As Seen In: WORLD ENERGY MAGAZINE
VOL. 10 NO. 4 2008

Nuclear Power:
Preparing for the Industry Resurgence

by James E. Bollweg
President
CBI Services, Inc.

The U.S. Department of Energy expects American demand for electricity to increase 40 percent by 2025. With this ever-increasing demand, coupled with perceived limits on available fuel supplies, power companies are examining more than ever their generating technology options, including nuclear power.

It is hardly a secret these days that the nuclear industry has reemerged as a market of interest after nearly three decades of minimal activity. Despite an exceptional industry safety record, public perception of the Three Mile Island incident in 1979 still casts a dark shadow over the nuclear landscape, while the 1986 Chernobyl tragedy understandably worsened overall public sentiment for new nuclear power. In the past few years, however, fossil fuel prices and sourcing issues, concerns associated with emissions, advanced technologies and, of course, the need for more reliable base-load power have pushed nuclear power back into the limelight.

But what are the primary drivers that will move the current group of proposed nuclear plants from the planning stages to the construction and operation stages? More important, how can the engineering and construction (E&C) contractors who will build these facilities be ready to accommodate an industry that could become a thriving business at any moment? Worldwide expenditures for nuclear power are expected to be between $35 billion and $150 billion by 2016 and more than $200 billion by 2030, according to the Energy Information Administration (EIA). For the companies that hope to acquire a portion of that business, there are several issues to consider in order to position themselves for the expected future work in the nuclear power industry.

Market Drivers

Contributing to the nuclear renaissance is the U.S. Energy Policy Act of 2005, which has prompted utilities to expedite their efforts for new nuclear power. The act provides such benefits as risk insurance to owners of the first six plants; payment of 100 percent of the costs for governmental and litigation delays at the first two plants (up to $500 million per plant) and 50 percent for the next four plants (up to $250 million per plant); an 80 percent loan guarantee for project financing should the owner be unable to pay; and a production tax credit of $18 per megawatt-hour for the first 6,000 megawatts (MW) of new nuclear power for up to eight years ($125 million per plant). Separately, but just as important, the Nuclear Regulatory Commission (NRC) has greatly streamlined the licensing process for new nuclear plants in the United States.

In addition to government support and incentives, the competitive cost of nuclear generation is another key driver affecting the growth of the nuclear industry. Nuclear power is competitive with the other major forms of power generation and has the lowest fuel cost of any large-scale generating option.

Given the projected increases in electrical demand by 2030, to maintain the nuclear market's 20 percent

share of electrical generation in the United States the country would need to build between 30 and 50 new 1,000 MW nuclear plants. Currently the demand for new nuclear power in the United States in the next 10 years is expected to be somewhere between 7,000 and 24,000 MW (most likely 15,000 MW). There are 31 proposed new U.S. nuclear units in the NRC licensing process. This number is increasing as plans for new plants are announced. Most experts feel the first nuclear plants in the United States will be approved for construction by 2009 or 2010 (to be in operation by 2013 to 2015).

But what about health, safety and environmental concerns? While nuclear power has proven to be reliable, competitive, safe and environmentally friendly from an air-quality standpoint, safety and nonproliferation continue to be critical issues for the public. In response, owners are incorporating new passive safety features that reduce complexity and increase overall safety. These new measures include backup systems that automatically take over in the event of an accident, streamlined control rooms, and fewer pipes and valves. In fact, the concept of a simplified design and fewer components is the cornerstone of the new Generation III and III+ designs. Generation IV designs will be even safer.

As for the environment, nuclear power is beginning to be grouped with clean power solutions such as wind, solar and hydrogen energy. Nuclear power's carbon emissions rates are comparable to such renewable fuels as wind and hydrogen.

Based on these drivers, it is safe to say that the resurgence of the U.S. nuclear industry is accelerating rapidly. Sixteen utilities have proposed at least 31 units at up to 24 sites (Figure 1), and several have already submitted their construction and operating licenses (COLs) to the NRC. These COLs are progressing in parallel with design certification activities and early site permits.

Although E&C contractors can see the vast potential for work within the nuclear industry, this resurgence does pose some problems. After more than 20 years of minimal activity, the ability of the E&C industry to accommodate this increase will be strained. Plus, most of the experience and skill in this industry reside with a few key personnel, many of whom are now nearing retirement. There are several ways contractors can position themselves in spite of these limitations.

Supporting the Nuclear Industry

The number of suppliers and contractors supporting the nuclear industry is limited. This can be attributed to several factors, including the cost of maintaining a nuclear quality assurance program and a lack of knowledge and experience resulting from little market activity in more than 20 years. In spite of a limited number of vendors and contractors at the moment, the demand for competitive bidding will likely create new competitors as the market expands. To compete successfully in the industry, however, several prerequisites are needed. These include the ability to develop standardized, proven designs; construction methods that provide cost and schedule certainty; and, of course, adherence to all nuclear codes and standards.

New plant designs. The next generation of nuclear power in the United States will employ standardized advanced technologies and designs. Often referred to as Generation III and III+ designs, these units are based on passive designs. They use gravity for moving cooling water and natural convection for heat removal. Far fewer pumps, fans, chillers or other rotating machinery are required for the safety systems.

For contractors to be competitive in the nuclear industry, they must be able to utilize automated processes to develop these proven, standard designs in an economical and timely fashion. This will ensure that construction can begin as soon as possible. In fact, 85 percent of the design phase should be complete at the start of construction.

