

# MARVEL Readiness, Startup, and Testing Plan

## Utilization

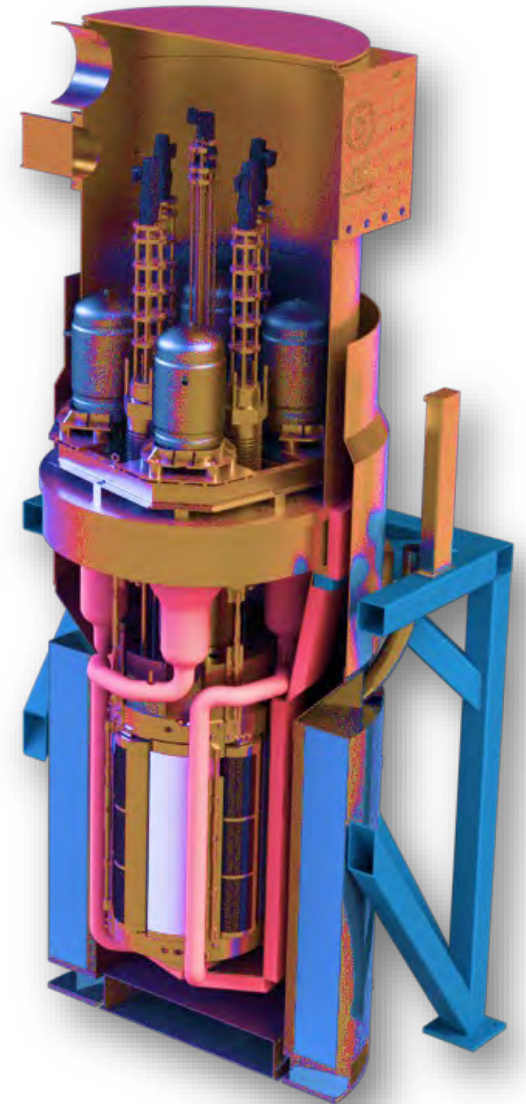
**2024 MARVEL Technology Review**

March 7<sup>th</sup>, 2024

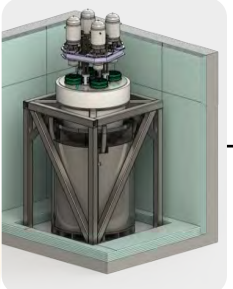
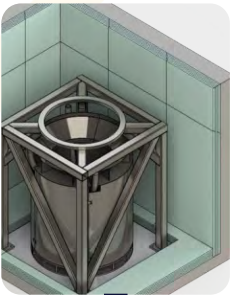
**Abdalla Abou-Jaoude, Ph.D.** | MARVEL testing & experiment interface

# Presentation Overview

1. MARVEL Readiness Steps
2. Startup Plan
3. Vision for MARVEL Utilization
4. Potential Testing Highlights
  - Microgrid
  - Combined heat and electricity
5. External Engagement

