Fuel Cycle Information Exchange

"The Future of Nuclear Engineering Education/Fuel Manufacturing"

U.S. Nuclear Regulatory Commission
The Universities at Shady Grove

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Office of Nuclear Energy
U.S. Department of Energy

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NE's Support of University Nuclear Engineering Education/Fuel Issues

- Where We've Been
- The Current Situation
- What's Ahead

University Nuclear Science and Reactor Support

Providing fresh fuel to university research reactors via the Reactor Fuel Program

Providing funding for innovative research at universities under the peer-reviewed Nuclear Engineering Education Research Program

Providing institutional support to universities offering a degree in nuclear engineering through the DOE/Industry Matching Grants Program

Encouraging universities with research reactors to "share" them with surrounding institutions providing research, training, and instructional opportunities through the Reactor Sharing Program

Encouraging partnerships among universities with research/training reactors, other universities, industry and utilities to improve the nuclear infrastructure regionally in the U.S. (INIE)

University Nuclear Science and Reactor Support (cont.)

Awarding fellowships and scholarships to nuclear engineering students and minority students through the Fellowship and Scholarship Program

Partnering minority institutions with Nuclear Engineering Universities for the purpose of increasing the number of minorities in the nuclear disciplines (University Partnerships)

Making improvements to university research reactors via the Reactor Upgrade Program

Supporting Radiochemistry graduate and postgraduate students and faculty through fellowships and faculty assistance

Supporting the Nuclear Engineering Education Recruitment program to encourage high school students to consider careers in nuclear engineering and related scientific courses of study by providing information on nuclear issues to them through American Nuclear Society Teacher Workshops

University Program Timeline (Approximations)

Fuel Purchased

Radiochemistry

NEER

- INIE
- ANS Outreach

Junior Faculty

Pre 1990 | 1992 | 1997 | 1998 | 1999 | 2001 | 2002/03 | 2005 | 2006

International Student Exchange Program (ISEP)

Matching Grants

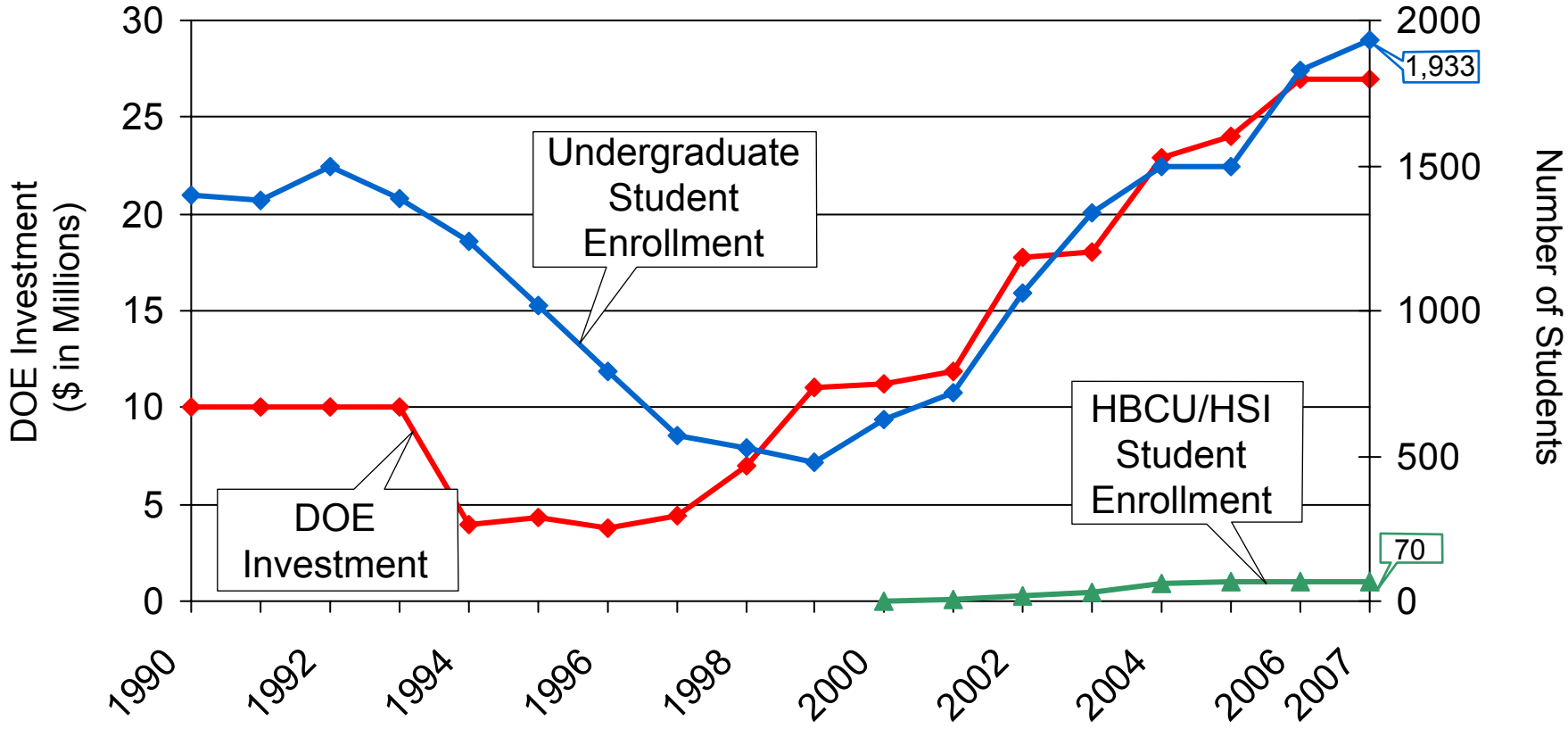
- Reactor Sharing
- Reactor Upgrades
- Fellows and Scholars
- "Splitting Atoms" video

