

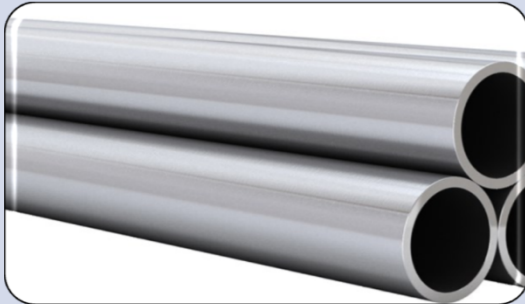
# Accident Tolerant Fuel Overview

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

- $\text{UO}_2$  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

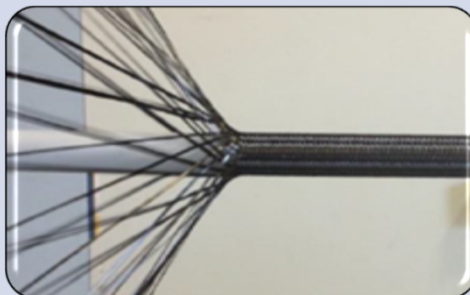
- Iron-Chromium-Aluminum based alloy fuel cladding.
- Commercialization is a few years away

# Longer Term ATF Technologies



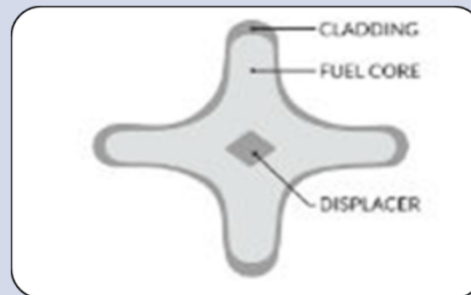
## High Density (Uranium Nitride) Pellets

