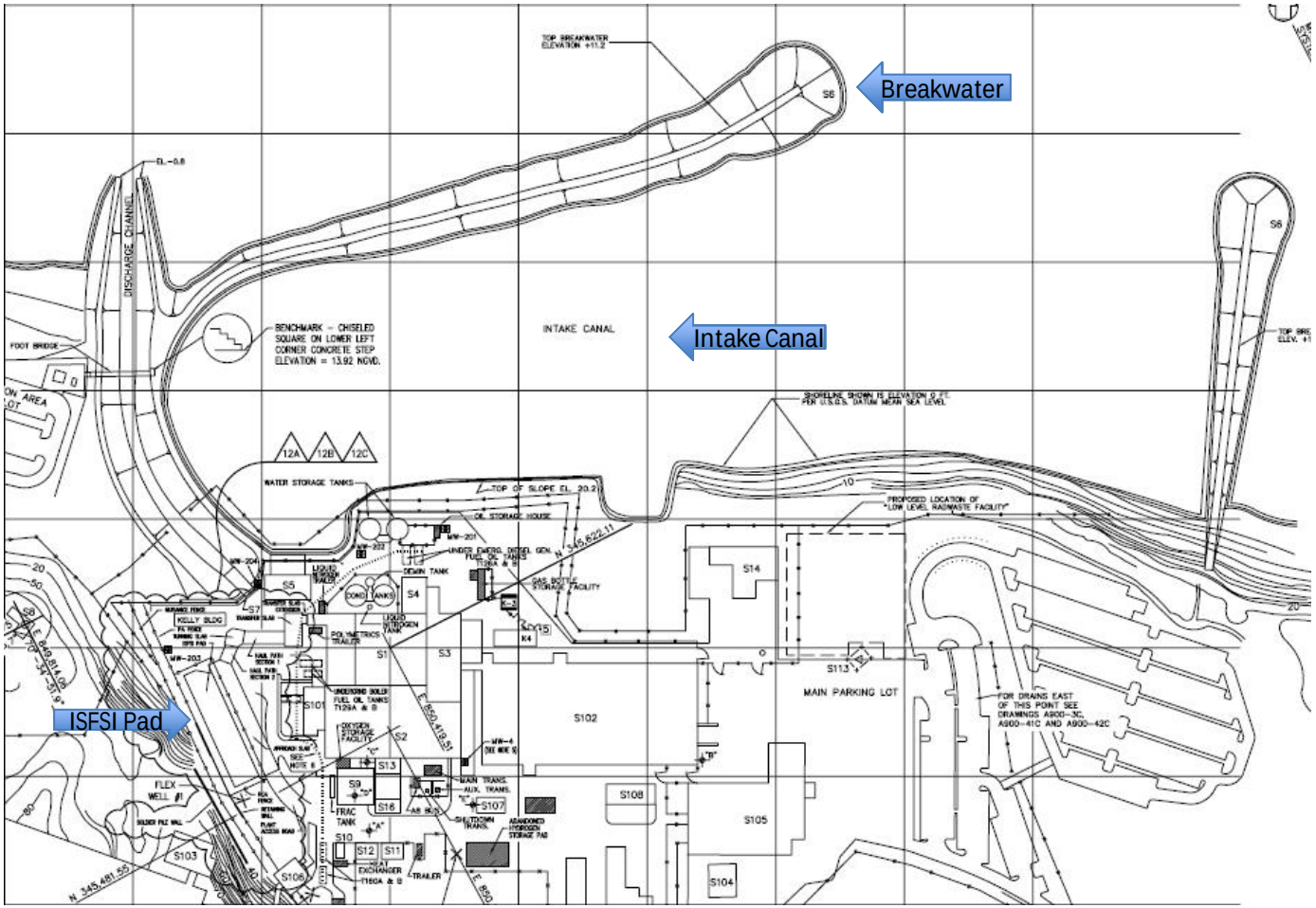
- The Pilgrim Nuclear Power Station Spent Fuel Pool is designed and licensed to store 3,859 fuel assemblies.
- There are currently 2,990 spent fuel assemblies stored in the Spent Fuel Pool.
- With Pilgrim in its final operating cycle, the remaining 580 assemblies in the reactor will be added to the pool in 2019.
- There are currently 544 spent fuel assemblies stored in 8 dry casks on the first Independent Spent Fuel Storage Installation (ISFSI) pad.
- Since commercial operation began in 1972, a total of 4,114 spent fuel assemblies have been generated.



