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APPROPRIATIONS
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Chairman Hobson, Congressman Visclosky, and members of the Subcommittee, it is a pleasure to be here today to discuss the future of nuclear energy in the U.S. I will discuss the Global Nuclear Energy Partnership or GNEP, through which the Department proposes to accelerate development and deployment of an integrated recycling capability in the U.S.

First, I will provide a brief overview of our GNEP efforts.

Second, I will discuss the expansion of nuclear power reactors in the United States.

Third, I will discuss the status of our efforts to plan for advanced recycling of spent fuel to accommodate the safe expansion of nuclear power.

1. GNEP OVERVIEW

As you know, I have been in the position of Assistant Secretary since April. During this time, I have worked to focus the priority of Office of Nuclear Energy on what I believe is our most important responsibility -- serving as a catalyst for a new generation of nuclear plants in the U.S. We are making progress on this front and in the longer term global expansion of nuclear energy through GNEP.

I am working with industry and the national laboratories to restore the U.S. to a position of international leadership in nuclear power to meet the goals of GNEP. Dr. Paul Lisowski is now on-board as my Deputy Program Manager of GNEP. Paul assumes this position after twenty years at Los Alamos National Laboratory, including ten years as a senior manager responsible for the Accelerator Production of Tritium Project and operation of the Los Alamos Neutron Science Center. Paul comes to this position with significant experience in fuel cycle technologies, in particular transmutation. He has a proven track record managing highly complex scientific and national security projects and programs and I am pleased to have him on our team.

GNEP is both a major research and technology development initiative, and a major international policy partnership initiative. It addresses two major issues that have suppressed the use of nuclear power in the latter half of the twentieth century: how to responsibly use sensitive technologies in a way that does not threaten global security, and

how to safely dispose of nuclear waste. The technology R&D addresses primarily the waste issue. International collaboration and diplomacy harnesses new technologies and policies to ensure nuclear power is used responsibly.

That is why we have proposed to establish an international framework to bring the benefits of nuclear energy to the world safely and securely without all countries having to invest in the complete fuel cycle – that is, enrichment and reprocessing. We propose to create an approach, which provides fuel and reactors that are appropriately sized for the grid and the industry needs of the country. Next week, I will attend the 50th anniversary of the International Atomic Energy Agency General Conference. For the first time in many years, a key focus is on how to facilitate the safe and secure expansion of nuclear energy. The IAEA has planned a special event to recognize the 50th anniversary. The special event will focus on developing an assured fuel cycle.

We also seek to develop international fuel leasing arrangements to assure the availability of fuel and international partnerships to develop advanced recycling on productive approaches, incentives and safeguards. To encourage countries to forgo fuel cycle activities, they must be assured of credible international fuel supplies backed by designated supplies and governmental entities. These efforts backstop the proven performance of a well-functioning international commercial fuel sector. In addition, in bringing the benefits of nuclear energy to the world, we want to work with other countries to facilitate export of reactors sized to the grids and utility needs of those countries. These reactors would have adequate safety and safeguards integrated into the design.

As you know, the Department is pursuing development and deployment of integrated spent fuel recycling facilities in the U.S. These are technologies that do not result in a separated plutonium stream. Specifically, the Department proposes to develop and deploy the uranium extraction plus (UREX+) technology to separate the usable materials contained in spent fuel from the waste products. We also propose to deploy a fast reactor capable of consuming those usable products from the spent fuel while producing electricity.

Based on international and private sector response to GNEP, we believe there may be advanced technologies available to recycle used nuclear fuel ready for deployment in conjunction with those currently under development by DOE. In light of this information, DOE is investigating the feasibility of these advanced recycling technologies by proceeding with commercial demonstrations of these technologies. The technology, the scale and the pace of the technology demonstrations will depend in part on industry's response, including the business aspects of how to bring technology to full scale implementation.

DOE will draw upon the considered review of these technologies in the Advanced Fuel Cycle Program (AFCI) program over the past several years. Consistent with the FY 2006 Energy and Water Development Conference Report H.R. 109-275, we are also exploring

potential locations in the U.S. where the integrated spent fuel recycle capability and related process storage could be successfully sited and demonstrated.

We have the opportunity now to invest in an advanced fuel cycle that can impact waste management in truly significant ways. Limited recycle with mixed oxide fuel in thermal reactors or existing light water reactors, in our view, does not offer the long-term benefits for the geological repository or support the same forward-looking advantages for the revival of U.S. nuclear leadership for the 21st century.

