CHAPTER 8: NUCLEAR WASTE, DISPOSAL FACILITY, DESCRIPTION (MINN. R. 7855.0600)

8.1 PROJECT DESCRIPTION

This chapter of our application provides the proposed additional dry cask storage capacity at the Prairie Island Independent Spent Fuel Storage Installation (ISFSI) and a description of the Prairie Island Plant, the nuclear fuel used at the Plant, and the spent nuclear fuel which is stored at the facility. It contains the information required in the Commission's application content requirement rules, Minnesota Rules, Part 7855.0600.

8.2 STORAGE PROPOSAL

Xcel Energy is requesting that the Commission approve the Company's request for a CN for additional storage sufficient to support an additional 20 years of plant operation using a welded canister Dry Fuel Storage (DFS) system. In order to support Plant operation beyond the current licensed life of 2033/2034, additional DFS systems are planned to be loaded in the 2030 timeframe to support adequate operating and spent fuel pool inventory margin. Xcel Energy proposes to increase the capacity of the spent fuel storage at the Plant by loading additional welded canister DFS systems and placing them within the existing ISFSI facility, which was constructed with sufficient space to accommodate the necessary additional storage modules.

The Company has entered into a contract with Orano TN Americas LLC to use the NUHOMS EOS 37PTH through the end of current license (EOCL) and we anticipate that should authorization be given by the federal and state governments for SLR and ISFSI expansion, respectively, the Company would continue to store spent fuel in the EOS 37PTH during the extended operating cycle. Regardless of the technology used during an extended operating license period, the analysis is bounding for NRC licensed welded canister DFS systems.

An estimate of the number of additional DFS systems required can be made using information on the selected DFS system design and fuel usage plans for the site. Combined, the two reactors discharge an average of 60 fuel assemblies each year. Using this value would result in an additional approximate 1,200 fuel assemblies over the 20-year extension. The NUHOMS EOS 37PTH design holds 37 Prairie Island fuel assemblies. Therefore, approximately 34 additional welded canister DFS systems are anticipated to be needed during the extended license period.

8.3 PRAIRIE ISLAND NUCLEAR GENERATING PLANT

The Plant is owned and operated by Xcel Energy. It is a two-unit pressurized water reactor rated for combined gross output at 1,100 MWe and was originally licensed by the NRC in 1973/1974 (Unit 1/Unit 2). The NRC approved a renewed license for the facility in 2011, allowing the plant to operate through 2033/2034. As discussed in our 2024 IRP, the Company intends to seek a subsequent license renewal (SLR) from the NRC, which would allow the Plant to operate an additional 20 years, to 2053/2054.

8.3.1 Plant Site Description

The site is located within the city limits of the City of Red Wing, Minnesota (population 16,672 according to 2022 census) on the western bank of the Mississippi River in Sec. 4 and 5, T113N, R15W, in Goodhue County, Minnesota, at 92° 37.9' west longitude and 44° 37.3' north latitude. (Figure 8-1 and 8-2).

The ISFSI is located approximately 900 feet southwest from the PINGP Units 1 and 2 (Figures 8-3 and 8-4). The PINGP site boundary is located adjacent to the Prairie Island Indian Community (PIIC) reservation, and the PI ISFSI is located within 1,798 ft of the PIIC reservation (Figure 8-4.)

The Plant site, including both the Plant and the ISFSI, consists of approximately 578 acres of land owned by Xcel Energy. Figure 8-3 shows the Plant site boundaries. Access to the Plant is restricted by a perimeter fence and other barriers.

Figure 8-4 shows an aerial photo depicting a 1-mile radius around the Plant.
Figure 8-5 shows a topographical map of the area around the Plant.

