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**THE U.S. DOMESTIC CIVIL NUCLEAR
INFRASTRUCTURE
AND
U.S. NONPROLIFERATION POLICY**

**A White Paper Presented by the
American Council on Global Nuclear Competitiveness**

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EXECUTIVE SUMMARY

This report examines the issue of whether the current United States (U.S.) civil nuclear infrastructure is sufficiently robust to help the United States maximize its opportunities to achieve its nonproliferation objectives, and if not, what new directions the U.S. Government and industry should take to help rectify the situation.

The health of the U.S. civil nuclear infrastructure can have an important bearing in a variety of ways on the ability of the United States to advance its nonproliferation objectives. During the Atoms for Peace Program and until the 1970s, the U.S. was the dominant supplier in the international commercial nuclear power market, and it exercised a strong leadership role in shaping the global nonproliferation regime. In those early days, the U.S. also had what was essentially a monopoly in the nuclear fuel supply market. This capability, among others, allowed the U.S. to promote the widespread acceptance of nonproliferation norms and restraints, including international safeguards and physical protection measures, and, most notably, the Treaty on the Non-Proliferation of Nuclear Weapons (NPT). The United States concluded agreements for cooperation in peaceful nuclear energy with other states, which require strict safeguards, physical protection and other nonproliferation controls on their civil nuclear programs.

Today due to its political, military and economic position in the world, the United States continues to exercise great weight in nonproliferation matters. However, the ability of the United States to promote its nonproliferation objectives through peaceful nuclear cooperation with other countries has declined. The fact that no new nuclear power plant orders have been placed in over three decades has led to erosion in the capabilities of the U.S. civil nuclear infrastructure. Moreover, during the same period, the U.S. share of the global nuclear market has declined significantly, and several other countries have launched their own nuclear power programs and have become major international suppliers in their own right.

It is highly significant that all but one of the U.S. nuclear power plant vendors and nuclear fuel designers and manufactures for light water reactors have now been acquired by their non-U.S. based competitors. Thus, while the U.S. remains a participant in the international market for commercial nuclear power, it no longer enjoys a dominant role as it did four decades ago. To the extent that U.S. nuclear plant vendors and nuclear fuel designers

and manufacturers are able to reassert themselves on a technical and commercial basis, opportunities for U.S. influence with respect to nuclear nonproliferation can be expected to increase. However, the fact that there are other suppliers that can now provide plants and nuclear fuel technology and services on a competitive commercial basis suggests that the U.S. will have to work especially hard to maintain and, in some cases, rebuild its nuclear infrastructure, if it wishes to exercise its influence in international nuclear affairs.

The influence of the United States internationally could be enhanced significantly if the U.S. is able to achieve success in its Nuclear Power 2010 program and place several new orders in the next decade and beyond.

There is a clear upsurge of interest in nuclear power in various parts of the world. As a consequence, if the U.S. aspires to participate in these programs and to shape them in ways that are most conducive to nonproliferation, it will need to promote the health and viability of the American nuclear infrastructure. Perhaps more importantly, if it wishes to exert a positive influence in shaping the nonproliferation policies of other countries, it can do so more effectively by being an active supplier to and partner in the evolution of those programs.

Concurrent with the prospective growth in the use of nuclear power, the global nonproliferation regime is facing some direct assaults that are unprecedented in nature. International confidence in the effectiveness of nuclear export controls was shaken by the disclosures of the nuclear operations of A.Q. Khan. These developments underscore the importance of maintaining the greatest integrity and effectiveness of the nuclear export conditions applied by the major suppliers. They also underscore the importance of the U.S. maintaining effective policies to achieve these objectives. Constructive U.S. influence will be best achieved to the extent that the U.S. is perceived as a major technological leader, supplier and partner in the field of nuclear technology.

As the sole superpower, the U.S. will have considerable, on-going influence on the international nonproliferation regime, regardless of how active and successful it is in the nuclear export market. However, the erosion of the U.S. nuclear infrastructure has begun to weaken the ability of the U.S. to participate actively in the international nuclear market. If the U.S. becomes more dependent on foreign nuclear suppliers or if it leaves the international

nuclear market to other suppliers, the ability of the U.S. to influence nonproliferation policy will diminish.

It is, therefore, essential that the United States have vibrant nuclear reactor, enrichment services, and spent fuel storage and disposal industries that can not only meet the needs of U.S. utilities but will also enable the United States to promote effective safeguards and other nonproliferation controls through close peaceful nuclear cooperation with other countries. U.S. nuclear exports can be used to influence other states' nuclear programs through the nonproliferation commitments that the U.S. requires. The U.S. has so-called consent rights over the enrichment, reprocessing and alteration in form or content of the nuclear materials that it has provided to other countries, as well as to the nuclear materials that are produced from the nuclear materials and equipment that the U.S. has supplied.

Further, the ability of the U.S. to develop improved and advanced nuclear technologies will depend on its ability to provide consistent and vigorous support for nuclear R&D programs that will enjoy solid bipartisan political support in order that they can be sustained from one administration to another. As the U.S. Government expends taxpayer funds on the Nuclear Power 2010 program, the Global Nuclear Energy Partnership, the Generation IV initiative and other programs, it should consider the benefit to the U.S. industrial base and to U.S. non-proliferation posture as criteria in project design and source selection where possible.

Finally, the ability of the United States to resolve its own difficulties in managing its spent fuel and nuclear wastes will be crucial to maintaining the credibility of the U.S. nuclear power program and will be vital to implementing important new nonproliferation initiatives designed to discourage the spread of sensitive nuclear facilities to other countries.

1. INTRODUCTION

This report addresses the question of whether the current United States civil nuclear infrastructure is sufficiently robust to help the United States maximize its opportunities to achieve its nonproliferation objectives, and if not, what new directions the U.S. Government and industry should take to help rectify the situation.

The report is presented by the American Council on Global Nuclear Competitiveness. The Council is a 501(c) (3) non-profit corporation formed in 2005. The mission of the Council is to alert Americans to the decline of the U.S. nuclear design and manufacturing industry, and to highlight the opportunities for a restoration of U.S. global leadership in this field.

The international nonproliferation regime has proved largely effective in limiting the spread of nuclear weapons. Contrary to predictions made during the 1950s and 1960s that 20 to 30 states would possess nuclear weapons by the 1970s, by the year 2007 only nine states have actually conducted nuclear weapons tests and a tenth (i.e., Israel) is widely regarded as possessing nuclear weapons. An eleventh, Iran, has engaged in activities in violation of its safeguards agreement with International Atomic Energy Agency (IAEA), which it entered into pursuant to its obligations under the Treaty on the Non-Proliferation of Nuclear Weapons (NPT or Treaty). As a consequence, Iran is presently subject to sanctions by the United Nations (UN) Security Council. On the other hand, 183 non-nuclear-weapon states have faithfully adhered to their obligations under the NPT and have adopted a strong nonproliferation ethic.