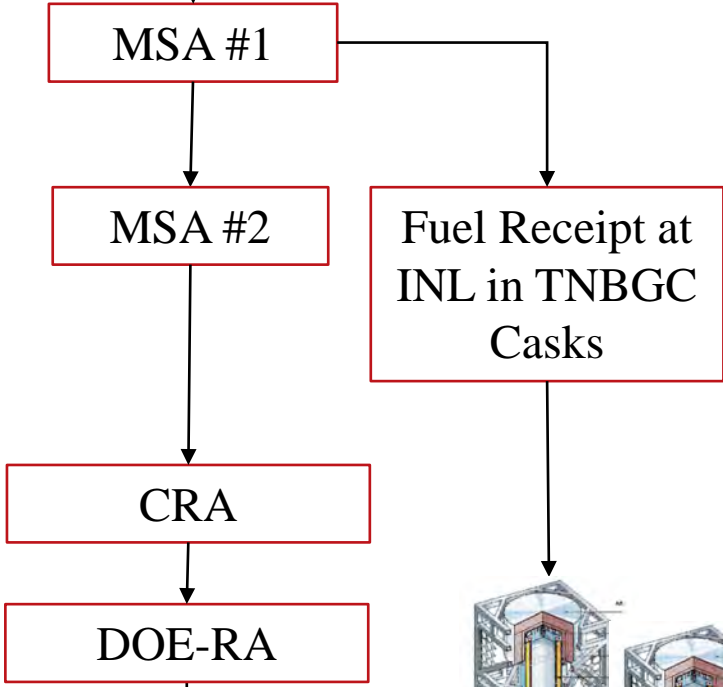


# MARVEL Readiness Activities

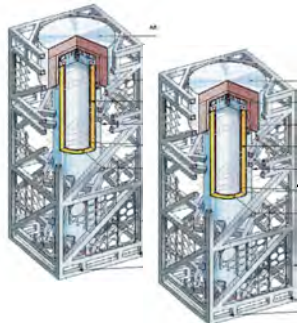


Non-Fuel Assembly @TREAT

DOE Approval of SAR Addendum



Approval to Complete Fuel Assembly & Core Load

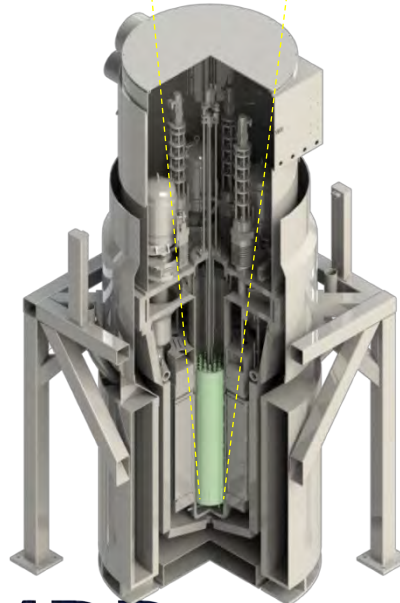
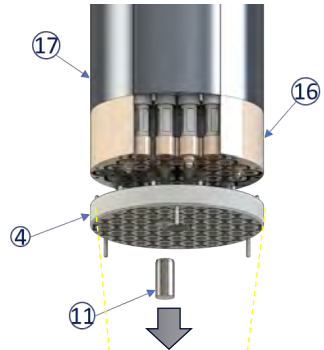
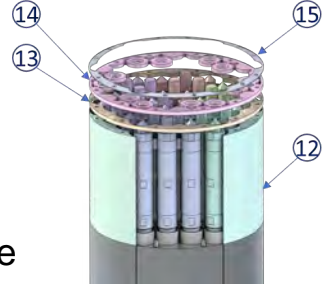


TREAT Limit = 8 pins  
2 x TNBGCs = 6 fuel pins



1 subassembly = 6 fuel pins  
6 subassemblies total with associated grid plates and reflectors