Figure 8-1
50-Mile Radius

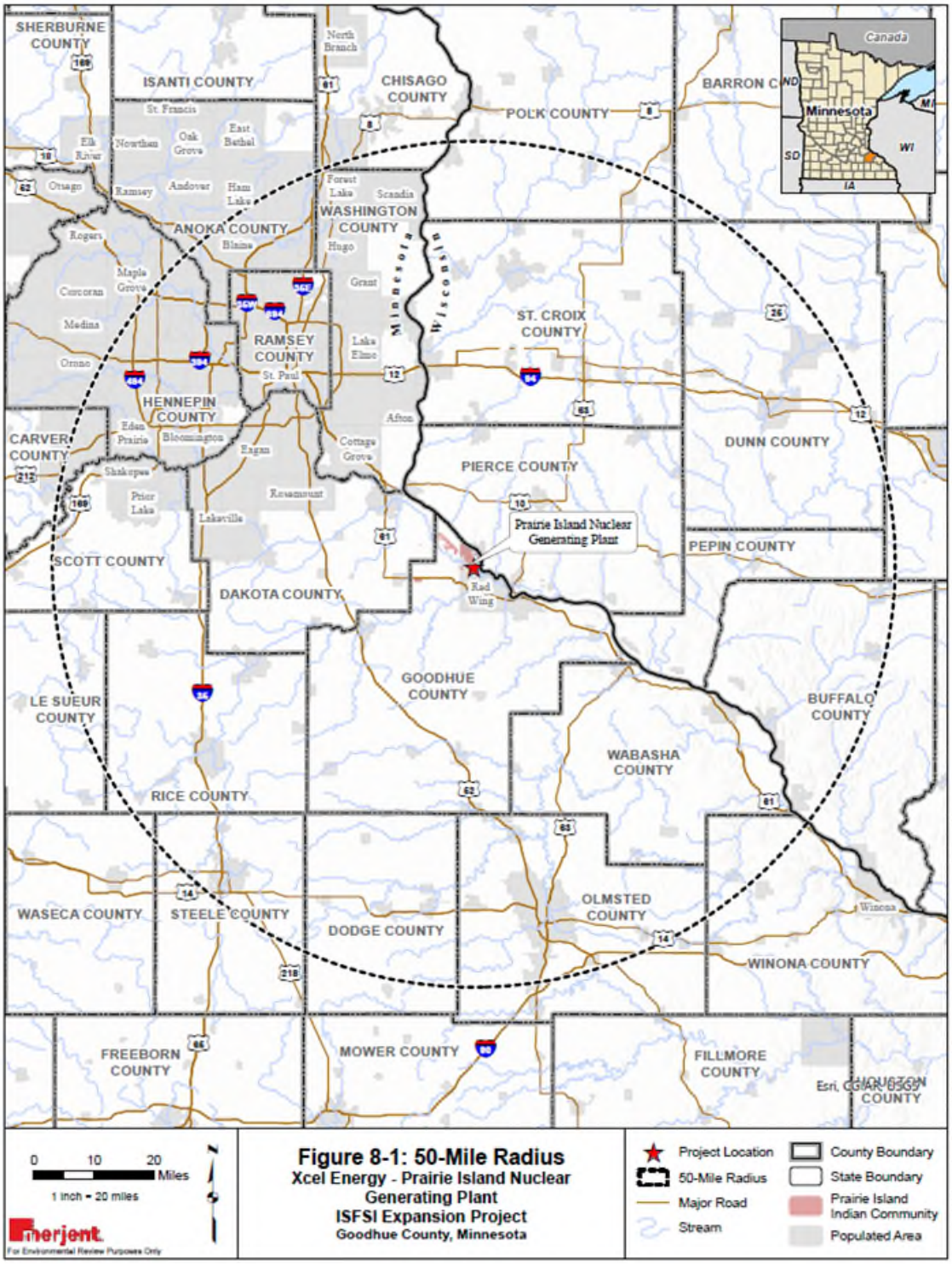


Figure 8-2
Six-Mile Radius

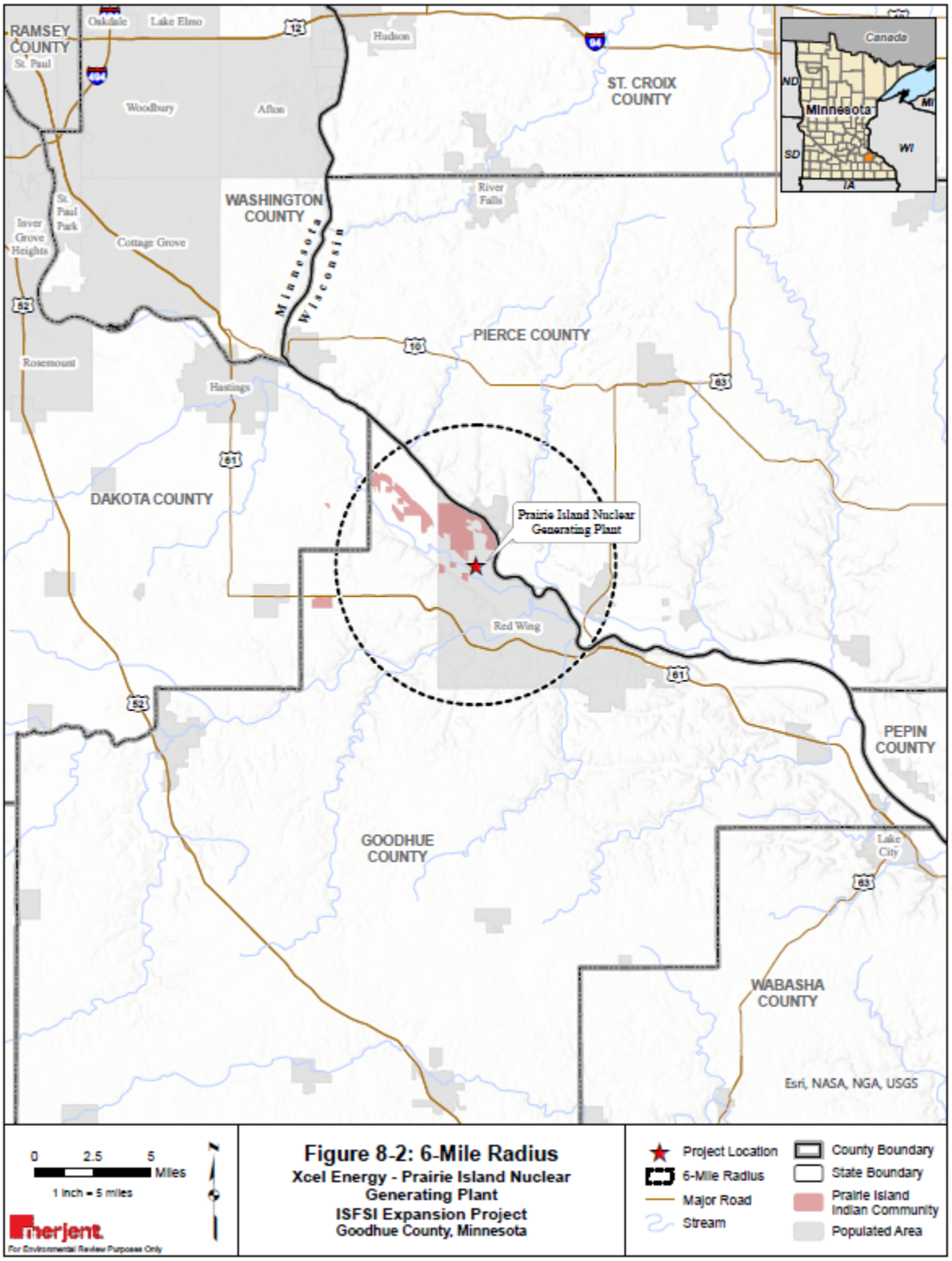


Figure 8-3
Plant Site Boundaries

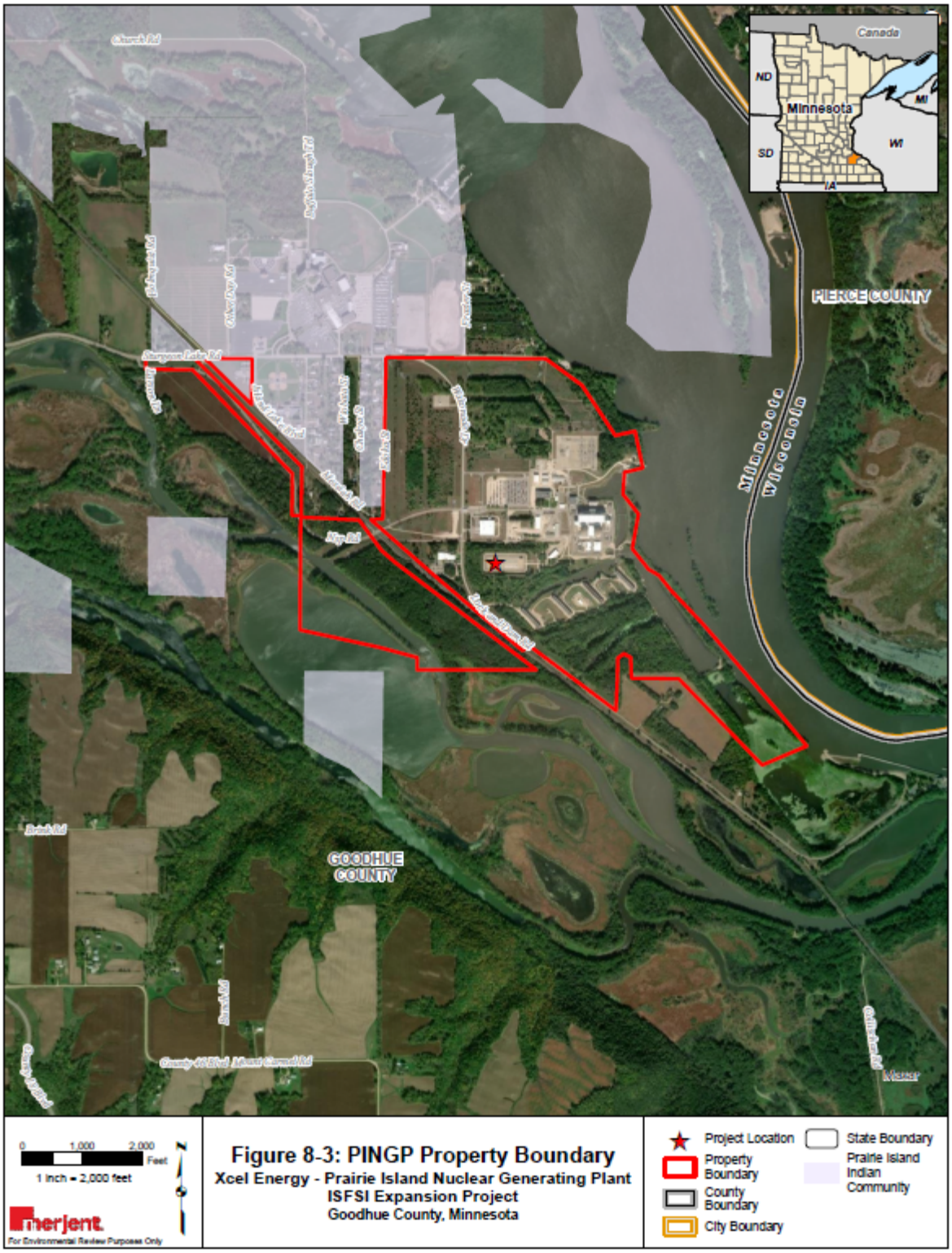


Figure 8-4
Prairie Island Indian Community and
Prairie Island Nuclear Generating Plant Layout

