

Global Nuclear Energy Partnership



Consolidated Fuel Treatment Center
Advanced Burner Reactor

Expressions of Interest
Industry Briefing

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Deployment Approach

▪ **Baseline Approach**

- Sequential: applied research & technology development; demonstration-scale facilities; commercial-scale facilities

▪ **Proposed Two-track Approach**

- First track
 - Demonstrate light-water reactor (LWR) spent nuclear fuel (SNF) recycle in a Consolidated Fuel Treatment Center (CFTC)
 - Fabrication of Advanced Burner Reactor (ABR) driver fuel
 - Construct and operate ABR, initially using driver fuel
- Second track (concurrent w/first track)
 - Transmutation fuel development, fabrication, qualification
 - Transmutation fuel in ABR
- No intermediate demonstration-scale as identified in baseline approach
- Potentially faster commercial deployment





Expressions of Interest

■ Purpose

- Solicit input from industry's base of developed and established technology
- Early participation with and buy-in from industry
- Produce a more informed design process with industry participation

6450-01-P

DEPARTMENT OF ENERGY

Notice of Request for Expressions of Interest in a Consolidated Fuel Treatment Center to Support the Global Nuclear Energy Partnership

AGENCY: Office of Nuclear Energy, Department of Energy

ACTION: Notice of request for expressions of interest.

SUMMARY: Based upon feedback since the President of the United States announced the Global Nuclear Energy Partnership (GNEP) in February 2006, the U.S. Department of Energy (DOE) is seeking Expressions of Interest (EOI) from domestic and international industry in building spent nuclear fuel recycling and transmutation fuel fabrication capabilities. DOE contemplates locating these capabilities together in a Consolidated Fuel Treatment Center (CFTC) and seeks expressions of interest from potential domestic host sites. DOE is also seeking to define the interest of industry to build upon their proven capabilities and participate in demonstrating spent nuclear fuel (SNF) recycling technologies that meet GNEP goals. This EOI will help inform DOE's GNEP Program as to those issues that industry and potential host sites consider important to the ultimate construction of sustainable, commercial-scale SNF recycling technologies that meet GNEP objectives. The information gained from this EOI will be used to create Requests for Proposals (RFP) for the proposed CFTC.

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AGENCY: Office of Nuclear Energy, Department of Energy

ACTION: Notice of request for expressions of interest.

SUMMARY: Based upon feedback since the President of the United States announced the Global Nuclear Energy Partnership (GNEP) in February 2006, the U.S. Department of Energy (DOE) is seeking Expressions of Interest (EOI) from domestic and international industry in building an Advanced Burner Reactor (ABR). An ABR in the United States would establish a fast reactor capability to be used to transmute fuel and consume transuranic elements within the fuel, generate electricity, and support implementation of GNEP. DOE is also seeking to define the interest of industry to build upon their proven capabilities and participate in demonstrating spent nuclear fuel (SNF) recycling technologies that meet GNEP goals. This EOI will help inform DOE's GNEP Program as to those issues that industry and potential host sites consider important to the construction of sustainable, commercial-scale SNF recycling technologies that meet GNEP objectives. The information gained from this EOI will be used to create Requests for Proposals (RFP) for the proposed ABR.

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Expressions of Interest

■ What DOE Wants to Receive

- Industry's thoughts on best path forward
- Potential solutions to accomplish GNEP's objectives
 - Reduce American dependence on fossil fuels and encourage economic growth
 - Improve the environment
 - Recycle nuclear fuel to recover energy and reduce waste
 - Encourage prosperity and clean development worldwide
 - Integrate latest technology for advanced safeguards to further reduce risk of nuclear proliferation
- EOI examples are only guidance
 - Provide some insight to DOE's thoughts
 - Intended to indicate general expectations
 - Not a committed path forward



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Consolidated Fuel Treatment Center

