



NextGen MURR
University of Missouri

NextGen MURR Radioisotope Processing Facility Design Approach

9-22-2026

**National Organization of Test, Research & Training Reactors
Annual Conference 2026**



NextGen MURR

University of Missouri

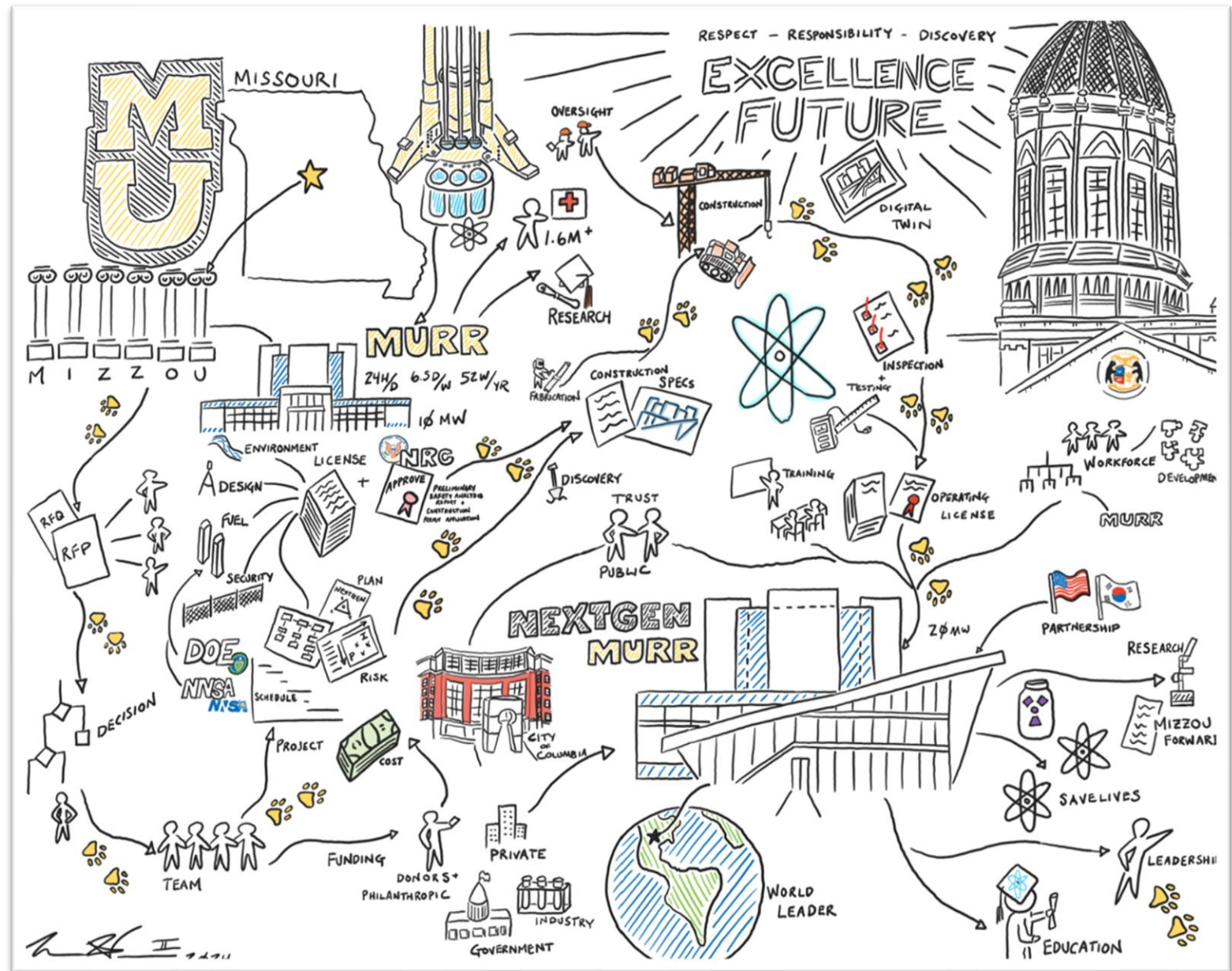
VISION:

The Nation's Center for Nuclear Excellence

Securing the world's most valued destination for nuclear science and technology opportunities and expanding the supply of critical materials for generations to come

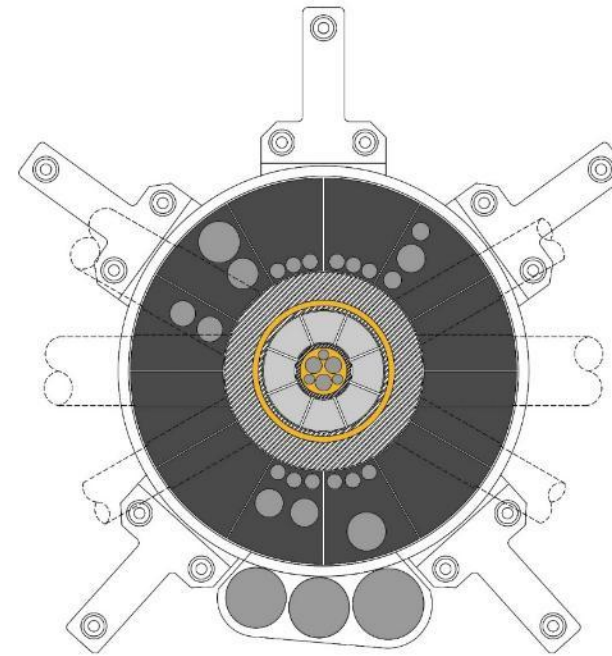
MISSION:

To establish a world-class center for nuclear excellence - advancing MURR's mission to positively impact society through leadership in nuclear science research, education, production of critical materials, and strategic partnerships to improve and save lives across Missouri, the nation, and the world.



