

**UMASS  
LOWELL**

# MA Advanced Nuclear and Fusion Roadmap Preliminary Findings

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# Roadmap Structure

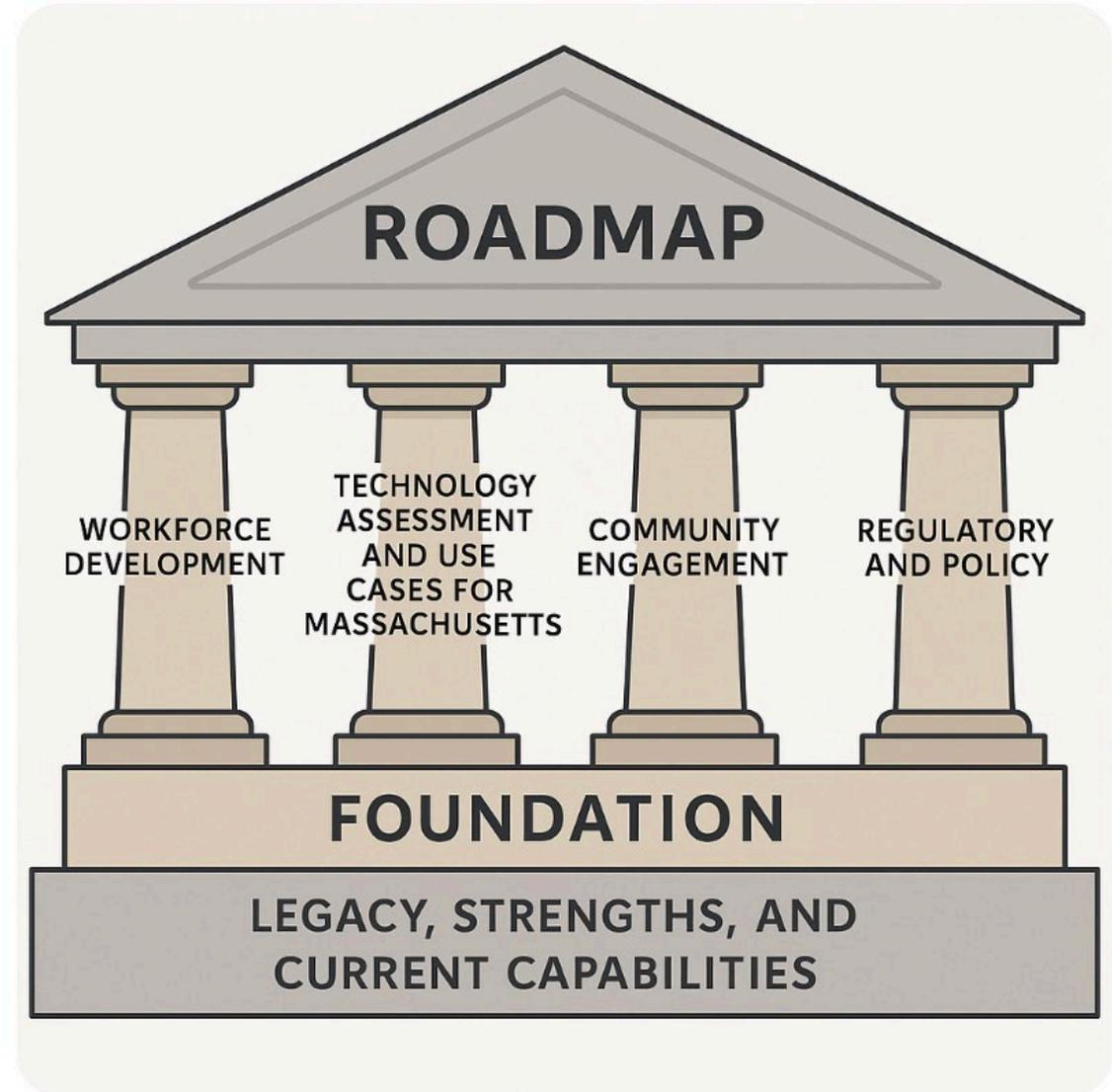
## Objective:

Frame what advanced nuclear and fusion *can realistically contribute* to Massachusetts' clean energy, economic, and innovation goals:

