

**SAFETY EVALUATION REPORT**

DOCKET NO.: 70-7020

LICENSE NO.: SNM-2017

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

SUBJECT: SENSOR CONCEPTS AND APPLICATIONS - LICENSE AMENDMENT  
REQUEST FOR LICENSE NUMBER SNM-2017 DATED  
April 22, 2016 (COST ACTIVITY CODE: L33412)

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 United States (US) ports of entry.

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 cargo. Typically, licensees operate their equipment and 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.

The quantity and type of SNM SCA requested to possess is of low strategic significance as defined in Title 10 of the *Code of Federal Regulations* (10 CFR) Section 70.4. SCA submitted its' initial application on August 18, 2010 to the Agencywide Documents Access and Management System (ADAMS) Accession Number: ML102500239, and a license was issued on December 27, 2011 (ML113080791) for a variety of SNM of differing enrichment in Uranium-235 (U-235). 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, Oak Ridge, and are slightly different than requested in the initial application.

The license was amended on February 5, 2015 (ML15005A346) to account for differences in the design and production of materials (test objects), resulting in a total of █ grams (g) more U-235 of this enrichment than authorized by the license. Another part of the amendment was to address the responsibilities and training requirements of an Authorized Users (AU), to include addressing selection and approval. The final part of the amendment was to address 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.

REGULATORY REQUIREMENTS

Paragraph 70.22(a)(4) of 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 (ML16126A274) on April 22, 2016:

- 1) A change to the possession limits of the license because of changes in the quantities of materials from which were originally requested. The requested change would add a [REDACTED] gram Pu source.
- 2) A modification to allow the use of limited material at a temporary worksite at the Virginia International Gateway, in Portsmouth, VA for the testing of standard portal monitor technology. Testing will not involve the use of any radiation-generating equipment, as has been used with vendors supported by SCA.
- 3) Administrative change to the radiation protection plan (RPP) to modify the list of Authorized Users (AU).

DISCUSSION

*Possession Limits*

When SCA was originally licensed, the application was for possession of sealed sources of a variety enrichments in U-235, as well as a sealed plutonium (Pu) source. The application requested a [REDACTED] g Pu source to be a part of their possession limits for use as a test object for DNDO testing. The source was constructed at the Pacific Northwest National Laboratories (PNNL) and was one of a group of duplicate sources constructed of varying Pu content. Schematics and a Criticality Safety Evaluation (CSE) were submitted that addressed all the materials on their application. A part of the review included physical security and, based on the amount of SNM requested in the application, would have made SCA subject to the physical security requirements of a Category II licensee, as defined in 10 CFR Part 70.4. The physical security requirements for licensees of SNM are found in 10 CFR 73.67, and additional requirements are necessary to Category II licensees. At the time, SCA decided to forego licensing of the [REDACTED] g Pu source and remain under the 1,000 g Category I ceiling, and minimize the necessary physical security requirements. SCA is now requesting to add a [REDACTED] g Pu source to their license.

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PNNL designed, tested and built a plutonium sealed source for the DHS. This source, [REDACTED] was designed for use as either a calibration source in the development of new radiation detector systems or to test existing radiation detector systems. The plutonium sealed source (“puck”) is in the shape of a [REDACTED] cm diameter disk approximately [REDACTED] cm deep. It is encapsulated in a tantalum liner that provides an inert barrier between the plutonium disk and the stainless steel outer housing. The mass of the plutonium in the puck is [REDACTED] g Pu.

*Temporary Worksite*

SCA has requested authorization to use material under their license at a temporary location, other than the Glenn Arm, Maryland facility. While SCA is authorized to handle the sources at locations of licensees (vendors) who are authorized to possess the sources, the original license does not authorize the use of these sources by SCA at any other location besides the Glenn Arm, Maryland facility. The standard use of these materials by SCA, to date, has been for a vendor to demonstrate their proprietary technology for locating SNM within cargo using some kind of scanning process involving radiation producing devices. SCA would handle placement of material within cargo, but this would be under the requirements of a vendor’s license.

For the purposes of upcoming testing under the DNDO, SCA is requesting to temporarily handle a limited amount of material on their license at a marine container terminal at Norfolk, Virginia. It is a US Customs designated port of entry and the testing will be under the use of Customs and Border Patrol (CBP) using standard passive portal monitor technology, which detects emitted photons and neutrons without the generation of radiation to accomplish detection. The testing is primarily focused on evaluating a software product, Enhanced Radiological Nuclear Inspection and Evaluation. Requested for this temporary worksite is the use of 2 high-enriched uranium (HEU) sources, of [REDACTED] g each, and the [REDACTED] g Pu source addressed in the previous section.

*Authorized Users*

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 that will assume the role of the Radiation Safety Officer 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. A license amendment request (LAR) (ML14296A429) submitted on October 23, 2014 provided a revised RPP to address the responsibilities and training requirements of an AU, to include addressing selection and approval. A list of qualified AUs was submitted and approved at that time.

FINDINGS

*Possession Limits*

The current license allows SCA to possess 17 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 percent enriched although almost [REDACTED] grams is 93 percent enriched.

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When the original license was issued, a CSE was submitted (ML11159A108) that evaluated for the materials containing varying U-235 enrichment and the [REDACTED] g Pu source addressed above, a total of 18 sources. The “worst case” was determined to have a  $k_{\text{eff}}$  of 0.649 and was independently verified by NRC staff (NRC, 2012). The Monte Carlo Neutron Particle Analysis was used to evaluate the  $k_{\text{eff}}$  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. The  $k_{\text{eff}}$  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.

