Written Testimony

of

Christofer M. Mowry

President, Babcock & Wilcox Nuclear Energy, Inc.

The Babcock & Wilcox Company

Before the

Committee on Science and Technology

U.S. House of Representatives

May 19, 2010

Chairman Gordon, Ranking Member Hall, and Members of the Committee:

My name is Chris Mowry and I am the President of Babcock & Wilcox Nuclear Energy, a division of The Babcock & Wilcox Company. I would ask that my entire statement and supplemental information be entered into the Committee record. My prepared remarks will be a summary of this statement.

It is my privilege to present this testimony today regarding the Department of Energy's (DOE's) Nuclear Energy Research and Development Roadmap (Roadmap). I will focus my testimony on Small Modular Reactors (SMRs) and the promise they hold to provide carbon-free, base-load nuclear power in a more flexible, affordable form, while generating a lasting increase in high quality jobs for America. I applaud the DOE for recognizing the real potential of SMRs and including significant support for their development in the Roadmap.

The Babcock & Wilcox Company has a rich legacy of innovating energy technology solutions for efficient and reliable electricity generation throughout the United States, North America and across the globe. We grew our business over the past 140 years by developing and commercializing practical solutions to the evolving challenges of the power generation industry. We provide a comprehensive portfolio of clean energy technologies, including such coal-based systems as oxy-coal combustion, post-combustion CO_2 scrubbing, and environmental control systems. We supply a wide range of renewable energy systems including biomass, concentrating solar power, and waste-to-energy. And, important to today's testimony, we consistently lead the

development and deployment of new nuclear energy technology solutions for industry and government.

B&W has more than 50 years of continuous nuclear engineering and manufacturing experience. Seven of the large nuclear power plants operating in the U.S. today were designed, manufactured and installed by B&W, including reactors in Arkansas, Florida, Ohio, Pennsylvania and South Carolina. Many other operating reactors incorporate major B&W nuclear steam supply components. Today, we provide customers with nuclear manufacturing and nuclear-related services from more than 17 facilities across North America. These locations are engaged in everything from manufacturing major components for nuclear power plants, to operating the Nation's nuclear energy laboratory in Idaho, to fabricating fuel for the High Flux Isotope Reactor at Oak Ridge National Laboratory and the University of Missouri's research reactor, both of which provide critical research and material testing services. Two of our manufacturing facilities maintain the only privately held NRC Category 1 nuclear fuel licenses to manage Highly Enriched Uranium in the United States. We also down-blend Highly Enriched Uranium into Low Enriched Uranium, which is then delivered into the marketplace for commercial reactor fuel.

B&W operates significant nuclear manufacturing facilities in Indiana, Ohio, Virginia and Tennessee, as well as in Ontario, Canada. We are the only American manufacturer accredited and capable of producing large N-stamped components for commercial nuclear power plants. We have fabricated more than 1,100 large Nuclear Steam Supply System (NSSS) components and pressure vessels, including approximately 300 nuclear steam generators worldwide. And,

we employ directly and through joint venture companies approximately 12,000 U.S. nuclear professionals.

Nuclear Power and Small Modular Reactors

The DOE Nuclear R&D Roadmap correctly states that "To achieve energy security and greenhouse gas (GHG) emission reduction objectives, the United States must develop and deploy clean, affordable, domestic energy sources as quickly as possible." It is clear that nuclear energy will play a critical role in achieving these objectives. The report also concludes that "The capital cost of new large plants is high and can challenge the ability of electric utilities to deploy new nuclear power plants." This concern is central to industry's motivation to develop and deploy SMRs as complements to large, gigawatt-sized reactors.

More than two years ago, B&W began evaluating the shifting nuclear industry landscape. Several factors, including the potential for climate change legislation and carbon emission regulation, the need for increased energy independence, the constraints on the nuclear component supply chain, the increasingly restrictive capital markets, and the growing concerns about water rights and transmission capacity were pushing the industry to innovate new approaches to nuclear energy. Over these past several years, it has become increasingly clear that when it comes to nuclear power generation technology, one size does not fit all.

