Nuclear Energy University Programs (NEUP)

NEUP Fiscal Year (FY) 2012 Status

Presentation to Nuclear Energy Advisory Committee (NEAC)
June 12, 2012

Michael Worley, NEUP Program Manager

Outline

- FY12 Solicitations, Budget and R&D Project Selections
- FY 12 IRP Solicitation Schedule and Elements
- FY13 Plans

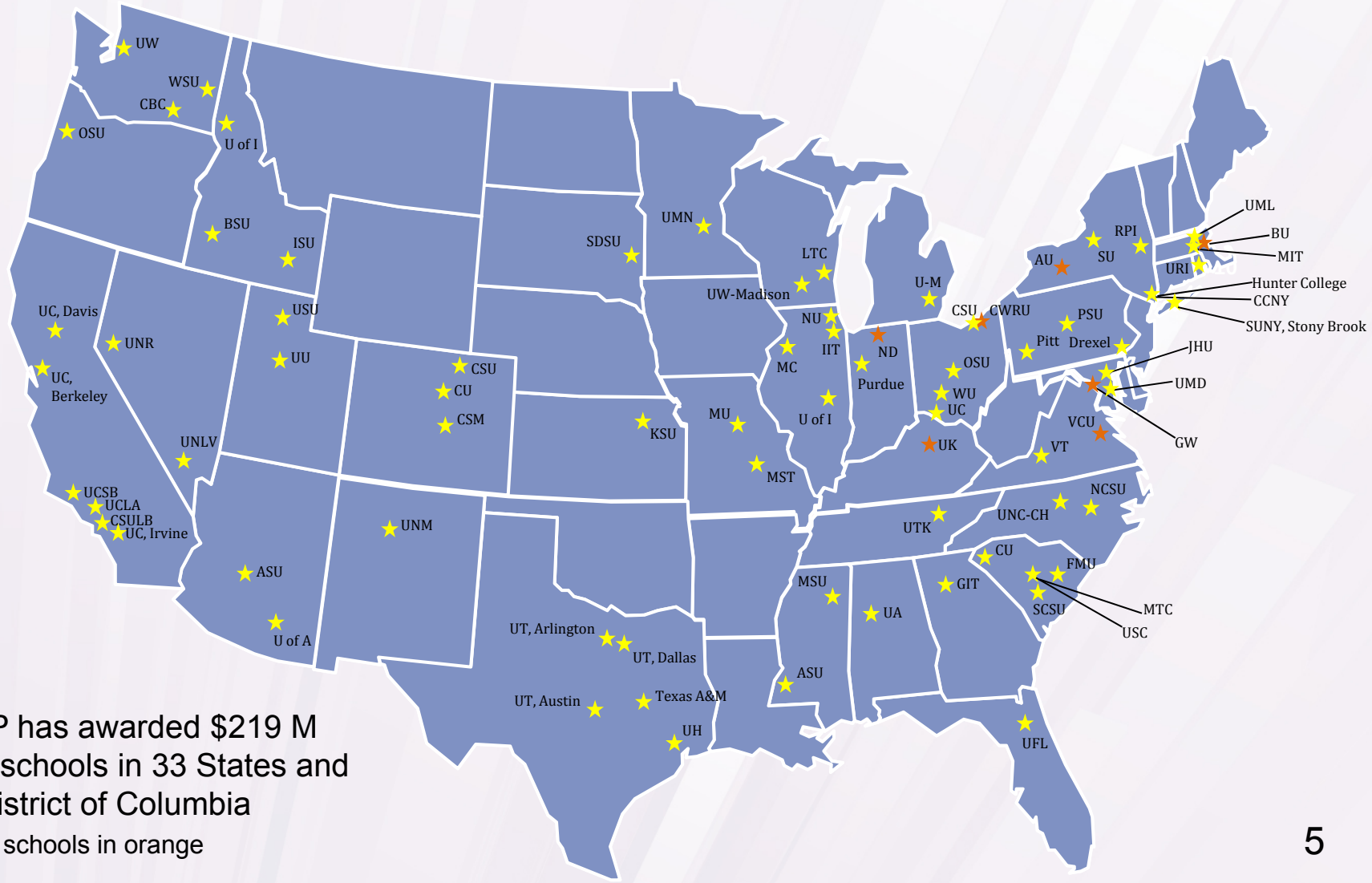
NEUP FY 2012 Solicitations and Budget

- Integrated Research Projects (IRP) - $13.9M
  - Advanced Light Water Reactor Fuels with Enhanced Accident Tolerance
  - Used Nuclear Fuel Storage
  - Inherently Safe Light Water Reactors
- Program/Mission Supporting R&D - $37.1M
- University Research Infrastructure - $6.0M
- IUP Fellowships and Scholarships - $5.0M
- Total = $62.0M

FY12 R&D Application/Award Overview

- Received 648 pre-applications
- 150 invited to submit full proposals
- 202 full proposals received (55 uninvited)
- 48 full proposals approved for award
  - 33 lead universities
  - 23 collaborating organizations (8 universities, 8 national laboratories, 6 industrial partners, and 1 foreign entity)

NEUP Award Recipients – 7 New Schools in FY 2012



NEUP has awarded $219 M to 79 schools in 33 States and the District of Columbia

**New schools in orange

IRP Solicitation Schedule and Elements

- Pre-solicitation workshop (and webcast) held in Washington, DC on May 2, 2012
- Issued solicitation for 3 projects on May 25, 2012
- Proposals due July 9, 2012
- Anticipate award announcement by the end of FY 2012
- Increased percentage of project funds provided by the government to non-university participants to ≤ 20%
- Cost sharing is encouraged but not required

IRP - Advanced Light Water Reactor Fuels with Enhanced Accident Tolerance

- Scope:
  - Develop advanced materials and/or fuel-cladding concepts suitable for use in existing light-water reactors or light-water reactors with design certifications (GEN-III+) that would improve performance and safety, both during reactor service and during long-term storage in spent fuel cooling pools.
  - Improvements to the nuclear fuel and cladding system may be accomplished by many possible methods including: design, materials, or combinations of the two to achieve possibly lower fuel operating temperature, higher temperature capability, higher strength capability, and increased resistance to oxidation.

