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TESTIMONY OF THE HONORABLE STAN WISE
CHAIRMAN, GEORGIA PUBLIC SERVICE COMMISSION

ON

THE FUTURE OF NUCLEAR ENERGY IN THE UNITED STATES OF AMERICA

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The Future Of Nuclear Energy In The United States

In assessing the outlook for nuclear energy in the United States of America, a quick look at the environment during the time that the last nuclear power plants were being built (Nuclear Then) compared to today's environment (Nuclear Now) offers some signs of encouragement for proponents of nuclear energy. We live in an energy intensive society, and according to the U.S. Energy Information Administration, all regions of the country will need additional generating capacity by 2025 with the greatest need in the Southeast and the West. Electricity demand over the next 25 years is forecasted to be 45% greater than it is today. [1]

Just to maintain the country's current generation mix, we would need to build the equivalent of 50 nuclear reactors of 1,000 MW each, 261 coal plants at 600 MW each, 279 natural gas plants at 400 MW each, and 93 renewable power supply sources at 100 MW each (a total of some 328 thousand MW).[2]

The table below summarizes the Nuclear Then and Nuclear Now environments and shows which aspects of the current environment are favorable for the outlook of new nuclear energy (pros) and which aspects of the current environment are unfavorable (cons). As you can see, the pros greatly outweigh the cons.

Nuclear Then	**Nuclear Now**	**Pros**	**Cons**
Long NRC licensing process	Streamlined NRC licensing process	**X**	
Individual plant designs	More standardized plant designs	**X**	
High construction/capital costs	Lower construction/capital costs	**X**	
Little/No Emissions/pollution concerns	Stringent air pollution/emission standards	**X**	
Low coal/natural gas fuel prices	Volatile/high coal/natural gas fuel prices	**X**	
No incentives	EPAct 2005 incentives	**X**	
Safety/Reliability concerns	More safe/reliable	**X**	
Nuclear energy less competitive	Nuclear energy more competitive	**X**	
Nuclear Waste disposal	Uncertainty/concerns with nuclear waste disposal		**X**

[1] United States Energy Information Administration Annual Energy Outlook 2005.
[2] Southern States Energy Board, *Nuclear Energy: Cornerstone of Southern Living, Today and Tomorrow*, p. 9.

Licensing – Plant Design – Construction Costs

The economics of nuclear power will always come into play when considering the outlook for nuclear energy. Anyone involved in the industry during the mid 1980s (when the most recently constructed nuclear power plants were going online) remembers how capital intensive these projects were. Factors contributing to the high level of capital investment needed for nuclear energy. Some of these included licensing and regulatory costs and the reactor designs of that era.

Following the lengthy licensing procedures for plants in the 1980s, the industry began to look at how the licensing process might somehow be compressed . According to the Nuclear Regulatory Commission (NRC,) it was "apparent that the complicated licensing process was a major deterrent to utilities who might consider building nuclear plants." The NRC proposed to facilitate the licensing procedures by replacing the traditional two-step process with a one-step system. In this system, the NRC established a graded approach that applied to the systems, structures, and components and their relationship to plant safety, thus ensuring safety while providing flexibility for development of new designs

In addition to compressing the licensing process, the certification of new standard reactor designs helps resolve safety issues with the design before it is ordered for a particular site. In our Nuclear Now environment, this will most certainly help to moderate cost overruns due to redesign. As I understand it, the design certification process has already been successfully completed for four advanced reactor designs: the Westinghouse AP-600 (Pressurized Water Reactor or PWR); the Westinghouse AP-1000; Combustion Engineering System 80+ (PWR); and the GE Advanced Boiling Water Reactor (BWR).

