Blue Ribbon Commission on America's Nuclear Future
Opportunities in Reactor and Fuel Cycle Technologies
Christofer M. Mowry, President, Babcock & Wilcox Nuclear Energy, Inc

Today's Nuclear Power Industry Imperatives

The evolution of geopolitics toward carbon-constraining legislation in response to climate change, global pressures on the nuclear component supply chain, increasingly restrictive capital markets, growing concerns about water rights and transmission capacity, and now a renewed focus on nuclear fuel management, are pushing the energy industry to conceive new approaches to nuclear power. Small, modular reactors (SMR) offer significant potential to begin addressing these challenges in a practical and affordable manner.

In the near term, our utility customers[1] want a smaller reactor that uses proven light water nuclear technology, that can leverage their substantial investment in existing nuclear infrastructure, and that can draw on the well-established conventional nuclear fuel supply chain. These requirements acknowledge the reality that the resurgence of our nation's nuclear industry rests upon continued excellence in plant operations, together with ongoing public acceptance and confidence in the technology. The broader adoption of nuclear power as a reliable, proven, carbon-free energy source, both for "repowering" existing fossil power facilities and for deployment across other segments of the energy industry, depends on a measured, incremental approach to innovation in reactor technology and the nuclear fuel cycle.

B&W mPower™ Reactor

In response to this range of emerging energy industry needs, we have developed the B&W mPower reactor. The B&W mPower reactor is a scalable, modular, Advanced Light Water Reactor (ALWR) system, which can be certified, manufactured and operated within today's existing regulatory framework, domestic industrial supply chain, and utility operational infrastructure. The B&W mPower reactor, which is designed to be air-cooled, has the capacity to match utility customer requirements in meaningful 125 MWe increments, while delivering a 4.5 year operating cycle between refueling outages. The scalable size of the B&W mPower reactor allows industry to utilize existing electrical transmission line infrastructure and, when used to repower aging fossil-power plants, reuse existing power plant assets. In addition, this size and scalability offers a market competitive solution with a more incremental approach to project financing.

The reactor system is located in a secure underground containment structure, which includes a spent fuel pool capable of holding the plant's 60-year design life of spent fuel. While the Blue Ribbon Commission and the nation identify an acceptable long-term disposition path for used nuclear fuel, the B&W mPower design provides safe and secure underground storage of used fuel for the life of the reactor. This approach offers an efficient, affordable, near-term alternative to above-ground dry cask storage. The reactor design is also sufficiently flexible to accommodate a future transition to MOX fuel and thereby integration with other longer-term components of a more closed, or "modified open", nuclear fuel cycle.

The Future of Light Water Reactor Technology

B&W is not alone in the emerging SMR industry. There are many companies currently pursuing the development of small reactors, based on a range of technologies from light water design to more long-term "Generation IV" concepts. The B&W mPower design is focused on providing an evolutionary light water reactor option. Generation IV technologies offer some appealing possible advantages with respect to spent fuel disposition, and should therefore be developed to potentially complement a light water reactor-based fleet of power reactors. However, in the near-term, utilities and the American public will generally be most comfortable investing, locating and operating reactor technologies that have a long history of successful operation and safety in the United States. This reality has been demonstrated by the siting challenges encountered by the Global Nuclear Energy Partnership (GNEP), and this lesson should be strongly considered in planning our new path forward.

Recommended Federal Actions

Public-private partnership is critical to help reduce risk and accelerate deployment of promising new light water SMR technologies. A successful cost-sharing program stemming from such a partnership should encompass all important development activities—including design and licensing—necessary to programmatically address the "first-mover" risks inherent in technology demonstration projects. In addition, the government should continue to support R&D activities related to advanced reactor technologies, to complement the light water fleet.