



ULTRA SAFE NUCLEAR

Ultra Safe Nuclear and Space Nuclear Power STIGUR Meeting



RELIABLE ZERO-CARBON ENERGY ANYWHERE

The Questions Asked

- *What is your technology approach, benefits and challenges, including scalability to other power levels from baseline?*
- *What is your overall programmatic approach? How would you organize the development of the FSP system and the schedule (funding permitting)*
- *What are your ground testing requirements and potential facilities?*

Who We Are



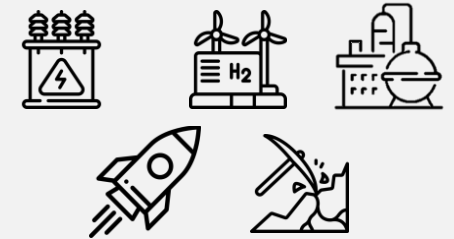
Intrinsically safe nuclear power for
reliable zero-carbon energy anywhere

**Intrinsically Safe Micro Modular
Nuclear Batteries**

High Temperature Heat



Multiple Use Cases



**Vertical Integration +
High Volumes =
Accelerated Learning Rate**



**Reactor and Fuel Factories
with Rapid Deployment**

Manufacture / Delivery



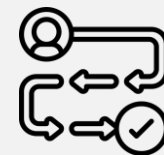
**Active Development Pipeline with Projects
in Advanced Stages**

Development / Execution / Operation / Service



Supportive Regulatory Pathway

**First to Market with Full-size Demos in
Canada and US**



Full-Stack Nuclear

Nuclear hardware and services to provide reliable energy anywhere.

