

Temporary Storage of Unit 2 Heavy Water

In the first Quarter of 2016, OPG considered options for addressing the storage of Unit 2 primary heat transport system (“PHT”) and moderator heavy water given that the D2O Storage Project remained under construction. OPG initially considered the option of using the tanks in the unfinished building as temporary storage. At the time, the seismic dike, five PHT tanks and the requisite piping to create a flow path to drain Unit 2 heavy water had been installed. OPG ultimately rejected this alternative because of the costs and resources associated with installing the required temporary systems to safely store heavy water in the building, and the impact storing heavy water in the building would have had on ongoing construction.¹

The plan adopted for addressing Unit 2 D2O was to use the existing HWMB facility to temporarily store Unit 2 heavy water. To make the necessary storage space available, modifications were made in the HWMB and D2O was transferred to Pickering and Bruce.

The first step in executing this plan was to reduce PHT and moderator inventories in the HWMB to minimum acceptable levels. The HWMB typically maintains an inventory of PHT heavy water sufficient to account for PHT water lost during events such as a unit cool down while preserving adequate storage capacity in case a partial drain of PHT heavy water is required. Available storage capacity in the HWMB was increased from about 365 Mg to about 392 Mg by raising the high level set-points on tanks.

The next step was to reconfigure the HWMB temporarily to increase PHT storage capacity by repurposing two storage tanks from moderator to PHT use. This repurposing provided storage for existing PHT heavy water within HWMB and allowed for HWMB PHT supply tanks to be emptied so they could accept the PHT heavy water drained from Unit 2 until sufficient quantities of heavy water could be shipped off-site.

¹ Once heavy water is placed in the D2O Storage Project Building, at least part of the building would have been classified as Zone 3 (denoting an area that contains radioactive systems) requiring workers entering to undergo radiation monitoring.

The HWMB received about 264 Mg of PHT heavy water from the bulk drain of Unit 2 in early January 2017.² Following the Unit 2 PHT bulk drain, about 305 Mg of D2O was transferred from the HWMB to Pickering and Bruce using 5 Mg Multi-purpose Transportation Packages (MPTPs) approved by the CNSC to transport heavy water. Shipping was via trucks configured to carry two MPTPs for a total load of approximately 10 Mg.

The heavy water transferred to Pickering and Bruce was used to lower the radioactivity of the moderator water in the generating units of those stations in the same way TRF product is used for that purpose. The transfer occurred over a six week period in January and February 2017. Once the transfer was complete, the HWMB tanks that had been temporarily repurposed to store PHT heavy water were emptied by transferring D2O back to PHT storage tanks.

In preparation for the Unit 2 moderator drain, the above actions along with additional support were required to make adequate space for storage of Unit 2 moderator water. In July 2017, approximately 340 Mg of moderator heavy water was drained from Unit 2 and stored in the HWMB in the tanks that had previously been repurposed for PHT use and other available storage tanks.

While OPG was able to temporarily create sufficient storage in the HWMB for one Unit's heavy water, the approach employed occupied all of the available storage at the HWMB. This left no margin to store additional heavy water at the HWMB if an operating unit had required an emergency drain. Had such an event occurred, OPG would have had to take extraordinary steps to address it. For example, had a leak developed in a Darlington unit's PHT system, OPG would have been unable to drain the system and store the water in the HWMB. Instead, OPG would have had to store the water temporarily in drums, which would have increased the risk of tritium emissions and worker exposure.

² About 100 Mg of PHT water was collected through additional draining through the header and vacuum drying. Because of its low curie count, this water was stored as downgraded D2O in the HWMB.

All movement of D2O had to be coordinated with TRF operations and with the storage requirements from a concurrent Darlington Unit 1 outage. Overall, to drain Unit 2, coordination was required among DRP, Darlington Outages, TRF/HWMB, Pickering Common Services, Nuclear Waste Management Division (for the transport of heavy water from Darlington) and Bruce Power.

In April 2019 and January 2020, D2O was restored to the Unit 2 moderator and PHT systems, respectively. This was accomplished by DRP, D2O Strategy Planning Team, TRF and Station Operations.