

## Case Study the Operation Mode of the Moderator and the Coolant in TRF(Tritium Removal Facility)

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### 1. Introduction

The heavy water is used as both the moderator and the coolant in CANDU type. The Wolsong Tritium Removal Facility (WTRF) has been in operation since 2007, contributing to reduce tritium concentrations both the moderator and the coolant.

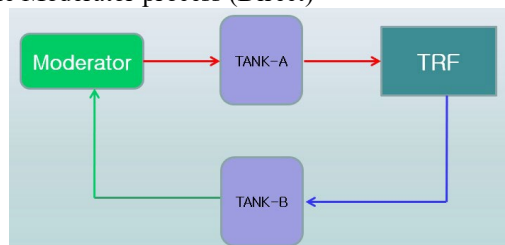
The performance target of Wolsong TRF is to remove 97% of tritium contained in 100kg/h with deuterated moderator. The design specification of Wolsong TRF is focusing to maintain at 370GBq/kg of the concentration of tritium in the moderator in Unit 1~4. This facility has resulted in reduced releases of gaseous and liquid tritium at Wolsong Nuclear Power Plant as well lower radiation exposure for public and plant workers.

The methods for tritium treatment of the moderator and coolant in operation are introduced in this paper.

### 2. Process Description

There are several types of method for tritium treatment of the moderator and coolant. Since the moderator has high tritium concentration than the coolant, TRF has primary processing of the moderator for improve removal efficiency. The moderator and the coolant are transferred to the TRF after being purified in the cleaning system within the plant.

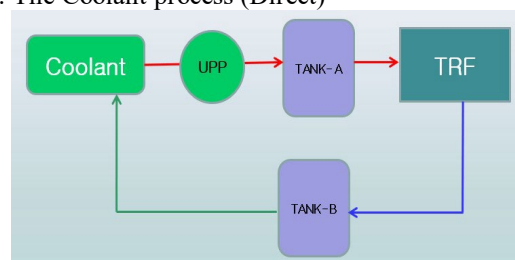
#### 1. The Moderator process (Direct)



< Fig 1. The Moderator processing >

- The high concentration moderator is stored in Tank A
- Passing through the TRF
- Tank B is stored low concentration tritium
- Return to plant as the moderator
- Simple Process

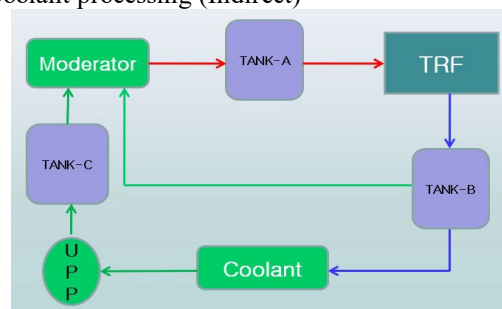
#### 2. The Coolant process (Direct)



< Fig 2. The Coolant processing >

- Included UPP(Upgrade Process Plant)
- Purification(lithium removal) and upgrading(>99.5%)
- Lithium has needed for maintaining high pH level
- The coolant has low purity of deuterium, resulting in lower operational efficiency for TRF

#### 3. The parallel process of the Moderator and the Coolant processing (Indirect)



< Fig 3. The parallel process >

- Mixed Process and It has some complexed
- High removal efficiency for the moderator and coolant
- Heavy water stored in Tank B after TRF, the most of it moved back to the moderator and used as the coolant if it needed
- The coolant can be processed indirectly without going through TRF
- The coolant has sent to UPP and used the moderator through Tank-C if it needed

### 3. Conclusion

By using TRF, The tritium concentration of the moderator and coolant was reduced significantly. The

Cernavoda TRF(Tritium Removal Facility) is currently under construction with an planned completion date of 2027. It expect to operate with improved method for removing tritium of the moderator and coolant.

#### **REFERENCES**

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[2] Gi-ha Whang, "A study on the Primary Requirement for the Safety of the Wolsong Tritium Removal Facility", 2001 Korea Nuclear Society Spring Conference, 2001