CORE GROUP

Nuclear Fuels + Materials

NUCLEAR GROUP

Manufacture + Deploy

ADVANCED TECHNOLOGIES GROUP

Future Looking Product Development

INNOVATION GROUP

MMR Technology Development

2011

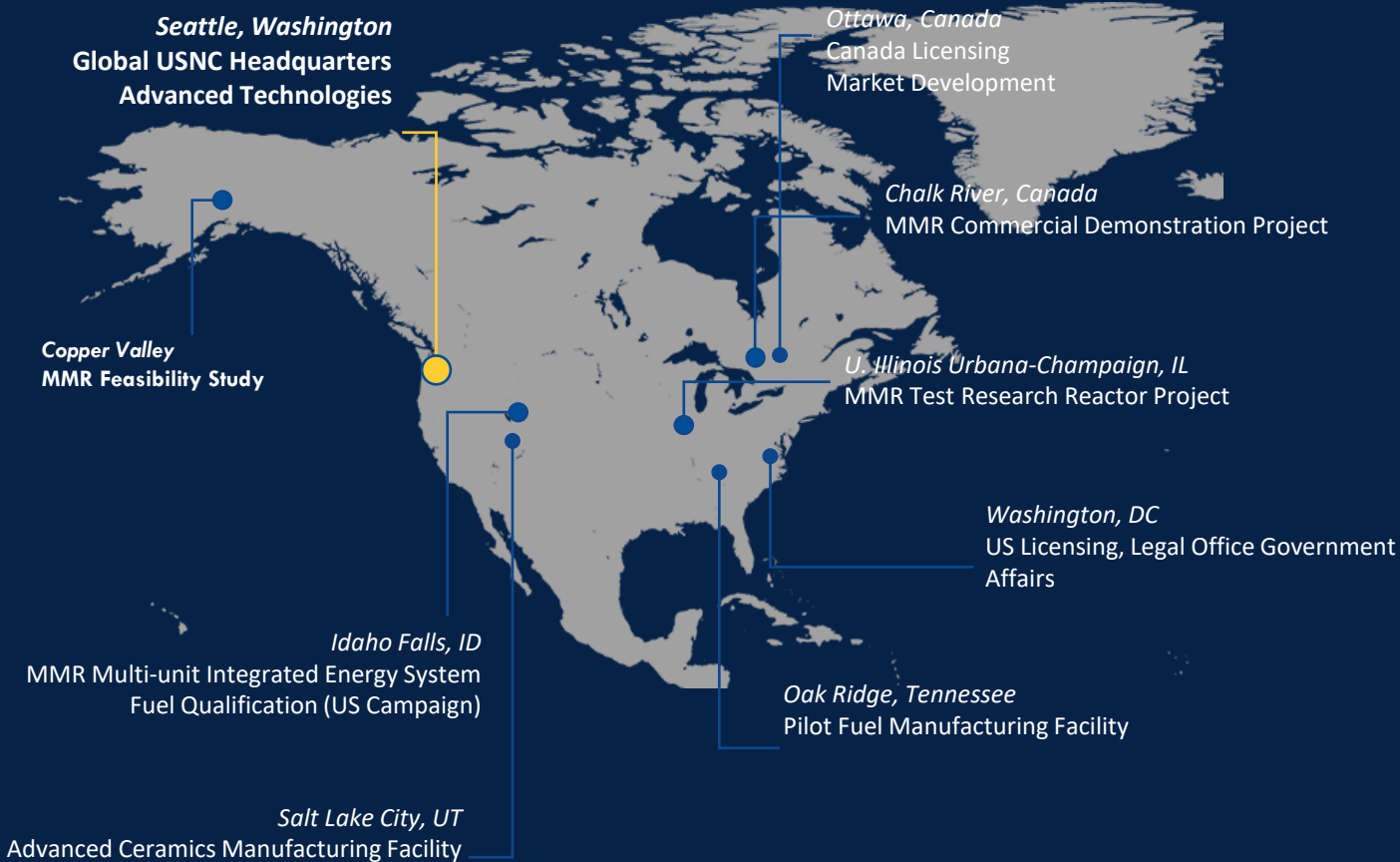
Founded

240+

Employees

2028

First MMR Demo

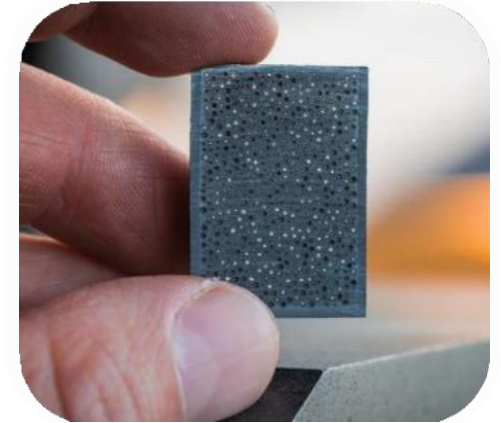
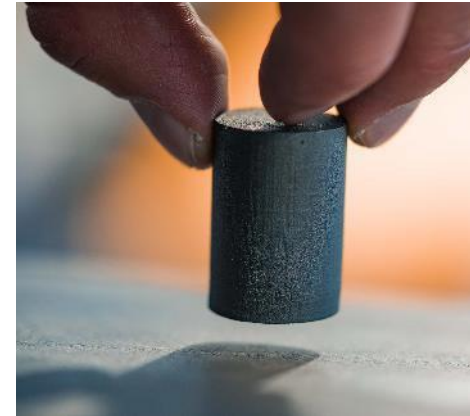


USNC Core Technology: Fully Ceramic Micro-encapsulated (FCM[®]) Fuel

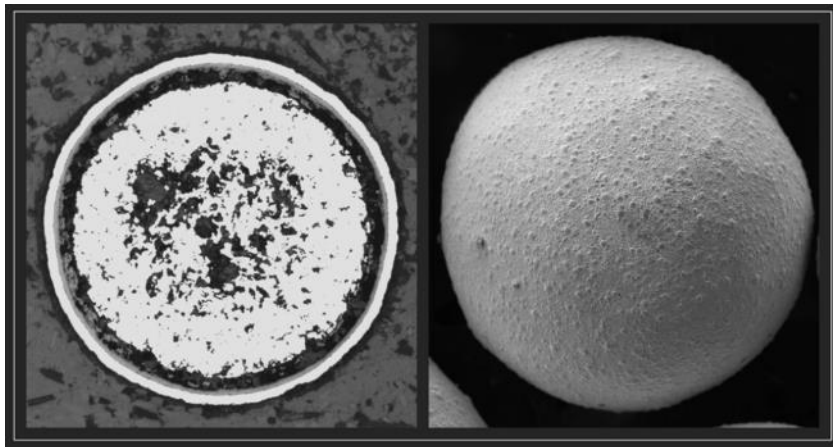
USNC's technology leverages our unique ceramics capabilities and expertise

