X-energy’s Lead in a Net-Zero Future

Meeting Future Electron and Non-Electron Energy Demands

NRC’s 2022 Virtual Regulatory Information Conference
March 08, 2022

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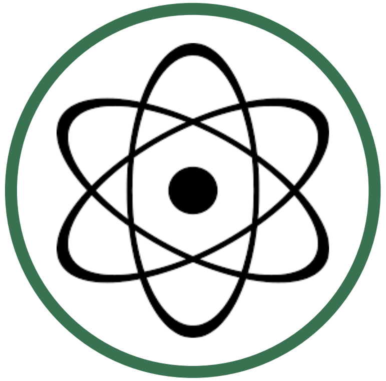
A New Era for Nuclear Energy

Environmental Consciousness

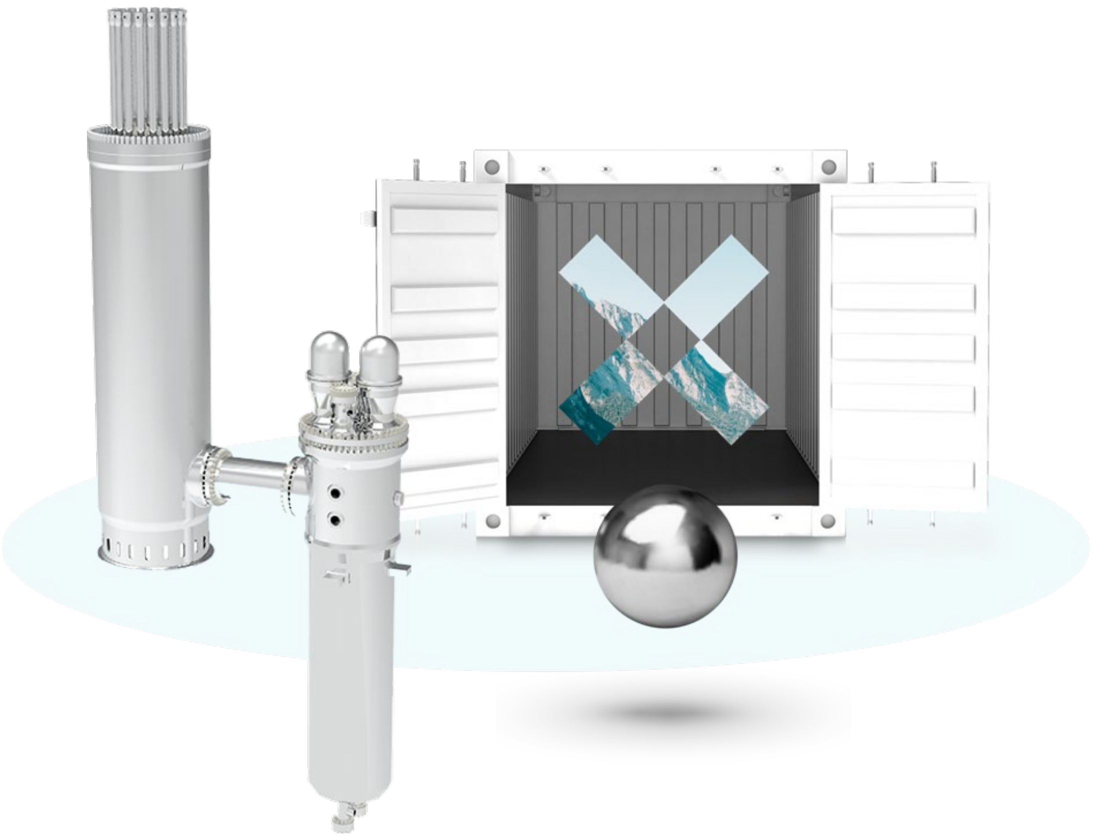
Breakthrough Technology



Political Alignment

Unprecedented Convergence for Advanced SMR Deployment

We Design & Build Reactors and the Fuel That Powers Them



Reactor: Xe-100

We're focused on Gen-IV High-Temperature Gas-cooled Reactors (HTGR) as the technology of choice, with advantages in sustainability, economics, reliability and safety.

Reactor: Xe-Mobile

To address the need for ground, sea and air transportable small power production. We've developed reactor concepts with potential civilian government, remote community and critical infrastructure applications.

