Statement of

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Subcommittee on Energy and Water, and Related Agencies

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Mr. Chairman and members of the Subcommittee:

My name is Alan Hanson, and I am Executive Vice President, Technology and Used Fuel Management, of AREVA NC Inc.

I appreciate this opportunity to testify before you today on the U.S. Department of Energy's Global Nuclear Energy Partnership (GNEP).

I am very pleased to join Assistant Secretary of Energy Dennis Spurgeon on this panel. Assistant Secretary Spurgeon comes to DOE with a distinguished industry background, which will help him to take on many challenges implementing our nation's nuclear energy policy. I look forward to working with him to achieve the objectives of GNEP.

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AREVA, Inc. is an American corporation headquartered in Maryland with 5,000 employees in 40 locations across 20 U.S. states. Last year, our U.S. operations generated revenues of $1.8 billion—9 percent of which was derived from U.S. exports. We are part of a global family of AREVA companies with 59,000 employees worldwide offering proven energy solutions for emissions-free power generation and electricity transmission and distribution. We are proud to be the leading supplier of products and services to the worldwide nuclear industry, and we are the only company in the world to operate in all aspects of the nuclear fuel cycle.

AREVA designs, engineers and builds the newest generation of commercial nuclear plants and provides reactor services, replacement components and fuel to the world's nuclear utilities. We offer our expertise to help meet America's environmental management needs and have been a longtime partner with DOE on numerous important projects. Relevant to today's testimony is the fact that AREVA operates the largest and most successful used fuel treatment and recycling plants in the world.

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What I hope to accomplish today is to provide a commercial, industrial perspective on how we as a nation might realistically achieve the bold objectives of the GNEP program. AREVA applauds the GNEP vision for expanding clean nuclear power to meet the ever-increasing global demand for energy while providing the framework to safeguard nuclear technologies and materials. We strongly believe that nuclear energy has a critical role to play in the future of our nation, just as we believe that GNEP puts the U.S. on the right track for leadership in the global nuclear industry.

AREVA has proven expertise in the areas GNEP is designed to address. Our accumulated experience makes us uniquely qualified in all of the industrial aspects of this

initiative. We have today commercially-available technology that can be implemented in the very near future, and AREVA is ready to commit its substantial resources to technically support the objectives of GNEP.

We believe that no time should be wasted since developing a comprehensive used fuel management strategy, one that is complementary and beneficial to our nation's repository program, will have the most important effect of increasing confidence in nuclear energy, thereby paving the way to the nuclear renaissance that Congress enabled with passage of the Energy Policy Act of 2005.

The Comparable Costs of Recycling

One of the major obstacles to implementing a used fuel management strategy that includes recycling in the United States has been the perceived high cost of recycling compared to a once-through approach in which used fuel is stored for a period of time and then disposed in a geologic repository.

Over the last decade, however, several factors have led to questions about the appropriateness of the once-through fuel cycle as an exclusive used fuel management strategy. In particular, cost estimates of the national repository to support the once-through policy have significantly increased from initial estimates. Additionally, at the current rate of used fuel generation, additional repository capacity is likely to be needed for fuel discharged after 2015. And finally, with a long-term increase in new U.S. nuclear power generation now foreseen, even greater volumes of used nuclear fuel will need to be disposed.

The underlying economics of a used fuel management approach that includes recycling have thereby shifted, driven also in part by higher uranium prices and by a deeper understanding of the long-term behavior of recycling byproducts that allows for significant optimization of valuable repository space.

Recycling as a key component of a comprehensive used fuel policy has gained recognition through the demonstrated, long-term operational effectiveness of treatment and fabrication technologies for more than 40 years of accumulated industrial experience combined with a higher level of confidence based upon economic data from actual operations such as AREVA's. These developments have made it increasingly important that the U.S. further investigate recycling as part of a comprehensive used fuel management strategy.

In this context, The Boston Consulting Group (BCG) recently completed an independent study commissioned by AREVA to review the economics of the back-end of the nuclear fuel cycle and, in particular, a fuel cycle which includes developing a recycling component in the U.S. using a technology consistent with America's nonproliferation objectives.

The study addressed the cost of a "portfolio" waste management strategy. A new recycling facility treating 2,500 metric tons of used fuel per year was assumed to be

operational by 2020. The facility would integrate used fuel treatment together with fuel fabrication on a single location and would function in combination with the development of a deep geologic repository for high-level waste from recycling and untreated legacy used fuel. The facility would utilize an AREVA recycling process called COEX™, which unlike conventional technologies never separates out pure plutonium.

