Current Status of Shutdown Sites Activities

Transportation Infrastructure Near Midwestern Shutdown Sites

Steve Maheras
Pacific Northwest National Laboratory

Council of State Governments
Midwestern Radioactive Materials Transportation Committee
Traverse City, Michigan
November 2014
Two Topics Covered

- Current Status of Shutdown Sites Activities
- Transportation Infrastructure Near Midwestern Shutdown Sites
  - Zion
  - La Crosse
  - Big Rock Point
  - Kewaunee
  - Summary of Transportation Alternatives
Current Status of Shutdown Sites

Activities

- Updated Shutdown Sites Report (SSR) is undergoing review for posting on the DOE-NE website
- Kewaunee site visit occurred 09/09-09/11/2014
- State and Regional Group (SRG), Tribal, and Federal Railroad Administration (FRA) representatives have participated in 7 of the shutdown site visits
Updated Google Earth imagery

Incorporated revisions to transportation certificates of compliance (CoCs)

- Transport of high burnup fuel in MP197HB transportation cask
- Previous CoC allowed 4 spent nuclear fuel (SNF) canister types (24PT4, 61BT, 61BTH, and 69BTH) and GTCC waste in RWC
- No transport of high burnup fuel
- Current CoC allows 9 canister types (24PT4, 24PTH, 32PT, 32PTH, 32PTH1, 37PTH, 61BT, 61BTH, and 69BTH) and GTCC waste in RWC
- Transport of high burnup fuel allowed in the 24PT4, 24PTH, 32PTH, 32PTH1, 37PTH, 61BTH, and 69BTH canisters

Updated the number of canisters stored at the Humboldt Bay site

Revised the estimated number of canisters stored at the Kewaunee and Crystal River sites

Added a discussion of the Kewaunee Harbor
Added discussions of mixed oxide SNF stored at the Big Rock Point and San Onofre sites

Expanded the discussion of steam generator shipments to and from the San Onofre site

Added a heavy haul truck to barge to rail transportation option for the San Onofre site

Added information about the site-specific licenses for Humboldt Bay, Rancho Seco, and Trojan

Added an appendix that discusses rail infrastructure assessments conducted during site visits to the Humboldt Bay, Big Rock Point, Rancho Seco, Trojan, La Crosse, and Zion sites

Added an appendix that presents a summary of state permitting requirements for oversize and overweight truck shipments in California, Oregon, Michigan, Massachusetts, Connecticut, and Wisconsin
Further Updates to Shutdown Sites Report

- Incorporate information from Kewaunee site visit
- Incorporate GC-859 inventory data
- Add additional information on the local transportation infrastructure and transload locations around the shutdown sites
- Site visits to San Onofre and Crystal River
- Add Vermont Yankee to Shutdown Sites Report
- Evaluation of additional sites as they shutdown
  - National news reports suggest that additional sites may be prematurely shutdown
Two Topics Covered

- **Current Status of Shutdown Sites Activities**
- **Transportation Infrastructure Near Midwestern Shutdown Sites**
  - Zion
  - La Crosse
  - Big Rock Point
  - Kewaunee
Locations of 12 Shutdown Reactor Sites

- 486 canisters total [462 SNF canisters, 24 GTCC canisters] at shutdown sites (estimated)
- Nine dry storage systems
- Eight transportation casks

Key
SNF – spent nuclear fuel canisters
GTCC – canisters of greater than class C waste
Near-Site Transportation Infrastructure and Experience

- Evaluate transportation mode options for the shutdown sites
- Near-Site Rail Access
  - Condition and capacity of near-site rail infrastructure
  - Potential transload locations
  - Site experience with rail shipments
- Local Roads and Highways
  - Distance to potential rail transload locations (rail spurs or sidings)
  - Characteristics and condition of roads and associated infrastructure that would be used by heavy haul vehicles
  - Site experience with heavy haul shipments
- Barge Access
  - Characteristics of onsite or nearby docks/slips/shorelines
  - Site experience with barge shipments
Zion site visit – 07/22/2013

Zion is currently loading SNF into NAC MAGNASTOR system for dry storage

On-site rail spur provides direct access to Union Pacific railroad

Track in the vicinity of Zion is double track mainline
  - Track class = 4

Northeast Illinois Regional Commuter Rail Corporation operates commuter service over the same track

Rail spur was recently refurbished to support decommissioning

During construction, Zion was served by barge, barge facility was abandoned after construction and there are no plans to re-establish
Zion is loading SNF and GTCC waste into TSC-37 canisters which are subsequently loaded into MAGNASTOR vertical concrete casks (VCCs) and moved to the ISFSI.