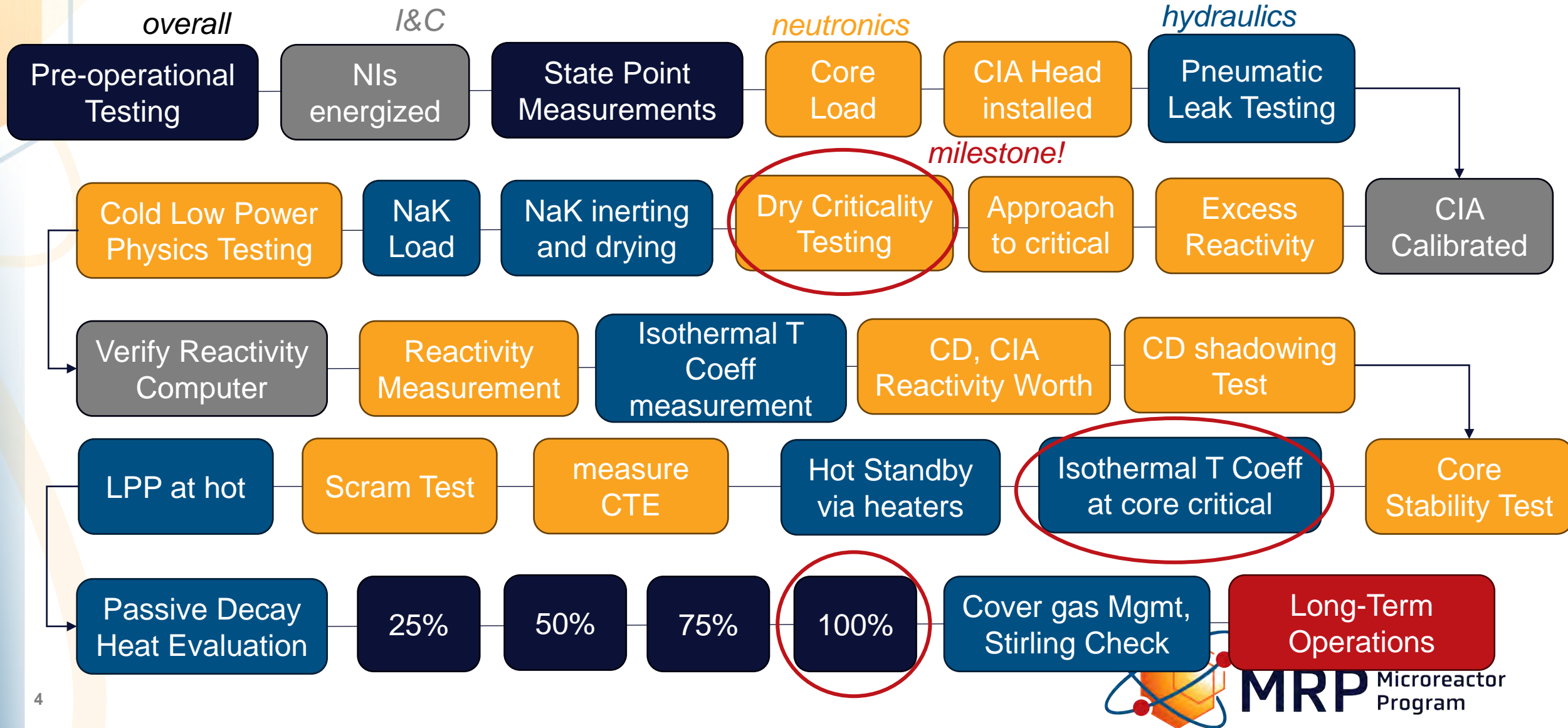
Load in core



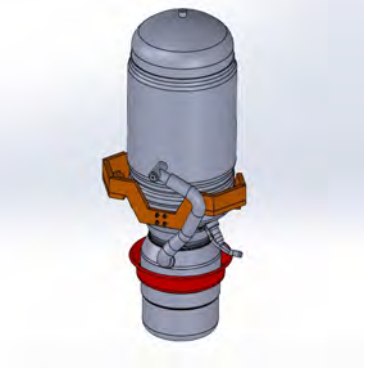
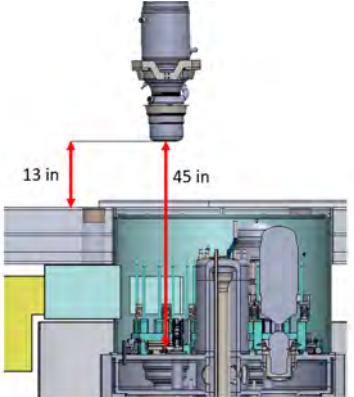
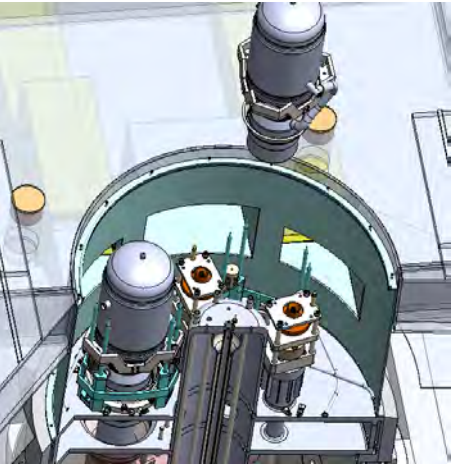
