

SAFETY EVALUATION REPORT

DOCKET NO: 70-7021

LICENSE NO: SNM-2018

LICENSEE: Rapiscan Laboratories, Inc.
Sunnyvale, California

SUBJECT: RAPISCAN LABORATORIES, INC. – AMENDMENT REQUEST FOR U.S. NUCLEAR REGULATORY COMMISSION LICENSE SNM-2018 (TECHNICAL ASSIGNMENT CONTROL NUMBER NUMBER. L33321)

BACKGROUND

Rapiscan Laboratories, Inc. (Rapiscan) has been contracted by the U.S. Department of Homeland Security (DHS) to conduct a research program for the development of new technologies that are capable of detecting Special Nuclear Material (SNM). The quantity and type of SNM Rapiscan requested to possess is of low strategic significance as defined in Title 10 of the *Code of Federal Regulations* (10 CFR) 70.4. Rapiscan submitted its' initial application on October 22, 2010 and a license was issued on September 24, 2012 for a variety of SNM of differing enrichment in Uranium-235 (U-235). One type of sources on the license is a set of 10 Triuranium Octoxide (U₃O₈) canisters, containing U-235, enriched to less than ██████%, which were in the design stage at licensing. These sources have been constructed at the Department of Energy (DOE), Oak Ridge, and are slightly different than requested in the initial application. They are of different dimensions resulting in a total of 28 grams more U-235 of this enrichment than the license allows. By letter dated March 20, 2014, Rapiscan requested an amendment to their license to accommodate the additional material, a total of 2008 g.

REGULATORY REQUIREMENTS

10 CFR Part 70.22(a)(4) requires the name, amount, and specifications of the SNM the applicant proposes to use.

10 CFR Part 70.34(a) requires a licensee to specify the respects in which the license is to be amended and the grounds for such amendment.

PROPOSED CHANGES

Rapiscan is requesting an amendment to their license because of changes in the quantities of materials from which were originally requested. Rapiscan is a vendor that has developed equipment for testing that utilizes SNM placed inside fully loaded cargo containers and other concealments in a variety of typical cargo materials seen in U.S. ports of entry. The DHS initiative is to be able to compare results from different vendors by using the same sources with their own proprietary equipment. Vendors would be licensed for the same materials but only

one set of sources would be constructed. These would then be shipped from one vendor location to another via an authorized and approved service. DHS would then be able to compare results of testing on the same materials. Rapiscan obtained a license in 2012 for a variety of materials containing SNM, on the basis of design information provided by DHS, in readiness for testing. The application included a total of [REDACTED] grams of U-235 as U₃O₈, enriched to less than [REDACTED]%, distributed among 10 metal discs sealed in titanium containers. These sources were constructed by the U.S. Department of Energy (DOE) and the final mass of U-235 contained in the sources, exceeded that which Rapiscan was licensed to possess. By letter dated March 20, 2014, Rapiscan submitted an amendment to their license to address the additional material, listed on their license under condition 8.C.

DISCUSSION

On April 2, 2014, a letter of Non-acceptance was sent to Rapiscan for failing to include an updated Criticality Safety Evaluation (CSE) to address the impact to safety from the additional material. On April 20, 2014, Rapiscan sent a revised application to include a CSE addressing the additional material. On May 30, 2014, a RAI was sent to Rapiscan regarding the content of the CSE. While the CSE addressed the additional 28 grams additional material in the U₃O₈ canisters, it did not fully include the other SNM sources on the license. The RAI requested an explanation why the mass of objects evaluated in the CSE was not consistent or bounding for the mass of objects proposed for licensing. While the addition of 28 grams in the canisters is consistent with the amendment request, the remainder of the items authorized in the license was not bounded by the CSE.

On June 5, 2014, Rapiscan responded to the RAI, stating that prior to construction of the CSE, the basis of the mass of materials requested for licensing were from design. In conference with agencies or vendors in possession of the now-constructed sources, Rapiscan based the CSE on the precise amounts of the constructed sources. Though the CSE could have been revised, to use the amounts of materials as specified in the license and provide a buffer for possession, Rapiscan elected to amend their license for the specific amounts of enriched materials, as understood through the construct of the CSE.

