

SAFETY EVALUATION REPORT

DOCKET NO.: 70-7020

LICENSE NO.: SNM-2017

LICENSEE: Sensor Concepts & Applications
5200 Glenn Arm Rd., Ste A
Glen Arm, MD 21057

SUBJECT: SENSOR CONCEPTS AND APPLICATIONS - LICENSE AMENDMENT
REQUEST FOR LICENSE NUMBER SNM-2017 DATED
OCTOBER 21, 2014 (TECHNICAL ASSIGNMENT CONTROL NUMBER
L33351)

BACKGROUND

Sensor Concepts & Applications (SCA) is a privately held corporation contracted by the U.S. Department of Homeland Security (DHS)/Domestic Nuclear Detection Office (DNDO) to conduct a research program for the development of new technologies that are capable of detecting Special Nuclear Material (SNM) in cargo containers. DHS's development program includes testing that utilizes SNM placed inside fully loaded cargo containers. During testing, the contents of the cargo containers will include a variety of typical cargo materials seen in U.S. ports of entry.

The DHS initiative is to be able to compare testing results from different vendors by using the same sources with their individual proprietary equipment. Vendors are licensed for the same materials, but only one set of sources has been constructed. These are shipped from one vendor location to another via an authorized and approved service. SCA acts as DHS's licensed agent to prepare and handle the cargo containers for testing. SCA places the SNM sources in the containers, which are processed through the vendor's equipment, to determine if SNM sources placed inside can be located when they are surrounded by the cargo. Licensees operate their equipment, but are not involved in the placement of SNM in containers, to ensure testing integrity. DHS is then able to compare results of testing on the same materials from various vendors.

REGULATORY REQUIREMENTS

Paragraph 70.22(a)(4) of Title 10 of the *Code of Federal Regulations* (10 CFR) requires the name, amount, and specifications of the SNM the applicant proposes to use.

Paragraph 70.22(a)(6) of 10 CFR requires identification of the technical qualifications, including training and experience of the applicant and members of his staff to engage in the proposed activities.

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

PROPOSED CHANGES

There are three changes requested in the amendment submitted (Agencywide Documents Access and Management System [ADAMS] accession number ML14323A517) on October 21, 2014:

- 1) A change to the possession limits of the license because of changes in the quantities of materials from which were originally requested.
- 2) A modification to the Radiation Protection Program (RPP) to clarify the training requirements and responsibilities for an Authorized User (AU), to include the approval process for that designation.
- 3) Specifying that SCA will comply with the terms of another licensee when performing work on that licensee's site.

DISCUSSION

The quantity and type of SNM SCA requested to possess is of low strategic significance as defined in 10 CFR 70.4. SCA submitted its' initial application on August 18, 2010 (ML102500239), and a license was issued on December 27, 2011 (ML113080791) 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 20%, which were in the design stage at licensing. The license was issued on December 27, 2011, based on the projected material specifications. These sources were constructed in the spring of 2014 at the U.S. Department of Energy (DOE), Oak Ridge, and are slightly different than requested in the initial application. The dimensions of the test objects were different than the design, resulting in a total of 28 grams more U-235 of this enrichment than the license allows. The License Amendment Request (LAR) submitted corrects for the difference in possession limits of this material.

Section 1.1 of the RPP submitted with the initial application generically described the role of an AU. An AU was described as an employee that is a Radiation Worker who will assume the role of the Radiation Safety Officer (RSO) when directed. Section 1.2 of the RPP provided an organizational chart indicating a supervisory aspect of the position, and the description stated the AU oversees personnel and operations. While the submittal described the training requirements and responsibilities for employees generally, it did not describe the specific training or qualification requirements for an AU. The LAR submitted a revised RPP to address the responsibilities and training requirements of an AU, to include addressing selection and approval.

Section 4.2 of a revised application (ML11159A107) submitted on May 18, 2011, described the generic process of SCA taking control of sources and placing them in cargo containers for analysis as described in the background. There was no description of SCA responsibility to a vendor's license requirements when working at a temporary work site for the DHS initiative. The LAR submitted addressed SCA's responsibility to conforming to the license requirements of any vendor's site where they might be working, where the SNM sources of SCA's license are concerned.

FINDINGS

Possession Limits

The increase in possession limits in the LAR affects all licensees that are sharing these materials under the DHS program described above and is consistent with a possession limit modification request submitted by Rapiscan Laboratories, Inc. (Rapiscan) in April 2014 (ML14113A031). Rapiscan had submitted their amendment request to address the quantitative difference in these specific material sources. Rapiscan was the first licensee under this program to receive the sources following their construction and submitted a LAR to include a Criticality Safety Evaluation (CSE) (ML14296A327) to adjust for their possession limits. The staff reviewed this CSE and found it to be adequate, and this was documented in the Safety Evaluation Report (SER) for that amendment (ML14164A398). As a result, no CSE was supplied or requested for this amendment from SCA.