As part of our SMR market evaluation, we drew on the experience and expertise of electric utilities themselves to help us define the type of SMR technology best suited to meet their near-term needs. Their guidance caused us to recognize that many utilities are not comfortable

financing large, gigawatt-sized nuclear power projects. For example, some smaller electric cooperatives, which have historically been unable to include nuclear power plants in their own generation portfolios due to size and cost, now view SMRs as a realistic way to increase their carbon-free baseload generation capacity. Larger utilities see significant value in small reactors as well, particularly in providing a more incremental approach to project financing and to meeting projections of modest system load growth. In the near term, our utility customers want a smaller reactor that uses proven light-water nuclear technology, that can lever their substantial investment in existing nuclear infrastructure, and that can draw on the well-established conventional nuclear fuel supply chain. They also want a practical carbon-free option that can be used to "repower" aging coal power plants. In response to this broad range of emerging energy industry needs, we have developed the B&W mPower^{TM} reactor.

B&W mPower Reactor

The B&W mPower reactor (Figure 1) 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 has the capacity to match utility customer requirements in meaningful 125 MWe increments, while providing a 4.5 year operating cycle between refueling outages (compared to 18 or 24 month refueling cycles for currently operating large reactors). The scalable size of the B&W mPower reactor will allow industry to utilize existing electrical transmission line infrastructure and, when used to repower aging fossil-power plants, reuse existing power plant assets.

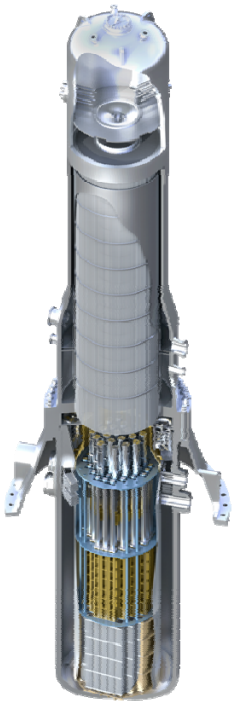

Figure 1

The use of conventional fuel, structures and power conversion equipment contributes to reliable, efficient plant operations within the existing Light Water Reactor (LWR) experience base of the industry. We plan on manufacturing the entire B&W mPower reactor in B&W facilities across North America, with the completed integral nuclear module then shipped by rail to plant construction sites. Factory assembly permits site infrastructure to be constructed simultaneously, reducing construction time. The reactor is designed to be installed in a secure underground containment structure (Figure 2), addressing aircraft impact concerns. The design also includes a spent fuel pool capable of holding 60 years' worth of spent fuel inside the underground containment. In other words, the spent fuel is stored securely for the life of the reactor. Additionally, the B&W mPower reactor plant is specifically designed to be air-cooled, thereby addressing concerns—particularly in the Southwest and Southeast—about local and regional water resources. These capabilities make the B&W mPower reactor a suitable power generation option for market segments such as replacement of aging fossil power plants, incremental

additions to existing nuclear sites, power sources for energy intensive industrial manufacturing sites, potential energy parks, as well as developing countries and remote areas with limited transmission and access infrastructure.

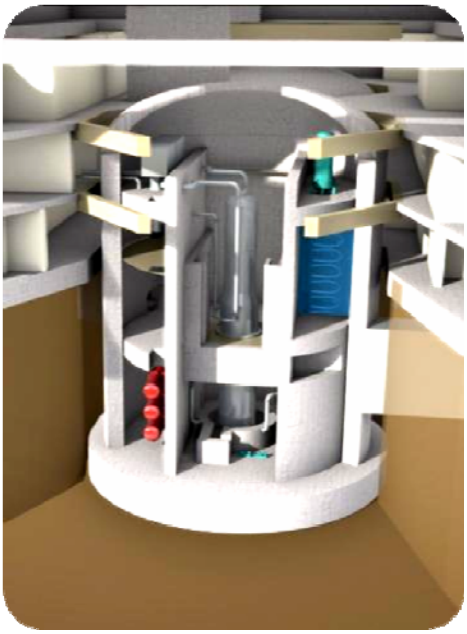

Figure 2

We are currently well into the design phase for the B&W mPower reactor and plan to submit our Design Certification Application (DCA) to the U.S. Nuclear Regulatory Commission (NRC) in 2012. Our initial efforts focus on obtaining NRC Design Certification and lead plant deployment in America. The NRC is already engaging us in Design Certification and licensing activities for the B&W mPower reactor. In support of these goals, we have developed a B&W mPower Consortium made up of B&W and leading U.S. utilities, including the Tennessee Valley Authority, First Energy and Oglethorpe Power Corporation. The Consortium is dedicated to addressing the proper regulatory framework, design requirements, and licensing infrastructure necessary to support the commercialization of the B&W mPower reactor. The ultimate goal of the Consortium is to deploy one or more demonstration plants in the U.S. by 2020, if not earlier.