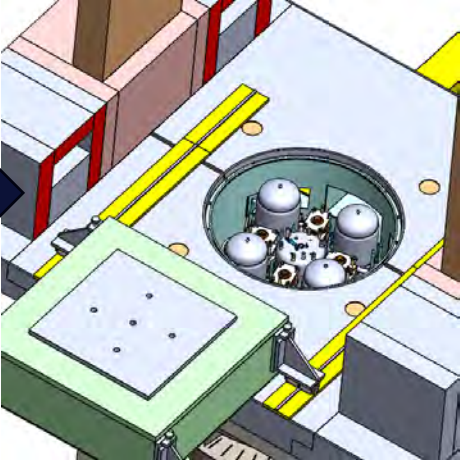
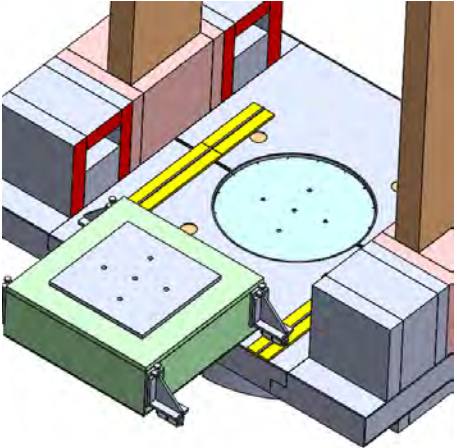
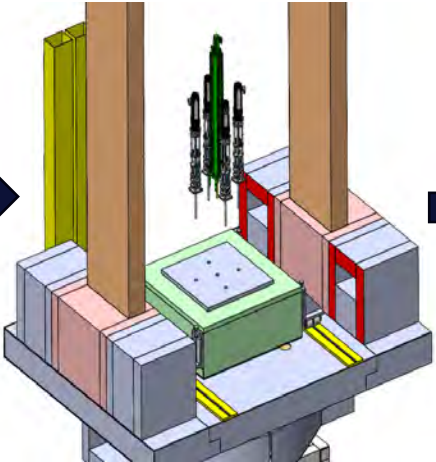
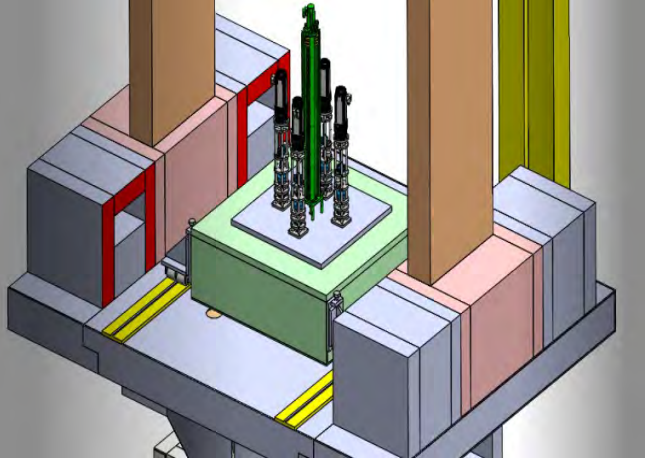
**MRP** Microreactor Program

