10CFR150.10 GENERAL EXEMPTION AND ENVIROCARE OPERATIONS

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ABSTRACT

The NRC granted Envirocare a specific exemption to the special nuclear materials (SNM) licensing requirements of 10 CFR Part 70. The exemption allows Envirocare, under specified conditions, to possess waste containing SNM in greater mass quantities than specified in 10 CFR Part 150 without obtaining an NRC license pursuant to 10 CFR Part 70. Rather than relying on mass to ensure criticality safety, concentration-based limits have been established such that accumulations of SNM at or below these concentration limits would not pose a criticality safety concern. Envirocare's effort, to increase its SNM possession limits, spans a number of years. This details the events and critical issues associated with Envirocare's SNM exemption process.

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Envirocare's operations include the disposal of uranium enriched in uranium-235, uranium-233 and plutonium. The NRC identifies these isotopes as "special nuclear material" (SNM). Agreement states are permitted to license the possession of SNM in limited quantities. Envirocare found its operations were unduly restricted by this limit and was effectively granted a special exemption from the NRC to use concentration based limits.

10CFR150.10 GENERAL EXEMPTION

A NRC license, as identified in 10 CFR 70, is required for any person to own, acquire, deliver, receive, possess, use, or transfer SNM. General exceptions to this requirement are limited to described fuel recycling, DOE, and DOD activities. The NRC has the ability to grant exceptions to 10 CFR 70 licensing based upon the application of an interested person or the NRC may grant an exemption based on their own volition provided such exemption, "are authorized by law and will not endanger life or property or the common defense and security and are otherwise in the public interest." Using this authority the NRC granted a general exemption for agreement states in 10 CFR 150. The exemption states that any person in an agreement states, "who manufactures, produces receives, possesses, uses or transfers byproduct material, source material, or special nuclear material in quantities not sufficient to form a critical mass is exempt from the requirements for a license are exempt." The NRC defined "not sufficient to from critical mass" in 10 CFR 150.11 as, "Uranium enriched in the isotope U-235 in quantities not exceeding 350 grams of contained uranium-235; uranium-233 in quantities not exceeding 200 grams plutonium in quantities not exceeding 200 grams; or any combination of them." As it pertains to disposal facilities, the possession limits apply to material above ground. The SNM quantity is not restricted, once the waste is disposed.

HISTORY

Because of the large volumes of waste received, Envirocare found it difficult to keep uranium-235 quantities below 350 grams. In 1995 Envirocare received more than 18,300 yds^3 of waste containing over 30,000 grams of uranium-235. The ability to receive this mass of SNM was only achievable because the NRC did not require wastes received and disposed of during the same day to be entered into the SNM inventory log and counted against the exemption limit. Consequently, the entries in the SNM inventory log consisted of wastes; requiring treatment, waiting for analytical results, or otherwise placed in storage. This did not effect Envirocare's ability to receive SNM wastes by rail. Because, it takes several days to process rail shipments, SNM received by rail was added to the SNM inventory log. Generators that wanted to ship waste by rail had to transfer the waste in route so the waste arrived at Envirocare by truck.

Envirocare first submitted a petition for rulemaking in October 1992. The petition which was published in the Federal register on February 22, 1993 requested that the NRC amend 10CFR150.11 to include concentration based limits. In a letter dated March 28, 1994 the NRC recommended that Envirocare apply for a 10 CFR Part 61 Radioactive Waste Disposal license. While Envirocare had an existing license with the state of Utah a NRC license was required to regulate alternate SNM requirements. The NRC's recommendation also stated that a preliminary evaluation was done and based on their findings "it is possible that no criticality hazard exists."