Pilgrim Dry Fuel Storage – Background (Cont'd)

- Pilgrim currently has one (1) operational ISFSI pad with a capacity of 40 casks administratively limited to 38 casks to facilitate shuffling/cask access.
- The current pad has eight (8) loaded Holtec System 100 Multi-Purpose Canisters (MPCs) each with 68 fuel assemblies.
- Current plans are to load additional casks in 2018.
- A second ISFSI pad is required to store all spent nuclear fuel on-site.
- Design, engineering and vendor selection will determine specifics such as the size of the second pad and the total number of cask systems.

Pilgrim Site Plan



Pilgrim Aerial View

Second ISFSI Pad Siting

- The effort to site the second ISFSI pad is an important project that the Decommissioning Planning Organization (DPO) is undertaking in conjunction with development of the Post-Shutdown Decommissioning Activities Report (PSDAR).
- There are a number of regulatory and technical requirements that will guide this process.
  - Storage Capacity and Layout
  - Interferences and Sub-Surface Utilities
  - Regulatory Requirements (NRC/Local Permitting)
  - Geotechnical
  - Physical/Engineering Design Considerations (Structural/Electrical)
  - Security Requirements
  - Radiological Considerations
  - Hazard Considerations
  - Impact on Decommissioning

Storage Capacity and Layout

- The capacity of the new ISFSI pad will accommodate all spent fuel in the Spent Fuel Pool (including fuel in the reactor) in coordination with the capacity of the existing pad.
- The capacity of the pad(s) will also include adequate additional storage for anticipated Greater than Class C (GTCC) waste.
- The new cask storage pad is assumed to be concrete and of similar design as the existing pad.
- The new storage pad design will consider the effects on storm water runoff and drainage.
- The pad layout and design shall be suitable for the Vertical Cask Transporter (VCT) operation.
- The design will assume compatibility with the Holtec HI-STORM Cask System.

Interferences & Sub-Surface Utilities

- All buried utilities (electrical, security, piping systems, leach fields, storm water) within the pad footprint shall be evaluated for the design loads imposed by the new pad and/or removed/relocated.
- Location options shall consider the complexity and impact of relocating or removing buried utilities.
- Where practical, the pad design shall be customized to accommodate the presence of any identified buried utilities.
- A preliminary survey of buried electrical utilities has been performed in conjunction with the previous pad's site selection process.

Regulatory Requirements (NRC/Local Permitting)

- Nuclear Regulatory Commission Requirements
  - 10CFR72, Subpart E, “Siting Evaluation Factors”
    - Subpart E of 10CFR72, Paragraphs 72.90 through 72.108
      - 72.90 General Requirements
      - 72.92 Design basis external events
      - 72.94 Design basis external man-induced events
      - 72.96 Siting limitations
      - 72.103 Geological and seismological characteristics
      - 72.108 Spent fuel for high-level radioactive waste transportation
  - 10CFR72, Subpart F, “General Design Criteria”
    - Subpart F of 10CFR72, Paragraphs 72.120 through 72.130
      - 72.122 Overall requirements
      - 72.126 Criteria for radiological protection
      - 72.128 Criteria for spent fuel, high-level radioactive waste, and other radioactive waste storage and handling
      - 72.130 Criteria for decommissioning

Regulatory Requirements (NRC/Local Permitting)

- Nuclear Regulatory Commission Requirements
  - 10CFR73, Subpart H, “Physical Protection”
    - Subpart H of 10CFR72, Paragraphs 72.180 through 72.186
      - 72.180 Physical protection plan
      - 72.182 Design for physical protection
      - 72.184 Safeguards contingency plan
- Local Permitting
  - Zoning Board of Appeals
  - Conservation Commission, Determination of Applicability
  - Construction Permit

Geotechnical

- Site selected must meet subsurface, geological and seismological design basis requirements for the new pad.
- The design basis of the pad shall be based upon the geological investigation requirements and seismological design criteria as described in 10CFR72.103.
- The cask pad shall be designed for dynamic loading and liquefaction settlements for the site selected.

