# Planning for Nuclear Power Plant Site Visits – 20481

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## ABSTRACT

The U.S. Department of Energy Office of Integrated Waste Management (DOE-IWM) is planning for future large-scale transport of commercial spent nuclear fuel (SNF) and high-level radioactive waste (HLW) to eventual disposal and/or storage facilities. As part of its planning efforts, DOE conducts evaluations of removing SNF from nuclear power plant sites.

Site visits are a pivotal piece in the site evaluations that are conducted by DOE, and significant planning efforts are undertaken to design and implement site visits. Site visits typically include three days of surveys and meetings, including one day each for the nuclear power plant site visit, evaluating near-site transportation infrastructure, and meeting with community engagement panels or advisory boards.

This paper outlines DOE-IWM's planning process for conducting nuclear power plant site visits and summarizes the key activities carried out to prepare for a site visit, including a discussion of the background research conducted prior to a site visit. Additionally, the paper describes the development of reference databases for site visits, the identification of unique site characteristics, and the use of geographic information system (GIS) applications to enhance the quality of the information collected during a site visit.

## INTRODUCTION

In order to prepare for the transportation of spent nuclear fuel (SNF) and high-level radioactive waste (HLW) from nuclear power plant sites to future storage or disposal facilities, the U.S Department of Energy Office of Integrated Waste Management (DOE-IWM) conducts evaluations of removing SNF from nuclear power plant sites.[a] The role of a site visit is to confirm aspects of inventories at the site, obtain detailed inventory data by canister, and obtain canister load maps. Additionally, site visits provide an opportunity to observe transportation

[a] This is a technical paper that does not take into account contractual limitations or obligations under the Standard Contract for Disposal of Spent Nuclear Fuel and/or High-Level Radioactive Waste (Standard Contract) (10 CFR Part 961). For example, under the provisions of the Standard Contract, spent nuclear fuel in multi-assembly canisters is not an acceptable waste form, absent a mutually agreed to contract amendment.

To the extent discussions or recommendations in this paper conflict with the provisions of the Standard Contract, the Standard Contract governs the obligations of the parties, and this paper in no manner supersedes, overrides, or amends the Standard Contract.

This paper reflects technical work which could support future decision making by DOE. No inferences should be drawn from this paper regarding future actions by DOE, which are limited both by the terms of the Standard Contract and a lack of Congressional appropriations for the Department to fulfill its obligations under the Nuclear Waste Policy Act including licensing and construction of a spent nuclear fuel repository

infrastructure at and near the sites, to fact-check and take detailed photos/videos, to exchange information with site managers, and to incorporate the perspectives of Tribal, State, and federal agency participants regarding transport of SNF from the site. This paper outlines DOE-IWM's planning process for conducting nuclear power plant site visits.

## NUCLEAR POWER PLANT SITE VISITS

DOE-IWM site visits typically include three days of surveys and meetings, including one day each for the nuclear power plant site visit, evaluating near-site transportation infrastructure, and meeting with community engagement panels, advisory boards, and/or State and Tribal representatives. During site visits, activities are undertaken to fill in information gaps, such as participating in nuclear power plant site tours, evaluating site transportation experience and near-site transportation infrastructure, examining the condition of near-site infrastructure, and meeting with nuclear decommissioning community advisory boards or panels, States, Tribes, or local officials.

These site visits play a key role in the site evaluations undertaken by DOE and require significant planning. Preparatory activities range from gathering data to documenting known conditions at the site to developing databases to assist in data collection at the site. Planning efforts may begin as early as six months before a site visit and encompass a wide range of activities. Major activities undertaken before a site visit include:

- Document and database research
- Google Earth and geographical information system (GIS) database development
- Coordination with nuclear power plant site managers and staff
- Near-site infrastructure planning activities
- Tribal identification and cultural affiliation research
- Identification of meeting participants

## DOCUMENT AND DATABASE RESEARCH

Preparatory research focuses on areas relevant to transportation planning, such as understanding the on-site infrastructure, near-site transportation infrastructure, and the overweight/overdimension transportation experience at the sites (which may or may not include experience with previous SNF shipments). In order to assess gaps in information for nuclear power plant sites, near-site infrastructure and experience, and the inventory of SNF, research is conducted to gather data on the current SNF inventory (wet and dry), dry storage and independent spent fuel storage installation (ISFSI) plans, the general site information that could assist in understanding on-site preparations and operations for receiving, handling, and loading SNF transportation casks, and any Tribes located in the vicinity of the site or who may have cultural or historic ties to the area.