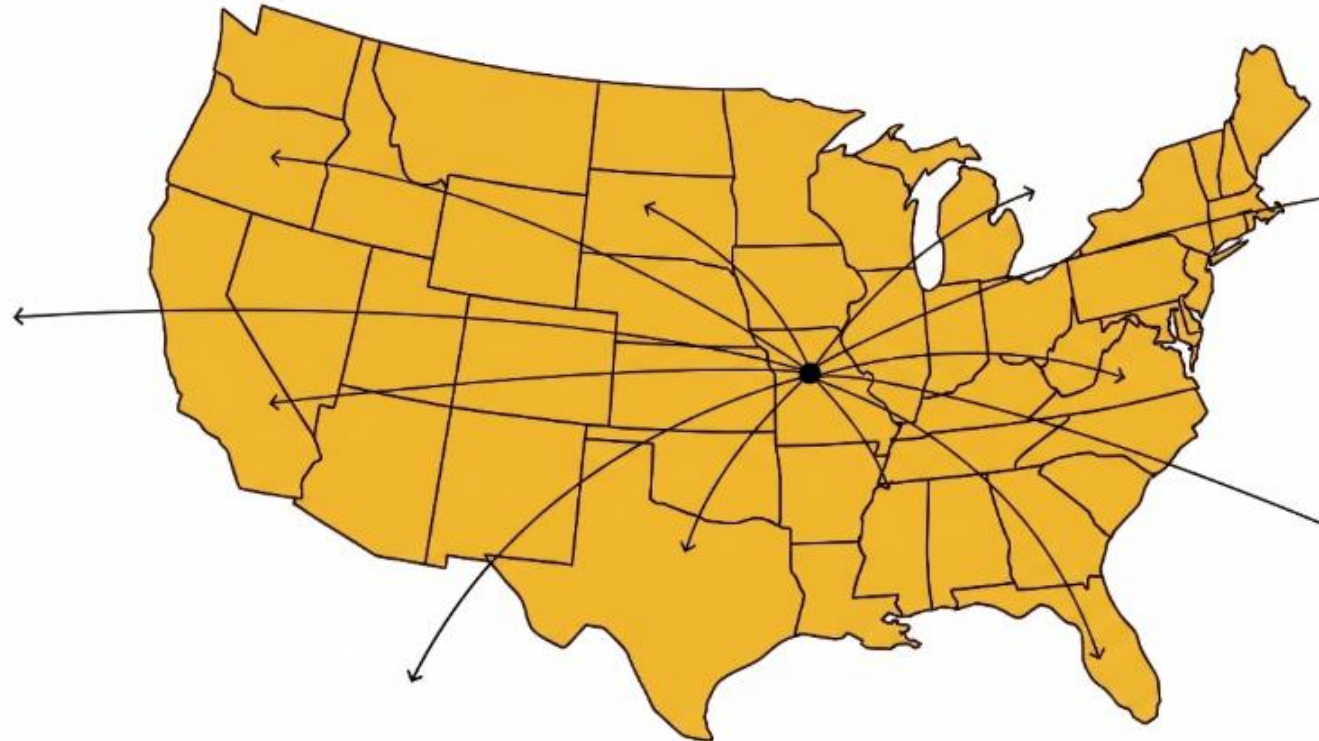
MURR is Unique in the World

- Operating power & design
 - 10 MW - Largest U.S. University Research Reactor
 - High peak flux (neutron intensity)
- Schedule
 - 24 hours a day
 - 6.5 days a week
 - 52 weeks per year
- Radioisotope Expertise
- Sole U.S. source of certain lifesaving cancer-fighting drugs



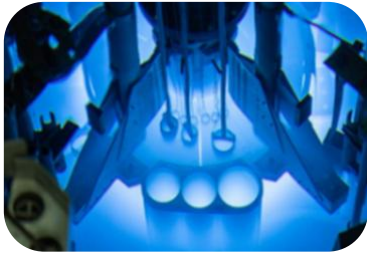
MURR is Unique in the U.S. and the World

- Nation's only domestic supplier of multiple critical medical isotopes.
- Central location + 52-week operating schedule ensures reliable access for patients.





Benchtop to Bedside Radiopharmaceutical Science



MURR



**Molecular Imaging
and Theranostics
Center**



**College of
Veterinary
Medicine**



**School of
Medicine**



**Roy Blunt NextGen
Precision Health
Building**



**Ellis Fischel
Cancer Center**



***Future:
Radioisotope
Science Center***



***Future:
NextGen
MURR***

NextGen MURR

Vision – Initial Design Concepts



MURR >>> NextGen MURR

NextGen MURR

- Higher power (20 MW+)
- Higher capacity for isotope production
- State-of-the-art neutron guide hall
- Expandable ecosystem concept

MURR

- Reliable reactor operating 52 weeks/year at 10MW
- Strong position as only US supplier of multiple medical isotopes with vibrant nuclear medicine ecosystem
- Strong position in neutron beam and other research

1. US medical isotope leader

Save and improve lives through expanded nuclear medicine pipeline and production

2. National nuclear science and research facility

Expand neutron beam and nuclear science research capabilities

3. Secure new US supply chains

Expanded industry collaboration with new silicon + industrial isotope production capabilities

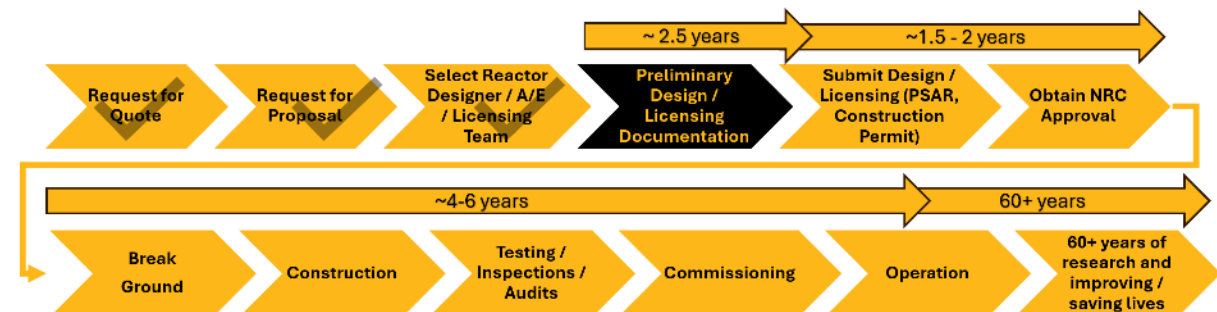
4. Developing the next generation nuclear leaders