40 VCCs have been loaded and moved to ISFSI as of October 2014, loading forecast to be complete in 2015 (total of 65 VCCs).
Zion Site Layout

- Staged Storage Casks
- On-site Rail Spur
- Lake Michigan
- Zion Reactor Site
- Zion ISFSI
Rail Interface at Zion
Zion Transportation Infrastructure

- Railcars Staged Onsite at Zion
- Trackmobile Used to Move Railcars Onsite
- Plant Lead Entering Zion Site
- Plant Lead Exiting Zion Site
Zion Transportation Infrastructure

Derailers on Plant Lead

Flop Derailer

Plant Lead Exiting Site Showing Switches

Plant Lead at Zion Access Road
Zion Transportation Infrastructure

Plant Lead Approaching Zion Site

Plant Lead with Concrete Ties on Corners

Closeup of Concrete Ties

East-West Section of Plant Lead with Wood Ties
Zion Transportation Infrastructure

Junction of Plant Lead with Union Pacific Railroad with Concrete Ties on Corners

Switch Derailer on Plant Lead

Union Pacific Railroad at Plant Lead (Looking North)

Union Pacific Railroad at Plant Lead Showing Zion Station (Looking South)
La Crosse site visit – 07/23/2013
5 canisters stored in vertical concrete casks (VCCs) at ISFSI
ISFSI loaded 07/2012-09/2012
Rail service to La Crosse is provided by the BNSF Railroad
Track in the vicinity of La Crosse is double track mainline
  - Track class = 4
Onsite rail system has been removed
On-site rail spur used to remove reactor pressure vessel (310 tons) during decommissioning
La Crosse is located adjacent to the Genoa #3 Power Plant, and has onsite barge access for barges delivering coal to Genoa #3
La Crosse Site Layout
Aerial View of On-site Barge Facility and On-Site Rail Spur
Aerial View of La Crosse ISFSI and Boat Ramp
La Crosse Transportation Infrastructure

Remains of Onsite Rail System Leading to Onsite Rail Spur

Remains of Onsite Rail System Leading to Reactor Building

La Crosse Transfer Cask

Onsite Rail Spur
La Crosse Transportation Infrastructure

- Onsite Rail Spur (Looking North)
- Double Track Mainline and Lock and Dam #8 (Looking North)
- Double Track Mainline, Onsite Rail Spur, and Barge Facility (Looking South)
- Switch for Onsite Rail Spur on Double Track Mainline
La Crosse Transportation Infrastructure

- Entrance to La Crosse ISFSI
- La Crosse Boat Ramp
- View from La Crosse ISFSI Looking Towards Boat Ramp
- View from Boat Ramp Looking Towards La Crosse ISFSI
La Crosse Transportation Infrastructure

Grade Crossing at Entrance to Boat Ramp Access Road (Looking North)

Grade Crossing at Entrance to Boat Ramp Access Road (Looking South)

Reactor Pressure Vessel on Onsite Rail Spur

Reactor Pressure Vessel on Mainline
Big Rock Point site visit – 07/25/2013
8 canisters stored in vertical concrete casks (VCCs) at ISFSI
ISFSI loaded 12/2002-03/2003
Big Rock Point no longer has direct rail access
Big Rock Point also does not have barge access
Steam drum (200,000 lb.) and reactor pressure vessel (565,000 lb.) removed using heavy haul truck to rail transport during decommissioning
Heavy haul road would also have to be re-established
Big Rock Point Site Layout
Big Rock Point Transfer Cask, J-Skid, Gantry Towers, and Horizontal Transfer System being maintained onsite

Transfer Cask and J-Skid

Gantry Towers

Horizontal Transfer System
Big Rock Point Heavy Haul Routes and Transload Locations
Steam drum (200,000 lb.) transported 13 miles by heavy haul truck to Petoskey, Michigan

- Transloaded onto railcar at a siding
- Transported to EnergySolutions low-level radioactive disposal facility in Clive, Utah