A variety of documents and databases are searched prior to conducting a site visit. To assess the inventory of SNF, the GC-859 database is consulted [1][b], industry forecasts and sources such as *StoreFUEL and SpentFUEL* are examined, and documents produced by the Nuclear Regulatory Commission (NRC) are also reviewed. Additionally, Facility Interface Capability Assessment reports and Facility Interface Data Sheets[c], Near Site Transportation Infrastructure (NSTI) reports[d], Services Planning Documents, and additional industry publications, such as *Radwaste Solutions*, are consulted.

In addition to the above sources, a variety of reports are also consulted in order to assess gaps in information for each site and the associated near-site transportation infrastructure. Publicly available information is identified in Atomic Energy Commission environmental statements, NRC license renewal documents, decommissioning National Environmental Policy Act (NEPA) documents, as well as in licensee irradiated fuel management plans and post-shutdown decommissioning activities reports. NRC databases are also examined for any relevant documents. Such databases include the NRC's Agencywide Document Access Management System and Licensing Support Network, as well as the Yucca Mountain Records Information System.

Finally, literature reviews and general background research is conducted online. During this research, information is specifically gathered on any previous SNF shipments conducted from the site, any shipments of large component parts via barge, heavy-haul, or rail that were conducted to/from the site (to understand overweight/overdimension transportation experience), and local newspapers are also consulted for any relevant information. In addition to research on historical shipments of large component parts, transportation experience and permitting requirements are also examined. Research is also conducted to identify potential barging options, as well as permitting and dredging requirements, for the nuclear power plant site. Research relies heavily on communication with federal and State agency personnel for information regarding specific permitting requirements within the State and at the nuclear power plant site. Federal and State agencies contacted during research include (but are not limited to) the U.S. Army Corps of Engineers (regulatory and engineering divisions) and State departments of

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[b] SNF data is collected by the U.S. Energy Information Administration (EIA) for the Department of Energy's Office of Standard Contract Management on the Form GC-859, "Nuclear Fuel Data Survey." The data include characteristics of SNF discharged from commercial U.S. nuclear power plants and currently stored at commercial sites in the U.S. EIA collected data on SNF annually from 1983 through 1995. Since 1996 EIA collected this data three times. The latest data cover all SNF discharged from and stored at commercial sites before June 30, 2013. The next release date will be during 2019.

[c] The DOE Office of Civilian Radioactive Waste Management (OCRWM) sponsored the Facility Interface Capability Assessment (FICA) project, whose objective was to assess the capability of each commercial facility to handle
various SNF shipping casks. This project involved visits to, and the collection and analysis of data from, 121
commercial nuclear reactors and one fuel storage facility

[d] DOE OCRWM sponsored the NSTI project. Under the NSTI project, the 76 sites from which SNF had planned on being shipped were evaluated and the capabilities of the near-site transportation infrastructure were examined for their ability to handle SNF shipments. The potential for upgrades to near-site infrastructure was also assessed.

environmental protection, transportation, maritime resources, fisheries, and coastal zone management.

## GOOGLE EARTH AND GIS DATABASE DEVELOPMENT

Prior to a site visit, GIS data on the nuclear power plant site is assembled. Custom data layers are developed in various areas relevant to transportation planning, such as transportation infrastructure, sensitive ecological resources, and site-specific features (e.g. property ownership, local heavy-haul transportation resources, etc.). GIS layers are assembled and used with the Google Earth application [2].

