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The Nuclear Renaissance: A Challenging Opportunity

How Westinghouse is Meeting the Challenges of the Industry with New Technology, Investment in Human Resources, and a Commitment to Supply Chain Management

Introduction

The predictions of a nuclear renaissance are not just confined to those in the media, or even to those of us in the industry. Elected government officials, policy makers, think tanks, and even environmentalists from around the world are stating, as did the Committee on U.S. Government Reform of the U.S. House of Representatives, that "nuclear energy must become the primary generator of baseload electricity."

With this worldwide interest in adding generation capacity, reducing greenhouse emissions, and moving toward sustainable power generation, nuclear power is experiencing a true rebirth. The result is that the industry is now faced with several resource challenges: how will new plant capacity be procured, and what methodologies exist for ensuring that plant components are not only of the highest quality, but also delivered on time and within budget? And, how will the industry address the need to bring in new talent, and transfer technology to the next generation?

Background

Since its founding by George Westinghouse in 1886, Westinghouse has provided numerous electricity-related innovations, including the AC technology that electrified the world. Westinghouse built the first industrial atom smasher in 1937, and the first commercial PWR in 1957. Today, the company's technology is installed at well over 40% of the world's 440 operating nuclear power plants, supplied by Westinghouse or one of its licensees.

Never has the company reduced its focus on the nuclear power industry, and in fact, while much of the nuclear power industry lay virtually dormant through the 1980s and 1990s, Westinghouse continued to invest in new technology, including the AP600 and AP1000. In the past 20 years, Westinghouse has invested more than $600 million and thousands of man years in advanced/passive technology. The market has responded quite favorably to the technology, and today, the Westinghouse AP1000 is identified as the design basis for 12 of 17 Generation III+ plants planned in the U.S. Interest is also strong in Europe and Asia.

In addition to the AP1000, Westinghouse is also involved with two other next generation nuclear power plant configurations, the Pebble Bed Modular Reactor (PBMR), and the International Reactor Innovative and Secure (IRIS). The PBMR technology uses a 900°C coolant outlet temperature, and with a rating of 400 MWt, the size is significantly smaller than traditional nuclear power plants and therefore best suited for distributed applications as well as oil sands recovery, steam methane reforming, coal-to-liquids conversion, and hydrogen generation.

Westinghouse is also working with 20 technical organizations around the globe to develop the IRIS design. IRIS is a small (335 MWe) pressurized water reactor utilizing an integral reactor coolant configuration. IRIS is best suited for developing countries because of its size, safety characteristics, and use of conventional light water reactor technology. The technology is very amenable to countries with limited nuclear infrastructure because of the familiar light water reactor technology, the long response times before actions need to be taken, and the extremely high level of safety inherent in the design.

As the demand for nuclear power continues to grow, so will the need for plants that are designed for specific regions of the world, or for specific applications. The AP1000, PBMR, IRIS, and other developments occurring at Westinghouse represent solutions that address the full spectrum of market needs well into the 21st century.

Human Resources

In anticipation of the nuclear renaissance, and to prepare to replace current employees who will become retirement eligible over the next decade, Westinghouse began hiring in moderate numbers at the turn of the decade. This followed a period where the company, as well as most industry organizations, did virtually no hiring.

Today, Westinghouse has accelerated the hiring of new graduates, with approximately 500 new graduate hires over the past five years, and a projected 150 more per year through at least 2010. The company has also hired 2,000 *experienced* employees in the past five years, and it is projected that 500 more per year will be brought on through 2010.

It is, of course, a challenge to absorb this number of new personnel. Westinghouse has instituted a combination of new hire orientation, technical training, and mentoring to bring the new hires to a level of proficiency so that they are productive and happy.

The process for recruiting new talent starts early. Westinghouse looks for qualified third and fourth year college students at career fairs, and by posting internship opportunities on the corporate website, in newspapers and trade journals, and through various colleges and universities. Westinghouse also hosts an "Intern Café" event each year, which provides candidates the opportunity to talk with a wide range of managers, and for managers to assess the skill sets of interns and match them with their particular needs.

Interns at Westinghouse are assigned a mentor to guide them through the duration of their internship. The mentor works with the student to provide direction on a project that has been assigned specifically for them.

At the end of the internship, Westinghouse holds an Intern Fair, which gives the student an opportunity to display the results or findings of their project, as well as receive an evaluation from their manager. Job offers are then made based on the level of success with the project, and the assessed potential of the individual.