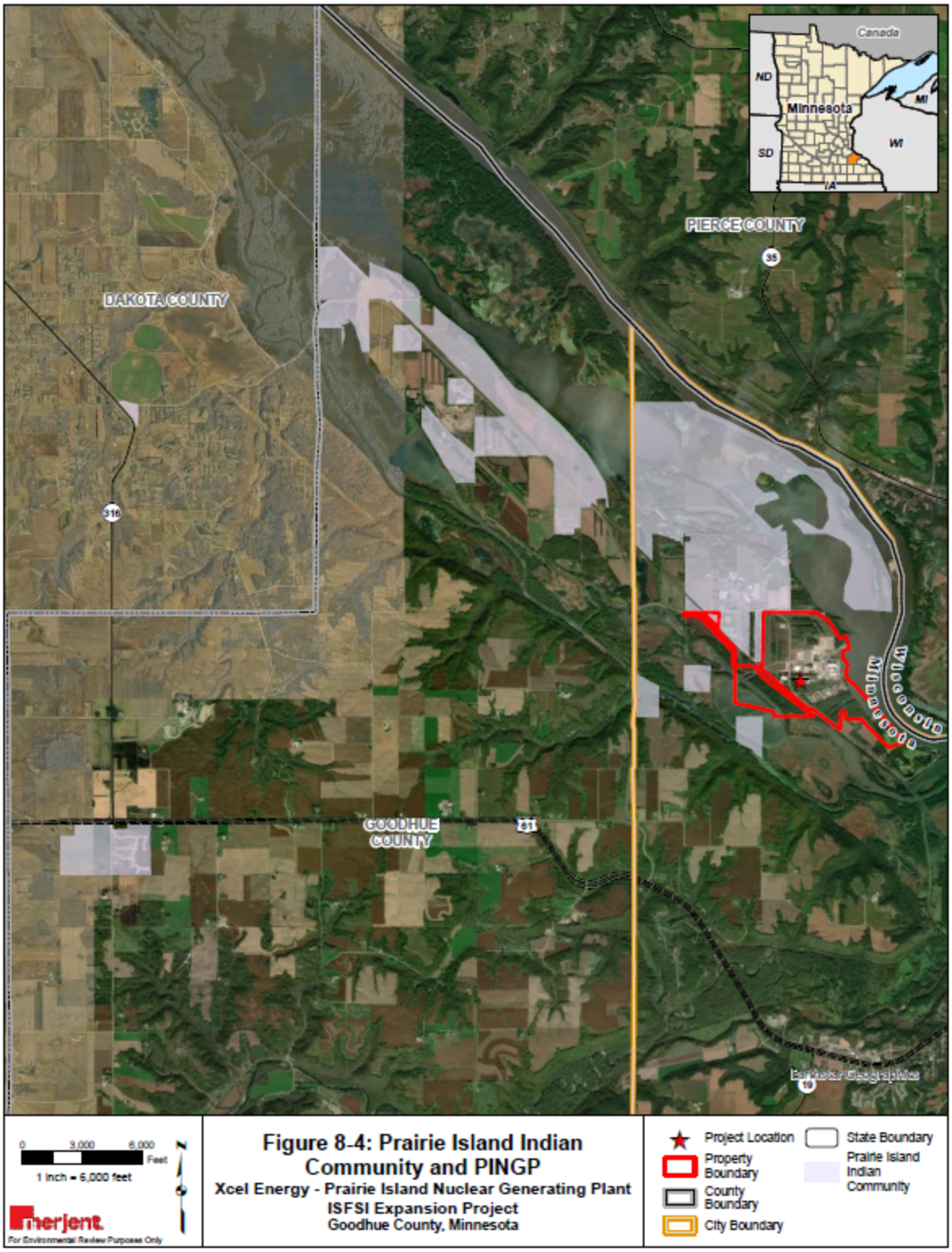


Figure 8-5
Area Topographical Map

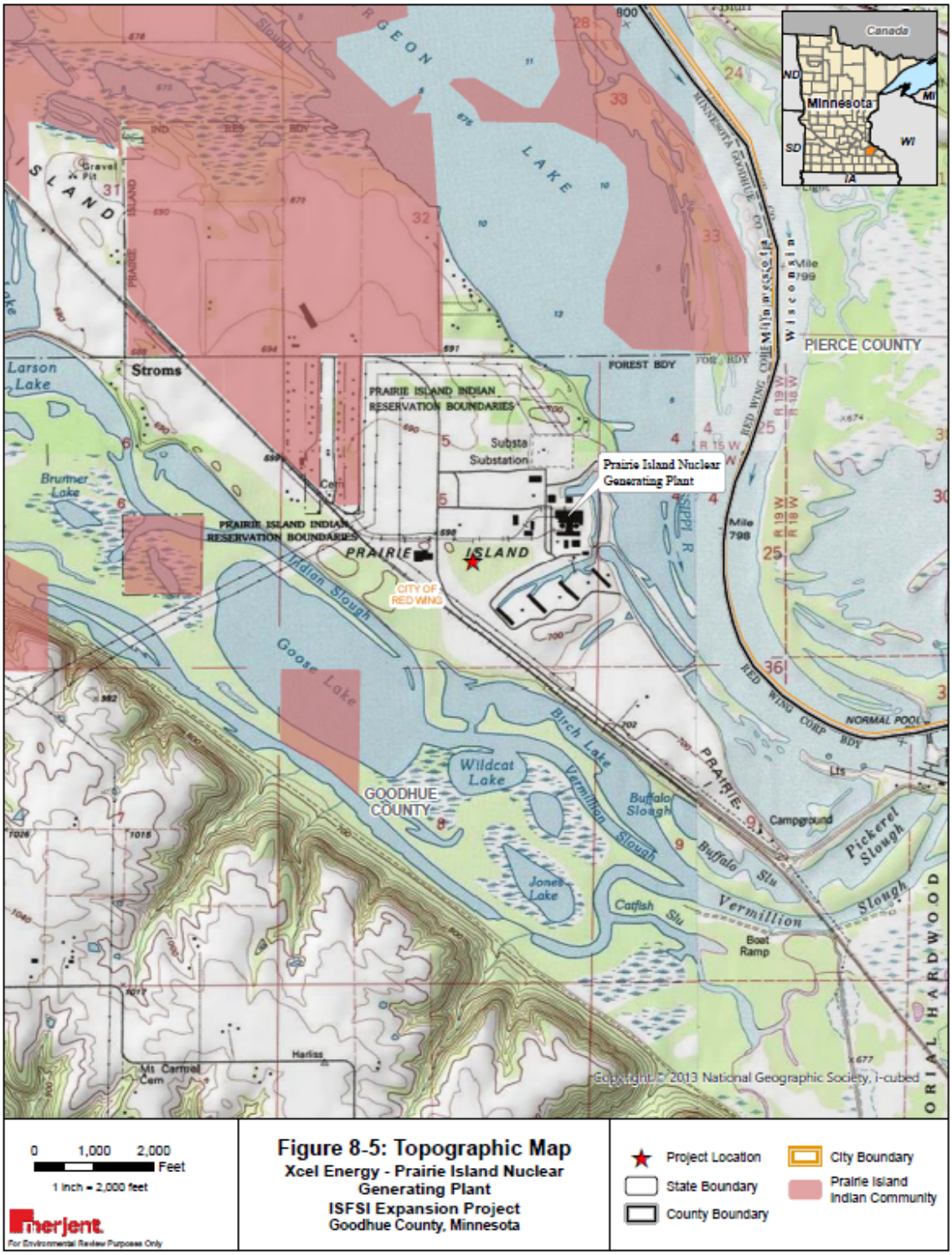
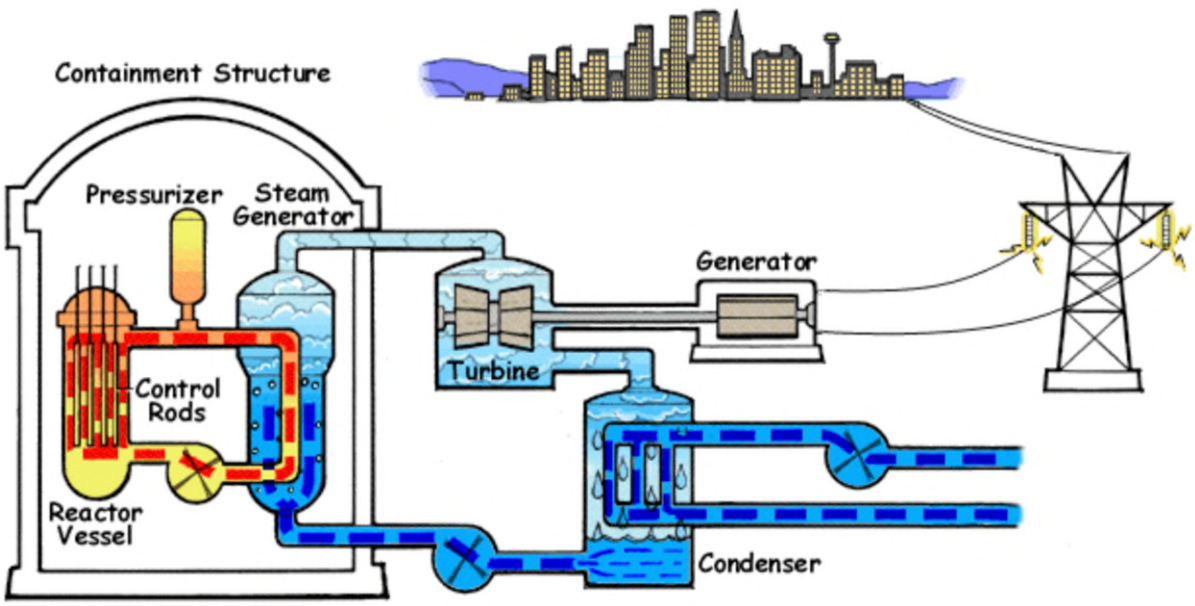


Figure 8-5: Topographic Map
Xcel Energy - Prairie Island Nuclear Generating Plant
ISFSI Expansion Project
Goodhue County, Minnesota

8.3.2 Plant Operation

In a pressurized water reactor, a nuclear reaction in the reactor core generates heat, which heats water in the primary loop. This heat is transferred to the secondary loop in the steam generators, and the steam produced inside the steam generators is directed to turbine generators to produce electrical power (Figure 8-6). The exhaust steam is cooled by a tertiary loop in a condenser and returned to the steam generators to be boiled again. The water in all three loops is force-circulated by electrically powered pumps. Emergency cooling water is supplied by other pumps, which can be powered by on-site diesel generators.