- University Partnerships
- Summer Internships

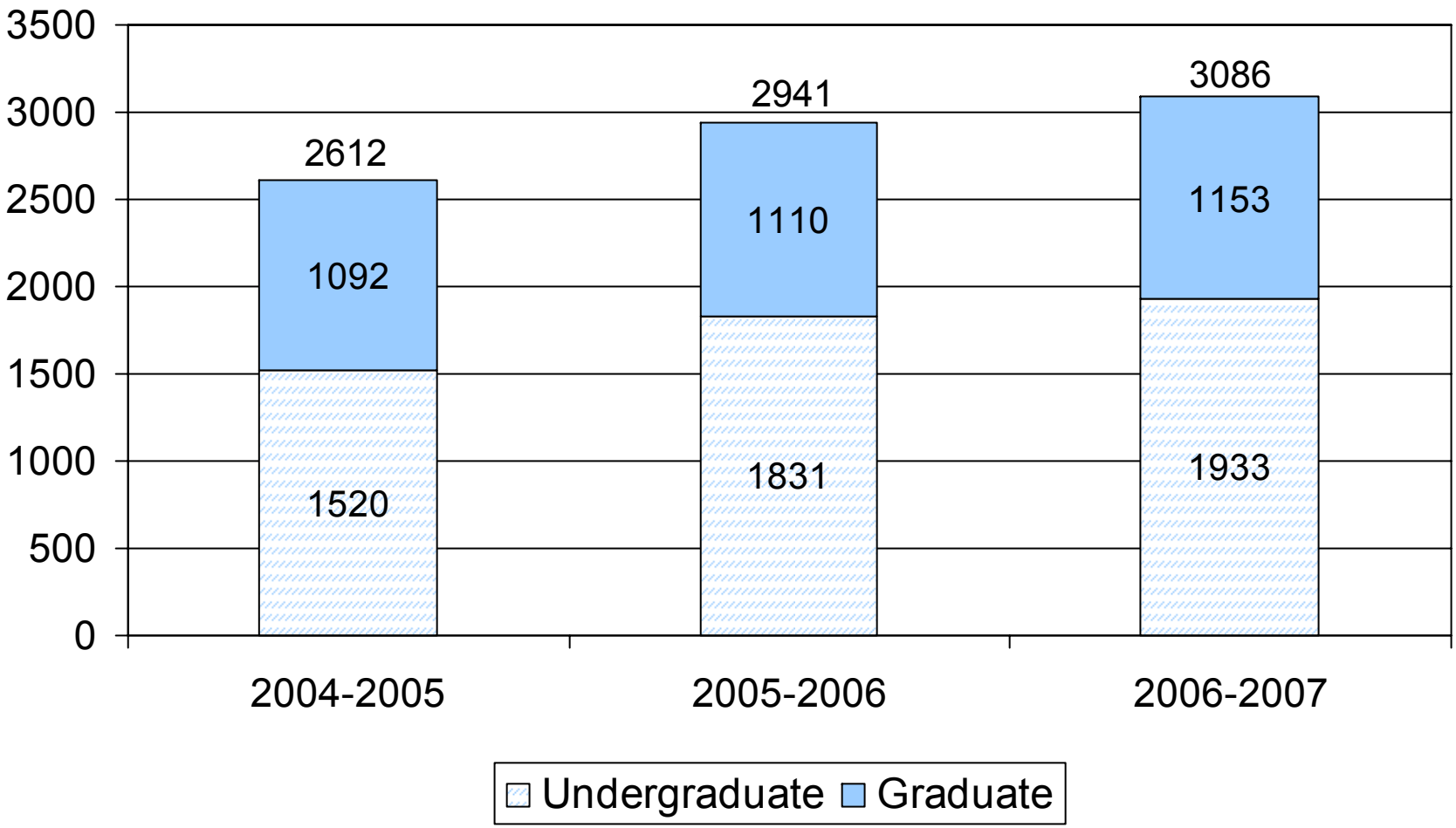
- HP Fellows (separate program)
- "Harnessed Atom" Module