Engineering Design Considerations

- Structural Design
  - Pad design must meet specific design parameters and limitations provided in the cask's Final Safety Analysis Report (CFSAR).
  - Designed in accordance with industry standards (e.g. ACI).
  - Structural design shall consider different loading combinations associated with progressive placement of the cask systems on the pad.
- Electrical Design
  - Grounding
  - Lighting
  - Temperature monitoring
  - Emergency back-up power provisions

Security Requirements

- The siting evaluation shall confirm compliance with the security requirements of 10CFR72.106, 10CFR73.51 and 10CFR73.55.

- The siting location shall assess the effect on the Security Owner-Controlled Area (SOCA) vehicle barrier required location(s) and determine minimum required distances from the barrier to the closest cask system.

Radiological Considerations

- Determination of site boundary dose shall be performed for the location of the new pad in accordance with 10CFR72.104(a)
- Verify compliance with 10CFR72.126 criteria for radiological protection.

Hazard Considerations

- Fire and explosive hazard evaluations will be performed as required the cask's Certificate of Conformance (CoC)
  - Fire from on-site storage of fuel, transformers, and forest fires, as examples.
  - Explosions from on-site gas storage, pipelines and combustibles.
- Other hazard evaluations will verify compliance with 10CFR72.122 regarding environmental conditions and events. This includes, but is not limited to evaluations for:
  - Flooding
  - Earthquakes
  - Tornados
  - Tornado Missile Events

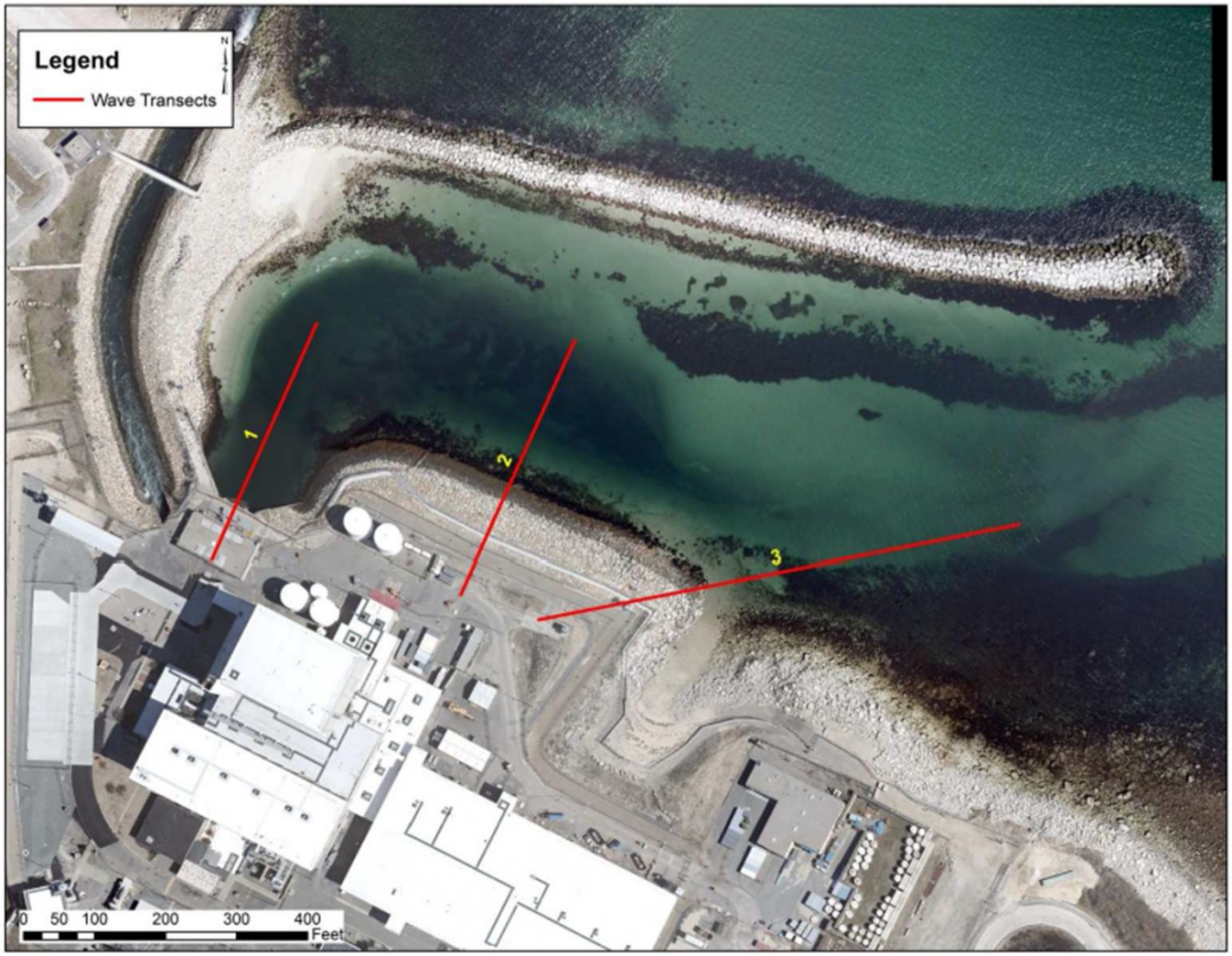
Hazard Considerations (Cont'd)

