



U.S. DEPARTMENT OF
ENERGY

Nuclear Energy

DOE Programs for Small Modular Reactors and Advanced Reactor Concepts April 6, 2010

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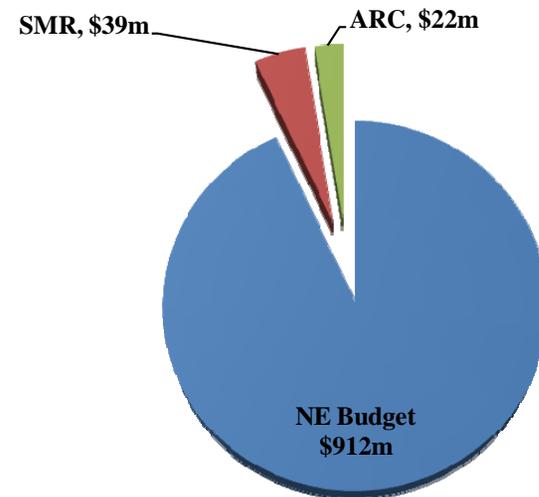
**Office of Advanced Reactor Concepts
Office of Nuclear Energy
Department of Energy**





Office of Advanced Reactor Concepts

- **Office of Advanced Reactor Concepts**
 - New Office established in FY2011
 - Responsible for both SMR and Advanced Reactor Concepts
- **FY2011 Budget Request for Advanced Reactor Concepts**
 - ~\$61M
 - Engage industry, NRC, federal and international organizations to establish the appropriate DOE role to enable and accelerate licensing and deployment of SMR and Advanced Reactor technologies into the commercial markets.



FY 2011 Budget Request



SMRs and Advanced Reactor Designs and Concepts

- **SMR and advanced reactor designs and concepts can be grouped into three sets based on:**
 - Design type
 - Estimated licensing and deployment schedule
 - Maturity of design

- **Three sets:**
 - Light Water Reactor (LWR) evolutionary based designs
 - 5-10 years
 - Non-LWR designs
 - 10-15 years
 - Advanced (Transformational) Reactor Concepts and Technologies
 - 15-25+ years

Note: DOE currently defines SMRs as those reactor designs that are ≤ 300 MWe, and fabricated in modules that are transportable from the factory to the site by rail, truck, or barge.



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SMR/ARC Program Focus Areas

- **Focus areas for RD&D based on estimated deployment schedules for reactor types:**
 - 5-10 Year
 - Cost-share partnership with LWR SMR designs where near-term NRC licensing can be completed.
 - 10-15 Year
 - Engage industry, universities, and DOE National Laboratories on new and innovative technologies and advanced reactor concepts (non-LWR) to enable them for licensing and deployment.
 - 15-25+ Year
 - Support previously established international collaborations established under GEN IV on advanced/transformational reactor concepts.



SMR/ARC Program Activities

■ **TARGET**

- Demonstrate if SMRs/ARCs meet safety requirements and offer economic or other advantages supporting deployment.

■ **FY 2010 Activities**

- Conduct FY2010 workshop(s) .
 - Evaluate SMR designs.
 - Schedule
 - R&D requirements
 - Maturity
 - Establish priorities to enable development and deployment.
 - Near-term
 - Long-term
 - Identify appropriate federal roles.
 - R&D
 - Funding
 - Establish DOE programs.
- Visit SMR vendors/customers to determine viability of design and commercial markets, and needs requirements.



SMR/ARC Program Activities

- **FY 2011+ Potential Activities:**
 - Fund NRC design certification fees for up to two (2) LWR SMR designs.
 - Cost-share.
 - Awarded through an open, competitive process.
 - Support RD&D activities at DOE national laboratories and universities.
 - Cost-shared where appropriate.
 - Advanced SMR/ARC designs involving experiment, theory, risk-assessment, and modeling and simulation.
 - Collaborate with NRC to develop an SMR/ARC licensing framework.
 - Identify where DOE R&D can support NRC's regulatory decision-making.
 - Develop objective cost models to assess the SMR business case.
 - Evaluate and support economics of SMRs.
 - Evaluate applicability of current nuclear codes and standards to support SMR/ARC licensing.
 - Collaborate with NRC, standards developing organizations and industry to identify gaps (NESCC, co-chaired by ANSI and NIST).
 - Develop new and/or revise nuclear industry codes and standards as needed.



SMR Deployment Challenges

- **Technical**
 - Developing necessary R&D and demonstration of new reactor technologies
- **Licensing**
 - Applicability of LWR requirements, codes and standards
 - Application “completeness” for certification and licensing
 - NRC staffing and skill mix for non-LWR SMRs
- **Financial**
 - Cost validation of advanced, simpler designs
 - Upfront financial investment for first-of-a-kind designs
 - Validating design for innovative structures, systems and components
 - Availability of loan guarantees
- **Other**
 - End-user/customer commitment
 - Stakeholder acceptance
 - Proposed “Clean Energy” legislation(s) recognizing nuclear as part of the clean energy portfolio.



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DOE Role in SMR/ARC Program

- **Partner with industry and governmental organizations to evaluate SMR market potential and support appropriate RD&D and cost-share activities for licensing and deployment.**
 - SMR RD&D activities for FY2011 and beyond will support –
 - NE R&D Roadmap.
 - NE Imperative Implementation Plans.
 - SMR Program Plan.
 - NE R&D Roadmap will focus on the technical and licensing challenges.
 - NE cost-share activities will focus on the licensing and financial challenges.



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DOE-NE SMR/ARC Program Benefits

- **Administration and Congress recognize nuclear energy must be part of the nation's future energy portfolio.**
 - Nuclear Power Plants provide carbon-free energy for diverse applications.
 - DOE will work with the NRC to enhance regulatory requirements and licensing process for SMRs/ARCs.
 - DOE and DoD are evaluating SMR/ARC options for energy security .

- **SMRs supports near- and long-term job creation and non-proliferation goals.**
 - Jobs span manufacturing, technical and operational fields.
 - U.S. leadership revitalized in nuclear design, engineering and manufacturing.
 - SMR/ARC designs will incorporate proliferation resistant features.

- **SMRs can respond to diverse market needs for electricity and process heat.**
 - Retrofit/repower fossil fuel electrical plants.
 - Grid/location challenges.
 - Manufacturing/petroleum industry.



Acronyms

Nuclear Energy

- **ANSI** **American National Standards Institute**
- **ARC** **Advanced Reactor Concepts**
- **DoD** **Department of Defense**
- **DOE** **Department of Energy**
- **GEN IV** **Generation IV**
- **LWR** **Light Water Reactor**
- **NE** **Nuclear Energy**
- **NESCC** **Nuclear Energy Standards Coordination
Collaborative**
- **NIST** **National Institute of Standards and Technology**
- **NRC** **Nuclear Regulatory Commission**
- **R&D** **Research and Development**
- **RD&D** **Research, Development, and Demonstration**
- **SMR** **Small Modular Reactors**
- **U.S.** **United States**