Figure 8-6



The Plant has an excellent operating history throughout its 50 years of operation. Both the Monticello and Prairie Island plants have maintained high levels of safety performance, achieving top marks on the industry's rigorous safety evaluations. Additionally, NSP has implemented "Transform the Maintaining the Plant Organization" efficiency opportunity as described in Nuclear Energy Institute (NEI) Efficiency Bulletin 17-23. The efficiency bulletin moves technical resources from engineering to the "Maintain" organization, enabling a unified decision-making strategy for keeping equipment reliable. The Company led the industry on that initiative and has been benchmarked by other nuclear plants on the work done in this area. The Company's implementation of this model is one of the factors that contributed to both

Prairie Island and Monticello achieving contiguous years of industry exemplary status. The resultant high levels of equipment reliability led the Company's nuclear fleet in 2022 to generate electricity at a capacity factor of 96 percent, and between 2020 and 2022, Prairie Island operated at over 95 percent capacity.

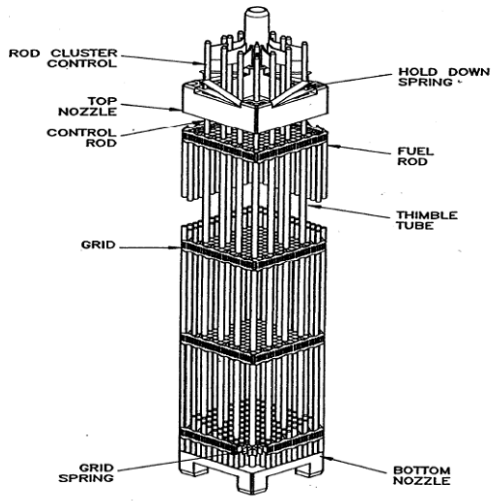
8.4 FUEL CHARACTERISTICS

The reactor core of each unit is comprised of 121 fuel assemblies. A fuel assembly (Figure 8-7) consists of 179 fuel rods spaced in a 14x14 square array secured by means of stainless steel upper and lower tie plates. Control rod guide tubes occupy sixteen locations of the array and an instrument tube occupies one location. Each fuel assembly is 7.76 by 7.76 inches wide and 161.3 inches long. Figure 8-8 below shows a representation of a typical fuel assembly used at Prairie Island.

Each fuel rod within the assembly consists of high-density ceramic uranium dioxide fuel pellets, each about the size of a thimble, stacked in a tube made of a special alloy of steel called Zircaloy. The air in the filled tube is evacuated, helium (an inert gas) is backfilled, and welding Zircaloy plugs in each end seals the fuel rod.

Approximately every 24 months, a unit is shut down to refuel the reactor. Between refueling outages the unit typically operates at full output around the clock. During each refueling operation under current power levels, just under half of the fuel assemblies in the reactor are replaced with new ones. Thus, a typical nuclear fuel assembly provides heat constantly over about a four-to-six-year period before its output declines to the point it is no longer useful. These spent nuclear fuel assemblies are then removed from the reactor and stored in the spent fuel pool.

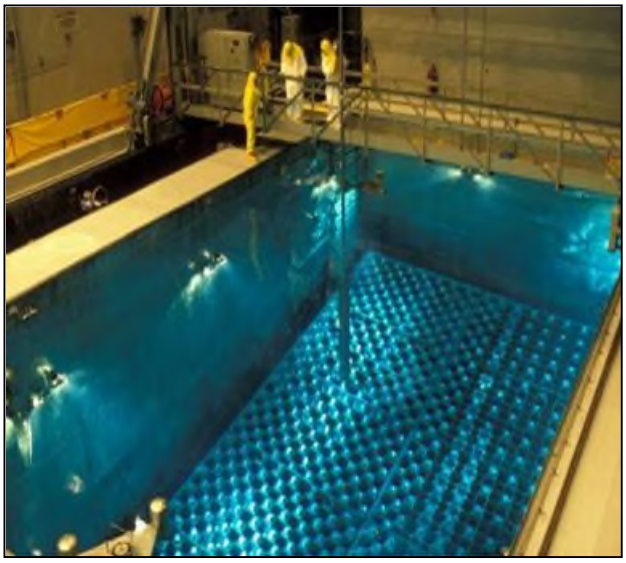
Figure 8-7



8.5 SPENT FUEL POOL

The spent fuel pool provides storage for spent fuel assemblies. The pool is located within the fuel pool enclosure in the auxiliary building. It is filled with storage racks that hold the spent fuel assemblies and other irradiated reactor components. The depth of water in the pool is 37 feet 9 inches. Figure 8-8 shows the spent fuel pool. The spent fuel pool is equipped with redundant cooling systems to remove heat that continues to be generated by the assemblies. The filtering portion of the system maintains pool water chemistry and removes suspended particles. The water above the spent fuel provides radiation shielding.

Figure 8-8
Spent Fuel Pool



The spent fuel pool also provides an area for cask loading operations. Space is set aside so that a cask may be lowered into the pool and assemblies transferred to it for dry storage or transport. Spent fuel assemblies are placed in the pool for cooling before they can be placed in dry fuel storage (DFS).

The NRC operating licenses allow for long-term storage of up to 1,386 spent fuel assemblies in the current spent fuel storage rack configuration. To facilitate plant evolutions, four additional storage racks, with a combined capacity of 196 assemblies, may be temporarily installed in the cask lay down area to provide a total of 1,582 storage locations. The fuel rods from 36 consolidated assemblies are stored in 18 canisters, occupying 18 storage rack locations. A total of 58 storage locations hold

material such as spent fuel assembly components from the consolidated assemblies, individual fuel rods, and other irradiated reactor instrumentation and hardware. Thus, there are 1,310 locations available for long term spent nuclear fuel assembly storage within the spent fuel pool.

8.6 SPENT FUEL INVENTORY AND PRODUCTION ESTIMATE

As of February 1, 2024, 3,013 spent fuel assemblies have been discharged from the Plants' reactors. 1,013 spent fuel assemblies currently reside in the spent fuel pool and 2,000 spent fuel assemblies are stored in the ISFSI. It is anticipated that another 641 spent fuel assemblies will be discharged from the reactor between 2024 and 2034, the end of current operating license. Forecasts are provided in Table 3 of Chapter 10. Starting in 2027, it is expected that 60 spent fuel assemblies will be discharged annually to support plant operations. Currently, approximately 56 spent fuel assemblies are discharged annually.

Assuming approval to continue operation through 2053/2054, Xcel Energy estimates that approximately 1,200 additional spent fuel assemblies would be discharged from the Plant's reactor during this extended period of operation.

Minnesota Rules part 7855.0600 Subp. C (2), includes a requirement to provide data regarding operation and retirement of the facility, including the level of radioactivity of each nuclear waste product in curies per year. The radioactivity of the fuel assemblies to be stored in the spent fuel pool (and eventually at the ISFSI) is dependent on several variables, including: the initial uranium enrichment, the amount of energy extracted from the fuel while it resides in the reactor, and the length of time that has passed since its discharge from the reactor. The level of radioactivity continues to decay once the waste is placed in the spent fuel pool and eventually at the ISFSI over time due to natural radioactive decay.

