

August 1, 2014

MEMORANDUM TO: Chairman Macfarlane
Commissioner Svinicki
Commissioner Magwood
Commissioner Ostendorff

FROM: Michael R. Johnson **/RA/**
Deputy Executive Director for Reactors
and Preparedness Programs
Office of the Executive Director for Operations

SUBJECT: STAFF RESPONSE TO STAFF REQUIREMENTS
MEMORANDUM SRM-M140106A AND
SRM-COMSECY-13-0030—COMPARISON OF INTERNATIONAL
SPENT FUEL MANAGEMENT POLICIES AND RACK DESIGNS

As directed by the U.S. Nuclear Regulatory Commission (NRC) Staff Requirements Memorandum (SRM) SRM-M140106A, "Staff Requirements—Briefing on Spent Fuel Pool Safety and Consideration of Expedited Transfer to Dry Cask Storage, held at 9:00 A.M., Monday, January 6, 2014, Commissioners' Conference Room, One White Flint North, Rockville, Maryland (Open to Public Attendance)," dated January 23, 2014, the staff gathered information from the international community on the storage of spent nuclear fuel at reactor sites. In addition, as directed by SRM-COMSECY-13-0030, "Staff Requirements—Staff Evaluation and Recommendation for Japan Lessons Learned Tier 3 Issue on Expedited Transfer of Spent Fuel," dated May 23, 2014, the staff assessed the operational and safety attributes of spent fuel rack designs used in other countries.

The NRC staff worked through the Office of International Programs to send surveys to the nuclear safety authorities of major nuclear power countries. The staff formulated these surveys to provide a detailed understanding of each country's spent fuel management policies and practices. Enclosure 1 to this memo lists the countries that responded to the survey.

COMSECY-13-0030, "Staff Evaluation and Recommendation for Japan Lessons Learned Tier 3 Issue on Expedited Transfer of Spent Fuel," dated November 12, 2013, stated that, "the staff assessed international practices related to spent fuel storage and determined that current U.S. fuel storage practices are consistent with international practices." The NRC staff based this assessment on research conducted through publicly available documents, as well as information gathered from staff attendance at international meetings on spent fuel issues. The staff's evaluation of international spent fuel management policies described in this paper re-confirms that U.S. spent fuel storage practices are consistent with international policies.

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The responses received by the NRC staff, listed in Enclosure 2 (Non-Public Official Use Only-Foreign Government-Controlled Information), indicate that the spent fuel management requirements of the NRC's international counterparts generally align with the NRC's regulatory requirements. Most nuclear power plants outside of the U.S. employ high-density storage, as indicated by the use of solid neutron absorbing materials in the storage racks. However, all the operating reactors in Sweden, as well as the 900 megawatt reactor class in France, have maintained low-density storage through frequent transfer of fuel to interim storage pools. In addition, those countries that use natural Uranium fuel in reactors (i.e., Canada and India) utilize moderator exclusion to prevent criticality and, therefore, do not regulate geometric spacing of the stored fuel assemblies. All of the international responses were consistent in describing requirements for maintaining open space in the spent fuel pools to provide space for a full reactor core to be transferred to the spent fuel pool at any time. Although U.S. reactor operators typically maintain space for a full core offload during most of the operating cycle, the NRC has no regulation or license condition requiring this capability. Only one responding country (Spain) identified a requirement to distribute recently discharged fuel among older assemblies. The staff also learned that Slovenia is currently evaluating a potential policy change to require expedited transfer of spent fuel to dry cask storage.

Several countries also responded that after the spent fuel pool is filled, they utilize interim wet storage facilities, while others utilize dry cask storage. Of the countries that responded, China, France, Japan, and Russia use interim wet storage at reprocessing facilities (the U.S. does not reprocess spent fuel); Finland, Sweden, India, Japan, and Russia use independent interim wet storage facilities; and Canada, China, Germany, Japan, Russia, and Spain use dry cask storage, similar to the U.S. A majority of these countries have licensing requirements for the spent fuel to be safely transferred to interim or dry storage when the pool approaches its storage capacity, which is consistent with NRC requirements.

The NRC staff is currently participating in an international working group on assessing the status of spent fuel pools through the Nuclear Energy Agency (NEA). Through the NRC's participation on this working group, the staff has determined that spent fuel rack designs used in other countries are consistent with those used in U.S. nuclear power plants. The spent fuel rack designs that have been utilized in other countries have been previously considered for use or are currently utilized for the safe storage of spent fuel in the U.S. A further description and assessment of this issue is described in the NEA report, which is scheduled to be completed by the end of calendar year 2014.

As a result, the NRC staff has confirmed that NRC policies and spent fuel storage practices are consistent with policies and practices in the international community. The staff will continue to engage its international counterparts on spent fuel management policies and will consider this information in the regular updates of NRC processes and policies.

Enclosures:

1. List of Countries
2. Responses from Countries (Non-Public)

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**Countries That Provided Detailed Responses to the U.S. Nuclear Regulatory
Commission's Survey on Spent Fuel Management**

Canada
China
Czech Republic*
Finland
France
Germany
Hungary*
India
Japan
Russia
Slovenia**
Spain
Sweden

* Indicates countries that did not send specific responses to staff questions, but instead referenced information in their respective country report for the International Atomic Energy Agency Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management.

** Information on potential spent fuel management policy changes in Slovenia was drawn from the summary of a management meeting between the U. S. Nuclear Regulatory Commission (NRC) and Slovenian regulators during March 2014, that was prepared by the NRC's Office of International Programs.