

EPRI's Accident Tolerant Fuel Research

Collaboration in Innovation

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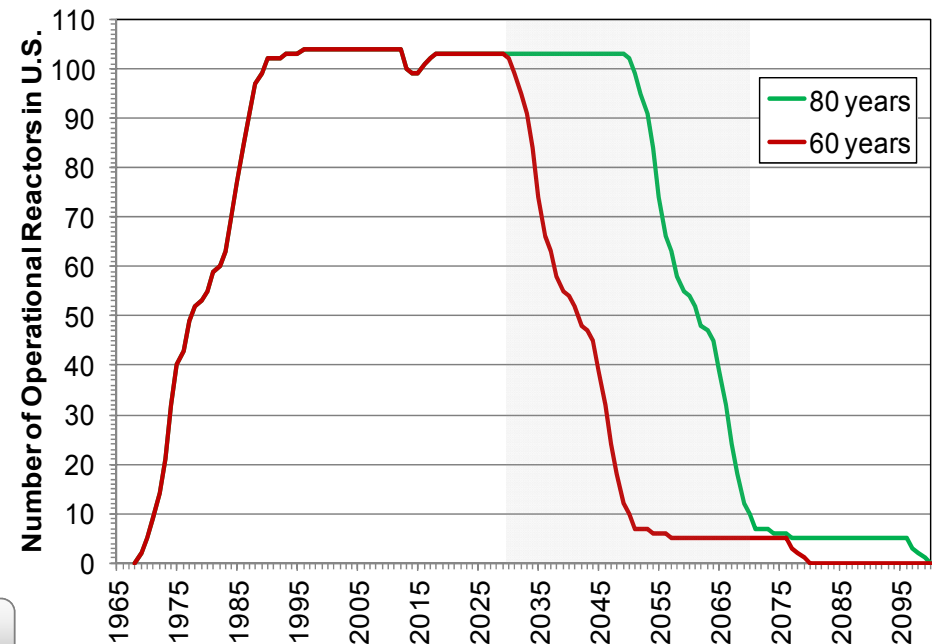


