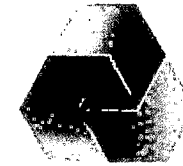




**Global Nuclear Fuel**

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FUEL COMPANY

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# 10CFR50.46 Exemption Request Pre-Submittal Meeting

## E110opt Cladding Material

March 6, 2017



**Exelon** Generation.

# Meeting Purpose

The objectives of this meeting are to:

- Provide a high-level overview of the E110opt cladding alloy
- Present information that demonstrates the safe, reliable performance of E110opt cladding
- Explain the approach used for the proposed Exemption Request, including a summary of the contents
- Obtain NRC feedback on the proposed Exemption Request to identify potential technical and regulatory issues that warrant additional discussion



# Meeting Agenda

- TVS-K Lead Test Assembly Project Overview
- E110opt Cladding Material: Evolution, Composition
- E110opt Operating Experience (Light Water Reactors)
  - Corrosion
  - Hydrogen Pick-up Performance
- Material Properties Highlights
  - High Temperature Oxidation Behavior
  - Irradiation Growth
  - Creep
- Summary and Comparison of E110opt Performance to other LWR Cladding
- 10 CFR 50.46 Exemption Request Approach
  - Proposed Contents
- Concluding Remarks

# Project Overview

- Exelon seeks NRC approval of a 10CFR50.46 Exemption Request to permit Braidwood Station Unit 1 to load up to eight TVS-K LTAs in the reactor core for operation in Cycles 22, 23, and 24 for evaluation (Unit 1 Cycle 22 starts in Fall 2019)
  - Exemption to be submitted by July 2017
  - Exemption will be for Braidwood Station Units 1 and 2
    - Flexibility to load either unit is requested to support potential first cycle Post Irradiation Exam and transfer to opposite unit
- TVEL fuel is currently used in non-US pressurized water reactors;
  - TVS-K LTA alloy does not conform to the specifications for either Zircaloy or ZIRLO™
  - Exemptions from the requirements of 10 CFR 50.46 and 10 CFR Part 50, Appendix K are required to support the use of the TVS-K fuel assemblies
- The LTA program is a joint initiative among Exelon, GNF-A and TVEL

# Exemption Request Proposed Content

- I Specific Exemption Request (i.e., Exemption Request Description)
- II Basis for Exemption Request
  - II.1 Exemption Justification Technical Overview
  - II.2 E110opt Cladding Characteristics and Properties
  - II.3 E110opt Metallurgical Characteristics
    - II.3.1 E110opt Composition
    - II.3.2 Material Processing
    - II.3.3 Basic Metallurgical Characteristics
  - II.4 Material Properties Assessment
    - II.4.1 Physical Properties
    - II.4.2 Thermal Properties
    - II.4.3 Tensile / Stress-Strain Properties
    - II.4.4 Creep and Fatigue Properties
    - II.4.5 Irradiation Growth
    - II.4.6 High Temperature Behavior
  - II.5 Justification for Exemption
- III Environmental Assessment
- IV Conclusion
- V References

## Concluding Remarks

- Cladding using E110opt alloy have similar or superior performance relative to other commercial PWR fuel cladding used in the U.S.
  - No breakaway oxidation and better PQD performance address concerns raised in research supporting 50.46c
- An exemption from 50.46 is sought to insert TVEL LTAs.
- The 50.46 Exemption Request will provide necessary information to support LTA insertion, as permitted by the Braidwood Station Technical Specifications.
  - Submittal planned for July 2017
  - NRC approval requested by July 2018

# THANK YOU FOR YOUR ATTENTION

**GNF**

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