Through education, research and workforce development

“NextGen MURR represents our commitment to research that changes lives. It will allow Mizzou to lead the nation in producing critical medical isotopes while opening new frontiers in science, engineering and patient care.” – President Mun Choi

NextGen MURR – Pre-Conceptual Design

- 20 MW+ Research Reactor
 - Risk Informed 104(c) Licensing
- High Peak Thermal Flux
 - $>5 \times 10^{14} \text{ n/cm}^2/\text{s}$
- At least 2x+ high flux capacity of MURR
- 52-week operation schedule
 - Short Outage Duration
- Neutron Guide Hall
 - 15-20 Neutron Beam Instruments
- Conservative design with HALEU fuel
 - Higher density Flat Plate U_3Si_2
- Integrated Nuclear Ecosystem
 - 220+ Acre Site Secured
 - Site Partner Opportunities







Facility List

1. Reactor Building
2. Reactor Auxiliary Building
3. Neutron Research Building
4. Radioisotope Processing Facility (RPF) Building with Shipping
5. Warehouse with General Shipping and Receiving
6. Research Building
7. Hot Machine Shop
8. Radioactive Waste Building
9. Service Gas Storage House
10. Stack
11. Chiller & Boiler Building
12. Cooling Tower for Chiller
13. Backup Power Generator Building with Fuel Storage Tank
14. Demineralized Water, Wastewater Treatment, and Pump Building
15. Cooling Tower for Secondary Coolant System
16. Water Tank and Sump Area
17. Fire Water Pump House
18. Fire Water Tank Area
19. Electrical Facilities Building
20. Substation
21. Administrative Building
22. Access Control Station
23. Cold Machine Shop
24. Training Center
25. Inside Fence Site Partner Space
26. Outside Fence Site Partner Space
27. Tornado Shelter



Facility List

1. **Reactor Building**
2. **Reactor Auxiliary Building**
3. **Neutron Research Building**
4. **Radioisotope Processing Facility (RPF) Building with Shipping**
5. **Warehouse with General Shipping and Receiving**
6. **Research Building**
7. **Hot Machine Shop**
8. **Radioactive Waste Building**
9. **Service Gas Storage House**
10. **Stack**
11. **Chiller & Boiler Building**
12. **Cooling Tower for Chiller**
13. **Backup Power Generator Building with Fuel Storage Tank**
14. **Demineralized Water, Wastewater Treatment, and Pump Building**
15. **Cooling Tower for Secondary Coolant System**
16. **Water Tank and Sump Area**
17. **Fire Water Pump House**
18. **Fire Water Tank Area**
19. **Electrical Facilities Building**
20. **Substation**
21. **Administrative Building**
22. **Access Control Station**
23. **Cold Machine Shop**
24. **Training Center**
25. **Inside Fence Site Partner Space**
26. **Outside Fence Site Partner Space**
27. **Tornado Shelter**



Facility List

1. **Reactor Building**
2. **Reactor Auxiliary Building**
3. **Neutron Research Building**
4. **Radioisotope Processing Facility (RPF) Building with Shipping**
5. **Warehouse with General Shipping and Receiving**
6. **Research Building**
7. **Hot Machine Shop**
8. **Radioactive Waste Building**
9. **Service Gas Storage House**
10. **Stack**
11. **Chiller & Boiler Building**
12. **Cooling Tower for Chiller**
13. **Backup Power Generator Building with Fuel Storage Tank**
14. **Demineralized Water, Wastewater Treatment, and Pump Building**
15. **Cooling Tower for Secondary Coolant System**
16. **Water Tank and Sump Area**
17. **Fire Water Pump House**
18. **Fire Water Tank Area**
19. **Electrical Facilities Building**
20. **Substation**
21. **Administrative Building**
22. **Access Control Station**
23. **Cold Machine Shop**
24. **Training Center**
25. **Inside Fence Site Partner Space**
26. **Outside Fence Site Partner Space**
27. **Tornado Shelter**