Great Lakes Central Railroad appears to be track class 1 in the vicinity of the transload location in Petoskey
Route Taken by Steam Drum in the Vicinity of Petoskey
Petoskey Transload Location

Mainline at Petoskey Transload Location

Closeup of Track at Petoskey Transload Location
Reactor Pressure Vessel

- Reactor pressure vessel (565,000 lb.) transported 52 miles by heavy haul truck to Gaylord, Michigan
  - Transloaded onto railcar at a siding
  - Transported to Barnwell low-level radioactive disposal facility in South Carolina
- Lake State Railway appears to be excepted track at the transload location
- 1000 feet south of transload location, track appears to be track class 2
Route Taken by Reactor Pressure Vessel to Bypass Low Overhead Clearance Abandoned Railroad Bridge
Low Overhead Clearance Abandoned Railroad Bridge on U.S. 31
Route Taken by Reactor Pressure Vessel in the Vicinity of Gaylord, Michigan
Reactor Pressure Vessel Transloading

ETMX1001 Railcar Staged for Transloading

Reactor Pressure Vessel Beside ETMX1001 Railcar

Transfer of Reactor Pressure Vessel to ETMX1001 Railcar

Reactor Pressure Vessel on Railcar
Gaylord Transloading Location

1000' South of Gaylord Transloading Location (Looking South)
Kewaunee site visit – 09/09-09/11/2014

Kewaunee has loaded 14 canisters into NUHOMS horizontal storage modules (HSMs)

NAC MAGNASTOR system will be used for future loadings
- 24 canisters estimated, plus 2 canisters of GTCC during decommissioning

Kewaunee does not have direct rail access or barge access
Steam generators have been shipped into and out of Kewaunee using barges/ship and heavy haul trucks.

Replacement steam generators arrived by ship at port of Kewaunee, were transloaded, and transported by heavy haul trucks to the Kewaunee site, about 10 miles.

Old steam generators were transported by heavy haul truck to the port of Kewaunee, were transloaded, and transported by barge to Memphis, TN for decontamination.

NUHOMS horizontal storage modules (HSMs) were also shipped to Kewaunee by barge and heavy haul truck.
Kewaunee Barge Route

City of Kewaunee

WI-42 (10 miles)

Kewaunee Site
Kewaunee Transload Location
Kewaunee Transload Location

Kewaunee Transload Location Parking Lot

Kewaunee Transload Location Water Front
Kewaunee Transportation Infrastructure – Rail

- NUHOMS horizontal storage modules (HSMs) were shipped by rail to a siding in Bellevue, Wisconsin, transloaded to heavy haul trucks and transported to the Kewaunee site, about 28 miles.
- Transformers were shipped by rail to a siding in Luxemburg, Wisconsin, transloaded to heavy haul trucks and transported to the Kewaunee site, about 24 miles.
- Several additional potential transload locations were also investigated:
  - Rockwood Spur and WI-310 (20-23 miles from Kewaunee Site)
  - Rockwood Spur and Menasha Avenue near Manitowoc Airport (22 miles from Kewaunee Site)
  - Denmark Spur and North Avenue (17 miles from Kewaunee Site)
  - Manitowoc Railyard as potential marshalling yard
  - Additional locations on south side of Manitowoc River (21 miles from Kewaunee Site)
Kewaunee – Bellevue Route
Bellevue Transload Location
Bellevue Transload Location

- Bellevue Transload Location (Looking North)
- Bellevue Transload Location (Looking South)
- Bellevue Transload Location at WI-29
- Approaching Bellevue Transload Location on WI-29 (Looking West)
Kewaunee – Luxemburg Route

- Luxemburg Transload Location
- Luxemburg Spur
- CR AB
- WI-29
- WI-42
- Kewaunee Site
Luxemburg Transload Location
Luxemburg Transload Location

Luxemburg Transload Location (Looking West)

Luxemburg Transload Location Further Down Track (Looking West)

Luxemburg Transload Location (Looking East)
Kewaunee – WI-310 and Rockwood Spur Routes

- Kewaunee Site
- WI-310 and Rockwood Spur
- CR BB
- CR Q
- WI-42
- CR VV and CR B
- WI-310

Google Earth
WI-310 and Rockwood Spur Transload Location

Potential Transload Location

Manitowoc County Building

WI-310

Rockwood Spur
Approaching WI-310 and Rockwood Spur from East

Potential Transload Location (Looking North)

