

# Reduced Enrichment for Research and Test Reactors (RERTR) Program

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# Mission Statement

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**The RERTR program supports the minimization and, to the extent possible, elimination of the use of HEU in civil nuclear applications by working to convert research and test reactors and radioisotope production processes to the use of LEU fuel and targets throughout the world.**

# RERTR Mandates & Commitments

- **The RERTR program gained two new DOE secretarial mandates when it was integrated into the Global Threat Reduction Initiative (GTRI) in 2004:**
  - Assist with the conversion to LEU fuel of civil research reactors around the world, the program identifies 106 reactors as eligible for conversion
  - Convert all U.S. civil research reactors to LEU fuel by 2013
- **Security and Prosperity Partnership of North America (US- Canada-Mexico):**
  - The RERTR program has a U.S. presidential mandate to convert the six U.S. research reactors that can convert with currently available LEU fuel by 2011
- **The RERTR program has obtained increased funding and governmental support to meet its accelerated mission**
  - Increased ability to minimize the cost and impact of conversion to LEU fuel/targets for owners and operators
  - Authority to lead U.S. research reactor conversions

# RERTR & Threat Reduction

- **Works to ensure that conversion to LEU fuel and targets minimizes financial and scientific penalties on a facility, and uses program funds to defray the cost that may result from conversion activities.**
- **Funding is not used to cover the cost of continued operation of a facility.**
- **A reactor facility needs to demonstrate that they have a long-term mission, and must be responsible for funding the day-to-day costs of operating the facility.**
- **Reactor conversions are coordinated with GTRI fuel disposition programs to promote HEU minimization.**
- **Works either bilaterally or in coordination with the IAEA to facilitate reactor conversions.**

# Approach

The RERTR program has the overall objective of implementing reactor conversions to LEU fuel with the following directives:

- 1. Achieve fuel assembly criteria for LEU conversion for each reactor,**
  - LEU fuel provides a similar service lifetime as the HEU fuel;
  - There is no significant penalty in reactor performance;
  - Safety criteria are satisfied.
- 2. Achieve LEU fuel conversions without requiring major, if any changes in reactor structures or equipment,**
- 3. Demonstrate the conversion and subsequent operation can be accomplished safely, and**
- 4. Determine, to the extent possible, that the overall costs associated with conversion to LEU fuel do not increase the annual operating expenditure for the owner/operator.**

# Program Implementation

The RERTR program includes three main elements:

## 1. Conversion and Analysis

- Feasibility Studies and Operational & Safety Analyses
- Regulatory Assistance
- Reactor Analysis/Code Development
- Working with reactor operators to ensure that new reactors are designed to use LEU fuels
- Funding assistance for LEU fuel qualification and purchase

## 2. LEU Fuel Development

- Previous LEU fuel development efforts enabled the conversion of 42 additional reactors using currently qualified fuels
- Higher-density U-Mo LEU fuel will enable 19 additional reactors to convert

## 3. <sup>99</sup>Mo Target and Process Development

- Technical demonstration with LEU targets of all commercial processes
- Cooperation with commercial enterprises and developing producers

# Conversion and Analysis

## Recent Accomplishments

- **Reactor Conversions :**
  - Czech Republic VR-1
  - Netherlands HFR
  - Libya IRT-CA
- **Conversion Analysis:**
  - Libya
  - Vietnam
- **Fuel Contracts:**
  - University of Florida
  - Texas A&M

## Current Collaborations

- **International:**
  - Argentina
  - Bulgaria
  - Ghana
  - Hungary
  - Kazakhstan
  - Libya
  - Nigeria
  - Poland
  - Portugal
  - Russia
  - Uzbekistan
  - Vietnam
  - IAEA
- **Domestic:**
  - ATR (INL)
  - HFIR (ORNL)
  - MIT
  - NBSR (NIST)
  - Oregon State Univ.
  - Purdue Univ.
  - Texas A&M Univ.
  - Washington State Univ.
  - Univ. of Florida
  - Univ. of Missouri
  - Univ. of Wisconsin

# Fuel Development

## Recent Accomplishments

- **Test Fuel Fabrication:**
  - IRIS-5
- **Test Fuel Irradiation:**
  - RERTR-6
  - RERTR-7A
  - RERTR-7B
- **PIE:**
  - RERTR-6
- **U.S. high-power research reactor working group established**

## Near-term Milestones

- **Test Fuel Fabrication:**
  - AFIP 1
  - RERTR 8
- **Test Fuel Irradiation:**
  - IRIS-5
  - RERTR -8
  - Russian monolithic mini-pins, dispersion tube and pin IRT full-sized assemblies
- **PIE:**
  - Russian dispersion mini-pins