New graduates are recruited from approximately 25 colleges and universities throughout the world. More than 400 candidates are invited each year to attend a day long session to meet with various Westinghouse managers, upon which they are assessed on their skill sets, GPA, and degrees obtained.

New hires attend a one week orientation held off site. They are then assigned to their hiring manager, and a mentor. All new engineers are mentored by experienced employees, including close to 2,000 that have actual "hands on" new build experience in the U.S., Europe and Asia.

Westinghouse mentors are selected by a formal review process after they achieve the requisite experience and demonstrate the required traits, such as technical leadership inside and outside the company, successful consultation to business leaders, and successful mentoring of other employees. Mentors are also identified based on their critical skill set and the demonstrated level of capability in transferring that skill set onto others.

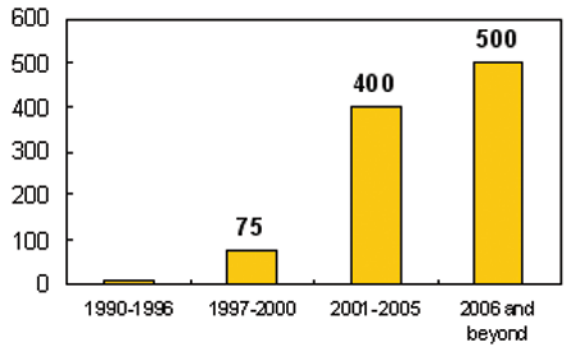

Figure 1: Hiring To Meet The Challenge: Westinghouse New Hires Per Year

Westinghouse is also helping to insure that new college graduates will be properly trained and enthused about a career in the nuclear power industry. For example, the company is supporting the development of a nuclear engineering program at the University of Pittsburgh, near the corporate headquarters in Western Pennsylvania.

The University of Pittsburgh program is starting with an undergraduate concentration and will likely advance to a graduate degree in the next few years. Classes in specific nuclear engineering areas will be taught by Westinghouse employees. This will allow Westinghouse expertise to be transferred to both university undergraduates and to current Westinghouse employees who desire to advance their knowledge in the nuclear engineering area.

Grooming new talent and continuously developing the skills of seasoned employees has proven to be a worthwhile investment. Westinghouse has an incredibly low turnover rate of just 3%, and for new graduates, the 5 year retention rate is 85%.

A Commitment to Supply Chain Management

Westinghouse has made significant infrastructure investments in supply chain management to support new build activities, with an emphasis on cost management, capacity management, shortened procurement cycles, and supplier oversight, especially in the area of quality. The challenge was to develop a supply chain that is capable of supporting the volumes and schedules of the nuclear renaissance, while optimizing flexibility, fairly distributing liability, and achieving profitability targets.

Recognizing that a strong commitment is required by suppliers, a team of Supply Chain Managers have been assigned to facilitate communication with critical suppliers, and to improve efficiencies in the constant transactions that take place. Supply Chain Managers also identify suppliers that represent an element of risk to the success of projects. They look at factors such as capacity issues, whether the supplier also supplies to a competitor, the historical business relationship, and the overall complexity of working with the supplier.

Westinghouse continuously evaluates, rates and monitors its suppliers, and single source, multiple source and alternative sources are identified. The focus is on increasing the velocity of movement through the supply chain, and mitigating the risk of constraint and cost at each tier of the supply chain.

With the AP1000, Westinghouse involved major suppliers early in the design process. These suppliers were given the freedom to influence design, with the aim of ultimately improving cost efficiencies and streamlining the overall planning of the project. The result of these efforts is a

power plant with fewer sourced components from a pool of tightly integrated suppliers and sub-suppliers.

Strategic Sourcing

Managing the strategic sourcing process is something that Westinghouse is taking very seriously. The company manages the *entire* supply chain, and holds all parties in the chain accountable for not just adhering to quality, cost and schedule requirements, but also providing input in any issues and challenges that may arise in the process.

By establishing global and regional sourcing teams, the company can better streamline the sourcing process, and better identify capacity needs. With firmly established supplier relationships in place, terms and conditions are established once, rather than on a project by project basis. Essentially, these are strategies that take the waste out of the supply chain and provide a positive impact on cost, schedule and overall customer satisfaction. The Westinghouse AP1000 was designed with these challenges in mind.

