UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

Before the Atomic Safety and Licensing Board

In the Matter of	)	
	)	Docket No. 72-10-ISFSI-2
Northern States Power Co.	)	
	)	
(Prairie Island Nuclear Generating Plant,	)	ASLBP No. 12-922-01-ISFSI-MLR-BRD01
Independent Spent Fuel Storage Installation)	)	

STATEMENT OF MATERIAL FACTS

Northern States Power Company-Minnesota ("NSPM") herby submits, in support of its Motion for Summary Disposition of the Prairie Island Indian Community's Contention 6 (High Burnup Fuel), this Statement of Material Facts as to which NSPM contends there is no genuine dispute.

A. High Burnup Fuel Storage at the Prairie Island ISFSI

1. NSPM is licensed to store high burnup fuel with an average assembly burnup of up to 60 GWd/MTU in TN-40HT casks in a dry helium environment. Decl. at ¶ 15. In practice, NSPM typically removes fuel from the reactor at lower burnup levels. *Id.* The cladding materials for fuel used at the Prairie Island Nuclear Generating Plant ("PINGP") are Zircaloy-4 and Zirlo ™. *Id.* Currently, only Zirlo clad high burnup fuel is stored at the Prairie Island Independent Spent Fuel Storage Installation ("PI ISFSI"). *Id.*

2. NSPM began storing high burnup fuel at the PI ISFSI on April 4, 2013. The highest burnup of fuel currently in storage is 54.1 GWd/MTU. Decl. at ¶ 15.

3. Long term integrity of the fuel cladding depends on storage in an inert atmosphere because this prevents cladding degradation due to oxidation mechanisms (i.e., corrosion). Decl.

at ¶ 17. This protective environment is established by removing water from the cask cavity and backfilling the cavity with an inert gas. *Id.* After loading the cask with spent nuclear fuel, the interior of the cask is vacuum dried and pressurized with helium above atmospheric pressure. *Id.* For conditions of normal operation, peak cladding temperatures are experienced during the vacuum drying process. *Id.* Technical Specifications are established to ensure that all water is removed from the cask and that the helium environment is established within a specified time period that ensures that peak cladding temperatures are limited. *Id.*

B. Demonstration that High Burnup Fuel Meets Requirements During Extended Storage

4. The NRC has approved storage of high burnup fuel for the first twenty years of storage where applicants demonstrate that the cladding temperature limits provided in Interim Staff Guidance 11, *Cladding Considerations for the Transportation and Storage of Spent Fuel*, Revision 3 ("ISG-11") (November 2003), will be met during storage operations. Decl. at ¶ 11; Interim Staff Guidance-24, *The Use of a Demonstration Program as a Surveillance Tool for Confirmation of Integrity for Continued Storage of High Burnup Fuel Beyond 20 Years* ("ISG-24")(July 11, 2014). Compliance with the temperature limits in ISG-11 prevents degradation due to cladding creep and hydriding. Enclosure 6 at 1-2; Decl. at ¶ 11.

5. ISG-11 provides temperature limits that ensure that the high burnup fuel cladding will maintain the configuration that is analyzed in the Safety Analysis Reports ("SAR") for spent fuel storage and thus meets the requirements of 10 C.F.R. § 72.122. Enclosure 5 at 1-3. ISG-11 provides a limit of 400°C (752°F) during normal conditions of storage, which provides reasonable assurance that creep and hydriding will not cause gross rupture of the cladding. *Id.* at Appendix A p. 2.

6. Creep is the dominant mechanism for cladding deformation under normal conditions of storage. *Id.* Hydriding is a materials phenomenon that results from the dissolution of hydrogen into the fuel cladding. The hydrogen in the cladding forms zirconium hydride precipitates, or particles. At elevated temperatures, the zirconium hydrides will dissolve and then, as the cladding temperature decreases over time, the zirconium hydrides precipitate or reform in a manner that could cause the cladding to become brittle. *Id.*

7. The PI ISFSI licensing basis, contained in the Prairie Island Independent Spent Fuel Storage Installation Safety Analysis Report ("PI ISFSI SAR"), includes a thermal performance analysis that demonstrates that the high burnup fuel peak cladding temperature limit for normal conditions of storage and short term loading operations specified in ISG-11 (i.e., 400°C (752°F)) are met. PI ISFSI SAR at A3.3-3, A3.3.2.2.5.1 and Figure A3.3-26. Technical Specification limits ensure that this design limit is maintained. Decl. at ¶ 17.

8. NSPM will not exceed twenty years of storing high burnup fuel at the PI ISFSI until April 4, 2033. Decl. at ¶ 20.

9. The NRC Staff has taken the position that meeting the temperature limits in ISG-11 may not be sufficient to demonstrate long term performance of high burnup fuel in dry storage beyond twenty years and that additional confirmatory data is needed. Enclosure 6 at 1. Thus, the NRC Staff requested that NSPM submit an aging management program ("AMP") to obtain additional data to confirm that the high burnup fuel continues to perform its intended function during the extended license period. Decl. at ¶¶ 6-8, 12.

C. NSPM's High Burnup Fuel AMP

10. On July 31, 2014, NSPM submitted a high burnup fuel AMP. Decl. at ¶ 14. The high burnup fuel AMP relies on the Department of Energy's "High Burnup Fuel Cask Research and Development Project" (the "DOE Cask Demonstration Project") to provide data regarding the performance of high burnup fuel during dry storage. *Id.* at 14. It also allows for the use of an alternate program that meets the requirements of ISG-24.