1. provide actionable recommendations
2. identify what questions require deeper analysis

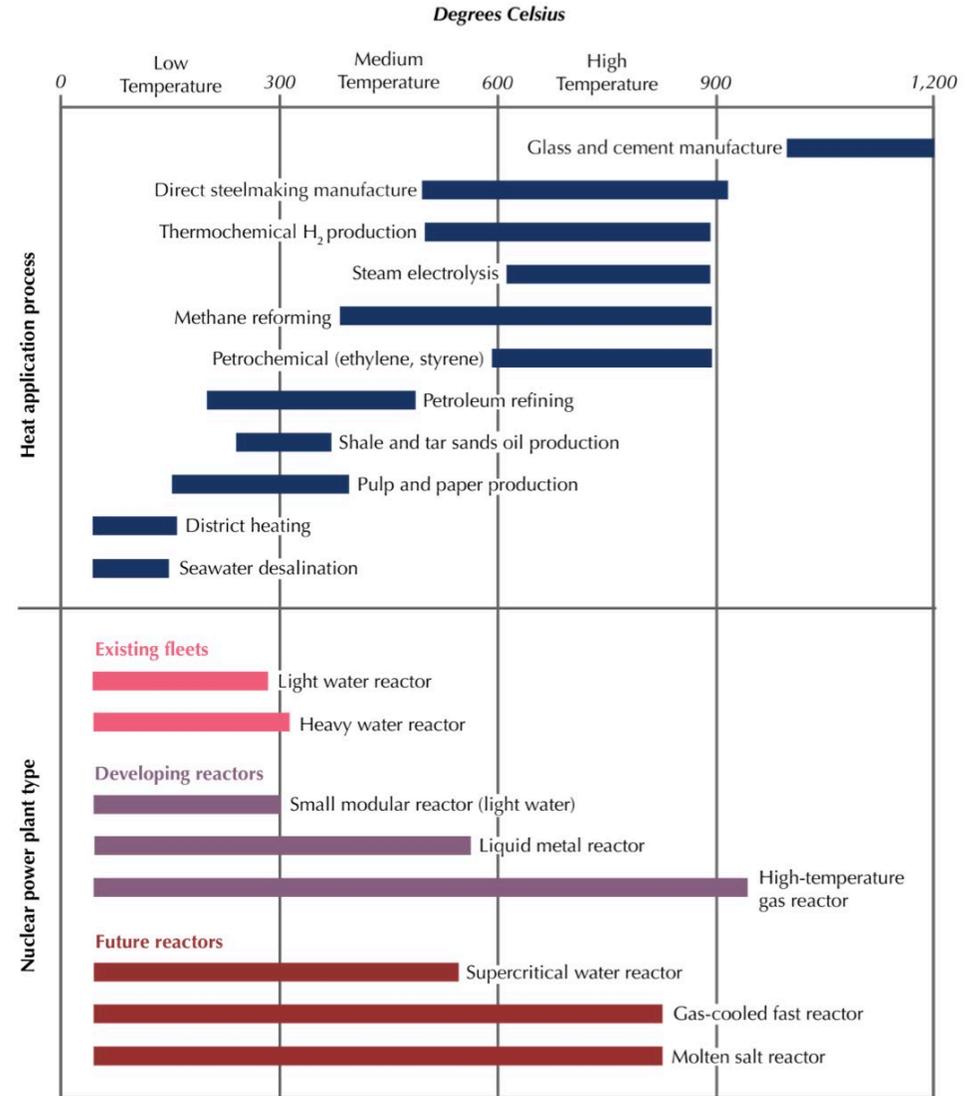
## Key Elements:

1. What this document is - baseline, reference, shared facts
2. What it is not - siting decision, procurement plan, advocacy



# Recommendations

1. Establish a State-Recognized Nuclear & Fusion Leadership Hub
2. Leverage and Align Massachusetts' Educational and Nuclear Workforce Strengths
3. Advance Climate Leadership, Winter Reliability, and Long-Term Affordability
4. Align State Policy and Regional Efforts



