**A Policy Vision for America's Nuclear Future**
Opportunities in Reactor and Fuel Cycle Technologies

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Chairman Domenici and Chairman Peterson, and members of the Subcommittee, I am Jack Fuller, chairman of the board of GE Hitachi Nuclear Energy (GEH). With me today is Dr. Eric Loewen, Chief Consulting Engineer of Advanced Plants.

As you look at steps to expand the safe, secure, and responsible use of nuclear energy in the future, I am delighted to describe to you GEH's vision for America's nuclear future - a future that includes a robust domestic nuclear industry that creates U.S. jobs, and promotes energy independence, while also producing low-carbon baseload electricity using advanced nuclear technologies.

Headquartered in Wilmington, North Carolina, GE Hitachi Nuclear Energy (GEH) is a world-class enterprise with a highly skilled workforce and global infrastructure dedicated to serving the nuclear industry. We are proud of our record of accomplishments in the United States and overseas that spans more than five decades. Our nuclear alliance is recognized as the world's foremost developer of boiling water reactors, robust fuel cycle products and highly valued nuclear plant services.

The United States has already begun to witness the success of the recent federal policies designed to bring about the next era for the nuclear industry. Today, with the incentives of the Energy Policy Act of 2005 in effect, the design and even some construction has begun on the next generation of light water reactors in the United States. Public support for clean, reliable nuclear energy is at record high levels. We have an opportunity to increase the percentage of electricity produced by nuclear plants above the current 20 percent.

For years now we have been hearing about the next nuclear "renaissance", I am reluctant to use that term, but I do envision a future that includes as many as 250 to 1000 new units worldwide by 2030 as estimated by the World Nuclear Association.

New reactor technologies, like GEH's ESBWR will include the latest safety and efficiency technologies. The establishment and funding of a U.S. federal loan guarantee program was an important first step to getting financial markets and state regulators comfortable with approving the investments needed in new nuclear. Additional steps such as establishing a price on carbon or implementing a clean energy standard would further encourage investment in new nuclear.

As a majority held U.S. company, GEH takes particular interest in the opportunities here in the United States. However, it is important to also recognize that the global opportunities will also add to our bottom line. Countries that never imagined safe, secure, clean, baseload electricity are considering building the next generation of nuclear plants - providing opportunity for economic development and basic human needs to areas that are in great need of affordable electricity.

Along with the new advanced fleet will come the need to bring new efficiencies to all aspects of the industry. From new technologies to extend the life of the existing fleet, to more efficiently enriching uranium, technology and innovation will drive the industry. Finally the most debated, although I would argue not the most difficult challenge – how to manage used nuclear fuel - an area that U.S. technology can address.

My statement will focus on this challenge, but first I want to touch on an important key issue: nuclear security. As was highlighted at President Obama's nuclear security summit in April, the security of nuclear materials is of utmost interest to all of us in industry. Non-proliferation concerns are real and GEH is committed to working with the U.S. government to protect nuclear technology and materials.

One step that is being taken is that GEH and other suppliers from around the world are working diligently to develop a voluntary code of contact that nuclear vendors could choose to adopt relating to exports of nuclear technology and products.

We take our obligation to nuclear security very seriously.

## Fuel Cycle Issues

Much of the discussion today will be on the back-end of the fuel cycle, but I want to talk about the front-end as well.

GE Hitachi Global Laser Enrichment (GLE) - a business venture of GE, Hitachi and Cameco - is pursing the commercial development of the laser enrichment technology originally developed in Australia and now exclusively licensed to GLE under a treaty adopted by the U.S. and Australia. There has been much speculation about the Silex technology, but not much is publicly known. And that is for a reason - protection of this unique technology. But as I did at the nuclear security summit, I will provide some information that is important for the public and policymakers to know.

The GLE technology is the latest process that has been attempted to more efficiently enrich uranium using lasers rather than gaseous diffusion or centrifuge technology. GLE has implemented the first phase of the project with the successful testing of the test loop on our site in Wilmington, NC. We are progressing to the next phase where we intend to focus on the commercialization of the equipment and technology. This phase should continue through the end of 2012. Finally, when we have fully vetted the process and thoroughly tested the equipment, GLE will consider the commercial deployment of the technology.

GLE works closely with the Nuclear Regulatory Commission, the Department of Energy (DOE) and other U.S. regulatory authorities to secure the GLE technology and related material, including periodic inspections of our existing facilities. We are also working with the U.S. Government on the international standards for the application of safeguards for the potential commercial facility. GLE is a unique technology and our relationship with the government is intended to foster the highest levels of confidence so that GLE's technology is protected and kept proprietary.

Perhaps the greatest misunderstanding about GLE is that the technology cannot be detected. That is incorrect - there are signatures that are evident without onsite inspection to ensure the detectability of a laser enrichment facility.

**Back-End**

Nuclear power plants today are operating safely and efficiently, however, operators face uncertainty relative to used nuclear fuel. In the short term, the used fuel can be safely stored in the fuel pools or in dry casks on the site. But, the ultimate responsibility for the management of the used nuclear fuel rests with the federal government.

I have faith that this Blue Ribbon Commission will provide the Secretary of Energy with guidance to move this issue forward.

The future of the industry depends on this critical issue being resolved since the current approach of dealing with waste distorts the public view of nuclear power, dampens our economic decisions for new builds, penalizes long-term planning, and throws away the decades-long research on innovative solutions.

Early in his first term, President Obama made a firm commitment to America's nuclear future. He declared that "a sound, comprehensive, and long-term domestic nuclear energy strategy . . . for managing used nuclear fuel and other aspects of the back end of the nuclear fuel cycle…" is needed.

I believe that leveraging the past two decades of scientific and engineering work in the arena of recycling, together the government and industry can develop an effective strategy for managing these nuclear materials.

