



# The Vision of NextGen MURR Update

Joint IGORR 22<sup>nd</sup> / IAEA Technical Meeting

17 June 2025

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Dr. Kyoungwoo Seo - KAERI



# NextGen MURR

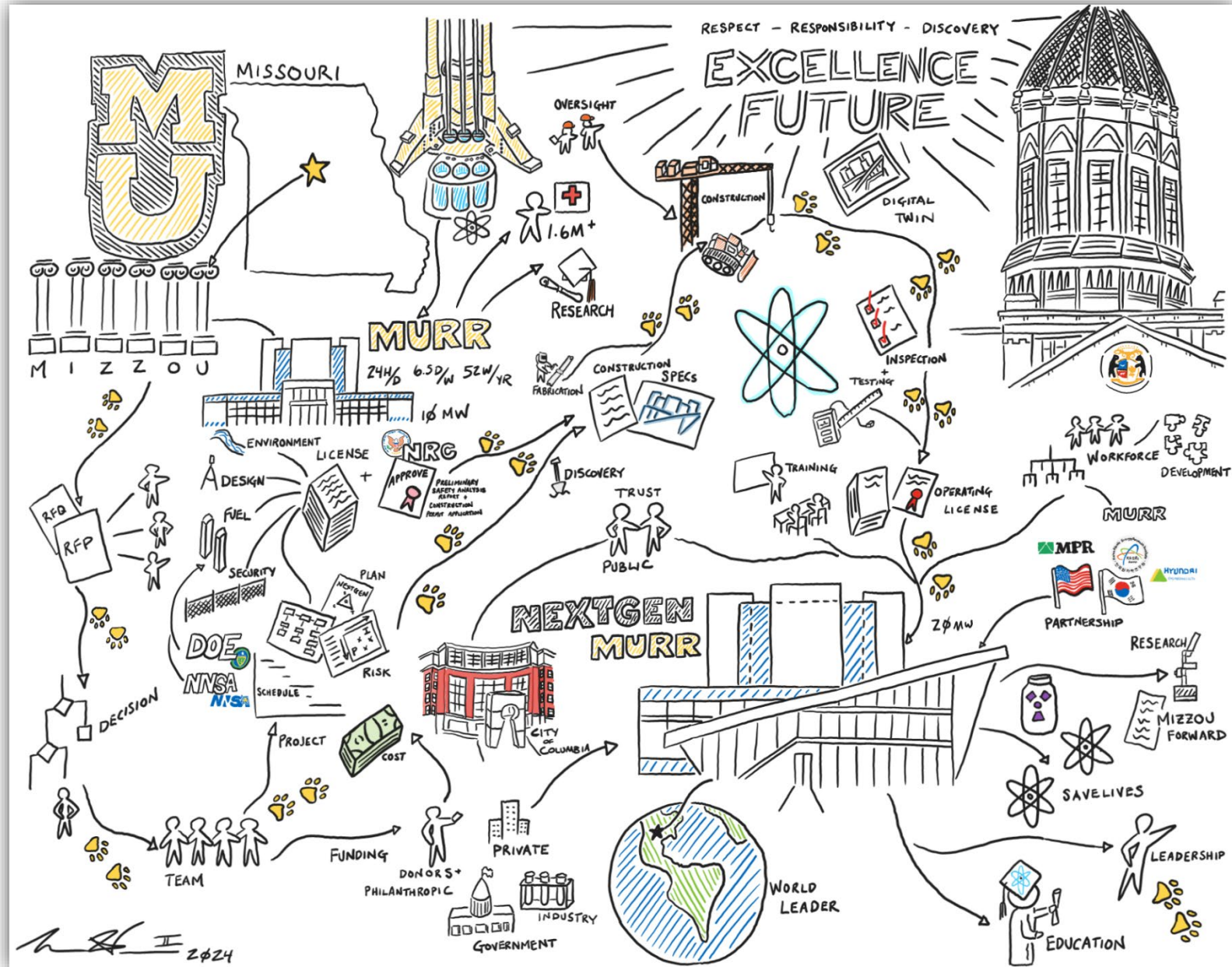
University of Missouri

## VISION:

Leader in radioisotope production and nuclear science and technology research in the western hemisphere.

## MISSION:

Mizzou's transformational initiative to license and build a new state-of-the-art reactor and establish an integrated nuclear ecosystem to more than triple Mizzou's medical isotope production and provide world leading nuclear science and technology research.