Key layers developed include the following:

- Property Boundaries and Owner-Controlled Areas (see Figure 1)
- Power Block and ISFSI Locations
- Strategic Rail Corridor Networks (STRACNET)
- Transload Facilities
- Navigable Waterways (see Figure 2)
- Environmental Justice Populations identified under Executive Order 12898 [3]
- Tribal Areas
- Marine Security Zones
- National Wetlands Inventory
- National Register of Historic Places

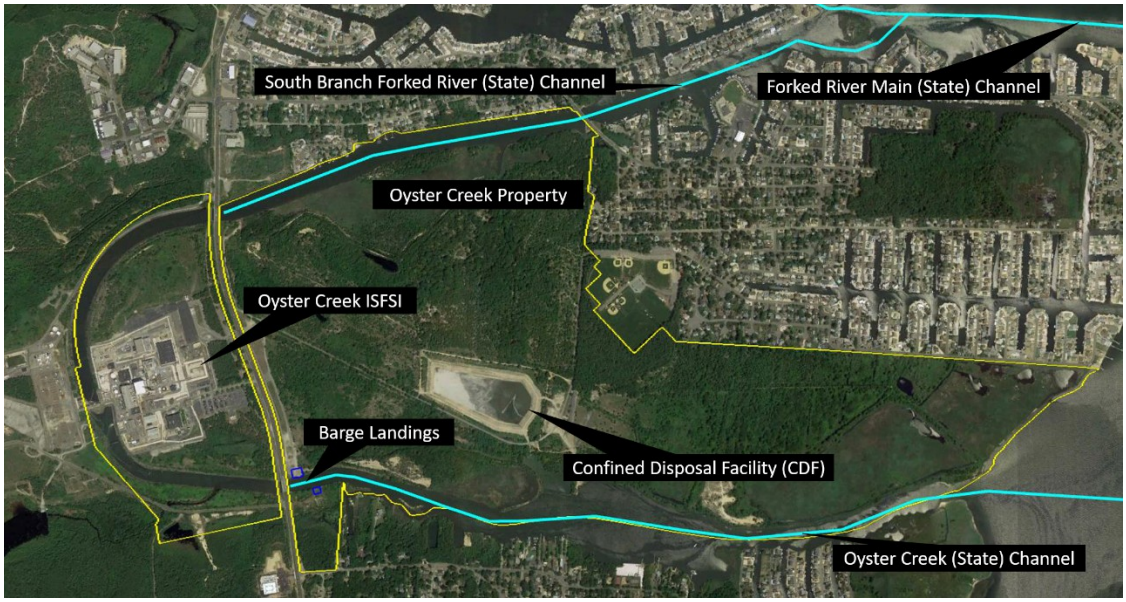


Fig. 1. Google Earth image depicting site property, barge landings, and adjacent waterways.