Expression of Interest





Fuel Separation Background

- **Support overall GNEP objectives**
 - Integral component of a closed fuel cycle
 - Separate spent LWR fuel into fast fuel material for transmutation
 - Improved management of waste streams
- **Initial Focus: Demonstrate Engineering-Scale Spent Fuel Separations**
 - Based on National Laboratory Demonstration Program
 - Completed pre-conceptual design documents
 - Demonstration design basis document
 - Scoped three generic concept alternatives
 - Focused technology development program on demonstration project





Consolidated Fuel Treatment Center Concept

■ Capabilities

- Separate the constituents of spent light-water reactor fuel into reusable material and waste products [track one]
- Fabricate fast reactor driver fuel, i.e., all non-transmutation fuel [track one]
- Augment as more advanced technologies become available through R&D
- Separate spent fast reactor fuel and fabricate fast reactor transmutation fuel [track two]

■ Requirements

- No separated pure stream of Pu
- Separate transuranics for consumption in an ABR to effectively reduce the burden on geologic repository
- Comply with National Environmental Policy Act





Seeking Industry's Input

▪ **Technology Selection**

- Separate fuel into isotopes for transmutation and waste streams/forms for better management and cost effectiveness
- Driver and transmutation fuel fabrication capabilities
- System scale, e.g., min/max throughput
- Technology development needs: reduce risk; promote commercialization
- Features to improve reliability and cost effectiveness, e.g., reduced security requirements (Category II or lower); minimize waste generation

▪ **Provide Details of Participation**

- Key features of Government and Industry relationship
- Funding approaches

▪ **Siting and Regulation**

- Regulatory framework or requirements
- Commercial vs. DOE siting considerations; co-location with the ABR; driver fuel capability
- Appropriate SNF process storage capacity



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Advanced Burner Reactor

Expression of Interest





Advanced Burner Reactor Background

- **Support overall GNEP objectives**
 - Integral component of a closed fuel cycle
 - Expand the use of clean safe nuclear power
 - Produce less spent nuclear fuel

- **Initial Focus: Small-scale test reactor**
 - Reasonable balance between flux level, conversion ratio and cost
 - Nearly completed pre-conceptual design documents





Advanced Burner Reactor Concept

▪ Capabilities

- Initial startup and operation using conventional driver fuel pending core conversion to transmutation fuel
- Supports commercial deployment of ABRs as part of a closed fuel cycle
- Demonstrate transmutation
- Qualify transmutation fuels and materials
- Demonstrate fast reactor safety
- Demonstrate cost reduction design features

▪ Requirements

- Provide fast neutrons to consume transuranic elements
- Generates electricity through the net consumption of transuranic material
- Complies with environmental and nuclear regulatory requirements





Seeking Industry's Input

▪ **Technology Selection**

- Reactor type (sodium cooled, etc.)
- Reactor size
- Driver fuel qualification approach and schedule
- Technology development and R&D needs
 - Reduce risk; promote commercialization

▪ **Provide Details of Participation**

- Key features of Government and Industry relationship
- Funding approaches

▪ **Siting and Regulation**

- Regulatory framework or requirements
- Commercial vs. DOE siting considerations; co-location with the CFTC; source of driver fuel



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Next Steps





Key Challenges

- **Domestic nuclear infrastructure**
- **Aggressive deployment timeline**
- **Substantial resource commitment**
- **Integration with existing facilities**





Path Forward

- **Seek Industry's participation for commercial-scale CFTC and ABR with EOI**
 - Early engagement with industry in a collaborative role to expedite a larger-scale separations, fuel fabrication, and fast reactor
 - Industry perspective on implementation differs from government's
 - Investment risk
 - Schedule
 - Waste management
 - Enhanced and Advanced safeguards
 - Proven technology with balanced innovation
- **Evaluate Expressions of Interest and incorporate into planning**
- **Make decision regarding issuance of Request for Proposals**
- **Work with NRC to develop potential license pathways**
- **Provide information to Secretary of Energy for June 2008 decision on GNEP path forward**

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Conclusion

- **Critical Success Factors**
 - **Broad collaboration and support**
 - **Adequate resources**
 - **Technically sound approach**
 - **Effective project management**

- **Questions & Answers**

