Exelon – Westinghouse Pre-Application Meeting

License Amendment Request to Modify Byron Station Facility Operating License In Support of the Molybdenum-99 Isotope Production Project

December 5, 2016

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Agenda

- Introductions
- Objective of the Meeting
- Need for the Change
- Production of Molybdenum-99
- Impact Evaluation
- Proposed License Amendment Request
- Submittal Schedule
- Summary and Conclusions
- Open Discussion

Objective of the Meeting

- Discussion of a proposed License Amendment Request that will allow the production, harvesting, and shipping of Molybdenum-99 (Mo-99) in the form of irradiated Molybdenum-98 targets from the Byron, Units 1 and 2, reactors.

Need for the Change

- Technetium-99m (Tc-99m) is the most widely used diagnostic medical isotope.
- The majority of the Tc-99m used in North America was produced from Mo-99 generated in the Chalk River NRU reactors in Canada.
- The Chalk River Mo-99 Production Facility (MPF) ceased operation on October 31, 2016, and all operation of the NRU reactors will be shutting down in March 2018.
- A major shortage of Tc-99m is in effect.
- A method is being developed to allow medical quality Tc-99m to be safely obtained from Mo-98 irradiated in vintage Westinghouse-style commercial reactors.

Production of Molybdenum-99

- The objective of this project is to produce Mo-99 by the neutron irradiation of Molybdenum, enriched in Mo-98 content, in a commercial PWR reactor core.
- The Movable Incore Detector Systems (MIDS) will be modified to allow production and harvesting of large batches of Mo-99 during normal plant operations.

Production of Molybdenum-99

- Mo-98 targets will be inserted into fuel assembly instrument thimbles by the MIDS fission chamber drives and remain inserted in the core for approximately seven Effective Full Power Days (EFPD).
- The Mo-98 targets are then withdrawn and placed in a licensed MIDUS Type B transportation container positioned near the MIDS equipment inside the Containment Building.
- The MIDUS Type B transportation container will be shipped to a near-by off-site licensed processing center working with or owned by NorthStar Medical Radioisotopes.

Production of Molybdenum-99

- The insertion and withdrawal of the Mo-98 targets is remotely controlled using the MIDS drive controls.
- Tubing will be added to the MIDS to allow the routing of the irradiated Mo-99 targets into a MIDUS Type B transportation container located near the MIDS hardware in the Containment Building.
- The MIDUS Type B transportation container will be sealed and taken out of the Containment through the Primary Airlock.
- The MIDUS container will then be shipped to the NorthStar processing facility in nearby Beloit, Wisconsin.

Production of Molybdenum-99

- The only required modifications to the existing MIDS will be as follows:
  - The installation of a guide tube from a spare 10-path Drive location to the location of the Transfer Cask in the Containment.
  - Replacing the existing fission chamber drive cable on the MIDS Drive corresponding to the selected 10-path Drive location with a cable assembly that allows targets containing Mo-98 to be attached and detached at the MIDUS Type B Transfer Cask loading point.
- A method for periodically transferring the heavy MIDUS Type B transportation container in and out of the Containment Building will also be developed.

Production of Molybdenum-99

- A Proof of Concept demonstration that will irradiate three small batches of Mo-98 will be performed to demonstrate that the production process can be done safely and that the Tc-99m product generated from the Mo-99 produced meets FDA requirements.

Impact Evaluation

- No Technical Specification changes are required.
- The Chapter 6 and 15 safety analyses are not impacted.
- No changes to the fuel assembly design are required.
- There is minimal impact on plant operations.
- A License Amendment Request (LAR) is required to revise the Byron Facility Operating Licenses, Units 1 and 2, in accordance with 10 CFR Part 30 to allow for the production and transfer of Mo-99.

Proposed License Amendment Request

- Condition 2.B.(5) of the current Operating Licenses for Byron, Units 1 and 2, will be revised to state:

  Pursuant to the Act and 10 CFR Parts 30, 40 and 70, to possess, but not separate, such byproduct and special nuclear materials as may be produced by the operation of the facility. Mechanical disassembly of the fuel assembly instrument thimbles containing Molybdenum-99 is not considered separation.

- The LAR will add the following Condition to the Operating Licenses for Byron, Units 1 and 2:

  Pursuant to the Act and 10 CFR Parts 30, to intentionally produce, possess, receive, transfer, and use Molybdenum-99.

Submittal Schedule

- Exelon plans to submit an LAR to revise the Operating Licenses for Byron, Units 1 and 2, in December 2016.
- EGC will request NRC approval by May 2017.

Summary and Conclusions

- There is a shortage of Tc-99m in North America when the Chalk River reactor in Canada stopped producing Mo-99.
- The MIDS at the Byron units can be modified to produce batches of Mo-99 by the neutron irradiation of Molybdenum, enriched in Mo-98 content, during normal plant operations without the need to modify fuel assemblies.
- The Mo-99 produced will be shipped using licensed transportation containers to a near-by off-site licensed processing center working with or owned by NorthStar Medical Radioisotopes.

Summary and Conclusions

- No Technical Specification changes are required.
- The Chapter 6 and 15 safety analyses are not impacted.
- No changes to the fuel assembly design are required.
- There is minimal impact on plant operations.

Open Discussion

- Questions/Comments