

DOE Small Modular Reactor Program

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The Secretary of Energy is Very Supportive of the Development of Small Modular Reactors

Quotes from the Wall Street Journal, March 23, 2010,
Energy Secretary Steven Chu:

“.....Even as we build a new generation of clean and safe nuclear plants—we are constantly looking ahead to the future of nuclear power. As [the WSJ] recently reported, one of the most promising areas is small modular reactors (SMRs). If we can develop this technology in the U.S. and build these reactors with American workers, we will have a key competitive edge.”

“Our choice is clear: Develop these technologies today or import them tomorrow.”



Development and Deployment of SMRs Will Result in Numerous Benefits for the U.S. Infrastructure and Economy

- **Supports near- and long-term job creation**
- **Reestablish U.S. technological leadership in nuclear design, engineering and manufacturing**
- **Supports Administration's non-proliferation goals**
- **Respond to utilities financial environment**
- **Meets diverse market needs for electricity and process heat**
 - Retrofit/repower fossil fuel electrical plants
 - Grid/location challenges
 - Manufacturing/petroleum industry
 - Desalinization plants
- **Provides a large potential export market**

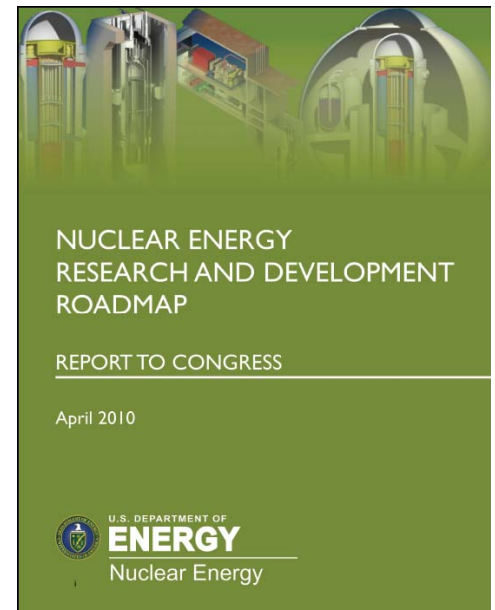
The Office of Nuclear Energy has developed an R&D Roadmap that supports efforts to accelerate the deployment of new reactors ...including SMRs

■ 4 Overall R&D Objectives:

- **Objective 1** – Improve the reliability, sustain the safety, and extend the life of current reactors.
- **Objective 2** – Improve affordability of new reactors to enable nuclear energy to help meet the energy security and climate change goals.
- **Objective 3** – Develop sustainable nuclear fuel cycles.
- **Objective 4** – Minimize risks of nuclear proliferation and terrorism.