The Department respectfully requests Congress' support for full funding for GNEP in order to continue the forward progress needed to inform a decision by the Secretary of Energy in mid-2008 on whether or not to proceed with design, construction and operation of prototype spent fuel recycling facilities. If successful, the Department will have set a course to re-establish commercial-scale spent fuel recycling capability in the U.S. This effort will greatly expand the supply of affordable, safe, clean nuclear power around the world, while enhancing safeguards to prevent misuse of nuclear material and assuring the availability of Yucca Mountain for generations to come.

2. FUTURE OF NUCLEAR ENERGY IN THE UNITED STATES

The resurgence of nuclear power is a key component of President Bush's *Advanced Energy Initiative* and a key objective contained in the President's National Energy Policy. The reasons for this are clear. As we enter a new era in energy supply, our need for energy – even with ambitious energy efficiency and conservation measures – will continue to grow as our economy grows. Electricity demand is expected to double over the next twenty years globally (EIA International Energy Outlook 2006, p. 63) and grown by 50 percent in the U.S (EIA Annual Energy Outlook 2006, Table A-8). While nuclear power is not the only answer, there is no plausible solution that doesn't include it.

Our Country benefits greatly from nuclear energy. One hundred and three nuclear plants operate today providing one-fifth of the nation's electricity. These plants are emissions-free, operate year round in all weather conditions, and are among the most affordable, reliable, and efficient sources of electricity available to Americans. Nuclear, like coal, is an important source of baseload power and is the only currently available technology capable of delivering large amounts of power without producing air emissions. U.S. nuclear power plants displace millions of metric tons of carbon emissions each year.

Over the last fifteen years, industry has done an exceptional job improving the management and operation of U.S. plants, adding the equivalent of 26[1]-1,000 megawatt units during this timeframe without building a single new plant (EIA Annual Energy Review, 2004). U.S. nuclear plants have a solid record of safety, reliability, availability, and efficiency. Longer periods between outages, reduction in the number of outages needed, power up-rates, use of higher burn-up fuels, improved maintenance, and a highly successful re-licensing effort extending the operation of these plants another 20 years,

[1] Increase in nuclear generation between 1990 and 2005 with a 90% capacity factor

have collectively improved the economics of nuclear energy. Today, nuclear energy is among the cheapest electricity available on the grid, at 1.72 cents per kilowatt-hour (www.nei.org).

Despite these successes and growing recognition of the benefits and need for more nuclear energy, industry has not ordered a new nuclear plant since 1973 (an additional plant ordered in 1978 was subsequently cancelled). In fact, not much baseload capacity—whether nuclear, hydro-electric, or coal—has been ordered since the 1970's, other than some coal-fired plants located close to the mouth of the coal mine in the western United States. In the 1980's, a large number of commercial orders for nuclear plants were cancelled and no new orders were placed. This was because of financial and regulatory challenges that significantly drove up the capital cost of nuclear plants and delayed their startup. In addition, investment premiums were so high that capital markets could no longer support nuclear power plant projects.

Today the conditions are significantly different, with volatile natural gas prices, increasing demand for electricity, and concerns about clean air, utilities and investors are planning for a new generation of nuclear plants in the U.S.

To address regulatory uncertainties that first purchasers of new plants face, in 2002, the Department launched the Nuclear Power 2010 program as a public-private partnership aimed at demonstrating the streamlined regulatory processes associated with licensing new plants. Under Nuclear Power 2010, the Department is cost-sharing the preparation of early site permits, expected to be completed in 2007 and early 2008. The Department is also cost sharing the preparation of a total of two combined Construction and Operating Licenses (COLs) for two consortia: Dominion Energy, which is examining the North Anna site in Virginia and NuStart – a consortium of ten utilities and two vendors – which will use DOE funding to move a COL forward on either the Bellefonte site in Alabama or the Grand Gulf site in Mississippi. Collectively, these two teams represent the operators of two thirds of nuclear plants operating today in the U.S.

Under this program, we are also jointly funding the design certification and completion of detailed designs for Westinghouse's Advanced Passive Pressurized Water Reactor (AP 1000), General Electric's Economic Simplified Boiling Water Reactor (ESBWR), and site-specific analysis and engineering required to obtain COLs from the NRC. The two COL applications are planned for submission to the NRC in late 2007 and industry is planning for issuance of the NRC licenses by the end of 2010.

