THIRD WAY

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The Future of Nuclear Energy: A White Paper

New Millennium Nuclear Energy Partnership

Overview

A Defining Moment for Nuclear Energy

The United States nuclear energy sector stands at a crossroads. We have the opportunity to resume construction of new nuclear plants, revive a once-vital nuclear supply chain, explore and deploy new technologies and reclaim our place as a global leader in the production of nuclear energy. If we do, this nation will reap the benefits: abundant, emissions-free baseload electric power and process heat for industry and substantial economic growth. Additionally, the United States will reestablish its leadership in global nuclear energy and non-proliferation policy, which is directly related to the credibility and vitality of our own nuclear industry.

But the rebirth of the American nuclear industry is not guaranteed. The lead times are long, and the costs of building new plants and developing new technologies are high. The various private sector firms that will ultimately decide the future of nuclear energy—through what they design, finance, purchase and build—all must consider the complex economics of such huge investments. This is made all the more difficult in the face of substantial uncertainties about broad government policies, specific regulatory actions and the price and availability of other energy sources.

Indeed, the future of nuclear energy is dependent upon an interwoven set of decisions made by both the public and private sectors. On the one hand, private industry cannot act without clear, stable policies and active involvement from the government; on the other, the policy goals of the government cannot be achieved without private sector action.

This paper, the New Millennium Nuclear Energy Summit, and subsequent working groups are providing forums for private industry, government and NGOs to develop a common understanding and vision for a near-term and multi-decade strategy to ensure that nuclear energy is a vital part of the United States' overall energy portfolio. The resulting strategy should offer options for private industry and government that are compatible with evolving national energy, environmental and regulatory policies.

The Summit of key government and industry leaders serves as the starting point for defining this nuclear energy strategy. The strategy will be developed in executable detail by working groups comprised of senior personnel from the private sector and government, with agreements reached during a series of meetings spanning the next several months. The strategy will then be re-visited periodically by the working groups.

In this paper we attempt to lay the foundation for this work. We describe the role that nuclear energy can fulfill in energy production, as well as a review of the major issues confronting nuclear energy's future in the United States. For each of these issue areas, we provide an overview of the emerging consensus among policymakers, regulators, power-generating companies, manufacturers, labor and NGOs on how to best manage these issues. We end with some recommendations for public-private partnerships for nuclear energy development, demonstration and deployment, with the expectation that the detailed policy and regulatory action items will be provided by the Summit and subsequent working group meetings.

The topics to be explored include:

- Broad Government Energy Policy
- Financing New Nuclear Plants
- Regulating Existing Nuclear Technology
- New Nuclear Technologies

- The Industrial Infrastructure
- Public Perceptions about Nuclear Energy

We address opportunities for improved fuel management and sustainability and high-level waste management in the new nuclear technology section. However, this paper does not address in detail the policy and programmatic considerations being weighed by the Secretary of Energy's Blue Ribbon Commission or questions relating to uranium enrichment and the front-end of the nuclear fuel cycle.

Context

Determining Nuclear Energy's Future

The United States energy supply is one of the most reliable, accessible and affordable in the world. However, that energy supply infrastructure is not fully sustainable, since it currently relies heavily on foreign sources of energy (e.g., crude oil). As a result, the energy sector experiences high volatility in energy prices. Further, current U.S. energy policy drives poor stewardship of finite hydrocarbon resources, especially for energy and feedstock use in the power generation, industrial and transportation sectors, contributing to industry's carbon footprint and degradation of the environment. There is no question that this country needs a comprehensive energy policy that addresses these issues while ensuring that the strengths of reliability, accessibility and affordability are maintained.

This paper, the Summit and the follow-on work focus on one aspect of a national energy policy: the role that nuclear energy can play in addressing the vulnerabilities in America's energy infrastructure. To make such a determination, we must consider the different perspectives of government and industry regarding the U.S. energy infrastructure and address the issues in a credible common strategy that serves both the national interests and the marketplace. Of course, both industry and government seek the availability of affordable energy and feedstocks. Beyond that:

- **Industry requires predictability from government.** Private sector firms must responsibly make a profit on their investments at a level of risk that is acceptable. Where very large and long-lived investments are required, firms must have predictability in the policy, regulatory and business environments they will face, both now and in the future.

