

**Environmental Review Section Evaluation of the Application for a Material License from  
International Isotopes, Inc. and the accompanying Environmental Report  
dated April 18, 2005.**

## **Summary**

The Environmental Review Section (ERS) has reviewed the Application for Material License from International Isotopes, Inc., (III) and the accompanying Environmental Report (ER) dated April 18, 2005. The ERS has determined that this action is categorically excluded under 10 CFR 51.22 (c)(14)(xvi) and that neither an Environmental Assessment (EA) nor an Environmental Impact Statement (EIS) is required. The processing of UF<sub>4</sub> with GeO<sub>2</sub> to manufacture GeF<sub>4</sub> and U<sub>3</sub>O<sub>8</sub> is not specifically discussed as a categorical exclusion (CATX) under 10 CFR 51.22. However, the ERS is satisfied that the quantity, form, waste stream and dose rate of source material proposed for use by III is similar to those listed in 51.22(c)(14)(i) through (xv) as required by 10 CFR 51.22 (c)(14)(xvi) which states:

*Any use of source, byproduct, or special nuclear material not listed above which involves quantities and forms of source, byproduct, or special nuclear material similar to those listed in paragraphs (c)(14)(i) through (xv) of this section (Category 14).*

## **Introduction**

International Isotopes, Inc. is proposing to process depleted uranium tetrafluoride (UF<sub>4</sub>) source material with germanium oxide (GeO<sub>2</sub>) to produce germanium fluoride (GeF<sub>4</sub>) and depleted uranium oxide (U<sub>3</sub>O<sub>8</sub>). The resulting GeF<sub>4</sub> product is very high purity and does not contain detectable levels of uranium, within the parts per trillion detection range. Since GeF<sub>4</sub> does not contain uranium, it is not a licensed product. The only licensed material after processing is U<sub>3</sub>O<sub>8</sub>, a stable low-level waste material. The GeF<sub>4</sub> product contains very high purity fluorine which is used in the semiconductor industry. III has been producing GeF<sub>4</sub> under a general license for several months to demonstrate that high-purity GeF<sub>4</sub> could be produced and is marketable.

## **Discussion**

The III GeF<sub>4</sub> production process is contained within a small commercial building, 80 feet wide by 100 feet deep, in the St. Leon Industrial Park in Idaho Falls, Idaho. The process mixes powdered depleted UF<sub>4</sub> in solid form with powdered GeO<sub>2</sub> in solid form in a reaction vessel to produce GeF<sub>4</sub> gas and depleted U<sub>3</sub>O<sub>8</sub> powder in solid form. Initial handling of UF<sub>4</sub> and GeO<sub>2</sub> occurs within a UF<sub>4</sub> glove box used to control contamination and airborne radioactivity. A drum hood is utilized to transfer the roasted depleted U<sub>3</sub>O<sub>8</sub> into a 55 gallon drum. The drum hood and glove box are kept under negative pressure and fed through a radiological grade HEPA air filter. The entire GeF<sub>4</sub> gas production process occurs under a flume hood within the building.

The amount of licensed material in possession by III at any one time will be no more than 6000 kg, or approximately seven 55 gallon drums, of depleted uranium in powder form. Because of the molecular weights of the material after the reaction is complete, for every 6000 kg of UF<sub>4</sub>

source material used, approximately 5500 kg of  $U_3O_8$  source material is produced, an approximate 10 percent reduction of licensed material. The resulting  $U_3O_8$  will be disposed of in a commercial waste disposal facility such as Envirocare in Utah or US Ecology in Richland, Washington. Both  $UF_4$  and  $U_3O_8$  are stable forms of licensed material and both can be disposed of in low-level waste facilities.

The processing of  $UF_4$  with  $GeO_2$  to manufacture  $GeF_4$  and  $U_3O_8$  is not specifically discussed as a categorical exclusion under 10 CFR 51.22. However, the quantity, form, waste stream and dose rate of source material proposed for use by III is similar to those listed in 10 CFR 51.22(c)(14)(xiii) and 10 CFR 51.22(c)(14)(xii).

### **Similarities to CATX 10 CFR 51.22 (c)(14)(xiii)**

10 CFR 51.22 (c)(14)(xiii) states:

*Manufacturing or processing of source, byproduct, or special nuclear materials for distribution to other licensees, except processing of source material for extraction of rare earth and other metals.*

When CATX 10 CFR 51.22 (c)(14)(xiii) was written, the statements of consideration (49 FR 9352) indicate it was targeted for the manufacture and processing of radiopharmaceuticals, labeled compounds for research purposes and sealed sources for use in gauging analytical equipment. Other licensees in this category use and handle radioactive materials in solid form to manufacture sealed sources. In 1978, licensees in this category had an average dose of 0.45 rem for persons with measurable exposure and an average dose of 0.21 rem for all persons monitored. The collective dose for this category of licensees was 3,280 man-rems. Ninety-eight percent of the facilities had releases in air of less than one percent of the maximum permissible concentrations in 10 CFR Part 20. The largest release reported was approximately 12 percent of the maximum permissible concentrations.