FINDINGS

The current license (allows Rapiscan to possess [REDACTED] SNM test objects containing various forms and enrichments of uranium material. In total, the mass of U-235 is approximately [REDACTED] grams. The uranium is primarily just under 20% enriched although almost [REDACTED] grams is 93% enriched. During this review, NRC staff noted that the CSE submitted with the licensee's request was not bounding for the masses allowed in the license; however, the licensee has verified that the CSE either bounds or accurately reflects the actual mass of the test objects and requested that masses allowed in the license be changed to correspond to those evaluated in the CSE.

Rapiscan will only use the material consistent with handling or storage of sealed sources and no processes are anticipated which could result in the material being in a form or geometry other than presented as test objects. Because of this, the licensee has identified no credible criticality accidents that could occur with the materials.

The licensee used MCNP to evaluate the k_{eff} of all SNM materials for a “worst case” accident. This accident evaluation considered a sphere containing the total of the SNM materials and surrounded by beryllium and water. When the original license was issued, this “worst case” was determined to have a k_{eff} of 0.649 and was independently verified by NRC staff (NRC, 2012). Staff did not expect the inclusion of a small amount of additional material to significantly impact the reactivity of the materials which is demonstrated by the modeled k_{eff} of 0.677 presented in the revised CSE. The k_{eff} determined from these evaluations remains sufficiently below unity (i.e., sufficiently subcritical) that staff considers this adequate to offset any bias that may be present and assure the objects remain subcritical.

Because the form and use of the material assure there will be no credible upsets resulting in a criticality, the licensee previously requested and received an exemption from the requirements of 10 CFR 70.24. Given that the licensee will not alter the physical form of the material and that all criticality evaluations show $k_{\text{eff}} < 0.7$ at the 95% confidence interval, a criticality accident is not a credible scenario and there is no need to modify the exemption.

ENVIRONMENTAL REVIEW

According to 10 CFR 51.22(c)(11), the issuance of amendments to licenses for fuel cycle plants which are administrative, organizational, or procedural in nature—or which result in a change in process operations or equipment—are eligible for categorical exclusion provided that:

- i. There is no significant change in the types or significant increase in the amounts of any effluents that may be released offsite.
- ii. There is no significant increase in individual or cumulative occupational radiation exposure.
- iii. There is no significant construction impact.
- iv. There is no significant increase in the potential for or consequences from radiological accidents.

The changes in this amendment do not affect the scope or nature of the licensed activity and will not result in a significant change in the types or amounts of effluents released offsite. There will not be any significant increase in individual or cumulative occupational radiation exposure, and there will not be any significant increase in the potential or consequences from radiological accidents. There is no construction associated with these changes, so there will not be any impact from construction.

CONCLUSION

The NRC staff reviewed the licensee’s amendment request as submitted on April 18, 2014, and the responses to the RAI of June 5, 2014, assessing the potential impacts of changes to the material amounts authorized in the license.

The staff reviewed the information submitted by the licensee and determined that the licensee’s equipment, facilities, and procedures will be adequate to assure subcriticality of the SNM test objects consistent with 10 CFR 70.23(a)(3) and (4), thus adequately protecting health and

minimizing danger to life or property. The information provided was sufficient for staff to make this determination and is, therefore, compliant with 10 CFR 70.34.

The NRC staff concludes that the information and regulatory commitments provided by Rapiscan in their license application provide reasonable assurance of adequate safety of the proposed operations and that the proposed operations will not have an adverse impact on the public health and safety, the common defense and security, or the environment; and meet the applicable requirements in 10 CFR Parts 19, 20, 40, 51, 70, 73, and 74.

PRINCIPAL CONTRIBUTOR

Gregory Chapman

Tyrone D. Naquin

REFERENCES

(NRC, 2012)

U.S. Nuclear Regulatory Commission, "Safety Evaluation Report for the Special Nuclear Material License Application Rapiscan Laboratories, Inc. Sunnyvale, California," ML113560142, September 2012