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Written submission from Evelyn Gigantes

Mémoire d' Evelyn Gigantes

In the Matter of the

À l'égard de

Ontario Power Generation Inc. - Darlington Waste Management Facility

Ontario Power Generation Inc. - Installation de gestion des déchets de Darlington

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Application to Renew the Class IB Waste Facility Operating Licence for Ontario Power Generation in Darlington, Ontario

Demande de renouvellement du permis d'installation de déchets de catégorie IB pour Ontario Power Generation à Darlington (Ontario)

Commission Public Hearing

Audience publique de la Commission

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Intervention in the consideration of licensing by the CNSC of the OPG application concerning the Darlington Waste Management Facility

by Evelyn Gigantes

The Darlington Nuclear Facility has been operating since the early 1990s and its waste is contained near the shore of Lake Ontario in four waste- container units. This licensing application proposes to more than double the size of the dry storage space on the site.

With refurbishment of the existing 4 Candu reactors, Darlington's operating license has been extended to 2055. During that time planning now underway foresees construction of at least one, or up to four, new Small Modular Nuclear Reactors on the Darlington site. Currently the choice for the first SMNR is the BWRX -300 design.

Much remains to be learnt about the attributes of SMNR waste. See this recent report from the Argonne National Laboratory.

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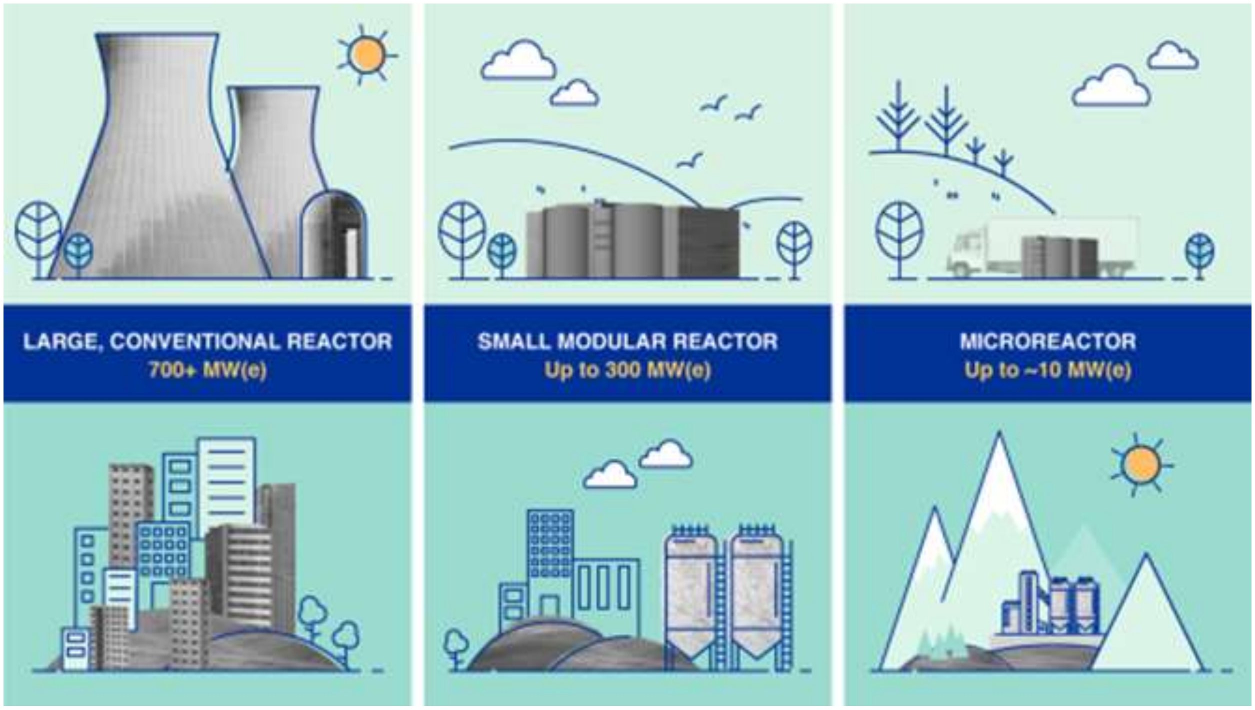
NOVEMBER 18, 2022
Study one of the first to address nuclear waste production of small modular reactors.



Small modular reactors have the capacity to provide more flexible energy generation, and they are roughly comparable proportionally in terms of nuclear waste compared to large light water reactors, a new Argonne report has found. (Image courtesy of the International Atomic Energy Agency.)

Nuclear energy is a key component of decarbonizing our economy, but large nuclear reactors are often complicated and expensive to build. To make nuclear energy more available and attractive, developers have put forward multiple designs of small modular reactors (SMRs) that have greater flexibility and offer lower up-front costs. Different types of SMRs with advanced reactor design features are currently under development in the United States and worldwide.

Researchers believe SMRs could be deployed at a variety of scales for locally distributed electricity generation. SMRs have approximately a tenth to a third of the power output of large light water reactors, which are the most common kind of nuclear reactor in commercial operation in the United States. The technologies and economics of SMRs have been widely studied; however, there is less information about their implications for nuclear waste. “We’ve really just begun to study the nuclear waste attributes of SMRs,” said senior nuclear engineer Taek Kyum Kim of the U.S. Department of Energy’s (DOE) Argonne National Laboratory.