- 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

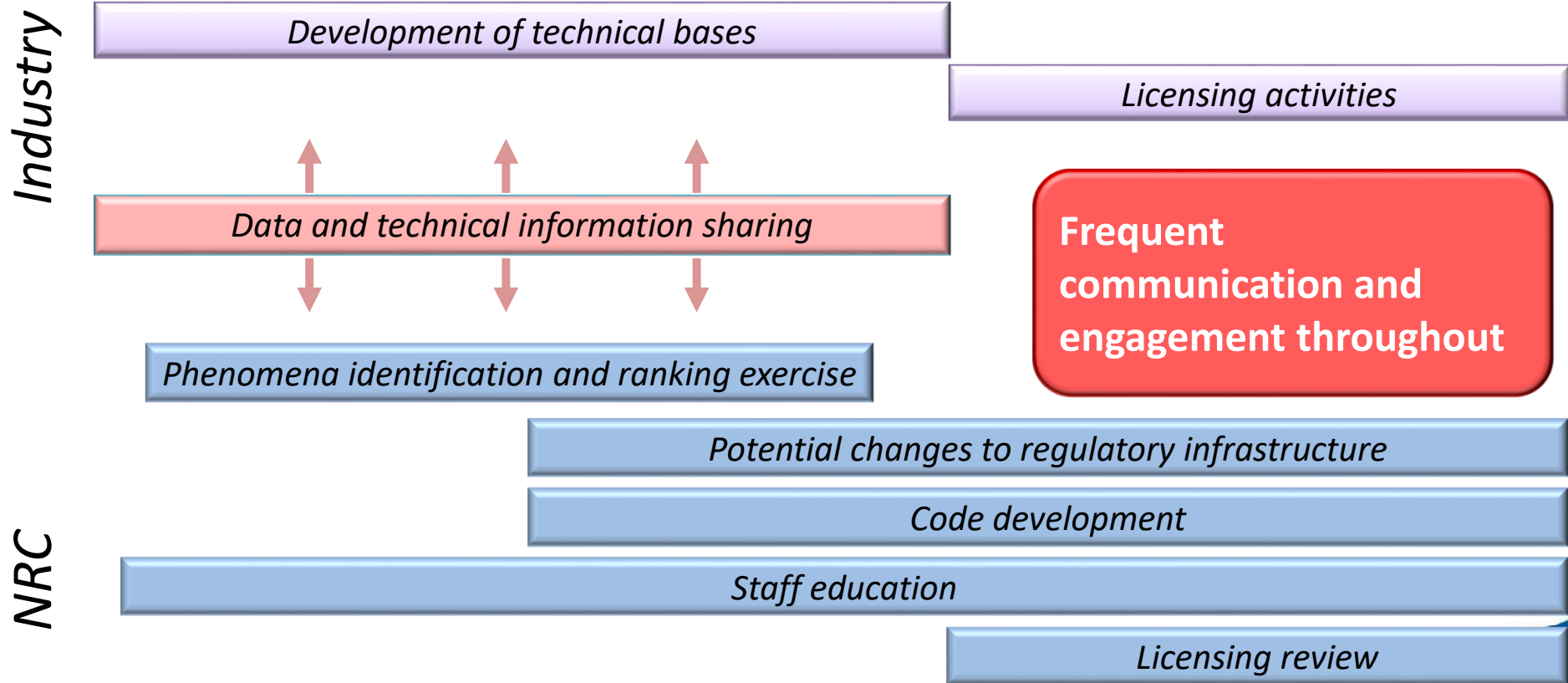
## Higher Burnup

- 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  $^{235}\text{U}$ .
- Industry goal up to 10 weight percent  $^{235}\text{U}$

# NRC ATF Project Plan



# Recent NRC Actions

SECY-21-0109: “Rulemaking Plan on Use of Increased Enrichment of Conventional and Accident Tolerant Fuel Designs for Light-Water Reactors”

