## Integrated Research Partnership

## Development of Advanced Reactor Technologies

The Office of Nuclear Energy's research into advanced reactor technologies offers the promise of improved economics, higher efficiency energy production, and more robust nonproliferation characteristics over existing reactor designs. However, the testing capabilities necessary for the development of the technical, economic, and regulatory data needed to demonstrate and commercialize advanced reactor technologies are virtually non-existent today within the U.S nuclear research community.

The Department of Energy's Nuclear Energy University Program is accepting proposals for an Integrated Research Partnership (IRP) focused on the development of advanced reactor technologies and supporting experimental testing capabilities. The Office of Nuclear Energy seeks innovative reactor concepts that advance nuclear reactor technology beyond the light water-cooled, helium-cooled, and sodium-cooled concepts now being investigated through its existing current nuclear reactor and fuel cycle research and development programs. The testing capabilities may include both in-reactor and non-reactor facilities and should be coupled to a comprehensive research plan for addressing key issues related to development and commercialization of the innovative, advanced reactor concept.

The funding will fund one partnership supporting the development of a single advanced reactor concept, the development of an integrated testing program, and the design, fabrication, and operation of in-pile and out-of-pile experimental capabilities. Proposed concepts and test programs must be novel, but developed enough to allow initial operations in a university laboratory by the end of the three-year period of performance.

Proposals should be for a period of three years and a total cost not to exceed $7.5 million. The Office of Nuclear Energy expects to provide a two to three-year award using fiscal year (FY) 2011 funds. If a two-year award is granted with FY 2011 funds, the intent is to provide the third year of support with FY 2012 funds. The winning project will be eligible for one additional extension for three years provided successful performance is demonstrated during the initial three-year award period. Proposals may include a combination of test capability development, research program development, experimental work, and computer simulations. A proposing team must include a designated lead university and at least one other university. A proposing team is encouraged to include one or more industry partners that may receive funding support from the project, and a proposing team may also include one or more national laboratories that may receive project funding support.

No more than 15 percent of the project funds provided by the government can go to non-university participants, including all government-funded national laboratory and industry partner shares combined. If an industry partner is provided government funds under this project, the industry partner will be required to augment those funds by providing a cost-share consistent with Energy Policy Act (EPAct) 2005 guidelines (i.e., 80 percent government – 20 percent industry). Additional credit will be given to proposals that include minority serving institutions as well as significant, unfunded collaborations with international institutions.

**Integrated Research Partnership**

**Accelerated Aging of Used Nuclear Fuel in Storage**

With the recent decision not to pursue Yucca Mountain as a geologic repository, it is clear that used nuclear fuel (UNF) will be required to remain in storage for longer periods of time than had previously been envisioned. The present regulatory basis for dry cask storage is 60 years, but NRC is considering extending that period. NRC commissioners and other authorities are discussing 100 year and longer storage schemes. The regulatory requirements address key safety-significant aspects of UNF storage systems such as structural, thermal, containment, radiation shielding, and criticality safety performance, as well as related operational requirements pertaining to UNF handling and retrievability. In addition, transportation will eventually be necessary, so the UNF must meet the regulatory requirements for transportation at the end of the storage period.

The Department of Energy's Nuclear Energy University Program is accepting proposals for an Integrated Research Partnership (IRP) related to extended storage of UNF. Long-term behavior of high burnup UNF (>45 gigawatt-days/metric ton) is of specific concern. Issues that need to be addressed include long-term integrity of the fuel cladding, maintaining the fuel assembly configuration, and canister integrity. The fuel cladding must be protected against degradation that leads to gross ruptures; the fuel assembly support brackets, spacers, etc. must function to prevent significant fuel deformation, such as bowing; and the canister must not leak. Examples of the issues to be addressed include the following long-term degradation mechanisms:

- Hydride diffusion and embrittlement
- Creep
- Corrosion
- Stress corrosion cracking
- Accelerated degradation due to marine environment (e.g., salty air)
- Degradation of Concrete

The funding will fund one partnership supporting research and development on accelerated aging techniques to better understand these long-term degradation mechanisms from a significantly shortened testing timeframe. Proposed accelerated aging techniques must be novel, but developed enough to allow initial operations in a laboratory by the end of the three-year period of performance. The product of this research could eventually inform the technical basis that provides the technical justification for extended storage.

Proposals should be for a period of three years and a total cost not to exceed $4.5 million. The Office of Nuclear Energy expects to provide a two to three-year award using fiscal year (FY) 2011 funds. If a two-year award is granted with FY 2011 funds, the intent is to provide the third year of support with FY 2012 funds. The winning project will be eligible for one additional extension for three years provided successful performance is demonstrated during the initial three-year award period. The proposal may include a combination of experimental work and computer simulations. A proposing team must include a designated lead university and at least one other university. A proposing team is encouraged to include one or more industry partners that may receive funding support from the project, and a proposing team may also include one or more national laboratories that may receive project funding support.

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