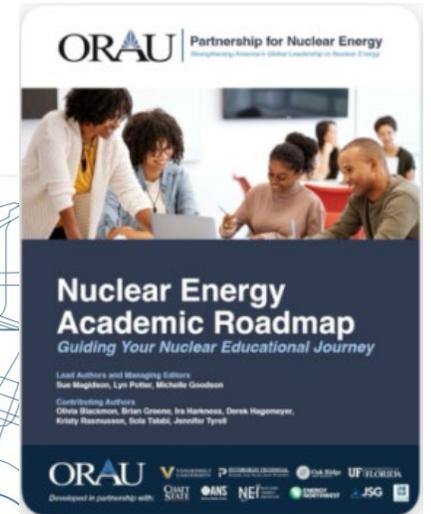
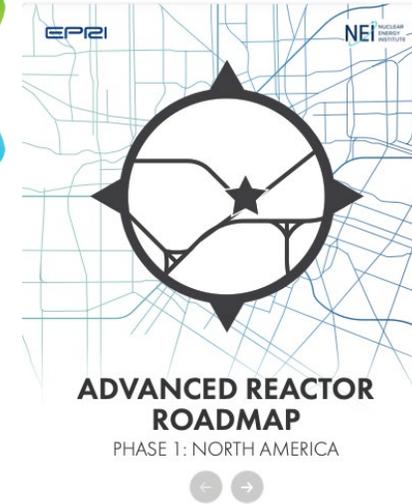
Source: [C2ES Climate Innovation 2050](#)

# Define – Direction, Facts, Alignment

1. Establish a common reference point on
  - advanced nuclear and fusion technologies,
  - readiness levels,
  - timelines—reducing confusion around
    - state authorities,
    - legislative authority,
    - industry expectations,
    - and the public interest/concern
2. Establish Facts:
  - Review current state of knowledge in context of Massachusetts and the region
  - Assess infrastructure and capacity
3. Find Alignment through public engagement (past 3 months!)
  - >1000 people engaged directly
  - >10 reactor tours
  - >10 presentations and panels
  - 9 stakeholder group meetings
  - Meetings with national and state organizations

# Identify Key References and Benchmarks

- Draws on nationally recognized references (DOE Liftoff reports, NRC licensing pathways, NEA dashboards, state exemplars like TN, TX and VA) to ground MA discussions in evidence
- Summarize
  - Key technologies in one place
    - Fission - Gen II, III, III+, SMR, AMR
    - Fusion
  - Licensing Status
  - Siting Considerations
  - Grid and non-grid use cases
  - Workforce Readiness



# Stakeholder Group Participants – Snapshot (not complete)

## State & Public Leadership

- MA Legislature (Senate & House)
- Energy & Environmental Affairs
- MA DPU, DCAMM, Attorney General
- Municipal & Regional Planning Bodies

## Federal & National Institutions

- U.S. DOE (Nuclear Energy)
- FERC
- National Labs (LLNL)
- National Governors Association

## Utilities & Grid Operators

- ISO New England
- Eversource, National Grid, Unitil
- Municipal Light Plants
- MMWEC

## Advanced Nuclear & Fusion Developers

- Commonwealth Fusion Systems
- Holtec, Oklo,
- Radiant Nuclear, StarCube
- Pacific Fusion, Longview Fusion

## Industry & Supply Chain

- MITRE, Arup, TRC, Tetra Tech
- Analog Devices, Schneider Electric
- Mirion Technologies
- Advanced materials & engineering firms

## Higher Education & Research

- UMass System & 5 campuses
- MIT, Harvard, BU, RPI, UConn
- International research partners

## Environmental & Public Interest

- Conservation Law Foundation
- Clean Air Task Force
- Acadia Center, GreenRoots
- Mass Audubon

## Labor & Workforce

- IBEW, NABTU, NLRB
- United Steel Workers
- Chambers of Commerce
- Workforce organizations

## Finance & Innovation Ecosystem

- The Engine
- Venture & Strategy Firms
- International Consulates
- Policy Strategy & Communications Firms