Envirocare requested a meeting with the NRC on June 19, 1997 and another meeting was held July 2, 1997 to work out possible options to settle the SNM limits issue. In these meetings the NRC presented several possible options in addition to submitting a Part 70 or 61 license application. The first option was the use of compliance orders to permit exceeding the Part 150 exemption limit during an interim period. A second option was for the NRC to grant the petition, published in the Federal Register on February 22, 1993. The NRC warned that this process could be "excruciatingly lengthy". The third option was for the NRC to grant a specific exemption. The NRC added that a petition for an exemption would need to be premised on need. They suggested that the need to accommodate mixed waste cleanups, as an example. It was also stated that Envirocare had to document why the requested exemption would not be a threat to health and the environment. The forth option was to split the current LARW license into a two separate licenses, one for LARW disposal and one for Mixed Waste Disposal. Envirocare informed the NRC that they wanted to pursue all of the options presented.

In a letter dated July 15, 1997, Envirocare petitioned the NRC for an immediate final rule and an exemption for the receipt and storage of diffuse SNM when such material is possessed by a licensed low-level radioactive waste disposal facility for management pending disposal. By July 30th, Envirocare had completed a part 70 application and had submitted it to the NRC. Because the NRC did not have the resources to do a full review they could not immediately start the acceptance process but they agreed to do a preliminary acceptance review. On March 4, 1998 the NRC notified Envirocare that their

application was not complete. Envirocare did not resubmit a second application because the NRC decided it would propose a specific exemption. On December 14, 1998 the NRC presented Envirocare with a draft exemption for comments. On March 4, 1999 the NRC approved an exemption from licensing requirements in 10 CFR 70.

PART 70 LICENSE

The preparation of the Part 70 License application required Envirocare to calculate the criticality safety risk of their proposal. Envirocare hired Norman Pruvost to do an independent nuclear criticality safety evaluation of Envirocare operations. The initial phases of this evaluation consisted of quantifying parameters to be used as the assumptions. Some of the parameters reviewed included the waste matrix, uranium enrichment, waste geometry, moisture values, and expected mean uranium concentrations in the waste. After weighing Envirocare's ability to technically validate alternative parameters used in the model against the estimated incentives, Envirocare decided to submit the part 70 license with a uranium-235 concentration limit that could be justified using the NRC's evaluation of Envirocare disposal operations. The nuclear criticality safety analysis consisted of confirming the criticality model used in CR-6505 and providing a description of how the model applied to the requested license.

The model assumptions were selected with the intent that no additional administrative controls would be required once the waste was received. The license requested the ability to receive uranium-235 up to 1.4 grams/liter. The safety analysis assumed 100% uranium-235, in a dry pure silicon dioxide matrix, having dry density of 1.6 grams in a cubic centimeter. Criticality was assumed to occur at a $K_\infty \leq 0.95$ for all geometries. The working assumptions used for the model also provided a conservative representation of the inhomogeneity effects in low enriched uranium.

Envirocare was surprised when the NRC returned the Part 70 License application. The NRC was asking that Envirocare provide more details concerning its operations, justify maximum credible SNM concentrations and moderation, and show that all waste forms will be subcritical under all normal and abnormal conditions. Envirocare felt these questions were inherently answered in the License Application. Envirocare did not feel that the mechanisms identified by the NRC presented an additional concern that was not adequately covered in the risk assessment included in the application. The risk assessment presented by Envirocare was conservative in every aspect with the exception of mass. The NRC's request for additional information implied that it was not willing to accept concentration as a valid control method. It also seemed to confirm suspicions that the NRC was going to require nuclear criticality safety requirements be based on historical precedence rather than actual risk.

Envirocare decided not to pursue part 70 permit, because the exemption best fit Envirocare's operations. The decision not to resubmit was not based totally on the NRC's request for additional information. The prospect of having a part 70 license was becoming less appealing as Envirocare became more familiar with the licensing and the administrative requirements. It was not until after the part 70 application was submitted

that Envirocare learned that the NRC would need to wait almost a year before the funds would be available to support the Part 70 License application. Envirocare was also concerned that the part 70 license would duplicate regulatory authority over areas already regulated by the DRC. It was also becoming evident that the administrative burden of controlling the waste transfer from the Part 70 license to the Utah RML for disposal would be significant.