FCM[®] Fuel – TRISO particles in a Silicon carbide matrix additively manufactured

Incredible fission product retention and high temperature operation



FCM fuel used in the MMR and Pylon Reactor



ZrC coated particle produced for NASA NTP



3DcarbideTM

One Stop Shop for Additive & Advanced Ceramics

We offer additive and advanced manufactured components for specialized applications on demand. Choose from 6 different ceramics.

SiC • ZrC • ZrO₂ • B₄C-SiC • ZrH_x • YH_x

[Submit Your Part](#)



Intrinsically safe nuclear power for
reliable zero-carbon energy anywhere

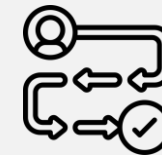
**Use Technology that
Scales from kW to MW**



**Maximize Overlap
Between Space and Earth**



**Ground Testing is
Essential**



FCM (particle fuel in UHTC matrix) and gas coolant enable scaling from kW to MW and 600 C to 1600 C outlet temperatures (even 3000 K...)

- MILLIWATT to GIGAWATT**
EARTH to SPACE

 - Synergetic ecosystem of nuclear energy products and services
 - Zero-carbon power. Minimal infrastructure required
 - Single systems from milli-Watts to Mega-Watts
 - All based on Ultra Safe principles & technologies
 - Shared design and fabrication resources



USNC is Deploying the Infrastructure Needed to Factory-Produce Nuclear Reactors by 2028

This is the same infrastructure we will/are using for our space nuclear systems. It is **NOT** funded by USG.

Pilot Fuel Manufacturing Facility (FCM and TRISO)



Advanced Ceramics Manufacturing Facility



We Make TRISO Today



Reactor Assembly Factory

Governor Ivey Announces Ultra Safe Nuclear Corp. Plans \$232 Million Micro-Reactor Assembly Plant in Gadsden, Creating 250 Jobs



MONTGOMERY – Governor Kay Ivey announced today that Ultra Safe Nuclear Corporation, (USNC) a Seattle-based company that's expanding micro-reactor technologies, plans to invest \$232 million to locate a facility in Gadsden to produce its industry-leading Micro-Modular Reactor.

USNC-Framatome JV for Fuel Manufacturing

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Framatome-USNC JV set to produce TRISO particles and FCM fuel

31 January 2023

Print Email



France's Framatome and US-based Ultra Safe Nuclear Corporation (USNC) are forming a joint venture to manufacture Tri-structural Isotropic (TRISO) particles and USNC's Fully Ceramic Micro-encapsulated (FCM) fuel. Framatome and USNC have signed a non-binding Heads of Terms Agreement to integrate their complementary resources to bring commercially viable fuel to market for advanced reactor designs.

USNC, headquartered in Seattle, is developing a Micro-Modular Reactor (MMR) and produces FCM nuclear fuel based on TRISO fuel particles. FCM fuel enhances safety through proprietary technology to embed TRISO particles in a silicon carbide matrix.

August 2022, USNC announced the opening of its Pilot Fuel Manufacturing (PFM) facility in Oak Ridge at the East Tennessee Technology Park (ETTP), to produce the first fuel for testing and qualification for use in its MMR.

Commercial Enriched Uranium Supply



UUSA will Supply Ultra Safe Nuclear Corporation with Enriched Uranium Product for Advanced Reactor Deployment

UUSA
01 March 2023

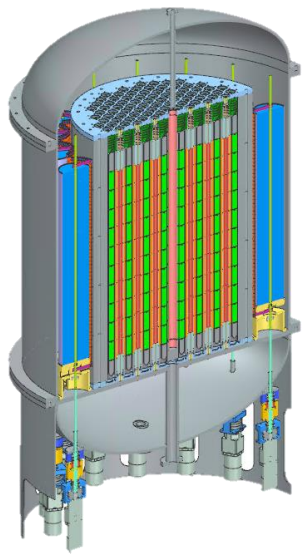
UUSA is excited to announce that we've entered into an enrichment services supply agreement with Ultra Safe Nuclear Corporation (USNC).

