ENCLOSURE 2

M190073

1Q19 GNF ATF Quarterly Meeting Presentation

Non-Proprietary Information

IMPORTANT NOTICE

This is a non-proprietary version of Enclosure 1, from which the proprietary information has been removed. Portions of the enclosure that have been removed are indicated by an open and closed bracket as shown here [[ ]].

Non-Proprietary Information

Global Nuclear Fuel

1Q19 GNF/NRC ATF Workshop

February 27, 2019

Agenda

Time		Topic	Who
2:00	15	Public: Introductions and Opening Remarks	Halac
2:15	10	Public: NRC Public Update on ATF	Proffitt
2:25	5	Public: Opportunity for Public Comment	Public
2:30	45	Irradiated Data Testing	Connor / Lin
3:15	30	Thermal / Mechanical Testing and Uncertainties	Cantonwine
3:45	20	LOCA-Related ARMOR Data & Analysis	Bolger / Lin
4:05	10	IronClad PIRT	Bolger / Halac
4:15	15	Severe Accident Plans	Bolger
4:30	20	Full Scale Tube Production Readiness	DeSilva
4:50	10	Transportation and Storage Plans	Halac
5:00	15	Public: Closing Summary and Comment	Proffitt

Introductions

Workshop Agenda Objectives

Workshop Outlook

- Informal Discussions
  - Non-binding information exchange
  - Results shared in an open/candid forum
  - Recommendations welcomed
  - Understanding that shared information is specific to ARMOR and is Confidential GNF-A Intellectual Property
- Primary Scope: Requirements to license new cladding/coating technologies in reload quantities
- Content/Agenda (Determined by mutual agreement)
  - Provide additional information on questions identified from previous meeting
  - Furnish focused project updates on aspects of interest

NRC Public Update on ATF

Public Comment

Data Testing

Irradiated and Non-Irradiated

[[

]]

Data Testing Summary

[[

]]

Non-Proprietary Information

ARMOR Unirradiated Testing Schedule

[[

]]

Materials Testing Update

[[

]]

ARMOR Irradiation and Testing Schedule

[[

]]

Hatch LTAs

[[

]]

[[

]]

[[

]]

Oak Ridge National Laboratory (ORNL) HFIR Irradiation Plan

[[

]]

[[

]]

[[

]]

[[

]]

Idaho National Laboratory (INL) Advanced Test Reactor (ATR)

Advanced Test Reactor

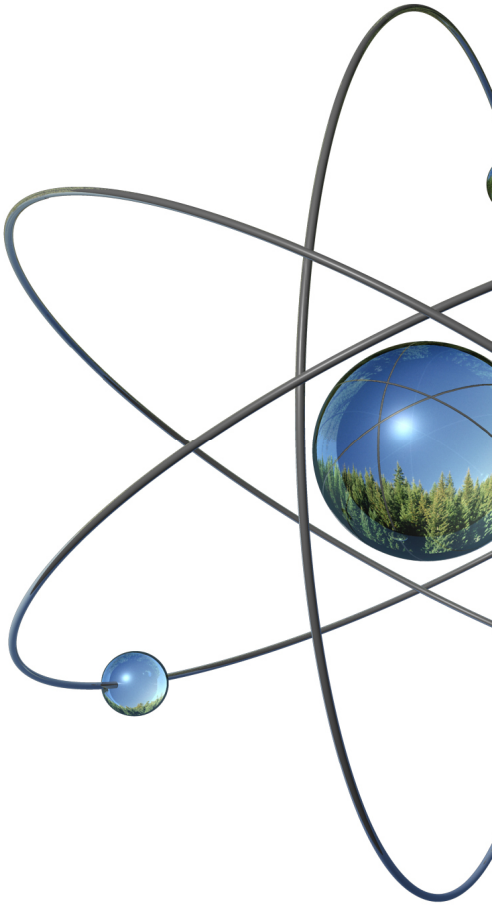
[[

]]

Thermal / Mechanical Testing

Uncertainties

ARMOR – TM Strategy (Debris Resistance Only)



Paul Cantonwine
Fuel Performance and Design

Summary

[[

]]

Thermal-Mechanical Analysis Methodology

[[

]]

[[

]]

[[

]]

Current Treatment of Oxide in PRIME

[[

]]

[[

]]

Bounding Scenarios of ARMOR Performance

[[

]]

Treatment of ARMOR in PRIME

[[

]]