This is an aggressive but realistic goal, one which will require industry leadership from B&W and its utility partners, the right balance between the promise of innovation and the certainty of proven ideas, and consistent support from the DOE, NRC, and Congress. A high-level version of the lead plant schedule, leading to initial deployment by 2020, is included in Figure 3.

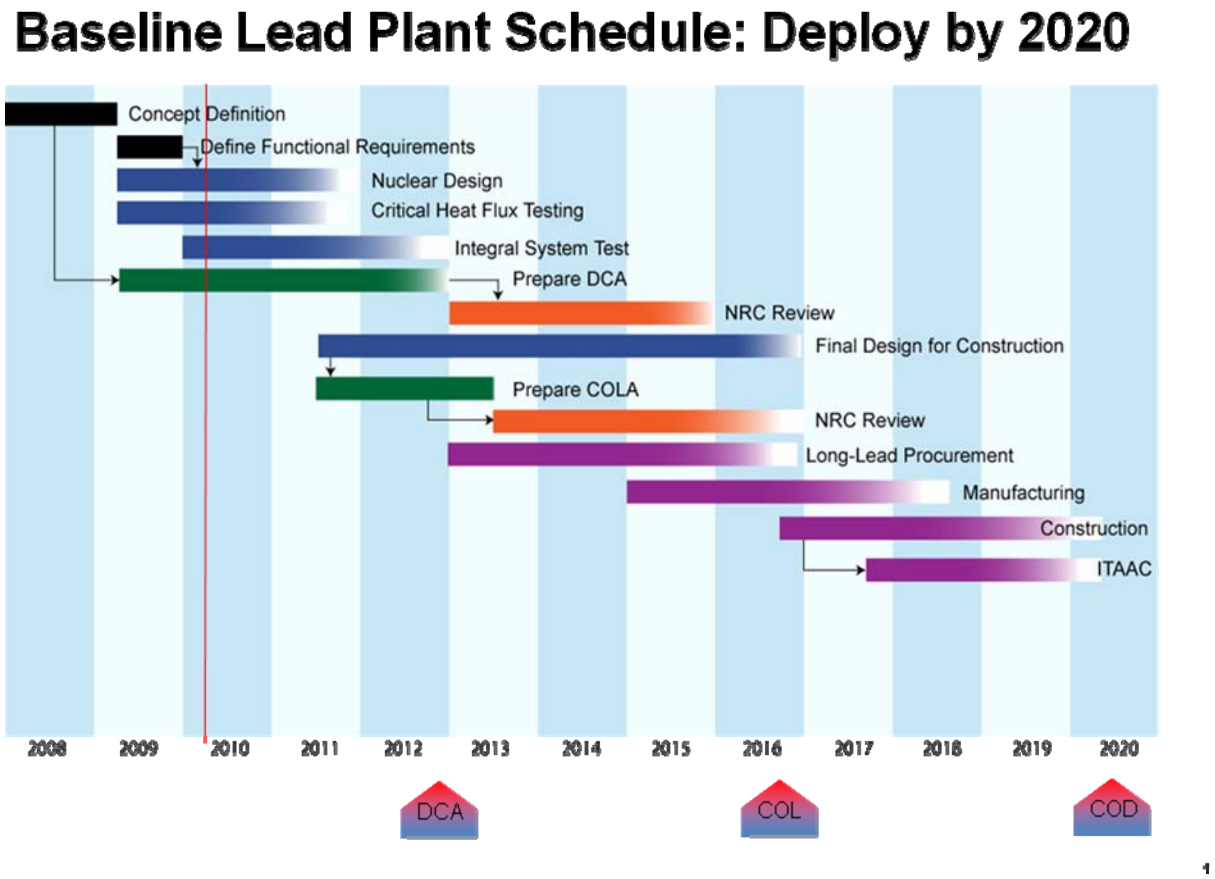

Figure 3

The B&W mPower reactor is intended to be a competitive source of power generation. Our current analysis of the levelized cost of electricity (LCOE), an industry standard metric for total cost of ownership, indicates that the economics range from 47 $/MWh to 95 $/MWh (Figure 4) for a nuclear plant composed of 4 B&W mPower modules generating 500MWe, depending on the deployment configuration. This LCOE range is competitive with new fossil generation and renewable power alternatives, even without a carbon "tax".

