

Tritium Research Activities in KAERI

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Korea operates twenty nuclear power plants and a nuclear research reactor. Out of the twenty operational nuclear power plants, four are CANDU reactors at the Wolsong Nuclear Power Site. In CANDU reactors, deuterium (heavy water) is used as a moderator and also as the primary heat transport from the nuclear fuel. The nuclear research reactor HANARO (the 30-megawatt High-flux Advanced Neutron Application Reactor in KAERI, which reached the first criticality on February 8, 1995) uses heavy water as a neutron reflector.

Tritium is formed by a neutron capture by the deuterium, thus producing a mixture of tritiated deuterium. If left to accumulate, the tritium oxide would become a hazard to the operating staff and to the public via emissions through the ventilation stacks should any leaks occur from the heavy water system. The primary purpose of a Tritium Removal Facility (TRF) is to reduce the tritium concentration in the heavy water moderator. The operation of the TRF commenced at the Wolsong Nuclear Power Site on July 26, 2007.

The ITER fuel cycle plant is composed of various subsystems such as a fuel storage and delivery system (SDS), a tokamak exhaust processing system, a hydrogen isotope separation system, and a tritium plant analytical system. Korea shares in the construction of the ITER fuel cycle plant with the EU, Japan and US, and is responsible for the development and supply of the SDS.

KAERI (Korea Atomic Energy Research Institute) has been developing tritium technologies related to the Wolsong TRF, HANARO, and ITER tritium systems. We thus present in this paper details on the development status of the ITER SDS beds, tritium storage vessel and transport containers, tritiated waste prepackaging, HANARO tritium management technologies, TRF tritium process, and TBM tritium systems.