

Rejuvenation of the Canadian Nuclear Laboratories Chalk River Campus

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The Canadian Nuclear Laboratories (CNL), formerly known as Atomic Energy of Canada Limited (AECL) prior to restructuring in 2015, is in the midst of major site rejuvenation activities. Much of the site's buildings and infrastructure was constructed or installed from the 1940s to the 1960s. As a result, many of the buildings and facilities as well as much of the infrastructure is near or at the end of its service life. The Government of Canada has made a significant investment into the Canadian Nuclear Laboratories to bring the site to modern standards and to expand on our existing research and commercial capabilities over a 10-year span. As a result, a number of capital initiatives are underway to make good on this investment.

These major activities include the decommissioning and demolition of a number of outdated or obsolete buildings and facilities, the refurbishment of some existing active laboratory facilities, and the construction of new, modern hot cells, active and inactive laboratories, administrative buildings, and infrastructure to allow CNL to continue with its existing commercial and research missions and to allow CNL to expand into new business and research opportunities that are currently limited by the physical constraints of the existing facilities.

In parallel with these large decommissioning, construction, and refurbishment projects are efforts to ensure that existing facilities remain safely operational until a smooth transition to the newer facilities is possible. There are also ongoing projects to pursue new opportunities outside of the standard CANDU-type work that makes up the majority of the work performed at the Canadian Nuclear Laboratories. This presentation will describe a number of these major activities which are underway, their current states of development, and their paths forward.

Site Rejuvenation Initiatives

Site Construction Projects. Currently there are a number of major capital projects underway at the site not directly related to new or refurbished laboratories and hot cells including, but not limited to, the following:

- 1) Construction of a new logistics building at the outer gate of the site to ease deliveries and reduce vehicular traffic on-site;
- 2) Construction of a new office building to consolidate office workers who are currently scattered across site with some in satellite offices located in the nearby town of Deep River;
- 3) Construction of a new conference centre to better allow for large presentations and conferences to be held on-site;
- 4) Construction of a new switch-yard and power house for bringing reliable services to the new and remaining facilities and buildings; and,
- 5) Separation of pedestrian and vehicular traffic pathways to improve industrial safety on-site.

Advanced Nuclear Materials Research Centre

One of the major facilities that will allow for this increased capability is the Advanced Nuclear Materials Research Centre. Currently, the CNL has multiple active laboratories and hot cell facilities that are in different buildings across the Controlled Area of the Chalk River Laboratories site. The ANMRC will consolidate these labs and hot cells into one common building which will increase efficiencies and reduce the number of shielded out-of-building transfers required.

Through the use of strategic functional adjacencies and in-building transfer systems, such as through-wall transfers between adjacent hot cells and transfers to other areas via pneumatic tube systems, active material transfers will require fewer external, shielded transfers which translates to better ALARA practices.

The larger size and layout of this new facility will allow a wider variety of shipping flasks to be handled and unloaded and a wider variety of fuels, such as full length LWR bundles, to be handled. The additional size, layout, and planned workflow of the new hot cells is also expected to significantly reduce the number of conflicts in the cells which will allow for more fluid scheduling and better schedule flexibility.

Hot Cells Bridging Project

With the ANMRC facility still in its conceptual design phase, it is not expected to be realized until the mid-2020s. As such, a bridging project was established to sustain the existing shielded facilities in the meantime. Extensive condition assessments were strategically conducted on the facility infrastructure, safety related systems, and critical processes. In total, 170 facility upgrades were identified in the two facilities. A risk-based methodology was used to assess and prioritize the upgrades, taking into consideration the condition, the consequence of failure, and the expected remaining life balanced with the time it will require to conduct the upgrades. A project plan was created to address the most critical jobs in a phased approach that can be adjusted as the conditions in the facility change. The first phase is well underway, and the second phase will be initiated in 2019.

Light Water Reactor Fuel PIE

In parallel to the aforementioned activities, a significant engineering effort is currently underway to allow both non-destructive and destructive PIE of full length LWR fuel elements to be performed in the existing hot cells at the Chalk River Laboratories as opposed to the normal ~500mm CANDU elements that these facilities were designed to handle. This work involves a number of custom designs, including a custom carriage containing a suite of NDE tooling which performs a number of operations simultaneously, modifications to our existing fission gas collection rig, and design of a new fuel cutting tool. Note that, since the hot cell being used for this activity is not dedicated to this work, all of the equipment is being designed for modularity and ease of installation, decontamination, and removal from the hot cell.

An existing flask that is to be modified is mated to the face of the cell to allow for the fuel to be translated through the NDE suite given the limited length of the hot cells that are available for performing this work.