[Read more >](#)

Pylon is an architecture applicable to multiple markets, maximizing synergy.

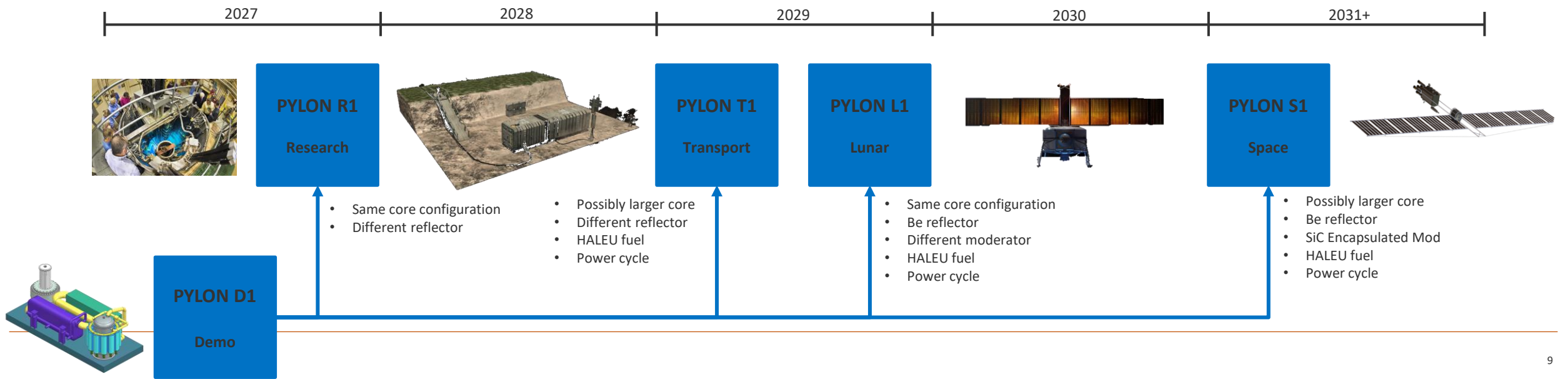
Overarching Characteristics

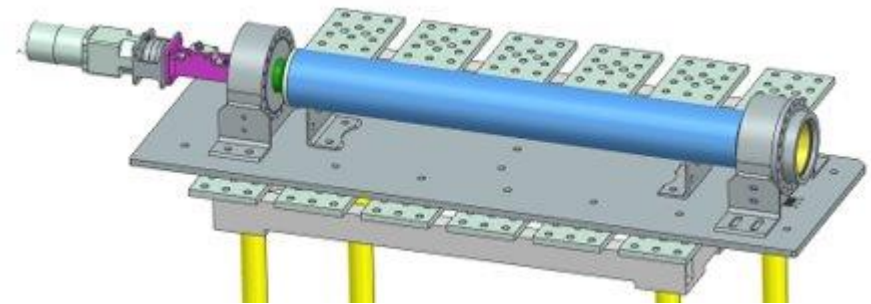
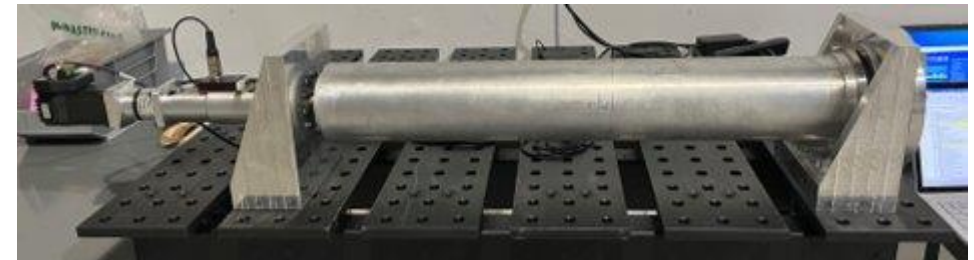
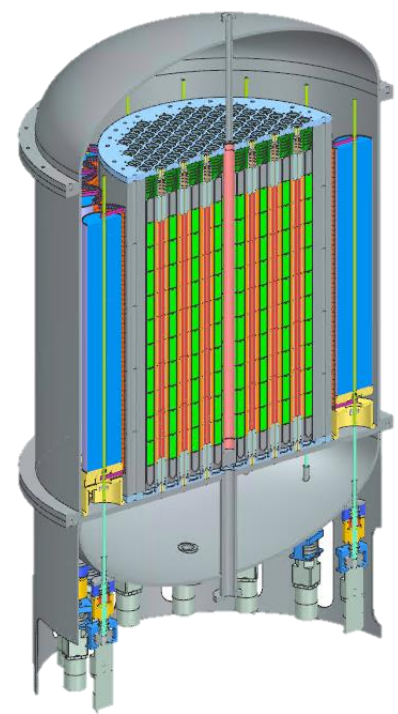