EXEMPTION

On December 14,1999 the NRC provided Envirocare with a draft exemption, which would be granted to the DRC, to be included in Envirocare RML. The NRC recognized that in order to stay in compliance with the 10 CFR 150 limit Envirocare was delaying the acceptance of shipments, which kept the shipments on the road longer. The NRC was also concerned that transporters shipping SNM to Envirocare by rail were having to off load their shipments onto trucks in Salt Lake City, Utah so the material the could be disposed in the same day it arrived. By using trucks Envirocare was able to dispose of SNM the same day it arrived this prevented having to add this material to the SNM possession inventory. The NRC felt that the current regulatory requirements where resulting in an increased risk to the public and prepared an exemption to correct the situation.

Although the NRC provided the nuclear criticality safety evaluation it took a number of months of discussions between Envirocare and the NRC to get it in its final form. The key elements of the final SNM exemption are included in the SNM exemption summary. Several significant items were changed from the original draft. The original draft only had one uranium-235 limit of 855 pCi/g, which could be used to accept uranium-235 up to 100% enrichment, and the unusual neutron moderator limits were written as fractional values of uranium-235. The original draft also prohibited the use of a number of mixed waste treatment reagents and the acceptance water-soluble chemical uranium compounds. The NRC was concerned that the soluble uranium would collect where they would eventually concentrate. In later revisions, the NRC also introduced analytical error limits and requirements prohibiting the acceptance of SNM in pure chemical forms.

SNM EXEMPTION SUMMARY

U-235 Enrichment	**Magnesium Oxide**	**Beryllium**	**Maximum Conc. U-235 g/L**	**Maximum Conc. U-235 CPI/g**	**Measurement Uncertainty (1 s)**
<10%	<=20%	<1	1.42	1900	.21
100%	<=20%	<1	0.89	1190	.13
100%	49%[Note 1]	49%[Note 1]	0.51	680	.76
100%	100%	100%	0.12	160	.02

Radionuclide	Maximum Concentration g/L	Maximum Concentration CPI/g	Measurement Uncertainty (1 s)
Pu-236	1.5E-9	500	75
Pu-238	9.3E-7	10,000	1,500
Pu-239	2.6E-4	10,000	1,500
Pu-240	6.9E-4	10,000	1,500
Pu-241	5.4E-6	350,000	50,000
Pu-242	4.1E-3	10,000	1,500
Pu-243	3.1E-13	500	75
Pu-244	4.5E-2	500	75

*- Mass concentrations converted from the exemption radioactivity concentrations for a waste matrix having a density of 1.6 g/cc.

Note 1: The sum concentration of Magnesium Oxide and Beryllium shall not exceed 49% of the weight of the waste.

Note 2: If the SNM is not homogeneously distributed throughout the waste then it must not be exceeded on an average in any contiguous mass of 145 kg. (At a density of 1.6 grams/cc this is about half of a 55-gallon drum.)

Note 3: Except as identified in the table the waste must not contain "pure forms" of chemicals containing carbon, fluorine, magnesium, or bismuth in bulk quantities.

Note 4: Except as identified in the table, beryllium, hydrogenous material enriched in deuterium, or graphite above one percent of the total weight of the waste.

Note 5: Waste packages must not contain highly soluble forms of uranium greater than 350 grams of uranium-235 and 200 grams of uranium-233. (Two hundred grams of uranium-233 is equivalent to an intermodal full of waste having uranium-233 concentrations at the license limit).

The generator is required to provide adequate information during the waste profile process to show compliance with these requirements listed above and provide certification of compliance with each manifest. The exemption also limited treatment technologies for treatment of SNM containing wastes to those already operating at Envirocare.

OBSERVATIONS

1. Envirocare initiated this process by requesting the NRC write a general exemption. This required the NRC to postulate, identify, and write exemption requirements to address all plausible scenarios. Envirocare was alone in requesting a modification be made to the 10 CFR 150.11 exemption, consequently the NRC felt the exemption was adequate. Both Barnwell and Richland disposal sites permitted their Part 70 licenses

to expire without renewal, which helped to support this position. Because Envirocare was not able to actually identify a general or industry safety concern the NRC was reluctant to respond and consequently recommended that Envirocare submit a license application.