Need for Accelerated ATF Path Forward

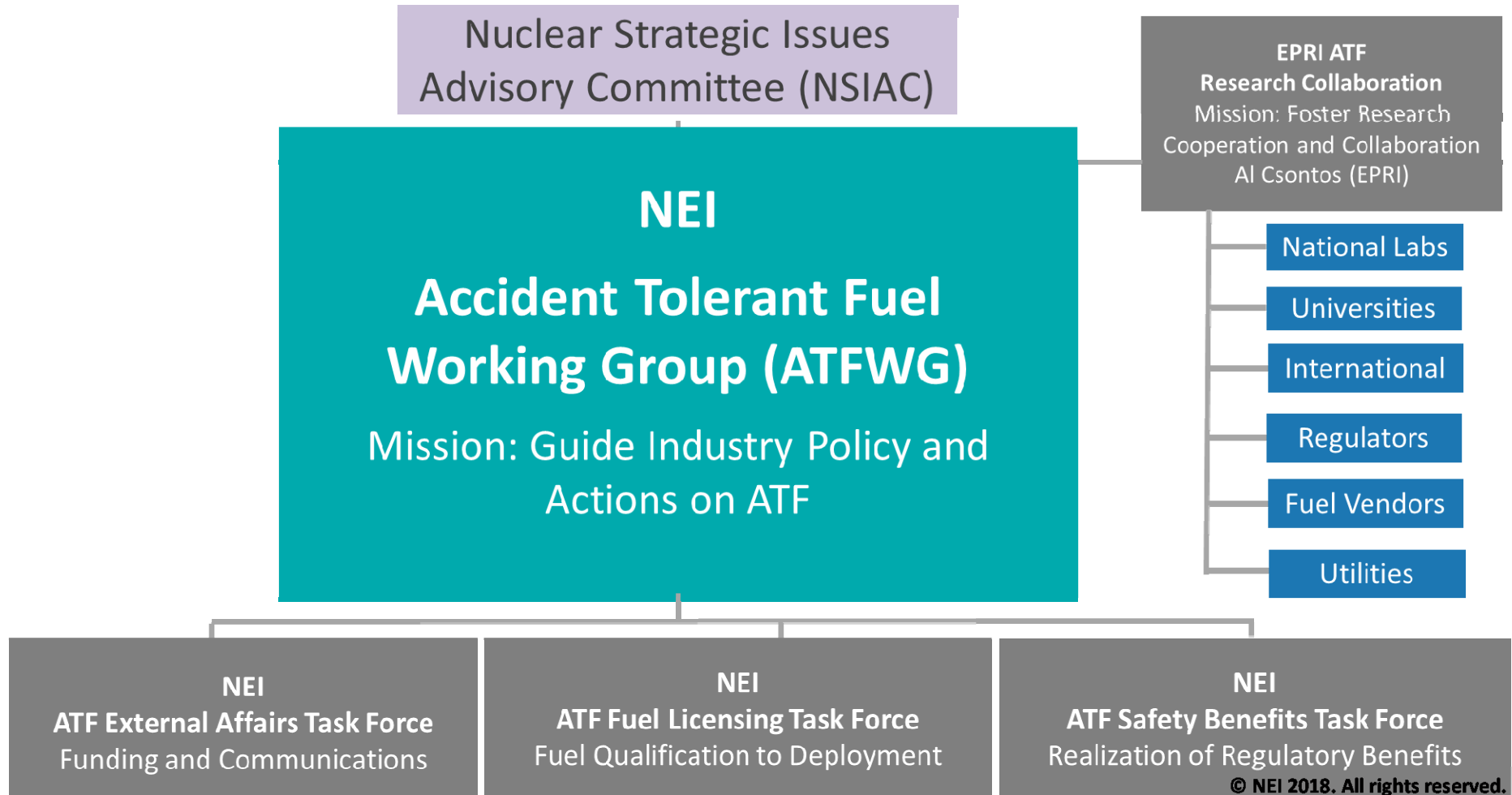
- Challenge: traditionally long fuel design to deployment timeframes
- Limited window of opportunity:
 - Existing fuel testing facilities
 - Abundant R&D programs
 - Limited economic viability for ATF benefits to the existing fleet
- Industry committed to support ATF reloads into commercial reactors by early to mid-2020s