# <sup>99</sup>Mo Target & Process Development

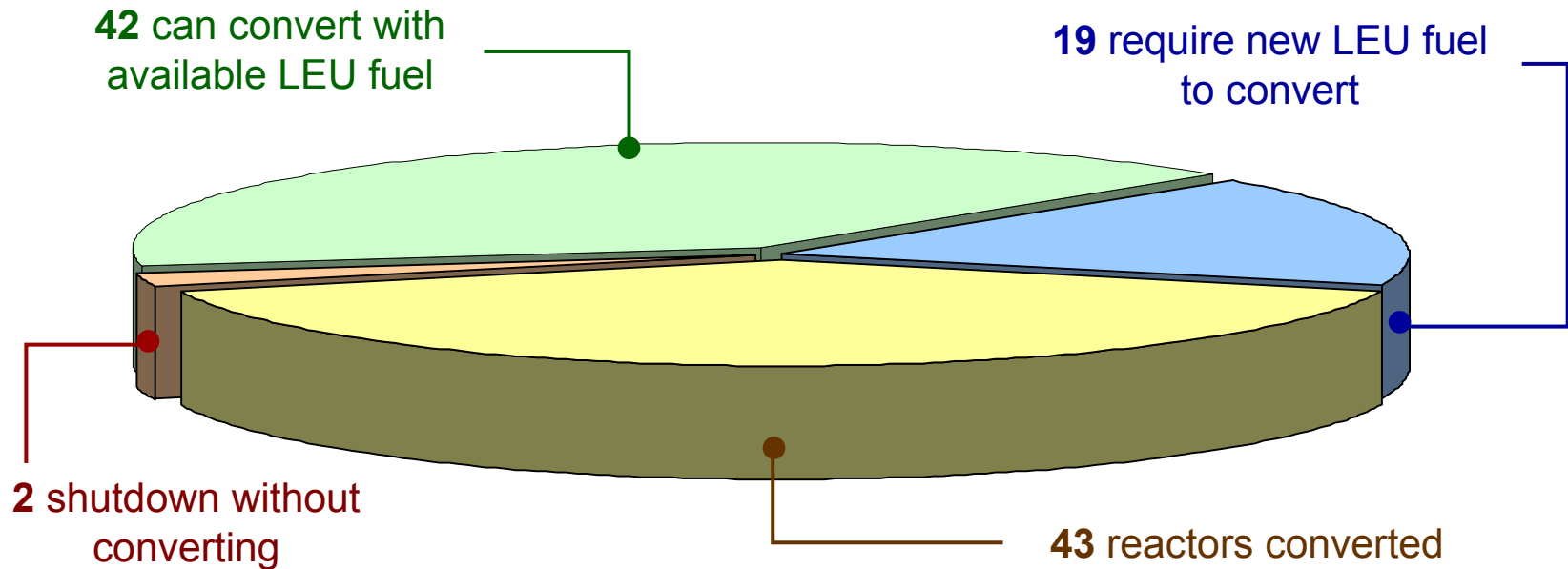
## Recent Accomplishments

- **DOE-NAS <sup>99</sup>Mo study**
- **IAEA CRP :**
  - Performed in coordination with
    - Argentina
    - India
    - Indonesia
    - ROK
  - with the participation of:
    - Chile
    - Kazakhstan
    - Libya
    - Pakistan
    - Romania

## Near-term Milestones

- **IAEA CRP :**
  - Possible demonstration of <sup>99</sup>Mo analysis and loading into a commercial-type <sup>99m</sup>Tc generator
- **Argentina:**
  - Perform a demonstration in collaboration with CNEA on LEU foil irradiation, target disassembly, alkaline digestion, as well as the initial step of the purification and recovery of <sup>99</sup>Mo from alkaline solution.

# Reactor Conversion Status



## Expected Conversions in 2006

- Libya IRT - LEU fuel delivered in December 2005; conversion expected August 2006
- University of Florida - September 2006
- Texas A&M Univ. – September 2006
- Portugal RPI -December 2006

# Conclusion

- **The RERTR program has demonstrated successful acceleration of the programs efforts to accomplish the conversion of 106 reactors by 2014 – with 7 conversions expected in 2006.**
- **U.S. commitment under SPP and GTRI to convert domestic research reactors with available fuels is expected to be met by 2009.**
- **Fuel development is on track to develop and qualify a new high density fuel by 2010.**
- **DOE-NAS <sup>99</sup>Mo study will be initiated this year – completed study is expected to provide resolution and path forward on this issue.**
- **RERTR 2006 Annual Conference –  
Capetown, South Africa: October 29-November 3, 2006**