Disclaimer: still under development  
Expected Startup Timeline: 6-8 months

# Draft MARVEL Startup Plan (PLN-6816)



# Stirling Engine Replacement

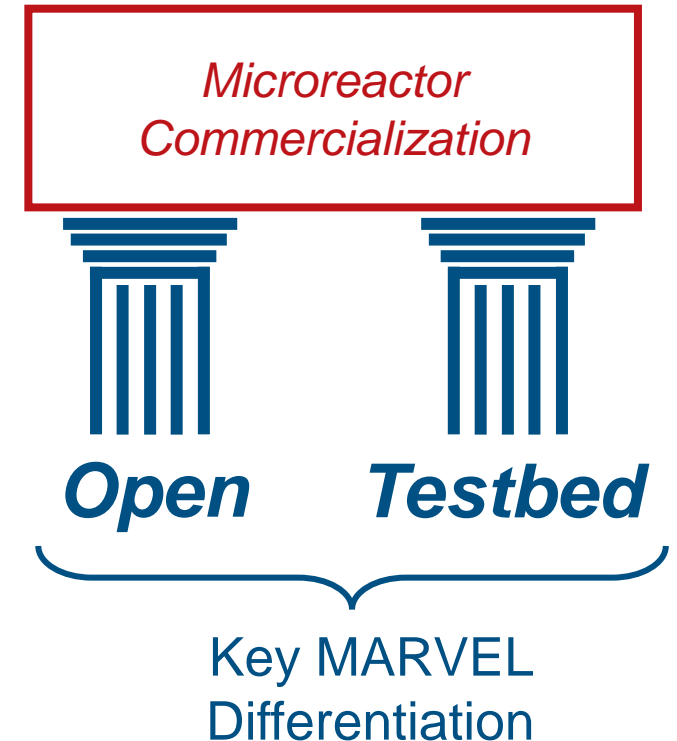


# MARVEL Value Proposition

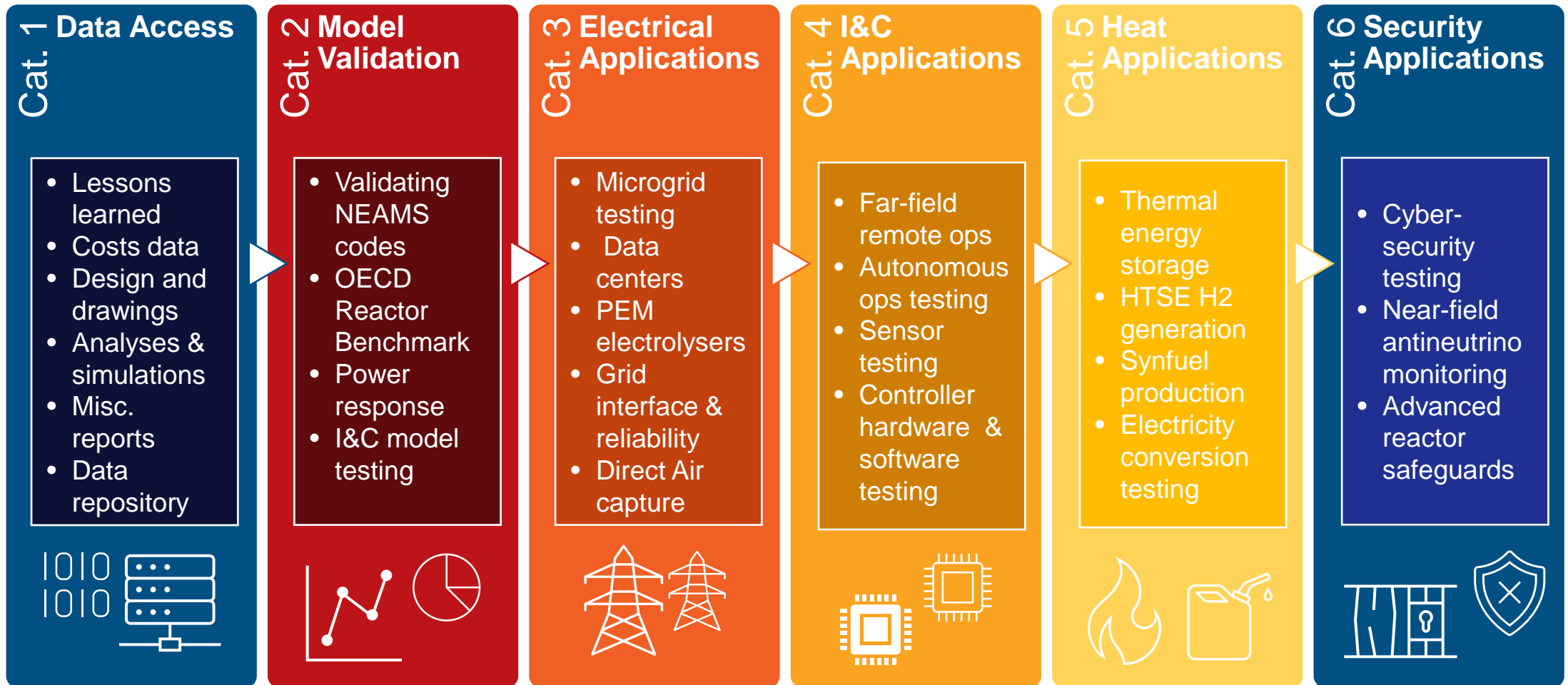
- First-of-a-kind demonstration that will proliferate ‘know-how’ and provide opportunity to test novel features
- Key attributes:
  - **Open:** Design & operational data access
  - **Testbed:** Platform for testing new technologies & nuclear applications
- Opportunities for collaboration:
  - **Vendors:** Design, technology testing, validation data
  - **Industry users:** New ways to leverage nuclear
  - **DOE programs:** Demonstrating new technology/applications
  - **Universities:** Furthering nuclear R&D
  - **Regulator:** Building confidence in adv. reactor ops

