Small Modular Reactors

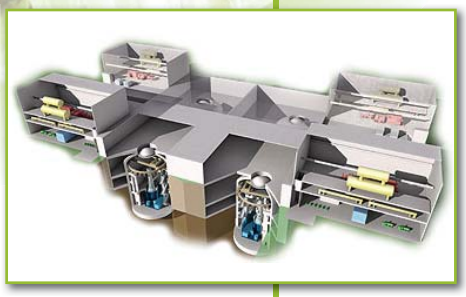
The U.S. Department of Energy's Office of Nuclear Energy

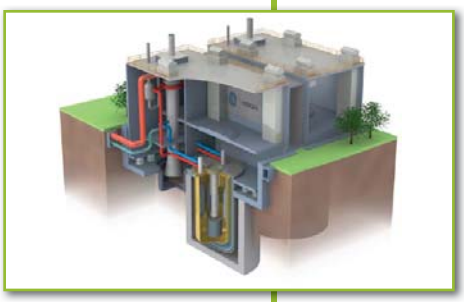
Small Modular Reactors (SMRs) are nuclear power plants that are smaller in size (300 MWe or less) than current generation base load plants (1,000 MWe or higher). These smaller, compact designs are factory-fabricated reactors that can be transported by truck or rail to a nuclear power site.

The Department of Energy (DOE) believes that there is a need and a market in the United States for SMRs. The DOE Office of Nuclear Energy's Small Modular Reactor program will advance the licensing and commercialization of SMR designs.

BENEFITS OF SMRs

The term "modular" in the context of SMRs refers to a single reactor that can be grouped with other modules to form a larger nuclear power plant. Even though current large nuclear power plants incorporate factory-fabricated components (or modules) into their designs, a substantial amount of field work is required to assemble components into an operational power plant. SMRs are envisioned to require limited on-site preparation as they are expected to essentially be ready to "plug and play" when they arrive from the factory. SMRs provide simplicity of design, economies and quality of factory production, and offer more flexibility (financing, siting, sizing, and end-use applications) compared to larger nuclear power plants.





SMRs can reduce a nuclear plant owner's capital outlay or investment due to the lower plant capital cost. Modular components and factory fabrication can reduce construction costs and duration. Additional modules can be added incrementally as demand for energy increases. SMRs can provide power for applications where large plants are not needed or sites lack the infrastructure to support a large unit. This would include smaller electrical markets, isolated areas, smaller grids, limited water and acreage sites, or unique industrial applications. SMRs can replace aging fossil plants or complement existing industrial processes or power plants with an energy source that does not emit greenhouse gases. Some reactor designs will produce a higher temperature process heat for either electricity generation or industrial applications.

SMRs also provide potential nonproliferation benefits to the United States and the wider international community. Some SMRs will be designed to operate for decades without refueling. These SMRs would be fabricated and fueled in a factory, sealed and transported to sites for power generation or process heat, and then returned to the factory for defueling at the end of the life cycle. This approach could help to minimize the transportation and handling of nuclear material. There is both a domestic and international market for SMRs and U.S. industry is well positioned to compete for these markets.

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Program Budget		
Small Modular Reactors ($ in Millions)		
	FY 2010 Actual	FY 2011 Request
	$0.0	$38.9

DOE SMR PROGRAM

The SMR program supports two activities:

- Public/private partnerships to advance mature SMR designs; and
- Research and development (R&D) activities to advance the understanding and demonstration of innovative reactor technologies and concepts.

Although several light water reactor (LWR) SMR concepts are based on proven reactor technologies, they have not been previously designed, licensed, or built for commercial deployment. DOE believes that these LWR SMRs can be commercially deployed within the next decade. NE's SMR program will establish competitive cost-shared projects to support NRC design certification of new LWR SMR designs.

Other SMRs are based on advanced and innovative concepts — designs based on fast spectrum neutrons, or high-temperature reactors — that offer added functionality and affordability. DOE will support R&D activities at its national laboratories and universities to develop and prove the proposed design concepts. Emphasis will be on advanced reactor technologies that offer simplified operation and maintenance for distributed power and load-following applications and increased proliferation resistance and security.

R&D activities will focus on:

- Basic physics and materials research and testing;
- State-of-the-art computer modeling and simulation of reactor systems and components;
- Probabilistic risk analyses of innovative safety designs and features;
- High-temperature and radiation effects on fuels and materials; and
- High efficiency power conversion systems.

PLANNED PROGRAM ACCOMPLISHMENTS

FY 2011

- Solicit, competitively select, and award project(s) with industry partners for cost-sharing the U.S. Nuclear Regulatory Commission (NRC) review of design certification document for up to two of the most promising LWR SMR concept(s) for near-term licensing and deployment.
- Conduct research, development, and testing of innovative technologies, structures, systems, and components necessary for licensing.
- Establish and support national laboratory and university R&D activities to advance innovative technologies.
- Support the development of new/revised nuclear industry codes and standards necessary to support licensing and commercialization of innovative designs.
- Develop recommendations, in collaboration with NRC and industry, for changes in NRC policy, regulations or guidance to license and enable SMRs for deployment in the United States.
- Collaborate with Department of Defense (DoD) and Idaho National Laboratory (INL) to assess the feasibility of SMR designs for energy resources at DoD domestic installations.