Accident Tolerant Fuel Overview

EPRI-DOE ATF WS
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Near-Term ATF Technologies

Coated Cladding
- A thin chromium-based layer is applied to the cladding outer diameter
- NRR staff have issued Interim Staff Guidance ATF-ISG-2020-01 to support reviews
- Currently awaiting topical reports

Doped Pellets
- UO₂ pellets contain small amounts of added materials that improve performance through larger grain sizes
- Already approved for BWRs. Two fuel vendors have submitted TRs for PWRs.
- No foreseen licensing challenges

FeCrAl Cladding
- Iron-Chromium-Aluminum based alloy fuel cladding.
- Commercialization is a few years away
Longer Term ATF Technologies

- **High Density (Uranium Nitride) Pellets**
  - Fuel made of Uranium Nitride instead of Uranium Dioxide

- **Silicon Carbide Cladding**
  - Ceramic composite-woven fibers around a monolithic tube

- **Extruded Metallic Fuel**
  - Extruded metallic bar composed of a Zirconium-Uranium matrix within a zirconium alloy cladding
Increased Enrichment and Higher Burnup

**Higher Burnup**
- Current limit ~ 62 gigawatt days per (GWd/MTU) rod-average burnup – Not a regulatory limit
- Industry goal to reach 75 to 80 GWd/MTU

**Increased Enrichment**
- Enrichment currently limited to 5 weight percent $^{235}$U.
- Industry goal up to 10 weight percent $^{235}$U
We make SAFE use of nuclear technology POSSIBLE.

NRC ATF Project Plan

Industry

- Development of technical bases
- Data and technical information sharing
- Phenomena identification and ranking exercise

Frequent communication and engagement throughout

NRC

- Potential changes to regulatory infrastructure
- Code development
- Staff education
- Licensing review

We make SAFE use of nuclear technology POSSIBLE.
## Recent NRC Actions

<table>
<thead>
<tr>
<th>Action</th>
<th>Description</th>
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<tbody>
<tr>
<td>SECY-21-0109: “Rulemaking Plan on Use of Increased Enrichment of Conventional and Accident Tolerant Fuel Designs for Light-Water Reactors”</td>
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<td>Research Information Letter 2021-13, “Interpretation of Research on Fuel Fragmentation, Relocation, and Dispersal at High Burnup”</td>
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<td>ATF Project Plan, Version 1.2</td>
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<td>Communication to industry: “Scheduling Expectations Regarding the Licensing of Accident Tolerant, Increased Enrichment, and Higher Burnup Fuels”</td>
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<td>Numerous workshops and stakeholder engagement throughout last year</td>
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NRC Activities Timeline

- **DAHER IE Transportation Package**
- **Westinghouse Traveller Type B**
- **Framatome Doped Pellets**
- **WEC ADOPT Doped Pellets**
- **WEC HBU to 68 GWD/MTU**
- **Framatome Increased Enrichment**

**TODAY**

- 

**2022**

- **MAP-12/13 CoC**
- **Schedule Expectations Letter**
- **RIC Session**

**2023**

- **HBU Workshop III**

**Additional HBU, IE, and Coated Cladding TRs**

**Increased Enrichment Rulemaking**

- **Severe Accident PIRT**
- **Project Plan V1.2**

**NRR Reviews**
**NMSS Reviews**
**Other Activities**
**Meetings**
ATF Website

- [www.nrc.gov/reactors/atf.html](http://www.nrc.gov/reactors/atf.html)

- Routine updates to lists of ATF-related:
  - Licensing actions
  - Documents
  - Public meetings
If you have additional questions or comments, please contact:

Accident_Tolerant_Fuel@nrc.gov