The subcommittee's primary question for the session today is: *"Do technical alternatives to today's once-through fuel cycle offer sufficient promise to warrant serious consideration and R&D investment, and do these technologies hold significant potential to influence the way in which used fuel is stored and disposed?"* I answer with an unequivocal - yes.

<u>Technical Alternatives</u>

We have been tempted in the United States to believe that a solution to the back-end of the fuel cycle is too complex to solve. However, on a simple level, it is no more difficult than what we do at home – recycle and reuse waste.

We can boil down the options into what I call the 3 R's: Repository, Reprocessing and Recycling.

GEH strongly believes that the third R - recycling - is the best policy and technology option for the U.S. to pursue.

Certainly we can design a safe repository for the long-term storage of used fuel. Or, we can follow the policy choice of our allies in France, Japan and the U.K. to reprocess the used fuel.

However, we have another option – we can implement the next step in technology by recycling our nuclear fuel, using scientifically proven technology. The question now is how to develop the policy framework so that this proven option can be brought to the marketplace.

Recycling addresses many of the concerns that seem to make this a difficult choice. First, it would decrease the long-term radioactivity of used nuclear fuel and thus reduce the storage time for the waste products. Today's used nuclear fuel could take up to 1 million years to return to the low-level radioactivity of uranium mined from the earth. The reprocessing process used today reduces that number to about 10,000 years. But, after recycling, the waste product would be highly radioactive for only 300-500 years, which significantly simplifies the need to engineer and authorize a repository. In the United States, this offers a new path to a much different and simpler repository than the envisioned repository.

So there will be no misunderstanding, it is not my intention to say that MOX-reprocessing is wrong. GEH's subsidiary GNF-J sells MOX fuel in Japan. That technology works.

But what I am suggesting offers additional benefits: By fully recycling nuclear fuel using sodium cooled recycling reactors, the United States would get several additional benefits.

A second benefit is that recycling can ultimately extract more than 90 percent of the available energy from uranium ore. Both a light water reactor and reprocessing with light water reactors extract less than 5 percent of the available energy from uranium.

Increasing the amount of energy we extract from uranium ore to 90 percent essentially makes available tremendous amounts of new, domestically available energy reserves for the security of our country. It converts a national problem into a national asset.

A third benefit is that this technology was specifically designed to minimize the risk of proliferation. It reduces the proliferation concerns since plutonium is not

separated from the other materials. Space constraints within the facility would make it impractical to modify the process to separate plutonium, would be easily detectible, and would still not produce plutonium with an isotopic mixture that could be readily used for weapons. Furthermore, theft of the material would be very difficult because the material is processed and dispositioned within the same secured facility, and because the material must be handled using large and heavy shielded equipment following the NRC's "defense in depth" principle.

Finally, the concept that we call the Advanced Recycling Center (ARC) also reduces the need for a continued government subsidy – it provides the benefit of paying for itself. This is possible because of the additional energy that it produces for sale in the market place covers the initial capital costs of both the separations plant and the recycling reactor.

Let me also comment on the second question posed by the subcommittee by suggesting *what federal actions could facilitate commercial efforts to develop and deploy these technology options, while meeting economic, safety, environmental protection and non-proliferation goals*:

The federal government should embrace the concept of full recycling as the appropriate path forward for the United States. Funding would be required to help get the technology through the NRC licensing process, and for the work needed for DOE Project Planning (DOE Order 413.3). Additional funding to demonstrate the technology by building a demonstration plant would be the best way to establish this technology in the United States. It seems to me that Nuclear Waste Funds could support this mission, which directly addresses the waste problem. As we look at this project, we believe that over the span of 10 years only half of the funds collected each year into the Nuclear Waste Fund would be needed to complete the project. At the same time, we will be continuing the viability of low carbon nuclear power well into the future.

Nuclear projects, such as recycling development are large and must be done safely and methodically. Therefore, they require many years to complete and policy must support sustained progress on these projects for many years.

Establishing a private/public entity similar to what is envisioned in the FedCorp legislation pending in Congress would help provide sustained, long-term leadership and management of large projects needed to address the waste issue. To better leverage the capability of U.S. industry to solve the waste issue, nuclear policy should:

- Establish a policy metric based on the amount of transuranic material remaining in nuclear waste bound for disposal. Less transuranics elements makes the waste easier to dispose of.

- Establish a policy metric based on the amount of "total" energy that the system produces per quantity of fuel ore. This encourages more efficient utilization of energy reserves and puts energy to use instead of putting that energy into a repository where it becomes a disposal problem.

- Establish a policy metric based on the compatibility of the waste form with the geologic repository medium. Some waste forms are more stable and easier to dispose of than others.

- Establish a policy metric based on the expected overall taxpayer/ratepayer cost, which includes the cost of any long-term government subsidies that would be required.

I respectfully encourage the Blue Ribbon Commission to take inventory. We are the nation that developed the first commercial nuclear power plants. We are the nation that invented separations processes, both aqueous and electrochemical. We are the nation that first tested fuel, such as mixed oxide (MOX), in both water and sodium cooled reactors. We are the nation that invested billions in nuclear fuel recycling during the Advanced Liquid Metal Reactor program. Today, that investment still stands as a sound technical alternative path.

It is time for us to realize that we are too great a nation to limit ourselves to a small vision, to follow what is being done overseas now. We are not, as some would have us believe, doomed to "being behind" in nuclear development as compared to the rest of the world.

We owe this vision to our grandchildren – to my granddaughters who some day may look back and know that we had their interests in mind – energy independence, with safe, secure economic and low carbon electricity from nuclear plants built in the United States.

I want to thank the members of the Subcommittee for the opportunity to share my thoughts with you today on this crucial matter for our nation and for generations to come.