- Outcomes:
  - Feasibility testing and analysis
  - Development, preliminary irradiation and demonstration of technical feasibility
  - Leading to demonstration in a commercial LWR within 10 years

- Cost and Schedule:
  - Three year duration not to exceed $3.5M

IRP - Used Nuclear Fuel Storage

- Scope:
  - Material degradation issues associated with long term behavior of high burn up used nuclear fuel (>45 gigawatt-days/metric ton) is of specific interest.
  - Focuses on areas of canister hardware not covered in the FY11 IRP and a more efficient system for packaging of canisters to include:
    - Fuel Assembly Hardware
    - Neutron Poisons
    - Bolts and Seals of Casks and Possible Canisters
    - Reducing Canister Drying Time
    - Adding Materials in a Canister to Maintain Geometry Configuration
    - Sealing Canisters without Welding
    - Rapid Welding of Canisters
    - Rapid Canister Processing
    - Numerical Modeling for More Efficient Loading
- Outcomes:
  - Develop data applicable to time periods significantly longer than the period of testing
  - Experimental and modeling approaches operational in the laboratory
  - Inform the technical basis for extended storage
- Cost and Schedule:
  - Three year duration not to exceed $4.4M

IRP - Inherently Safe LWRs

- Scope:
  - Focused on large GW-class Light Water Reactor designs that goes beyond the GEN III+ passively safe designs with improved performance and inherent safety features
  - Improve the safety goal from “passively safe” (GEN III+) to “inherently safe” which means a reduced likelihood of severe accident consequences
  - An inherently safe design would include: novel and innovative reactor systems; structures; components; materials (including fuel and cladding); and passive features
  - Addresses GEN VI performance goals: sustainability (fuel utilization and waste minimization); economics; proliferation resistance; and physical protection

- Outcomes:
  - Conceptual design and safety analysis
  - Research results that prove out key design concepts
  - A comprehensive research plan that would move the proposed concept forward

- Cost and Schedule:
  - Three year duration not to exceed $6.0 million

NEUP FY 2013 Planning Conference

- August 7-8, 2012, at the Marriott Metro Center in Washington, DC
- Engage university community
  - Identify expected focus of FY13 NEUP R&D solicitations
  - Review general NEUP objectives/emphasis areas
    - Improved integration with NE R&D Programs
    - Increased emphasis and process improvements for oversight and monitoring of ongoing projects.
    - Clearly define roles and responsibilities
  - Solicit feedback

Summary of Planned Improvements for FY13

- Limit total number of projects for a principal investigator
  - Improve application and project execution processes
- Preclude new project award if existing no cost extension
  - Improve execution
- Enhanced management involvement in work scope development and NEUP integration into NE R&D programs
- Improved communication with and among reviewers
- Employ social media as a performance metric for student investment via IUP

BACK-UP SLIDES

FY12 IRPs on Accident Tolerance

FCR&D and RCR&D will each solicit an FY12 IRP related to advanced LWR systems with enhanced accident tolerance.

FCR&D IRP on LWR Fuels with Enhanced Accident Tolerance

- Focus on advanced fuel concepts suitable for use in existing LWRs or those with design certifications (Gen III+).
- Advanced materials and/or fuel-cladding concepts that would improve performance and safety, both during reactor service and during long-term storage.
- Improvements to the nuclear fuel and cladding system may be accomplished by many possible methods including: design, materials, or combinations of the two.
- Feasibility testing and analyses

RCR&D IRP on Inherently Safe LWRs

- Focus on large GW-class LWR designs that are inherently safe (beyond Gen III+ passively safe designs).
- Whole synergistic design (novel and innovative reactor systems, structures, components, materials including fuel and cladding, passive features, etc.) that would make the reactor inherently safe
- Improvements to all GEN IV performance goals including sustainability (fuel use/waste minimization), economics, proliferation resistance and physical protection
- Conceptual design and safety analysis

FY12 IRPs on Accident Tolerance

- Near-Term vs. Longer Term Focus
  - FCR&D and RCR&D will each solicit an FY12 IRP related to advanced LWR systems with enhanced accident tolerance.
  - The FCR&D project will focus on advanced fuels for currently operating reactors and those with design certifications (Gen III+).
  - The RCR&D project will focus on advanced LWR concepts (beyond Gen III+) and the associated fuel designs.

- Near-Term (demonstrated in commercial LWRs within 10 years)
  - Must fit within dimensional constraints of current reactors (qualified in existing reactors)
  - Must maintain or improve: cycle length, reactivity coefficients and safety margins, DNB margins, and response to design-basis accidents
  - Cannot degrade current performance
  - Potential advances include: clad coatings, advanced claddings, getters, (FCM fuel?)

- Longer-Term
  - Advanced reactor systems could be designed to incorporate a wider range of fuel concepts
  - Potential advances include: higher enriched fuels, new fuel compositions, new geometries and assembly/core configurations