Off-site construction. In addition to standardization, new nuclear plants will be of modular construction. Based on several plants that have been built in Japan and China in recent years, construction schedules are expected to be between 36 and 48 months from first concrete pour to fuel load. This can only be achieved through modularization.

Modularization is the process of engineering and fabricating construction projects into shippable packages or segments that can be installed economically and logistically at the permanent site. These tasks are carried out in a shop environment rather than at a permanent

New Nuclear Plant Status

Company	Site(s)	Design, # of Units	Early Site Permit (ESP)	Construction / Operating License Submittal
Alternate Energy Holdings	Bruneau, ID	EPR	-	FY 2009
Amarillo Power	Vicinity of Amarillo, TX	EPR	-	FY 2009
AmerenUE	Callaway, MO	EPR	-	FY 2008
Constellation (UniStar)	Calvert Cliffs, MD, plus two other sites	EPR (3)	Will go to COL but submit siting information early	First submittal - FY 2008
Detroit Edison	Newport, MI	Not yet determined	Not yet determined	FY 2008
Dominion	North Anna, VA	ESBWR (1)	Approved November 2007	November 2007
Duke	William States Lee, Cherokee County, SC	AP1000 (2)	-	December 2007
Duke	Davie County, NC	Not yet determined	Under consideration	Not yet determined
Duke	Oconee County, SC	Not yet determined	Under consideration	Not yet determined
Entergy	River Bend, LA	ESBWR (1)	-	FY 2008
Entergy (NuStart)	Grand Gulf, MS	ESBWR (1)	Approved April 2007	FY 2008
Exelon	Clinton, IL	Not yet determined	Approved March 2007	Not yet determined
Exelon	Victoria County, TX	ESBWR (1)	-	FY 2008
Florida Power & Light	Turkey Point, FL	Not yet determined (2)	Not yet determined	FY 2009
NRG Energy / STPNOC	Bay City, TX	ABWR (2)	-	September 2007
PPL Corp.	Susquehanna, PA	EPR	-	FY 2009
Progress Energy	Harris, NC; Levy County, FL	AP1000 (2); AP1000 (2)	-	Harris - FY 2008; Levy County, FL - FY 2008
South Carolina Electric & Gas	Summer, SC	AP1000 (2)	-	FY 2008
Southern Company	Vogtle, GA	AP1000 (2)	Under review, Approval expected early 2009	FY 2008
Texas Utilities	Comanche Peak, TX	APWR (2)		FY 2008
TVA (NuStart)	Bellefonte, AL	AP1000 (2)	-	October 2007

FY - Federal Fiscal Year, CY - Calendar Year

Source: Nuclear Energy Institute

Figure 1: Proposed nuclear plants in the United States

It is important that contractors have the required expertise not only in the fabrication of modules but also in their engineering and design.

site, so fewer field personnel are required. Implementing a modular concept has several advantages, such as giving the contractor a greater degree of control over the quality-assurance and quality-control aspects of the project. In addition, civil work can occur simultaneously with shop fabrication and assembly, reducing the overall project delivery schedule, which is important to nuclear plant owners.

It is important, however, that contractors have the required expertise not only in the fabrication of modules but also in their engineering and design. Knowing what to place on modules, how to ensure adequate spacing and what constructability requirements in the shop and field must be met are just a few of the engineering aspects to be considered.

Adherence to codes and standards. For contractors to enter (or reenter) the new nuclear power plant business, they must meet the stringent safety requirements of nuclear codes and standards. This is crucial since the operation of nuclear facilities is strictly regulated to protect both the public and the environment. Contractors will need to develop nuclear-grade policies and systems for their engineering, procurement, project control, fabrication, quality-assurance, welding and construction operations. CB&I, for instance, had these procedures in place many years ago and is now upgrading them to meet current standards and requirements. CB&I also is renewing its American Society of Mechanical Engineers Section III stamps, which are required for nuclear work.

In addition to these elements, contractors will need to hire and develop staff with the necessary disciplines to handle nuclear work. And they will require flexibility and creativity to work with owners, developers and suppliers to structure business arrangements that can accommodate the complexity and risk-sharing needed to engineer and build multibillion-dollar nuclear facilities.

The Future of the Nuclear Market

Upcoming work on new nuclear power projects is almost a certainty at this point and will provide many opportunities for contractors to participate. However, to prepare for these opportunities, contractors should consider the following:

- dedicating resources to pursue opportunities
- updating all policies and procedures required to execute nuclear work
- developing employees with nuclear expertise not only to pursue the opportunities but also to execute the projects

Plant owners have similar goals for these new projects: to have them completed safely, on budget and on time, with limited maintenance and at a quality acceptable by today's nuclear codes and standards. By adopting standardized designs, using proven construction methods that ensure cost and schedule certainty, and having a solid business plan in place for identifying areas of the market where they can participate, contractors will soon see a large amount of nuclear business. ■

James E. Bollweg is president of CBI Services, Inc., the company's union-operating subsidiary. He was named to the position in June 1998. He previously served as area director of operations for Europe, Africa and the Middle East.

Mr. Bollweg joined CBI in 1975 and has held a series of successively responsible positions with the company in operations and sales. He earned a B.S. in mechanical engineering from Western Michigan University.