Finally, the Early Site Permits (ESP) and the Combined Construction and Operating Licenses (COL) steps are changes that have consolidated the steps required to obtain an operating license. These steps help to make the entire process more efficient and manageable.. The ESP process allows an applicant to address site-related issues, such as environmental impacts, for possible future construction and operation of a nuclear power plant at a site. The NRC's review process requires both a technical review of safety issues and an environmental review for each application. If approved, an ESP gives the applicant up to 20 years to decide whether to build one or more nuclear plants on the site and to file an application with the NRC for approval to begin construction.

Instead of filing separate applications for a construction permit and then an operating license, a prospective nuclear plant operator applies for one combined construction and operating license (COL), during which time contentious licensing issues and public participation in the project are vetted prior to construction.

Emissions/Air Pollution

There are 103 nuclear reactors operating in 31 states across the country. Nuclear energy is the nation's second-leading source of electricity, after coal, with average production costs that are cheaper than coal or natural gas for electricity production. In the Nuclear Now environment, there are many who are concerned about global warming and harmful emissions into our atmosphere. One of the most favorable aspects of nuclear energy is that it helps states meet Clean Air Act goals as well as reduces carbon emissions. The Southern States Energy Board reports that without nuclear energy, carbon dioxide emissions would have been 28 percent greater in the electricity industry in 2004, and an additional 700 million tons of carbon dioxide would have been emitted each year—about the same as the annual emissions from 136 million passenger cars.

Nuclear power plays a vital role in a diverse energy portfolio, and nuclear power plants already generate 20 percent of U.S. electricity safely, and without emitting any greenhouse gases or controlled air pollutants. Steve Specker, president of the Palo Alto, CA-based Electric Power Research Institute (EPRI), said during a recent panel on future generating costs that as the electric industry begins to recognize and assign a cost associated with CO_2 emissions, the total operating cost of the coal-fired generation will increase relative to nuclear generation.

Fuel/Production Costs

In the Nuclear Then environment, we experienced much lower natural gas and coal prices and gas did not represent as much of a fuel source for electric generation as it does today. Fast forward to today's Nuclear Now environment and we find record high natural gas prices, coupled with higher coal prices due to a number of factors including supply and shipping problems. A March 15, 2006 Wall Street Journal article, *Taking Lumps – As Utilities Seek More Coal, Railroads Struggle to Deliver* chronicled emerging delivery service issues and consequences of such. In summary, the outlook for fuel prices in the Nuclear Now environment is price volatility and record high fuel prices for natural gas, coal, and consequently – higher electricity rates.

This natural gas and coal price volatility is one the main reasons that nuclear energy looks so attractive right now. Relative to other fuel types, nuclear energy has consistently provided a level of price stability for the nation's nuclear power consumers. Recognizing that the total cost of producing electricity from nuclear power consists of three major categories: investment in capital costs; operation and maintenance; and fuel – a closer look at production costs helps identify both the economic and environmental benefits of nuclear energy. Although capital costs are high, the overall production cost of electricity from nuclear generation is relatively stable over time due to the low fuel costs and continued reductions in operating and maintenance costs.

