Innovations in Nuclear Infrastructure and Education (INIE)

Presented to the
Nuclear Energy Research Advisory Committee
Crystal City, Virginia

John Gutteridge
Director, University Programs
Office of Nuclear Energy, Science and Technology

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INIE
The Stimuli ….

- **Declining number of operating university research/training reactors**
- **Dwindling student population in nuclear engineering**
- **Closing or loss of identity of university nuclear engineering programs**
- **Looming shortage of nuclear engineering graduates**
- **Threat of additional reactor closures --**
  Cornell, Michigan, MIT

INIE
The Response

- **NERAC task force report entitled, "The Future of Nuclear Engineering Programs and University Research and Training Reactors," (1999-2000) headed by Michael Corradini, confirmed that:**
  - University nuclear engineering in the U.S. was in jeopardy
  - Reactors were rapidly decreasing
  - All this was in sharp contrast to the increasing need for experts trained in nuclear science
  - University reactors are an important part of undergraduate and graduate education
- **An outgrowth of this was the NERAC Task Force on University Research Reactor's headed by Robert Long**
  - Several recommendations were made including the provision of Federal funding in FY 2002 to initiate a competitive peer-reviewed process for the establishment of geographically distributed regional university research/training reactor user facilities

INIE
Implementation

- **Solicitation: December 21, 2001**
- **Proposal received: March 15, 2002**
- **Peer-review panel meets: April 2002**
- **Secretary Abraham press announcement: June 10, 2002**
- **Total of $5.5 million divided among four consortiums**
  - Western Nuclear Science Alliance ($1,200,000)
  - Consortium of Big-10 University Research and Training Reactor ($1,970,000)
  - Massachusetts Institute of Technology ($1,100,000)
  - Southwest Consortium ($1,050,000)
- **Funding made available in late FY 2002**

INIE
Western Nuclear Science Alliance

- **Participants**
  - Oregon State (OSU), California-Davis (US-Davis), Washington State, Idaho State, California-Berkeley
  - Seven industrial partners
  - Five national labs
- **General**
  - Largest research reactors in western U.S.
  - Only NE and HP departments on west coast
  - Develop new curriculum
  - Promote reactors to wider scientific community
  - Share and enhance reactor capabilities
  - Unique internships and summer programs
  - Distance education

INIE
Western Nuclear Science Alliance (cont.)

- **Research Objectives**
  - Create neutron radiography capability at OSU
  - Expand neutron radiography capability at UC-Davis
- **Education Objectives**
  - Expand nuclear engineering health physics and radiochemistry programs at all five universities
  - Increase number of graduates entering nuclear industry

WNSA Structure

Alliance Management Council
6 Members

Oregon State University
University of California-Davis

Alliance Advisory Committee

Members from all Alliance Partners

University Alliance Partners

- Idaho State University
- University of California-Berkeley
- Washington State University