- **Government's goal is to foster economic growth in an environmentally responsible manner.** In our national energy policy, the government should play a primary role in providing a supportive environment for national economic growth through the availability of reliable, clean, safe and affordable energy. Integral to achieving this goal is enabling commercialization of new clean energy technologies, many of which involve substantial up-front business risk that cannot be borne solely by the private sector.

Both industry and government agree that there is a world-wide market for nuclear energy infrastructure. Unfortunately, this global market currently is not being served by U.S. companies, given that domestic nuclear construction has been stalled for over two decades. This is also the result of business practices and government policies that allowed American nuclear technology to be transferred to foreign companies as a condition of foreign purchase of nuclear energy facilities using that technology.

Currently, some countries are already in the construction-phase for new nuclear power plants. Most notable is China, but others include France, Japan, Russia, Korea, India and countries in the Middle East. In each of the nations proceeding with nuclear energy projects, governments and industry are aligned in support of nuclear energy and are often indistinguishable. As a result, global manufacturers of nuclear technology are dominating a market that the U.S. once led.

The U.S. has the fundamental capabilities to meet a global nuclear energy market and historically has shown the

capacity to address such needs with innovation and efficiency. By rebuilding the U.S. nuclear energy sector—including domestic nuclear manufacturing—this country almost certainly can become a principal competitive supplier of the technologies, engineering, equipment, and construction methodologies in the global energy market, while at the same time creating thousands of American jobs. However, rebuilding the nuclear industry may require increased support from government agencies that traditionally have not been active in the nuclear industry. This could include the Department of Commerce and the Department of State, which could assist our industries in efforts to compete effectively with the countries that have direct support from their governments.

Enabling construction of new domestic nuclear energy production and rebuilding the U.S. nuclear manufacturing capability not only means more American jobs and clean, reliable energy for the United States, but also improves our national security posture. By contrast, if U.S. companies are to cede future global nuclear energy projects to foreign manufacturers, the U.S. government will lose much of the leverage it has had to address nuclear proliferation concerns around the world. Countries that do not enforce stringent non-proliferation protocols, such as Russia, are now able and eager to export nuclear technology to countries like Iran.

Responsibility for ensuring more government assistance for nuclear energy does not rest solely with the President. Congress could be more assertive in efforts to authorize 123 agreements with countries seeking civilian nuclear energy programs, allowing the U.S. to maintain tighter oversight of these programs than many competing nations would.

Seeing these opportunities, many leaders in government, industry, labor and the NGO community are viewing nuclear energy as a way to drive national economic growth, national security and environmental stewardship. That, plus the continued and improved performance of the existing fleet and successful license renewals, has contributed to talk of a

“nuclear renaissance” in the United States for the first time in more than thirty years. But substantial issues remain if that vision is to be realized.

Issues

Dealing with Uncertainty

Each of the following topics focuses on particular issues that either lack direction or are impediments to achieving a vital nuclear energy industry in the U.S. and ensuring a substantial role for the American nuclear industry in the growing global energy infrastructure.

Broad Government Energy Policy

With Washington embroiled in a seemingly endless debate over energy and energy-related policies, the private sector must continue to make investment decisions for new and upgraded energy infrastructure and new energy technologies while faced with important uncertainties about the direction of government policies and regulations regarding energy issues. As examples:

- **Emissions Policy:** Nuclear provides an energy source that is effectively free of emissions. However, there are considerable policy uncertainties of how this should be weighed when making decisions about building new energy plants. For example, regarding greenhouse gas emissions, in 2010 alone the House passed a cap and trade bill, but a similar bill did not succeed in the Senate; the Senate Energy and Natural Resources Committee reported out bipartisan energy legislation that included a renewable portfolio standard, but it has not moved; the EPA is preparing to regulate greenhouse gas emissions, but some in Congress are attempting to stop or delay EPA action; and the recent election results could have a significant impact on the future of such legislative and regulatory initiatives, or they might not. Hence, it is difficult for energy producers and users to estimate the relative price for nuclear-generated energy compared to fossil fueled alternatives (e.g., natural gas)—an essential consideration in making the major capital investment decision necessary for new energy production that will be in place for decades.

- **Energy Security Policy:** The U.S. gets 60% of its oil from imports, much of it coming from countries not aligned with American priorities. This makes us vulnerable to volatile energy and feedstock prices and uncertainties in supply. This energy and feedstock price and supply volatility directly affects the petroleum, transportation and petrochemical industries, with consumers bearing the brunt of the costs. As we have already begun to see, such uncertainties and volatility in price and supply can drive industrial investment and jobs offshore.