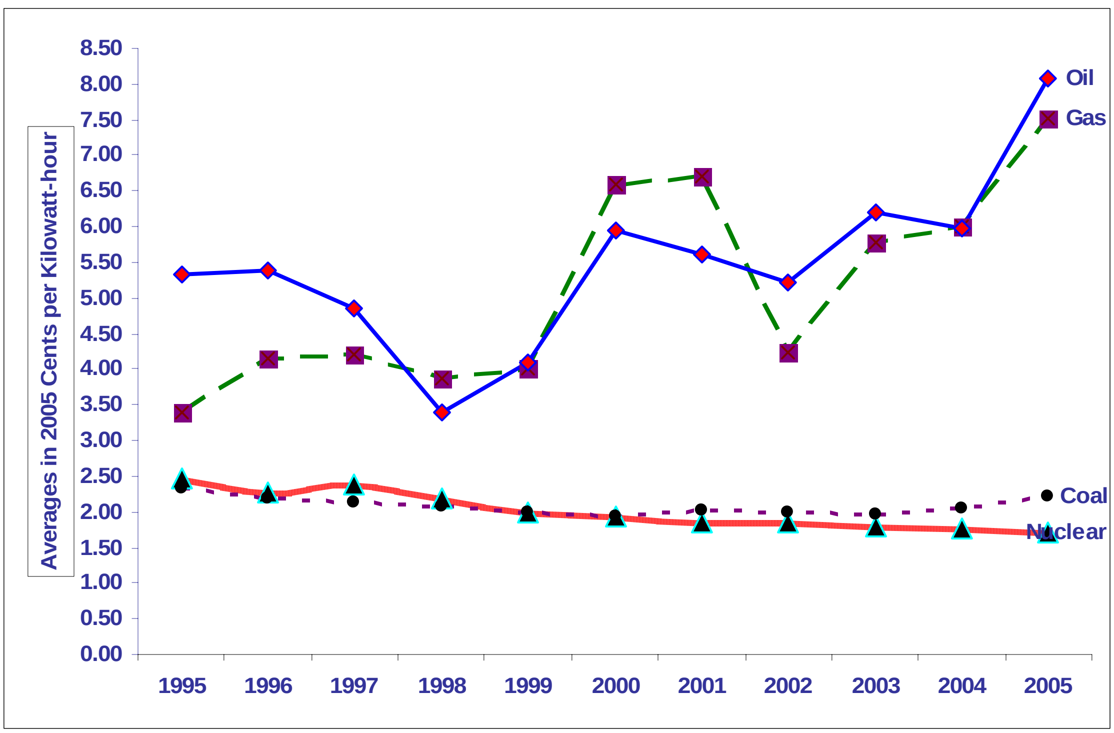
Nuclear fuel has been a relatively abundant resource for which there is little concern over long-term availability or price stability. Fuel costs include purchasing uranium, and conversion, enrichment, and fabrication services. For a typical 1,100-MW reactor, the approximate cost of fuel for one reload (replacing one third of the core) is about $40 million, based on an 18-month refueling cycle. The average fuel cost at a nuclear power plant in 2004 was 0.42 cents/Kwh, which is cheaper than most other fuel sources for electric generation[3].

Since 1981, production costs of nuclear energy increased from 2.54 cents/Kwh to a high of 3.63 cents/ Kwh in 1987 before declining steadily to an average in 2004 of 1.68 cents/Kwh (2004 dollars). Although this was higher than the production costs of coal-fired electricity during the 1990s, the production cost of nuclear and coal were essentially the same at the turn of this century. In 2004, production costs for nuclear plants were slightly lower than the cost of coal-fired generation (1.68 cents/Kwh for nuclear versus 1.92 cents for coal).

By comparison, the production costs for gas-fired generation was 5.87 cents/Kwh in 2004, several times that of the cost of nuclear energy. Because nuclear plants refuel every 18-24 months, fuel costs are not subject to fuel price volatility like natural gas and, more recently, coal-fired power plants.

The figure below illustrates Production Costs of Various Generating Options.

U.S. Electricity Production Costs
1995-2005



Production Costs = Operations and Maintenance Costs + Fuel Costs
Source: Global Energy Decisions
Updated: 6/06

[3] Nuclear Energy Institute 2006.

Energy Policy Act of 2005 Incentives

The Energy Policy Act of 2005 contains several provisions that make the outlook for nuclear energy in the United States more favorable. These include limited investment incentives, such as loan guarantees for carbon-free energy sources, production tax credits for new nuclear power plants and federal insurance to protect companies against avoidable delay in the government's reactor licensing process. The legislation also provides for a $1.1 billion partnership between the federal government and the industry to facilitate construction of advanced reactor designs[4].