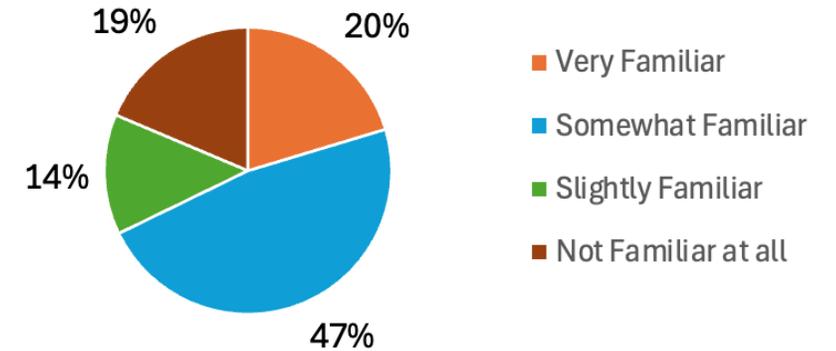
## Stakeholder - Polling Data

- Conducted a short polling at each stakeholder group meeting asking 7 questions to all the participants
  - Questions developed to get insight around – foundational strengths in MA, workforce, nuclear technology, regulations and community awareness
  - The data synthesized individually and combined provide valuable insight on broad prospective from the stakeholder groups

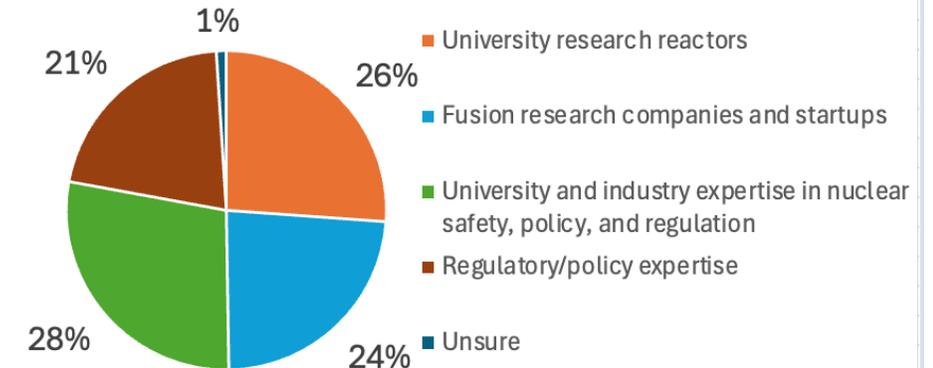
# Stakeholder Polling – Key Take-aways

- Most participants (67%) view themselves as at least "somewhat familiar" with nuclear fission or fusion technologies, but 33% view themselves as only "slightly familiar" or "not familiar at all"
- Perception of familiarity with state and federal regulatory frameworks is similar, with 61% viewing themselves as at least "somewhat familiar" and 39% as only "slightly familiar" or "not familiar at all"
- Participants recognized key state assets to support advanced nuclear development
- Perspectives were broadly distributed regarding the State’s readiness to develop a workforce for advanced nuclear fission and fusion

How familiar are you with advanced nuclear fission or fusion technologies (e.g., SMRs, microreactors, fusion pilot plants)?



Which of the following assets do you believe Massachusetts currently has to support advanced nuclear development? (Select all that apply)



# Stakeholder Polling – Key Take-aways

- Across all Stakeholder Groups, the vast majority (91%) of polling participants feel that Massachusetts communities need more information to discuss the role of nuclear energy in the State's clean energy future
- Five proposed types of coordinated support received similar levels of endorsement to advance work across all pillars of the roadmap



# Stakeholder Feedback - Techr

1. Gap - Centralized, trusted information Hub
2. Sentiments - Emerging supply-demand gap
3. Action - Near-term focus on proven technologies
4. Essential - Cost discipline and realism



