

# Advanced Test Reactor National Scientific User Facility

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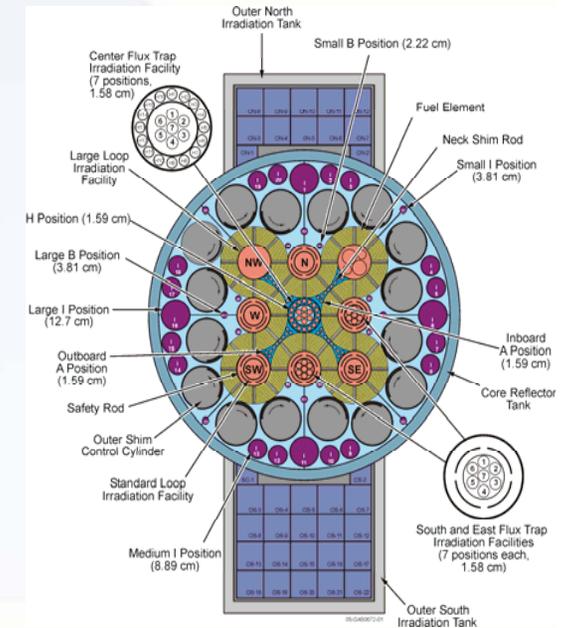




# Providing Access to World-class Facilities

*Seventy-five project proposals submitted as part of the first five solicitations, twenty-three ongoing projects*

- **Reactor Irradiation**
  - ATR
  - MITR
- **Critical Facilities/Radiography reactors**
  - ATR-C
  - NRAD
- **Post-irradiation Examination (including rapid turnaround experiments)**
  - INL
  - IIT
  - Michigan
  - NCSU
  - UNLV
  - UW
- **Other National User Facilities**
  - Advanced Photon Source
  - SHaRE
  - NIST Reactor



# Irradiation of Potential Inert Matrix Materials

*University: University of Florida*

*University Investigator: Prof. Juan Claudio Nino, Materials Science & Engineering*

*INL Investigator: Pavel G. Medvedev*

*Project Goal:* Evaluation of the irradiation stability of potential IM materials and the investigation of irradiation-structure-property relationships.

*Sample Types:* Ceramic discs of the following compositions for were loaded:  $\text{MgO} \cdot 1.5\text{Al}_2\text{O}_3$ ,  $\text{MgAl}_2\text{O}_4$ ,  $\text{MgO}$ ,  $\text{Nd}_2\text{Zr}_2\text{O}_7$ ,  $0.7\text{MgO} \cdot 0.3\text{Nd}_2\text{Zr}_2\text{O}_7$ , and  $\text{Mg}_2\text{SnO}_4$ .

*Two specimen geometries were loaded, one for thermal diffusivity measurements and another for TEM characterization .*

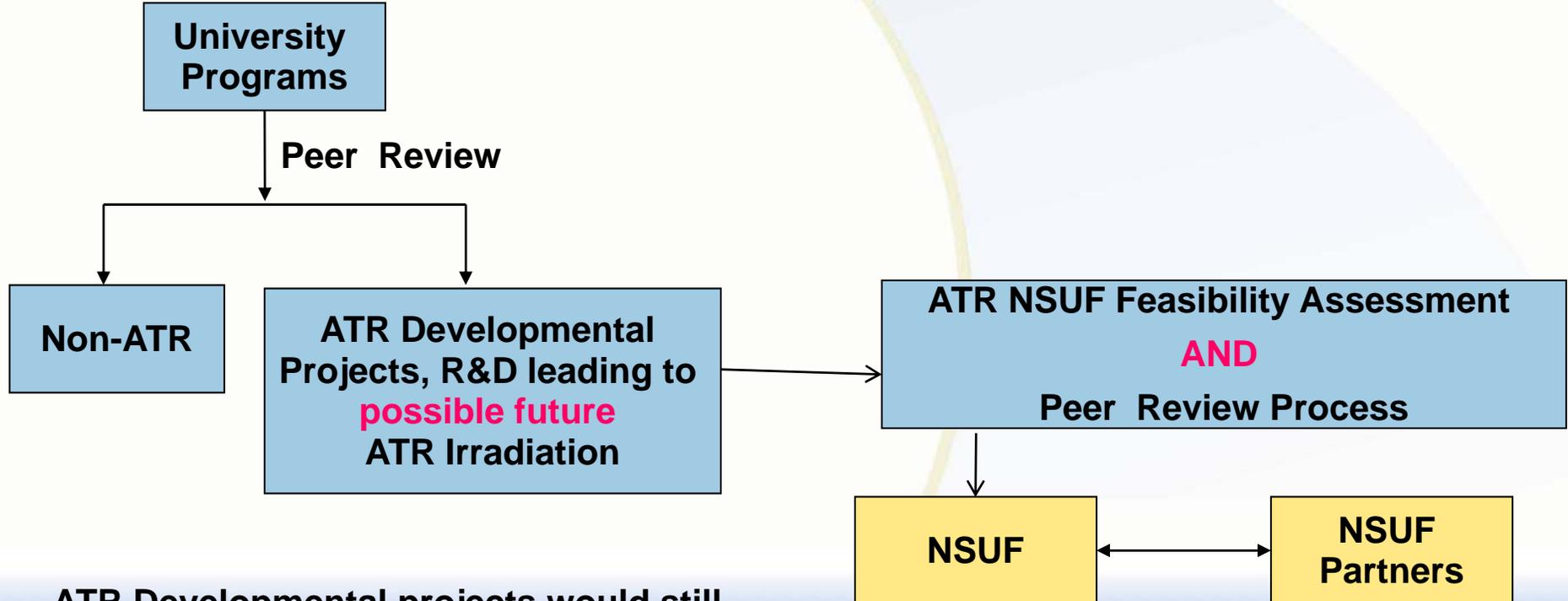
The specimens have now been irradiated at  $\sim 350$  and  $700$  °C to a damage level of  $\sim 1$  and  $2$  dpa in three capsules. The PIE plan documentation for first capsule has been completed.