Note: Several of these programs had been funded in the Office of Energy Research (now Office of Science), but were dropped due to lack of interest/funding.

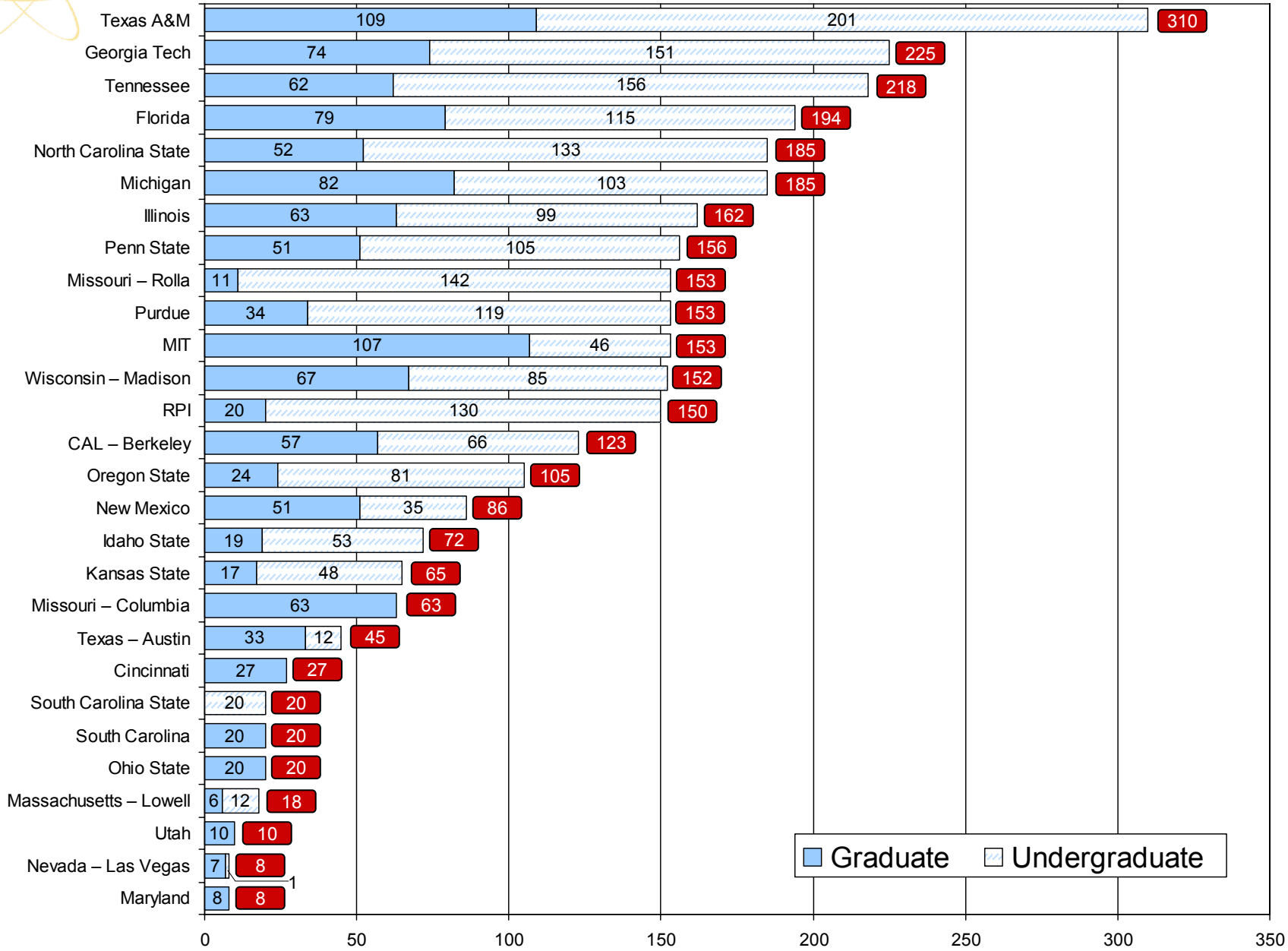
Trends In Enrollments



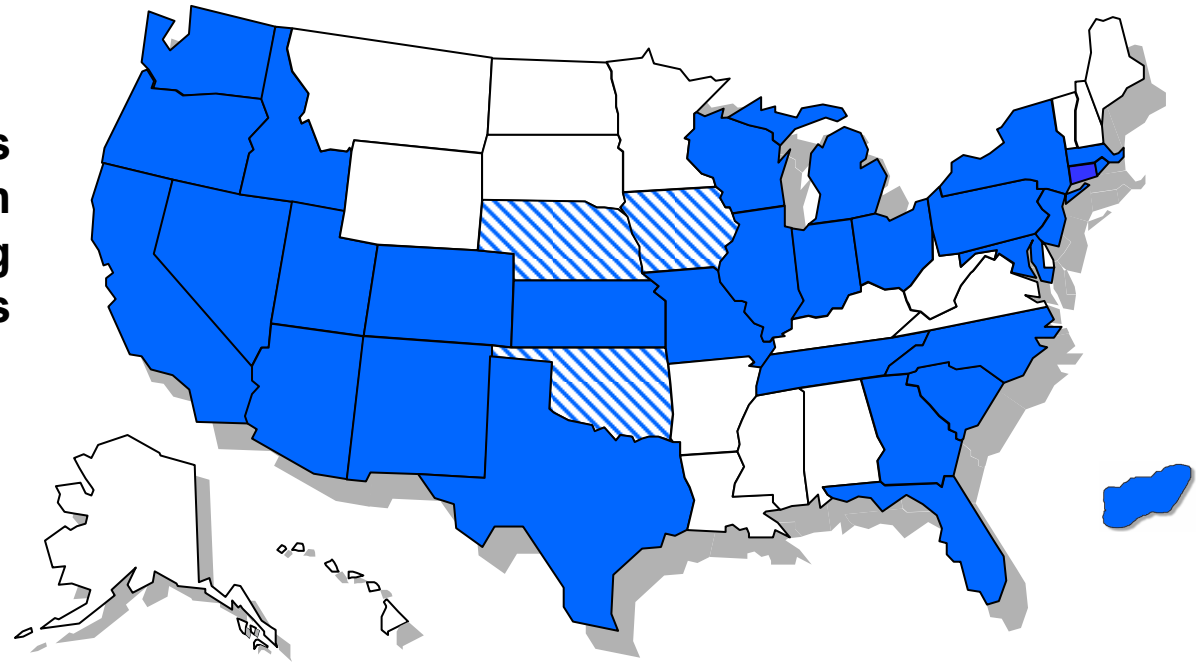
Undergraduate and Graduate Enrollment – Nuclear Engineering (2004-2007)