SCA submitted a CSE (ML16126A296) for the addition of the Pu source under consideration in this submitted application. The dimensions of the Pu source to be added are identical to the source that was evaluated in the original application, but contains less mass, at only [REDACTED] g Pu. The CSE is consistent with that of the original application, making the CSE for the original application bounding for this submittal, due to the smaller mass of Pu present. The CSE evaluated for all U-235 source on the standing license and the additional Pu.

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 percent confidence interval, a criticality accident is not a credible scenario and there is no need to modify the exemption.

Inclusion of the [REDACTED] g Pu source to the license will give SCA a total of 999 g of Category I material. SCA is authorized to receive the Pu source (PSS-006, 102.3 g) and will provide documentation to the staff upon receipt of this source. SCA will document receipt of this material within the Nuclear Material Management Safeguards System, consistent with the terms of their standing license. This arrangement is consistent with the requirements of 10 CFR 70.34 and the amendment is in accordance with the requirements of 10 CFR 70.21(a). The staff finds that this amendment to the license is acceptable and meets the requirements of the regulations.

*Temporary Worksite*

The temporary worksite that SCA is requesting to use is [REDACTED], a part of marine container terminal and US Customs designated port of entry. The port controls access using a biometric access control system. The access system is via a security card, identified as a Transportation Worker Identification Credential, issued only to individuals that have met screening requirements set by the Transportation Security Administration. SCA is requesting to use one bay of a large transportation facility. Two exterior doors open into one large bay containing an interior office space, to be used for operation. The Bay doors can only be opened from the interior and the space is part of a larger warehouse facility.

Three SNM test objects are scheduled for use; two of the [REDACTED] g HEU test objects and the [REDACTED] g Pu source described here as an addition to the license. The Pu source will be delivered to SCA via a Registered User from PNNL at VIG. Confirmation of receipt will be provided to staff. No other SNM on the SCA license is authorized for use at this temporary worksite. SCA will coordinate with DNDO, PNNL, and the CBP to facilitate delivery of equipment, supplies, source material, and vehicles to their proper location.

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The test objects will be stored in a 2-hr fire safe within an SCA controlled office space within the designated bay. No other radioactive material will be stored within the safe. Security to the office space is granted only to SCA AUs, secured by an American National Standards Institute grade 2 electronic keypad. The office is protected by an alarm system and armed whenever the space is not occupied. Any alarm is reported to SCA and port security. Port security and first responders will be briefed on the nature and location of materials. Fire protection systems installed at VIG include a sprinkler system and an offsite monitored fire alarm system, with manual pull stations available. The fire protection systems interface through an offsite central monitoring station which notifies the local fire department. Portable fire extinguishers are deployed within the building and fire hydrants are located throughout the port in accordance with industry standards.

SNM test objects will be checked out, as needed, of the safe each day by an SCA AU and placed, under the supervision of an AU, into a shipping container mounted on a chassis. Formal check-in/out procedures will be in use to document daily use. Once placed in the shipping container, the doors will be locked and the container drayed through the portal monitor system being evaluated. The shipping container will not leave the facility with any SNM within. When testing for the day is complete, SNM test objects will be checked back into the storage safe. Testing is anticipated to begin in July and last approximately one month. Once this testing cycle is complete, further use of material at this site will require a separate LAR.

All SCA staff working with the test objects will be monitored with a National Voluntary Laboratory Accreditation Program dosimeter. Direct reading dosimeters, such as ionization chambers and electronic dosimeter are available, as needed. It is not anticipated that SCA staff will be exposed to radiation in excess of public limits of 10 CFR 20.1302. It is not anticipated that there will be detectable radiation levels at the exterior of the bay. Once this test cycle is complete, sources will be returned to the Glenn Arm, Maryland facility and a verification survey of the bay completed. No residual contamination from use of these sealed sources is anticipated. This working plan is consistent with the routine uses of these materials by SCA, the requirements of 10 CFR 70.34, and the amendment is in accordance with the requirements of 10 CFR 70.21(a) and the terms of use enclosed in the standing license. The staff finds that this amendment to the license is acceptable and meets the requirements of the regulations.

*Authorized User*

SCA requested to make changes to the designated AUs. On October 23, 2014, SCA submitted a LAR (ML14296A429) which, among other things, described their process for training and qualifying AUs. That process was determined to be acceptable and was approved in Amendment 1 to the license on February 2, 2015 (ML15005A346). SCA is authorized to add or remove personnel from their qualified AU list, in accordance with these license commitments. If the process is changed, SCA needs to submit a LAR to modify the process. This arrangement is consistent with the requirements of 10 CFR 70.34 and the amendment is in accordance with the requirements of 10 CFR 70.21(a). The staff finds that this amendment to the license is acceptable and meets the requirements of the regulations.

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:

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- 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 22, 2016, assessing the potential impacts of changes to the material amounts authorized in the license, the use of a temporary worksite as described, and the adjustments to the AU's working under SNM-2017.

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 to describe the procedures and uses of materials at the temporary worksite and determined the procedures are acceptable and consistent with the requirements of 10 CFR 70.23(a)(4). The staff reviewed the licensee's training and qualification program for AU's and find it is adequate and consistent with 10 CFR 70.23(a)(2). 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 SCA in their LAR 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

Tyrone D. Naquin

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.
- (NRC, 2015) U.S. Nuclear Regulatory Commission, "Safety Evaluation Report for the Special Nuclear Material License Application Sensor Concepts & Applications, Inc. Glen Arm, Maryland," ML15005A346, February 2015.

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