# ATR NSUF-NEUP Relationship

## Philosophy:

- Support NE Programs
- Do not commit reactor irradiation positions before a research effort is technologically ready for ATR irradiation and PIE.



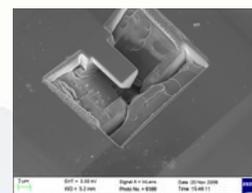
ATR Developmental projects would still need to pass ATR-specific review

# Timeline

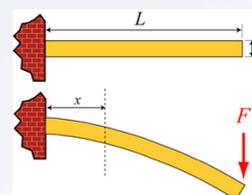
- Two calls per year
- Proposal call open majority of the year
- Spring 2010
  - Spring 2010 submission window opens: October 29, 2009
  - Last day to submit proposals: April 1, 2010
  - Announcement of awards: User Week, early June 2010
- Fall 2010
  - Fall 2010 submission window opens: April 2010
  - Last day to submit proposals: Oct 5, 2010
  - Announcement of awards: Jan 2011
- ***Partnership and Rapid Turnaround proposals can be submitted at any time***

# FY 2010: New PIE Capabilities

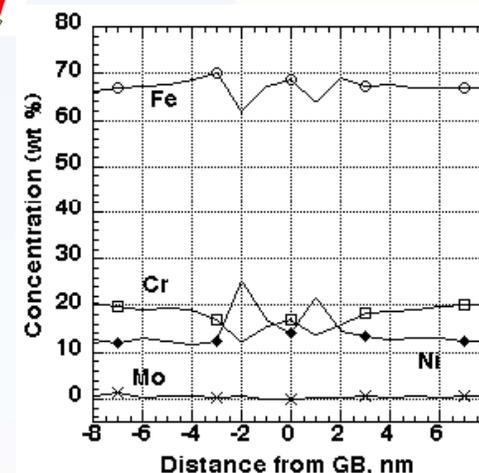
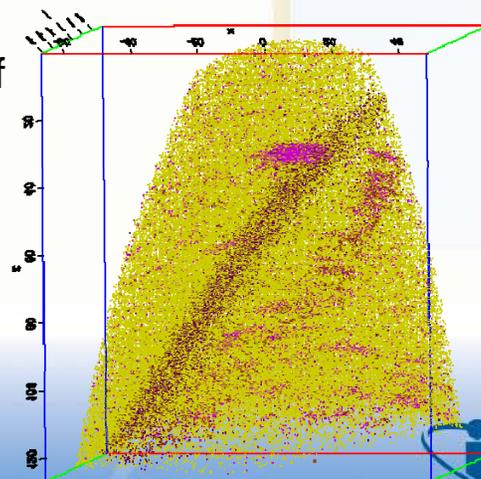
- **Mechanical properties**
  - Nanoindenter/AFM
  - Small sample mechanical testing
  - Automated micro-hardness tester
- **Analysis at micro- and nano-scale**
  - FEG-STEM-chemical and structural analysis at the nano-scale
  - Atom Probe-identify single atoms (few in world available for use on radioactive material, none on fuel)
  - Raman spectroscopy-light scattering to understand atomic structure
  - SEM hot stage-real time analysis of changes in structure due to temperature
- **Sample Preparation**
  - Dual-beam FIB #2
- **Fuel Examination**
  - Consolidated Fuel Exam Machine feasibility study-would save space in HFEF



Nano-indenter, in combination with the FIB, can perform mechanical analysis on the nanometer scale