This leaves private sector leaders in a significant quandary. Without predictability about the future of policy and regulation in these areas, energy suppliers and major energy consumers are left to guess the future price and availability of various forms of energy and feedstocks.

Yet investment decisions need to be made today to address growing energy demand. With no comprehensive, long-term energy policy, the energy industry will continue to make its investment decisions primarily on current economics. Without such long-term policies, these decisions could be expected to result in a new energy infrastructure that does not meet our future energy security and environmental needs.

Nuclear energy directly addresses both emissions and energy security. It provides an emissions-free alternative to fossil fuels for electric power generation and for industrial process heat. In combination with carbon conversion processes, nuclear energy provides a means of producing synthetic fuels and feedstocks from indigenous carbon sources such as coal and biomass—with minimal emissions.

Still, this uncertainty about broad government energy policy is a particular challenge for nuclear energy. With large capital costs and an extended development and construction time, these uncertainties may inhibit power generation company executives from building a new nuclear plant without a clearer sense of national energy policy on issues like the cost of emissions or production portfolio requirements.

In addition, current national energy policies do not account for the true costs of using fossil fuels or other sources of energy, such as the costs to the environment and public health, or the substantial cost of avoiding interruptible power generation that accompanies the use of renewable sources. While the long-term price of nuclear energy can be competitive compared to natural gas (particularly if carbon impacts are considered) and other sources of energy, such as wind, the large initial capital investment for nuclear energy is a hurdle that can make other alternatives more attractive. Policies that do account for all the externalities of a fuel source allow nuclear energy to be a more attractive option. Such policies would impact everything from the cost of financing to the size and maturity of the domestic supply chain.

In addition to the need for a comprehensive energy policy, there also must be better coordination of nuclear energy issues within the government, as policies that impact the future of the nuclear energy industry are being implemented across several different federal agencies. Moreover, coordination of best practices, technology, and safety oversight between the United States and other governments could be improved as other countries move into the nuclear energy world.

> ***Emerging Consensus:*** *While there is no clear consensus on what the fundamental energy policies should be, there is broad agreement that the industry needs clarity on long-term energy policy as quickly as possible. These policies include greenhouse gas emissions, energy security, feedstock security and the associated impacts on job creation, as well as issues specific to nuclear energy. These include proliferation controls, used fuel and high-level nuclear waste disposition. Moreover, there is consensus that federal and state agencies could and should work together on nuclear energy issues. Working groups resulting from the Summit can be an ongoing vehicle for federal and state government and industry collaboration to shape energy policy and identify the obstacles to better communication within government and with other countries to advance safe nuclear energy.*

Financing New Nuclear Plants

New nuclear energy facilities are expensive: for example, estimates for a gigawatt-sized reactor range from $6-10 billion per reactor for a large light water reactor for electric power generation. More than 70% of the price of energy from a nuclear reactor arises from the cost of the initial investment to construct the plant. Consequently, most of the costs must

be borne before the reactor begins to produce energy or revenue.

Attracting sufficient and affordable financing requires that the financial community believes that its investment will perform as intended. The financial industry must have confidence both in the specifics of the project and that the government will maintain reasonable constancy in energy policy. Confidence in the success of the investment is even more difficult to achieve in the merchant marketplace compared to the regulated power generation environment in which the current nuclear energy fleet was originally built.

In addition to the large scale and costs of these projects, financiers must weigh considerable political risk. With domestic nuclear energy construction relatively dormant for more than twenty years, and with the political, social and management issues that led to the shuttering of the completed Shoreham plant in 1989, financial firms are understandably wary about future changes in the political winds. There is therefore no question that government must play a role in mitigating some of the financial risk of at least the first wave of new reactors.

The most important role for government assistance in managing the financing costs for the initial wave of new reactors is through loan guarantees like those authorized in the Energy Policy Act of 2005. The future owner of the nuclear energy facility pays the premium for these government "insurance policies," which mitigate the risk of project failures. This government action leverages major investments by private industry to provide clean, safe and reliable energy, as demonstrated by today's operating fleet of power-generating reactors.