*"You can't really know where you are going  
until you know where you have been."*

*Maya Angelou*

# MURR

## University of Missouri Research Reactor (MURR)

Background

Vision + Mission



# MURR: Background

- **Largest University Research Reactor in the United States**
- Started Operation 1966
- 10 MW open pool, light water reactor
- Cylindrical vessel w/ central flux trap
  - Peak flux  $4.5 \times 10^{14}$  n/cm<sup>2</sup>/s
- 6 beam ports - Neutron Research
- World Class Operating Schedule
  - Operates 24 hours / day
  - 6.5 days / week
  - 52 weeks / year
- **Only U.S. supplier of multiple radioisotopes used to treat cancer.**
  - Treated over 450,000 patients 2024



Research  
&  
Development

Education

**Our Core  
Missions:  
Research  
&  
Education**

Economic  
Development

Reactor  
Operations





# MURR Vision and Mission

- **Vision:**

The world's most valued destination for nuclear science and technology opportunities.

- **Mission:**

Positively impact society through expertise in nuclear science research, education, and partnerships to improve and save lives across Missouri and the world.

## University of Missouri: Benchtop to Bedside Radiopharmaceutical Science



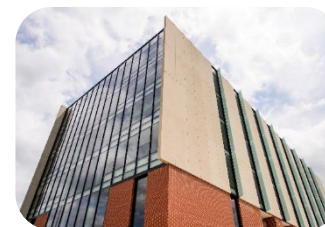
MURR / MURR West



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  
University of Missouri

# NextGen MURR

NextGen MURR Initiative  
Initial Design Concepts



# MURR >>> NextGen MURR Transformation

## MURR to NextGen MURR Transformation ...

- 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

**NextGen  
MURR**

- Higher power (20 MW+)
- Higher capacity for medical isotopes
- State-of-the-art neutron beam guide hall

1. **US leader in medical isotopes** expand position as US irradiator, build pipeline of products, expand eco system
2. **National facility for neutron beam science** become a national research facility for neutron beam research, solidifying available capacity
3. **Developing the next generation of 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 - Initial Design Concepts

- 20 MW+ Research Reactor
  - Risk Informed 104c Licensing
- High Peak Flux
  - $5 - 10 \times 10^{14} \text{ n/cm}^2/\text{s}$
- 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







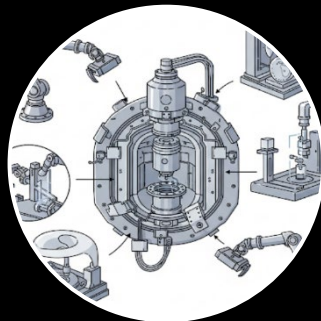
# NextGen MURR – RAISE Philosophy

- **R**eliable
- **A**daptable
- **I**nnovative
- **S**afe
- **E**fficient



## Reliable

- Operate ~52 Weeks / Year
- Redundancy / Diversity
- Maintainability
- Replaceability



## Adaptable

- Ability to Modify / Alter
- Focus on Future-Proofing
- Minimum Provisions
- Expandable



## Innovative

- Integrated Research
- Education / Training Focus
- New Technologies
- Digital Twin
- Advanced Capabilities
- High Flux
- Neutron Scattering



## Safe

- Nuclear Safety = Top Priority
- Health and Safety of the Public
- ALARA design principles



