As we move forward into 2020, here’s a look back at a few highlights from 2019:

**Predictability and longevity: COG fuel channel research and projects continued**

The Fuel Channel Life Management (FCLM) project and associated research and development conducted through COG has improved confidence in the fitness-for-service of CANDU pressure tubes, allowed for safe extended operation of CANDU reactors 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. Progress continued in 2019 on Phases 3 and 4 of COG’s multi-year fuel channel (FC) program, with a focus on improving plant performance and supporting life cycle management, including life extension. The program has enabled more flexibility for synchronizing refurbishment and major component replacement activities at Darlington and Bruce stations, significantly strengthening project outcomes at both sites. The industry uses program outcomes to provide input to standards set by the Canadian Standards Association (CSA) associated with managing fuel channel fitness-for-service.
The resulting increase in longevity of station operating life means better return on investment for consumers.

COG’s 13th Fuel Channel Seminar, held in May, attracted more than 200 participants including from COG’s Canadian and international members, supplier participants and academia with a presentation by Canada’s nuclear regulator on the impact of the research within the regulatory framework.

Progress in areas of related research was also reported in the Spacer Life Management and Pressure Tube Surveillance projects.

**A COG-developed fuel bundle design brings further defense-in-depth to KHNP reactors**

A modified fuel bundle design developed to remove heat and increase safety margin was loaded into the Korea Hydro and Nuclear Power (KHNP), Wolsong plant, in November, marking a first in a CANDU-6 reactor.

On Nov. 22, KHNP received approval from the Korean nuclear regulator to proceed with placing a 37-element (37M) fuel-loaded core into Wolsong, Unit 1. The technology had previously only been used in Ontario CANDU plants.

Beginning in 2012, COG’s Safety and Licensing R&D program undertook research to improve heat removal in fuel under accident conditions, thereby increasing safety margin in CANDU plants. After successful implementation at Ontario plants, KHNP in collaboration with COG began to look at ways to use the 37M design for its three CANDU-6 reactors.

**Building a best practice foundation for decommissioning and waste management**

Before you can build the solutions, you need to understand the challenges.

With that in mind, COG’s Decommissioning and Waste Management Peer Group (DWMPG) used 2019 to benchmark common experiences and issues in decommissioning activities by viewing, first-hand, the facilities, structures and activities put in place by existing dismantling operations, enabling better future planning and execution. The collection of benchmarking data helped to generate a base of information supporting identification of common issues for future research and development. This work will be expanded to new members and issues, broadening the data available to inform short and long-term decision-making.

The DWMPG coordinated with COG’s Strategic R&D team in shared areas of research such as heavy water tritium removal; containment of Carbon 14 CANDU waste streams; and concrete construction at CANDU facilities. The DWMPG also set a foundation for future work, initiating task teams and projects to support peer group initiatives.

Progress was also reported on several related joint projects in areas including: waste processing, packaging and storing; monitoring and modelling of environmental contaminants in soil and water; as well as the application of robotics and automated systems in CANDU decommissioning.

The COG Radioactive Waste Leadership Forum (RWLF), established to identify strategies and solutions for management of the waste streams from low and intermediate level waste to used fuel, has helped enhance mutual understanding and alignment on major issues and strategic direction for the industry. The Forum also considers factors impacting worker and public safety, protection of the environment and cost effectiveness.

**Expanding knowledge and strengthening member capability**

COG and the International Atomic Energy Agency (IAEA) teamed up with Korea Hydro and Nuclear Power (KHNP) to host the 15th COG-IAEA Technical Committee Meeting, followed by a COG-WANO equipment reliability workshop in Korea, in November. TCM presentations reinforced the CANDU industry’s continued commitment to safety culture, continuous improvement and human performance and the 90+ participants had the opportunity to learn about KHNP’s company-wide focus on safety culture, Ontario Power Generation’s (OPG) Asset Management Improvement Initiative, New Brunswick Power’s impressive improvement in Equipment Reliability and Societatea Nationala...
Nuclearelectrica (SNN) Romania’s successful Preventive Maintenance Optimization Program, among other topics.