Data from AREVA's global operations, supplemented by site visits and additional analyses, were used by The Boston Consulting Group as a starting point for an independent, third-party assessment of this assumed recycling model. BCG's analysis and conclusions found that the unit costs derived from an integrated plant are significantly lower than previously published findings suggest.

While the capital investments and operational expenses of a U.S. treatment plant may have been expected to be close to those of AREVA reference facilities, a much higher used fuel throughput can be reasonably projected in an American context because of the U.S. facility's larger size and a higher rate of utilization, which in turn results in economical unit costs. Utilization was assumed to be at about 80 percent of nameplate capacity, a technical assumption that can be backed by AREVA's own operational experience. Higher utilization in the U.S. is not only possible but desirable because of a larger volume of newly discharged fuel and existing inventory.

Previous estimates of the cost of treatment and recycling have been based upon sparse publicly-available industry data. These estimates did not consider the effects of building only the specific facilities needed or the economies of scale and higher rates of utilization, and they also used different assumptions for financial calculations. Additionally, previous studies did not account for the full repository optimization potential a recycling strategy offers. A national repository with today's statutory capacity, for instance, can ultimately handle four times more used fuel when operated as part of a portfolio program because efficient modes of recycling can significantly compact final waste volumes and minimize the heat and toxicity of disposed materials.

The Boston Consulting Group study, which assumed very conservative variables such as the price of uranium at $31 per pound and the sum cost of a national repository at 2001 DOE estimates, concluded that the total cost of recycling used fuel in combination with an optimized repository can be comparable to the cost of a once-through program.

The National Benefits of Recycling

Additionally, recycling as part of a portfolio strategy was found in the BCG study to present a number of significant national benefits. Some of those discussed in the report include:

1. Forgoing the need for additional civilian repository capacity, beyond the initial 63,000 metric ton capacity of the first repository, until at least 2070.

2. Contributing to early reduction of used fuel inventories at reactor sites; in particular, removing newer, hotter fuel for recycling within four years of discharge, thus eliminating earlier the need for additional investments in interim storage capacity.

3. Relying on existing technology with appropriate modifications that can in turn provide a systematic, progressive operational transition to more advanced technology developments as they become available.

GNEP Can Be a Successful Public-Private Enterprise

DOE has recently engaged industry in the future development of the GNEP initiative, formulating a two-track approach under the direction of Assistant Secretary Spurgeon and requesting from industry Expressions of Interest in a Consolidated Fuel Treatment Center (CFTC) and an Advanced Burner Reactor (ABR). In so doing, "DOE seeks to determine the feasibility of accelerating the development and deployment of advanced recycling technologies that would enable commercial scale demonstrations that meet GNEP objectives."

Based on AREVA's own experience, we believe such an industrial and evolutionary approach, while factoring for the application of incremental innovations, offers the highest probability of success for introducing used fuel recycling in the U.S.

In parallel, an extensive R&D program utilizing the wonderful capabilities of our national laboratories should continue to be funded to further develop advanced separations and reactor technologies.

Together with a team of other U.S. industry leaders, AREVA responded positively and with great enthusiasm to both DOE requests for Expressions of Interest. I have no doubt that other capable nuclear companies have also made known to DOE their desire to participate in the GNEP initiative. With adequate public-private coordination, we forecast that a workable business framework can be achieved that will draw less heavily from the American taxpayer than is widely predicted while simultaneously leveraging significant investment interest from interested companies such as AREVA.

Industry Can Begin Meeting the Objectives of GNEP

AREVA looks forward to the accelerated execution of a GNEP two-track approach. We believe there are three compelling policy reasons for immediate action:

1. **Need for a comprehensive and effective waste management strategy.** We want a strategy that provides full confidence that the byproducts resulting from the generation of nuclear power can be adequately dealt

with for generations to come. This will help to ensure that the nuclear renaissance can move forward and that new U.S. power plants can begin being built immediately.

2. **Optimization of a national repository.** Today, the first national repository is limited by statute to a maximum capacity of 63,000 metric tons of civilian used nuclear fuel. The total volume of used fuel to be generated in the U.S. by the year 2100 is expected to exceed the statutory capacity significantly, especially under the scenario where there is a nuclear renaissance and new U.S. plants. Beginning implementation of recycling in the near-term, however, will postpone or eliminate the need for siting, funding and constructing additional geologic repositories.

3. **Ending of interim storage charges.** Used fuel should be moved away from the reactors as soon as possible. Acting on the two-track framework described above, used fuel could be moved away from today's power plants to a recycling facility perhaps as early as 2015, thus forgoing Federal liabilities that would otherwise be accrued to compensate utilities for interim storage.