# Stakeholder Feedback – Community Engagement

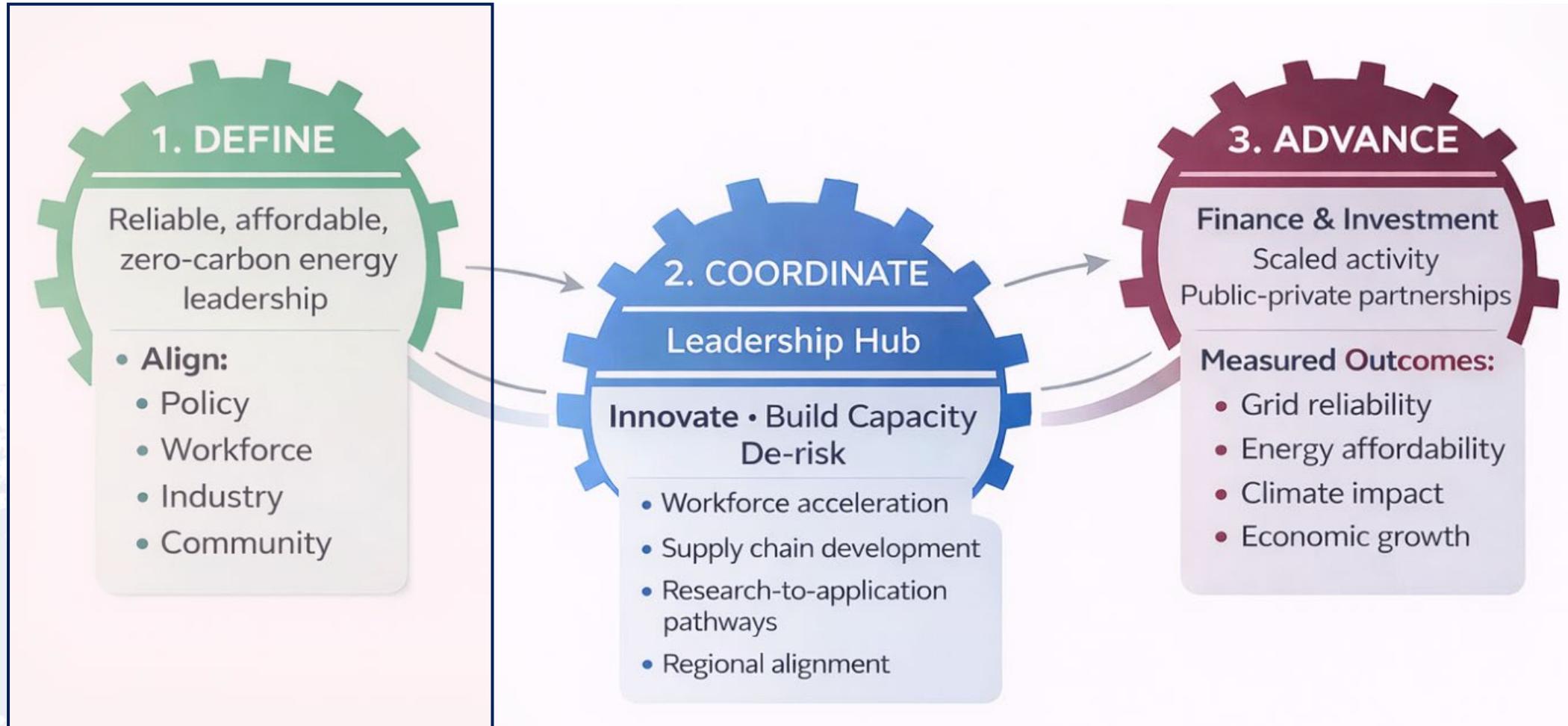
1. Gap – Public understanding of nuclear technology
2. Sentiments – Engagement must be collaborative, not one-way
3. Action – Trusted messengers are critical to public engagement
4. Essential – Broad and committed community engagement and access are critical to trust