Fuel: TRISO-X

Our reactors use tri-structural isotropic (TRISO) particle fuel, developed and improved over 60 years. We manufacture our own proprietary version (TRISO-X) to ensure supply and quality control.

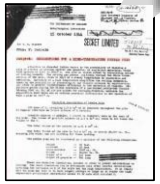
Space Applications

NASA, DOE, and DOD are exploring our technology and fuel for nuclear thermal propulsion and fission power for the lunar surface.

HTGR’s Leverage Proven Technology with Novel Flexibility

Continuous innovation to improve safety and economics with a focus on simplicity, reliability, flexibility.

USA

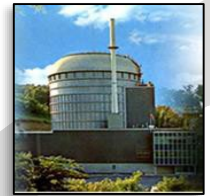


1944
ORNL

UK

1966-1975
Dragon

USA



1966-1974
Peach Bottom

Germany

1967-1988
AVR

USA

1967-1988
Fort St. Vrain

Germany

1986-1989
THTR

Japan

1998-Present
HTTR

China

2000-Present
HTR-10

China

2021 - Present
HTR-PM

USA

2009 – Present

Xe-100 Deployment ARDP - 2027

The HTGR is the SMR reactor technology nearest deployment that allows for flexibility in siting and application

- **Electricity Generation**
- **Mining / Oil Extraction**
- **Process Heat**
- **Hydrogen Production**

Simple Design

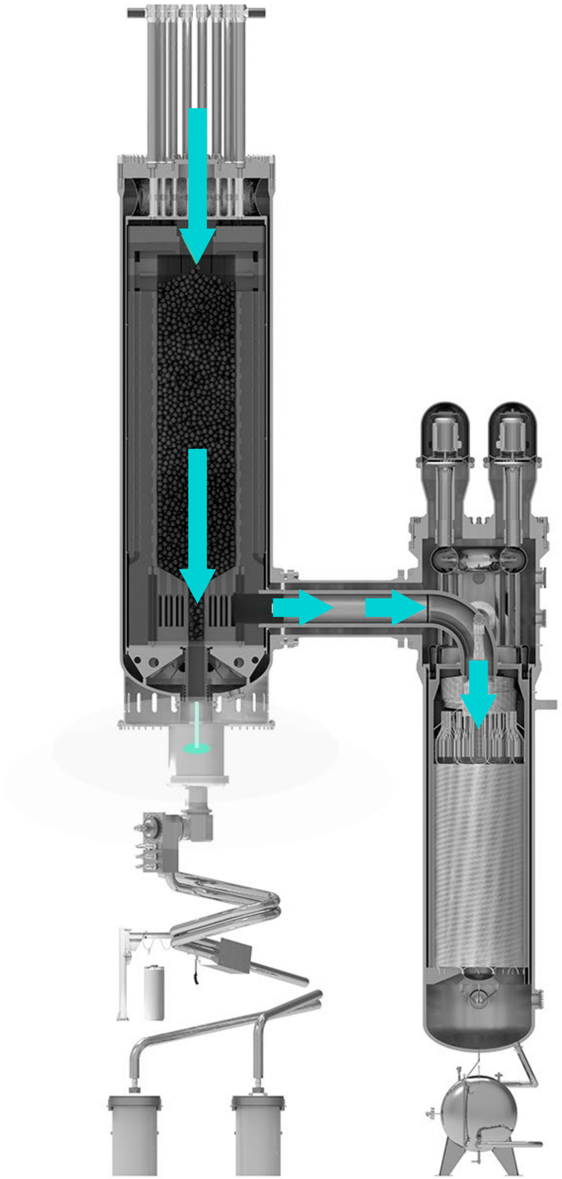
Relying on inherently safe designs allows for a drastic reduction of components.

Reduction of components enables predictability on costs & significant reduction of regulation barriers.

Why is this important?