As an industrial and commercial company, AREVA believes in an evolutionary approach to technology development. It begins by first applying a solid baseline of state-of-the-art, proven technologies, and then, but only then, integrating improvements and upgrades of more advanced, innovative technologies within a disciplined, continuous improvement process. Using this approach, we wish to continue to apply industry advancements to the GNEP program as it advances in the years ahead.

AREVA has successfully adopted and used this strategy on several occasions during the deployment of its treatment facilities at La Hague. The inclusion of additional hot cells in the initial footprint of the CFTC, which are intended to be used at a later date to receive new technology, is an example of this approach. Making such provisions in the initial design provides a high degree of flexibility.

AREVA is also working on innovative business models that would stimulate and effectively leverage private investments. We are exploring business model options that require very limited direct government financial support over the next decade, thus allowing resources to be spent on the development of a final waste repository and on R&D for advanced transmutation fuel technologies, which are crucial to the overall long-term success of the GNEP initiative. We are looking forward to entering into discussions with DOE in the weeks to come.

Our proposed evolutionary approach meets the fundamental objective of GNEP to reduce proliferation risk through the combination of advanced safeguard techniques and technology improvements. Our phased approach will carefully ensure from Day One that the attractiveness levels of process materials are kept as low as possible by:

1. Avoiding any separation of pure plutonium at any location within the treatment and recycling facility (which is ensured with the AREVA COEX™ process).

2. Limiting the concentration of plutonium in solution anywhere in the process facility consistent with attractiveness level D or below, thus making the recycling plant a Category II facility with respect to materials control and accountability classification.

3. Implementing advanced nuclear material measurement to enhance the accuracy of material accountability and reporting time; a development program will be undertaken with the relevant DOE national laboratories most specialized in this area, and advanced safeguards will be integrated into the facility design from the start.

4. Implementing the *defense-in-depth* principle, which involves multiple levels of physical barriers between nuclear materials and the exposed environment.

Advanced burner reactor development, also an important component of the GNEP initiative, is currently envisioned by DOE to keep apace with the operational start of an integrated recycling facility so it can address the actinide byproducts of evolutionary recycling.

However, an emerging industry consensus cautions that focusing any national recycling strategy solely in conjunction with ABR deployment carries a serious programmatic risk because a full ABR fleet likely will not be available until some years after a recycling plant is fully operational. Even if the technology program for ABR development is accelerated, utilities will require as many as ten years of proven operational experience before considering private financing and commercial deployment.

Thus, a more successful recycling strategy should allow for the fabrication of both ABR fuel and fuel for today's fleet of light water reactors. The latter could be used in the interim as ABRs come on-line, improving the overall economies of the GNEP initiative.

AREVA, with more than four decades of sodium-cooled fast reactor expertise, is uniquely positioned to support the commercialization of ABRs in the U.S. under the framework of the GNEP initiative. AREVA has recommended to DOE an approach that can demonstrate economic viability in the shortest practicable timeframe.

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AREVA believes that GNEP has the potential to vault the U.S. into a position of leadership in the global nuclear industry. We welcome the two-track approach recently announced by DOE and are eager to move forward with it.

AREVA believes that recycling, as a complementary strategy to the development of a geologic repository, can be done economically and that this is the best comprehensive waste management strategy for dealing with used nuclear fuel.

AREVA is interested in being a partner with DOE and thereby helping to put the "Partnership" into GNEP. We stand ready to support DOE and the nuclear energy industry in this historic initiative.

Mr. Chairman and members of the Subcommittee, I appreciate having this opportunity to join you today. I would be pleased to answer any questions you may have at this time.

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Dr. Alan S. Hanson
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AREVA NC Inc.

Alan Hanson was appointed Executive Vice President, Technology and Used Fuel Management, of AREVA NC Inc. in 2005. He continues his responsibilities as Chief Executive Officer of AREVA subsidiary Transnuclear, Inc., which he joined in 1985.

Dr. Hanson began his career in 1975 with the Nuclear Services Division of Yankee Atomic Electric Company. In 1979, he joined the International Atomic Energy Agency in Vienna, Austria, where he served first as Coordinator of the International Spent Fuel Management Program and later as Policy Analyst with responsibilities for safeguards and nonproliferation policies.

Dr. Hanson completed his undergraduate studies in mechanical engineering at Stanford University and earned a Ph.D. in nuclear engineering from the Massachusetts Institute of Technology. He is a member of the American Nuclear Society and the American Society of Mechanical Engineers.