With dozens of new nuclear plants under construction, planned or under consideration world-wide, many countries around the world are clearly moving forward with new nuclear plants (www.world-nuclear.org/info/reactors.htm). And it is no different here in the U.S. We are nearing completion of the initial phase of preparations for a new generation of nuclear plants. Through the Nuclear Power 2010 program and incentives contained in the Energy Policy Act of 2005, government and industry are working together to effectively address regulatory and financial impediments that the first purchasers of new plants face.

As a result, I am confident that we will see the first announcements of new U.S. plants before President Bush leaves office. I am also confident that we will see construction begin by 2010. Already we are seeing indications that new orders are in the planning stages, with utilities announcing procurements of long-lead components. Earlier last month, the Nuclear Regulatory Commission indicated that it has received letters of intent from potential applicants for a total of 19 site-specific COLS for up to27 reactors. This progress would not have been possible without NP 2010 and incentives like risk insurance, which respectively mitigate the financial and regulatory risks facing the first few new nuclear power facilities.

However, for the long-term viability of our nuclear generating capacity, we must proceed with a geologic repository. We are pursuing initial operation of Yucca Mountain as early as 2017 so that we can begin to fulfill our obligation to dispose of the approximate 55,000 metric tons of spent fuel already generated and approximately 2,000 metric tons generated annually. Whether we recycle or not, we must have Yucca Mountain open as soon as possible. But as you know, the statutory capacity of Yucca Mountain will be oversubscribed by 2010 and without the prospect of spent fuel recycling, simply maintaining the existing generating capacity in the U.S. will require additional repositories.

This is one of the key reasons why I believe we must accelerate the development and deployment of advanced recycling technologies – technologies that will enable us to reuse our valuable energy resources and that extend the capacity of Yucca Mountain for generations to come. But it also important for our own future that nuclear energy expands in the world in a way that is safe and secure, in a way that will not result in nuclear materials or technologies used for non-peaceful purposes.

3. SPENT FUEL RECYCLING

The U.S. operates a once-through fuel cycle, meaning that the fuel is used once and then disposed of without further processing. In the 1970's, the U.S. stopped the old form of reprocessing and then committed to not separate plutonium, a nuclear proliferation concern. But the rest of the nuclear economies – France, Japan, Great Britain, Russia and others engage in recycling, a process in which spent fuel is processed and the plutonium and uranium are recovered from the spent fuel to be recycled back through reactors. As a result, the world today has a buildup of nearly 250 metric tons of separated civilian plutonium. The world also has vast amounts of spent fuel and we risk the continued spread of separated plutonium via fuel cycle separation technologies. Furthermore, recent years have seen the unchecked spread of enrichment technology around the world.

Having ceased reprocessing of spent fuel for several decades, with anticipated growth of nuclear energy in the U.S. and abroad, the U.S. is now considering a new approach that includes recycling of spent nuclear fuel using advanced technologies to increase proliferation resistance, recovering and reusing portions of spent fuel, and reducing the amount of wastes requiring permanent geological disposal. Since 2000, Congress has

appropriated funds for the AFCI for research and development on a number of different recycle concepts.

Within the AFCI program, we have had considerable success with the UREX+ technology, demonstrating the ability at the bench and laboratory scales to separate uranium from the spent fuel, at a very high level of purification that would allow it to be recycled for re-enrichment, stored in an unshielded facility, or simply buried as a low-level waste. With UREX+, the long-lived fission products, technetium and iodine, could be separated and immobilized for disposal in Yucca Mountain. Next, the short-lived fission products cesium and strontium are extracted and prepared for decay storage, where they are allowed to decay until they meet the requirements for disposal as low-level waste. Finally, transuranic elements (plutonium, neptunium, americium and curium) are separated from the remaining fission products, fabricated into fast reactor transmutation fuel, and consumed or destroyed in a fast reactor. After these elements are consumed, only small amounts would require emplacement in a geologic repository. This approach is anticipated to increase the effective capacity of the geologic repository by a factor of 50 to100.

Last month, DOE issued two requests for Expressions of Interest from domestic and international industry, seeking to investigate the interest and capacity of industry to deploy an integrated spent fuel recycling capability consisting of two facilities:

- A Consolidated Fuel Treatment Center, capable of separating the usable components contained in light water spent fuel from the waste products;

- An Advanced Burner Reactor, capable of consuming those usable products from the spent fuel while generating electricity;

The Department asked industry to provide input on the scale at which the technologies should be proven. Ultimately, as in the initial plan reported to the Congress in May, the Department ultimately seeks the full commercial-scale operations of these advanced technologies. It is premature, however, to say exactly what form or size the recycling facility will take until we analyze important feedback recently received from industry.