MARVEL  
Value:

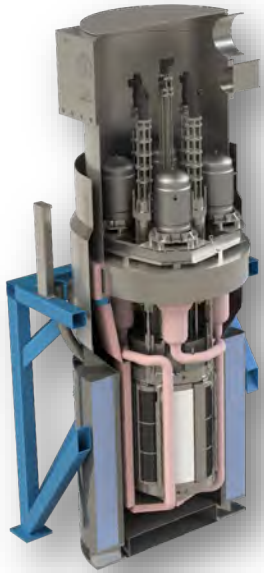
*Open Platform for Testing, Data Generation, and  
Technology/ Application Demonstration*



# Conceptual MARVEL Applications



# Tentative MARVEL Utilization Timeline



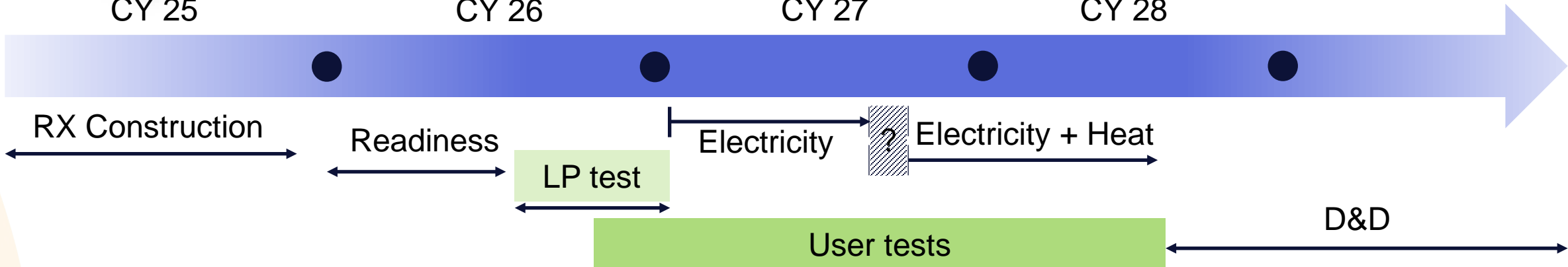
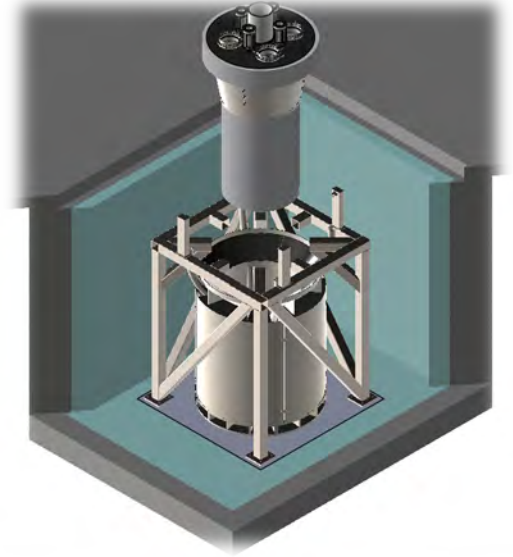
CY 25



