



Hydro-Québec workers engage in decommissioning activities at the Gentilly-2 CANDU station, which ceased operations in 2012. Hydro-Québec is a participant in COG collaborative decommissioning studies. Image: Hydro-Québec

Innovation post-operation

A CANDU path to decommissioning

COG's decommissioning program is supporting members as they use innovative technologies and shared knowledge to meet decommissioning needs

Decommissioning is an end-of-life activity but excellence in decommissioning is also essential for future industry sustainability.

When it comes to maintaining reputation and public confidence, demonstrated capability to responsibly manage decommissioning and nuclear waste management are table stakes along with safe, reliable nuclear operation.

As some CANDU units come to the end of their operational life, the industry is turning to innovative technologies, shared knowledge and new processes, developed collaboratively through COG, to meet the need for cost-effective and environmentally-responsible decommissioning.

Units at several CANDU electricity generating stations are approaching or have begun decommissioning activities:

- Hydro-Québec's Gentilly-2;
- Korea Hydro and Nuclear Power's Wolsong (Unit 1);

- Ontario Power Generation's Pickering Nuclear; and
- Pakistan Atomic Energy Commission's KANUPP (Unit 1).

As well, Canadian Nuclear Laboratories' (CNL) research reactor at Chalk River and other CNL-managed assets are actively being decommissioned as part of the company's cross-Canada decommissioning, site remediation and legacy waste management work.

Several COG joint projects are focused on decommissioning work including calandria segmentation and fuel encapsulation.

In addition to work through current joint projects, COG is a community member of OPG's Canadian Centre for Nuclear Sustainability (CCNS).

CCNS was launched in October 2020 by OPG and is based in Pickering in close proximity to the nuclear plant. The organization is focused on collaboration, research and innovation in nuclear decommissioning and waste

management, among other areas. The centre aims to drive sustainability through development of best practice decommissioning and waste management and by leveraging these activities for regional economic development and innovation. Several suppliers and other organizations are co-located at the centre.

COG and CCNS are investigating opportunities that will take advantage of the collaboration mechanisms both organizations offer.

While decommissioning comes at the end of the nuclear life cycle, demonstrated innovation and effectiveness in its management is essential to nuclear's future. COG-member efforts, independently and through COG, are helping to make that happen.

COG decommissioning projects at a glance

In the last year, COG's decommissioning joint projects progressed plans and activities specific to their participants. The lessons learned and associated OPEX will benefit the entire industry.

Highlights from COG's projects in this area include:

Calandria segmentation

COG's Calandria Segmentation Study joint project, which launched in 2018, has been focused on developing decommissioning and segmentation strategies for reactors at OPG's Pickering Nuclear, Hydro-Québec's Gentilly-2 and, ultimately, KHNP's Wolsong Plant.

The initial phases of the project aimed to develop a calandria segmentation plan for Pickering Unit 1, including cost estimates, worker dose assessment and a detailed plan for disassembling and safely removing reactors, several years after shutdown.

The project deliverables, to date, have included a detailed report with the recommended segmentation strategies as well

as different decommissioning timing scenarios (11, 20 and 30 years after shutdown). In 2019, KHNP and Hydro-Québec joined the project for the recently completed Phase 4 which focused on segmentation strategies for the CANDU-6 reactors located at both organizations' plants.

Two primary calandria segmentation or removal concepts have emerged through the study including an approach where calandria and reactor components are removed with light water and a hybrid removal approach involving component removal and borrowing methods from CANDU refurbishments and retubing.

The study also proposes waste management plans that outline how and where calandria and reactor components can be safely stored, once removed.

This year, KHNP is expected to use the study results to support Wolsong Unit 1 decommissioning schedule work.

Fuel encapsulation

Another decommissioning-related joint project is fuel encapsulation which was completed at the end of last year. The project involved the design and procurement of first-of-its-kind defective fuel bundle encapsulation equipment.

COG was asked by program participant, Hydro-Québec, to manage all aspects of the new tool's development and work directly with supplier participant, ATS Automation, on its testing and creation.

The tool has already been used to safely remove defective fuel bundles at Gentilly-2, work Hydro-Québec began in August 2020. It helped remove approximately 36 defective fuel bundles at the plant which was shut down in 2012. The tool was developed and designed with inputs from the Nuclear Waste Management Organization and OPG.

COG provided project management services, technical oversight and contract administration to support this joint project.



COG is currently supporting KHNP, Korea in the development of a decommissioning schedule for Unit 1 at its Wolsong plant (pictured). Image: KHNP