Accelerating ATF is a Heavy Lift

Projected operating life for Domestic LWR fleet

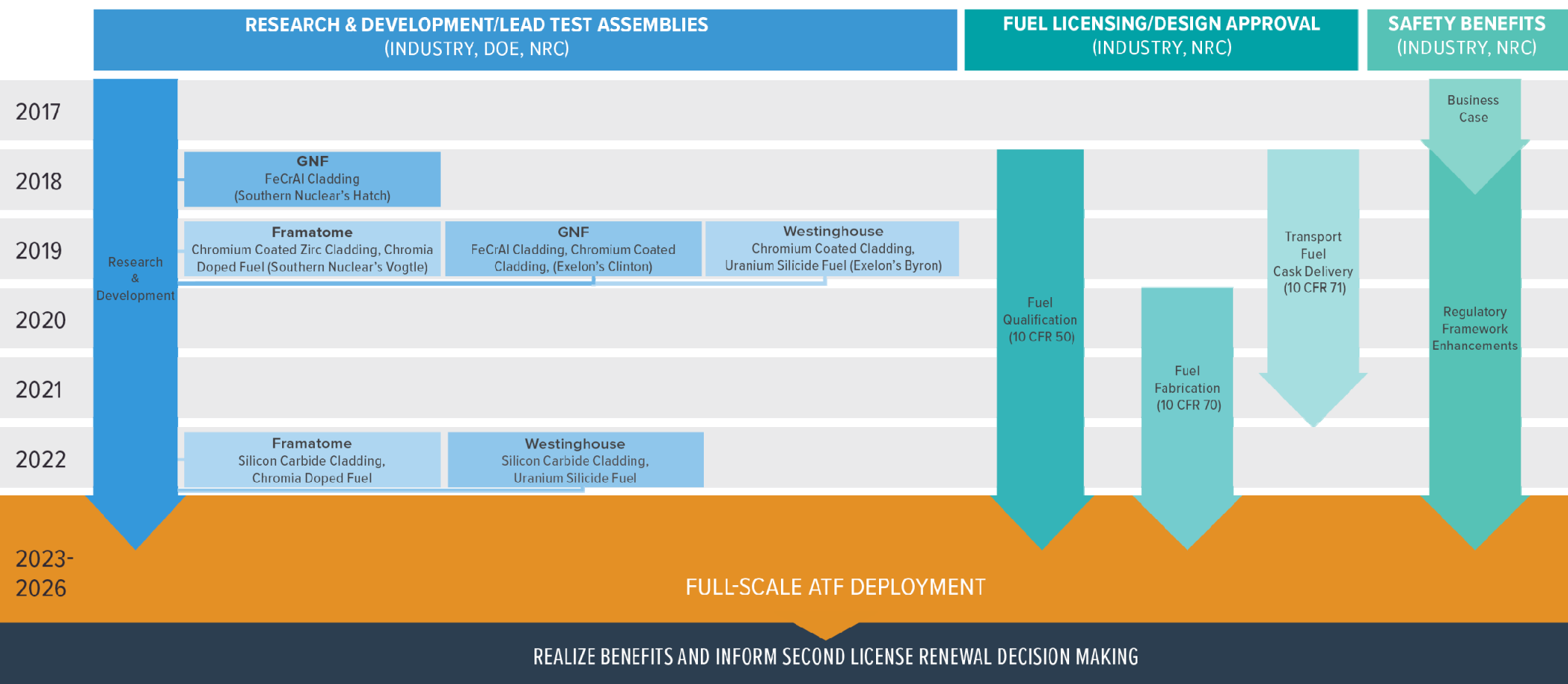


U.S. Industry ATF Program



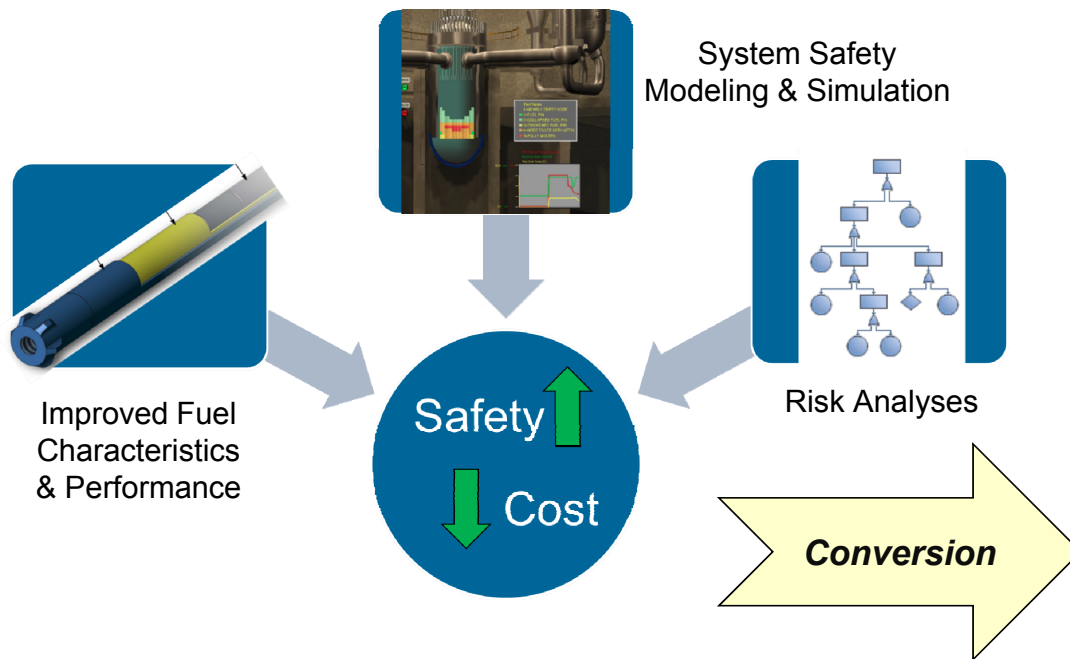
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U.S. Industry ATF Program Path Forward