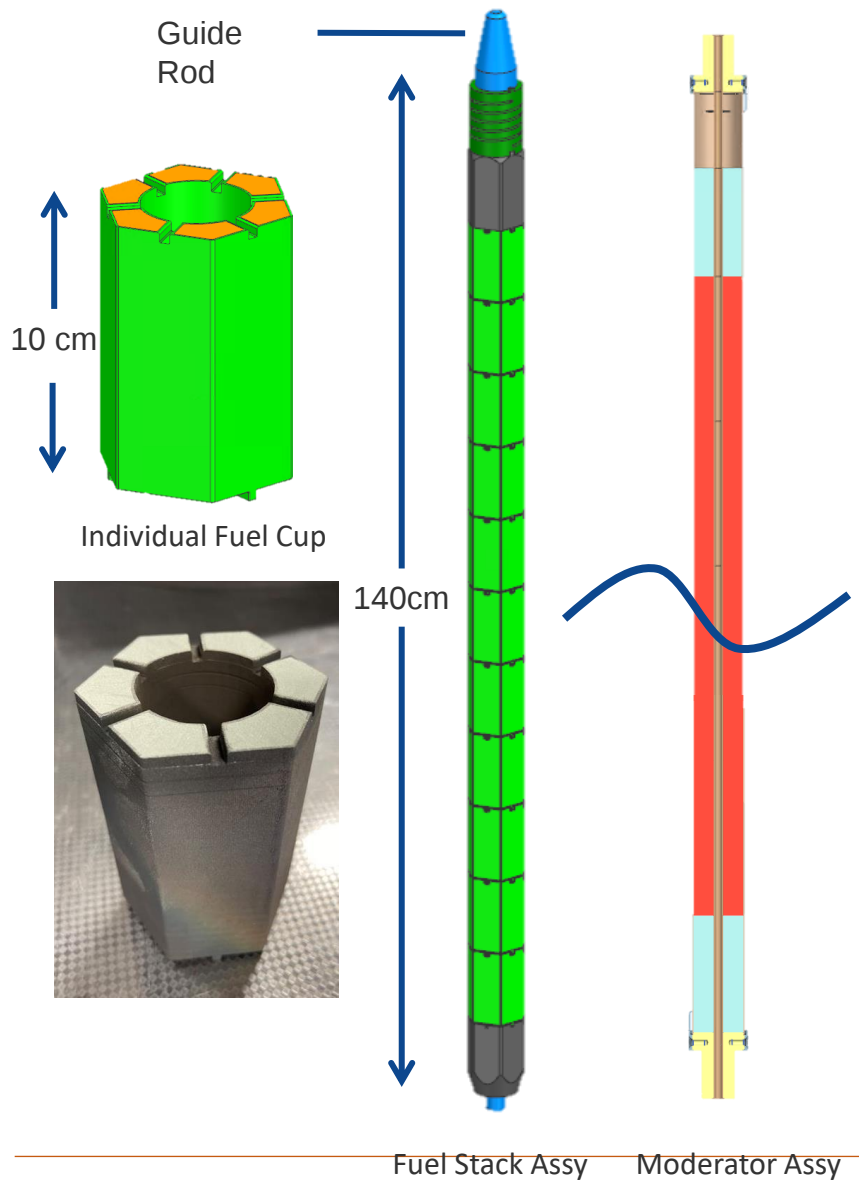
- FCM Fuel in geometry only possible with additive manufacturing
- Hydride moderator with regenerative cooling
- Gas coolant
- 9.9% U²³⁵ “LEU+” or 19.75% U²³⁵ HALEU
- Control drums and control rod for reactivity control