Nuclear Engineering Enrollments
Academic Year 2006-2007



States With Participating Universities



Program Participants

Clark/Atlanta
Clemson University
Colorado State University
Georgia Institute of Technology
Idaho State University
Kansas State University
Livingstone College*
Linn State Technical College
Massachusetts Institute of Technology
Morgan State University*
New Mexico State University**
North Carolina State University
Ohio State University
Oregon State University
Pennsylvania State University
Polytechnic University of Puerto Rico**
Prairie View A&M University*
Purdue University
Reed College
Rensselaer Polytechnic Institute
Rhode Island Nuclear Science Center
South Carolina State University*
Texas A&M University
Texas A&M Kingsville**
Three Rivers Community College
Tuskegee Institute*
University of Arizona
University of California-Berkeley
University of California-Davis
University of California-Irvine
University of Cincinnati
University of Florida
University of Illinois
University of Maryland
University of Massachusetts-Lowell
University of Michigan
University of Missouri-Columbia
University of Missouri-Rolla
University of Nevada – Las Vegas
University of New Mexico**
University of South Carolina
University of Tennessee
University of Texas
University of Utah
University of Wisconsin
Washington State University
West Point Military Academy
Wilberforce University*
Worcester Polytechnic Institute

**U.S. Historically Black Colleges and Universities; **Hispanic Serving Institution*

Research Reactors and Fuel

- Provide fuel to any of the 27 reactors that require it
- Support Reactor Instrumentation (upgrades) and Reactor Sharing Program through a peer-reviewed award program
- Work with NNSA to convert university reactors from HEU to LEU
  - Texas A&M – 2006
  - Florida – 2006
  - Purdue – 2007
  - Oregon State – 2008
  - Washington State – 2008
  - Wisconsin – 2009

Research Reactors and Fuel (cont.)

- Working with NNSA to meet Secretary of Energy's mandate to convert all research reactors to LEU by 2014
- NE's role
  - Continue responsibility for university research reactor program
  - Enhanced security during conversion
  - Spent fuel shipments from converted reactors
- NNSA's role:
  - Purchase of material and fabrication of replacement fuel for converted reactors
  - Initial core loading of fresh LEU fuel for converted reactors

Research Reactors and Fuel (cont.)

- Future Conversions
  - MIT, MURR, NRAD, HFIR, ATR, NIST
- NNSA is responsible for development of the new U-Moly dispersion fuel for these reactors
- Fuel development work is expected to be completed in 2010 to allow for fuel fabrication in support of core conversions
- A new fuel production line for U-Moly/dispersion fuel is needed at BWXT soon if the fuel is to be fabricated and deadlines achieved

In Summary: Where We've Been – 1997-2006

- The Road to the University Program
  - Support for research, reactors, students, faculty, outreach, fuel, minority institutions, etc.
- Politically Popular Program
- Many Initiatives Along the Way
  - INIE
  - Radiochemistry
  - "Harnessed Atom"
  - Junior Faculty

The Current Situation – 2007/2008

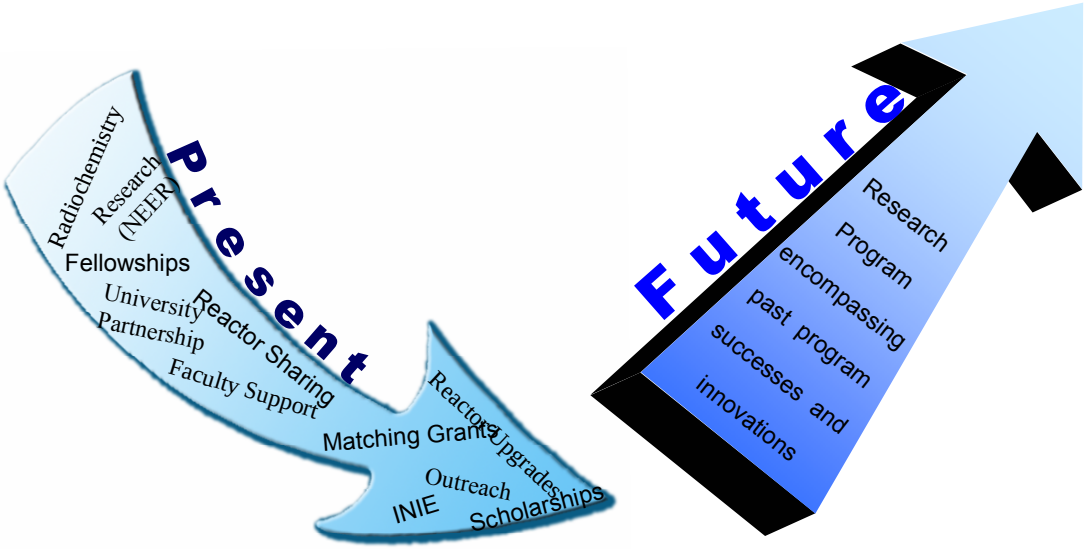
- University Program “zeroed” for FY 2007 and FY 2008
- Fuel support continues ($3.0M/year)
- “Mortgages” of existing programs fully funded
- Begin anew with university community to develop a new basis for supporting university nuclear engineering research and infrastructure