Despite the fact that earlier dire predictions have not been realized, the international nuclear nonproliferation regime now faces serious, new challenges. These include the threats posed by the nuclear programs of the Democratic People's Republic of Korea (DPRK) and Iran; the clandestine marketing of sensitive nuclear materials and technology by A.Q. Khan; the procurement networks employed by such countries as Iran and the DPRK to support their respective nuclear weapons programs; and the risks that terrorists may gain access to nuclear weapons or nuclear weapons-usable material.

These difficulties come at a time when the international community is demonstrating an increasing interest in expanding the use of commercial nuclear power not only to meet growing energy needs but also to address the environmental problems produced by other energy sources.

One of the key challenges that the nonproliferation regime faces is, therefore, to ensure that this projected growth in commercial nuclear power will take place under conditions that provide the maximum protection against the misuse of civil nuclear technology for military or nuclear explosives purposes. At the same time, if this challenge is not met effectively, it will undermine the prospects of achieving the expanded use of peaceful nuclear power and the benefits that it can provide in the coming decades.

The health of the U.S. civil nuclear infrastructure can have an important bearing in a variety of ways on the ability of the United States to advance its nonproliferation objectives. During the Atoms for Peace Program and until the 1970s, the U.S. was the dominant supplier in the international commercial nuclear power market, and it exercised a strong leadership role in shaping the global nonproliferation regime. Today due to its political, military and economic position in the world, the United States continues to exercise great weight in nonproliferation matters. However, the ability of the United States to promote its nonproliferation objectives through peaceful nuclear cooperation with other countries has declined. The fact that no new nuclear power plant orders have been placed in over three decades in the U.S. has led to erosion in the capabilities of the U.S. civil nuclear infrastructure. Moreover, during the same period, while the U.S. share of the global nuclear market declined significantly, several other countries launched major nuclear power programs and became major international suppliers in their own right.

Against the background of the challenges facing the nonproliferation regime and the erosion of the U.S. civil nuclear infrastructure, this report addresses the following issues.

- The role that the United States has played in shaping the global nonproliferation regime, including the key part that U.S. peaceful cooperation with other countries has played in promoting U.S. policy;

- The significant role that nonproliferation factors play in providing the stable political environment required for the implementation of peaceful nuclear power programs;
- The status of the nonproliferation regime, the specific challenges it now faces, and the principal new initiatives to meet these challenges that are now under consideration;
- The major ways in which the U.S. nuclear infrastructure has supported the ability of the United States to achieve several nonproliferation and related national security and foreign policy objectives;
- The relationship between the role of the United States as a major player and technology leader in international nuclear affairs and its capacity to promote effective nonproliferation policies;
- The status of the U.S. nuclear infrastructure, the nature of U.S. dependence on other supplier countries in certain areas, and the potential adverse effects that any lost capabilities in the U.S. civil nuclear infrastructure have had on the independence of the United States, its influence internationally and on its national security, foreign policy and economic interests; and
- The major steps to strengthen its civil nuclear infrastructure that U.S. Government and industry leaders need to take in order to preserve U.S. influence in nonproliferation developments, to help meet global energy needs, and to advance U.S. foreign policy and national security interests.

In summary, this report takes stock of the status of the U.S. peaceful nuclear infrastructure and reviews the important role that a healthy U.S. civil nuclear fuel cycle and R&D program could play in helping the United States to advance its nonproliferation objectives. It also recommends steps that the U.S. Government and industry leaders could take to further these goals.

2. THE BASIC PHILOSOPHIES UNDERPINNING THE GLOBAL NONPROLIFERATION REGIME

The global nonproliferation regime had its origins in the 1950s when the United States and several other countries with nuclear capabilities made important decisions to declassify certain aspects of nuclear technology so that they could be shared with other nations solely for peaceful purposes. The U.S. and these other states had a strong awareness that their decisions could produce important benefits in the field of energy, medicine and agriculture. However, they also shared a profound recognition that nuclear materials, equipment and technologies could be misused.

Consequently, the United States as well as other states concluded that suppliers should share civil nuclear technology with other countries only if they were able and willing to put into place a rigorous system to ensure that civil uses of nuclear materials, equipment and technologies would not be diverted to the manufacture of nuclear weapons, nuclear explosive devices or other military purposes.

In 1953 President Eisenhower proposed the establishment of the Atoms for Peace program to share nuclear technology with other states for peaceful applications. This program also recognized that effective controls had to be placed on peaceful nuclear trade to ensure against its use for military purposes. Following the Atoms for Peace speech, the United States amended its Atomic Energy Act and led the effort to establish the International Atomic Energy Agency (IAEA) and its safeguards system. Beginning in 1955, the U.S. entered into agreements for cooperation with other countries to share in the research and power applications of the atom.

The basic philosophy of the Atoms for Peace program rested on two principles. The first was that countries should have a right to enjoy the peaceful benefits of nuclear energy and that governments should encourage and facilitate international commerce in nuclear materials, equipment, and technology in order to promote global economic development and welfare. The second was that states that desired the benefits of peaceful applications of nuclear energy must make effective commitments not to misuse that technology for non-peaceful purposes and to accept adequate verification of those commitments.

These same two principles formed the basis of the NPT. Indeed, the NPT strengthened and expanded the nonproliferation side of the equation in two important respects. While the Atoms for Peace program made international cooperation dependent on certain nonproliferation assurances, these assurances were not comprehensive. No renunciation of nuclear weapons or nuclear explosives in general was required as a condition of export, and no commitment to verify the peaceful character of all nuclear activities was required. The NPT, on the other hand, reflected the conviction that to enjoy the benefits of peaceful uses of nuclear energy, a country's commitments must be complete and comprehensive. Hence, Articles II and III of the NPT obligate non-nuclear weapon states party to the Treaty to forgo the manufacture and acquisition of nuclear weapons and nuclear explosives and to accept safeguards on all their peaceful nuclear activities. In return, Article IV of the Treaty reaffirms the right of all parties to develop and use nuclear energy in conformity with their nonproliferation obligations and binds all parties to facilitate the fullest possible exchange of equipment, materials, and scientific and technological information for the peaceful uses of nuclear energy. Article IV also requires that parties in a position to do so cooperate in contributing to the further development of the applications of nuclear energy for peaceful purposes.