The current license allows SCA to possess ■ SNM test objects containing various forms and enrichments of uranium material. In total, the mass of U-235 is approximately ■ grams. The uranium is primarily just under 20% enriched although almost ■ grams is ■% enriched. The staff noted the CSE submitted (ML14296A327) for these materials 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. SCA 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.

Monte Carlo Neutron Particle (MCNP) analysis was used to evaluate the k_{eff} of all SNM materials for a “worst case” accident. The 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 The U.S. Nuclear Regulatory Commission (NRC) staff (NRC, 2012). The 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.

Another clarification regarding the LAR is addressed here regarding materials on the SCA license. Section 6.1 of the LAR stated that the SNM listed on SCA’s Maryland State Radioactive Material License will be modified to remove SNM once SCA has the NRC license to possess SNM. SCA had submitted a copy of their Maryland State License with their initial application and staff was unaware of any additional SNM that would be affected by the request in this LAR.

On December 17, 2014, SCA responded (ML14351A399) to a December 9, 2014 Request for Additional Information (RAI) sent to SCA for clarification of issues in their LAR. SCA clarified that, prior to submittal of this LAR, consideration had been given to add SNM to the State license that would not be a part of the material on the NRC license under the DHS program. SCA has since determined and responded that there will be no changes to the materials on the State license. A copy of the most recent Maryland State License, September 23, 2013, was supplied as a part of the response to the RAI. The response to the RAI clarified that there is no additional SNM to be addressed or licensed by SCA under this DHS program.

Authorized User

Section 1.1 of the amended RPP submitted as a part of the LAR described the responsibilities of an AU and that the Radiation Safety Committee will approve staff assigned as AU's. Section 1.2.2 further detailed the requirements for qualifying an AU to include 2 years of supervised work experience as an alternative to 2 years of technical training. The staff requested in the RAI that SCA describe what type of work experience would constitute 2 years of technical training, how the supervised work experience is documented, and whether or not the AU qualification is renewed and reapproved.

Sensor Concepts clarified in their December 17, 2014, response to the December 9, 2014, RAI that a prospective AU will work under the direction of the RSO, participating in activities involving the use of radioactive materials and using equipment to conduct radiological surveys. This work is documented by the RSO, as a part of a performance evaluation. An AU, upon recommendation from the RSO, will receive approval by the Radiation Safety Committee. An approved AU will be listed on the State License and will require re-approval annually.

Vendor License Commitments

Testing under the DHS initiative requires that SCA assume control of the sources for placement in cargo containers at a vendor's worksite. Following observation of SCA work performance during a site visit to one of the vendors involved in the DHS program, the Project Manager (PM) communicated to SCA on July 24, 2014 (ML14211A003) that their license did not address SCA's commitments to the license requirements of the vendors whose sites they would find themselves working. While each vendor participating in this initiative is licensed for the same materials, the locations are different and the radiation safety requirements of their temporary worksites vary. The LAR submitted on October 21, 2014 that SCA will take possession of the sources at a vendor's worksite after they have received instruction on security, licensing, and safety requirements. SCA will inventory and sign for possession of sources on a daily basis and return the sources to the vendor's possession at the end of the working day. At no time will SCA retain possession of the sources past the end of the vendor's workday. A License Condition (LC) has been added to address compliance with the safety and security requirements of licensees whose sites SCA may be working temporarily:

When working at temporary job sites of licensees in possession of the materials identified on this license, Sensor Concepts & Applications Authorized Users and Staff will follow the radiation protection and licensing requirements specific to the site they are working.

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 October 21, 2014, and the responses to the RAI of December 17, 2014, assessing the potential impacts of changes to the material amounts authorized in the license, the clarification of training requirements and responsibilities for AU's, and commitment of SCA to conform with vendor's license requirements when working at their facilities.

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), thus adequately protecting health and minimizing danger to life or property. The staff reviewed the information provided by the licensee and determined the licensee's training and qualification program for AU's is adequate and consistent with 10 CFR 70.23(a)(2). The staff reviewed the commitment provided by the licensee regarding compliance of SCA with the terms of a vendor where SCA is conducting work as a temporary worksite for the materials identified on this docket, and find it to be consistent with 10 CFR 70.23(a)(4). 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 CONTRIBUTORS

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REFERENCE
(NRC, 2011)

U.S. Nuclear Regulatory Commission, "Safety Evaluation Report for the Special Nuclear Material License Application Sensor Concepts & Applications, Inc. Glen Arm, Maryland," ML113080791, December 2011.