PANEL SESSION 20: D&D of Nuclear Power Plants – Global Emerging Issues and Strategies

Co-Chairs: **Rateb Abu Eid,** *US NRC*
Fred Sheil, *Sheil Consulting, Ltd.*

Panel Reporter: Michelle Claggett, *Project Enhancement Corporation*

Panelists:

1. **Loren Sharp,** *Director/Nuclear Plant Manager, PG&E's Humboldt Bay Power Plant*
2. **John Christian,** *President, Logistics, Processing and Disposal (LP&D), Energy Solutions*
3. **Jerry Kato,** *Director, Nuclear Decommissioning & Waste Repositories, Ontario Power Generation (Canada)*
4. **Bruno Thomauske,** *Professor RWTH Aachen University (Germany)*
5. **Claudio Pescatore,** *Principal Administrator, Nuclear Energy Agency*

This panel session focused on worldwide D&D issues at Nuclear Power Plants. This panel discussed national and international emergent issues including:

1. Increased number of NPPs for decommissioning
2. Strategies for decommissioning
3. Waste disposal responsibility and interaction with decommissioning
4. Need for expertise for D&D in the future
5. Regulations
6. Shared Risk

Summary of Presentations

Loren Sharp gave a presentation on the Humboldt Bay Power Plant (HBPP), sharing the history of the site and the current state of decommissioning there. He began by highlighting the safety achievements of HBPP including the receipt of the Shermer L. Sibley Award (the top safety award a PG&E facility can receive) for three consecutive years (2008-2010). The Humboldt Bay Power Plant opened in the early 1950's because the area demand for power was growing. Unit 1 was commissioned in 1956 and Unit 2 in 1958 to provide power to Humboldt County. Fossil units 1 & 2 were decommissioned in 2011 after Humboldt Bay Generation Station operations began in 2010 to provide cleaner and more reliable electricity to the county. The nuclear generation facility, Unit 3, at the HBPP operated from 1963 to 1976. In 1985, Unit 3 entered "SAFSTOR" and in 2008 completed the movement of fuel stored in Unit 3 to the Independent Spent Fuel Storage Installation (ISFSI). From 2014 through 2016 there is planned construction of a slurry wall, 150 feet in diameter, 170 feet deep, with a clay layer on the bottom at Unit 3. The decommissioning of Unit 3 is scheduled to be complete by December 31, 2015.

John Christian opened his presentation by sharing a new model strategy for D&D. In a first-of-a-kind arrangement, Zion*Solutions*, an Energy*Solutions* company, acquired plants from Exelon through a license transfer in September 2010 to conduct decommissioning from an owner perspective. The license transfer is part of an accelerated decommissioning cleanup plan that will allow Zion Station in Illinois to be released for unrestricted reuse after the ten year performance period, shaving 12 years off the original schedule. Once decommissioning is complete the ownership will be transferred back to Exelon. This model was designed to capture efficiencies and to show that the contractual approach taken during decommissioning is a major driver of overall costs. Now 4 years into the performance period, the ISFI construction is complete and the movement of spent fuel is well underway. The schedule for 2014-2015 includes loading 61 casks, complete GTCC packaging, RV segmentation, ready class B/C waste for shipment, remove large components, and to ready remaining structures for demolition.

Jerry Kato opened his presentation with Ontario Power Generation (OPG) facts. Nuclear power provides over 55% of Ontario's electricity and OPG is the largest facility owner in Canada with 20 reactors at 3 sites. OPG owns and operates 6 reactors at Pickering and 4 at Darlington. In addition they own 2 additional reactors at Pickering which are shutdown and in Safestor and 8 reactors under lease to Bruce Power. The Pickering Station end of operations is scheduled for 2020. Conversely, the Darlington and Bruce reactors will be refurbished over the next decade. OPG owns and operates its own waste management facility at the Bruce site and is currently under license application to build a deep geologic repository (DGR) at Bruce site for its L&ILW waste. This is a first of a kind in North America.