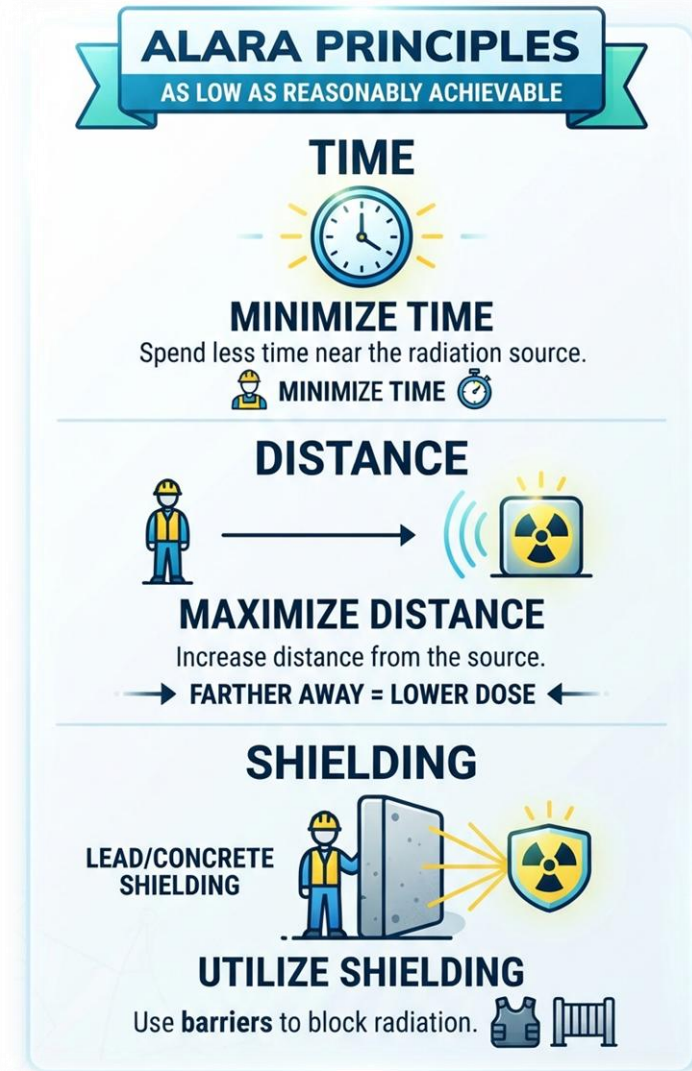


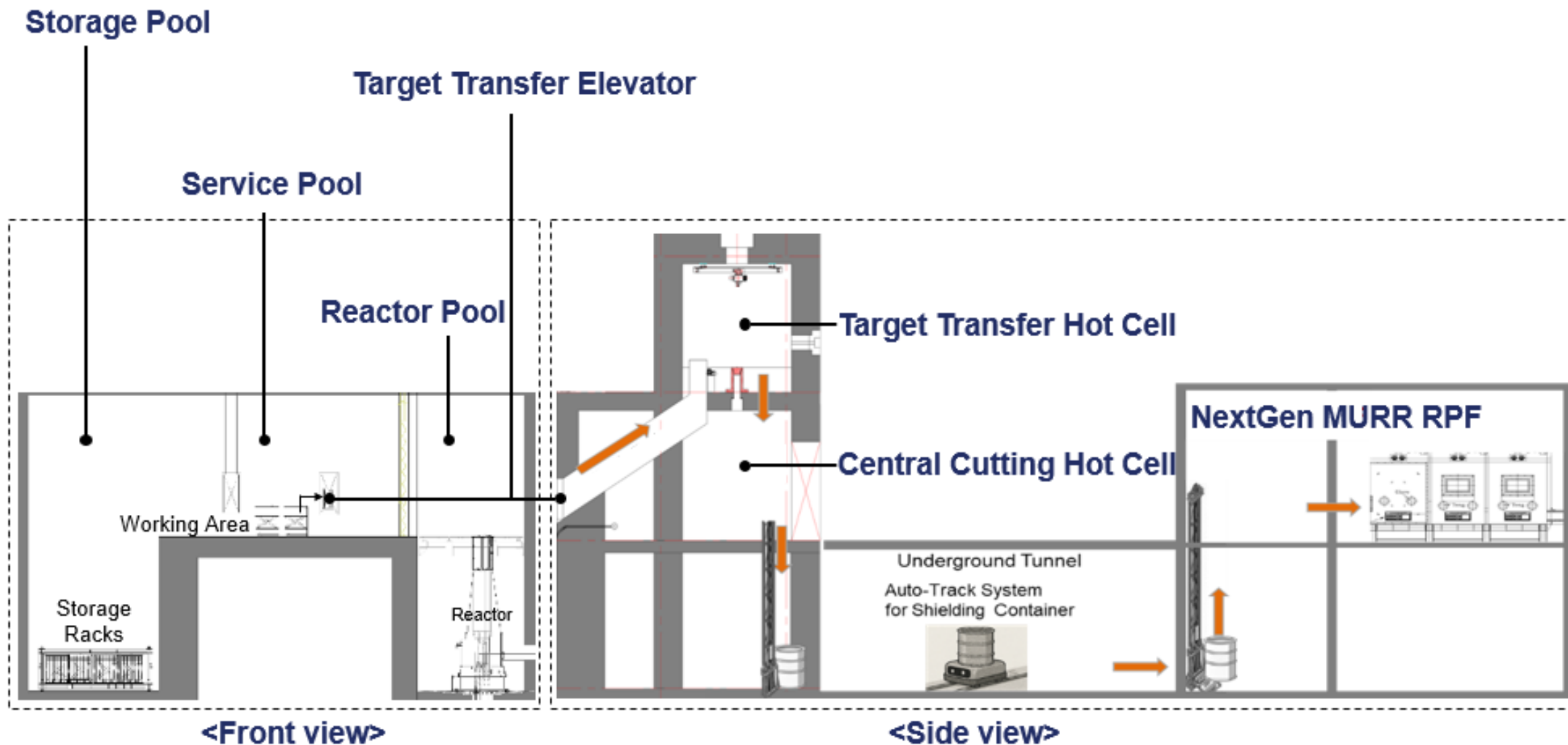
Facility List

1. **Reactor Building**
2. **Reactor Auxiliary Building**
3. **Neutron Research Building**
4. **Radioisotope Processing Facility (RPF) Building with Shipping**
5. **Warehouse with General Shipping and Receiving**
6. **Research Building**
7. **Hot Machine Shop**
8. **Radioactive Waste Building**
9. **Service Gas Storage House**
10. **Stack**
11. **Chiller & Boiler Building**
12. **Cooling Tower for Chiller**
13. **Backup Power Generator Building with Fuel Storage Tank**
14. **Demineralized Water, Wastewater Treatment, and Pump Building**
15. **Cooling Tower for Secondary Coolant System**
16. **Water Tank and Sump Area**
17. **Fire Water Pump House**
18. **Fire Water Tank Area**
19. **Electrical Facilities Building**
20. **Substation**
21. **Administrative Building**
22. **Access Control Station**
23. **Cold Machine Shop**
24. **Training Center**
25. **Inside Fence Site Partner Space**
26. **Outside Fence Site Partner Space**
27. **Tornado Shelter**

