Current Diablo Canyon Independent Spent Fuel Storage Installation

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Overview

- Diablo Canyon (DC) Independent Spent Fuel Storage Installation (ISFSI) Background
- Design, Capacity, and Capabilities
- Inspections and Results
- License Renewal
DC ISFSI Background
DC ISFSI Background

- Site-specific 10 CFR Part 72 license for storage
- Holtec HI-STORM 100SA system
  - Anchored cask design for seismic considerations
  - 10-year spent fuel pool cooling time
- ISFSI pad will hold all fuel for the licensed plant life
- Current status:
  - 7 completed loading campaigns
  - 1,856 fuel assemblies stored at the DC ISFSI in 58 casks
- Transportability:
  - Holtec is in the process of licensing (10 CFR Part 71) all loaded casks for transportation
DC ISFSI Design, Capacities, and Capabilities
Component Descriptions

- **MPC – stores the spent fuel (up to 32 assemblies)**
  - Integrally-welded pressure vessel
  - Includes an outer shell (0.5” thick), a lid (9.5” thick), and a base plate (2.5” thick)
  - Sits on pedestal within the overpack (fabricated as a metal-encased concrete disc, up to 16” thick)

- **Overpack – houses the MPC**
  - Made of 1” thick inner and outer concentric metal shells
    - provides approximately 30” of annular space that is filled with unreinforced concrete
  - Includes a baseplate (2” thick), and a bolted lid (fabricated as a metal-encased concrete disc, up to 19” thick)
Inspection Requirements

• Recurring inspections being performed
  – Overpack and vent inspections
  – ISFSI storage pad concrete inspections
  – Radiation surveys
  – Pre-service inspections for transportation equipment

• Future real-time radiation monitoring
  – PG&E included a request for funding in the 2021 Nuclear Decommissioning Cost Triennial Proceeding:
    “…real time radiation monitoring will be employed at the ISFSI pad and a control location. A Mirion Perimeter Radiation Monitoring System, or equivalent, will detect and transmit the data to State and County of San Luis Obispo agencies for data interpretation and posting on a publicly available web site.”
  – Allows for real-time monitoring of existing and future systems
Capabilities

• **Accessibility**
  – MPCs are accessible for inspection using remote systems
  – Access through vents

• **Retrievability**
  – Spent fuel is required by federal regulations to be retrievable
  – Defined as “the ability to safely remove the spent fuel from storage for further processing or disposal”

• **Repairability**
  – MPCs are accessible (as noted above)
  – SONGS has demonstrated a remote surface repair process
  – Research is proceeding to support an ASME code case based on demonstration results
1. Robotic camera inserted into vents

2. Robotic camera travels up and down inside of overpack

3. Typical video snapshot from robotic camera (looking down)
DC ISFSI Inspections and Results
• MPC inspections conducted in 2014 & 2021

• 2014 Scope
  – 2 MPC inspections (visual inspection of accessible surfaces by remote means) – joint with EPRI

• 2021 Scope
  – 8 MPC inspections (visual inspection of accessible surfaces by remote means)
  – 8 overpack inspections (visual inspection of accessible surfaces)
    • Radiation monitoring
  – ISFSI storage pads and structural concrete (visual inspection of above grade, accessible surfaces)
Inspection Findings – MPCs

Conclusions (example photos on next slides)

- Overall good condition; no challenge to safety or intended functions prior to next inspection
- Degradation rates versus margins indicate no need to shorten proposed 5-yr inspection frequency
  - Negligible general corrosion or rusting is expected. Over time, an iron oxide layer forms on the surface; therefore, further rusting after that formation is not expected
  - Depths are less than maximum allowable depths already analyzed
  - Corrosion rates demonstrate that the corrosion will not propagate through-wall over the 60-year license

Explanation of MPC Minimum Wall Thickness

Greatest depth estimated during inspection: 0.014” (orange area) less than 4 sheets of paper

MPC Minimum Wall Thickness: 0.45” (grey area)

MPC Total Thickness: 0.50” (grey + green + orange)
Context on MPC Surface Finish

Typical consumer stainless steel finish

Typical MPC before loading

Note: not shiny so that it facilitates heat transfer

Typical MPC surface finish before loading (close-up)
Inspection Findings – MPCs

Example photos of indications:

