



U.S. DEPARTMENT OF  
**ENERGY**

**Nuclear Energy**

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# **Nuclear Energy Enabling Technologies Reactor Materials**

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# Overview

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## ■ Vision

- The NEET-RM will enable the development of innovative and revolutionary materials and provide broad-based, modern materials science that will benefit all four DOE-NE objectives.

## ■ Goal

- Bring about revolutionary improvements in safety, performance, reliability, economics, and proliferation risk reduction and promote creative solutions to the broad array of nuclear energy challenges related to reactor and fuel cycle development through innovative materials development, promoting the use of modern materials science and establishing new, shared research partnerships.



# Management and Budget

## ■ Program Management and Execution Structure

- Roles and Responsibilities
- Approach to Project Management
  - Focus on solicited research
    - Involves universities, national laboratories ,and industry
  - Research is identified via workshops, annual NE Materials meeting and input from NE programs

Activity	Funding Level (FY2013 under CR)
Competed Research	\$5M
Modern Materials Science Capabilities	\$1.0M
Collaboration and Coordination	\$1.2M



# Program Outcomes

- **FY 2012**

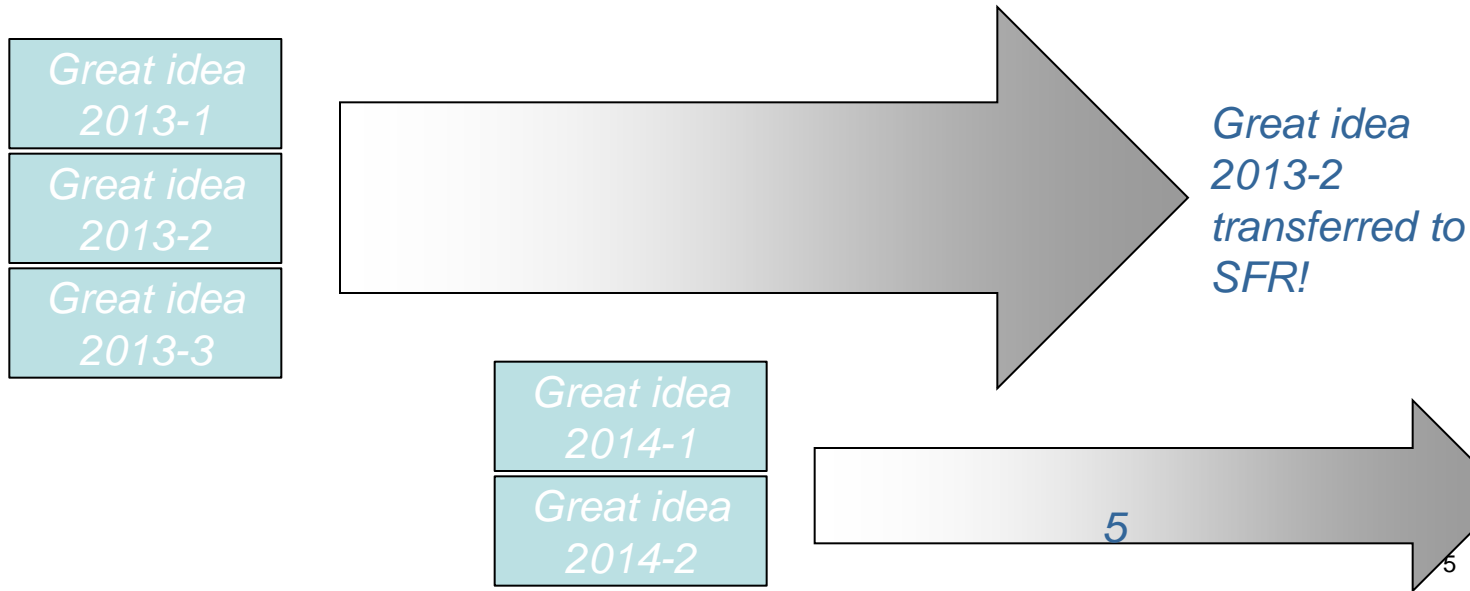
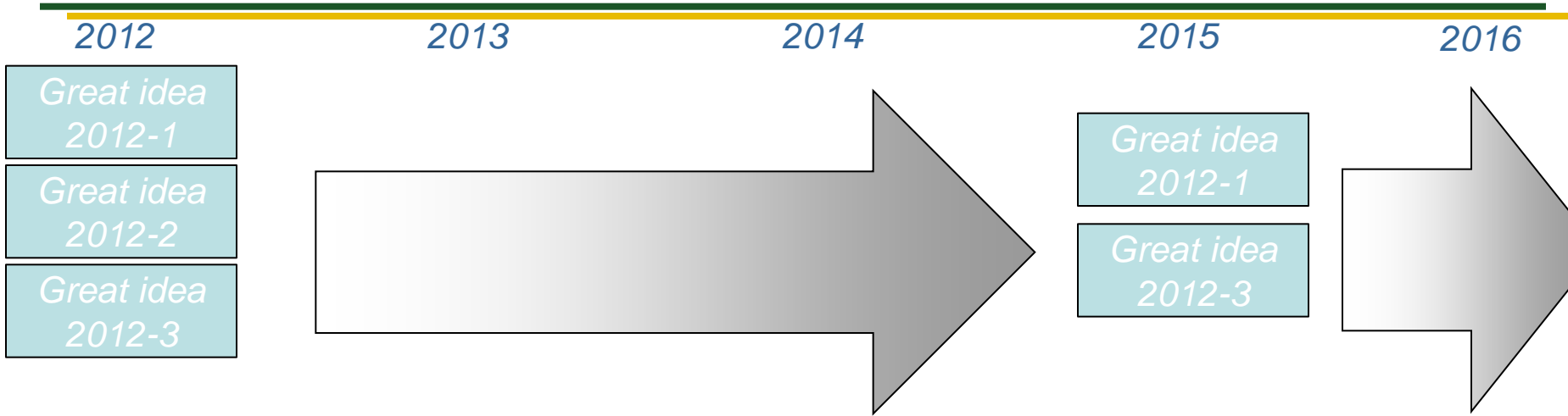
- Funded 9 proposals to develop innovative materials for use in current/future nuclear reactors and fuel cycles.
- Developed the draft NE Materials Research Plan, including a prioritized list of analytical capabilities needed to support modern material science research.
- Hosted the annual NE Coordinated Materials Research Meeting