The TN-40HT Safety Analysis Report[1] includes a calculation of the total radioactivity content (measured in Curies) of a design basis fuel assembly[2] for the TN-40HT DFS system. This is the maximum Curie content of an individual assembly loaded into a

[1] A Safety Analysis Report (SAR) is a requirement of and defined within 10CFR Part 72.24: *Each application for a license under [10 CFR Part 72] must include a Safety Analysis Report describing the proposed ISFSI or Monitored Retrievable Storage Installation (MRS) for the receipt, handling, packaging and storage of spent fuel, high-level radioactive waste, and/or reactor-related Greater-Than-Class-C (GTCC) waste as appropriate, including how the ISFSI or MRS will be operated.*
[2] A design basis fuel assembly is a spent fuel assembly that has structural and thermal parameter upper limits established in a DFS system's SAR to ensure maximum thermal loading for storage requirements is not exceeded. A design basis fuel assembly and its associated limits are established within the specific license of each DFS system.

TN-40HT and is calculated to be 2.13E+5 Curies. This calculation of Curies for a design basis fuel assembly was used to determine a conservative, bounding limit of the level of radioactivity of each nuclear waste product in Curies per year. Assuming 60 fuel assemblies are discharged from the reactor each year, an estimate of total radioactivity per year would be 60 x 213,000 = 12,780,000 Curies per year. This value is conservative, as it is a theoretical maximum.[3] The actual Curies loaded into the ISFSI would be less than that amount, as a full DFS system of design basis fuel is never loaded.

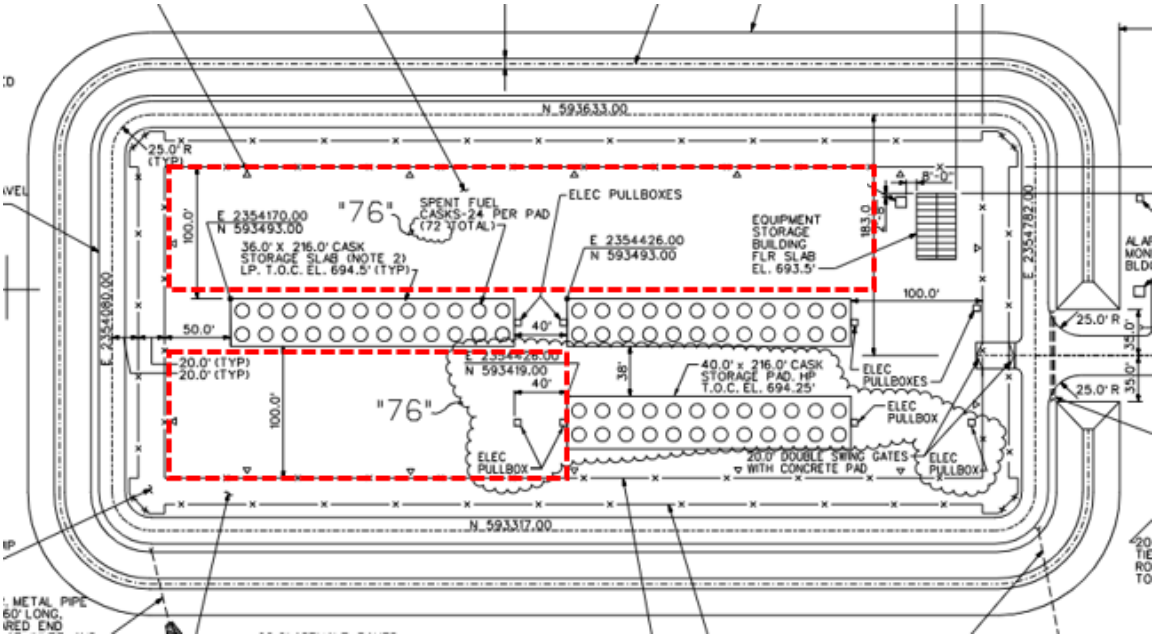
The Company also considered radiological dose impact of the Project and hired a third-party vendor to perform an analysis to estimate the levels of radioactivity and cumulative impact from the additional storage required to support an additional 20 years of operation. At the time this third-party analysis was performed, a DFS system technology had not been selected and, therefore, a bounding analysis was performed using the maximum contact dose rates of the three potential new technology DFS systems. Additional conservative assumptions were used to validate that regardless of the DFS system technology selected by the Company, calculated dose values at the nearest site boundary and at the nearest resident will meet acceptance criteria for 10 CFR 72.104(a), 40 CFR 190.10(a) and 10 CFR 20.13.01(a). Radiological impacts are discussed further in Chapter 12.

8.7 EXISTING ISFSI FACILITY

The ISFSI consists of a lighted area, approximately 720 feet long and 340 feet wide, roughly 5-1/2 acres in size, located west of Prairie Island cooling towers as shown on Figure 8-3. The tallest structures are the light poles that are approximately 40 feet tall. Two fences surround the facility with a monitored clear zone between the two fences. Within the storage area, the casks are currently stored on three reinforced concrete pads. Two are 36’ x 216’ x 3’, and one pad is 40’ x 216’ x 3’. The additional casks necessary to support SLR would require an additional fourth and possibly fifth concrete pad to be located within the area outlined below in Figure 8-9.

[3] At the time of this application, Orano TN Americas LLC has not yet completed the SAR for the EOS 37PTH and its use at the Plant with the Plant’s specific fuel design. The SAR will establish the design basis fuel assembly limits, which will be used to determine spent fuel assembly loading orientation within the EOS 37PTH for future loading activities at the Plant. Margin to the upper design basis fuel assembly limits (i.e., structural and thermal limits) are always maintained as exceedance of these values would result in federal regulatory violation. This makes the calculated value conservative.

Figure 8-9
Potential ISFSI Pad Locations



The storage facility can accommodate two additional pads without having to change the security perimeter.

Currently, there are 50 TN-40/40HTs stored in the ISFSI on the 3 existing pads shown in Figure 8-9 and more accurately depicted in an aerial view of the facility in Figure 8-11. The 2 center pads are full and there are 2 TN-40HTs on the southeast pad. In 2024, 3 additional TN-40HTs are planned to be loaded and stored on the southeast pad and in 2025, the final 2 TN-40HTs are planned to be loaded and put on the southeast pad for a total of 55 TN-40/40HTs stored in the ISFSI as part of the existing license.

The TN-40/40HT DFS systems are all-in-one metal casks that provide both containment and shielding. The cask walls are 9.5 inches thick for the TN-40/40HT casks. This thickness ensures proper shielding from radiation and containment of the spent fuel. Individual TN-40/40HT DFS systems are approximately 8 feet in diameter, 16 feet in height, and weigh approximately 240,000 lbs. when loaded. See Photo 8-9.1 below.

Photo 8-9.1
TN-40 DFS Systems on ISFSI Pad

The lid on the TN-40/40HT DFS system is 10 inches thick and is bolted closed with 48 bolts. There is a double metallic seal which is pressurized and monitored at all times to ensure the cask is properly sealed.

In August of 2022, the Commission approved a Change in Technology Certificate of Need to change the existing bolted lid TN-40/40HT technology to a welded DFS system or welded canister system.[4]

The Company has selected Orano (TN Americas, LLC) EOS 37PTH DFS systems and as previously stated, has signed a contract to use these systems through the

[4] The Minnesota Public Utilities Commission approved Xcel Energy's request for a change in PINGP DFS technology in August 2022. The final order was issued October 5, 2022 (Docket No. E-002/CN-08-510). The selection process criteria and results have been filed pursuant to the order under Docket No. E002/CN-08-510.

EOCL. It is anticipated that the Company will continue to use this welded canister system during a license extension if approved. These are two-part systems that have a metal canister to contain the spent fuel and a concrete overpack to provide radiation shielding. This technology will be discussed further in the next section and in Chapter 9. The shift from TN-40/40HT technology to the new technology will occur prior to the end of the current NRC operating license. Specifically, in 2026, 10 new technology DFS systems (i.e., welded canisters) are planned to be loaded and placed in the ISFSI on the existing southeast pad. The subsequent spent fuel loading campaign, anticipated in 2030, will be in support of extended operation beyond the current license period.

The location of the ISFSI storage facility on the Plant site is shown in Figure 8-10. An aerial view showing major components of the facility is shown in Figure 8-11. An aerial view of the ISFSI showing potential locations of future storage pads is shown in Figure 8-12.