> ***Emerging Consensus:*** *Loan guarantees are vital—most of the first wave of new plants cannot be built without them. Congress should increase the amount of money available to finance projects under the loan*

> *guarantee program, and the Executive Branch should set a premium cost that is commensurate with the government's risk. Further, tax benefits in the form of investment tax credits, production tax credits and accelerated depreciation could be useful tools to foster investment, and a long-term financing program that addresses the continuing large-scale new investment over several decades could be necessary. The working group assigned this issue should identify what other additional financial incentives the federal government could provide (or could improve) to help move the nuclear industry forward.*

Regulating Existing Nuclear Technology

Nuclear energy is by far America's most regulated energy production technology. The Nuclear Regulatory Commission (NRC), in seeking to fulfill its mandate to ensure public safety and protect the environment, is involved in virtually every step of the design, construction and operation of a reactor. Together, the NRC and the licensed nuclear operating companies have made the nuclear industry one of the safest industries in the country.

A long, complicated licensing process can add significant uncertainty and cost to the construction of a plant. Adopting lessons learned from the licensing of power reactors in the 1960s, '70s and '80s, Congress directed a modified NRC reactor license process that combines the licensing for construction and operation into one process in the 1992 Energy Policy Act (codified in 10 CFR 52). Not until recently have companies submitted applications for a new reactor license—re-starting the reactor license process that hadn't been utilized in two decades and using the modified provisions of 10 CFR 52. These substantive improvements in the licensing process are now being tested in the processing of several early site permits, design certifications and combines licences (COLs).

Currently, the new reactor licensing process is estimated to take up to five years each for a COL. The NRC has acknowledged that for the first few reactors there have been some challenges, both for the NRC and the industry, as they work through a new regulatory process. However, the NRC believes the process for subsequent reactors will be timelier, because industry will know what to expect from the regulator. To date, reviews from outside organizations such as the Bipartisan Policy Center have proposed only modest improvements in the process.

In 2002, U.S. Department of Energy (DOE) initiated Nuclear Power 2010 (NP2010) as a joint government/industry cost-shared program to further the design of selected next generation large light water reactor technologies. The program also was designed to demonstrate the modified licensing process for deployment of new nuclear plants, with a focus on the new generation of large light water reactors. This was done to increase the predictability of the licensing process, reduce processing time and, consequently, reduce investment risk. To date, however, dramatic reductions in licensing process time have not been realized. This could change once the NRC moves through the first set of applications, since the more generic issues for the designs will have been resolved, leaving only the site-specific issues to be reviewed.

Moreover, although the existing fleet is performing with high efficiency and a near-perfect safety record, the industry faces some increasing uncertainties about its ability to renew operating licenses. The prospects for renewing for over 60 years remain particularly uncertain. While on the whole plant efficiency has been rising steadily, some plants can achieve further power up-rates but may be reluctant to take on the expense without clarity about future policy and license renewals.

> ***Emerging Consensus:*** *Most in the private and public sectors agree that the NRC continues to enforce the*

> *current licensing requirements effectively and that the new certification and license applications are being timely processed, given the current licensing requirements. Many of the delays so far have been a result of miscommunications and mutual learning between industry and government working through a new process. While there is some frustration from applicants about the length of the COL process, the new 10 CFR 52 process is not fully tested—lessons learned from review and processing of the first batch of applications should reveal improvements going forward. Further, the success of the process for closure of license conditions has not yet been demonstrated and carries important risk of delays. This will not be tested until a plant is built and begins operation.*

To be sure, many stakeholders believe that some of the licensing requirements can be modified based on the extensive experience gained from the licensing and successful operations of more than 100 domestic reactors and 400 reactors world-wide. However, there is no clear consensus on what modifications should be made to the NRC process. Working groups resulting from this Summit can be an ongoing vehicle for government, industry and other stakeholder discussions on how to improve the process and modify requirements, while still protecting public safety. This could include the concepts of risk-informed licensing bases using probabilistic analysis (as opposed to the current use primarily of prescriptive and deterministic requirements) and the overall approaches to containment performance and emergency planning.

New Nuclear Technology

While the main focus of current new construction has been on large-scale light water reactors, the nuclear energy industry has started to explore alternative nuclear technologies for electric power generation, high temperature process heat for industrial energy needs, for improving fuel utilization and for minimizing nuclear waste. These new approaches offer exciting potential for growth in the industry

and perhaps exportable technologies that will address energy security, feedstock security, and emissions concerns. They also will compete with European and Asian companies and governments that are bringing new technologies to the global energy marketplace.