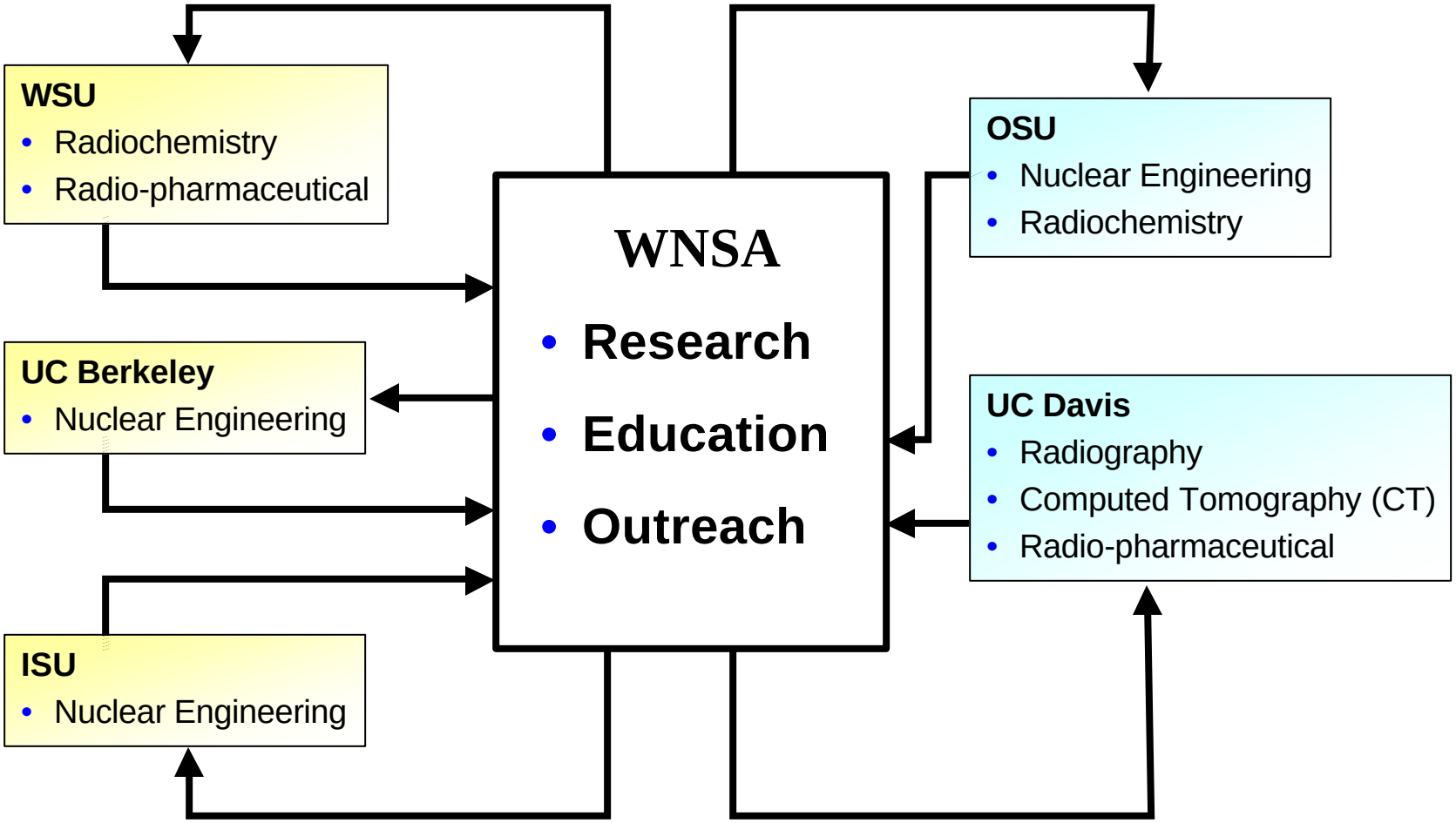
National Laboratory Alliance Partners

- Argonne National Laboratory
- Idaho National Engineering and Environmental Laboratory
- Jet Propulsion Laboratory
- Lawrence Livermore National Laboratory
- Los Alamos National Laboratory
- Pacific Northwest National Laboratory

Industrial Alliance Partners

- Adelphi Technology
- Energy Northwest
- Entergy
- Nova Scientific
- R.G.D. Research
- Science Application International Corp.

WNSA Programmatic Objectives



INIE
Big-10 Consortium

- **Participants**
  - Penn State, Wisconsin, Illinois, Purdue
  - All institutions offer BS, MS and PhD levels in nuclear engineering
- **Objectives**
  - Develop innovative graduate and undergraduate education and training using the reactor facilities both on-site and at-a-distance
  - Identify key attribute for advanced research and training through development and design of a “virtual” university research training reactor (URTR) with the intention of constructing a new URTR
  - Create a novel educational outreach and education program for industry, labs and regional educational institutions
  - Develop grant program to enable collaborative research between the four consortium programs, other schools, and our industrial and laboratory partners

INIE
Big-10 Consortium (cont.)

- **Areas of Expertise**
  - Penn State -- experimental tasks
  - Purdue -- thermal hydraulics
  - Illinois -- computational tasks
  - Wisconsin -- safety and risk analysis
- **Approach to Accomplish Objectives**
  - Graduate Research and Education
    - Enhancement, next-step innovation, and design of future URTR
  - “Virtual” URTR
    - Major advanced computational environment for analysis and configuration of URTR’s

INIE
Big-10 Consortium (cont.)

- **Approach to Accomplish Objectives (cont.)**
  - Center for Nuclear Engineering Education and Outreach
    - Innovative distance learning for credit to non-nuclear institutions
    - Outreach to pre-college students and teachers as well as general public
  - Mini-Grant
    - Allows for innovative research activities for faculty and graduate students in nuclear and other scientific disciplines at all institutions as well as with our industrial and national laboratory partners

INIE
MIT

- **Participants**
  - MIT, Rhode Island Nuclear Science Center (RINSC)
- **General**
  - INIE will permit the MITR to be equipped with state-of-the-are instruments for research making the facility attractive to more faculty and research scientists
  - RINSC will contribute to the BNCT and educational aspects of INIE
  - Increased usage of the MITR for research and education will justify the MIT Administrator's decision to support a substantial portion of reactor expenses
- **Objectives**
  - Create state-of-the-art in-core materials test facility at MITR focused on advanced nuclear power reactors
  - Transform BNCT facilities into national user facility
  - Greatly increase hands-on educational training of the next generation of nuclear managers and research training of future nuclear engineers through new thesis projects

INIE
Southwest Consortium

- **Participants**
  - Texas A&M, Texas-Austin, New Mexico, Sandia
- **General**
  - Distance learning for classroom courses and web viewable reactor monitoring (not control)/participation in real-time experiments
  - Upgrade of lab equipment
  - Establish Consortium Research Coordinator
  - Upgrade UNM reactor
- **Objectives**
  - Enhance laboratory courses that are delivered locally and by next-generation distance-education techniques
  - Stable, long-term research program with an increased user base
  - Support for outstanding graduate students
  - Support of experimental research
  - Sharing of personnel, students and facilities among the consortium institutions

INIE
The Future

- **Most INIE proposals include increased funding (versus FY 2002) in years 2-5**
- **DOE/NE would like to fund 3 additional INIE's beginning in FY 2003**
- **Congressional marks may permit additional INIE's or full support of initial INIE's**
- **First 4 INIE's include 14 universities, and 7 INIEs would involve 24 institutions**
- **Enthusiastic/innovative responses of 4 INIE consortiums is encouraging for future prospects of nuclear engineering/university reactors**