# Phases – Define, Coordinate, Advance



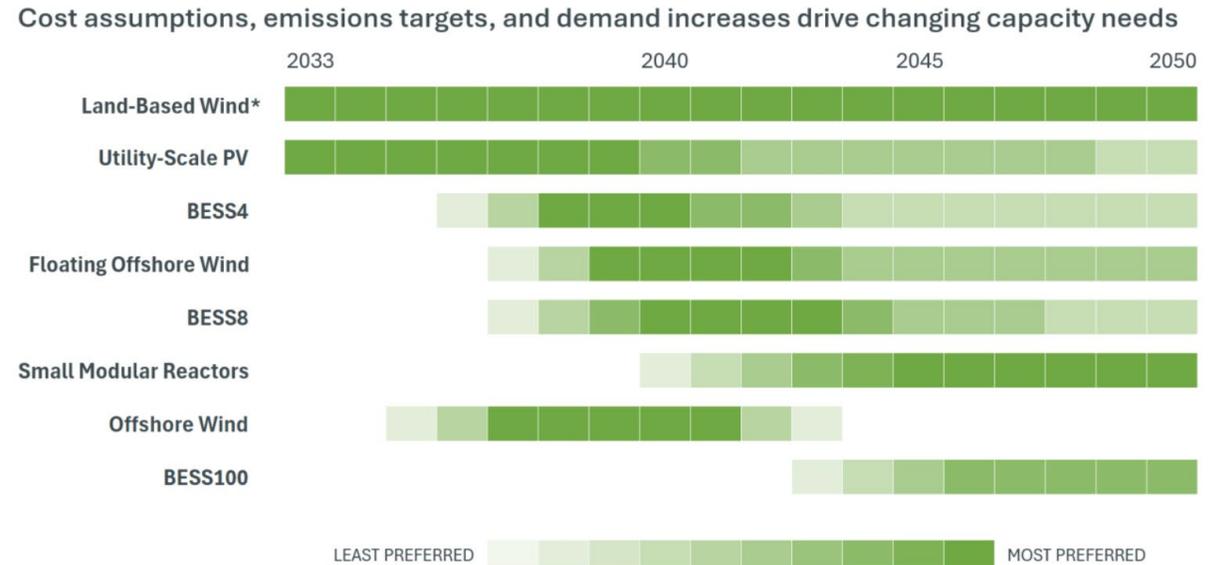
## Define - Firm, Carbon-free, Capacity

- **25 states** explicitly recognize nuclear energy within statutory definitions of clean, carbon-free, zero-emission, or advanced clean energy, or treat nuclear as eligible for clean energy compliance, procurement, or credit mechanisms
- MA recognizes fusion energy as Renewable Portfolio Standard (RPS) Class I renewable energy generating source
- Recent legislation in states across the US emphasizes **ecosystem development**—workforce, supply chains, financing and innovation hubs—alongside, or ahead of, reactor deployment
- States increasingly reference **regional coordination** to address shared markets, infrastructure, workforce needs, and cost considerations

# Define - Partners in a Net-Zero New England

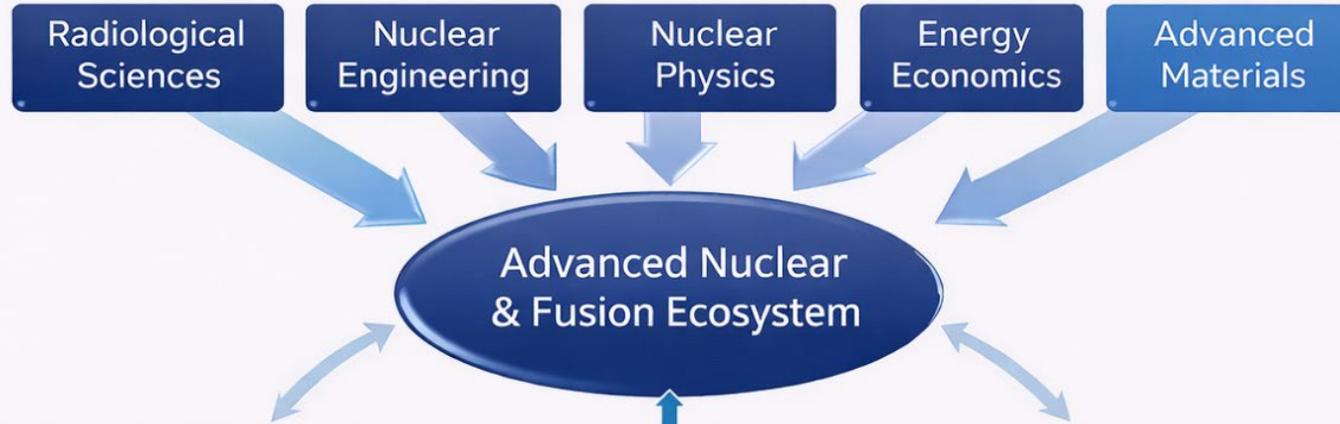
- New England faces unique structural challenges:
  - High winter heating demand (oil and natural gas)
  - Winter fuel constraints and price volatility
  - Limited in-region firm carbon-free generation
- Spring/fall decarbonize first (high wind & PV availability)
- Winter remains hardest to decarbonize