The integrated recycling facilities would include process storage of spent fuel prior to its recycling, on a scale proportionate to the scale of recycling operations. A third facility, the Advanced Fuel Cycle Facility - would be designed and directed through the Department's national laboratories and would be a modern state-of-the-art fuels laboratory designed to serve the fuels research needs to support GNEP.

We have solicited industry expressions of interest in order to leverage the experience of existing, proven capabilities of industry and fuel cycle nations to develop advanced recycling technologies for GNEP. These entities will be critical in helping bring these facilities to operation in the United States, while meeting GNEP goals. We are also examining the feasibility of incorporating advanced technologies that are closer to

deployment, in conjunction with those currently under development by DOE, to reduce the time and costs for commercial deployment.

We are now in the process of reviewing industry's response to last month's request for Expressions of Interest. Based on our limited review thus far, I can tell you that industry has responded with positively and we look forward to working with industry.

In addition, last month the Department issued a Financial Assistance Funding Opportunities Announcement, seeking applications by September 7, 2006, from private and/or public entities interested in hosting GNEP facilities. Specifically, the Department will award grants later this fall for site evaluation studies. As this Committee knows, Congress made $20 million available [H.R. 109-474, FY 2006 Energy and Water Development Appropriations Bill], with a maximum of $5 million available per site. Because we will need process storage for fuel to be treated, part of the purpose of this Financial Assistance Funding Opportunity Announcement is to understand the ability of and interest in proposed sites receiving fuel for process storage. The information generated from these site evaluation studies may be used in the preparation of National Environmental Policy Act (NEPA) documentation that will evaluate potential environmental impacts from each proposed GNEP facility.

The Department is continuing to plan and prepare for the development of appropriate NEPA documentation to support activities under GNEP. The Department issued an Advance Notice of Intent to prepare an environmental impact statement in March 2006 and is preparing to issue a Notice of Intent in the fall 2006. The current plan is to complete the NEPA process in 2008, assisting in Departmental decisions about whether to move forward with integrated recycling facilities, and if so, where to locate them.

The overall GNEP effort involves several program secretarial offices, including the National Nuclear Security Administration (NNSA). For example, NNSA will provide key assistance in assuring that safeguards approaches and technologies are incorporated into the facilities early in the planning process. In addition, while DOE currently sponsors university research grants through its R&D programs via the Nuclear Energy Research Initiative, universities will be engaged in GNEP-funded research. Industry will also be engaged as the program progresses through the design process.

Designing, developing and deploying the separations, fuels, and reactor technologies requires that DOE carry out a variety of research, ranging from technology development for those processes initially identified to longer-term research and development on alternatives for risk reduction. In addition, the Office of Science held three technical workshops in July 2006 on basic science in support of nuclear technology. Although not limited solely to GNEP, the results of this activity will help guide the long-term R&D agenda for closing the fuel cycle. Furthermore, advanced simulation is expected to play an important role in the development of this program, as it does today in many leading commercial industries. DOE organized a workshop on simulation for the nuclear industry at Lawrence Livermore National Laboratory which was chaired by Dr. Robert Rosner, Director of Argonne National Laboratory and Dr. William Martin from the

University of Michigan. We also participated in a nuclear physics workshop sponsored by the Office of Science.

Systems analysis also forms an important part of the ongoing GNEP effort and will have an increased role during the next two years. Through systems analysis, we will investigate several key issues, including life cycle costs, rate of introduction of fast reactors and separations facilities, a detailed study of the technical requirements for GNEP facilities and the complete fuel cycle, and how to ensure that they relate to the top level goals of the program. The results of these analyses are essential to establishing the basis for each key decision in the AFCI program and will have a profound effect on GNEP program planning.

In short, there has been considerable progress on the Department's FY 2006 efforts on GNEP. The Department has continued applied research and technology development efforts in concert with the Department's national laboratories. The Department has engaged the international community to identify areas of potential cooperation, cost-sharing, and support.

In FY 2007, the Department seeks to continue the research and development activities necessary to support GNEP, including issues associated with developing transmutation fuel. The Department will also continue work on conceptual designs for the Advanced Fuel Cycle Facility.

CONCLUSION

In closing, the U.S. can continue down the same path that we have been on for the last thirty years or we can lead to a new, safer, and more secure approach to nuclear energy, an approach that brings the benefits of nuclear energy to the world while reducing vulnerabilities from proliferation and nuclear waste. We are in a much stronger position to shape the nuclear future if we are part of it. This is an ambitious plan and we are just at the initial stages of planning. I look forward to coming before the committee in the future as the GNEP program plans take shape.