Optimized Flow Paths

- Take advantage of large greenfield site
 - Design site layout with room for expansion
- Implement As Low As Reasonably Achievable (ALARA) principles
 - Separate personnel flow from radiological material flow
 - Each radiological / non-radiological boundary shall have monitoring equipment
- Implement Good Manufacturing Practice (GMP) principles
 - Separate GMP material flow from radiological material flow
 - Separate GMP material flow from waste flow
 - Separate GMP material flow from cardboard / wood
 - Each classified / unclassified barrier shall have an ante room & gowning space



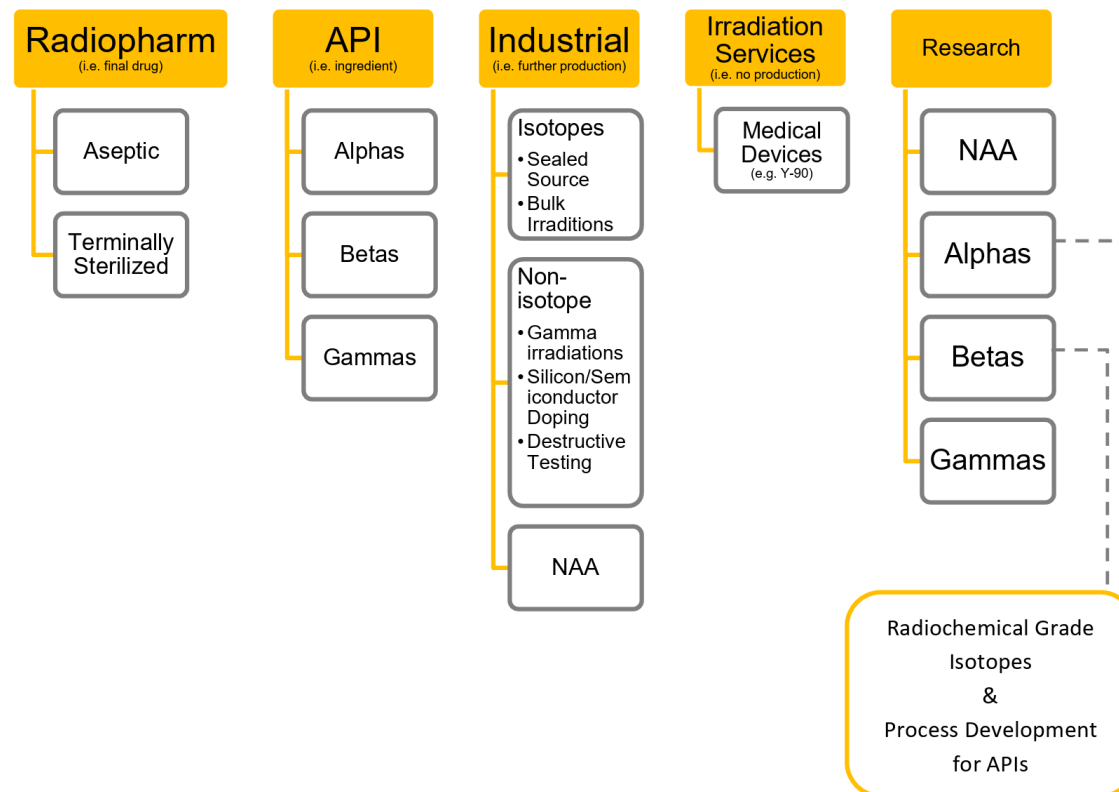


RPF Constraints

- RPF must be expandable
 - No large internal facility that is sized for the lifetime of NGM
- RPF design must align with applicable regulation
 - 10 CFR Part 50.21 Class 104(c)
 - 10 CFR Part 33 Broad Scope Byproduct Material License
 - U.S. Food and Drug Administration (FDA) Good Manufacturing Practice (GMP)
- RPF will have API production performed in dedicated product lines
- Alpha emitter handling and processing should be performed in isolated areas
- Security must be considered when designing RPF / Reactor Building interface