CY 26

CY 27

CY 28



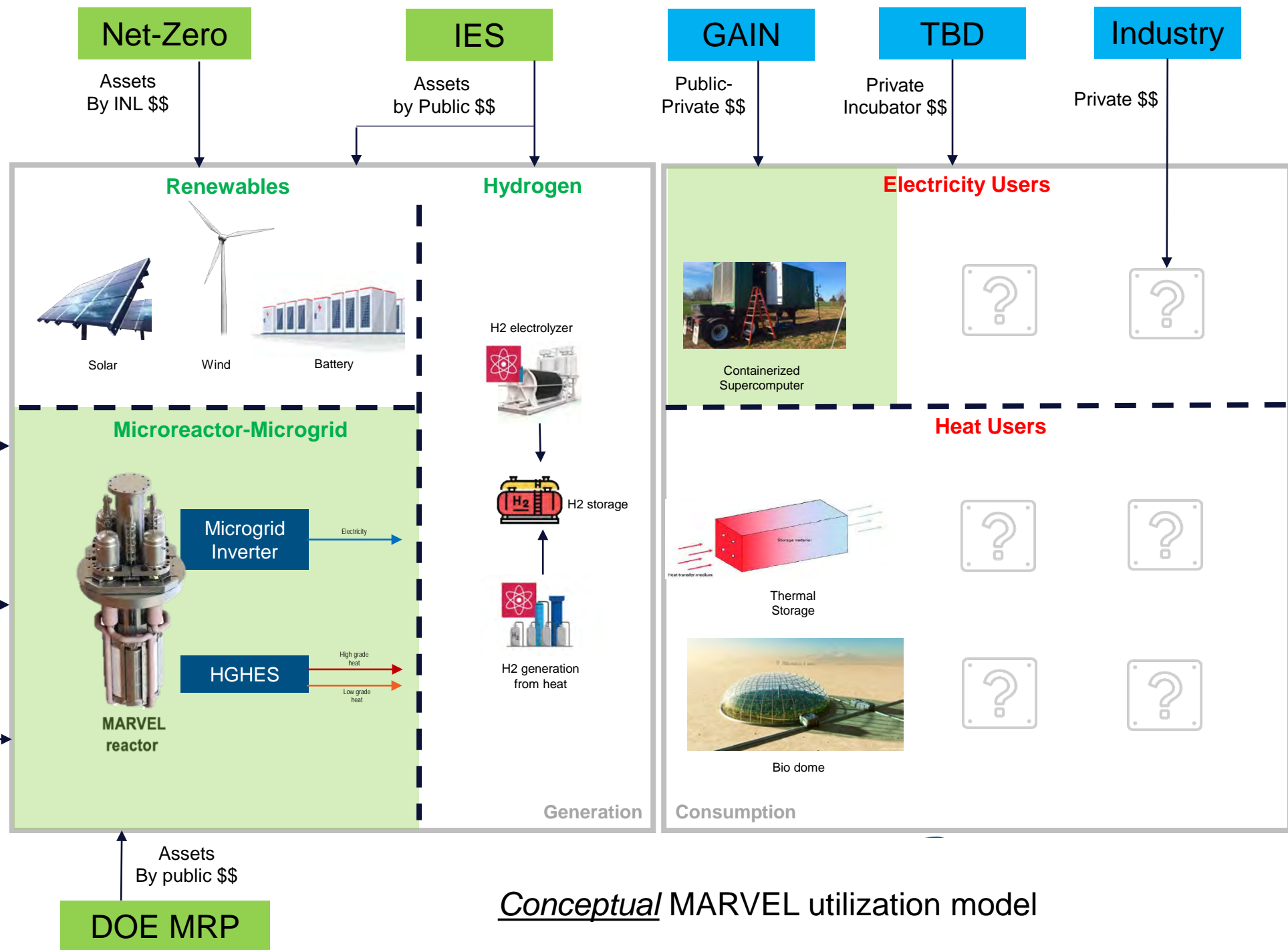
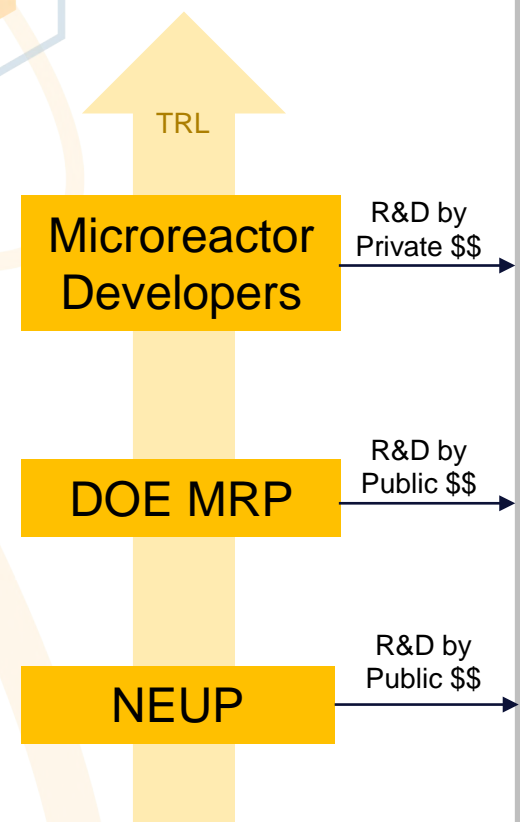
Where do you fit in?