The Continuous Collaborative Improvement Visits (CCIV) program got fully operational in 2019 following its 2018 launch. The program was created to strengthen information exchange and bring immediate results in operational excellence. The first focus area of the program was outage performance, specifically on scheduling. Experts from Canadian utilities visited the Peach Bottom Station and brought back lessons learned for New Brunswick Power’s 2019 Point Lepreau spring outage. The second CCIV focused on maintenance productivity. In the fall, the CCIV team visited Excelon’s Byron station in the US and the Ringhals station in Sweden. These lessons were transferred to Bruce Power in November with strong results that earned positive recognition from Bruce Chief Nuclear Officer Len Clewitt.

Tackling common issues together: The C6 Fleet Steering Committee gains momentum

The C6 Fleet Steering Committee met regularly throughout 2019 and tackled several common areas of interest gaining momentum in this collaboration forum. The committee put in motion a full list of topics they will further build on in 2020 including design modification exchange, airlock reliability improvements, plant outage optimization, common preventive maintenance programs and inter-utility emergency part transfer process improvements. The purpose of the C6 Fleet Forum is to exchange information on design, safety analyses, equipment lifecycles and to discuss common issues.

SMR industry harmonization and technology advances made through the COG program

COG’s Small Modular Reactor (SMR) program moved at a fast pace in the past year, helping to advance SMR technology and strengthen industry harmonization. COG’s SMR deployment activities are helping the industry develop a national and international SMR approach.

The COG SMR Technology and CEO Forums are focused primarily on the development of a common industry framework and approaches to support on and off-grid applications of SMR technology.

Progress in these areas was achieved through several activities including:

- The completion of a COG-led SMR harmonization survey;
- A global workshop on the security of SMRs, co-sponsored by COG, along with Natural Resources Canada, the Canadian Nuclear Safety Commission, Canadian Nuclear Laboratories and WINS (the World Institute of Nuclear Security);
- COG-hosted meetings for CEOs and SMR vendor participants to further regulatory affairs and waste management initiatives, and
- Collaboration with other industry organizations including the Canadian Nuclear Association on Canada’s SMR Roadmap.

Suppliers take a leading role in safety and performance

COG’s Supplier Participant program grew to 28 members in 2019 and earned international recognition for its unique collaboration model. The program has developed safety and quality culture within the CANDU supply chain through knowledge management and leadership development.

With increased participation of contractors and vendors embedded in leadership roles for CANDU refurbishment projects and operations, COG members identified a need to strengthen safety and quality culture within the supply chain. The program uses a similar approach to knowledge management through OPEX sharing, performance targets and leadership/ supervisor training as the approach used by COG member utilities.

Outcomes from the program include:

- Established processes for regular sharing of OPEX and key industry learnings;
• Implementation of a First Line Supervisors Training Program;
• HU metrics program launching in October 2019; and
• A shared-cost quality assurance audit program.

As well, bi-monthly forums serve as a bridge for direct interaction between the supplier community and the utilities.

**Strengthening the relationship between the regulator and industry**

A transparent and strong relationship between industry and the regulator provides tremendous mutual benefits. Ultimately, and most importantly, an effective utility-regulator relationship benefits the public who relies on high-performing nuclear plants for safe, clean, reliable and affordable electricity.

Through COG, several initiatives helped build pathways for continuous improvement on standards and communications including: A meeting with the CNSC and industry on the conduct of safety culture assessments to validate the alignment of current industry practices with regulator expectations. As well, the establishment of the forum of the regulatory affairs managers and CNSC regulatory program directors to share information and identify emerging regulatory issues ensures all parties are aware of the most up-to-date information on key regulatory topics. COG continues to develop initiatives that will strengthen the regulator-industry channels of communication.

**Strengthening business processes to improve member service**

**Improved IT services for better functionality and cyber security**

COG continues to update its cyber security tools, working with experts in the field and continually benchmarking with our members to ensure information on our COGonline member website remains secure. A new OwnCloud server that provides encryption over SSL (Security Sockets Layer) for all shared content was created for sharing transactional data with members and other organizations, and, provides a storage tool for the iPads used for the Knowledge Management Program training courses.