The years since the initiation of the Atoms for Peace Program have shown the vital connection between the conduct of peaceful international nuclear trade and the fostering of nonproliferation norms and legal commitments. Nuclear trade has enabled some governments -- especially the United States -- to lay the basis for an effective nonproliferation regime. During the 1950s and 1960s, the United States used the influence stemming from its position as a dominant supplier of nuclear technology to forge various elements of today's nonproliferation regime. Indeed there have been two important principles underlying the current approach to nonproliferation. First, there has been a widespread recognition that international nuclear cooperation is unlikely to occur unless it is based on a solid foundation of safeguards, assurances of peaceful use, effective physical protection, and other controls designed to prevent the diversion of civil nuclear programs to explosive purposes. Secondly, an effective nonproliferation regime cannot be based solely on a system of denials, constraints and controls. It must also involve constructive engagement with, and promotion of peaceful nuclear programs in cooperating partner states.

Perhaps the main achievement of the Atoms for Peace Program is that states pledged to forego nuclear weapons and to accept international inspections of their nuclear programs in return for receiving technical assistance and other forms of peaceful nuclear cooperation. Acceptance of international inspections was an unprecedented intrusion on national sovereignty and a truly revolutionary development in international politics. Indeed, states would never have been willing to forego the manufacture of nuclear weapons and to accept such infringements on their sovereignty, unless they had sufficient incentives to do so. Non-nuclear-weapon states would never have accepted international safeguards and no-explosive use pledges without receiving the quid pro quo contained in Article IV of the NPT, which affirms the “inalienable right of all the Parties to the Treaty to develop research, production and use of nuclear energy for peaceful purposes without discrimination and in conformity with Articles I and II of this Treaty” and affirms that, “All the Parties to the Treaty undertake to facilitate, and have the right to participate in, the fullest possible exchange of equipment, materials and scientific and technological information for the peaceful uses of nuclear energy.”

Historically, the ability of the U.S. to help prevent the spread of nuclear weapons has stemmed from many factors, not least of which has been the political, military and economic power that the US has exercised in international affairs. The U.S. has used many tools to promote its nonproliferation objectives. One important instrument that the U.S. has employed for decades in building the international nonproliferation system has been its ability to provide nuclear fuel, nuclear power plants and fuel cycle services to countries on a reliable and stable basis, under strict nonproliferation controls and conditions.

In the early days of the nuclear era, the U.S. essentially had a monopoly in the nuclear fuel supply market. This capability, among others, allowed the U.S. to promote the widespread acceptance of nonproliferation norms and restraints, including international safeguards and physical protection measures, and, most notably, the NPT. The United States concluded agreements for cooperation in peaceful nuclear energy with other states, which require strict safeguards, physical protection and other nonproliferation controls on their civil nuclear programs.

Moreover, the strength of U.S. civil nuclear capabilities gave it an important seat at the international table, not only in negotiating the norms that should

govern the conduct of civil nuclear power programs to protect against their misuse or diversion to nuclear weapons, but also in shaping the key elements of the global nonproliferation regime. In addition domestic U.S. nuclear programs have enabled the United States to make important contributions to achieving technical improvements in international safeguards, physical protection, and nuclear detection systems.

However, the challenges now confronting the international nonproliferation regime come at a time when the U.S. commercial share of the global nuclear market has declined and when there are serious concerns about the health of the U.S. nuclear infrastructure.

3. CHALLENGES FACING THE NONPROLIFERATION REGIME AND POSSIBLE NEW DIRECTIONS

Although the nonproliferation regime has been largely effective in limiting the spread of nuclear weapons, many experts and observers believe that the end of the Cold War has accelerated the risks of proliferation and that the current nonproliferation system needs to be strengthened. They have expressed concern that certain countries that possess nuclear weapons, fissile materials or sensitive nuclear technologies that can produce weapons-usable materials might transfer them to other states or to terrorist organizations. The Government of Pakistan has admitted that A.Q. Khan, the former head of the Khan Research Laboratory, has transferred enrichment technology to North Korea, Iran and Libya, as well as nuclear weapons technology to Libya.

Some experts also believe that, although the NPT has generally worked well since it went into effect in the 1970s, several “legal loopholes” have become apparent, which have allowed some states to abuse the Treaty by using it as a cover to obtain nuclear material that could subsequently be used to develop nuclear weapons. They believe that Iran and Iraq both joined the NPT in order to reap the rewards promised by Article IV of the Treaty, while seeking to develop covertly a nuclear weapons capability.

Under the NPT, a non-nuclear weapons state is free to acquire enrichment and reprocessing plants so long as such states conform to the provisions of Article II not to manufacture or acquire nuclear weapons or nuclear explosive devices and Article III to place all of their peaceful nuclear activities under IAEA safeguards. Many experts fear that, under the NPT, states such as Iran have acquired the technology needed to produce separated plutonium or highly enriched uranium and that, once having acquired these weapons-usable materials, they could withdraw from the Treaty on 90-days notice and develop nuclear weapons without violating the NPT.

Thus in recent years attention has largely focused on the risks of proliferation associated with the spread of enrichment and reprocessing facilities and the weapons-usable materials that they produce. This problem has led to a number of proposals to discourage the spread of enrichment and reprocessing capabilities. These have included calls by the Director General of the IAEA, Mohammed El Baradei, urging states to place enrichment and reprocessing facilities under some form of multinational control and

proposals to improve international nuclear fuel assurances as an inducement to states to refrain from acquiring and operating enrichment plants.

Further, in a speech on February 11, 2004 at the National Defense University, President Bush proposed two new initiatives designed to address this specific problem. Specifically he proposed that (a) the members of the Nuclear Suppliers Group should refuse to sell enrichment and reprocessing equipment and technologies to any state that does not already possess full-scale, functioning enrichment and reprocessing plants and (b) the world's leading nuclear exporters should ensure that states have reliable access at reasonable cost to fuel for civilian reactors in order to discourage the spread of enrichment and reprocessing facilities.

Since then, the U.S. had been engaged with other suppliers and the IAEA in discussing the challenges of assuring fuel services to those states that forswear enrichment and reprocessing.

For example, at the 2005 IAEA General Conference the U.S. Secretary of Energy announced that the U.S. intended to establish a strategic reserve based on 17.4 tons of highly enriched uranium (HEU) that would be blended down to help qualified states deal with any disruptions in supply from their nuclear fuel suppliers, provided that these qualified states are fulfilling their nonproliferation obligations.