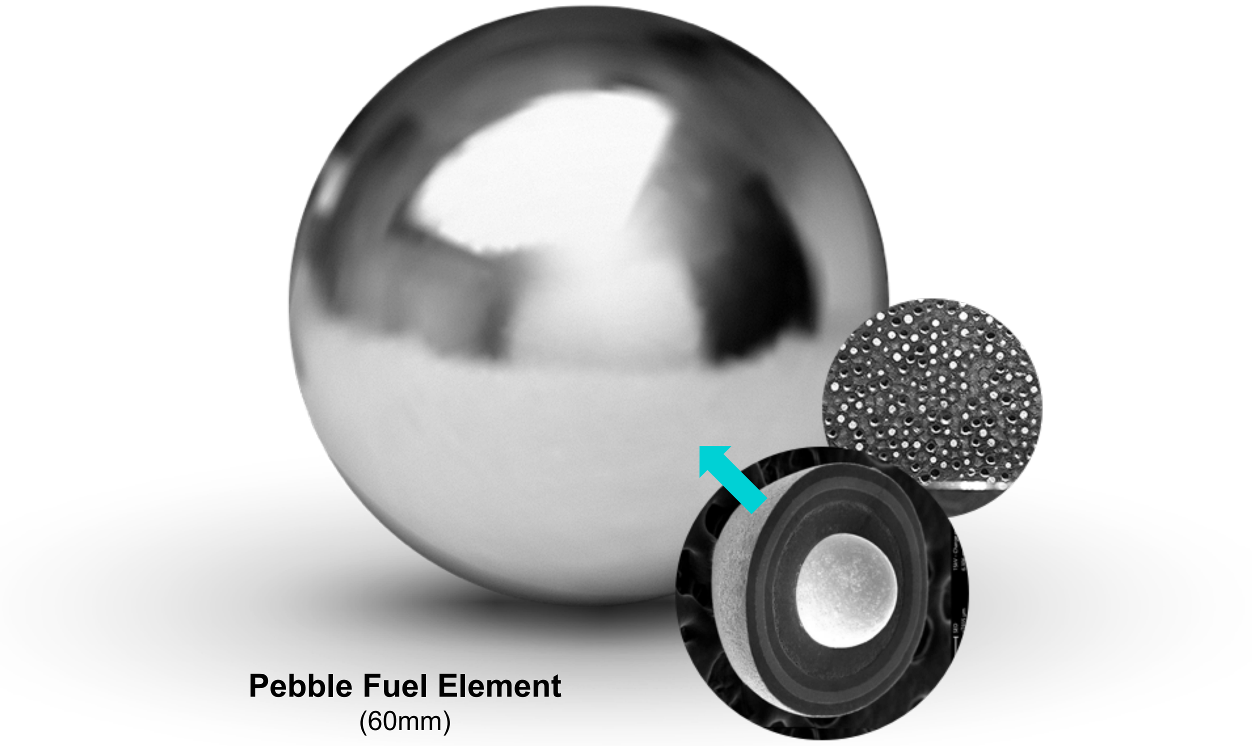
- Allows us to revolutionize the way turnkey nuclear reactor solutions are delivered.
- Reduced cost of upfront engineering effort.
- Higher certainty on construction cost and timelines equates to lower risk.
- 4 modules optimized for the ‘sweet-spot’ size—320 MWe with load-following capabilities similar to a natural-gas plant.
- Deployment for electricity or process heat supports **Deep Decarbonization.**

→ **1/10th the components of a traditional nuclear plant**



Xe-100 Reactor (80 MWe)

Intrinsic Safety: Our Fuel



Pebble Fuel Element
(60mm)

TRISO Fuel particle
(≈1mm)

We manufacture our own proprietary TRISO encapsulated fuel (TRISO-X) to ensure supply & quality control.

The U.S. DOE describes TRISO fuel as “the most robust nuclear fuel on Earth,” it retains waste and fission products within the fuel during ALL conditions, even worst-case accidents and cannot melt.

Why is this important?

- Because TRISO-X Fuel IS the containment vessel we will have no more expensive, gigantic concrete & steel structures to build, maintain and decommission.
- TRISO Fuel has 40+ years of prototype and full-scale demonstration reactors.
  This is a proven safety approach.
- The low reactor power density and self-regulating core design (i.e., if cooling stops,
  the core shuts down), ensures the reactor is always ‘walk-away safe.’

Physics, not mechanical systems, ensures 100% of safety.