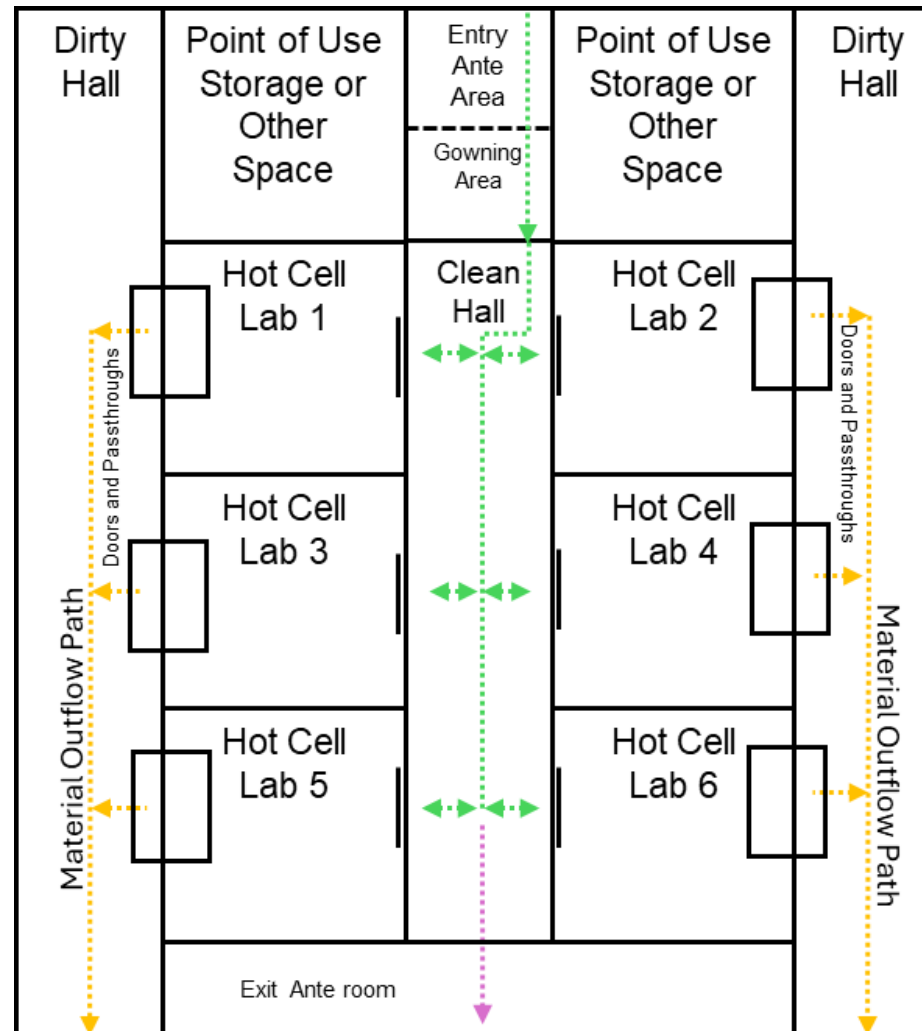
NGM Product Groupings

- NGM designed to support multiple areas:
 - Nuclear science and research
 - Irradiation services
 - Radioisotope handling and processing
 - Radiopharm
 - NTD Silicon
- Focus on adaptability...future proofing

