



World Nuclear Association Annual Symposium
8-10 September 2004 - London

Global Nuclear Energy: A GE Perspective

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Introduction

Nuclear energy is over fifty years old! It's a mature and proven industry, but having demonstrated its potential, where does it go from here?

As the President and CEO of a global nuclear business this is a question I face on a continuous basis, responding to customer needs and market demands within a global political framework that is diverse and distinct in its positioning. In fact, you could even say we have a global dichotomy on the future of nuclear energy.

On one hand, many industrialized and developing nations, including several in Asia, have turned to nuclear power to address their burgeoning energy demands, thereby reducing their growing reliance on fossil fuels and controlling their air pollutant emission levels.

On the other hand, several Western European nations – such as Germany, Belgium and Sweden – have indicated a policy of nuclear decommissioning, without a clear line of sight to a logical successor for this energy in their national portfolios.

So, why the sharply divided view and resulting action around the globe? If China is aiming to commission about two new plants a year up to 2020 with a keen interest in US based technology, and yet this technology can find no orders in its domestic market, there must be some significant drivers that are impacting the nuclear industry on a national basis.

We have learned valuable lessons from fifty years of nuclear energy production, imposed stringent management practices and developed new technology to ensure nuclear power plants operate safely and efficiently. Perhaps where we have not done a good job is in the education of the public and the development of long-term solutions to the challenges of economics and spent fuel storage. If we believe in the potential and future of nuclear energy technology, this will need to change.

The Good News ...

Despite the apparent global dichotomy on nuclear energy and regional moratoriums on new build, nuclear power is nonetheless gaining some important support around the world, where industry leaders, governments, and even leading environmentalists are pointing to its safety, efficiency and air pollutant avoidance as key factors for a balanced global energy portfolio.

For example:

- UK Prime Minister Tony Blair told Members of Parliament in July of this year that Britain might have to consider expanding its nuclear generating capacity if the nation hopes to honor its commitment to the Kyoto Protocol's environmental targets.
- In the United States, an April 2004 poll of 1,000 Americans by Bisconti Research showed that 65 percent believed that nuclear power "should be one of the ways" to provide electricity – tying with the 2000 rating as the highest since the poll was launched in 1995.
- The US government's Department of Energy is also working to preserve and expand the nation's nuclear generating capacity by focusing on four general areas:
 - Operating License extensions;
 - Nuclear power plant uprates;
 - Funded Combined Operating Licenses for new nuclear reactor technologies, such as GE Energy's ESBWR (the DOE's 2010 Program); and
 - Funded nuclear hydrogen cogeneration through the development of next generation reactors that operate at extremely high temperatures, such as the High Temperature Gas Reactor (the DOE's Next Generation Nuclear Plant program)
- US nuclear power generation has enjoyed a record decade since the early nineties, establishing record production levels in 2002, average industry capacity factors greater than 90% since 2000, generation costs down by 38% and industry safety measures that have improved by over 65% since 1992.
- In China, the ambitious plans for an installed base of 35GW by 2020 are well publicized and Western industry interest in the potential of this market is, understandably, high.
- Further underlining the Asian lead in the development of new nuclear plants, recent data indicates that of the 31 nuclear power plants presently being built globally, 58% of them are in Asia (in China, Japan, India, Taiwan, etc).

I could go on, but I think the point is clear ... nuclear energy is proven and highly efficient. It has achieved many of the goals established in the early 1950's to the extent that we continue to see new developments in technology, and new plants being built in developing and developed nations across the world. But...

The ‘Not so Good’ News ...

Nuclear energy policy, operating records, technology development, and public relations are not consistent on a global scale. We’ve seen notable incidents such as Three Mile Island and Chernobyl, and recent issues in Japan [inspections records] and the U.S. [PWR boric acid problems] that have undermined the performance of the industry and created, somewhat understandable, public concerns with the use of nuclear technology to generate electricity (and yet, the use of nuclear technology in medicine is widely accepted and lauded for its service to mankind.)

In the U.S., I believe we have come to face four barriers to new nuclear power plants, namely:

- **Perception** – Public concerns and the ‘Wall Street’ test
- **Regulations** – Licensing procedures, public interventions, etc.
- **Economics** – Capital costs and development schedules
- **Spent Fuel** – Spent fuel management and final disposal

But...how real are these ‘road blocks’?