- Flooding
  - Background Information
    - Existing ISFSI pad is at elevation 25' above Mean Sea Level (MSL)
    - Existing ISFSI pad is approximately 300 feet from the shoreline
    - Each Holtec HI-STORM 100 cask system has a loaded weigh of approx. 173 tons
    - Each Holtec HI-STORM 100 cask is 18'-3" feet tall and 11 feet in diameter
  - Definitions
    - Mean Sea Level – The average level of the ocean's surface, calculated for all stages of the tide and used as a reference for elevations.
    - Mean Low Water – A datum derived from the average height of all low waters recorded at a given location over a 19-year period.
    - Mean High Water – A datum derived from the average of all high waters recorded at a given location over a 19-year period.
    - Maximum Astronomical Tide – The highest tide which can be predicted to occur at a given location.

Hazard Considerations (Cont'd)

- Flooding
  - A flood evaluation was performed during the siting selection evaluation for the first ISFSI pad in 2010.
  - A Flood Hazard Re-Evaluation Report was developed in 2015 for the Pilgrim Nuclear Power Station as requested by the NRC to support the evaluation of the NRC staff recommendations for the Near-Term Task Force (NTTF) review of the accident at Fukushima Dai-ichi.
  - The evaluations both conclude that the current pad elevation meets the worst case flooding scenarios for the site.

Hazard Considerations (Cont'd)



PNPS Wave Transects

Hazard Considerations (Cont'd)

- Flooding
  - A summary from the Flood Hazard Re-Evaluation Report supports the location of the first pad.

Mechanism	Stillwater Elevation	Waves/ Runup	Reevaluated Hazard Elevation
Storm Surge			
Probable Maximum Hurricane Plus Wind Wave Effects at Upstream Face of Intake Structure	15.8 ft MSL	4.0 ft	19.8 ft MSL
Probable Maximum Wind Storm Plus Wind Wave Effects Near the Reactor Building	15.3 ft MSL	7.1 ft	22.4 ft MSL
Probable Maximum Hurricane Plus Wind Wave Effects Near Reactor Building	15.8 ft MSL	6.3 ft	22.1 ft MSL

Conclusions

- The effort to site the second ISFSI pad is an important project to the decommissioning of Pilgrim and management of the Spent Nuclear Fuel.
- There are numerous regulatory and technical requirements that will inform this process.
- More information will be available as the second pad site selection process moves forward.
- Entergy Pilgrim plans to keep the NDCAP membership up to date on new information and progress on these efforts.

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