Subsequently, six states, France, Germany, the Netherlands, Russia, the UK and the U.S. made a proposal at the June 2006 IAEA Board of Governors' Meeting that offers improved fuel assurances in order to discourage countries from building enrichment and reprocessing facilities.

In addition, at its meeting in July 2006 the G-8 group of nations issued a statement in support of establishing improved fuel assurances in order to discourage the spread of sensitive nuclear technologies. In particular, it supported the six-nation proposal submitted to the IAEA Board of Governors in June 2006.

Lastly in February 2006 the U.S. Department of Energy (DOE) proposed a major new initiative, the Global Nuclear Energy Partnership (GNEP) aimed at the development, demonstration and deployment of advanced separations and burner reactor systems. The initiative has several important features:

- The demonstration of new separation techniques for recycling nuclear fuel that would allow the U.S. to close its fuel cycle and to develop somewhat more proliferation-resistant technologies by avoiding the presence of separated plutonium. In this connection, the U.S. nuclear services firm, *EnergySolutions* has acquired many BNFL employees as well as BNFL's technologies in modern fuel reprocessing and waste treatment and is seeking to offer an alternative to the MOX fuel cycles without separating pure plutonium. Similarly AREVA-COGEMA, Inc. is also offering the prospect of treatment recycling plants with no separated plutonium.
- The advancement of the nuclear waste management program within the United States by coupling these new separation techniques with advanced recycling reactors with the objective of reducing the volume of waste per reactor that would have to be disposed of in Yucca Mountain. The program is specifically intended to remove the need to follow the Yucca Mountain Project with several additional geological repositories. It assumes work will continue that is devoted to completing the Yucca Mountain Project.
- The establishment of a new international nuclear fuel assurance regime in order to discourage the spread of enrichment and reprocessing facilities. A major long-term aspect of this objective is a proposal that those supplier states with industrial enrichment and fuel recycling capabilities should work to provide so-called "cradle-to-grave" services to states that agree to refrain from acquiring enrichment and reprocessing facilities. Under this approach the supplier states would lease enriched uranium to consumer nations and would accept the return of the resultant spent fuel for recycling. Under the proposal contained in GNEP, achievement of this goal will take some time since such cradle-to-grave services would be put into place only after the proposed advanced recycling technologies have been proven and have become operational.

The pursuit of GNEP is a major policy and technical goal of the Administration of President Bush. However, fulfilling the promise of GNEP is a long-term endeavor that will require commitment across several Administrations. The U.S. ability to fulfill this long-term promise could be aided by a strengthened U.S. civil nuclear infrastructure. In the short-term,

the U.S. and world is looking to expand the peaceful use of nuclear energy in the civilian sector.

4. THE STATUS OF THE U.S. CIVIL NUCLEAR INFRASTRUCTURE

The world has evolved significantly with respect to commercial nuclear power. The U.S. role in these markets has been strongly influenced by a combination of events which have led to the fact that there has not been an order to build a new commercial nuclear power plant in the U.S. in more than 30 years. This has led to a decline in the infrastructure that would be required to build new nuclear power plants or the facilities envisioned under GNEP. Much of what little U.S. nuclear manufacturing infrastructure does still exist is presently devoted to serving the needs of the U.S. Government, including various nonproliferation initiatives and the naval nuclear propulsion program. Large parts of this infrastructure would require modification to enter into the commercial nuclear power market.

During a typical eight year period during the 1970s and 1980s there were 30 to 40 or more nuclear power units under construction and receiving operating licenses in the U.S. using almost exclusively U.S. industrial resources. This is in contrast to the conclusions of a recent assessment¹ that stated “major equipment (reactor pressure vessels, steam generators and moisture separator reheaters) for the near-term deployment of [new] units would not be manufactured by United States facilities.” The same report found that “reactor pressure vessel (RPV) fabrication could be delayed by the limited availability of the large nuclear-grade forgings that are currently only available from one Japanese supplier (Japan Steel Works, Limited).”² The report concluded that “the necessary manufacturing, fabrication, labor, and construction equipment infrastructure is available today or can be readily developed to support the construction and commissioning of up to *eight* nuclear units during the period from 2010 to 2017”. Eight units in an eight year period is a figure that could be used to characterize a possible renaissance of nuclear power in this country and is in sharp contrast to the U.S. industry’s previous ability to support construction of 30 to 40 nuclear plants during an 8 year period.

¹ DOE NP2010 Nuclear Power Plant Construction Infrastructure Assessment, MPR-2776, Rev. 0, October 21, 2005, MPR Associates, Inc. under contract to the U.S. Department of Energy.

² DOE NP 2010 Nuclear Power Plant Construction Infrastructure Assessment, October 21, 2005, MPR-2776, p. 2-2

Thus the challenge the U.S. nuclear industry faces today is whether the U.S. civil nuclear infrastructure will be strong enough to support a hoped for nuclear revival in this country, which could entail the construction and commissioning of up to eight nuclear power units during the 2010 to 2017 period. Several studies have been devoted to this question, and the answer is by no means certain. The shortage in skilled labor is expected to double in this country by the year 2020 and the workforce will stop growing as the baby boomers start to retire.

In addition, during the last thirty years new nuclear power plants have been ordered and subsequently built in other parts of the world (e.g., France, Japan, the Republic of Korea, Russia, Ukraine, Czech Republic, and India). Many, but by no means the majority, of these plants are based upon nuclear steam supply system (NSSS) designs that had their origins in U.S. technology. Recently after some heated competition, the People's Republic of China (PRC) announced its decision to purchase four new Westinghouse designed NSSS. However, there have been recent statements to the effect that the PRC may also order units from AREVA (France), which was the other competitor. AREVA is a global full-range provider of nuclear products and services that is owned by the French government.

It is also highly significant that all but one of the U.S. NSSS and nuclear fuel designers and manufactures for light water reactors have now been acquired by their non-US based competitors. For example, Exxon Nuclear (Richland, Washington) was acquired by Siemens (Germany); the nuclear services and commercial fuel businesses of the Babcock & Wilcox Company (Lynchburg, Virginia) were acquired by Framatome (AREVA-France); then Siemens and Framatome formed a joint venture that is effectively controlled by AREVA. Combustion Engineering (Windsor, Connecticut) and Westinghouse (Pittsburgh, Pennsylvania and Columbia, South Carolina) were acquired by BNFL (United Kingdom) and most recently by Toshiba (Japan) in partnership with the Shaw Group (Baton Rouge, Louisiana). General Electric Company (Wilmington, North Carolina) formed Global Nuclear Fuel, retaining 51% ownership, while Hitachi and Toshiba (Japan) hold the balance.