Some States are taking steps to help remove some of the impediments to building energy infrastructure, including nuclear power plants. In its June 28, 2006 Order, the Georgia Public Service Commission ordered that "effective January 1, 2006 the [Georgia Power]Company shall record the actual costs incurred, net of any amounts billed to co-owners, in developing, filing and obtaining a federal Early Site Permit (ESP) and/or Combined Operating License (COL) and other permits required for new regulated retail nuclear generation at the Vogtle Electric Generating Plant in FERC Account 183, Preliminary Survey and Investigation Charges".[5] This Order was issued by the Georgia Public Service Commission in response to a request filed by Georgia Power Company seeking an accounting order, and is just one example of something that is being done on the state regulatory level that bodes well for the outlook of new nuclear generating facilities in Georgia.

Safety – Reliability – Competitiveness of Nuclear Energy

Safety, without a doubt, gets the largest amount of consideration when looking at the viability of nuclear energy, whether it be operational safety or waste disposal radiological safety concerns. Because the consequences of the unsafe operation of nuclear power plants are so severe, utilities and regulators must do their due diligence in assessing the outlook for nuclear energy from a safety and reliability prospective.

In the mid 1980s, the Nuclear Then environment was struggling to come through the Three Mile Island event. The 1979 accident at the Three Mile Island Unit 2 (TMI-2) nuclear power plant near Middletown, Pennsylvania was the most serious in U.S. commercial nuclear power plant operating history, even though it led to no deaths or injuries to plant workers or members of the nearby community. However, this event brought about sweeping changes involving emergency response planning, reactor operator training, engineering, radiation protection, and many other areas of nuclear power plant operations. It also caused the U.S. Nuclear Regulatory Commission to heighten its regulatory oversight. Resultant changes in the nuclear power industry and at the NRC had the effect of enhancing plant safety and performance.

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[4] Energy Policy Act of 2005, SEC. 952. NUCLEAR ENERGY RESEARCH PROGRAMS.
[5] Georgia Public Service Commission Docket No. 22449-U Order, Georgia Power Company Request for An Accounting Order, June 28, 2006, p. 3.

For example , the NRC in 2000 moved toward a new reactor oversight process for the nation's nuclear plants. This process is based on quantitative performance indicators and safety significance. Today's reactor oversight process is designed to focus industry and NRC resources on equipment, components and operational issues that have the greatest importance to, and impact on, safety. The agency and the industry have six years of experience with this revised reactor oversight process and the approach is successful in improving the transparency, objectivity and efficiency of regulatory oversight.

Despite safety statistics, nuclear power still has its critics. The Natural Resources Defense Council (NRDC), suggest that there are still perceived risks of the accidental release of radioactivity and that there are occupational and public health risks with uranium mining and milling. An NRDC position paper in 2005 stated, "Unfortunately, in terms of helping solve the problems of global warming, the nuclear power industry in its present state suffers from too many security, safety and environmental exposure problems and excessive costs to qualify as a leading means to combat global warming pollution" (Cochran et al 2005, p. 2).

However, other organizations, such as the Pew Center for Global Climate Change, the Progressive Policy Institute, the Earth Institute at Columbia University and Princeton University believe that nuclear energy is one way to meet the dual challenge of meeting our growing electricity demand and reducing carbon emissions.

Reliability - Competitiveness of Nuclear Energy

There has been an upward trend in the capacity factor for U.S. commercial nuclear power plants since the 1980s. Reliability is measured by capacity factor – the amount of energy a facility generates in one year divided by the total amount it could generate if it ran at full capacity. A capacity factor of one implies that the system ran at full capacity the entire year.

The chart below illustrates nuclear energy's superiority over other fuel types, thus solidifying nuclear energy as not only a clean source of future energy, but a reliable one as well.