Among the various cyber security

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**What does COG do?**

**Creation of knowledge**

Through research and development as well as joint projects COG members invested more than $71.4 million between April 2018 and March 2019, to create original research and advancements in CANDU technology, equipment and performance. Through the work of forums, peer groups and committees, COG members advanced our understanding and use of best and new industry practices.

**Retention of knowledge**

Using COG's member website and databases on COGonline as well as through close to 200 peer and industry meetings in Canada and worldwide, COG continued to ensure the knowledge across our membership and within our supplier and stakeholder communities was captured and reported in a way that makes the information accessible to our members when they need it most.

**Transfer of knowledge**

COG continued to develop and create new opportunities for training and benchmarking for both our members and participants including a new training program for the supplier community and a new forum for SMR vendors.

**Our members’ priorities are our business goals**

In 2019, COG’s business goals centred around:
• Providing products and services of value to our members,
• Furthering COG and industry strategic initiatives that advance the sustainability of COG and the industry; and
• Ensuring business efficiency to provide optimum value for our members and participants through management of COG people and processes.

**Who is COG?**

COG begins with the diverse and talented pool of people who work here but it is much more than that.

Together, with our members, participants, contractors and vendors, including some of the brightest scientists and researchers in nuclear science and technology, COG employees help further innovation and continuous improvement for the millions of people who rely on our members for safe, reliable and affordable electricity.
actions and tests performed was a black box penetration test of COG’s network infrastructure to identify any vulnerabilities and make recommendations for remediation, to prevent intrusion and business disruption.

Members visiting COG offices for workshops and meetings will also experience the benefits of a new enterprise-class wireless network that provides seamless and secure wireless access to members, other guests and staff at the COG office resulting in better coverage and improved security.

A COG standard for liability that allows for greater collaboration

A new COG Standard for General and Nuclear Liability Terms and Conditions (COG-PR-STD-002-R0) establishes the general liability and nuclear liability provisions that will apply to agreements for COG projects and will be referenced in all such agreements subject to specific agreed-to exceptions. The development of the standard is a major contributor to further international research and development collaboration amongst COG members and participants. The new standard will be referenced in all COG agreements, including the recently refreshed agreements for COG’s Research and Development program and COG’s Industry Standard Toolset program.

A new management system to streamline and simplify COG’s business

A major overhaul of COG’s management systems means better service provided more efficiently to COG members and allows COG employees to focus more time on delivering services. The Management Information System (MIS) project delivers three new integrated systems (ADP Workforce Now, Microsoft Dynamics 365 Business Central and Change-point Project Services Automation) allowing COG to further modernize its project management, human resources, financial reporting, member invoicing and vendor payment processes reducing both time and cost.

SNN, Romania rejoins COG research programs and COG board of directors

Societatea Nationala Nuclearelectrica (SNN) rejoined the Chemistry, Materials and Components (CM&C) and Fuel Channel research programs at the end of 2019. SNN temporarily left the programs in 2016 and, its return to these two high-value areas of research is a great benefit to SNN and to all COG members. With SNN’s return, the areas of research are strengthened by both additional financial contributions and knowledge of the SNN participants. In addition, COG is most pleased to welcome back Sorin Ghelbereu, Engineering Director as the company’s representative on the COG Board of Directors.

Recognition for 35 years of industry leadership

At the May Canadian Nuclear Society Conference in Ottawa, the COG team, which celebrated its 35th year in the industry in 2019, was recognized with the John S. Hewitt Team Achievement Award for “its achievements in advancing technical and leadership knowledge and sharing operating experience across CANDU stations around the world.” COG was recognized for its numerous industry contributions including: Solving industry technical challenges such as enhancing the understanding of pressure tubes to develop improved fitness for service criteria for fuel channels, feeder-thinning mechanisms and life-cycle management; helping members manage obsolescence; and for engaging the supplier community through a collaborative forum that allows them to learn from each other and the utilities in a manner that strengthens the industry, overall. The committee also noted the collaboration between COG, universities and other partner organizations in Canada and worldwide, as well as the development of young professionals.

The day had added significance for COG President and CEO Fred Dermarkar who was recognized with the prestigious Ian McCrae Award, which honours an individual for substantive contributions to the advancement of nuclear energy in Canada.