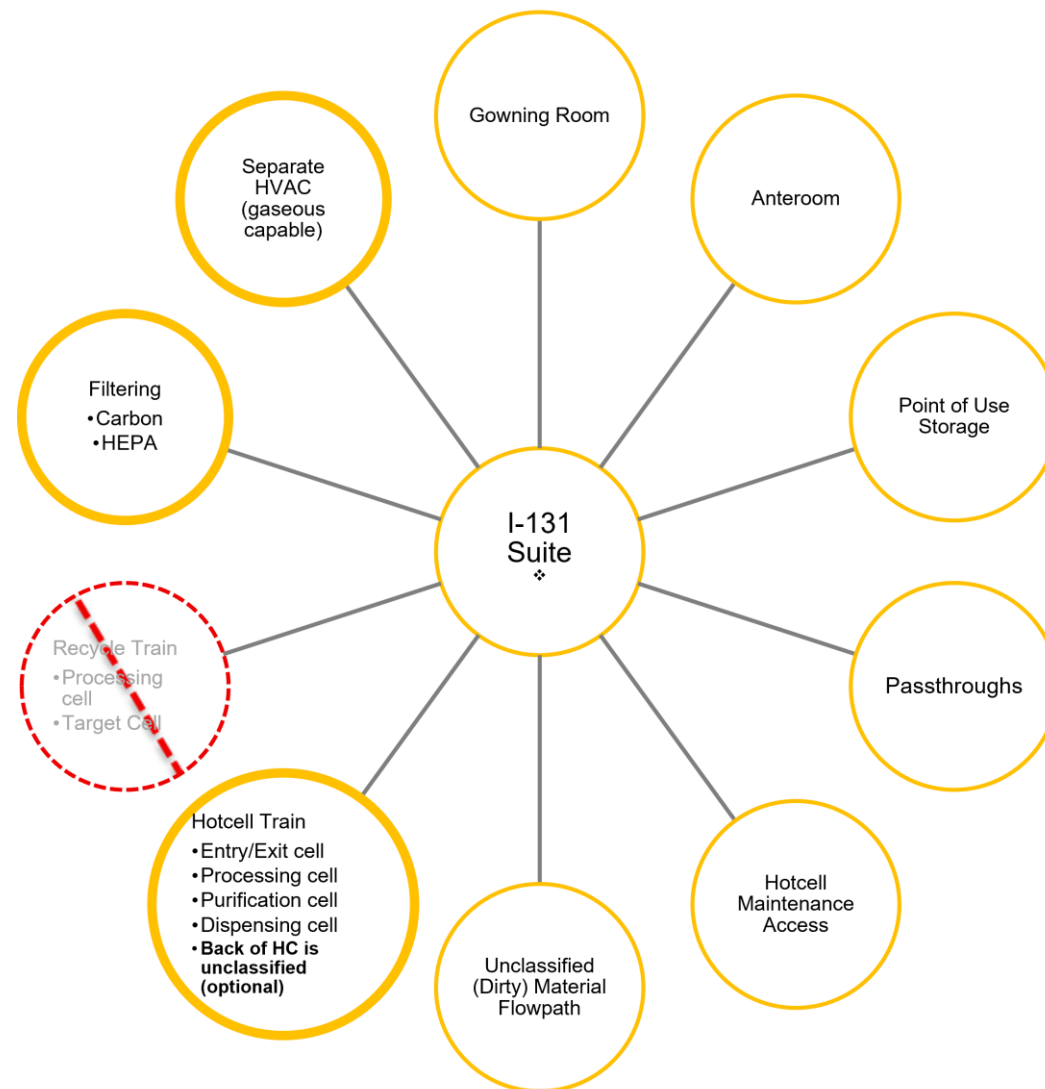


RPF Module

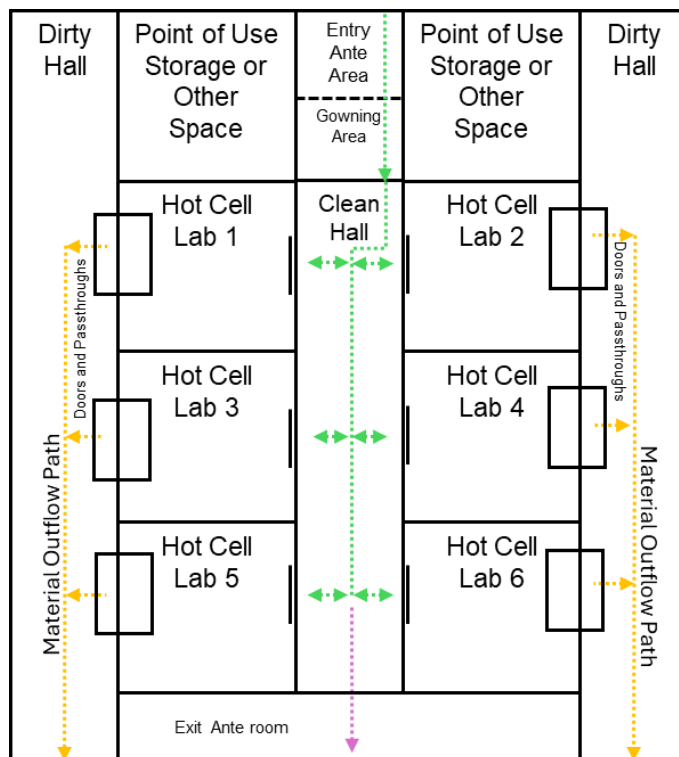
- A group of rooms used for production or research
- Has a footprint that can be reused
- May be modified to fit specific product or research type
- HVAC and other utilities may be modularly integrated for ease of expansion
- Interfaces with Common Areas / Functions
 - Shipping, receiving, warehouse, calibration, machine shop, hot cell maintenance, waste handling, health physics, security, decontamination, laundry, etc.
- Includes large doors and passthroughs to support manipulator servicing and other maintenance



RPF Module Types

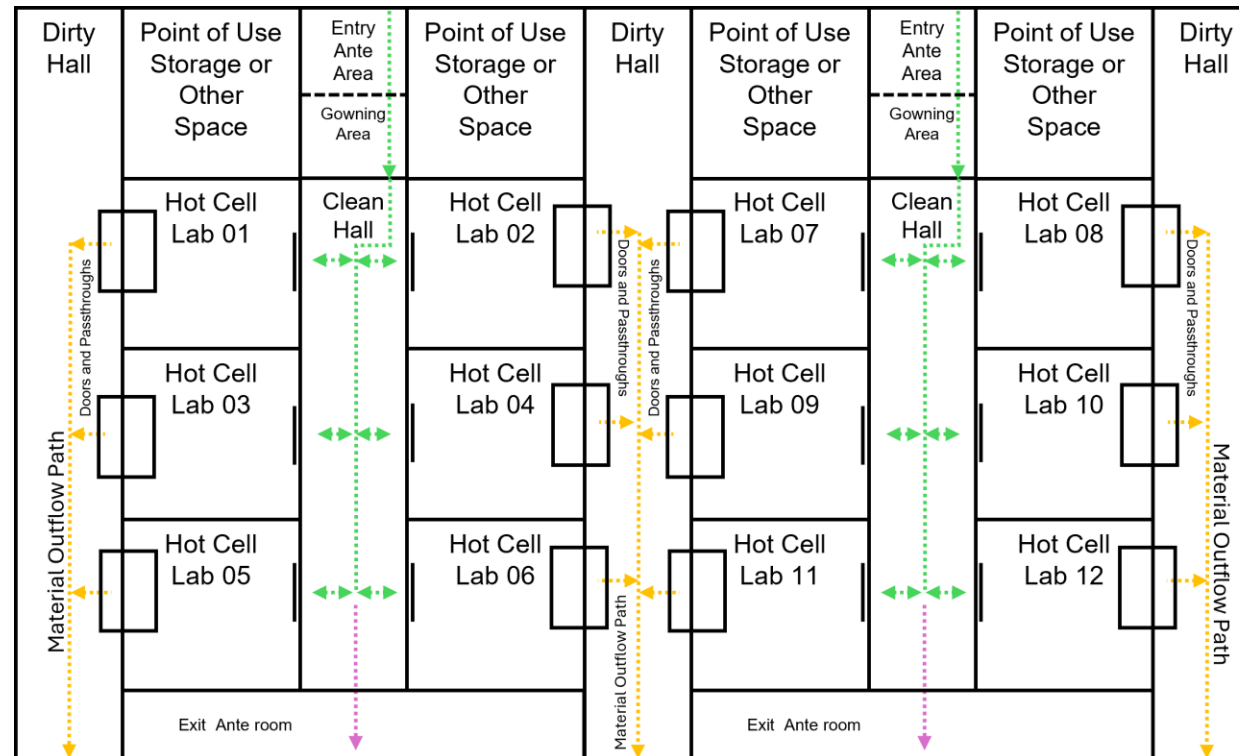


Modular, Expandable RPF



Scale with national need

Modular, Expandable RPF



Scale with national need

Lessons Learned

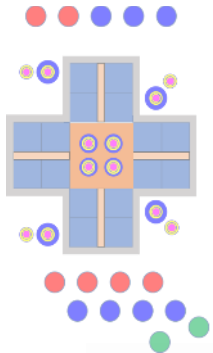
- More offices, meeting spaces, and breakrooms
- Locker rooms with showers
- One centralized decontamination area
- Centralized entry / exit for Radiation Controlled Area (RCA)
- Eliminate need for transfers between material and reactor licenses
- No hot work near entry / exits
- Have multiple dock doors for shipping and receiving
- Redundancy of vial/target washing hot cells
- Replicate RPF features in site partner buildings
- *Ability to use MURR facilities during early NGM operation period*



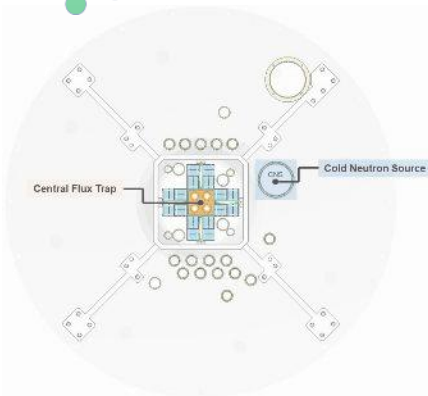
NextGen MURR: Integrated Nuclear Ecosystem



HALEU Fuel
($5.3 \text{ g/cm}^3 \text{ U}_3\text{Si}_2$)