How do you fit in?





# Possible Stakeholders



*Conceptual* MARVEL utilization model

# MARVEL Use Case Aspiration

Stochastic Inspection

Automobile, Aerospace robotics

Dynamic Manufacturing

Factory  
Fabrication  
Technology

Transportability

Advanced Logic & Automation

Digital Twin, Machine Learning

Hands-off operations testing

Automated  
Control  
Systems

Applications Validation Testing

Operations & Maintenance

Combined Heat & Power

Remote Monitoring

Grid Integration

Advanced reactor  
Dynamics

Test  
Microreactor

Applied Research

*“Original Investigation undertaken in order to acquire new knowledge directed towards a practical implementation of MRs”*

# How to Engage? Some *Suggestions*...

## Industry | External

- **What test needs do you have with MARVEL?**
  - Reactor & Instrumentation
  - Control & HMI
  - Microgrid
- **When do you need to perform these tests?**
  - Q3-Q4, CY26: Startup testing & benchmarks
  - Q1-Q2, CY27: Microgrid applications
  - Q3-Q4, CY27: I&C and HMI
  - Q1-beyond, CY28: Heat applications
- **Funding mechanisms**
  - Subcontract: CRADA, SPP
  - GAIN vouchers (apply by Q1 of 2026!)
  - Others (iFOA?)
- **Call to action: Fill out the [pre-engagement questionnaire](#)**

## DOE Programs | Internal

- **DOE Program**
  - IES: combined nuclear heat & electricity demo
  - OE/NetZero: nuclear microgrid demo
  - ASI: new sensors & controls demo
  - NEAMS: software validation for adv. Reactors
  - LDRD: new technology R&D
  - NNSA: safeguards and security
  - FECM: direct carbon air capture with nuclear
- **Other Gov Programs**
  - NASA FSP: similar power requirements
  - DOS FIRST: international training
- **University proposals**
  - NEUPs on harvesting/processing data?
  - IRPs on hardware testing?
  - Submit in 2025 CINR call!



**Questions?**