In addition, NSSS and nuclear fuel designers and manufactures outside of the U.S. (e.g., in France and Russia) have developed significant bases of operational experience, and are able to compete effectively with their U.S. based counterparts.

During the 1960s, the U.S. supplied virtually 100% of the Western market for uranium enrichment services. The U.S. was also a major supplier of uranium. At its peak in 1979, employment in the United States uranium industry was nearly 22,000 person-years. Employment levels today are a mere 3 percent of what they were in the late 1970s. Domestic uranium production is about 7 percent of the 1980 production level.³

Today the U.S. enrichment company, USEC, has a world market share of less than 30% of the uranium enrichment market. In addition, USEC only supplies about half of total U.S. requirements for enrichment services, the vast majority of which are actually obtained under contract with an arm of the Russian government for down-blended HEU. Furthermore, the U.S. Government's gas diffusion enrichment technology that is currently being used at the Paducah, Kentucky plant by USEC is over 50 years old and uses vast quantities of electricity which puts it at an increasing cost disadvantage. Although USEC plans to replace this aging plant with an advanced U.S. centrifuge enrichment technology during the next several years, the company has recently noted that it will "need some form of investment or other participation by a third party and/or the U.S. Government to raise the capital required in 2008 and beyond to complete the project..." Further, the centrifuge enrichment facility being constructed in New Mexico by LES, Inc. uses Urenco centrifuge technology.

Thus the role of the U.S. today as supplier of enrichment services is very different and far weaker when compared against the virtual monopoly the U.S. once held in the Western world. In contrast, the European enricher Urenco has been and is presently deploying its centrifuge technology in both Europe and the U.S., while simultaneously increasing its market share worldwide. In addition, Russia has initiated a determined effort to enhance its role as a supplier of enrichment services, and nuclear power technology in general.

In January 2006, Russian President Vladimir Putin proposed the establishment of an international center in Russia, under IAEA control, for the provision of uranium enrichment services, and Russia has moved forward quickly in setting up such a center. Russia is also considering the

³ *Uranium Industry Annual 1992*, U.S. Energy Information Administration, DOE/EIA-0478(92), October 1993

possibility of offering to take back from its foreign customers spent fuel produced from the nuclear fuel that Russia supplies.

Thus, while the U.S. remains a participant in the international market for commercial nuclear power, it no longer enjoys a dominant role as it did four decades ago. To the extent that U.S. NSSS and nuclear fuel designers and manufacturers are able to reassert themselves on a technical and commercial basis, opportunities for U.S. influence with respect to nuclear nonproliferation might be expected to increase. However, the fact that there are other suppliers that can now provide NSSS and nuclear fuel technology and services on a competitive commercial basis suggests that the U.S. will have to work especially hard to maintain and, in some cases, rebuild its nuclear infrastructure, if it wishes to exercise its influence in international nuclear affairs.

A Bechtel Power Corporation report prepared in 2004 found that companies are concerned about the “leadership and commitment provided by the industry, owners, and government to proceed with nuclear power plant development in the United States. It would appear that these suppliers are ready and capable of responding to a new rollout, but in order to commit any resources, they are looking for a solid commitment over a defined schedule for the new facilities.”⁴

The following chart, prepared by the World Nuclear Association, provides a projection of the number of new nuclear power plant orders that could be placed in several countries over the next few decades. This provides some insight into the size of the potential global market, if interest in nuclear power continues at current levels.

29 January 2007											
	NUCLEAR ELECTRICITY GENERATION 2005		REACTORS OPERABLE Jan 2007		REACTORS under CONSTRUCTION Jan 2007		REACTORS PLANNED Jan 2007		REACTORS PROPOSED Jan 2007		URANIUM REQUIRED 2007
	billion kWh	% e	No.	MWe	No.	MWe	No.	MWe	No.	MWe	tonnes U
Argentina	6.4	6.9	2	935	1	692	0	0	1	700	135
Armenia	2.5	43	1	376	0	0	0	0	1	1000	51
Belgium	45.3	56	7	5728	0	0	0	0	0	0	1079

⁴ *Study of the Impact on Domestic Manufacturing and Supply Infrastructure Resulting from New Nuclear Plant Deployment*, Bechtel Power Corporation, September 29, 2004, p.A-9

29 January 2007											
	NUCLEAR ELECTRICITY GENERATION 2005		REACTORS OPERABLE Jan 2007		REACTORS under CONSTRUCTION Jan 2007		REACTORS PLANNED Jan 2007		REACTORS PROPOSED Jan 2007		URANIUM REQUIRED 2007
	billion kWh	% e	No.	MWe	No.	MWe	No.	MWe	No.	MWe	tonnes U
Brazil	9.9	2.5	2	1901	0	0	1	1245	4	4000	338
Bulgaria	17.3	44	2	1906	0	0	2	1900	0	0	255
Canada*	86.8	15	18	12595	2	1540	2	2000	0	0	1836
China	50.3	2.0	10	7587	5	4170	13	12920	50	35880	1454
Czech Republic	23.3	31	6	3472	0	0	0	0	2	1900	550
Egypt	0	0	0	0	0	0	0	0	1	600	0
Finland	22.3	33	4	2696	1	1600	0	0	0	0	472
France	430.9	79	59	63473	0	0	1	1630	1	1600	10368
Germany	154.6	31	17	20303	0	0	0	0	0	0	3486
Hungary	13.0	37	4	1773	0	0	0	0	0	0	254
India	15.7	2.8	16	3577	7	3178	4	2800	15	11100	491
Indonesia	0	0	0	0	0	0	0	0	4	4000	0
Iran	0	0	0	0	1	915	2	1900	3	2850	143
Israel	0	0	0	0	0	0	0	0	1	1200	0
Japan	280.7	29	55	47700	2	2285	11	14945	1	1100	8872
Kazakhstan	0	0	0	0	0	0	0	0	1	300	0
Korea DPR (North)	0	0	0	0	0	0	1	950	0	0	0
Korea RO (South)	139.3	45	20	17533	1	950	7	8250	0	0	3037
Lithuania	10.3	70	1	1185	0	0	0	0	1	1000	134
Mexico	10.8	5.0	2	1310	0	0	0	0	2	2000	257
Netherlands	3.8	3.9	1	485	0	0	0	0	0	0	112
Pakistan	1.9	2.8	2	400	1	300	2	600	2	2000	64
Romania	5.1	8.6	1	655	1	655	0	0	3	1995	92
Russia	137.3	16	31	21743	3	2650	8	9600	18	21600	3777
Slovakia	16.3	56	5	2064	0	0	2	840	0	0	299
Slovenia	5.6	42	1	696	0	0	0	0	1	1000	145
South Africa	12.2	5.5	2	1842	0	0	1	165	24	4000	332
Spain	54.7	20	8	7442	0	0	0	0	0	0	1473
Sweden	69.5	45	10	8975	0	0	0	0	0	0	1468
Switzerland	22.1	32	5	3220	0	0	0	0	0	0	575
Turkey	0	0	0	0	0	0	3	4500	0	0	0
Ukraine	83.3	49	15	13168	0	0	2	1900	0	0	2003
United Kingdom	75.2	20	19	10982	0	0	0	0	0	0	2021
USA	780.5	19	103	98254	1	1200	2	2716	21	24000	20050
Vietnam	0	0	0	0	0	0	0	0	2	2000	0
WORLD**	2626	16	435	368,860	28	22,735	64	68,861	158	124,225	66,529
	billion kWh	% e	No.	MWe	No.	MWe	No.	MWe	No.	MWe	tonnes U
	NUCLEAR ELECTRICITY GENERATION 2005		REACTORS OPERATING		REACTORS BUILDING		ON ORDER or PLANNED		PROPOSED		URANIUM REQUIRED