Capacity markets must value firm winter capability – not just annual energy output



Regional studies suggest firm, dispatchable resources (e.g., SMRs, long-duration storage) could reduce capacity build-out needed to meet demand for electricity and achieve state decarbonization requirements by 2050 (reducing overall system costs for consumers)

# Define - Innovation Ecosystem



**Workforce Development & Education**

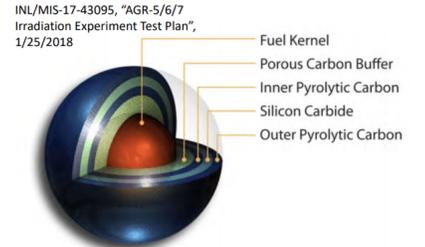
- Undergraduate & Graduate Curriculum
- Community Colleges & Technical Pathways
- Skilled Trades & Apprenticeships
- Reactor Operator Training
- Radiation Safety Training
- Summer Institutes

**Core Nuclear Infrastructure**

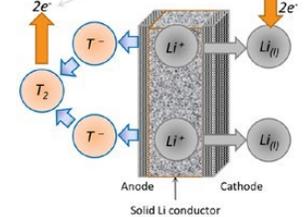
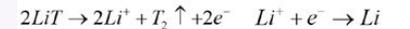
- Research reactors (UMLRR, MITR)
- Accelerators & cyclotrons
- Fusion test devices
- Applied research labs

**Research & Technology Development**

- Fuel cycle & advanced materials
- Neutron & imaging science
- Detector & instrumentation development
- Data, modeling & AI integration



Typical TRISO particle layer structure

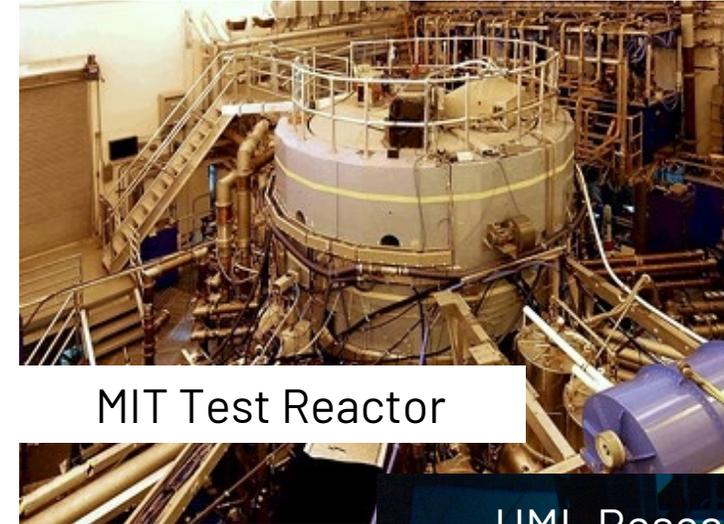


$$E_{400^\circ C}^0 = -2.82V$$

$$E_{400^\circ C}^0 = -3.22V$$

# Define - Innovation Ecosystem

- Nuclear Power – Yankee Rowe, Pilgrim, 3Yankee
- Research Facilities
  - UMass Lowell Research Reactor, MIT Test Reactor, MGH
- Industry
  - Mirion, GE, Schneider, Lanthus, Shine Medical, Commonwealth Fusion, Massachusetts Municipal Wholesale Electric Co. (MMWEC), Holtec, EMP, Allied Power