- **FY 2013**

- Begin acquisition of high priority modern material science capabilities and update the NE Materials Research Plan, if needed.
- Fund 5 to 6 proposals to develop advanced materials characterization methods.
- Host the annual NE Coordinated Materials Research Meeting.



# Innovative idea development is intended to follow a SBIR approach





# Coordination Across NE

## ■ Representatives from these programs on the federal and laboratory side work together to determine the direction and foci of NEET-RM

- Fuel Cycle Research and Development
  - F. Goldner and S. Maloy (LANL)
- Advanced Reactors
  - W. Corwin and S. Sham (ORNL)
- Next Generation Nuclear Plant
  - W. Corwin and R. Wright (INL)
- Light Water Reactor Sustainability
  - S. Lesica/R. Reister and J. Busby (ORNL)

## ■ Input from SC, NNSA, NRC, etc.



# Competed Research

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- **Advanced reactor materials characterization techniques and tools.**
    - Successful completion of awards will provide advanced methods for sample preparation and new tools and techniques for examining and understanding material microstructures in a variety of conditions ranging from as-received to treated or irradiated.
  - **Potential Benefits**
    - Understanding of the effects of irradiation, temperature, pressure and corrosive environments on material microstructures and mechanical behavior.
    - More efficient use of existing irradiated materials and enable fabrication of smaller specimens from previously examined materials.
  - **High-risk/reward and transformational concepts are appropriate for NEET.**

# Promoting modern materials science is a key NEET goal

- **The key components to modern materials science include computational techniques, experience, and modern tools and research techniques. NEET will promote these areas.**
- **Computational techniques: The expanded use of modern computational techniques can greatly improve material and process development efficiency. Promotion of these tools across the five objectives will be performed.**
- **Modern Tools and Techniques: The objective of this task is to provide resources that will expand capabilities for all programs and efforts.**
  - Advanced characterization techniques allow for improved understanding in materials performance at all stages of development and use.
  - Strategic investments in new tools will be evaluated by an independent review panel and will provide tools benefiting the entire NE portfolio.
  - Other techniques such as ion beam irradiations may provide complementary resources to reactor irradiations in all NE programs, but must be coordinated and enhanced for maximum utility.
  - Investments to complement other existing facilities such as the ATR NSUF may provide greater tools and availability to the NE efforts as well as University programs.





## Collaborations will help leverage DOE-NE programs and efforts

- The final element to NEET is to promote collaboration and cooperation.
- **Materials Research Partnerships:** Other agencies such as the Office of Science, EERE, Fossil Energy, Fusion Energy, the ITER project, NASA, and others, also sponsor research in nuclear materials. Renewed engagement with these organizations may yield new research partnerships.
- **International Partnerships:** Throughout the NE materials portfolio, there are numerous international collaborations with some overlapping. This effort will stimulate additional collaborations in cross-cutting areas (e.g. design methodology issues)
- **NE Materials Visibility:** Increased visibility of the NE programs will spur interest in new partnerships.
  - An annual meeting involving all NE materials programs and other organizations will be held to allow for both broad discussion of each program and detailed working groups.
  - A semi-annual newsletter with highlights in materials research will inform outside agencies about key work in the NE portfolio.