A fleet mentality

*Through the C6 Fleet Steering Committee, individual operators gain exponential benefits*

Two years ago, the CANDU 6 Fleet Steering Committee (SC) was formed with the idea of exchanging designs, safety analysis basis, equipment lifecycles and to discover what else could come of gathering operators with common technology and common issues together.

After several technical workshops and a three-day meeting in Korea at Wolsong Nuclear Power Plant in September 2016, the group has leveraged individual experience into the benefits that accrue from a global fleet.

“One of the interesting things for us (in New Brunswick) was the closure of the G2 plant,” says Point Lepreau’s Paul Thompson, who chairs the committee. “It had a significant impact on us because we shared a lot with Hydro Québec. That’s one of the reasons for our interest in the CANDU 6 Fleet.

“What I am seeing that is working quite well is the information exchange and questions being asked by the fleet members. It’s a very healthy dialogue developing and in time, I am hoping we get to share more projects, more common work so that we can not only share in the cost but also bring the designs back together, which will lead to even more sharing.”

Facilitated by COG’s Joint Projects director Macit Cobanoglu and project managers Nidhi Gaudani and KiSang Jang, in 2016 the operators held six technical workshops followed by the three-day meeting at Wolsong, hosted by Korea Hydro and Nuclear Power (KHNFP). Other fleet members — CNNO, China, New Brunswick Power, NASA, Argentina and SNN, Romania as well as the original equipment manufacturer, Candu Energy, also participate.

The Wolsong meeting started with a discussion about critical CANDU 6 OPEX and plant performance status. The second Day 2 workshops focused on safety analysis, and ageing and obsolescence. Fleet members had an opportunity to visit Wolsong NPP1 for a plant tour on the last day. The tour included the control room, turbine building and a fish farm built to demonstrate to residents of local fishing villages that Wolsong has no adverse impact on the environment and the fish stocks.

Fleet members identified derating of their CANDU 6 units towards the end of fuel channel life due to various fuel channel and primary heat transport system aging related concerns as their “top of mind” issue. Various remedial measures to delay or eliminate derating such as deployment of 37M fuel, steam generator primary side cleaning, and use of EVS-ROP/NOP methodology for margin recovery were discussed in detail during workshops that followed the C6 Fleet SC meeting.

Meeting participants identified obsolescence, parts availability, and enhancements in sharing of emergency spares as other top priorities issues.

The cost of delays in securing required emergency spares could reach into many millions of dollars in lost generation resulting from outage extensions. Conversely, creating a solution through collaboration could mean maintaining both revenues and reliability as happened in 2016 when COG members were able to

Members of the C6 Fleet Steering Committee were hosted by Korea Hydro and Nuclear at the Wolsong Nuclear Power Plant in September 2016. The committee, which began in 2015, meets throughout the year, often using CANDU Owners Group teleconferencing technology but gather in person each year. The next annual meeting is November 20-21, 2017 the C6 Fleet Steering Committee will meet again, this time in Argentina. The meeting will be followed by the COG-IAEA sponsored Technical Committee Meeting (TCM) to be hosted by NA-SA Argentina.
come to the aid of Wolsong.

Another topic where good exchange of information took place was the development of Single Point Vulnerability (SPV) lists. Presentations by AMEC Foster Wheeler and SNC Candu Energy led to an exchange of many ideas and a path forward on use of the EVS‐ROP/NOP methodology for CANDU 6 reactors along with a number of other primary heat transport system aging mitigation strategies. COG is currently in the process of developing a phased joint project on the use of EVS ROP/NOP methodology for CANDU 6 reactors.

Other discussion topics included improvements in integrated reactor building leak rate test frequency, a review of the enormous benefits of COG’s Fuel Channel R&D and Fuel Channel Life Management (FCLM) Joint Projects, and the ongoing and planned refurbishment projects.

Year round the benefit of the committee is the opportunity for ongoing development on these issues as well as a chance to really delve into operating experience, says Thompson. Many of the meetings are facilitated by COG’s teleconferencing capability.

In addition to video conferences, there are periodic face-to-face meetings of the steering committee. So far there have been meetings in Romania, China, Korea and Canada, in addition to the planned meeting in Argentina this coming November.

“Our big meetings are generally quarterly and there’s a section dedicated to information exchange. We tend to pick two or three high profile events that have happened and go into a fair amount of detail and what the lesson-learned is. By spending a bit more time and going into these events it becomes much more usable and useful for everyone. We’ve gotten a lot of positive feedback from the offshore utilities and in return we are getting very useful OPEX from them.”

Aside from the common topics of interest, Thompson says the international diversity brings a unique opportunity as well.

“It’s always good to see how others have approached things. Certainly when you are looking at five different countries, it is interesting to see how approaches are adapted. We’re seeing a much more open approach than in the past and I think we’ll continue to see that coming along.”