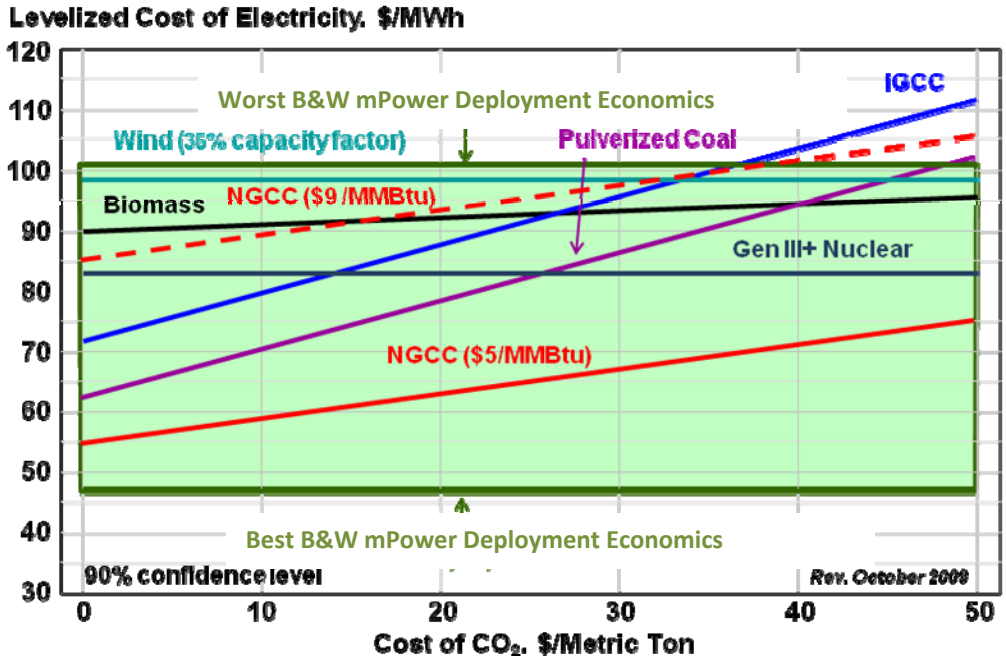

Figure 4

Manufacturing of the B&W mPower reactor has the potential to create thousands of jobs in the next 10-15 years across North America, including Ohio, Indiana, Virginia and Tennessee. The B&W mPower reactor will be fully supported by a North American supply chain, including all forgings. Current estimates of manufacturing job growth are variable based on broad predictions

of the market for small reactors. As more of the development and final design work is completed, and fabrication and assembly methods are defined, good estimates of manufacturing job growth will become available.

When used to repower aging coal facilities, the B&W mPower reactor creates a net increase in high-quality jobs at the power plant. On an equivalent basis, approximately four times as many jobs are created per unit of power generated by a B&W mPower plant compared with an aging coal plant. Nuclear power plants trade lower, very stable fuel costs for more high-quality jobs. This is a great trade-off for our country's economy and its employment challenges.

The B&W mPower reactor will also generate significant indirect jobs in the areas of engineering, project management, field construction and plant operations. Engineering and design work for the B&W mPower program has already created more than 100 full-time positions in Virginia and Ohio and led to the establishment of dedicated facilities in Virginia.

Generation III Light-Water and Generation IV Technologies

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 DOE's R&D Roadmap recognizes the importance of both near-term light water-based SMRs, as well as the longer-term, non-light water technologies. In the Roadmap, the DOE properly recognizes the relative maturity of these various technologies, acknowledges that basic research needs for light water technology are minimal, and focuses the Roadmap on identifying priorities that enable their development,

demonstration and commercial application. Simultaneously, the DOE rightly plans to support a range of R&D activities for longer term non-light water technologies. The DOE has struck a good balance between near-term and long-term efforts. It has prudently created a broad programmatic foundation supporting SMR technologies that meet market realities and effectively complement large nuclear power plants and other sources of energy.

Federal Support for SMRs

This Committee recognized the value of public-private partnerships when it established the Nuclear Power 2010 program in the Energy Policy Act of 2005. Today, NP 2010, a 50-50 cost-shared program between the Department of Energy and utility industry partners, effectively addresses the technical, regulatory, and institutional barriers to building new, gigawatt-class nuclear power plants in the United States, providing the framework for industry decisions to construct and operate those plants. A similar model will also help reduce risk and accelerate deployment of promising new SMR technologies into the energy industry.