Figure 8-10
Plant Site and ISFSI Location

Figure 8-11
Aerial View Dry Spent Fuel Storage Facility

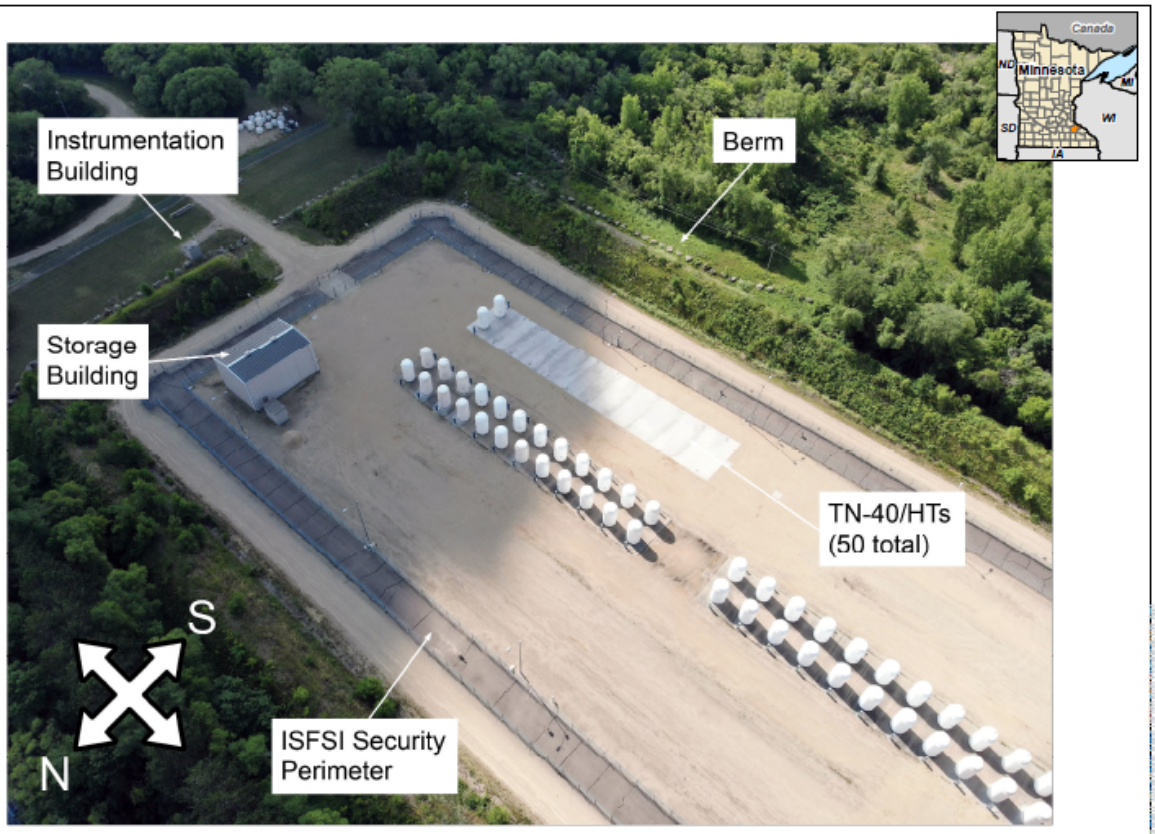


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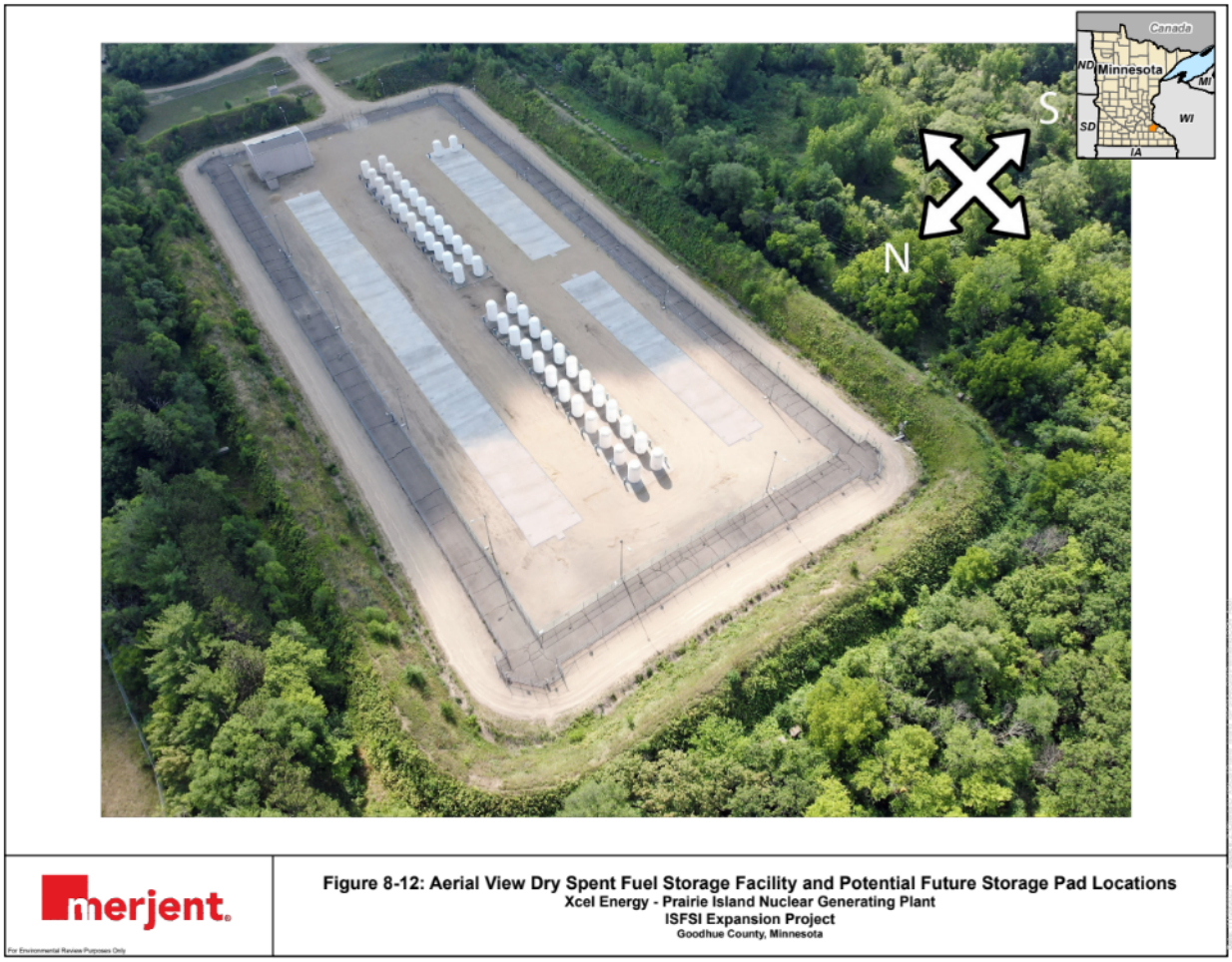
Figure 8-11: Aerial View Dry Spent Fuel Storage Facility
Xcel Energy - Prairie Island Nuclear Generating Plant
ISFSI Expansion Project
Goodhue County, Minnesota

Figure 8-12
Aerial Photo Showing the Dry Spent Fuel Storage Facility and Potential Future Storage Pad Locations



8.8 NUMBER OF STORAGE CONTAINERS

Xcel Energy will use a welded canister type of DFS system for the additional storage capacity at the Plant's ISFSI. Specifically, the Company and Orano TN Americas LLC have entered into a contract to use the NUHOMS EOS 37PTH DFS system through the end of the current operating license. It is currently anticipated that if SLR and ISFSI expansion are authorized by the federal and state governments respectively, then the EOS 37PTH will continue to be used during the extended license period. In this type of system, the spent fuel assemblies are loaded into a metal canister with welded lids that provide a leak-tight containment of the spent fuel. The interior of the canisters is dried of any water and filled with the inert gas helium. These canisters are

then placed in a horizontal concrete overpack (Figure 8-14). The concrete overpacks provide further radiation shielding to workers and members of the public, and also protect the canisters from external hazards. There are currently several welded canister designs licensed by the NRC. These various designs have the capacity to store up to 37 fuel assemblies similar to those used at the Plant. Using the EOS 37PTH, approximately 34 additional DFS systems will be needed for the storage of approximately 1,200 spent fuel assemblies.

