The CANDU industry’s work on fuel channel development is an incredible success story built on collaboration. The breadth of that industry-wide collaboration was reflected in the attendance, this spring, at the 13th CANDU Owners Group (COG) Fuel Channel (FC) Seminar with participants from COG’s Canadian and international members, supplier participants and academia. The purpose of the seminar was to share outcomes of work carried out by COG in support of fuel channel operation and to highlight recent results of COG’s FC R&D program and related FC Joint Projects (JPs) such as Fuel Channel Life Management (FCLM).

At the seminar, presentations from COG’s member utilities, including Ontario Power Generation (OPG) and Bruce Power, highlighted the value of COG’s program in addressing operational issues. They also emphasized the need for ongoing collaboration and innovation as CANDU reactors continue to age. COG also showcased the advances and achievements of its FC R&D program, shared technical updates as well as key FCLM results. Canadian Nuclear Safety Commission director and seminar keynote speaker, John Jin, provided regulatory perspectives on fuel channel fitness for service evaluation, highlighted the importance of fracture toughness model validation on operating licences and shared the regulator’s views on using risk-informed approaches as part of FC probabilistic methodologies.

Other COG members, industry and supplier participants in attendance included New Brunswick Power, China National Nuclear Operation, RATEN, Romania (translated into English as Technologies for Nuclear Energy State Owned Company of Romania), Canadian Nuclear Laboratories, Kinectrics and SNC-Lavalin. Canadian universities also attending included Queen’s, Western and Royal Military College. Student researchers from Queen’s were recognized at the seminar for their emerging FC-focused work.

From R&D to industry solutions COG’s FC R&D program is focused on improving plant performance and supporting life cycle management, including life extension and timeframes for refurbishment. Industry also uses program outcomes to provide input to standards set by the Canadian Standards Association (CSA) associated with managing fuel channel fitness-for-service. The FC R&D program participants have established priority areas for R&D efforts that ultimately address and manage the primary fuel channel aging mechanisms.

FCLM research has improved confidence in the fitness-for-service of CANDU pressure tubes and led to improvements in industry standards used worldwide to confirm pressure tube integrity. The work includes accelerated aging and subsequent testing of actual CANDU reactor components that were removed to evaluate late-life material properties.

A game-changing result The Ontario electricity sector is a prime example of the exponential value received from the FC R&D program, FCLM and Spacer Life Management project efforts. The province’s three nuclear plants have all benefitted from demonstrating fitness for service through the research projects. The plants earned relicensing for operating beyond initial design-based estimates and, as a result, gained thousands of additional hours of generation. FCLM allowed both Bruce Power and Darlington Nuclear to defer the start of unit refurbishments resulting in valuable additional generation and, importantly, added flexibility for more optimal scheduling of refurbishment / major component replacement projects.

At the same time, Ontario has continued to benefit from an on-going base load supply of carbon-free power from the province’s oldest plant, Pickering Nuclear, also as a result of extended licence to operate due to safety validation made possible by the fuel channel research. The overall outcome for Ontarians has been billions of dollars of additional revenue from the publicly-owned assets and a continued supply of low-carbon electricity even as the refurbishment projects are underway. The Ontario story is illustrative of how this industry research can play an important role in improving the lives of people throughout the COG-member countries.

Once feedback from the spring Fuel Channel Seminar has been reviewed, COG and the FC Technical Committee will start planning for its next meeting, scheduled for May 2021.