U.S. Capacity Factors by Fuel Type
2005

Fuel Type	Average Capacity Factors (%)*
Nuclear	89.6
Coal (Steam Turbine)	72.6
Gas (Combined Cycle)	37.7
Gas (Steam Turbine)	15.6
Oil (Steam Turbine)	29.8
Hydro	29.3
Wind	26.8
Solar	18.8

* Preliminary
Source: Global Energy Decisions / Energy Information Administration
Updated: April 2006

Existing nuclear power plants are generally competitive even in deregulated markets and particularly when initial investment costs have been amortized   Factors in the Nuclear Now environment such as EPAct 2005 incentives, and the safety and reliability outlook makes U.S. nuclear power generation even more competitive.

Spent Fuel Management and Disposal

What to do with spent nuclear fuel is a potential limiting factor in a nuclear renaissance. While we though the policy path was chosen twenty-five years ago, progress seems to have been more difficult than anyone thought and there remains uncertainty over disposal that could be a deterrent for making major capital investment decisions to build new reactors that may operate fifty or more years and discharge used fuel.

The nation has attempted to deal with the issue of disposal of spent nuclear fuel (SNF) and high-level radioactive waste (HLW) for more than four decades. During this period, it was established in law that the federal government would be responsible for the ultimate management and disposal of SNF and HLW generated by the civilian commercial nuclear power industry. (Atomic Energy Act of 1954, 42 USC 2011 et seq).

In 1982, after years of debate and evolving national policies, Congress adopted the Nuclear Waste Policy Act of 1982 (NWPA), 42 USC 10101 et seq., which confirms and details the federal government's responsibility for the disposal of SNF and HLW. The NWPA established a comprehensive program, including a schedule, for transporting, storing, and disposing of the SNF and HLW in a deep geologic repository, and provided a mechanism for funding the cost of those activities – subsequently determined to be Yucca Mountain in Nevada.

Utility regulators in States with utilities providing nuclear power have been frustrated that the utilities and their ratepayers have committed over $25 billion since 1983 to the Nuclear Waste Fund, yet the promised acceptance of spent fuel for safe disposal that was to have begun in 1998 has not occurred. The situation in Georgia puts me and my fellow commissioners in a position of having to explain to ratepayers why they have paid close to $900 million for nuclear waste disposal so far and we have nothing to show in return.

The federal government must honor its statutory and contractual obligation to accept and either store or dispose of the spent fuel that now sits in 72 reactor storage sites in 34 States. This Subcommittee knows well the liability that continues to grow the longer that performance is delayed.

I am concerned about the latest schedule that shows the earliest date for initial waste acceptance is 2017. I am also aware that the DOE witness testifying before the Senate when that new schedule was unveiled said that there is “zero probability” that date can be met unless the legislative proposal in H.R. 5360 now before Congress is enacted. State utility commissioners especially urge enactment of Section 5 of that bill. It would reform the Nuclear Waste Fund appropriations process by reclassifying annual fee payments to the Fund as “offsetting collections.” That would assure that annual revenue is made available for appropriations for development of the repository, as intended in the Nuclear Waste Policy Act. Without such reform the past appropriations rate will not be up to the levels needed once the repository construction is licensed.

Even though it is taking more time and resources than anyone wants, geologic disposal in a geologic repository, such as proposed at Yucca Mountain, remains the consensus for the best long-term solution to the high-level nuclear waste problem. Congress should press ahead with support for the repository program.

Interim Storage

Fast forward to 2006 and we are still struggling with completion of the Yucca Mountain repository, thus making interim storage and recycling of SNF options worthy of discussion and consideration. There are several reasons why interim storage of spent nuclear fuel –away from present reactor storage sites –might be needed:

a) It will be at least another ten years or so before the Department of Energy repository planned for Yucca Mountain is ready to even begin waste acceptance for permanent disposal . Ideally, DOE would have met the mandate of the Nuclear Waste Policy Act and the contractual agreement that the utilities were compelled to enter into which required initial waste acceptance by January 1998. DOE’s failure to begin acceptance of the SNF is further exacerbated by the utilities’ continual payments into the NWF. Some state commissions, including the Georgia Public Service Commission, have initiated proceedings to investigate the possibility of ordering its utilities to escrow their NWF payments.[6] Unfortunately, that is where things stand in the Nuclear Now environment. Meanwhile, approximately 52,000 metric tons of spent fuel sits today at commercial reactor sites;

