

2023

CANDU Owners Group Inc.



A YEAR OF EXCELLENCE IN COLLABORATION

January 2024 - For the nuclear industry, 2023 was an impactful year which concluded on a high note, with governments around the world committing to tripling nuclear power by 2050! It was also a tremendous year for COG, as we completed critical projects, launched new initiatives and helped the industry collaborate in areas both traditional and ground-breaking. COG's Collaboration Model is unique, and I am proud of our team who works hard each and every day to help meet evolving and emergent member needs, and all that we achieved together in 2023.



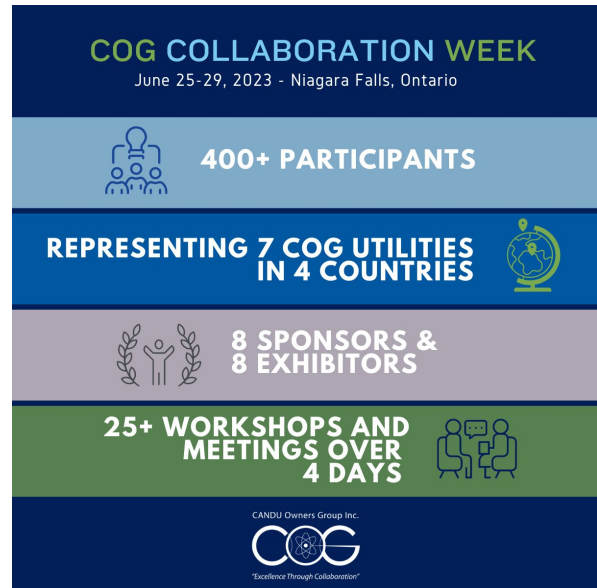
While we are already well underway in supporting our members in delivering a successful 2024, we always find it valuable to reflect on our achievements and learnings from the previous year.

The success of our collaboration model is attributable to the commitment and mindset of our members. Our successes are your successes – thank you for your ongoing dedication to working together towards the common goal of performance excellence.

Rachna Clavero
President and CEO

COG's 2023 Collaboration Week – Asset Management and Innovative Solutions

From June 25-29, COG welcomed over 400 participants from Canada and around the world to Niagara Falls, Ontario for COG Collaboration Week (CCW). This bi-annual event provides a unique platform for nuclear professionals and technical experts from across the industry to network, learn from one another, and find new opportunities to innovate and collaborate.



In addition to meetings of COG's CANDU 6 Fleet and Fuel Handling and Asset Management Peer Groups, CCW featured numerous workshops focused on topics such as University Research and Innovation Engagement, Refurbishment Best Practices, and Obsolescence Management. In addition, suppliers of COG's R&D program came together to speak to the benefits of COG projects and how they have helped industry maintain subject matter expertise, build talent and sustain key facilities.

The CCW format integrates workshops, meetings and networking opportunities, enhancing the collective learning experience. Most importantly, CCW brings together the people who drive innovation forward.

Hear from CCW attendees on this year's event:



Fostering International Engagement

In-person connection, strong relationships and engagement with our international members continue to be key areas of strategic focus. At COG, we represent the collective CANDU owners globally.



In March, the COG team met with executives from COG member, Nuclear Power Corporation of India Limited. The teams are working to advance opportunities for collaboration, and further engagement in COG programs. With plans underway for 10 new 700 MW PHWRs to support NPCIL's existing fleet, there is much to be gained from information sharing.

In November, the COG team had the pleasure of meeting with the Societatea Nationala Nuclearelectrica SA (SNN) head office team in Romania. A COG member since 1991, SNN currently operates two CANDU 6 units, demonstrating the highest levels of operational excellence and supplying approximately one fifth of Romania's electricity. To support energy security and climate change goals, SNN plans to refurbish Unit 1, complete construction of two new CANDU units, and deploy SMRs.



COG will continue to support our utility members as they strive to achieve operational excellence and life extension through sharing of OPEX, information exchange, research and development, auditing, inspection procedure certifications, projects and training.

The value of collaboration is further reflected through our CANDU 6 (C6) Forum. C-6 Fleet Forum - Formed in 2015 and supported by our Joint Projects & Services group, the CANDU 6 Fleet Forum fosters collaboration among C6 utilities in different geographic regions including Romania, China, Korea, Canada (New Brunswick) and Argentina. The Forum enables the group to share expertise and experience on topics of common interest, leveraging individual experience into the benefits that accrue from a global fleet.

Our collaborative efforts also extend to secondments. We are pleased to have Jinil Koo at COG on secondment from KHNP through 2024, along with Irina Sfirlea from SNN in Romania.

With the nuclear industry becoming increasingly global in nature, and new nuclear technologies gaining momentum in Canada and around the world, we are continuously seeking opportunities to support our members through collaboration across jurisdictions.

Strengthening the Supply Chain - COG's Supplier Participant Program

In 2023, COG's Supplier Participant Program (SPP) continued to grow; the program currently has more than 40 members.