Turning into Parking Lot at WI-310 and Rockwood Spur (Looking North)

Traffic Circle on WI-310 (Looking East)
Kewaunee – Rockwood Spur at Manitowoc Airport Route
Rockwood Spur at Manitowoc Airport
Transload Location

- Rockwood Spur
- Potential Transload Location
- Menasha Avenue
Rockwood Spur at Manitowoc Airport
Transload Location

Potential Transload Location (Looking North)

Potential Transload Location (Looking South)

Access Road at Potential Transload Location (Looking North)
Kewaunee – Denmark Route

- Kewaunee Site
- WI-42
- CR BB
- CR R
- Denmark Spur
- North Avenue and Denmark Spur Transload Location
- CR T

Image credit: Google Earth
Denmark Spur and North Avenue Transload Location

Denmark Spur

Potential Transload Location

North Avenue
Denmark Spur and North Avenue Transload Location

Potential Transload Location (Looking South)

Potential Transload Location (Looking North)

Potential Transload Location (Looking West)

Potential Transload Location (Looking East)
Manitowoc Railyard – Potential Marshalling Yard
Manitowoc Railyard

Manitowoc Railyard (Looking North)

Manitowoc Railyard (Looking South)
Other Potential Transload Locations – Manitowoc

- As part of the Kewaunee site visit, met with CN yard office staff in Green Bay to discuss potential rail transload locations
- At their suggestion, additional locations in Manitowoc were investigated
Kewaunee – Manitowoc Route
Potential Transload Areas – Manitowoc

Potential Transload Location (Looking Northwest)

Potential Transload Location (Looking Southeast)

Potential Transload Location (Looking Southeast)
<table>
<thead>
<tr>
<th>Reactor Site</th>
<th>Transportation Mode Options</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maine Yankee</td>
<td>Direct rail, Barge to rail</td>
<td>The condition of the onsite rail spur and Maine Eastern Railroad would need to be verified.</td>
</tr>
<tr>
<td>Yankee Rowe</td>
<td>Heavy haul truck to rail</td>
<td>—</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Potential rail transload location at east portal of the Hoosac Tunnel (7.5 miles from site).</td>
</tr>
<tr>
<td>Connecticut Yankee</td>
<td>Barge to rail, Heavy haul truck to rail</td>
<td>Depth of barge canal uncertain and may require dredging to accommodate barges. Potential rail transload location at Portland rail spur (12 miles from site).</td>
</tr>
<tr>
<td>Humboldt Bay</td>
<td>Heavy haul truck to rail, Heavy haul truck to rail</td>
<td>Potential rail transload locations located 160 to 260 miles from site. The condition of the Fields Landing Terminal barge transload location would need to be verified.</td>
</tr>
<tr>
<td>Big Rock Point</td>
<td>Heavy haul truck to rail, Barge to rail</td>
<td>Potential rail transload locations in Petoskey, Michigan (13 miles from site) and Gaylord, Michigan (52 miles from site).</td>
</tr>
<tr>
<td>Rancho Seco</td>
<td>Direct rail, —</td>
<td>The rail spur is not being maintained.</td>
</tr>
<tr>
<td>Trojan</td>
<td>Direct rail, Barge to rail</td>
<td>The onsite rail spur was removed. Barge used to ship reactor pressure vessel and steam generators.</td>
</tr>
<tr>
<td>La Crosse</td>
<td>Direct rail, Barge to rail</td>
<td>The onsite rail spur was used to ship reactor pressure vessel.</td>
</tr>
<tr>
<td>Zion</td>
<td>Direct Rail, Barge to rail</td>
<td>The onsite rail spur was recently refurbished.</td>
</tr>
<tr>
<td>Crystal River</td>
<td>Direct rail, Barge to rail</td>
<td>Extensive onsite rail system. Have not conducted site visit.</td>
</tr>
<tr>
<td>Kewaunee</td>
<td>Heavy haul truck to rail, Heavy haul truck to barge to rail</td>
<td>Potential rail transload locations in Bellevue, Luxemburg, Denmark, and Manitowoc. Potential barge transload location in city of Kewaunee.</td>
</tr>
<tr>
<td>San Onofre</td>
<td>Direct rail, Heavy haul truck to barge to rail</td>
<td>Onsite rail spur recently refurbished. Have not conducted site visit.</td>
</tr>
</tbody>
</table>