During the late 1970s the U.S. made a notable change in its policies toward the back end of the fuel cycle and advanced nuclear reactor technology. Like a few other countries, the U.S. had earlier visualized the ultimate deployment of the closed fuel cycle, i.e., reprocessing of spent nuclear fuel to extract usable nuclear fuel for recycling in fast reactors that can more effectively use the recovered nuclear fuel. However, in 1976 the U.S. Government terminated all work on reprocessing and elected to proceed with the once-through fuel cycle (i.e., spent nuclear fuel is permanently disposed of without reprocessing). The Government took the position that this was the preferable way to proceed from a nonproliferation and economic perspective. In fact, it undertook a major effort to induce other advanced fuel cycle states, including France, Japan and the UK to abandon their own plans for spent fuel reprocessing.

However, while most countries have not proceeded with reprocessing programs, several countries that employ nuclear energy extensively have continued with a closed fuel cycle approach that is centered around the use of mixed oxide (MOX) fuels. France and the UK offer commercial reprocessing services and MOX fabrication for other countries. Japan has recently begun operation of a commercial scale reprocessing facility, plans the wide-scale use of MOX fuel, and has a long-term plan to commercialize the fast reactor. The U.S. has no commercial reprocessing or MOX fuel fabrication plant. Much of the technological leadership in reprocessing and MOX fuel fabrication is now in France, and French technology is even being used in the MOX fuel fabrication plant being constructed at Savannah River for the disposition of excess U.S. weapons plutonium.

During the last several decades, the U.S. has been struggling to implement a national policy for management of commercial spent nuclear fuel, independently of whether it will result in direct disposal of the spent fuel or reprocessing and recycle. In fact, the U.S. Government is presently in protracted litigation with most U.S. utilities for monetary damages associated with DOE's inability to accept their spent fuel and dispose of it as called for in contracts that it has with each of these customers. One adverse implication that this may have on U.S. nuclear nonproliferation policy is that it seriously undermines the ability of the U.S. to offer fuel leasing or cradle-to-grave fuel cycle services to foreign countries. The ability to make such offers could be a valuable tool for discouraging the spread of sensitive nuclear technologies.

The U.S. National Laboratories and affiliated research institutions have constituted an important component of the U.S. nuclear infrastructure. However, starting in the late 1970s, bipartisan support for nuclear R&D started to erode. This led to an erratic degree of support from the U.S. Government for nuclear R&D as the U.S. has moved from one Administration to another.

For example, during the 1978 to 1981 period civilian nuclear R&D received 34% of the total DOE budget for energy R&D. During the 1991 to 1995 period this figure dropped to as low as 16% and there was an effort during the 1990s to terminate all Federal funding for civilian R&D related to the advancement of nuclear power. The theory, in part, was that the light water reactor was a proven, commercially established technology that did not require any further Federal support. While this decision has since been reversed, the DOE budget that had been requested for civilian nuclear R&D for fiscal year 2007 still represented only 8 % of the total DOE budget for energy R&D. While this proportion is expected to increase if GNEP moves forward, that has not yet occurred and DOE's funding requests for the program for fiscal year 2007 were cut by about one-third as DOE has moved to implement the Joint Funding Resolution that was passed to fund most government agencies for fiscal year 2007.

DOE's FY 2008 request for nuclear energy R&D is nearly \$570 million, more than double the FY 2007 appropriation. However, much of the request (nearly \$400 million) is for the GNEP program which has yet to engender fulsome support amongst all necessary policymakers.

5. CURATIVE MEASURES

The U.S. has and should continue to be able to influence the nonproliferation regime as a superpower in the years ahead. However, a policy that significantly strengthens the U.S. civil nuclear infrastructure will not only help the United States to build new nuclear power plants, but will also enhance its ability to advance its nonproliferation agenda. The U.S. will need to actively pursue several key objectives

New Nuclear Plant Orders

Consumer countries are likely to turn for support and assistance to those states possessing the most vigorous domestic nuclear power programs that are placing new power plant orders, extending international fuel cycle services, and maintaining leadership roles in supporting innovative improvements in advanced technologies. This suggests that the influence of the United States internationally could be enhanced significantly if the U.S. is able to achieve success in its Nuclear Power 2010 program and place several new orders in the next decade and beyond. Conversely, if the 2010 initiative falters, or if U.S. companies only are given subordinate roles in processing new plant orders, then this can only further weaken the U.S. nuclear infrastructure as well as the stature of the U.S. in the international nuclear community. Experts believe that the U.S. nuclear infrastructure is capable of sustaining the goals of the 2010 program, but this will require the resolution of a number of formidable problems, including arrangements for the acquisition of long lead time components and coping with anticipated shortages of experienced personnel.

Maintaining the U.S. as a Significant Global Supplier

The health of the U.S. civil nuclear infrastructure will also be crucial to the success of U.S. efforts to play a significant role as a nuclear supplier and to advance its nonproliferation objectives.