There are a growing number of stakeholders within a broader community who have a higher level of interest and expectation of involvement in these activities of refurbishment at Darlington, license application for DGR at the Bruce site, and decommissioning at Pickering. Citizens, community leaders, NGOs, and First Nations are demanding more detailed information, transparency from the projects, and direct and meaningful input throughout the process. There is increasing level of media interest as well, especially in the waste arena and the DGR. Increase focus on decommissioning funding is also an area of high interest during these economic times. What decommissioning option is the safest and best value for the ratepayer? How confident is the estimate when dismantlement is 30 to 60 years away? How secure are the invested funds? Regulators must have confidence in the estimate and the funding. A major challenge in Ontario and elsewhere in the world is to find locations for the decommissioning waste. In North America, used fuel is under federal control and low/intermediate level waste is the responsibility of the licensees. What will the ultimate cost be to the licensee? Should the licensee depend on the market to deliver disposal options? All of these challenges need to be addressed and ultimately, will the stakeholder community accept the plans?

Bruno Thomauske spoke to the increase in the number of plants to be decommissioned in Europe in response to the events of Fukushima and specifically the phase out of Germany's nuclear plants by 2022. The number of plants to be decommissioned will be dependent on

political decisions and the electricity market situation. 19 Nuclear Power Plants (NPPs) were in operation in Germany in 2011. Five months after the Fukushima accident Germany shut down 8 NPPs and the plan is to consecutively shutdown 9 more NPPs through 2022. Professor Thomauske discussed three decommissioning strategies: immediate decontamination and dismantling, safe enclosure (Safestor), and entombment. The strategy selected may depend on a variety of factors of influence such as using expert knowledge of the still existing operational staff, cost or waste minimization, access to a repository for radioactive waste, cash flow, and limited resources to staff, contractors, or expert groups. The role of the staff and who should do the decommissioning work and the importance of incentivizing the staff was a major point of discussion during the presentation. Should the plant operators also do the decommissioning work? Are they experts in decommissioning and are they motivated to accelerate decommissioning or are they more concerned with job security and what happens to employment status after dismantlement? Or should dismantling be done by experts in D&D from external companies?

Claudio Pescatore shared statistics on the number of NPPs decommissioned by type and by country in 2013 from the IAEA. The majority of NPPs under decommissioning are PWRs and BWRs with the number of NPPs entering decommissioning between now and 2050 showing a sharp increase over time, especially for the PWR reactor type. Future NPPs decommissioning by region predicts the majority of decommissioning activities through 2029 will be in Europe and Russia, accounting for 101 of the 131 NPPs worldwide. Between 2030 and 2050 North America will see a sharp increase, rising from 16 of 131 total decommissioning projects in the 2020s, to 52 of 119 in the 2030s, and over half of the total in the 2040s. Options for decommissioning include deferred dismantling, partial dismantling, and placing into safe enclosure, which can be combined into different decommissioning strategies. Additional options include immediate dismantling and removal of all radioactive materials and in situ disposal, the encapsulation of radioactive materials and subsequent restriction of access. There are a variety of reasons for decommissioning, including the reactor technology or process becoming obsolete, becoming unprofitable, due to an operating incident, licensing changes, the economy, or political issues. Due to the large volume of NPPs estimated to be decommissioned in the future, a shortage of nuclear experts is expected worldwide. In Europe, the European Commission estimates that 40,000 nuclear experts will be hired by 2020, about 10,000 of which will be involved in decommissioning and waste management activities. In addition to the technical challenges involved in highly complex decommissioning projects requiring technical experience, there are also non-technical challenges to manage. Reiterating what the previous speakers highlighted, it is important to assure adequate funding when needed, to obtain the support of the local population and authorities, and to motivate workers and assure a good safety culture. The public is now showing more interest in decommissioning and is becoming a more active player, affecting decisions.