Sandia National Laboratories

Energy, Climate, & Infrastructure Security

Energy Security for DoD

The concept of small modular reactors (SMRs) is experiencing an increased interest for both commercial and military applications because of:

- Expected lower capital costs to first power vs. traditional site-built 1000+ gigawatt electric nuclear power plants);
- Size and modular scalability, making them comparable to adding natural gas-fired power plants but with more stable fuel costs and greater capacity factors;
- Improved performance from standardization of the design and factory production; and
- Benefits of carbon-free energy production

Vision

To enhance the nation's security and prosperity through sustainable, transformative approaches to our most challenging energy, climate, and infrastructure problems.

From a Department of Defense (DoD) perspective, SMRs offer great advantage for energy security with stable fuel cost profiles, a secure installation for meeting base-load power demands with a robust, secured reactor design (i.e., energy security), potential to provide potable water and synthetic fuels, and a means to exceed DoD greenhouse gases (GHG) reduction goals.

While presently SMRs are being proposed based on various reactor technologies, SMRs based on light-water reactor (LWR) technologies and experience seem to be closest to design certification. Of the LWR-based SMRs, the commercial market leaders appear to be the Generation mPower unit from the Babcock and Wilcox Company & Bechtel, and the NuScale Power, Inc.

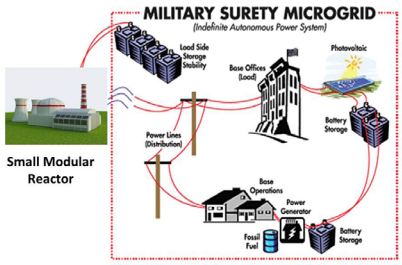
From a Department of Defense perspective, SMRs offer great advantage for energy security with stable fuel cost profiles, a secure installation for baseload power demands, potential to provide water and synthetic fuels production, and a means to exceed all GHG reduction goals. The naval reactor propulsion program provides an analog for the small modular reactor industry benefits: factory production with domestic manufacturing, and the improved performance from standardization of the design and operations with a robust, secure reactor design.

Sandia National Laboratories is working through the DOE-DoD Memorandum of Understanding for Energy Security to apply SMRs to DoD bases. Current efforts are under way through the SPIDERS (Smart Power Infrastructure Demonstration for Energy Reliability and Security) (web link) program to demonstrate:

- Cyber-security of electric grid
- Smart Grid Technologies & applications
- Islanded micro-grid
- Integration of distributed & intermittent renewable sources
- Demand-side management
- Redundant back-up power systems
- Incorporate SMRs

First efforts are focused on identifying the requirements for the SMR and identify if a commercial option is available.

The results of this effort are focused on a system model adaptable to all DoD bases and



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