Kim and his colleagues from Argonne and DOE’s Idaho National Laboratory have recently published a report that endeavors to measure the potential nuclear waste attributes of three different SMR technologies using metrics developed through an extensive process during a comprehensive assessment of nuclear fuel cycles published in 2014. Although SMRs are not yet in commercial operation, several companies have collaborated with the DOE to explore different possibilities for SMRs, and the three designs studied in the report are all scheduled to be constructed and operational by the end of the decade.

One type of SMR, called VOYGR and in development by NuScale Power, is based on a current conventional pressurized water reactor design but scaled down and modularized. Another type, called Natrium and being developed by TerraPower, is sodium-cooled and runs on a metallic fuel. A third type, called the Xe-100 and developed by X-energy, is cooled by helium gas.

In terms of nuclear waste, each reactor offers both advantages and disadvantages over large LWRs, Kim said. “It’s not correct to say that because these reactors are smaller they will have more problems proportionally with nuclear waste, just because they have more surface area compared to the core volume,” he said. “Each reactor has pluses and minuses that depend upon the discharge burnup, the uranium enrichment, the thermal efficiency and other reactor-specific design features.”

One notable factor that influences the amount of nuclear waste produced by a reactor is called burnup, and it refers to the amount of thermal energy produced from a certain quantity of fuel. The Natrium and Xe-100 reactors have significantly higher burnup than LWRs, Kim said. A higher burnup is correlated with lower nuclear waste production because fuel is converted more efficiently to energy. These designs also have higher thermal efficiency, which refers to how efficiently the heat produced by the reactor is converted into electricity. The VOYGR pressurized water reactor design, due in part to its small size, has a slightly lower burnup and thermal efficiency compared to a larger pressurized water reactor.

The spent fuel attributes vary somewhat between the designs, with VOYGR being similar to LWRs, Natrium producing a more concentrated waste with different long-lived isotopes, and Xe-100 producing a lower density but larger volume of spent fuel.

“All told, when it comes to nuclear waste, SMRs are roughly comparable with conventional pressurized water reactors, with potential benefits and weaknesses depending on which aspects you are trying to design for,” Kim said. “Overall, there appear to be no additional major challenges to the management of SMR nuclear wastes compared to the commercial-scale large LWR wastes.”

The funding for the research was provided by DOE’s Office of Nuclear Energy through the Systems Analysis and Integration Campaign.

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Interesting though this preliminary analysis is, it makes no mention of the super- dangerous radionuclides that would be produced in the case of SMNRs, like that now named as the choice for construction in New Brunswick on the Point Lepreau nuclear site, which will require fuel that has been pyro-processed. This re-processing of spent CANDU fuel will produce significant plutonium, which marks the beginning of an increase in the danger of radionuclide pollution and more intense security concerns.

It is worth noting that Canada's effort to define a new Nuclear Waste Management Policy is still floundering. If development of MNSRs actually proceeds in Ontario and New Brunswick, the learning curve about how best to manage the wastes generated by SMNRs and the re-processing of CANDU fuels for those MSNRs requiring high levels of radionuclides will likely generate even more quandaries.

Back to Darlington. There is significantly more waste that will be generated at the Darlington site, cooled in liquid for about 10 years, then transferred to a new type of dry containment.

It is worth noting that current emissions of tritium at the Darlington site are said by OPG and CNSC staff to come not from stored contaminated reactor waste, but from reactor operating emissions which air moisture deposits on the site. Given how close the Darlington reactors are to the shoreline of Lake Ontario, this undoubtedly means tritium contamination of the lake itself. There is growing concern among environmental observers that radionuclide contamination of the Great Lakes needs serious study and should be incorporated into the factors monitored and reported in the work of the International Joint Commission on the Great Lakes.

I do not support the refurbishment of old CANDU reactors because of their demand for cooling water from the Great Lakes, and I do not support the development of new, smaller reactors on the existing CANDU sites. These proposed SMNRs are not even subject to automatic environmental review under the new Impact Assessment Act, and they will eventually be a source of new types of radiological waste, increasing the problems we already face with how to manage such waste.

Many nuclear reactors have had their operations affected so far by changes in weather caused by climate change. This past summer France has had to shut down many reactors because the water intended to cool them has suffered significant temperature increases.

To me this seems good reason to delay approval of the current application for doubling (and more) the dry storage capacity of dry waste containment on the Darlington site. I think it is the moment in the nuclear history of this country to step back and determine that we want to halt our radionuclide losses and begin quickly to electrify energy sourcing by using intensive energy conservation programs, linking existing hydropower from one province to another, and rapidly developing renewable generation of electricity.

I believe it's time for Canada to accept the fact that, after decades of trying, no nuclear nation has an operational, long-term method of managing high-level nuclear waste in a satisfactory manner. Nuclear is not a magic solution for our energy needs, or those of other nations. Its' costs in money, pollution, construction time and security threats make it an unacceptable way to try and avoid additional climate change. Some nations may choose to arm themselves with nuclear weapons, but we should no longer accept that such a choice means nations like ours should expand nuclear energy production – to the contrary.

As a final note: it is annoyingly laughable that CNSC should contemplate a change of terminology for the onsite Darlington nuclear waste management facilities. Imagine how difficult it would be in future for a member of the public to find information about the "Nuclear Sustainability Services Darlington". I hope the Commission will not indulge in this attempt at deception.