- **Staining/Discoloration**
- **Scrape marks – very shallow**

Note: Static in photos is camera effect from radiation

View orientation: looking down into annulus

Inside surface of overpack
**Inspection Findings – MPCs**

**Example photos: close-ups of MPC surface**

- **MPC surface**
  - **Rust spots**
  - **Divots**

**Rust estimated dimensions: 0.008” deep**
- For reference: a sheet of paper is 0.004” thick
- Rust equates to ~1.8% of minimum wall thickness (0.492” out of 0.5” wall thickness remaining)

**Divots/Gouges estimated dimensions: 0.014” deep**
- Divots/gouges equate to ~3.1% of minimum wall thickness (0.486” out of 0.5” wall thickness remaining)

**View orientation:**
- Looking at MPC

**Note:** Static in photos is camera effect from radiation
Inspection Findings – Overpacks

Conclusions (example photos on next slide)

- Overall good condition; no challenge to safety or intended functions prior to next inspections
- Degradation rates versus margins indicate no need to shorten proposed 5-yr inspection frequency
  - Corrosion and divot/gouge depths are less than maximum allowable depths already analyzed; therefore, no impact to intended functions
  - No base metal penetration from paint chipping/ coating damage

Overpacks are subject to routine inspections, including daily inspections, as described on slide 7

- If workers notice any issues, they are entered into the Corrective Action Program
Inspection Findings – Overpacks

Example photos of indications:

- **Staining**
  - Superficial Rust
    - Smaller than top of pencil eraser
  - Max allowable material loss for overpack outer portions is 0.125”

Note: Static in photos is camera effect from radiation.

View orientations:
- 2 views
Inspection Findings – Overpacks

Example photo of inner overpack wall:

Superficial Gouges/Divots

Max allowable material loss for overpack inner shell is 0.25”
Soil Laboratory Results: non-aggressive

- Means the soil will not cause pre-mature aging
- Will continue to confirm soil conditions on a 5-year frequency

Concrete Results

- No findings prevent the concrete from performing its intended function or required immediate corrective action
- ISFSI Pads: 43 indications (e.g., cracks, delamination, scaling)
- Cask Transfer Facility Structural Concrete: 5 indications (e.g., cracks, delamination, voids)
Inspection Findings – Dose

Radiation Monitoring

- Dose rates measured at the upper overpack vents in normal configuration
- Highest measured dose rate was 1.2 mrem/hr (3.9% of licensed value)
  - Equates to ~0.018 mrem/hr for a person standing at the ISFSI fence (minimum 40 ft from closest overpack)
  - For reference: dental x-rays result in ~0.4 mrem
• PG&E performed an industry leading number of system inspections for license renewal

• Findings reinforce there is no compromise to the safety functions

• PG&E made the inspection results publicly available
  – Included in the license renewal application submitted to the NRC
  – Shared with the nuclear industry

• Periodic system inspections will continue to ensure there is no loss of intended functions
DC ISFSI License Renewal
DC ISFSI License Renewal Process

NRC Guidance Development: 4 years

DC ISFSI LRA Prep: 1.5 years

NRC Review: 2-3 years

Draft NUREG-1927, Rev. 1 issued (2015)

Final NUREG-1927, Rev. 1 issued (2016)

Draft NUREG-2214, Rev. 0 issued (2017)

Final NUREG-2214, Rev. 0 issued (2019)

Prepare draft LRA per NRC guidance

Conduct NRC Pre-Application Meeting

Perform ISFSI pre-application inspection

Update LRA w/ inspection results and submit

CZMA review / approval

NRC review / approval

Renewed ISFSI license issued

45-day public comment period

60-day public comment period

Public input through DCDEP Strategic Vision

Public input

Opportunity to request a hearing and petition to intervene

Mar 9, 2022 submissions; see next slide

PG&E Outreach (ongoing)
DC ISFSI License Renewal Review Process

NRC Review

• Safety review: will be documented in publicly available Safety Evaluation
• Environmental review in accordance with National Environmental Policy Act: will be documented in publicly available Environmental Assessment

California Coastal Commission Review

• Evaluates consistency of DC ISFSI license renewal with the California Coastal Management Program (CCMP) and Coastal Zone Management Act (CZMA)

Next Steps and Public Participation

• After the NRC deems the LRA sufficient (~1-3 months after submission), a notice is posted in the Federal Register
• Federal Register notice announces a 60-day opportunity for interested parties to request a hearing regarding the renewal of the license. It will also give instructions for how to file a request for hearing
• PG&E will notify the DCDEP when the Federal Register notice is issued
Thank You

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