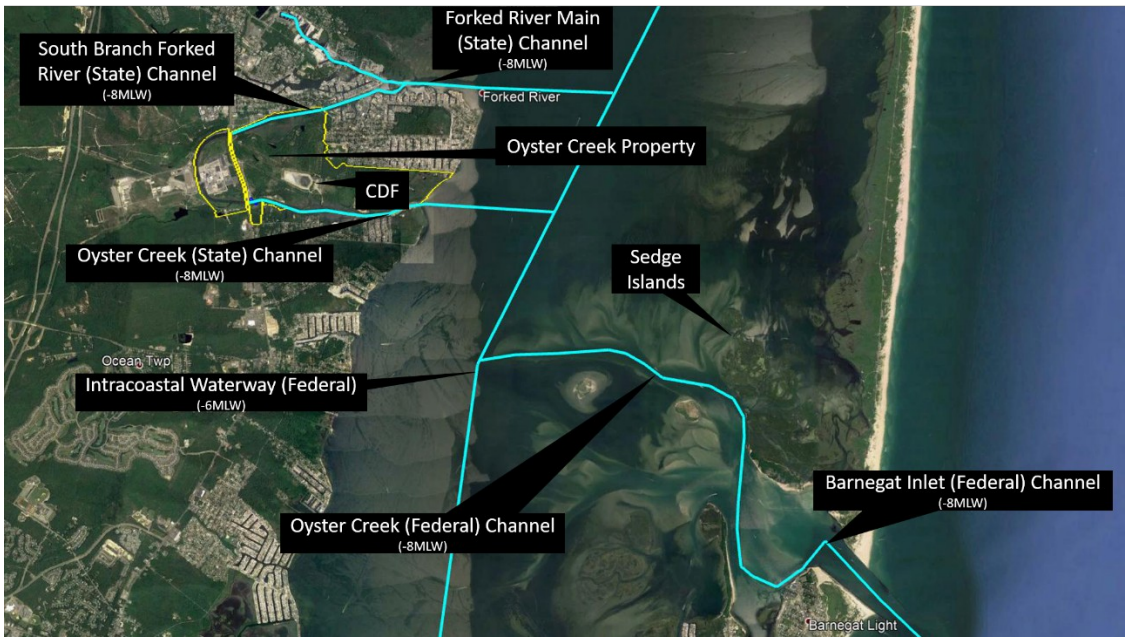


Fig. 2. Google Earth image depicting the Barnegat Inlet navigation channel network and dredging depths.

## COORDINATION WITH NUCLEAR POWER PLANT SITE MANAGERS AND STAFF

One of the primary sources for information on the conditions of on-site and near-site transportation infrastructure and experience, aside from observations and information collected during site visits, is information provided by managers and staff at the nuclear power plant sites. While the information provided during the site visit is invaluable, prior to the site visit, coordination occurs with site managers to identify key staff to attend the site visit and a set of questions is developed by the DOE-IWM site visit team, which is then distributed to site managers. Questions are developed and distributed typically four to six weeks in advance of a site visit. These questions are tailored for the specific nuclear power plant site. During the site visit, any answers provided by the site are discussed, or if no answers have yet been received, the questions are discussed during the visit. Furthermore, the DOE-IWM site visit team assigns topic areas to each member of their team. By doing so, each member is responsible for asking a set of detailed questions on a topic, such as barging and dredging, overweight/overdimension transportation experience, or SNF inventory.

Development of the site visit questions is extensive and incorporates information gathered from a variety of sources. Questions are informed by information discovered during the literature reviews and research discussed in the previous “Document and Database Search” section. Within each category of questions, more detailed questions are developed, and a brief description is included for site managers, which allows site managers to understand the rationale behind particular questions.

Key question categories for each site visit include:

- General site questions: These questions consist of general overview questions pertaining to conditions at the site.
- Site overweight/overdimension transportation experience and on-site or near-site overweight/overdimension transportation infrastructure and capabilities: Questions in this category allow for a discussion of any prior shipments the site may have made and additionally allow for a discussion of any major transportation-related issues that may have arisen during the site's previous shipment efforts.
- SNF inventory: Questions in this category relate to the SNF inventory at the site, GC-859 discharge data, current and future ISFSI plans, canister loading maps, and dry storage systems.
- Cultural affiliation and Tribal involvement: Questions in this category aim to identify culturally affiliated Tribes at and near the site.

## NEAR-SITE INTRASTRUCTURE PLANNING ACTIVITIES

Evaluating the near-site transportation infrastructure and transportation options near nuclear power plant sites is a key feature of the nuclear power plant site evaluations. Analyzing transportation mode options consists of examining near-site rail access, local roads and highways, and barge access. For each potential mode of transport, data regarding the site's experience with previous shipments, whether by rail, heavy-haul, or barge, is gathered and discussed with the site during the visit. Additional research and analysis often include examining the condition and capacity of near-site rail infrastructure and identifying potential transload locations (see Figure 3). Analysis of local roads and highways includes measuring the distance to potential rail transload locations and examining the characteristics and condition of roads (e.g., spatial and clearance characteristic, sharp turns, bridges, presence of overhead wires, weight restrictions, etc.) and their associated infrastructure that could potentially be used by heavy-haul trucks. Examining barge access consists of examining the characteristics of onsite or nearby docks, slips, or shorelines.