b) There are 14 shutdown reactor sites where all but the SNF and the necessary infrastructure that supports it remains. Whether out of a sense of fairness to the surrounding communities which no longer get any electricity or economic benefit from the former reactors, or for the simple notion that the spent fuel can probably be more economically and securely managed if it were transferred to a consolidated storage facility managed by the government or a private enterprise - this 3,800 tons of waste should be stored better elsewhere. Even if that material

[6] Georgia Public Service Commission Docket No. 12269-U, Notice of Inquiry into the Nuclear Waste Fund Payments.

were sent to one interim storage site, it would reduce the number of storage sites by thirteen;

c) Taking some positive action to build some amount of interim storage, beginning shipment container procurement and beginning transportation route planning would all be positive signs that the government is not going to continue the status quo of simply handing the problem of missed waste acceptance schedules to the courts to mitigate damages. It would help to build public confidence for future shipments to the repository if we begin to see that these types of shipments (to interim sites) can be and are conducted safely and with coordination with state and local authorities;

d) It appears that the statutory capacity limit for Yucca Mountain will have to be lifted or a second repository will be needed to accommodate the projected amount of SNF just from the present nuclear fleet. Spent nuclear fuel recycling will be discussed later, but here it is worth noting that it will take decades before we have the type of "proliferation-resistant" reprocessing operating at production volume. Therefore, we will need some place to store the SNF, while it is awaiting permanent disposal or reprocessing, until those capabilities are in place; and,

e) It is a matter well beyond my expertise, but as I understand it, there are some homeland security related concerns with some present spent fuel storage facilities—aside from assurances from the Nuclear Regulatory Commission—that might indicate the material can be stored more securely in an alternate location. This is all quite sensitive, certainly, but there might be a need for interim storage to accommodate this type of consideration.

While on the subject of interim storage, it is highly appropriate to address the "Consolidation and Preparation" or CAP approach as proposed in the Senate FY 2007 appropriations bill. While the Georgia Public Service Commission and other utility commissions which are represented in the National Association of Regulatory Utility Commissioners (NARUC) have strongly urged congress and DOE to consider central interim storage for some time, the general consensus was that:

a) It would be consolidated at one or just a few places that would be built and operated with some economies of scale benefits;

b) We often considered interim storage at Yucca Mountain to make the most sense in terms of savings in transportation once the repository is built there; and,

c) Since the interim storage would be needed only as a result of the DOE failure to begin waste acceptance in 1998, the costs of interim storage should come from other appropriations and not the Nuclear Waste Fund.

The CAP proposal is quite different from those conditions. The proposed bill excludes not only Yucca Mountain as a storage site, but it also rules out any use of the already licensed but un-built temporary storage facility to be built by the utility consortium, Private Fuel Storage, LLC, in Skull Valley, Utah. Instead, each State with a commercial nuclear reactor—31 by my count—would be considered by DOE for a CAP site or possibly a regional facility to serve several States. The timeline for such a 31 state concurrent site search is impractical. In fact, it has not yet been determined even if such a facility is needed in each state, the need in tonnage to be stored --although the period of storage is set at 25 years – and consequently, the cost of the CAP initiative. Yet the bill provides that the Nuclear Waste Fund will be used to pay for CAP storage. As I read the Nuclear Waste Policy Act, storage is not included among the authorized uses for the Nuclear Waste Fund. Moreover, until the Nuclear Waste Fund appropriations process is reformed (as under H.R. 5360), any funds appropriated for CAP storage would reduce funds unavailable for the main purpose of the Fund: to build a permanent repository.