Perception...no other form of energy production elicits quite the same level of subjective emotional response and, oftentimes, skepticism about its potential. Yet recent public opinion surveys continue to demonstrate that the majority of the public supports the use of nuclear technology to provide electricity. This perception is also likely to increase over time, as awareness of the issues surrounding greenhouse gas emissions and the need for a balanced energy portfolio become more widely known and understood by the public.

Investor and shareholder concerns however, would probably be better addressed by the demonstration of sound economics and efficient licensing procedures for the deployment of new nuclear plants. This is something that the DOE’s 2010 program in the US is seeking to address and is currently part of our investment program in new reactor design, where we are reviewing the potential for an ABWR *plus* solution and developing our next generation BWR design called ESBWR.

Regulations...there is no question that the licensing process of the 70’s and 80’s lengthened the deployment phase of many projects, but the new Combined Operating License process overseen by the Nuclear Regulatory Commission has been developed to address this issue. It is likely, however, that the industry must also work together with a single voice for the next round of nuclear plant development in order to expedite the licensing process and engender the right response from ‘key stakeholders’.

The industry will also need to be backed up by enlightened public policy that recognizes the benefits of nuclear power and provides the same level of support and incentives that many of the fossil fuel and renewable energy alternatives enjoy today.

Economics...capital costs are at the heart of the future competitiveness of new nuclear power plants. New designs, improved deployment models and finance packages are likely to combine in solutions that are competitive and attractive to the industry.

We are acutely aware of the key commercial factors and have recently been considering just how imaginative we can be, as a global nuclear OEM, in providing the right solutions for our customers.

The recent DOE 2010 program in the U.S., focused on taking new reactor technology through the Combined Operating License process, is providing a unique vehicle for GE and the industry to assess the viability of new nuclear reactor designs by taking them through the Combined Operating License approval process, thereby creating new technology that is capable of being deployed by 2010 and beyond.

Our new reactor design, ESBWR, was established with some simple goals in mind...evolve the proven BWR technology to a new level, making it easier, faster and cheaper to construct, whilst improving safety parameters and operational ease even further with the best available GE technology.

Spent Fuel...must be addressed in a safe and environmentally acceptable manner. This is achievable through public policy that supports advanced fuel cycles and final disposal solutions. According to the IAEA, the United States, along with Finland and Sweden, are reportedly ahead of most other nations on addressing the issue of permanent spent fuel disposal sites for high-level waste (HLW). Finland plans to have a facility built and operational by 2020 while Sweden has two candidate sites.

In the United States, a small HLW facility exists in New Mexico. The federal government has also approved plans to dispose HLW at Yucca Mountain in Nevada.

The quantities of spent fuel are relatively small (a plant operating for 40 years generates an amount of waste equivalent to a small house), known and physically contained in ways that would be hard to replicate in other energy generation sources.

Nuclear energy is therefore one of the key sources of emission-free electricity today and must be considered as one of the few potential sources of emission-free electricity in the future, where its contained waste can be mitigated and managed in numerous ways.

So What ...

So, how will events unfold? Well, no one can perfectly predict the future, but is it really inconceivable to envision a new era of nuclear plant deployment on a global scale? The market dynamics are pointing in that direction and, as public concerns about global warming elevate to a point of unacceptability, it is feasible that public opinion and energy policy will move towards a position of stronger support for nuclear energy.

As an industry we must continue to support the potential for safe, efficient and clean air energy from nuclear power, by attracting and developing new industry talent, the development of new technology for operating plants, and the development of next-generation nuclear fuels and reactor designs that will provide improved capital costs and faster development cycles for the next generation of new plants.

We must have new technology that can be backed up by regulatory support, energy policies that recognize the value of nuclear energy for the environment and national security through the use of a balanced energy portfolio, whilst accepting the responsibility of environmental stewardship and the provision of long-term solutions for spent fuel storage.

These factors combined with a single industry voice to educate and update the public and investors alike, would combine to provide a compelling argument for a nuclear renaissance that makes sense from all angles.

It is my hope that in my role as a business leader of one of the few remaining privately owned nuclear vendors, we can provide the business savvy and engineering excellence required to go part of the way... the industry as a whole and national governments must take us the rest of the way by addressing policies and perceptions that continue to hold us back.

As a business we remain committed to a broad and balanced technology portfolio for safe and efficient energy generation, of which nuclear energy is an essential component.

Here's to the next fifty years!