There is a clear and compelling upsurge of interest in nuclear power in various parts of the world that is independent of U.S. policy and prerogatives. As a consequence, if the U.S. aspires to participate in these programs and to shape them in ways that are most conducive to nonproliferation, it will need to promote the health and viability of the American nuclear infrastructure. Perhaps more importantly, if it wishes to

exert a positive influence in shaping the nonproliferation policies of other countries, it can do so more effectively by being an active supplier to and partner in the evolution of those programs.

Concurrent with the prospective growth in the use of nuclear power, the global nonproliferation regime is facing some direct assaults that are unprecedented in nature. International confidence in the effectiveness of nuclear export controls was shaken by the disclosures of the nuclear operations of A.Q. Khan. These developments underscore the importance of maintaining the greatest integrity and effectiveness of the nuclear export conditions applied by the major suppliers. They also underscore the importance of the U.S. maintaining effective policies to achieve these objectives. Constructive U.S. influence will be best achieved to the extent that the U.S. is perceived as a major technological leader, supplier and partner in the field of nuclear technology.

As the sole superpower, the U.S. will have considerable, on-going influence on the international nonproliferation regime, regardless of how active and successful it is in the nuclear export market. However, if the U.S. nuclear infrastructure continues to erode, it will weaken the ability of the U.S. to participate actively in the international nuclear market. If the U.S. becomes more dependent on foreign nuclear suppliers or if it leaves the international nuclear market to other suppliers, the ability of the U.S. to influence nonproliferation policy will diminish.

It is, therefore, essential that the United States have vibrant nuclear reactor, uranium enrichment, and spent fuel storage and disposal industries that can not only meet the needs of U.S. utilities but will also enable the United States to promote effective safeguards and other nonproliferation controls through close peaceful nuclear cooperation other countries. The U.S. should establish a high priority goal to rebuild an indigenous nuclear industry and support its growth in domestic and international markets. U.S. nuclear exports can be used to influence other states' nuclear programs through the nonproliferation commitments that the U.S. requires. The U.S. has so-called consent rights over the enrichment, reprocessing and alteration in form or content of the nuclear materials that it has provided to other countries, as well as to the nuclear materials that are produced from the nuclear materials and equipment that the U.S. has supplied.

The percentage of nuclear materials, including separated plutonium, that are subject to U.S. consent rights will diminish over time as new suppliers of nuclear materials and facilities take a larger share of the international nuclear market. Unless the U.S. is able to compete effectively in the international market as a supplier of nuclear fuels, equipment and technology, the quantity of the nuclear materials around the globe that the U.S. has control over will diminish significantly in the future. This may not immediately weaken the effectiveness of the nonproliferation regime since all the major suppliers have adopted the export guidelines of the Nuclear Supplier Group. However, only the U.S., Australia and Canada have consent rights over enrichment and reprocessing of the nuclear materials subject to their agreements. Consequently, if there is a major decline in the U.S. share of the international nuclear market, the U.S. may not be as effective as it has been in helping to ensure a rigorous system of export controls.

Nuclear R&D

Further, the revitalization of the U.S. nuclear infrastructure will depend on the U.S. ability to provide sustained bipartisan support for nuclear R&D programs in order that they can be sustained from one administration to another. The ability of the United States to continue to make significant contributions to the improvement of safeguards, physical protection and proliferation resistance of nuclear systems is dependent, at least in part, on the continued health of the U.S. technological base. This assumes close collaboration between industry and the national laboratories, which could be increased through greater use of Cooperative Agreements between U.S. firms and national laboratories.

GNEP contains some important new ideas that could advance U.S. nonproliferation objectives. Envisioned within both GNEP and the U.S.-led Generation IV Initiative is the development and deployment of next-generation nuclear power plant designs that, if completed, could help restore a U.S. competitive edge in nuclear system supply. As the U.S. Government expends taxpayer funds on the Nuclear Power 2010 program, the Global Nuclear Energy Partnership, the Generation IV initiative and other programs, it should consider the benefit to the U.S. industrial base and the benefit to U.S. non-proliferation posture as criteria in project design and selection where possible.

Importance of Resolving the Nuclear Waste Issue

In this connection, one of the most severe challenges facing the nonproliferation regime in the years ahead is to prevent the spread of sensitive nuclear fuel cycle facilities such as enrichment and reprocessing plants. The goal of establishing fuel leasing or cradle-to-grave programs by the U.S. is an important component of GNEP, and, if achieved, it could prove to be far more effective than other approaches in discouraging the spread of enrichment and reprocessing facilities. The countries that are likely to have the greatest interest in a cradle-to-grave program will be those with small or modest-size nuclear power programs that would likely face serious technical, economic and political problems in managing their spent fuel or disposing of their nuclear wastes.

The ability of the United States to offer nuclear fuel leasing or cradle-to-grave fuel cycle services to other states on a broad basis faces formidable hurdles. The U.S. Government is already in breach of its contract with domestic owners and operators of nuclear power plants to have begun acceptance of their commercial spent nuclear fuel in 1998 in fulfillment of its obligations under the National Waste Policy Act. The Yucca Mountain Project continues to face formidable legal, regulatory and budgetary obstacles that must be overcome if spent fuel is ever to be shipped to that site for disposal. In addition, the statutory limit that was established by Congress of 70,000 metric tons of uranium for the proposed Yucca Mountain repository is significantly less than the amount of spent fuel that will be discharged by the nuclear power plants that are presently operating in the U.S. during their lifetimes.

Materially reducing the volume of waste that will have to be disposed of in the U.S. has been one of the major motivating forces behind the R&D objectives of GNEP to develop new advanced closed fuel cycles. However, even though Yucca Mountain may have the physical capacity to store more than 130,000 tons of spent fuel, Congress must take a separate action to authorize it to go beyond its present statutory limit. Aside from capacity limits, there remain numerous legal, technical and regulatory issues that must be resolved before the Yucca Mountain repository will become operational even for domestic spent nuclear fuel and high level radioactive waste. In the absence of legislative changes by Congress, the present statutory capacity of Yucca Mountain will be fully utilized to accommodate

domestic civilian and government spent nuclear fuel and high level radioactive waste.

All this suggests that the ability of the United States to resolve its own difficulties in managing its spent fuel and nuclear wastes will be crucial to maintaining the credibility of the U.S. nuclear power program and will be vital to implementing important new nonproliferation initiatives designed to discourage the spread of sensitive nuclear facilities to other countries.