Development Philosophy

- Pylon D1 leverages extensive DOE investment and facilitations for a rapid and cost-effective technology demonstration.
- Use of MMR Fuel and systems enables leveraging of fuel irradiation and qualification and synergy with MMR design and licensing experience
- Start with low-hanging markets with straight-forward and achievable performance requirements and grow into larger and more aggressive applications





Zirconium Hydride 1.59 samples next to Zircaloy-4 control

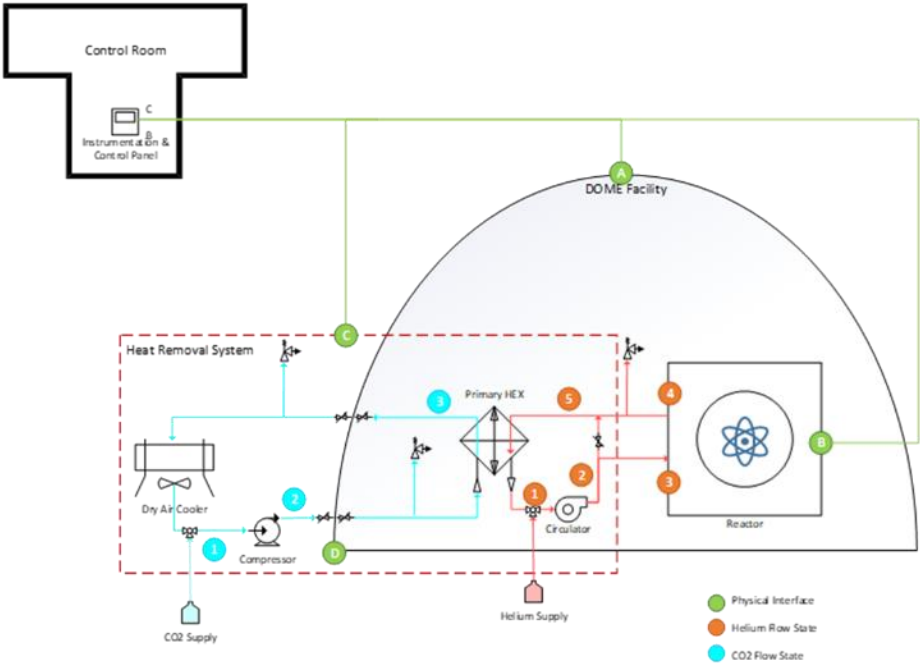
USNC is developing Pylon outside of the NASA FSP program using internal investment.

Program Overview

- A derivative reactor is being developed to be tested at the NRIC DOME facility at Idaho National Laboratory as early as possible (alternative sites are being considered):
 - **Verify licensability and key performance, operations, safety and cost aspects.**
- Reactor-focused: increase TRL of key nuclear technologies, minimize cost and schedule

Technical Performance Requirements

- Demonstration Requirements: 1 MWth @ 1000 K reactor outlet, 2.5MW-yr core energy
- Use of 9.9% Enriched U (LEU+) allows demo with **currently available fuel**
- Metal Hydride moderator



Pylon D1 1 MWth	Pylon T1 5-10MWth (1-3 MWe)
Graphite Reflector Lower-Cost	Beryllium Reflector Lower-Mass
9.9% Enriched (LEU+) Available Now	19.75% Enriched (HALEU) Available Soon
Helium based Heat Removal Focus on Nuclear Demo	He-Xe Brayton Power Cycle Focus on Strong Partnership

Some Programmatic Comments