Participants collaborate to provide the best services to their utility customers, ensuring a robust supplier network to support the CANDU nuclear industry. Bi-monthly SP meetings provide a platform for OPEX

sharing, averaging five pieces of OPEX topics discussed. Ongoing and future refurbishments, CANDU new builds and domestic and international demand for SMRs and MMRs present significant prospects for Canada's suppliers. By sharing best practices and lessons learned in safety and performance, the SPP is strengthening the supply chain to meet nuclear challenges and optimize opportunities.



Exploring New Frontiers: Launch of Innovation Technology Workshop

The tremendous amount of interest among our utility members in emerging technologies is driving innovation and technology in COG's Research and Development Portfolio, and CANDU owners are keen to explore the opportunities to apply them in their plants. COG recently established the Innovation Peer Group (IPG) as a community of practice for sharing ideas, insights, progress on initiatives, challenges and lessons learned. Its success has resulted in the recognition of an industry-wide need for a series of technology-oriented workshops, based on topics such as virtual reality, robotics, electronic procedures, machine learning, and cybersecurity. These technologies can be applied to both new builds and existing plants and promise improvements in outages, maintenance, operations, equipment reliability and in general improved plant safety and economics.



With the looming threat of climate change, the nuclear industry needs both to boost current plant viability and build infrastructure to leverage these new technologies and realize new opportunities. For example:

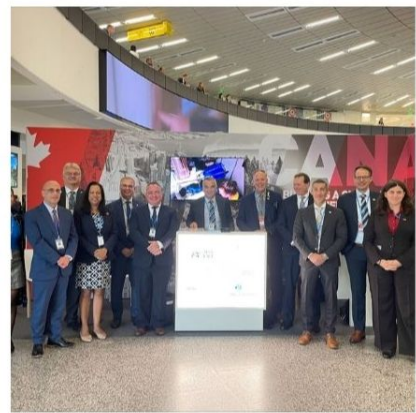
- Augmented and virtual reality can integrate data and workflow, enhancing work planning and worker safety
- Automated scanning can upgrade predictive maintenance and anomaly detection, saving outage time and worker exposure.
- Advanced robotics can significantly reduce manual labour. Additive manufacturing and advanced welding can improve component design and reliability.

In 2023, as part of CCW, we launched the COG Innovation and Technology Workshop Series, which brought together COG members, suppliers and invited speakers to highlight specific technology and innovation initiatives through presentations and panel discussions. The multi-day seminar showcased a variety of current technology and innovation initiatives. Panel discussions explored future focus areas at CANDU facilities, how to foster and accelerate innovation, and opportunities to apply emerging technologies in operating plants.

Feedback has been resoundingly positive and planning is underway to support this initiative and hold regular workshops annually.

Thought Leadership to Support Global Net Zero Goals

- In April, COG participated in the First Meeting of the International Network on Innovation to Support Operating Nuclear Power Plants held at the International Atomic Energy Agency (IAEA)'s Headquarters. The event marked the launch of the International Network on Innovation to Support Operating Nuclear Power Plants (ISOP). The network brings together key nuclear professionals from participating countries to enable identification of the ongoing activities in innovation as well as the pressing challenges and barriers facing operating nuclear power plants; clarify gaps in ongoing support; and subsequently, develop recommendations for collaboration to address identified gaps, as appropriate, through the IAEA and other organizations. The event was also attended by staff from the Canadian Nuclear Safety Commission, the UK Office for Nuclear Regulation and US Nuclear Regulator Commission.
- In August, COG's President and CEO Rachna Clavero visited the EPRI complex in Charlotte, NC, to meet with their leadership team and discuss EPRI's support to the COG members, including how to work together, leverage our organizations, and help our members reach their net zero goals. COG manages the EPRI memberships for the CANDU domestic fleet and SNN.
- In September COG was part of 'Team Canada' at the IAEA General conference, where we heard resoundingly from other nations and technology owners that the work done by the industry through COG's unique and highly regarded collaboration infrastructure is recognized around the world as a key enabler for both CANDU and advanced nuclear technologies. We heard resoundingly from other nations and technology owners that the concept of 'utility helping utility' and 'supplier helping supplier' is unique to the CANDU community. And our long history of collaboration is the roadmap to our continued success.