6. CONCLUSIONS

In summary, the U.S. has historically played a key role in the evolution of the international nonproliferation regime. This has involved participation in a wide range of activities, including support of the IAEA safeguards system and the NPT. Over the years the U.S. has also worked hard to (i) strengthen the nuclear export controls of all supplier states, (ii) promote the effective protection of nuclear materials and facilities, (iii) constrain the spread of sensitive nuclear technologies, and (iv) incorporate guarantees and consent rights in its agreements for cooperation concerning the civil uses of nuclear energy.

Presently, the U.S. continues to be at the forefront in meeting the challenges facing the nonproliferation regime. It has, among other things, worked with the UK and the IAEA to persuade Libya to dismantle its programs of weapons of mass destruction. The U.S. has also collaborated with its European allies as well as Russia and the PRC in crafting UN Security Council resolutions that imposed sanctions on Iran and called upon that government's leaders to suspend its sensitive nuclear activities. At the same time the U.S. has supported the diplomatic efforts of the European Union and others to offer Iran economic and energy incentives if Tehran agrees to forego its enrichment and reprocessing activities and the construction of its heavy water production reactor. The United States worked with the PRC, Japan, and the Republic of Korea (i.e., South Korea) to persuade the Democratic People's Republic of Korea (i.e., North Korea) to freeze its nuclear activities and to allow IAEA inspectors into North Korea in return for energy and economic assistance. The U.S. also led initiatives to provide the states of the former Soviet Union with financial and technical assistance in strengthening the material accountancy, control and protection measures of nuclear weapons and materials at risk.

If the United States hopes to continue to exercise strong and specific influence internationally in nonproliferation matters in the future, it can best achieve this objective by remaining an active player in international nuclear affairs by providing advanced nuclear power systems, uranium enrichment services and nuclear fuel to other countries; and by maintaining its ability to develop and apply advanced nuclear technologies. A revival of nuclear power in the United States with new nuclear power plant orders should greatly help enhance U.S. power and influence in international nuclear affairs, but we must also seek to once again be a major supplier of nuclear

power technology and equipment world-wide. Conversely, if the U.S. nuclear power program starts to diminish significantly through the retirement of old nuclear power plants without new replacements, then its voice in civil nuclear matters and nonproliferation will decline internationally, even though the U.S. may remain a superpower on the political level.

It is easy to exaggerate the risks of nuclear weapons proliferation associated with the use of civil nuclear power programs and peaceful nuclear cooperation. States with civil nuclear power programs could divert nuclear material to nuclear weapons; they could exploit a civil nuclear power program as a cover for acquiring materials, equipment and technology for a nuclear weapons program; they could also try to use peaceful nuclear cooperation as a means of acquiring skills for developing nuclear weapons. There have been instances in which states have misused civil nuclear programs and peaceful nuclear cooperation in these ways. However, these abuses of peaceful nuclear power programs have been few in number, while the vast majority of states have adhered faithfully to their nonproliferation obligations.

In addition, it is easy to overstate the role that civil nuclear cooperation can play in advancing nonproliferation goals. U.S. collaboration in the peaceful uses of nuclear energy with other states has been a crucial catalyst for the acceptance of the international safeguards system as well as other aspects of the nonproliferation regime. However, peaceful nuclear cooperation is only one of several tools that the United States and other states have used to prevent the spread of nuclear weapons. Nevertheless, the orderly growth of nuclear power and the pursuit of nonproliferation objectives must go hand in hand and can be made mutually reinforcing.

Appendix – About the Authors

HAROLD BENGELSDORF, currently a Principal with the consulting firm of Bengelsdorf, McGoldrick, and Associates, held numerous senior positions in the U.S. government, including the Energy Department and its predecessor agencies, the State Department, and the U.S. Mission to the IAEA. Among his appointments, he served as the director of both key State and Energy Department offices that are concerned with international nuclear and nonproliferation affairs. Throughout his career, Mr. Bengelsdorf contributed significantly to the development and implementation of U.S. international fuel cycle and nonproliferation policies, having participated in several White House and National Security Council studies. He was involved in the negotiation of numerous bilateral and multilateral nuclear and nonproliferation agreements, including the development of full-scope IAEA safeguards (INFCIRC/153) to implement the Nuclear Nonproliferation Treaty (NPT). He retired from government service in 1982.

FRED MCGOLDRICK, currently a Principal with the consulting firm of Bengelsdorf, McGoldrick, and Associates, has been involved in the field of nuclear nonproliferation and international nuclear cooperation for over 25 years. From 1973 until 1982, he served in the Department of Energy and its predecessor agencies where he played a major part in formulating and implementing U.S. nonproliferation and international nuclear fuel cycle policy. In 1982, Dr. McGoldrick joined the U.S. State Department where he negotiated peaceful nuclear cooperation agreements with China, the European Atomic Energy Agency, Japan, South Africa, Switzerland, Argentina and Brazil. He also played a key role in U.S. policy to prevent the spread of nuclear weapons in countries in South Asia, Latin America, South Africa and the Middle East. He participated in developing and implementing U.S. policy toward the NPT and the fissile material cutoff treaty. Dr. McGoldrick also served as Minister Counselor in the U.S. Mission to the IAEA. He retired from the State Department in 1998.

MICHAEL SCHWARTZ is a Principal with the Washington, D.C. based consulting firm of Energy Resources International, Inc., which he co-founded in 1989. Mr. Schwartz has provided consulting services to electric utility companies, suppliers, industry associations and governments on an international basis since the mid 1970s. His areas of involvement have included market analyses for all components of the nuclear fuel cycle, including uranium supply, conversion services, uranium enrichment

services, fuel fabrication, and spent fuel storage and disposal. In each of these areas, Mr. Schwartz has provided a broad range of assistance to his clients in policy formulation, strategic planning, commercial and economic evaluation, and technical analyses. In the course of these activities he has also performed viability assessments and due diligence reviews of major fuel supply companies. Mr. Schwartz has supported applicants in both federal and state regulatory hearings associated with matters such as the need for new uranium enrichment facilities and at-reactor spent fuel storage.

About the Council

The American Council on Global Nuclear Competitiveness is a 501(c) (3) non-profit corporation formed in 2005. The Council alerts and educates Americans on the decline of the U.S. in nuclear reactor design, manufacture, and supply and of the opportunities for a restoration of U.S. global leadership in the nuclear energy industry.

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The American Council on Global Nuclear Competitiveness: 1) encourages and supports the nuclear initiatives of the President and Congress; 2) educates elected officials, policymakers, the media and the public on the policy and technology aspects of an American nuclear renaissance; and 3) summons private sector leadership to organize and to promote such a transformation. The Council seeks the return of American nuclear leadership to the world through the emergence of an American-led global nuclear enterprise.

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