What’s Ahead?

NE Supports Universities

The transition from a university program budget line item to embedding university research and support within our mission related R&D programs will provide:

- greater research opportunities for universities while incorporating infrastructure activities
- increased funding corresponding to increases in NE's research program areas



FY 2007 and Beyond

- **Introduce new Funding Opportunity Announcement**
  - R&D focused (NERI)
  - University Program elements included
  - Provide an opportunity for U.S. Universities to become directly involved in an integrated teaming relationship with DOE/NE
  - FY 2007 allotment is $30M over three years

FY 2007 and Beyond (cont.)

- Introduce another Funding Opportunity Announcement: **GNEP University Readiness**
  - Provide an opportunity for nuclear schools to prepare themselves to support GNEP R&D programs
  - $4 million total ($100K/per university)
  - One time award

Global Nuclear Energy Partnership

NE supports Universities

- Total support for university activities in FY 2006 was approximately $50M
- A funding level of $54M will continue in FY 2007
- Based on our FY 2008 budget request we expect growth in our university funding commensurate with the growth in GNEP

FY 2006-08 University Funding*

Program	FY 2006	FY 2007	FY 2008
University Reactor Infrastructure and Education Assistance	**26,730**	**16,547**	**0**
Research Reactor Infrastructure	**0**	**0**	**2,947**
R&D Program Funded Research	**24,391**	**38,252**	**58,572**
Generation IV	6,067	5,463	5,772
Nuclear Hydrogen Initiative	5,116	4,300	4,300
Advanced Fuel Cycle Initiative	13,208	24,489	48,500
Total Funding for Universities	**51,121**	**54,799**	**61,519**

*These actuals and estimates do not include National Laboratory directed funding for universities. Funding within individual programs may vary depending upon the performance of individual program activities. Total funding for Universities is expected to be as shown.

Why Change?

- DOE/NE R&D-related university-based research will be beneficial to DOE and university community
- The Office of Nuclear Energy wants to support nuclear engineering education (Stewardship)
- Research-based approach should help develop a better education network among universities, laboratories, the nuclear industry and government

"Dissenting View" – Some Recommendations of the ANS Special Committee on Federal Investment in Nuclear Education

"Nuclear's Human Element" Recommends:

- DOE undertake a workforce study to determine the aggregate demand for nuclear engineering graduates in the next 5-10 years
- DOE should revise current "University Program" making it more research driven and mission oriented
- Congress should retain a separate funding line for University Programs
- Congress should increase funding for University Programs commensurate with levels authorized for EPACT 2005
- Over the longer term, DOE should convene an interagency working group to provide high level guidance on the overall structure of the NE University Program

Summary

- University Support Program while achieving past successes is changing
- Administration desires to support universities via NE mission-related research
- Congress and universities are skeptical and prefer NE programs of the past decade since they perceive infrastructure, not research, at risk with new approach
- FY 2008 will be a pivotal year as Congress debates the best way to support nuclear engineering at universities
- House Committee Mark provides $15M for NRC university support – no funds for DOE/NE

Summary

- Within NE, fuel support continues unhindered with additional funds being considered over the next few years to enable NE to continue to support HEU to LEU conversions and rebuild fuel inventory (now depleted) for several university research reactors

- Decision must be made by DOE as to how to proceed to fund required new fuel line at BWXT for U-Moly/ dispersion fuel

Questions?

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