SAFETY EVALUATION REPORT

APPROVAL OF REQUEST TO REMOVE RTGS FROM DEPARTMENT OF NAVY LICENSE

DOCKET NO. 03029462

1.0 Executive Summary

This Safety Evaluation Report (SER) evaluates an exemption and associated license amendment request to Master Materials License No. 45-23645-01NA. This license is held by the Department of the Navy (Navy). This is a Master Materials License (MML) and covers many sites around the country, and allows the Navy to issue permits and perform inspections of those permits. Licensing responsibilities are shared between the NRC and the Navy. The Navy submits non-routine permit terminations to the NRC for approval.

The Navy has requested authorization to remove from their MML six radioisotope thermoelectric generators (RTGs) that are currently licensed for storage on the ocean bottom pending development of a viable disposal option.

2.0 Safety Review

Each RTG consists of a strontium-90 titanate heat source, thermoelectric generator, thermal insulation, biological shielding, and a pressure vessel/housing that is designed to withstand at least 20,000 feet of ocean depth. The strontium pellets are sealed in a stainless steel liner. Final encapsulation of the liner is within an alloy that is resistant to seawater corrosion. The strontium capsules are designed to retain their integrity for at least 300 years while exposed to seawater at 10,000 pounds per square inch. Three of the six RTGs utilize a minimum of 270 pounds of depleted uranium shielding, while the remaining three utilized lead shielding. The half-life of strontium-90 is 28.8 years.

Under 10 CFR 30.11, in order for the NRC staff to grant an exemption from the requirements of 10 CFR 30.36, the staff needs to find that an exemption : 1) is otherwise authorized by law, 2) will not endanger life or property or the common defense and security; and 3) is otherwise in the public interest.

1) Is this action authorized by law?

No other provision of NRC regulations or law proscribe granting the exemption, and it is consistent with the NRC's general regulatory approach to other irretrievable or unreasonable to retrieve material

2) Will this action endanger life or property or the common defense and security?

No. NRC staff evaluates this aspect of the request using a similar framework as that used for irretrievable sources. This is accomplished by evaluating a series of questions such as: A) Has reasonable effort been made to recover the material; B) What are the potential dose consequences of leaving the material in place; C) Are the RTGs immobilized in place; and D) How will the chances of intrusion be minimized?

A. Has reasonable effort been made to recover sources**?**

In 1978 the U.S. Navy attempted the recovery of three RTGs by use of a deep submergence vehicle (i.e., The Trieste). The RTGs were buried in silt and only a limited number of lift points were accessible. The Trieste's manipulator arm was damaged during the attempt to recover the RTGs.

B. What are the potential dose consequences of leaving the material in place?

NRC staff evaluated the Navy's dose assessment (ML19165A234) and found the scenarios and input parameters considered, as well as the methods used to calculate doses to be acceptable. Resulting doses for the scenarios evaluated are well below the NRC's regulatory requirements. NRC staff believe that the scenarios considered are overly conservative since there is no reasonably foreseeable exposure scenario associated with the RTGs buried in silt at the bottom of the North Atlantic and Pacific Oceans. Beyond the scenarios considered in the submittal, NRC staff also considered that direct exposure to an individual would be further minimized by the RTGs' shielding, the silt covering the RTGs, the density of the water, and any submersible's walls. Based on the information provided and these considerations, NRC staff finds that doses associated with the RTGs will be less than 1 mrem/yr.

C. Are the RTGs immobilized in place**?**

Based on photos the staff reviewed in the submittals, it appears that these RTGs are buried or semi-buried in silt. Additionally, three RTGs have a minimum of 270 pounds of depleted uranium shielding, the other three RTGs utilize lead shielding. This weight, coupled with the fact that these RTGs are buried in varying degrees in the ocean floor, have essentially immobilized them (during the recovery attempt in 1978, it was observed that over 60% of the RTG to be recovered was buried in sediment and that only limited lift points were available for use).

D. How will the chances of intrusion be minimized?

These RTGs are located in remote areas of the ocean in the ocean floor. There are a limited number of vehicles capable of reaching depths of 10,000 feet or greater. Given this, the NRC staff finds it unlikely that these RTGs will be intruded upon.

3) Is this action in the public interest?

Yes. NRC staff finds that granting an exemption under 10 CFR 30.11 to recognize the irretrievability of these RTGs and remove them from the Navy MML to be in the public interest, as this will limit the danger to personnel and material if NRC staff required additional retrieval attempts are made.

These RTGs are likely completely buried in silt. Given this, and the fact that during a previous attempt to retrieve these RTGs the deep submergence vehicle was damaged, the Navy has concluded that retrieval is not possible.

3.0 Regulatory Framework

License termination is usually accomplished at a site for the possession of byproduct material under the regulatory framework of Section 30.36 of Title 10 of the *Code of Federal Regulations* (10 CFR). However, in this instance, the NRC staff believes that an exemption pursuant to 10 CFR 30.11, "Specific exemptions" should be granted to recognize the irretrievability of these RTGs and allow the Navy to remove these RTGs from their MML due to the fact that they no longer possess the material (i.e., these RTGs are irretrievable) and further retrieval attempts could endanger men and material due to the depths involved.

4.0 Description of Request

The Navy has requested authorization to remove from their MML six RTGs that are currently licensed for storage on the ocean bottom pending development of a viable disposal option. In 1970 and 1977, the Navy emplaced six RTGs in the deep oceans of the North Atlantic and South Pacific at depths greater than 10,000 feet to provide power for acoustic transponders. These RTGs were licensed under U.S. Atomic Energy Commission license number 04-07316-04, and then were subsequently placed under MML permit number 45-4650-N1NP after the Navy became a Master Materials Licensee.

5.0 Environmental Review

The NRC staff has prepared an environmental assessment (EA) in support of the proposed action. On the basis of the EA, the NRC finds that are no significant environmental impacts from the proposed action, and that preparation of an environmental impact statement is not warranted. Accordingly, the NRC has determined that a Finding of No Significant Impact is appropriate.

6.0 Conclusion

In summary, based on the NRC staff's review of the Navy's submittal dated August 29, 2018, NRC staff concludes that granting a 10 CFR 30.11 exemption to the U.S. Navy from the decommissioning requirements in 10 CFR 30.36 for these RTGs is protective of public health and safety and is in the public interest.