MIT Test Reactor



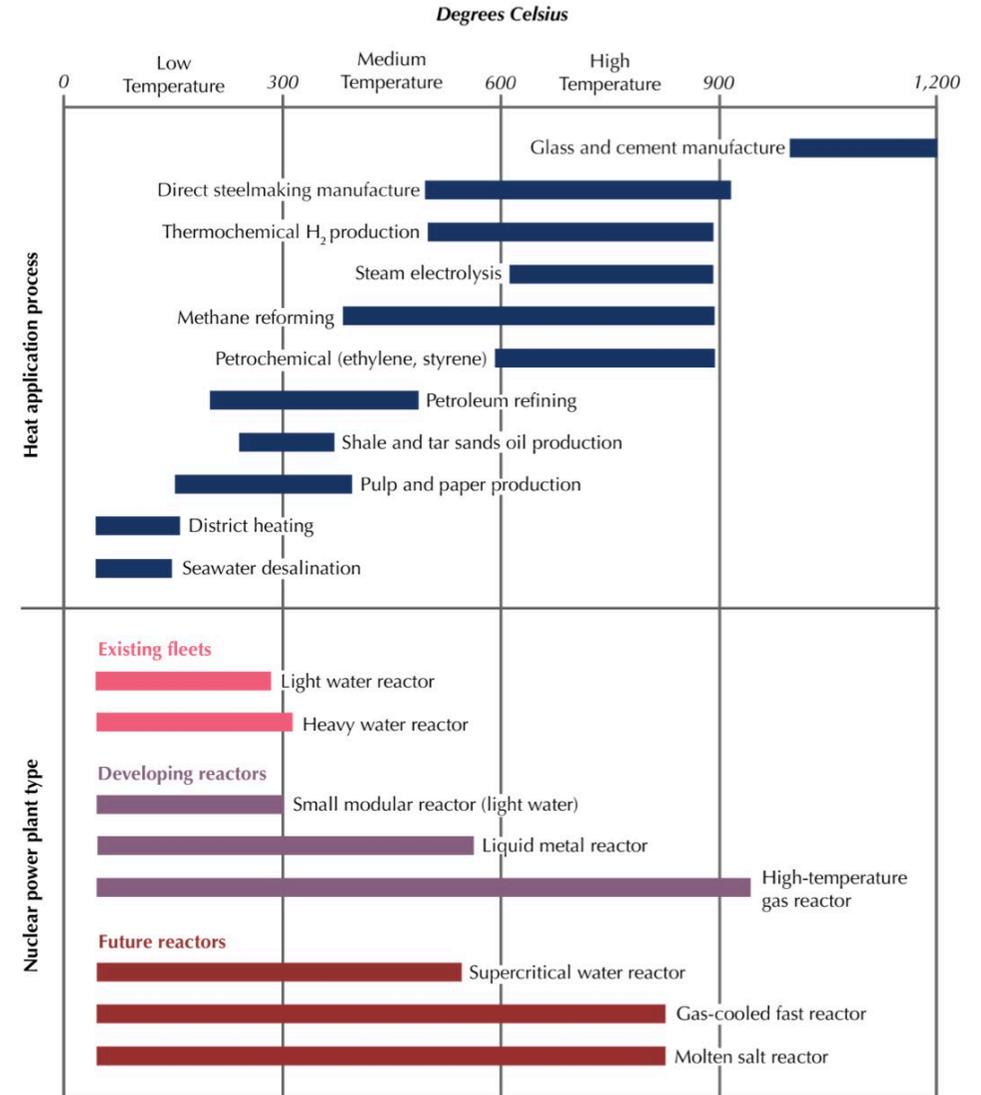
Fusion Device (conceptual)



UML Research Reactor

# Recommendations

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Source: [C2ES Climate Innovation 2050](#)

# Thank You

**Registration & Updates:** [www.uml.edu/nuclearroadmap](http://www.uml.edu/nuclearroadmap)

**Inquires about Roadmap:** [nuclearroadmap@uml.edu](mailto:nuclearroadmap@uml.edu)

**Inquires about Nuclear Engineering Program :** [nuclear@uml.edu](mailto:nuclear@uml.edu)



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Lord, Give me  
**COFFEE**  
to change the  
things I can.

AND **WINE**  
to accept the  
things I can't.

POSTED BY THE  
FOIGHT LIKE A GIRL CLUB™

PERSONAL USE ONLY



Lord, Give me  
**GEN III+**  
to meet the Gigawatt  
demand I need now.

AND **AMR**  
for everything else.

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