Fig. 3. Examining the condition of the Cape Cod Canal Bridge

In order to prepare for gathering supplemental data during the site visit, the DOE-IWM site visit team works extensively with federal and State agency staff to identify potential transload locations that may warrant further investigation during a site visit. For example, the DOE-IWM site visit team works with the Federal Railroad Administration (FRA) to identify potential intermodal transfer locations, local rail carriers the DOE-IWM site visit team may want to meet with during the site visit, and any other potential locations that could serve as transload locations. Working with additional agency staff, such as the FRA, helps the DOE-IWM site visit team identify whether a certain mode of transport may be plausible for moving SNF off-site, whether there may be any commuter stations or industrial leads along a line, or whether certain locations may be better suited for heavy-haul truck to rail or barge to rail intermodal transfers. Including local rail carriers in site visits bolsters the understanding of railroad operations in the vicinity of the sites and provides for increased clarity on transportation mode options available from the site. Additionally, working with local rail carriers assists in understanding rail access, any site limitations, as well as interchange locations and rail conditions. While DOE-IWM works extensively with FRA and local rail carriers in preparation and during site visits, DOE also works extensively with State agency staff and/or Tribal representatives to prepare for site visits (see “Identification of Meeting Participants” for additional discussion).

## TRIBAL IDENTIFICATION AND CULTURAL AFFILIATION RESEARCH

Prior to a site visit, Tribes who may have historical, cultural, and/or geographical ties to a site or who may be potentially impacted by future transportation activities near-site are identified, and cultural resources-related information[e] is also

[e] Such information includes cultural resources field work completed before and after construction, any cultural resources identified, determination whether a cultural resources protection plan is (or

gathered for nuclear power plant sites. Such research helps to create a comprehensive list of Tribes that may have ties to a nuclear power plant site or who may be potentially impacted by future transportation activities.

Documents examined for such data include publicly available NRC license renewal documents, decommissioning NEPA documents, National Historic Preservation Act (NHPA) documents, licensee post-shutdown decommissioning activities reports, and documents provided by State and National Register of Historic Places documents. Research is conducted to identify any Tribes within a 50-mile radius of the site and/or who may have historical ties to the area. To identify Tribes, several online databases and documents are examined. The Bureau of Indian Affairs (BIA) Tribal Leader's Directory is consulted to obtain an updated list of federally recognized Tribes that are located within the same State as the nuclear power plant.[f] The U.S. Housing and Urban Development (HUD) Tribal Directory Assessment Tool (TDAT) is also consulted to identify federally recognized Tribes by querying the State and county in which the nuclear power plant site is located.[g] Additionally, the National Native American Graves Protection and Repatriation Act (NAGPRA) Consultation Database is also queried by the State and county of the nuclear power plant to identify both federally and non-federally recognized Tribes that may have filed NAGPRA-related claims in that county. In addition, NHPA Section 106 consultation lists are retrieved from various NRC NEPA- and NHPA-related documents where available.[h] State permitting documents are also reviewed to identify any Tribes with whom a utility may have engaged.

## IDENTIFICATION OF MEETING PARTICIPANTS

Identifying the appropriate staff to attend a nuclear power plant site visit is pivotal to the success of the site visit and both the quality and quantity of information gathered during the visit. In order to identify the appropriate staff to attend these visits, the DOE-IWM site visit team works with a host of contacts, including State Regional Group (SRG)[i] representatives, Tribal representatives who engage with DOE on nuclear and radioactive material transportation issues, site utility managers, and FRA representatives.

SRGs, which have cooperative agreements with DOE, include the Southern States Energy Board, the Western Interstate Energy Board, the Council of State Governments – Midwest, and the Council of State Governments – Eastern Regional

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has been) in place, whether prior consultation and/or engagement with the SHPO and Tribes was conducted, and identification of any cultural resources issues or concerns that emerged as a result of those interactions. All cultural resources related data is obtained from publicly available documents which, due to restrictions on the public disclosure of specific cultural resource information, may be incomplete.

[f] The U.S. Bureau of Indian Affairs federal directory maintains a list of all federally recognized Tribes that reside in the United States. The database can be queried by state and region. It also contains contact information for each Tribe.

[g] TDAT was developed by the Office of Environment and Energy to help users identify Tribes that may have an interest in the location of a HUD-assisted project and provides Tribal contact information to assist users with initiating Section 106 consultation under the NHPA.

[h] Not all nuclear power plants underwent license renewal or NRC licensing actions that would require NHPA/NEPA consultation.