Testing Needed to Support TM Evaluations

[[

]]

LOCA-Related ARMOR Data & Analysis

LOCA-Related ARMOR Summary

[[

]]

ARMOR ECCS/LOCA Licensing Plan

[[

]]

Non-Proprietary Information

ARMOR ECCS/LOCA Licensing Plan

[[

]]

[[

]]

[[

]]

[[

]]

[[

]]

[[

]]

LOCA-Related ARMOR Summary

[[

]]

- NRC feedback on approach

IronClad PIRT – GNF Perspective

IronClad PIRT

- PIRT is the NRC tool for addressing future ATF changes.
  - Current ATF PIRT of Coated Clad at PNNL in April
  - Future ATF PIRT on Severe Accidents, Non-Zirc Clad, etc.
- GNF is doing expert Design Reviews of IronClad.
- GNF will spectate on NRC-sponsored ATF PIRT panels.
- GNF will provide IronClad feedback on non-Zirc clad PIRT.
- GNF will address PIRT explicitly via IronClad LTR.

Severe Accident Plans

[[

]]

Severe Accident Progression – FeCrAl Example

From ORNL/TM-2016/237: Severe Accident Analysis of BWR Core Fueled with UO_2/FeCrAl with Updated Materials and Melt Properties from Experiments

Scenario 2 LTSBO Injection Lost at 8 hour, Unmitigated – Impact of FeCrAl

- Initial generation of hydrogen extended 69 minutes (740 to 809 minutes)
- 100 kg of hydrogen generated extended 188 minutes (791 to 979 minutes)
- First cladding metal melting extended 177 minutes (827 to 1004 minutes)
- First cladding collapse extended 177-208 minutes (827 to 1004-1035 minutes)
- Noble Gas release fraction from fuel (approximate values)
  - Time of 10% release: from 14 hours to 17 hours
  - Max % release: from 99% to 95%
  - Time to max % release: from 17 hours to 22 hours
- Mass of hydrogen gas generated by 32 hours decreased (2911 to 2156-2372 kg)
- Mass of CO gas generated by 32 hours decreased (18,488 to 6397-7260 kg)

Full Scale Tube Production Readiness

Production Readiness

[[

]]

[[

]]

[[

]]

[[

]]

[[

]]

Transportation and Storage Plans

ARMOR / IronClad Transport

- Shipping **Non-Irradiated IronClad**: RAJ-II Letter Authorization Request
  - June 21, 2017: GNF RAJ-II Letter Authorization Pre-Application Meeting [ML17193A169]
  - July 28, 2017: GNF submits initial RAJ-II Letter Authorization Supplement Report [ML17212A177]
  - October 19, 2018: GNF submits a revised version of the RAJ-II Letter Authorization [ML18292A606]
  - February 6, 2019: NRC approval of the RAJ-II Letter Authorization for IronClad [ML19036A737]
  - Approved for 17 shipments through December 2021
  - No more than 4 IronClad LTAs per truck (2 LTAs per RAJ-II container)

[[

]]

- Shipping **Non-Irradiated ARMOR**: RAJ-II Certificate of Compliance (CoC)
  - ARMOR is covered by the RAJ-II CoC [ML19025A105]

[[ ]]

ARMOR / IronClad Transport

- Shipping **Irradiated IronClad** / **ARMOR**: GE Model No. 2000 (GE2000)
  - November 29, 2018: Closed meeting between GEH and NRC to discuss shipments of irradiated fuel
  - December 17, 2018: GEH and NRC meeting to discuss the ATF program and shipments of irradiated fuel rods in the GE2000 [ML18346A021]
  - February 5, 2019: GEH and NRC meeting to discuss the technical approach for the GE2000 Safety Analysis Report (SAR) Amendment to support the ATF program [ML19025A013].
  - March 11, 2019: Scheduled follow-up meeting between GEH and NRC to discuss the GE2000 SAR [ML19053A589]

[[

]]

ARMOR / IronClad Storage

- Storage of **Irradiated IronClad / ARMOR**
  - Storage of irradiated fuel is typically site specific

[[

]]

Summary & Next Steps

Summary

- Thermal / Mechanical Testing and Uncertainties
- Irradiated Data Testing
- LOCA-Related ARMOR Data & Analysis
- IronClad PIRT
- Severe Accident Plans
- Full Scale Tube Production Readiness
- Transportation and Storage Plans

Non-Proprietary Information

Global Nuclear Fuel