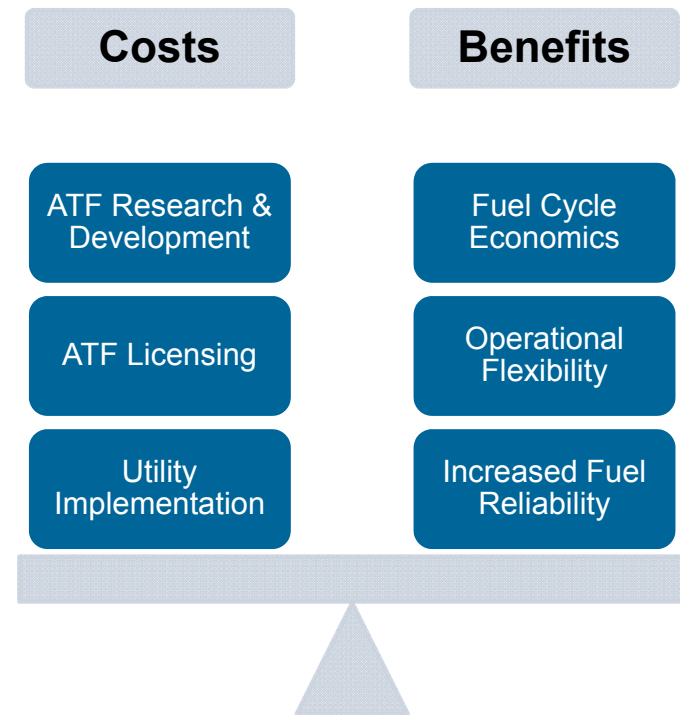


ATF Valuation 1.0: Safety & Economic Benefits Study

EPRI ATF Safety Benefits Scoping Study



Industry ATF Business Case



Potential Concomitant Safety and Economic Benefits of ATF

ATF Valuation 1.0: Consensus Sequences

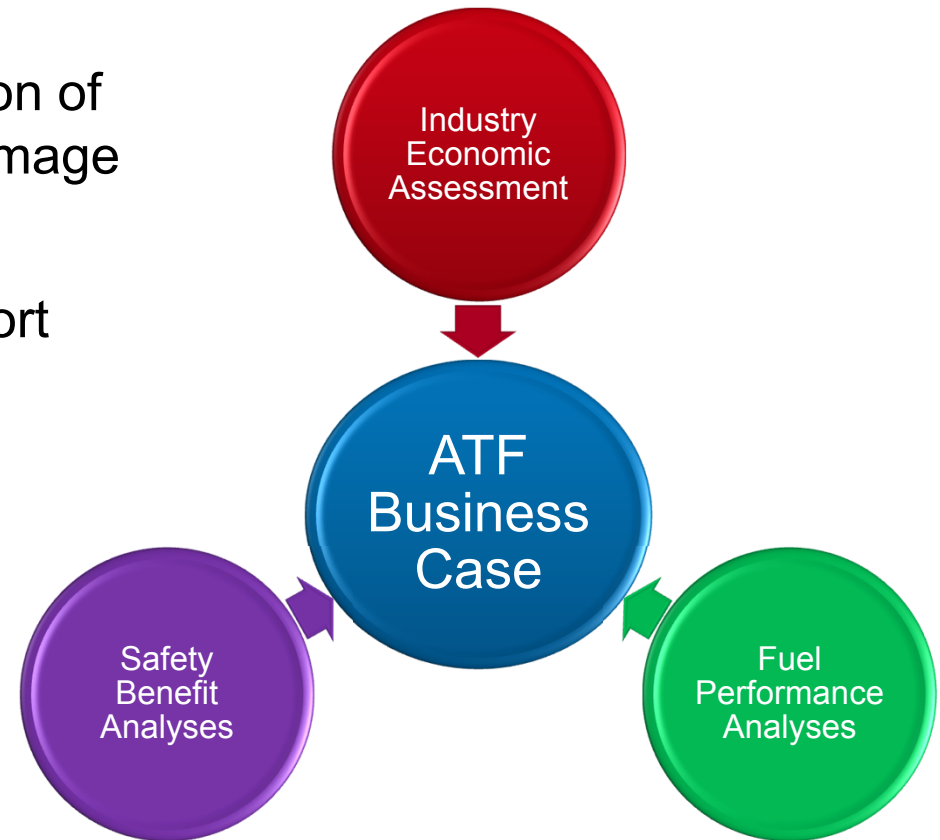
- Beyond Design Basis – MAAP v5.05
- Design Basis – TRACE v5 Patch5