Several governors have written to the CAP proponent, Sen. Domenici, expressing their concerns over the CAP approach. They, along with the public, see assurance that the proposed temporary storage will be limited to 25 years, even if meaningful progress is not evident at Yucca Mountain. This type issue was raised in the Skull Valley venture where the State opposed and still opposes the facility for a number of reasons, including doubts that once there the fuel would ever be moved. There is even opposition to adding dry cask storage at reactor sites, as recently shown in Vermont and California. Some States have laws against adding spent fuel storage within the State.

This Subcommittee's 2005 proposal to have DOE designate a few federal sites where radioactive waste is already stored and to expand those facilities to take in some commercial spent fuel from reactor sites appeared reasonable. It seemed to be predicated on achieving economies of shared overhead, improved security and it would also help build public confidence by showing that spent fuel can be (and always has been) safely transported. The Subcommittee's latest approach of including interim storage with the siting of the Global Nuclear Energy Partnership (GNEP) demonstration facilities seems to make sense, although it is unclear how many tons of storage that would involve. Under any circumstances, the funding should not come from the Nuclear Waste Fund.

Spent Fuel Recycling

Based on very limited knowledge of reprocessing or recycling spent fuel, it appears that other countries are reprocessing today and that it had been the plan to reprocess spent fuel in the U.S. However, President Carter chose to foreclose that some 30 years ago out of concern for limiting proliferation of nuclear materials in other countries, as well as some environmental and economic factors involved.

The President's National Energy Policy report of 2001, in the context of seeking to expand the use of nuclear energy in this country, recommended the development of "reprocessing and fuel treatment technologies that are cleaner, more efficient, less waste-intensive and more proliferation-resistant." When the average person learns that the present open-fuel cycle nuclear reactors in this country only utilize five percent of the energy value of the fuel it is natural to ask whether we should discard the balance as "waste." Therefore, the question becomes whether "spent" nuclear fuel is waste or an energy resource?

Since the Administration announced the GNEP initiative in February 2006 there has been considerable discussion, assessments of the geopolitical difficulty and some confusion over economics, timeline to production scale and the ability to achieve the Administration's mandatory condition of proliferation-resistant reprocessing. Having nothing new to offer on any of those considerations, some conclusions are:

a) It is likely to be decades before a reprocessing capability is licensed in the United States;

b) Even if we were to reprocess all present and future spent fuel inventory, there is still a requirement for long-term disposal of some residue waste in a repository such as Yucca Mountain; and,

c) The economics of commercialization of reprocessing are as yet unproven and some form of government subsidy may be in order.

Nonetheless, with potential advances in technology, reprocessing or recycling of spent nuclear fuel is a promising area that is worthy of research. I support the Administration's budget request for $250 million in research and development in 2007 to help further examine the potential costs and benefits of reprocessing. We are encouraged to see the involvement of industry, academic institutions and the national laboratories.

Pending resolution of the NWF payments issue, along with an acceptable solution for interim storage of the SNF, utilities will likely face serious challenges with state commission certification processes. The permanent disposal of nuclear waste is the biggest obstacle to the growth of nuclear energy in the United States.

Conclusion

In conclusion, the outlook for nuclear energy in the United States is good. Public support for nuclear energy is growing, including many environmentalists and opinion leaders across the political spectrum. It has improved economic and environmental factors. Public support for nuclear energy in the United States has grown steadily as a result of excellent plant safety and performance, as well as growing awareness of nuclear energy's benefits. A March 2006 survey revealed that 86 percent of the general public agrees that nuclear energy will play an important role in meeting our nation's electricity needs in the years ahead. In addition, 73 percent found it acceptable to add a new reactor at the nearest existing nuclear plant site. Overall, 68 percent of Americans surveyed support nuclear energy, while 29 percent oppose it, according to polling results obtained by Bisconti Research.

I thank the Chairman and the Subcommittee for inviting me to appear before you today.