One segment of this new nuclear technology is already entering the licensing stage: light water small modular reactors (SMRs). SMRs could offer an approach to nuclear energy that can lessen the capital investment burden on owners while providing smaller and scalable power sources. The scalable nature of this nuclear technology allows the plants to be better sized for local considerations, including the availability of cooling water and transmission grid capacity. Fulfilling the promise of SMRs requires that the traditional economies of scale for larger nuclear plants can be offset by a combination of simplicity of design, factory mass production of systems and equipment and shorter construction schedules.

Other modular reactor technology includes high temperature gas-cooled reactors (HTGRs) and sodium cooled reactors. These could extend nuclear energy to applications beyond electric power generation, like supplying high temperature heat to energy-intensive industrial users, improve fuel utilization and achieve waste minimization. Pursuing the potential commercialization of HTGR technology is part of the Next Generation Nuclear Plant Project authorized by the Energy Policy Act of 2005.

If we are to achieve the benefits promised by these advanced nuclear technologies, we must develop an advanced reactor regulatory process that enables designs and alternative siting to move through the NRC licensing process. Today, the NRC has applied deterministic and prescriptive licensing requirements for the current operating nuclear fleet, and the industry has chosen these requirements as the basis for the forthcoming generation of large light water reactors. The current process is not necessarily intended to incentivize new advancements in nuclear technology. In fact, the licensing of

advanced reactors and technology is expected to challenge current NRC policies, regulations and regulatory guidance. These challenges must be overcome if the government and industry are to realize the potential for these advanced technologies to provide energy as well as economic growth.

In addition, adequate and timely funding is an essential enabling requirement to conduct the research, development and demonstration of new nuclear energy technologies. Foreign governments have taken an aggressive approach to supporting nuclear technology R&D as well as taking a strong role in export promotion of nuclear designs developed within their countries. This is one of the primary reasons that U.S. industry is lagging in the international marketplace. The U.S. government should follow suit to help the domestic nuclear industry get off the ground. The subsequent investment in building new nuclear energy producing facilities—which will be orders-of-magnitude larger than the government's investment to enable commercialization of new nuclear energy technologies—will then be borne by the private sector, once the initial risk is mitigated. Nonetheless, neither the government nor private sector institutions are sufficient to address the long-term and complex issues that accompany development and deployment of new nuclear energy technology.

Another way for the government to get involved in advanced technologies is as a "first-level" or "launch" customer for new technologies that are ready for full-scale demonstration. For example, both the DOE and the Department of Defense (DOD) have recently signed memoranda of understanding encouraging companies to explore the use of SMRs on DOE and DOD properties inside the U.S. These kinds of partnerships are crucial to enabling near-term deployment of new nuclear technology.

> ***Emerging Consensus:*** *The government will need to provide financial assistance—for funding of technology development, up-front design and*

licensing risk reduction, and full-scale technology demonstration—to help new nuclear energy technologies across the substantial gap between technological development and large-scale deployment. The timeframe for such bridging will be ten years for even light-water based technology, requiring an innovative approach to ensuring the continuity of federal funding for specific projects.

Moreover, Congress should provide expanded support and engagement with DOE's activities for developing and demonstrating advanced nuclear energy technologies. Congress should ensure that the NRC has the mandate and resources necessary to prepare the regulatory framework to license advanced nuclear energy technologies. The working group assigned this issue should identify the greatest needs and most cost-effective ways that government and industry could accelerate new nuclear energy technologies from development through demonstration and into deployment.

The Industrial Infrastructure

The U.S. once had a comprehensive and self-sufficient nuclear energy supply chain, with everything from heavy forgings to advanced technology parts invented, developed and manufactured in this country. Over the course of the last three decades, however, the U.S. largely has divested itself of the industrial capability to manufacture and assemble nuclear plant components. Now, if an American firm wants to build a full-size reactor, it must import many of the parts. The largest of the forgings must come from an overseas supplier (e.g., Japan Steel Works, where the wait for a reactor vessel head is more than three years).

If a nuclear renaissance takes place in the U.S., private investment in industrial infrastructure will follow, and American plants will once again produce the nuclear

components we need for our domestic industry. This holds the promise for substantial economic growth. But this vision will be realized only if a domestic industry is in position to compete with what is now a mature industrial capability in Europe and Asia.

Right now, the nuclear energy industry does little by way of investment in either the physical infrastructure of the supply chain or the education and training of personnel for the nuclear industry. Without such investment, the dollars going into the new plants and reactors in the U.S. will be sent offshore to those countries that have the infrastructure in place. Moreover, the U.S. will miss out on the opportunity to profit from the boom in global nuclear energy construction—profits and jobs currently going elsewhere.