	Fuel:	UO ₂	UO ₂	UO ₂	Cr-Doped UO ₂	U ₃ Si ₂	UO ₂	U ₃ Si ₂	U-Zr 50/50 w/o
BDBA Scenarios:	Clad:	Zr	FeCrAl	Cr-Coated Zr	Cr-Coated Zr	Zr	SiC	SiC	Zr
SBO	PWR	√	√	√	√	√	√	√	√
	BWR	√	√	√	√	√	√	√	√
Fukushima	BWR	√	√	√	√	√	√	√	√
TMI	PWR	√	√	√	√	√	√	√	√
DBA/AOO Scenarios:									
LB LOCA	PWR	√	√	√	√	√	√	√	√
	BWR	√	√	√	√	√	√	√	√
SB LOCA	PWR	√	√	√	√	√	√	√	√
	BWR	√	√	√	√	√	√	√	√
LOFW	PWR	√	√	√	√	√	√	√	√
Turbine Trip	BWR	√	√	√	√	√	√	√	√

TMI and Fukushima scenarios identical to historical events

ATF Valuation 1.0: Key Conclusions

- For BDBA cases:
 - ATF delays core damage, but, restoration of core cooling needed to prevent core damage
- For DBA/AOO cases:
 - Safety margin improvements may support operational enhancements
- Consistent with stakeholder results:
 - Vendors, MIT, UW, INL, and ORNL
- ATF a key element to an integrated approach to enhanced plant safety
- ATF Valuation 2.0 opportunities for expanding benefits underway



ATF PIRT Gap Analyses

- ATF gap analyses with the Phenomena Identification & Ranking Table (PIRT) Process:
 - Leverage global resources to identify, prioritize, and target R&D to accelerate ATF innovation
 - Facilitate R&D decisions by identifying and ranking key technical, regulatory, and operational issues
- Issue resolution report:
 - Prioritized plan that addresses identified gaps
 - Foster stakeholder engagement that addresses generic technical and regulatory issues
- Cooperative PIRTs (gap analyses) with ATF stakeholders key to reduce duplication of effort
- Potential SiC and Advanced Fuels PIRTs:
 - Data and modeling gaps



Advanced Modeling and Simulation (M&S) for ATF

- Advanced M&S and/or modifications of existing codes:
 - Near-term concepts: existing approved codes with minor modifications
 - Longer-term concepts: advanced M&S and/or significant modifications
- Advanced M&S used in other industries to reduce time and cost of introducing new innovative technologies from design to market
- Potential benefits of advanced M&S for ATF:
 - Design optimization and operational assessments (Crud, etc.)
 - Potential opportunities to reduce number of iterations of irradiation testing and post-irradiation examinations possibly along with advanced NDE
- Further collaboration with ATF stakeholders to identify and prioritize modeling gaps for longer-term concepts through PIRTs

Summary

- Industry committed to support ATF reloads by mid-2020s
- ATF Valuation 1.0 completed:
 - “...the work completed by the task force does illustrate the potential for economic benefits to utilities resulting from the deployment of ATF.”
- ATF Valuation 2.0 underway:
 - Examining additional opportunities for safety and economic benefits
- PIRT Gap Analyses:
 - Identify technical/regulatory gaps, areas of synergy, and common opportunities for research collaboration to reduce duplication
- Advanced M&S could be leveraged for longer-term ATF concepts as tools for both regulators and industry



Together...Shaping the Future of Electricity

ATF Valuation 1.0: Stakeholder Collaboration



Extensive stakeholder collaboration on ATF safety benefits