11. NUREG-1927, *Standard Review Plan for Renewal of Spent Fuel Dry Cask Storage System Licenses and Certificates of Compliance* (March 2011) ("NUREG-1927") lists ten elements that must be addressed in an AMP. NUREG-1927 at 23-24. NSPM's high burnup fuel AMP addresses each of these ten elements. Decl. at ¶¶ 15-23.

12. The interior of the dry storage cask, and thus the fuel cladding, cannot be readily inspected. Therefore, the NRC Staff has issued guidance in ISG-24 to allow the use of a demonstration project to monitor for cladding degradation provided that the demonstration project and AMP meet certain conditions. Enclosure 6 at 3-5.

13. The DOE Cask Demonstration Project is progressing. A test plan has been published. Decl. at ¶ 16. The DOE Cask Demonstration Project is designed to collect data from a spent nuclear fuel storage system containing high burnup fuel in a dry helium environment. *Id.* The North Anna Power Station will be the host facility for the Project and the source of spent nuclear fuel. *Id.* The DOE Cask Demonstration Project entails loading and storing a TN-32 bolted lid cask with intact high burnup spent nuclear fuel. *Id.* The Project has tentatively selected 32 fuel assemblies with four different kinds of cladding. *Id.*

14. The fuel selected for the DOE Cask Demonstration Project bounds the burnup of the fuel currently in storage at the PI ISFSI and has fuel assemblies of similar cladding type. Decl. at ¶ 16. If the burnup of the fuel stored at the PI ISFSI is higher than that in the DOE Cask Demonstration Project, ISG-24 provides that NSPM is required to demonstrate through evidence based on testing that the fuel in the demonstration project is reasonably characteristic of NSPM's fuel. Enclosure 6 at 3.

15. The cask in the DOE Cask Demonstration Project will be instrumented to gather data that can be used to confirm the models used to demonstrate compliance with the ISG-11 temperature limits and to monitor the condition of the fuel after it is loaded into the demonstration project cask. Decl. at ¶ 18. Temperature data will be recorded during the vacuum drying process, which is the time when peak clad temperatures are experienced. *Id.* The current schedule for the DOE Cask Demonstration Project shows cask loading in 2017. Thus, temperature data will be available to NSPM in a short time to confirm that the temperatures in the DOE Cask Demonstration Project bound the temperatures in the application. *Id.*

16. The DOE Cask Demonstration Project will monitor the interior of the cask for fission gases, cavity pressure, moisture, hydrogen, and oxygen. *Id.* Periodic samples will be taken throughout the storage period. *Id.* This data will be available to NSPM on a quarterly basis.

17. The demonstration cask will remain in storage at the North Anna ISFSI for at least ten years. *Id.* After that point, the cask will be transported to a facility capable of handling the fuel in dry conditions and performing the testing necessary to determine the aging effects specified in ISG-24 Condition 5, such as cladding creep, fission gas release, hydride reorientation, cladding oxidation, and cladding mechanical properties. *Id.*

18. The DOE Cask Demonstration Project, as described in paragraphs 13 through 17, meets the first seven Conditions in ISG-24 for using a demonstration project. NSPM's high burnup fuel AMP meets the final (eighth) Condition because it provides that data related to high burnup fuel performance will be collected through its Operating Experience Program and that appropriate analysis, corrective actions, and trending will occur through its Corrective Action Program. Decl. at ¶ 18. Additionally, NSPM's high burnup fuel AMP contains a series of "Toll Gates", at which points formal evaluations will be performed of the data from the DOE Cask Demonstration Project and any other available source of data regarding the behavior of high burnup fuel. Decl. at ¶ 19. The first Toll Gate for an assessment at Prairie Island will be in 2028. *Id.* This Toll Gate assessment will provide confirmation that the high burnup fuel continues to perform its intended function well before exceeding twenty years of storage at the PI ISFSI. Decl. at ¶ 20.

19. The NRC Staff approved the Calvert Cliffs Nuclear Plant ISFSI renewed license, which includes a high burnup AMP that relies on the DOE Cask Demonstration Project. Decl. at ¶ 13. The NRC issued the Calvert Cliffs ISFSI renewed license with a license condition requiring it to submit the results of the confirmatory evaluation related to high burnup fuel cladding performance specified in its high burnup AMP by April 30, 2028. Enclosure 11 at ¶ 22. This license condition also specifies that the evaluation shall include an assessment of the ability of stored high burnup fuel assemblies to continue to perform the intended function(s). *Id*. If such a demonstration cannot be made, Calvert Cliffs must cease using the cask or submit a license amendment to modify the cask. *Id.* The NRC prepared a draft PI ISFSI renewed license, which contains substantially the same license condition except that it says that NSPM's evaluation is to

be submitted by April 4, 2028 and adds that the evaluation is to serve as confirmation that the high burnup fuel continues to perform as expected per ISG-11 Revision 3. Enclosure 10 at ¶ 26.

D. Conclusion

20. NSPM has demonstrated in its Application, which includes the PI ISFSI SAR, that its high burnup fuel will continue to perform its intended function by (1) demonstrating that the fuel temperature remains below the limits established in ISG-11, and (2) developing and submitting an AMP that will confirm that high burnup fuel cladding will continue to perform as expected in ISG-11.

Respectfully Submitted,

/Signed (electronically) by Jay E. Silberg /

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