Figure 8-13
Horizontal Storage Module (HSM)

8.9 DUAL PURPOSE DFS SYSTEM (CANISTER) SYSTEM DESCRIPTION

The NUHOMS EOS 37PTH is licensed for both the storage of spent fuel under 10 CFR Part 72 and transport under 10 CFR Part 71. The NUHOMS 61BT Dry Fuel Storage System currently in use at Monticello is also licensed for both storage and transport, and both are welded canister DFS systems stored in HSMs.

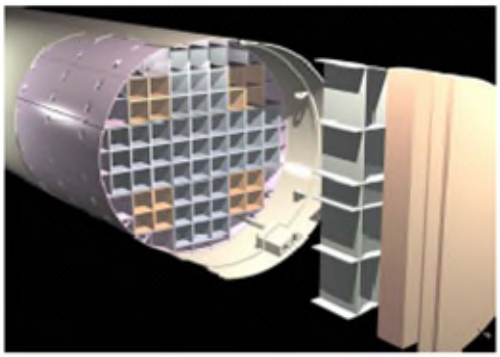
The NUHOMS EOS 37PTH system, as does any welded-canister system, consists of the following primary components:

- Sealed Metal Canister– a steel container used to store up to thirty-seven Prairie Island type fuel assemblies.
- Concrete Overpack – a concrete vault used to protect and shield the metal canister.

- Transfer Cask – an intermediate steel cask used to handle and move the canister from the spent fuel pool to the concrete storage module.
- Lifting Yoke – a steel lifting device that interfaces with the crane to lift the transfer cask into and out of the spent fuel pool.
- Transfer vehicle – a trailer or vehicle used to safely support and move the transfer cask from the reactor building to ISFSI.
- Ancillary Devices – auxiliary equipment used to dry, weld, backfill and seal the steel canisters for storage.
- Transportation Cask – a steel overpack cask used to ship the spent fuel canister from one site to another.

8.9.1 Welded Canister

In a canister-based system, confinement is accomplished in a steel canister with welded lids, regardless of whether these systems are stored vertically or horizontally. While some details differ between the various designs, all are similar in terms of their overall design and construction.



As an example, below we describe some of the dimensions and characteristics of the NUHOMS EOS 37PTH canisters.

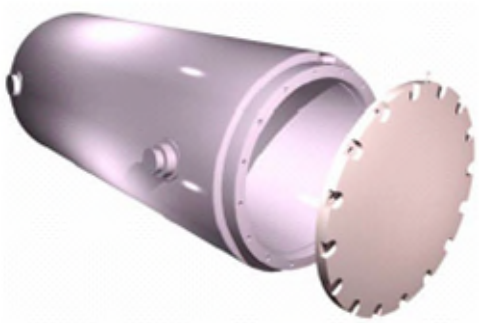
The canister consists of a stainless-steel shell and cover plates, internal basket constructed of alloy steel and aluminum and Metal Matrix Composite plates as neutron absorber materials, and a radiation shield plug made out of coated carbon steel. The EOS 37PTH shell is a half-inch thick steel cylinder with an outside diameter of 75.5 inches and variable length. The cavity length is sized to fit the fuel. The lid is secured to the shell with a double weld closure to ensure no leakage of radioactive gases or gas used to backfill the canister. The shell, lid, and basket are constructed of stainless steel to provide a corrosion-resistant environment for the spent fuel. The lid incorporates a carbon steel plug to provide radiological shielding for workers during closure operations.

8.9.2 Storage Module

The NUHOMS Horizontal Storage Module (HSM), or concrete overpack, provides a protected storage location for the welded canisters. The storage module is made of reinforced concrete and is designed to provide radiological shielding, protection from environmental conditions, structural integrity, and heat removal. In the NUHOMS system, the welded canister is transferred from the transfer cask to the storage module at the ISFSI.

8.9.3 Transfer Cask

The transfer cask is used to lift and handle the canister during spent fuel loading, closure, and transfer operations. The empty canister is placed inside of the transfer cask. The transfer cask is lifted using trunnions on either end of the cask. The cask also provides radiological shielding to protect plant personnel until the canister is loaded into the storage module.



8.9.4 Lifting Yoke

The lifting yoke assembly provides the interface between the plant crane and the transfer cask and is used to maneuver the cask within the Reactor Building. A lifting pin connects the crane hook to the lifting yoke. It is designed to be compatible with

the reactor building crane hook. The lifting yoke engages the outer shoulder of the transfer cask lifting trunnions.

8.9.5 Transfer Trailer/Transfer Vehicle

The NUHOMS horizontal DFS system uses an trailer to transport the transfer cask between the reactor building and ISFSI. The trailer is used to bring the empty transfer cask into the reactor building. The Canister is placed inside the Transfer Cask. After loading spent fuel in the Canister, which is still in the Transfer Cask, and performing required operations described in later sections, the loaded DFS system is horizontally onto the transfer trailer for transport to the ISFSI.

8.9.6 Vacuum Drying System

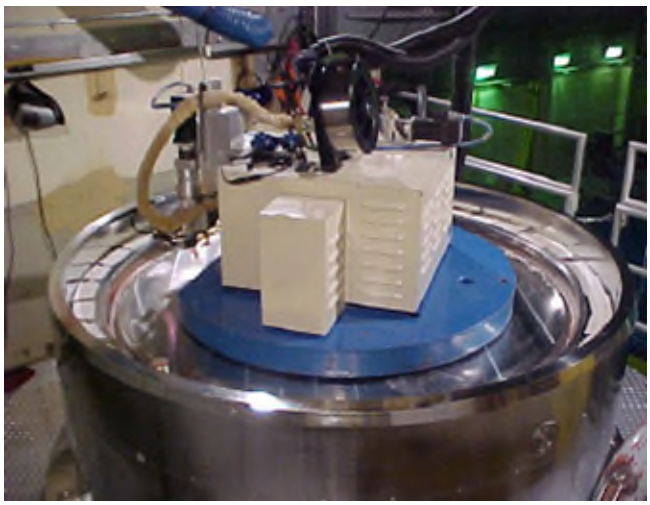
The Vacuum Drying System removes all the moisture out of the canister after it is removed from the spent fuel pool. It performs blow down (bulk water removal), vacuum drying, and helium backfilling operations after fuel loading and prior to final closure.

8.9.7 Welding

The inner and outer canister lids are secured by multi-layer welds to ensure canister integrity. The closure welding of the canister employs the high purity process, multi-layer welding, using an automated welding machine.

Closure welds are subjected to non-destructive examination to ensure high quality welds.

After welding, the canister is leak tested to meet the standards of a "leak tight" container. Leak testing of the closure takes advantage of the helium environment within the canister and draws a vacuum on the top closure welds.



8.9.8 Transportation Cask

Transportation casks are licensed under 10 CFR Part 71 for transport of the canister from the Plant. The canister is placed inside the transportation cask. The transportation cask utilizes a bolted closure system.

Impact limiters mounted on either end of the transportation cask provide impact protection to meet accidental impact requirements of 10 CFR Part 71. The impact limiters absorb energy during an impact event.

8.10 OPERATIONS

This section provides a description of the fuel loading operations for transferring spent fuel from the pool to the ISFSI using a welded-canister design, similar to the NUHOMS EOS 37PTH, as well as the operational sequence for off-loading canisters from the storage module at the ISFSI and transporting them off-site.[5]

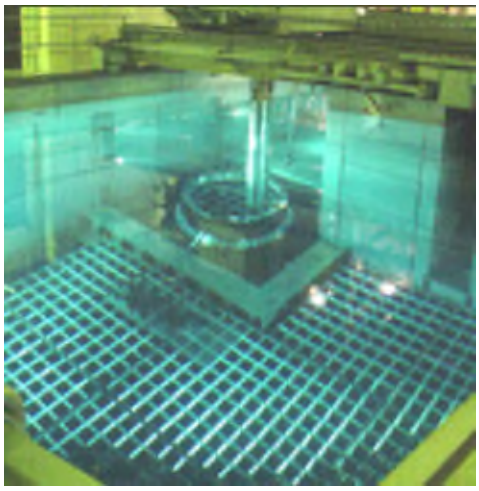
8.10.1 Canister Loading

Canister loading includes physically placing the fuel assemblies into the canister, decontamination, draining, drying, and seal-welding, and includes the following sequence of events:

1. Stage the Transfer Cask and Canister inside the truck bay door of the plant.
2. Lift the empty Canister by its lifting lugs and place it vertically in the Transfer Cask.
3. Install the pneumatic seal between the Transfer Cask and the Canister and fill the canister with water.
4. Engage the lifting yoke with the Transfer Cask upper trunnions.