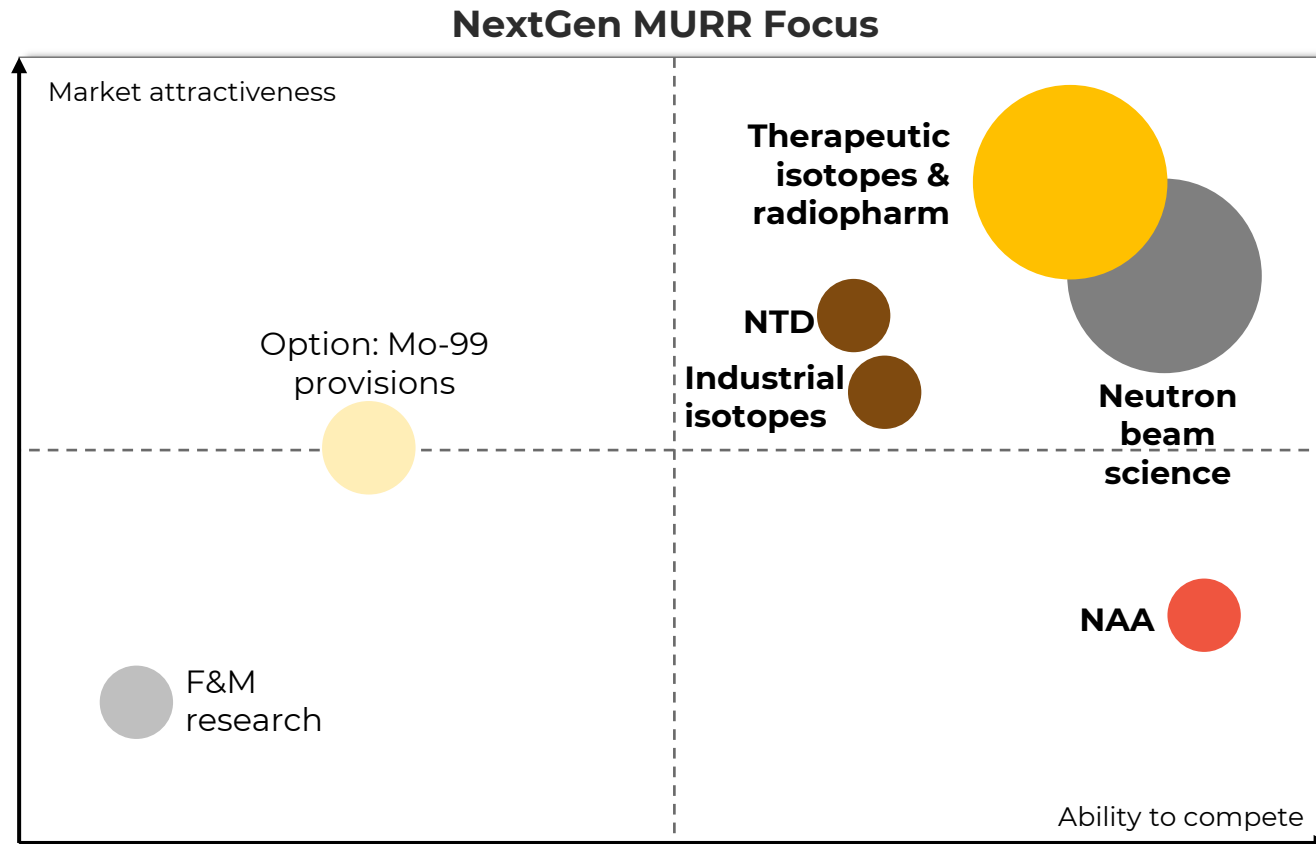
## Efficient

- Economical / Affordable
- Optimized Work-Flows
- Increased Automation
- Design Simplicity
- Optimal Fuel Usage