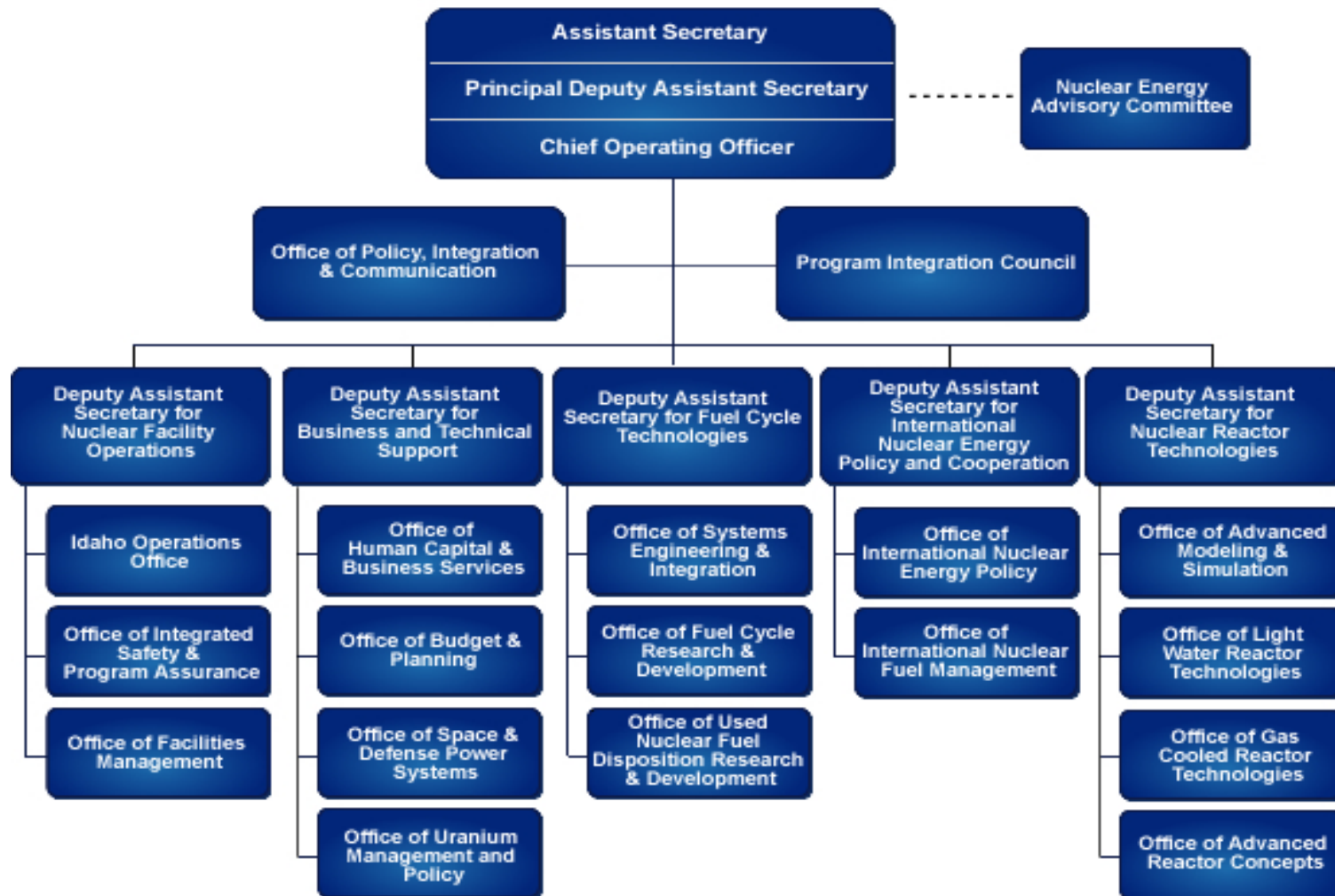
■ Key elements of the Objective 2 strategy involve:

- R&D on SMRs that have the potential to achieve lower proliferation risks and more simplified construction than other designs.
- In the longer term, support R&D of advanced reactor technologies that offer lower costs and waste generation.
- Investigate revolutionary reactor concepts that promise improved performance
- Support R&D of nuclear energy's potential to displace fossil fuels in the production of process heat



Roadmap can be accessed at:
http://nuclear.energy.gov/pdfFiles/NuclearEnergy_Roadmap_Final.pdf

Office of Nuclear Energy Organization Chart



Mission of the Deputy Assistant Secretary for Nuclear Reactor Technologies

- **Develop new and advanced reactor designs and technologies that advance the state of reactor technology.**

- **Broaden nuclear power as a resource capable of contributing to the nation's energy supply, environmental goals, and energy security needs by resolving technical, cost, safety, and security issues through RD&D.**

- **Reactor Concepts RD&D program consolidates and integrates a variety of nuclear technology initiatives to support this mission.**

- **Complementary Sub-Programs**
 - *Small Modular Reactors (SMR)*
 - *Advanced Reactor Concepts (ARC) (formerly Generation IV)*
 - Light Water Reactor Program
 - Next Generation Nuclear Plant Demonstration Project