- In October, Sonia Qureshi, COG's Director of Joint Projects and Services, chaired the Technical Meeting on Lessons Learned on Design Changes and Strategies for Managing Ageing Effects in PHWRs at the IAEA Headquarters in Vienna. Organized in partnership with the International Atomic Energy Agency (IAEA), the meeting brought together representatives from Member States owning and operating PHWRs to capture and share the experience, knowledge and lessons learned on the implementation of design, analytical and operational changes made in PHWRs to mitigate ageing effects. CANDU Owners were strongly represented with participants from Korea (Korea Hydro & Nuclear Power (KHNP), Korea Institute of Nuclear Safety; China (CNNC China Nuclear Power Engineering Co., LTD.); India (Nuclear Power Corporation of India Limited); Romania (Societatea Nationala Nuclearelectrica SA); Canada (Ontario Power Generation, Bruce Power, Canadian Nuclear Laboratories, Canadian Nuclear Safety Commission, COG); and Argentina (Nucleoeléctrica Argentina S.A.). The information exchanged will serve as the basis for an IAEA publication on the topic.
- Subsequently, COG participated in the OECD Roadmaps to New Nuclear conference where nine associations representing the nuclear industry in OECD countries, including COG, released a joint communiqué highlighting the essential role of nuclear and calling on deepening the cooperation with governments, international organizations and across the industry. The communiqué sets out concrete actions needed in order to meet global climate targets. COG is proud to be a signatory and we are committed to helping our members and industry advance collaboration towards achievement of our collective net zero and energy security goals.
- In December, COG was invited to participate in a panel at the Canadian pavilion at COP 28 (28th Conference of the Parties to the U.N. Framework Convention on Climate Change) to reflect on how the COG model supports international collaboration on clean energy. COG also participated in the Net Zero Nuclear initiative which had a strong presence at COP, culminating in a commitment by 22 countries to triple nuclear power by 2050. A strong showing from the global nuclear industry and CANDU owners in Canada and worldwide underscores our members' commitment to driving excellence through collaboration in support of our shared net zero goals.

Building the next Generation of Leaders

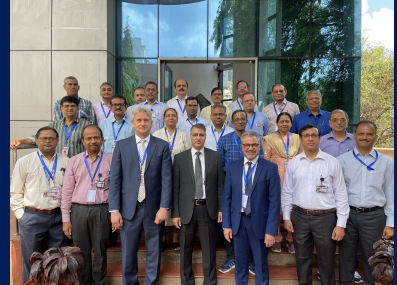
In 2023 we ramped up our leadership training offerings to help prepare the talent pipeline for the expansion and growth ahead of the nuclear industry in Canada and worldwide.

Highlights include:



COG is actively working on an extensive training program with SNN as they bring on hundreds of new staff to support their many new and ongoing site activities. From April through November, 2023, COG delivered a total of eight week-long leadership training programs to approximately 160 SNN staff at their Cernavoda site.

In May, we traveled to India to provide more than 20 senior leaders from India's various operating nuclear plants, including seven from NPCIL headquarters in Mumbai with Senior Leadership training.



A recent program provided Safety Culture training to senior leaders from KHNP in Canada, including a supported site visit to Pickering.

A Nuclear Professional Development Seminar (NPDS) was delivered to CNNO management in September, featuring site visits to Point Lepreau and Bruce Power, with additional programs being planned for 2024.



In September we also assisted the IAEA in Ankara Turkey with the development of a 'Train the Trainer' program, working with trainers from over 15 countries.



In October, COG presented a proposal for joint COG/WiN Canada custom leadership training to help close the gender gap in nuclear.

In November/December, we trained 45 managers in a week-long leadership course at New Brunswick Power, addressing supervisory issues highlighted in their Recover Plans.

COG is committed to supporting our members through information exchange, fostering connections and sharing best practices across our international membership, and providing comprehensive, high-value learning and development programs.

Continued Collaboration is Essential

It was a successful and eventful year for COG members and the industry globally. As we look to the future, the work done by the industry through COG's unique and highly regarded collaboration infrastructure is recognized around the world as a key enabler for both CANDU and advanced nuclear technologies.

It is expected that 2024 will be another pivotal year for nuclear energy, with major decisions and progress anticipated for large and small reactors. COG utilities are growing and expanding their nuclear capabilities and fleets, and with an expanded scope to support our members' advancements into new nuclear technologies, COG has been pivoting to leverage our inimitable collaboration model in support of new technologies and new members.

2024 marks COG's 40th anniversary. We look forward to celebrating four decades of COG collaboration with you over the coming year, as we continue to evolve to support the nuclear industry for the next 40 years - and beyond. Working together, we're building our collective clean energy future.

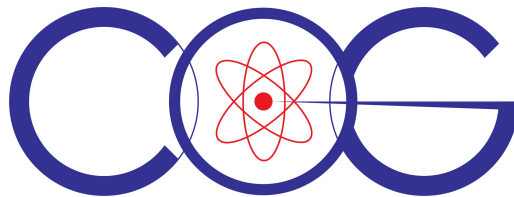
No one can articulate the value of collaboration better than the COG community. Hear directly from COG members, participants and partners on the essential role of collaboration in driving continued performance and success while accelerating progress towards our collective clean energy future.



Keep Up to Date with COG News and Updates

- COG has a YouTube channel – [watch our videos](#).
- [Follow us](#) on LinkedIn for weekly news and updates.
- Visit [COGonline.org](#), our one-stop collaboration tool and information access portal with more than 45,000 OPEX data entries, a calendar of events, and a workspace for peer teams, forums and committees.

CANDU Owners Group Inc.



"Excellence Through Collaboration"

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