

A Study on the Implementation of Export Controls for Spent Nuclear Fuel

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1. Introduction

Recently, various studies related to the storage, management and treatment of spent nuclear fuel have been actively conducted in domestic and abroad. However, there are not many studies on export control of spent fuel. South Korea is implementing export control of nuclear items and technology in accordance with the NSG Guidelines, Nuclear Safety Act and the Foreign Trade Act. If the spent fuel is to be exported or imported as needed, or if exporting spent fuel reprocessing technology, a government ex/import license is required.

In this paper, characteristics of reprocessing of spent fuel were analyzed and items for ex/import licenses were reviewed. On the basis on there, it intends to draw some points to be used for improvement of nuclear export control system in ROK.

2. Reprocessing of spent nuclear fuel

2.1 Process and status of spent fuel processing

The spent fuel treatment method is largely a wet and dry method. According to NSG guidelines, Reprocessing irradiated nuclear fuel separates plutonium and uranium from intensely radioactive fission products and other transuranic elements. That is, the method of physically separating Pu and U corresponds to reprocessing. Currently, in the case of pyro-processing under development in Korea, Pu and U are not separated and thus do not fall into the category of reprocessing. In the case of enriched U or Pu, which is the core material of nuclear weapons, it is a controlled item. In recent years, several countries are studying ways to make Pu separation difficult in reprocessing in order to improve nuclear nonproliferation. US UREX + (Uranium Extraction), UK GANEX (Group ActiNides Extraction) and Japan's NEXT (New Extraction System for TRU

Recovery) are under development.

2.2 Export control related to reprocessing of spent nuclear fuel

According to the NSG Guidelines and the Public Notice on trade of strategic goods and technologies, the export of sensitive items or technology is controlled strictly. Facilities, equipment and technology related to concentrate reprocessing are sensitive items or technology. These sensitive exports to countries covered by the NSG denial notification are limited.

Suppliers should not authorize the transfer of enrichment and reprocessing facilities, and equipment and technology therefore if the recipient does not meet, at least, all of the following criteria: NPT Party, comply with the obligations of the IAEA safeguards agreement, adhere to NSG guidelines, comply with UNSCR 1540, comply with inter-governmental nuclear cooperation agreements, apply physical protection, and comply with IAEA safety standards. Prior to beginning transfers of reprocessing facilities, equipment, or technology, suppliers should consult with NSG Participating Governments regarding the non-proliferation-related terms and conditions applicable to the transfer.

3. Export control implementation of spent nuclear fuel

Nuclear fuel assemblies are subject to control items in accordance with the Public Notice on trade of strategic goods and technologies Annex 2 0A001.f, 0C002 before and after use. There are two cases where export control related to spent fuel is required. First, reprocessing of spent nuclear fuel to overseas consignment, and second, export of items or technology related to spent fuel reprocessing. In both cases the export control procedure will be very similar.

3.1 Export control procedures for reprocessing of spent nuclear fuel

Japan has reprocessed approx. 7,000 tons in the UK and France. If Korea is reprocessed abroad, it will be possible in the UK and France as well as in Japan. Licensing is required from the Nuclear Safety and Security Commission (NSSC) before import and export, and a government to government assurances (GTGA) are required in advance. When exporting trigger list items, it is necessary to receive the GTGA from the recipient country and it takes several months to exchange through diplomatic channels of the Ministry of Foreign Affairs.

In addition, because nuclear fuel assemblies contain more than 1 effective kg of nuclear material, suppliers should report them at the time of importation and exportation according to the provisions of the IAEA Comprehensive Safeguards Agreement. Based on this, The NSSC conducts an advance notification to the IAEA.

3.2 Expected Control Items

According to the Public Notice on trade of strategic goods and technologies, plants for the reprocessing of irradiated fuel elements, and equipment specially designed or prepared therefor are controlled as 0B006. Detailed control items are as follows; irradiated fuel element chopping machines (0B006.b), dissolvers(0B006.c), solvent extractors and solvent extraction equipment(0B006.d), chemical holding or storage vessels(0B006.e), neutron measurement systems for process control(0B006.f), The complete system (0B006.f) is composed of a neutron generator, a neutron detector, amplifiers, and signal processing electronics. Most of the detailed items are related to wet reprocessing. The only overlap in the wet and dry processes is the process of peeling and chopping the fuel cladding. In the case of wet reprocessing, the process proceeds to dissolution in a nitric acid solution after cutting, whereas in the case of dry process, the porous pellet is produced through powder production or high temperature heat treatment for the next step of electrolytic reduction. Therefore, items that are highly likely to be controlled in Korea are 0B006.b and 0B006.f.

3.3 Other considerations

If the spent fuel contains US or Canadian nuclear material, it is necessary to further review the bilateral nuclear cooperation agreement and observe its obligations.

In addition, transportation of nuclear fuel assemblies must be reported in accordance with the Nuclear Safety Act. In the case of international transport, it must be guaranteed from the countries concerned that the nuclear material under international carriage will be protected and shall comply with the physical protection rating standards and requirements in accordance with INFCIRC/225 rev5. The fuel after irradiation is Category 2. Further research is needed on these areas.

4. Conclusion

Domestic and overseas interest in the processing of spent nuclear fuel is increasing. Several countries are actively conducting research on nuclear nonproliferation related to spent nuclear fuel. In this article, we examined the implementation of export control related to spent fuel.

Technology related to the reprocessing of spent nuclear fuel is sensitive technology, and there are many requirements for import and export as follows; Export control of INFCIRC/254, physical protection of INFCIRC/225, safeguards and additional protocol obligations of the IAEA, obligations for nuclear cooperation agreements, and public safety requirements.

It is expected that Korea will continue to be interested and researches such as improving the related laws on nuclear nonproliferation related to processing of spent nuclear fuel and developing related systems.

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