FEG-STEM can perform chemical analysis on the nanometer scale

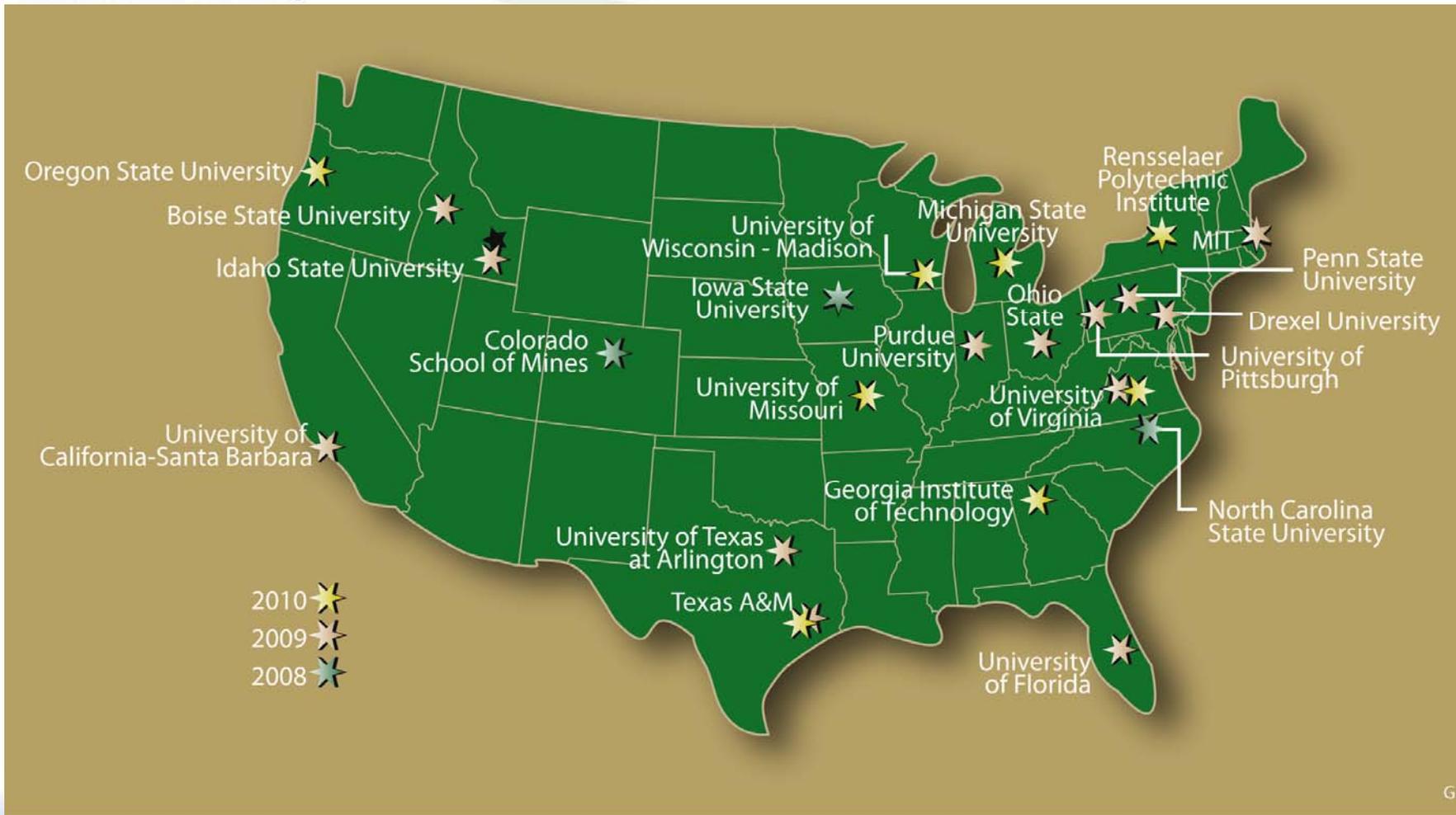


Atom Probe maps material composition atom-by-atom in 3D

# New User Experiment

- **Goal:** to help university scientists, inexperienced in reactor-based testing, to learn the intricacies of designing and conducting an in-reactor test
- **Participating Universities (17 participants)**
  - UNLV
  - UNR
  - Utah
  - Drexel
  - Boise State
  - RPI
  - Texas Arlington
  - Texas A&M
- **Capsule Contents (selected by NSUF staff)**
  - Concrete (LWR issue)
  - Instrumentation (ATR measurements)
  - Stress Relaxation (LWR issue)

# University Visit Program



## Requests

- WPI
- Montana State
- Portland State

# ATR NSUF Contacts

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# Combining Tools to Get a Better Answer