[i] Certain SRGs receive funding from DOE through cooperative agreements to support State engagement with DOE in planning for future SNF transport.

Conference. Representatives work closely with DOE on future SNF transport planning. Depending on the location of the nuclear power plant site, prior to a site visit DOE-IWM works in conjunction with the appropriate SRG representative to identify both the appropriate site contact, as well as State agency staff, who can best provide insight during the site visit. State representatives who attend the site visits typically represent their State departments of energy, transportation, environmental or natural resources, radiation protection, emergency management, heavy-haul or dredging/barging permitting, State police, State Rail Safety Participation Program, and in some instances, coastal zone management and fisheries departments. SRG representatives also assist in putting the DOE-IWM site visit team in contact with site managers, who then coordinate extensively with DOE-IWM to plan the visit and identify site staff to attend.

DOE-IWM also works with members of the Tribal Radioactive Materials Transportation Committee (TRMTC), whose operations are supported by a cooperative agreement with DOE-IWM. TRMTC members help to identify appropriate Tribal representatives to attend the site visits, including local Tribal representatives. Tribal representatives provide their unique perspective on the site visits and assist in exploring issues associated with cultural affiliation and Tribal involvement with past and present site activities.

In addition to the participants identified by the site, SRGs, or Tribal representatives, a host of federal agency representatives also attend site visits. As previously discussed, the FRA coordinates extensively both with DOE-IWM and potential rail carriers for the site visit. As the regulator of the U.S. railroads, the FRA representatives bring unique experience to the site visits. They also coordinate meetings with the rail carriers that serve the nuclear power plant sites and/or are located nearby. As such, representatives from local rail carriers attend the site visits when applicable. Additionally, representatives from the U.S. Army Corps of Engineers and the U.S. Coast Guard participate in site visits where barge transportation is considered a potential mode of transport for shipping SNF. These representatives provide essential knowledge regarding barging and/or dredging activities that may need to occur,  local conditions that could impact barge shipments (such as weather restrictions), information on coordination, regulation, and permitting, and information on any local companies that may be have been used historically for barging. Finally, in some cases, observers from the NRC and the International Atomic Energy Agency are invited to participate as observers. Additional subject matter experts, including those from DOE’s national laboratories and consultants, also attend the site visits.

Participants from leadership positions within local community engagement panels or advisory boards are also either invited to attend the site visits or are invited to attend separate meetings with DOE-IWM. Such meetings provide the opportunity for DOE-IWM to inform the panels of DOE-IWM activities and the roles and responsibilities of federal agencies during decommissioning. These meetings also allow the community engagement panels to ask questions of DOE-IWM, to share their experiences, and to provide their insight. Furthermore, they provide the opportunity to build relationships with these organizations that will provide future benefits to multiple parties.

## CONCLUSIONS

Extensive planning for DOE nuclear power plant site visits is critical to their success. Planning undertaken by the DOE-IWM site visit team includes a suite of activities, such as conducting document and database searches, developing GIS databases, coordinating with nuclear power plant site managers and staff, conducting near-site infrastructure planning activities, identifying Tribes and conducing cultural affiliation research, and identifying meeting attendees who will be best suited to provide pertinent information during the site visits. Gathering documents from a variety of databases, exchanging information with nuclear power plant site managers, as well as supplementing that information by utilizing other resources, such as Google Earth, allows for a more informed site visit to occur and a more robust analysis of each site on the ground. Thorough planning for nuclear power plant site visits helps to provide higher quality information gathered during the visits.

Additionally, working in coordination with various federal agencies, SRGs, site managers/staff, State agency staff, and Tribal representatives improves the type of information gathered, and it allows for additional, unique perspectives to inform the transportation planning activities. Information provided by these attendees has not only helped to provide additional perspectives, but information provided by the sites, coupled with the opportunity to visit a site, continues to be critical to DOE's understanding of the conditions at and near-site. Furthermore, including a broader array of meeting participants improves the understanding of the site- and region-specific transportation infrastructure at the sites, helps local community engagement and advisory panels to understand the unique roles of government agencies during decommissioning, and assists in building relationships that lay the groundwork for success.

## REFERENCES

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