2. When the NRC opted to write a specific exemption they based their criticality safety risk evaluation on previous work which was done to evaluate the criticality safety of disposed wastes. The NRC had information that could be readily applied to identify nuclear criticality risks. This permitted the NRC to respond rather quickly once this safety issue was identified. I do not know what action would have been required if the information had not been readily available.

3. Envirocare had to make some concessions but the final exemption was consistent with what was proposed in the original Part 70 License application. That is Envirocare was not required to implement additional administrative or engineering controls once the waste was received. There was a considerable amount of work remaining to get a comparable Part 70 License. Based on the NRC's response I did not think they would ever approve the approach proposed in the Part 70 application. It took a number of phone calls and a considerable effort on both sides to resolve the issues.

4. The draft exemption proposal provided by the NRC included wording based on the general licenses and exemptions provided in 10 CFR 71 to limit "unusual neutron moderators" i.e. tritium, beryllium, and graphite to a fraction of the mass of the fissile material present in the waste. The requirement implies that as fissile material concentrations decrease, the safety risks from the presence of unusual neutron moderators increase. Based on Envirocare's nuclear criticality assessment and NRC's own assessment, in NUREG/CR-5342, this requirement could be changed to something more practical without effecting criticality safety.

1. U.S. NUCLEAR REGULATORY COMMISSION, "In the matter of Envirocare of Utah, Inc.", Docket No. 40-8989 (May 7, 1999)

2. TITLE 10 OF THE CODE OF FEDERAL REGULATIONS PART 150, "Exemptions in Agreement States", Office of the Federal Register National Archives and Records Administration, Sections 10 and 11 (July 31, 1980)

3. TITLE 10 OF THE CODE OF FEDERAL REGULATIONS PART 70, "Domestic Licensing of Special Nuclear Material", Office of the Federal Register National Archives and Records Administration (as amended)

4. ENVIROCARE OF UTAH, INC., "Request to add a Special Nuclear Material concentration based limit in 10CFR150.11", letter to U.S. Nuclear Regulatory Commission, (October 21, 1992)

5. U.S. NUCLEAR REGULATORY COMMISSION, "Response to February 22, 1993 Exemption Request", letter to Envirocare of Utah, Inc. (April 02, 1993)

6. U.S. NUCLEAR REGULATORY COMMISSION, "Recommended actions for NRC approval to possess SNM quantities of more than 350 grams", letter Envirocare of Utah, Inc. (March 28, 1994)

7. U.S. NUCLEAR REGULATORY COMMISSION, "U.S. Nuclear Regulatory Commission and Envirocare of Utah, Inc. June 19, 1997 Meeting Minutes", letter to Envirocare of Utah, Inc. (July 9, 1997)

8. U.S. NUCLEAR REGULATORY COMMISSION, "U.S. Nuclear Regulatory Commission and Envirocare of Utah, Inc. July 2, 1997 Meeting Minutes", letter to Envirocare of Utah, Inc. (July 22, 1997)

9. ENVIROCARE OF UTAH, INC., "Re: Envirocare of Utah, Inc. Diffuse Special Nuclear Material Request for Interim Final Rule and Exemption From Licensing Requirements", letter to U.S. Nuclear Regulatory Commission (July 15, 1997)

10. U.S. NUCLEAR REGULATORY COMMISSION, "Subject: License Application Acceptance Review (TAC L51562)", letter to Envirocare of Utah (March 4, 1998)

11. U.S. NUCLEAR REGULATORY COMMISSION, "Proposed Draft Conditions", FAX to Envirocare of Utah (December 14, 1998)

12. L. E. TORAN, et al., "The Potential for Criticality Following Disposal of Uranium at Low-Level Waste Facilities", NUREG/CR6505, Vol. 1, U. S. Nuclear Regulatory Commission (January 1977)

13. N. L. PRUVOST (Computer Services Inc.), "Criticality Safety Analysis", letter to Envirocare of Utah (November 5, 1997)

14. C.V. PARKS et al., "Assessment and Recommendations for Fissile-Material Packaging Exemptions and General Licenses Within 10 CFR Part 71", NUREG/CR-5342 (June 1998)