Reactor Position Optimization:
Radioisotope + NTD
Silicon Production +
Nuclear Science



High Thermal Flux Volumes
($>\text{MURR}$)



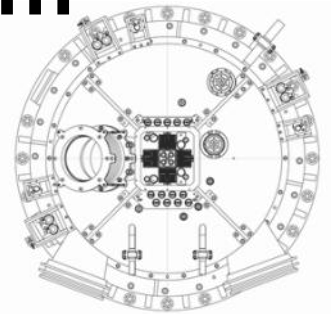
VISION:

The Nation's Center for Nuclear Excellence

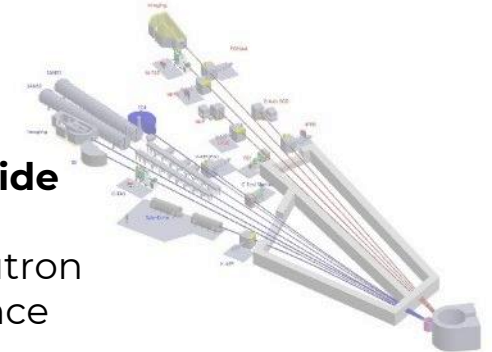
Securing the world's most valued destination for nuclear science and technology opportunities and expanding the supply of critical materials for generations to come

20+ MWth
104(c) License
8-10 Year Timeline

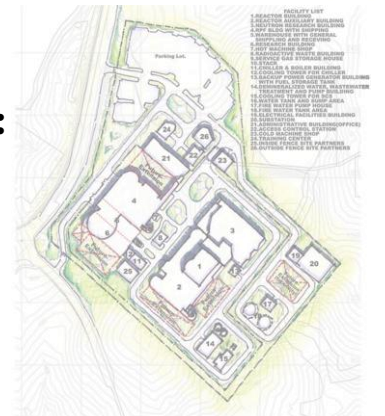
Cold and Thermal Guides



Neutron Guide Hall:
National Neutron Beam Science Facility



Optimized Site Layout:
Research, Guide Hall,
Radioisotope Processing,
Workforce Development



NextGen MURR will serve as an asset of national strategic significance in both radioisotope supply and research excellence.



NextGen MURR VISION:

The Nation's Center for Nuclear Excellence

Securing the world's most valued destination for nuclear science and technology opportunities and expanding the supply of critical materials for generations to come

NextGen MURR will serve as an asset of national strategic significance

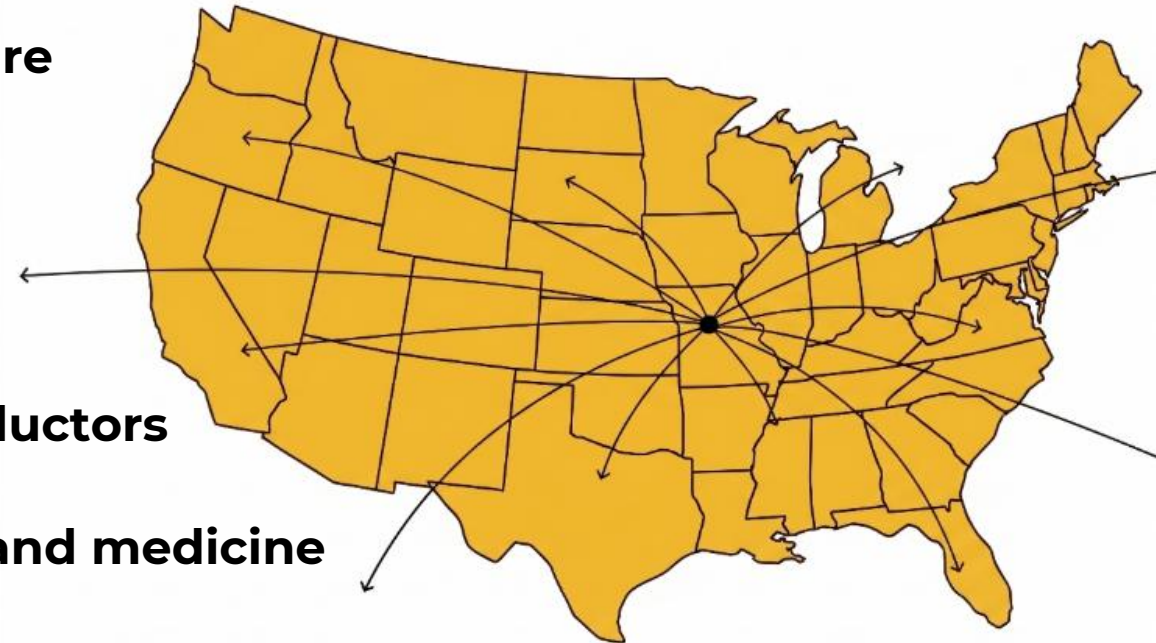
Strengthening national security of supply for the future

Develop the next generation nuclear workforce.

Ensure life-improving treatments for U.S. patients

Establish new domestic supply chains for semiconductors

Advance the U.S. research portfolio in technology and medicine





The University of Missouri's vision is to build upon the 60 years of safe, reliable, and innovative operation of the University of Missouri Research Reactor (MURR), to pursue a new, state-of-the-art, research reactor, NextGen MURR.

NextGen MURR will serve as an asset of national strategic significance in both radioisotope supply and research excellence.

NextGen MURR will secure the nations radioisotope supply, ensuring life-improving treatments are provided to U.S. patients, and will secure excellence within the nations research portfolio, leading the technological and medical advancements of the future.



NextGen MURR

University of Missouri

VISION:

The Nation's Center for Nuclear Excellence

Securing the world's most valued destination for nuclear science and technology opportunities and expanding the supply of critical materials for generations to come

MISSION:

To establish a world-class center for nuclear excellence - advancing MURR's mission to positively impact society through leadership in nuclear science research, education, production of critical materials, and strategic partnerships to improve and save lives across Missouri, the nation, and the world.