With only one unit of the 10 CANDU 6’s worldwide, Thompson notes Point Lepreau is the minority shareholder in the group. But, all the more reason why there is such value for New Brunswick Power to participate, he says.

“New builds of CANDU reactors still help everyone, even if those reactors aren’t in Canada, it does benefit the other members. COG needs to continually strive to continue to serve the domestic interests while at the same time continuing to reach out to make it easier for the off-shore participants to participate fully in all the endeavours that COG has. As some of the offshore members join during the three-day meeting in Wolsong in September 2016, the C6 committee had the opportunity to build on six technical workshops facilitated by COG leading up to the September event. The workshop topics, each of common interest to the C6 operators, were: Primary heat transport system; ageing; rod-based guaranteed shutdown system; airlock obsolescence; fuel handling system obsolescence; and emergency diesel generator obsolescence.

C6 issues and action list

At its September 2016 meeting, the Steering Committee identified a number of issues and is developing solutions and shared resources to manage challenges, many of which are related to operating units in the second half of their life. By combining resources, the cost of managing many of these issues can be reduced. Committee chair Paul Thompson says many of the lessons learned here can be extrapolated to the rest of the CANDU industry. Focus areas include:

• Derating of their CANDU 6 units towards the end of fuel channel life due to various fuel channel and primary heat transport system aging
• Spare parts exchange opportunities
• Methodologies for margin recovery

Among its actions, COG will facilitate a table-top exercise on the efficacy of emergency spare part sharing and is currently in the process of developing a phased joint project on the use of EVS ROP/NOP methodology for CANDU 6 reactors. Other COG research projects including the use of 37M fuel and Fuel Channel R&D and Fuel Channel Life Management (FCLM) Joint Projects are also valuable in addressing the identified issues.
more of these working groups, it is important to ensure we’re giving them the opportunity to contribute.”

Thompson says the committee’s success has in part been based on everyone’s willingness to overcome language barriers and time zones. This includes strategies such as preparing and distributing materials in advance, having meetings on a 24-hour clock and taking “time outs” to allow time for full translation during meetings.

“Working at a power plant, it’s not unusual to switch to a night shift. So if every few months, I need to have a meeting at 2 a.m., I am OK with it,” says Thompson who describes the commitment by all participants as highly collaborative.

While the C6 Fleet has a more specific technology bond, Thompson says the C6 group is an adjunct not a replacement for the bigger COG membership.

“It’s important that it not become a second COG because there’s still a block (of information) that needs to be shared back with the Ontario units.”

Like all things COG, it is an incredible opportunity for collaboration that all CANDU operators can benefit from.

Mr. Hwee-Soo Jeon, vice president, Wolsong Site, KHNP speaks to the international participants of the C6 Fleet Steering Committee meeting hosted at the station.

THANKS FOR THE HELP

Korea sends a note of appreciation after COG network tracks down an emergency part and provides installation OPEX

Each year COG Joint Projects & Services receives several hundred requests including emergency spare part (ESP), benchmarking, technical information and other miscellaneous requests. Sometimes these are associated with a joint project or a project initiation form (PIF) and the original request can result in more questions requiring detailed answers to get to a full resolution of the issue.

Some questions are out of the ordinary! Have you ever heard of a dog bone expansion joint?

On March 7, 2016 the Wolsong Nuclear Power Plant 1 manager Jongha Jeon called COG to request support to resolve an emergency need to replace a condenser expansion joint prior to restart from an annual outage in early April. Previously KHNP’s Yeong-gwang Unit 1 PWR had shut down from failure of a dog bone expansion joint (condenser exhaust neck expansion joint) due to a defect. Wolsong Unit 1 was now on outage and planned to replace the same joint, in part, to meet a regulatory requirement.

However KHNP did not have the spare part. Wolsong urgently requested COG arrange the buy-in of the part or facilitate an emergency spare part exchange. The initial KHNP request was for an ESP made by the W1 plant manager. COG was able to leverage other COG members and its Inter-station Assistance Program to find the missing drawings and identify a potential supplier that same day. Using COG information, KHNP was able to obtain an emergency quotation from the vendor, explains COG’s Paul Lafreniere.

Mr. Song (the Wolsong engineering manager) made another request to COG for OPEX as lack of access prevented a good assessment of the installation issues to be expected.

“COG immediately performed benchmarking (15 questions) of COG member stations to collect the required OPEX,” Lafreniere relates.

The benchmarking results from New Brunswick Power and SNN-Romania were sent to KHNP on March 18, 2016 providing information on CANDU plant experience with the joint defects and solutions, replacement periods and spare parts. The end result was KHNP got the part they needed, the knowledge to install it and a happy ending thanks to facilitation by the COG team and the members’ collaborative efforts.

Benchmarking Q&As are recorded in the Joint IE / ISA COGonline website.