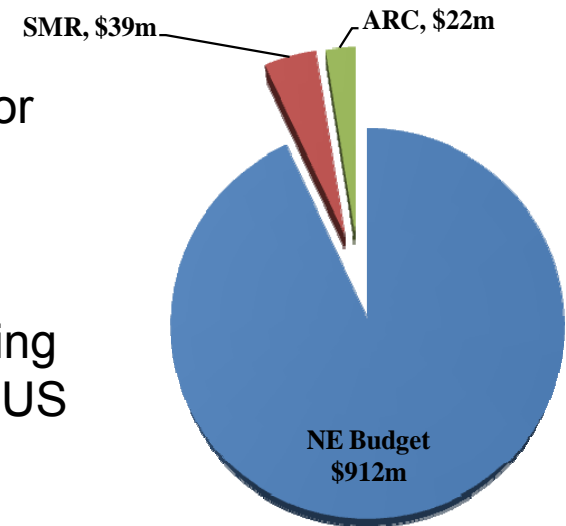
Office of Advanced Reactor Concepts

■ Office of Advanced Reactor Concepts

- New Office established in FY2010
- Limited budget in 2010 – Leveraging existing programs to get started
- Responsible for both SMR and Advanced Reactor Concepts

■ FY2011 Budget Request

- ~\$61M - \$39 M – SMR \$22 M – ARC
- Engage industry to enable and accelerate licensing and deployment of light water SMR designs into US commercial markets
- Collaborate with NRC on licensing processes to address issues unique to both SMR and ARC designs
- Support R&D needs for both SMR and ARC
- Continue to support and engage international communities on ARC technologies



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
 - Gas, metal or molten salt cooled
 - 10-15 years
 - Advanced (Transformational) Reactor Concepts and Technologies
 - 15-25+ years

Note: DOE currently defines SMRs as those reactor designs that are nominally $\leq 300\text{MWe}$, and fabricated in modules that are transportable from the factory to the site by rail, truck, or barge.

FY 2010 SMR Program Activities

- **Visiting selected SMR vendors in Spring and early Summer 2010**
 - Evaluate SMR Design Maturity and licensing status
 - Identify R&D requirements/gaps
- **Engaging with potential end-users (utilities, potential industrial users, DOE/NNSA sites, and DoD)**
- **Funding a SMR cost study (Initial Draft due Fall 2010)**
- **Engaging NRC and NEI Task Groups on regulatory path forward**
- **Initiating procurement process for the FY11 design certification cost share opportunity**
 - Draft Funding Opportunity Announcement (FOA) is written and under preliminary review by DOE business clearance!
- **Conduct SMR workshop**
 - June 29 - 30
 - Technical Breakout sessions to identify and prioritize R&D requirements
 - Will provide the basis for FY11 funding split for R&D budget (\$21 M)

FY 2011 SMR Program Activities

- **Fund up to two (2) LWR-based SMR designs toward design certification**
 - 50-50 Cost-share with vendor partners
 - Currently limited by agreement with OMB to funding NRC review-related costs, but looking to expand this scope
- **Support R&D activities at DOE national laboratories, universities and industry**
 - Cost-shared where appropriate
 - Efforts will involve experiment, theory, risk-assessment, and modeling and simulation
- **Collaborate with NRC to develop a SMR 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 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

Summary: DOE Role in Supporting the Deployment of SMRs

- Partnering with industry and governmental organizations to evaluate SMR market potential and support appropriate R&D and cost-share activities for licensing and deployment
- Collaborating with NRC on technical and licensing issues
- Identifying opportunities for industry, state and federal government agencies, and end-users to collaborate on innovative deployment options such as carbon-free energy parks
- Supporting the deployment of SMRs on federal government land (e.g., DOE/DoD) to meet the administration's clean energy and GHG goals
- Analyzing the feasibility of integrating nuclear energy with other energy sources to provide electricity and energy for a range of industrial applications