NRU ^{99}Mo Production

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Canada

Agenda

- National Research Universal (NRU) Background
- ^{99}Mo Production Timeline
- ^{99}Mo Production Contingency
- Preparation for Contingency Period

Background: National Research Universal

- Located at Chalk River Laboratories, Ontario, Canada
- First critical November 3rd, 1957
- Heavy water moderated, heavy water cooled
- Full power rating at 135MWt
- Combined with neutron beam science and fuel development, NRU has contributed to six decades of isotope production enabling many millions of treatments and diagnostic procedures in over 80 countries
- More than ^{99}Mo, NRU also produces ^{125}I, ^{131}I, ^{60}Co, ^{192}Ir, ^{90}Y, and ^{133}Xe for commercial uses
- ^{99}Mo is HEU based, targets are manufactured at Chalk River based on imported HEU

Timeline: National Research Universal

- 2010: Canada put in place a long-term strategy for the security of supply of ^{99}Mo
  - NRU will cease production of ^{99}Mo in October 2016, move away from Government involvement in ^{99}Mo production, not use HEU, develop more resilient diversified supply chain
  - $35M invested over two years to support research, development and demonstration of non-reactor based technology
- 2012: Canada invested further $25M to advance non-reactor based technology
- 2015: Canada announced contingency to supply ^{99}Mo from NRU after October 2016 until permanent shutdown of NRU in March 2018
- 2015: restructuring of AECL was completed, Government-owned, Contractor-operated (GoCo) model implemented
  - Canadian Nuclear Laboratories (CNL) operates NRU, including ^{99}Mo production
  - Planning for NRU stand-by capability and permanent shutdown are contract requirements

Timeline: National Research Universal

Going forward:

- End routine production of ^{99}Mo October 31, 2016
- Establish and maintain stand-by ^{99}Mo capability between November 01, 2016 and March 31, 2018
- Continue other operations including neutron beam research, non ^{99}Mo isotope production, and operating of experimental fuel loop until March 31, 2018
- Permanent shutdown of NRU reactor March 31, 2018

The NRU Contingency

- 2015: Canada announced extension of the NRU operations until March 31, 2018, availability of NRU to supply ^{99}Mo after October 2016:
  - **only** in the unexpected circumstance of a significant shortage of extended duration
  - **only** if alternative technologies or other sources of supply are not available
- A decision on the NRU contingency will be based on several factors, including:
  i. the degree of the global shortage
  ii. the availability of current producers, alternative technologies, or other sources of supply to compensate during that period
  iii. mitigation strategies
- If these conditions are met, the NRU Contingency is subject to:
  - the availability of highly enriched uranium (HEU) targets
  - necessary licences from the regulator for CNL to produce ^{99}Mo
  - availability of processing capability and capacity at CNL and Nordion
- The NRU Contingency is not to be considered outage reserve capacity (ORC), and is not meant to hinder or prevent the market entry of alternative sources of supply on a sound commercial basis

Communications protocols

- Canada is committed to actively engaging with major national and international stakeholders that have data relevant to potential and actual supply disruptions
- Canada recognizes that a decision on whether to enact the NRU Contingency would need to be taken very swiftly
- Clear and well-understood communications protocols will be important to ensure rapid information sharing among stakeholders
- Three communications protocols will be established:
  1. Canada and the Emergency Response Team / Association of Imaging Producers & Equipment Supplies – with HLG-MR Secretariat involvement
  2. Health Canada, Natural Resources Canada, CNL, AECL and Nordion
  3. Canadian federal, provincial and territorial governments, professional associations, and private sector actors

Clarification: AECL and CNL roles

- The restructuring of AECL was completed in Summer 2015 with the implementation of a Government-owned, Contractor-operated (GoCo) model.
- From the perspective of the production of ^{99}Mo, the roles are as follows:
  - CNL:
    - Responsible for the management and operation of the Nuclear Laboratories, including the NRU, and all other facilities;
    - Carries on all aspects of the ^{99}Mo business including: production from the NRU, initial processing in the Molybdenum Processing Facility (MPF), and sale of product to Nordion; and
    - Holds the regulatory licences.
  - AECL:
    - Remains a government entity and owner of the Chalk River site, and all assets and facilities, including the NRU and the MPF;
    - Oversees the GoCo contractual relationship to achieve value for money in the services that CNL provides to Government on a contractual basis;
    - Has responsibility for HEU; and
    - Provides instruction to CNL to produce ^{99}Mo should the Government decide to call on the backup supply

AECL and CNL preparations

Licensing

- CNL has received an extension of the Chalk River Laboratories Site Licence (which includes NRU and MPF) from the Canadian Nuclear Safety Commission, the Canadian regulator; the licence runs to March 31, 2018, to coincide with end of NRU operation.

Human resources and staffing

- CNL staff retention is being addressed and plans to retain and maintain capabilities are underway for the standby period.

Maintenance

- CNL maintenance for NRU and MPF will continue during the standby period.

Transfer Arrangements

- All arrangements are in place between CNL and Nordion for maintaining the supply capability.

AECL and CNL preparations, continued…

HEU

- CNL has planned for targets and raw material to support an emergency ‘call for production’ from the Government of Canada.
- Canada has been engaging with the U.S. in preparation for the contingency period, and together are committed to an effective backup supply.
- AECL follows the established HEU export license application process of the U.S. Nuclear Regulatory Commission, and will continue to follow the established export license processes so long as there remains a need for HEU for isotope production from the NRU.
- AECL is working to mitigate all risks associated with the implementation of the Contingency, including the availability of targets.

Summary – Key Points

- The schedule for NRU operation is defined
- ^{99}Mo production contingency can be made available under defined and specific conditions until March 31, 2018
- Detailed planning for the contingency period is in place

Thank you.

Questions or Comments?

Annex: GoCo Model Structure