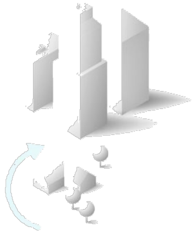
The Ladder of Innovation

X-energy's innovations compound, with the benefits accruing to our customers

Our innovation story results in more safety, lower cost, and a more reliable product delivery platform

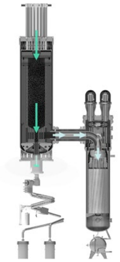
1. Intrinsically Safe Fuel

X-energy produces its own fuel that is intrinsically safe – it cannot melt down



2. Intrinsically Safe Reactor

Because the fuel can't melt down, the reactor does not require mechanical safety systems – it relies on physics and intrinsic safety features

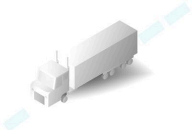


3. Simplified Reactor Design

Because the Xe-100 is dependent on intrinsic safety, rather than complex mechanical safety, the design is radically simpler

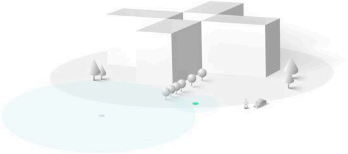
4. Simplified Licensing Case

Because the reactor is simplified and relies on intrinsic safety, licensing is less complex and faster



5. Road-Shippable & Modular

Because the licensing is not prescriptive and the reactor is simplified, it is easier to produce modular components. These can be road-shipped and assembled on-site



6. Standardization & Integrated Delivery

Because X-energy produces its own Triso fuel and the Xe-100 is a radically simplified reactor, X-energy can disrupt the broken nuclear product delivery model and create more value for customers

Competitive Position Reinforced by ARDP

X-energy's selection for the DOE's Advanced Reactor Development Program ("ARDP") represents a critical advantage that cannot be replicated

ARDP Overview

- In May 2020, the DOE announced the ARDP to speed the transition of next generation nuclear reactors from concept to demonstration through cost-share partnerships
- In October 2020, X-energy was selected to deliver a commercial a first-of-a-kind advanced nuclear plant with Energy Northwest[1] as well as a commercial TRISO-X fuel fabrication facility
- ***The program provides 50% cost share on all costs to deliver the first plant***

What ARDP Selection Means to X-energy

✓ **Recognition from the DOE as an advanced reactor technology of choice**

✓ **Secures first customer deployment**

- Partnered with Energy Northwest to deploy with one of the public utility districts
- Customer also benefits from the 50% cost share on their development and construction costs

✓ **Provides $1.2 billion in funding from the DOE**

- Fully funds all remaining design, licensing and commercialization milestones of the reactor
- Funds the completion of the first TRISO-X fuel fabrication facility

✓ **Strengthens DOE's support of the advancement of TRISO fuel**

- Exemplifies the DOE's commitment to scaling TRISO fuel production in the U.S.
- We are the only advanced reactor company producing TRISO fuel