Localization and Technology Transfer

By working closely with Korean customers and implementing an extensive and aggressive technology transfer program, Westinghouse has been able to assist in establishing self-reliance and localization in Korea's nuclear industry. In effect, the primary component supply chain was extended with Korea developing the capability to design, manufacture, and supply NSSS primary equipment and much of the BOP equipment for their plants. The goal of achieving 95% technical self-reliance for nuclear component design, manufacturing and procurement was met. As a result, Korean industry will be active in support of the anticipated technology transfer and component supply for the AP1000 nuclear plants anticipated for construction in China, thereby further extending the supply chain.

The Positive Impact of the AP1000 on Supply Chain Management

The AP1000 standard plant is comprised of 50 large and 250 small modules. These modules are constructed in parallel and independent of one another at a shipyard-like factory. The components are then assembled on-site. The result is a nuclear power plant with an overall construction schedule of 60 months, including only 36 months from the first concrete pour to fuel load. Equally important, this simplification results in lower construction and operating and management costs. For example, the AP1000 has:

- 50% fewer valves
- 35% fewer safety grade pumps
- 80% less pipe
- 45% less seismic building volume
- 85% less cable

The AP1000 is a standard design that is not altered. Therefore, all plants use the same suppliers for all engineered components. All pumps, valves, instruments and heat exchangers are identical, ensuring that significant and long term economies of scale will be achieved.

Supply Chain Success Factors

In the process of sourcing components for the AP1000, several factors will influence success. First, the supply chain must be *integrated*. To achieve this, there must be trust and relationship development and willingness to share in collaborative problem solving, risk sharing and cross-functional/location enterprise teaming. Secondly, the designer and supplier need to be committed to achieving the ultimate goal of meeting and exceeding customer satisfaction by providing a true value chain for the end user. Thirdly, contractual governance must be aligned. Various arrangements can be held, from "arm's length" contracts, to joint ventures, strategic alliances, to full equity participation. By entering into various levels of commitment with suppliers, all parties are held accountable for quality/reliability, maintaining capacities, and adhering to schedules. Again, the end goal is to optimize customer satisfaction.

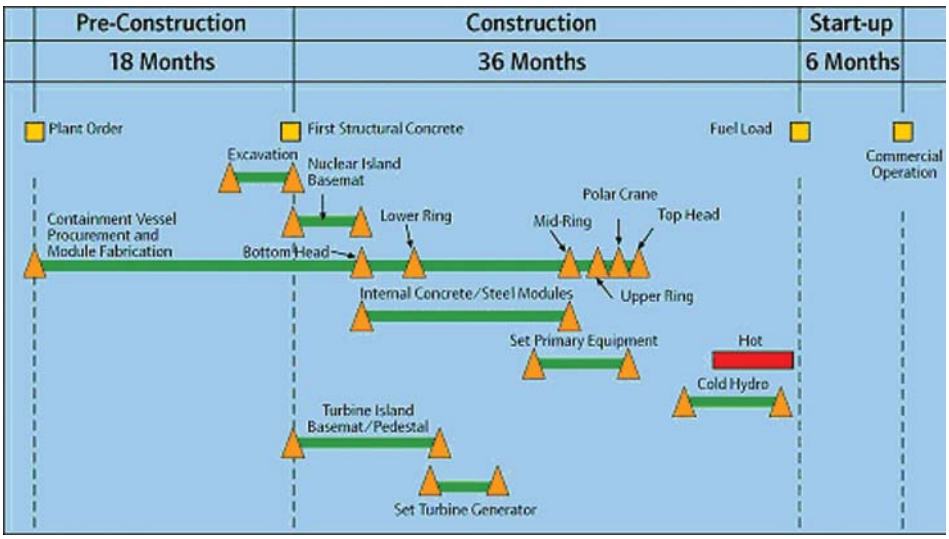

Figure 2: Schedule For a Standard AP1000 Plant – 60 Months.

Figure 3

Looking Ahead

As the nuclear renaissance continues to develop, the industry will have further challenges that need to be addressed, particularly as they relate to supply chain management. We must continue to manage and identify global capacity, determine worldwide demand, identify gaps in the supply chain and implement gap closure plans. We must align supply strategies to the area of the world where the plant is to be built or supported to minimize logistics complexity and improve cost effectiveness. We must identify customer localization requirements, reduce lead times, and continue the pursuit of qualified suppliers. The diligent project execution of the next wave of nuclear power plants will ensure that the renaissance continues well into the future.

Finally, the investment in and training of human capital is the driving force behind this industry. The effective transfer of technology from our industry's seasoned engineers and scientists to a new generation of innovators will ensure that nuclear power generation technology continues to move forward.