In its Fiscal Year (FY) 2011 budget request, the DOE requested funding for a new SMR program, to include both a cost-sharing initiative supporting near-term Design Certification of light water SMR technologies and R&D activities for longer-term technologies. There are also several bills under consideration in both the House and Senate that incorporate cost-sharing programs for SMRs, all articulating strong support for their development. A meaningful SMR cost-share program is vital to the energy industry. The timeline, scope and competitive selection criteria of such a program will have a significant impact on the ultimate success of SMRs in meeting our emergent energy industry challenges. To “develop and deploy clean, affordable,

domestic energy sources as quickly as possible," as DOE states in the Roadmap, an SMR cost-share program should support the near-term deployment of scalable, modular nuclear power in a way that enables the market adoption of practical, affordable carbon-free nuclear power. This program must foster development of technology that domestic utilities are likely to construct, own, and operate in quantity, while accelerating the creation of stable, high quality American jobs. We believe the B&W mPower reactor meets these criteria today.

To deploy SMRs by the end of this decade, it is important that the cost-share program scope span the spectrum of necessary industry development activities—including Design Certification, final design engineering, as well as Early Site Permit and Combined Operating License activities—rather than being confined simply to offsetting NRC fees. In any industry, unique risks are inherent in being a technology "first-mover". Recent worldwide experience in nuclear construction projects has shown that successful efforts to deploy new nuclear plant designs rely on government and industry cooperation encompassing support, design, licensing, and first-of-class plant construction. Government cooperation is essential to realistically address the licensing and schedule risks inherent in such demonstration projects. Through public-private cooperation, government and industry can share the risks and benefits of deploying the first SMR plants by the end of this decade.

As mentioned previously, B&W believes a reasonable programmatic goal is to deploy light water-based SMR technology in this country by the year 2020. Working outward from that goal, NRC Design Certification should be completed for one or two SMR designs by the year 2016. DOE has requested $39 million in FY 2011 for the SMR program, with funding split between the

near-term, cost-shared Design Certification of two light-water SMR designs and the longer-term R&D for more conceptual SMR designs. Both program components are valuable. However, we are concerned that any reasonable split of this $39 million between the near-term Design Certification work and the longer-term R&D would significantly slow building industry momentum supporting a near-term SMR demonstration program, risking achievement of the goal to deploy a lead plant by 2020. This is why we have encouraged a number of Congressional Members to support a programmatic increase of the overall SMR program account to $55 million for FY 2011, which would leave adequate funds for long-term R&D while also providing reasonable funding to initiate meaningful Design Certification and licensing activity for up to two light water SMR technologies.

As this Committee considers legislation relating to SMRs, I would offer that a successful cost-sharing program must rely on competitive selection criteria that support our Nation's energy and security goals. Emphasis should be placed on:

- Modularity that enables factory manufacture of the integral nuclear steam supply system,
- Domestic utility commitment to near-term deployment of the technology,
- Economic competitiveness of the design without long-term government support,
- Domestic supply chain maturity to support near-term manufacturing, and
- Ability for the design to be certified and licensed within the existing regulatory structure.

These criteria will ensure that the SMR design selection is market-driven, and that public funding used to support those designs will ultimately be well spent on a successful program—one that enables a significant and long-lasting reduction in America's carbon emissions, that

increases America's energy independence, and that creates substantial high-quality American jobs. In other words, these program selection criteria will help ensure that America leads innovation in this new technology and enhances its global competitiveness in the energy industry.

Closing Comments

B&W believes that SMRs such as the B&W mPower reactor offer America a practical and affordable source of near-term, domestically produced, clean energy. Delivering on the promise these reactors hold will depend on leadership and foresight from both the nuclear industry and government.

In 1957, the first commercial nuclear power plant at Shippingport, PA achieved full power operation, the result of a partnership between the Atomic Energy Commission and Duquesne Light Company. This cooperation between industry and government set in motion the development of the U.S. commercial nuclear industry, which for 50 years provided technology leadership to the world and today supplies 20 percent of all electricity generated in America, and 70 percent of our carbon-free electricity generation. America's nuclear industry owes its existence to a successful public-private partnership which first demonstrated the commercial application of nuclear energy. Our government's investment in this first-of-a-kind technology more than 50 years ago provided lasting and significant value to the Nation.

Today we have a new opportunity—an opportunity to reestablish America's leadership role in the commercial nuclear power industry that we first launched in 1957. A new public-private partnership will enable the U.S. to demonstrate the promise which SMR technology holds for our

energy industry by the end of this decade. The DOE's Nuclear Energy R&D Roadmap has created a strong foundation from which to pursue this goal, and I look forward to working with the Committee on legislation to implement it.

Thank you for the privilege of testifying before the Committee. I am happy to answer any questions the Committee may have.