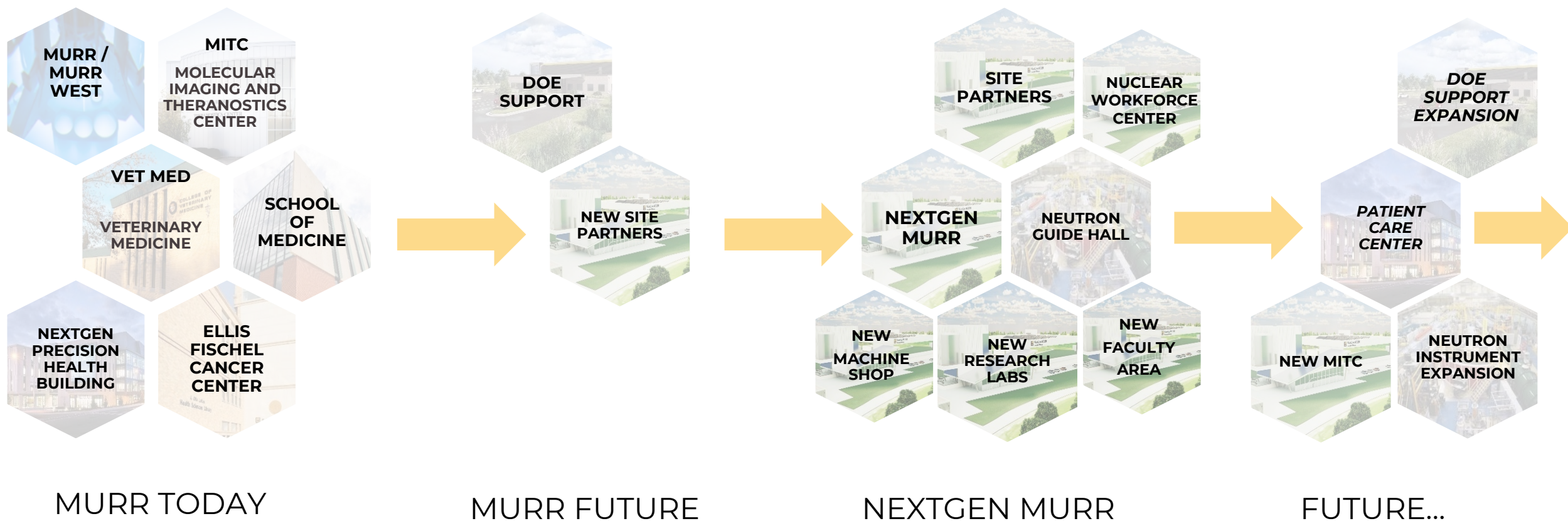


# NextGen MURR Focus – Market Analysis



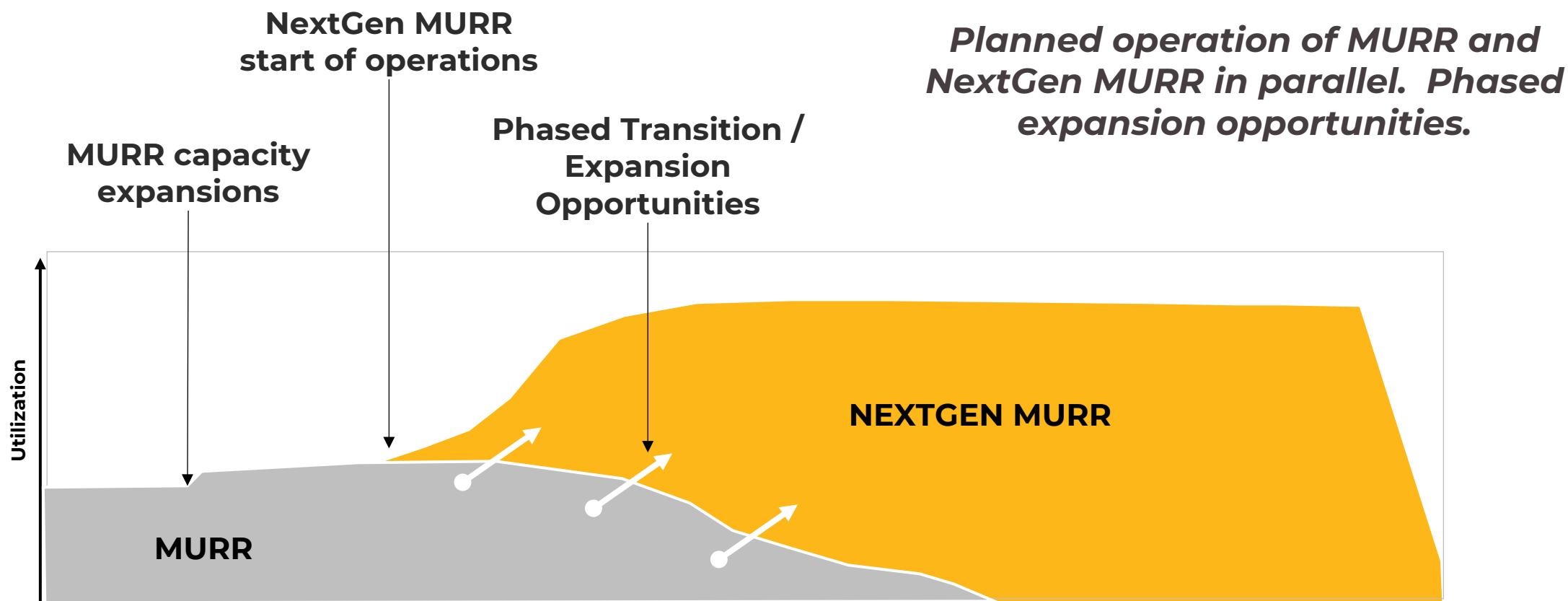
- **Therapeutic isotopes & radiopharm**  
Secure US-based supply for growing demand  
Partner for radiopharm companies along life cycle
- **Neutron beam science**  
Largest national user facility on university campus
- **Industrial isotopes**  
US supplier for non-destructive testing sector
- **Neutron Transmission Doping**  
US supplier in strategically important sector
- **Neutron Activation Analysis**  
Support wide range of research applications and development of new energy solutions and therapies
- **Fuel & Materials research**  
Research will be in scope as opportunities emerge
- Post Irradiation Examination included in Ecosystem
- **Molybdenum-99**  
Not in scope but provisions may be included if partners are willing to invest