III is processing small quantities of source material  $UF_4$  in solid form to produce  $GeF_4$  gas and  $U_3O_8$  in solid form. The waste product,  $U_3O_8$  is licensed material and will be sent to a licensed low-level waste facility. The marketable product,  $GeF_4$ , is not NRC licensed material and is not radioactive. However, if  $GeF_4$  were NRC licensed material, III's manufacturing process would fit into 10 CFR 51.22(c)(14)(xiii)'s exclusion for manufacturing or processing of source material for distribution to other licensees, as the product will be used in the semiconductor industry for the manufacture of computer components. This is similar to the uses of products covered by 10 CFR 51.22(c)(14)(xiii), specifically gauging and analytical equipment. The III manufacturing and processing of source material is similar in description to that in 10 CFR 51.22(c)(14)(xiii), although the marketable material is not licensed material.

Occupational dose rates for the III manufacturing process are similar to those described in the statements of consideration for 10 CFR 51.22 (c)(14)(xiii). III anticipates that exposure from internally deposited radioactivity during III normal operations associated with transferring depleted uranium into and then out of the reaction vessel every day for a working year, without considering the use of engineering controls, is calculated to be 0.625 rem/year. Considering the use of engineering controls at the facility, such as a vacuum hoods and protective shielding, this exposure rate should be substantially less. These exposure levels, even without

considering engineering controls, are similar to the average dose of 0.45 rem for persons with measurable exposure as defined in the statements of consideration.

Public dose rates for the III manufacturing process are similar to those described in the statements of consideration for 10 CFR 51.22 (c)(14)(xiii). In section 4.12.2.2 of their ER, III estimates that dose to the maximally exposed individual member of the public resulting from the proposed action will be  $2.8 \times 10^{-2}$  mrem/year (0.000028 rem) using the US EPA COMPLY Code. This is less than one percent of the maximum permissible concentration in 10 CFR 20.1301(a)(1) of 100 mrem/year (0.1 rem) and is below the threshold used in the statements of consideration for 51.22(c)(14)(xiii). These calculations were verified in the Air Quality Permitting Statement of Basis dated November 10, 2004, completed by the Idaho Department of Environmental Quality, Air Quality Division, and are included as Appendix J of the III ER.

The exception in 10 CFR 51.22 (c)(14)(xiii) for the processing of source material for extraction of rare earth and other metals does not apply to the manufacturing process proposed by III. In the statements of consideration, this involves generation of large volumes of waste containing low levels of radioactive material, which would be akin to conventional uranium mills and uranium mill tailings sites. The process proposed by III will produce far less waste than that of a conventional uranium mill or mill tailings site. III anticipates one or two waste shipments per year of less than 6000 kg each. 6000kg of  $\text{DU}_3\text{O}_8$  can be shipped in seven to eight 55 gallon drums.

#### **Similarities to CATX 10 CFR 51.22 (c)(14)(xii)**

10 CFR 51.22 (c)(14)(xii) states:

*Acceptance of packaged radioactive wastes from others for transfer to licensed land burial facilities provided the interim storage period for any package does not exceed 180 days and the total possession limit for all packages held in interim storage at the same time does not exceed 50 curies.*

III will have in its possession depleted uranium source material that will not exceed 6000 kg at any one time as per their license application. This equates to a total of approximately 2.41 curies of depleted uranium possessed at any one time. Of that amount, only 1000 kg will be in the process equipment. Therefore, III will possess a maximum 5000 kg at any one time of packaged depleted uranium. Once the  $\text{UF}_4$  is processed, the resulting  $\text{U}_3\text{O}_8$  will be repackaged and transferred to a licensed land-disposal facility.

The activities considered in the original statements of consideration are analogous to the transport carried out by common and contract carriers. Packages transported and stored are not permitted to be opened prior to transfer to licensed land-disposal facilities. Radioactivity in storage at any one time is kept to a maximum of 50 curies and storage is limited to 180 days or less. Although III manufacture and processing of the source material involves opening of the packaging material, which differs from the intent of this CATX, the form of the material is analogous to what III will possess, specifically depleted  $\text{UF}_4$  and depleted  $\text{U}_3\text{O}_8$ . However, the radioactivity contained within the material III will possess at any one time, approximately 2.41 curies, is more than an order of magnitude less than what is permitted under 10 CFR 51.22 (c)(14)(xii), 50 curies. III will possess the form of material discussed under 10 CFR 51.22 (c)(14)(xii), but radioactive quantities will be far less than what is allowed.

## **Conclusion**

The manufacturing and processing of  $\text{GeF}_4$  from depleted  $\text{UF}_4$  is analogous to the manufacture and processing of source material for distribution to other licensees, as discussed in CATX 10 CFR 51.22 (c)(14)(xiii), with the exception that the marketable product is not a licensed material and the waste product will be distributed to another licensee for disposal. The form, quantity, waste stream, and average dose rates that III license would permit is similar to those discussed in both 10 CFR 51.22 (c)(14)(xiii) and 10 CFR 51.22 (c)(14)(xii). The ERS concludes that CATX 10 CFR 51.22 (c)(14)(xvi) can be used to categorically exclude this licensing action since it will not have a significant effect on the human environment such that neither an EA nor an EIS is required.

The conclusion of the ERS, that a categorical exclusion for this licensing action is appropriate, is for this specific III licensing action only. Subsequent licensing amendments for additional manufacturing capacity, the processing or manufacturing of different products, or other proposed actions will have to be evaluated individually, and a EA or EIS may be required.