[5] As discussed in sections 4.2 and 9.1, there is currently no viable option for offsite storage.

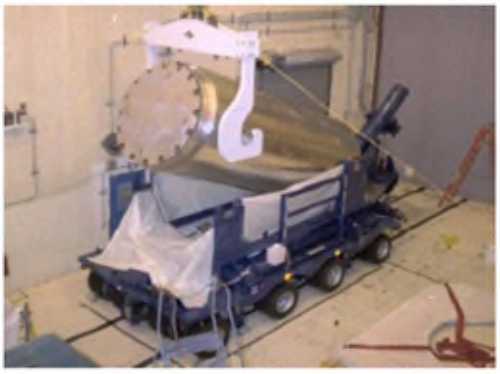
5. Lift the Transfer Cask and Canister up to the fuel pool.
6. Lower Transfer Cask into the pool.
7. Load the spent fuel assemblies into the Canister.



8. Install the canister shield plug underwater.
9. Lift the Transfer Cask out of the pool water.
10. Drain water as required before the welding operation.
11. Wash down the exposed portions of the Transfer Cask.
12. Move to cask decontamination area.

13. Lift the automatic weld machine (AWM) and install it over the inner top cover plate. Lift AWM and inner top cover together and install them over the canister. (The inner top cover plate and welder can be lifted and installed separately).

14. Perform inner top cover weld.
15. Connect the vacuum drying system to the vent and siphon ports.
16. Remove bulk water from the canister using pressurized air.
17. Perform vacuum drying and helium backfilling.
18. Install and seal weld the vent and siphon port covers.
19. Mount the AWM and outer cover plates on the canister.
20. Weld the canister outer top cover plate.
21. Bolt the Transfer Cask lid.
22. Lift the Transfer Cask and move it to the loading bay.



8.10.2 Transport to the ISFSI

DFS system transfer operations include: 1) transferring the loaded canister and Transfer Cask to the on-site transfer trailer, 2) transferring the DFS system to the ISFSI, and 3) inserting the canister into the storage module. The details of the operations include:

23. Set the lower trunnions of the Transfer Cask into the support skid on the trailer.
24. Rotate the Transfer Cask to a horizontal orientation.
25. Use the transfer trailer to transfer the canister and Transfer Cask to the ISFSI.
26. At the ISFSI, back the trailer and align the Transfer Cask with the storage module.
27. Remove the hydraulic arm access cover, the Transfer Cask lid and the storage module door.

28. Use the hydraulic arm to insert the canister into the storage module.
29. Install the storage module door.

The loading cycle time for each container placed in the ISFSI is expected to take approximately one week based on typical operating experience.

8.10.3 Removal for Offsite Shipment

In the event options for offsite storage become available, the following process will be used to safely transport loaded DFS systems offsite. The storage system does not require lifting of the loaded canister during transfer to and from the storage module. The Transportation Cask can be backed up to the storage module and the canister transferred from the storage module. The steps are as follows:

1. Align the Transportation Cask with the storage module.
2. Remove the storage module's door.
3. Connect the hydraulic arm to the canister and withdraw the canister from the module into the Transportation Cask.
4. Install the Transportation Cask covers and seals.
5. Perform an assembly verification leak test on the Transportation Cask per ANSI N14.5, Table A-1, 8.5.5 (for a welded-canister system).
6. Lift the Transportation Cask from the trailer and place on a rail car.
7. Install the Transportation Cask impact limiters.
8. Perform a radiological survey for transportation.
9. Move the Transportation Cask and canister to the rail spur.

8.11 LIFE OF THE STORAGE FACILITY

The economic life of the ISFSI and storage system (the period over which the investment in the facility will be depreciated) will be based on a judgment about how long it will remain in service. The length of time of operation of the ISFSI depends on how long the Plant will operate and the availability of off-site storage or a permanent repository.

The NRC's general license for the storage of spent fuel in each DFS system fabricated under a Certificate of Compliance terminates 40 years after the date that the particular DFS system is first used by the general licensee to store spent fuel, unless the DFS system's Certificate of Compliance is renewed, in which case the general license terminates 40 years after the DFS system's Certificate of Compliance renewal date. In order to renew a license, a demonstration must be made that the facility can continue to operate within the specifications of the storage license. No maintenance is required on the welded canister DFS systems or storage modules themselves.

Physically, the facility can be operated indefinitely. The materials used in the DFS system (canisters and storage modules), principally stainless steel and reinforced concrete, are sturdy and long-lived. The system requires no active support systems to ensure performance other than simple pressure and/or temperature monitors that are readily replaceable. Should it be necessary, a welded canister can be transferred to a new storage module. The supporting infrastructure (intrusion detection, cameras, lights, weed mitigation and access roadways) will be maintained as needed.

8.12 ISFSI DESIGN, CONSTRUCTION, COST AND SCHEDULE INFORMATION

The facility footprint allows additional storage capability without changing the overall dimensions of the ISFSI. The Company will first conduct soil testing to verify conditions are suitable for building the pads. This will also include an archaeological survey of the ground as required per a "Settlement Agreement Among the Prairie Island Indian Community and Northern States Power Co. Regarding Contentions 1, 6 and 11" entered in 2009. The PIIC will be offered the opportunity to provide feedback in preparation of these activities and to observe during the surveys.

8.12.1 Construction Details

When constructing up to two new storage pads, the Company would first excavate up to 6 feet of surface material within the existing ISFSI where the new pad(s) would be

placed. Approach aprons are also required per the technology selected, and therefore, the Company would also remove up to 6 feet of surface material in the areas immediately adjacent to the storage pads where the new concrete approach aprons would be placed. This excavation would total approximately 5,760 cubic yards. Excavation would be limited to removal of sub-grade materials that were previously disturbed and/or placed as part of original ISFSI construction; no native materials would be impacted by the excavation. The excavated materials may be stored temporarily on site within the ISFSI fence line or outside the fence line on a previously disturbed/gravel area prior to permanent removal from the site. Any excavation would then be backfilled with engineered fill and compacted. There are no existing buried cables or other structures within the area where the new ISFSI pad(s) are to be constructed.

The Company would then pour the new concrete storage pad(s) and concrete approach aprons, as required, within the excavated areas. The Company expects that minimal grading and drainage would need to be performed to maintain the existing drainage pattern. The concrete will be allowed to cure, then the area surrounding the concrete will be backfilled. Gravel surfacing stone would be placed on the area surrounding the pad(s). The pads would then be available for placement of DFS systems. The construction sequence would not undermine the substrate beneath the existing pads.

There are alternatives for storage pad sizes and locations including the following options:

- an approximate 216 ft [to 256 ft] x 40 ft x 3 ft fourth pad in the southwest corner of the ISFSI plus a potential fifth pad of same or similar size in the northwest or northeast of the ISFSI. This fourth pad in the southwest corner may abut to the existing third pad, or
- a fourth pad only on the north side of the ISFSI. This pad could be as large as 472 ft x 40 ft x 3 ft.

The size and location will depend on the engineering requirements determined by the vendor and will also depend on making short and long-term decisions that maintain low costs for customers.

The Company estimates that the Project will be executed on the following timeline:

- The Company anticipates a single construction mobilization to complete the work within the ISFSI to construct and pour the initial concrete pad(s) and

approach aprons for the DFS systems. This phase could take up to a year and will occur sometime between 2027 and 2029 to support the 2030 loading campaign. The 2030 DFS system loading campaign would occur on the existing third pad as well as a new fourth pad.

The new EOS 37PTH systems are planned to be ordered and initial fabrication to begin as early as 2026 to support loading in 2030. As stated, it is anticipated that the first loading campaign in support of a 20-year license extension would begin in 2030 and take approximately four months to complete.

8.12.2 Project Cost

The estimated installed cost of the additional storage at the ISFSI in 2020 dollars is $173.8 million. The estimate includes the following major component costs:

Regulatory Processes	$ 3.5 M
Engineering, design, and construction	$ 9.4 M
Canisters/storage modules/loading	$160.9 M
Total	**$173.8 M**