# NextGen MURR Ecosystem - Phased Expansion



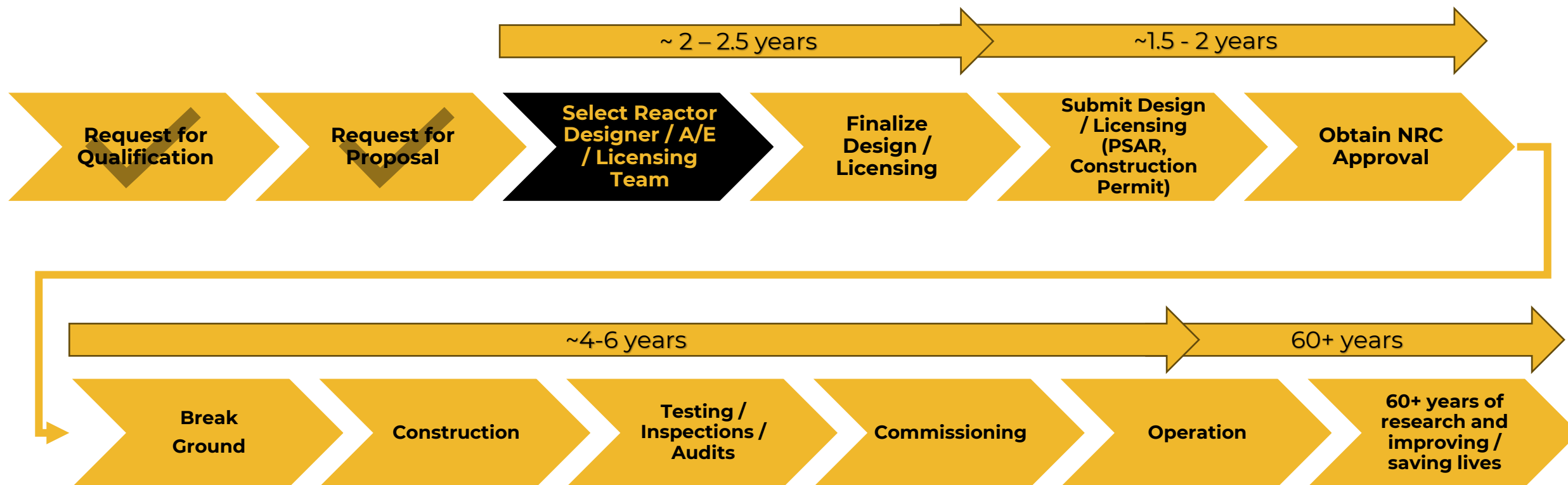


# MURR + NextGen MURR Ecosystem Integration





# NextGen MURR - Timeline







# NextGen MURR Design Studies Phase

Contract Signing  
Overview



## NextGen MURR: Design Studies Phase

- NextGen MURR initiative officially underway
  - April 16 – Signing Ceremony
  - May 20 – Design Studies Phase Kick-off
- Scope – NextGen MURR Roadmap:
  - Programming Studies
  - Preliminary Site Evaluations
  - Develop Cost/Schedule Estimate
- Duration:
  - 6 Months



“The new reactor will be designed to meet the needs of the future...it’s a strategic national asset in the making.”



NextGen MURR  
University of Missouri

# NextGen MURR Consortium

New Nuclear Partner

KAERI – HEA/HEC – MPR Associates



## KAERI KOREA ATOMIC ENERGY RESEARCH INSTITUTE

- At the forefront of nuclear advancement, where top-tier engineering meets groundbreaking science.
- Proven proficiency in developing and design research reactors:
  - HANARO
  - Jordan Research and Training Reactor
- KAERI will **serve as the Reactor Designer and serve as the Design Authority** for NextGen MURR.



*KAERI's exceptional experience in design, development and use of research reactors will bring the vision of NextGen MURR into reality.*



## HYUNDAI ENGINEERING CO., LTD.

- Globally renowned company offering superior engineering, procurement and construction services to customers worldwide.
- Performed nuclear engineering and licensing support for research reactors, commercial power plants and nuclear fuel cycle facilities for 40 years.
- HEC will **serve as an integration hub and lead the architectural and engineering design efforts** for NextGen MURR







## MPR Associates

- Over 60 years of U.S. nuclear experience
- MPR will **lead the regulatory and licensing activities** and **support regulatory engagement** for NextGen MURR.





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