Xe-100 Applications

energy Xe-100

200 MWt
80 MWe
565°C

Refining Processes

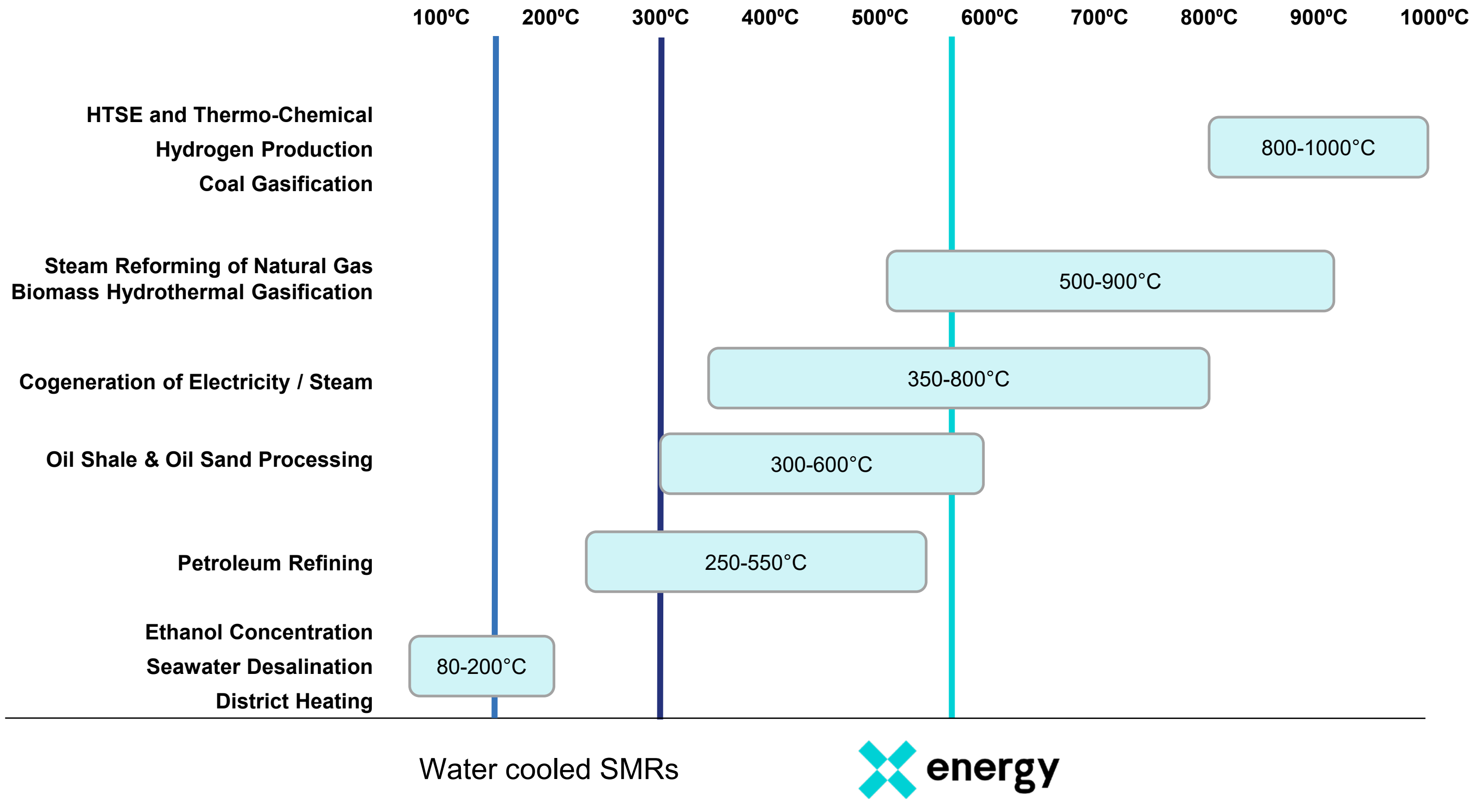
Hydrogen Production

Ammonia Production

Coal Plants

Natural Gas Plants

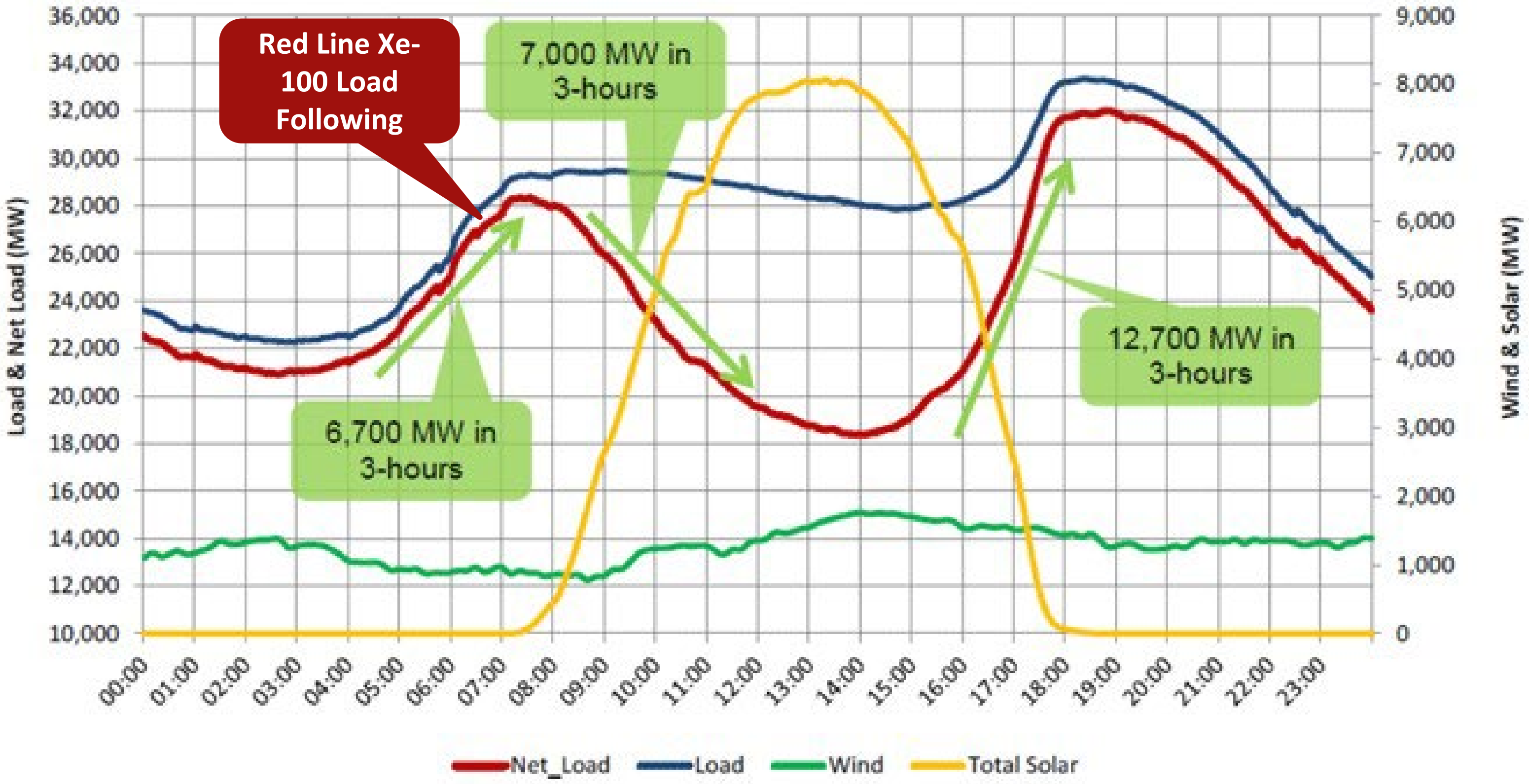
Positioned to Decarbonize Industrial Processes



Xe-100 Load Following Capability / Market Capture

Ramp rate of 5% per minute, up or down between 40-100% power

Provides grid resiliency and stability for intermittent renewables



Regulatory Nexus – Diversity in New Deployments

Cogeneration and industrial process heat

- How are we preparing to bring in non-traditional customers that desire nuclear options, but are not existing nuclear users?

Economics of deregulated markets

- Highly dependent on predictability and timeliness of licensing activities

Peaking and renewables integration

- Depends on load-follow technology capability and license-ability of automation

Integrated end-to-end solution providers

- Design, license, fabricate/construct, deliver, operate, service, decommission as part of a PPA: the user just wants power
- Impact on how [and on whom] regulatory oversight is conducted

AR Regulatory Landscape: What's Changing?

Functional Containment & Mechanistic Source Terms

- Defending the technical adequacy of barriers other than a pressure-retaining containment structure to fulfill the safety function of radionuclide retention (i.e., TRISO-coated particles)
- Providing evidence, verification, and validation that current modeling/analysis capabilities can predict radionuclide production, release, retention, and transport characteristics

Licensing Basis Event Identification & Safety Classification Approaches

- For reactor designs with less operating experience, using probabilistic and deterministic methods for establishing:
  - What events are postulated to occur?
  - How likely are they to occur?
  - What are the consequences?

Fuel Qualification

- Developing the bases for new fuel forms that adequately establish safe performance envelopes
- Verification and validation of fuel performance codes

Emergency Planning Requirements (and Expectations)

- Current requirements enforce planning zones in the community for emergency preparedness and response to radiological accidents
- Many advanced reactors can demonstrate significantly reduced needs for those zones (both in size and postulated consequences)
- Leads to possibility of siting plants much closer to the end-user

Path Forward to Establish Review and Schedule Confidence

- Communications
- Establish a Regulatory engagement plan with expectations and performance metrics for both sides to use
- Task and Resource Planning
- Identify policy issues early for resolution planning
- Identify potential technical challenging review areas and planned exemptions early
- Leverage consensus Codes and Standards
- Leverage the Licensing Topical Report review process
- Pro-active engagement with the Advisory Committee on Reactor Safeguards (ACRS)
- Regular periodic Executive briefings

Achieving Decarbonization Goals

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