Indeed, the export of large reactor technology would have a major impact on helping the President meet his goal of doubling U.S. exports within five years. The National Export Initiative, announced in Fall 2010, aims to increase U.S. exports from $1.57 trillion in 2009 to $3.14 trillion by 2015. The sale of only a dozen large reactors overseas could make substantial strides toward this goal, and generate jobs throughout the supply chain for Americans at home and abroad.

> ***Emerging Consensus:*** *To ensure that the U.S. reaps the full economic benefits of a domestic nuclear energy revival, the government should offer a set of incentives to help jump-start and re-build the U.S. industrial capacity for providing nuclear energy infrastructure. These incentives could include tax credits for companies to spur development of nuclear parts manufacturing facilities in the U.S.; extension of Section 48c tax credits that help companies retool to build clean energy technologies like N-stamp products; and expansion of American companies' access to foreign markets so that our manufacturers can compete on a level playing field with overseas*

> *competitors. The working group assigned this issue should identify the weakest links in our nuclear industry infrastructure and what policies are needed to strengthen them.*

Public Perceptions about Nuclear Energy

Even after substantive and sustained improvements in safety performance and generating capacity, and despite its high marks from everyone from the NRC to the 9/11 Commission, the nuclear industry continues to confront a public that is largely uninformed and somewhat skeptical about nuclear energy. Their questions focus largely on safety: the relative risk of the nuclear plant itself, the security of plants from terrorist attack, and the relative safety of our current waste storage and disposal options. While it is unnecessary and unrealistic to try to generate in-depth public understanding of nuclear operations, it is vital that the public and decision-makers have the basic facts about nuclear energy's track record and the myriad safeguards that ensure its continuing safe and successful operation. This information should include as context the performance, costs, and risks for all energy sources, as well as other societal risks.

Industry groups have made substantial efforts to answer the public's questions. But recent issues, such as leakage of low-level radioactive contamination from underground piping and the battle over the impact of nuclear power plants (or any other large electric power plant) obtaining cooling water from nearby waterways, indicate that the public communications battle is not yet won. Negative perceptions of nuclear safety stubbornly persist, especially in communities far from nuclear plants and without direct experience in the production of nuclear energy. These perceptions are further aggravated by the high-profile debates, in Congress and elsewhere, over nuclear proliferation, the management of used nuclear fuel and high-level waste disposition.

> ***Emerging Consensus:*** *The government and private industry should redouble efforts to educate the public on the benefits of nuclear energy and the performance, costs, and risks from all energy sources. The working group assigned this issue should identify ways of communicating the relative risk to the public and describing how the nuclear energy industry can safely provide the U.S. with abundant, emissions-free energy and the potential for substantial economic growth.*

Recommendations

Government and Industry as Partners

As the topics outlined above make clear, nuclear energy involves a complex and intimate relationship between government and industry. Indeed, in most other countries, nuclear energy is primarily a government-run enterprise. While the U.S. nuclear industry itself is private, it is necessarily intertwined with the government at every stage.

Developing, demonstrating and deploying new energy technologies is essential to making the transformation in energy infrastructure that is necessary to fulfill the broad national interests described earlier. Given the costs involved, the development of new nuclear technology is generally beyond the reach of industry alone and requires government assistance to share development risk. Government-industry partnerships will be required to address the considerable business risk that is encountered, particularly in the early design and licensing activities. These relatively small government investments will leverage major investments by private industry.

Government involvement in the nuclear energy sector is not new. The current fleet of light water reactors evolved from the original Atomic Energy Commission-sponsored reactor

development work and demonstrations. If we are to undertake a new round of nuclear energy facility construction, government once again must be deeply involved at the outset.

The authors anticipate that the working groups will develop a detailed set of recommendations for policy changes and future public-private partnerships for nuclear energy development. To begin, and in light of the emerging consensus around the topics above, we offer the following two recommendations for consideration by the working groups.

Recommendations:

- A joint government-industry working group should seek to determine the best overall approach and the "rules of engagement" for forming such partnerships. From there, a government-industry council could be created to explore the interagency and government barriers to expanded nuclear energy and provide periodic reports to the Administration and Congress regarding progress and recommended changes to a multi-decade nuclear energy strategy.

- An independent agency should be formed to manage the government's interests in public-private partnerships, energy technology development, and long-term financing support for clean energy programs and projects like those required for nuclear energy.

TOPICS

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