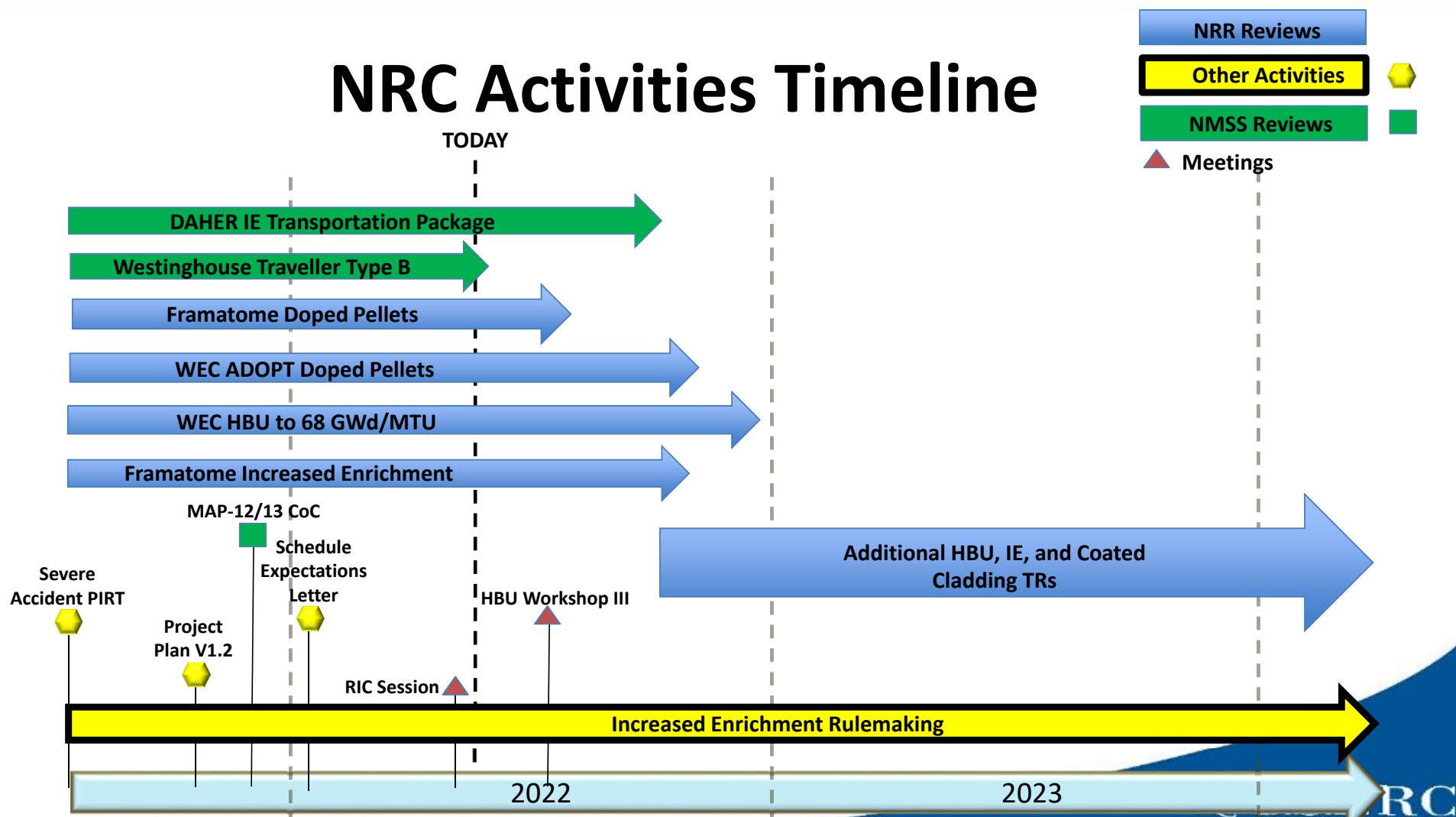
ATF Project Plan, Version 1.2

Research Information Letter 2021-13, “Interpretation of Research on Fuel Fragmentation, Relocation, and Dispersal at High Burnup”

Communication to industry: “Scheduling Expectations Regarding the Licensing of Accident Tolerant, Increased Enrichment, and Higher Burnup Fuels”

Numerous workshops and stakeholder engagement throughout last year

# NRC Activities Timeline



# 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



The screenshot shows the 'Accident Tolerant Fuel Regulatory Activities' page. At the top is a blue header with the title. Below it is a navigation bar with links: 'Stay Connected', 'FAQs', 'Additional Topics', and 'References'. A dark blue section titled 'What is Accident Tolerant Fuel?' contains text explaining that ATF are new technologies to enhance safety. It mentions the NEIMA act signed in 2019 and lists two key points: (1) making reactors more resistant to incidents and (2) lowering electricity costs. Below this are two columns: 'Why the Interest Now?' and 'What is the NRC's Role?'. The 'Origins' section features a play button icon. The 'Accident Tolerant Fuel Technologies' section at the bottom has three images: a reactor core, fuel rods, and a close-up of fuel elements.

Accident Tolerant Fuel Regulatory Activities

Stay Connected ▼ FAQs Additional Topics ▼ References ▼

**What is Accident Tolerant Fuel?**

Accident tolerant fuels (ATF) are a set of new technologies that have the potential to enhance safety at U.S. nuclear power plants by offering better performance during normal operation, transient conditions, and accident scenarios.

On January 14, 2019, the President signed the Nuclear Energy Innovation and Modernization Act (NEIMA). NEIMA, Section 107, "Commission Report On Accident Tolerant Fuel," which provides a definition of ATF as a new technology that:

(1) makes an existing commercial nuclear reactor more resistant to a nuclear incident (as defined in section 11 of the Atomic Energy Act of 1954 (42 U.S.C. 2014)); and

(2) lowers the cost of electricity over the licensed lifetime of an existing commercial nuclear reactor.

**Why the Interest Now?**

**What is the NRC's Role?**

The NRC's role with ATF is to review the new fuel technologies and their associated enrichment, fabrication, transportation, and storage aspects to ensure that they maintain public health and safety when implemented by NRC licensees.

The NRC reviews the technologies against all applicable guidance, available data, and past precedent applications to determine if the new fuel design continues to meet the NRC's regulations.

Is the NRC ready for applications?

**Accident Tolerant Fuel Technologies**

We make SAFE use of nuclear technology POSSIBLE.



**If you have additional questions or  
comments, please contact:**

**[Accident\\_Tolerant\\_Fuel@nrc.gov](mailto:Accident_Tolerant_Fuel@nrc.gov)**