Nuclear Electricity:

A Key to Sustainable Development

"The more important responsibility of this atomic energy agency would be to devise methods whereby this fissionable material would be allocated to serve the needs of mankind. Experts would be mobilized to apply atomic energy to the needs of agriculture, medicine, and other peaceful uses. A special purpose would be to provide abundant electrical energy in the power-starved areas of the world."

—Address by Mr. Dwight D. Eisenhower,
President of the United States, to the
470th Plenary Meeting of the United Nations
General Assembly, December 8, 1953

Four decades ago, the international efforts to apply nuclear technology for the betterment of mankind envisioned by President Eisenhower began with the creation of the International Atomic Energy Agency (IAEA) under the aegis of the United Nations. Since that time, the IAEA has presided over the successful international development and expansion of nuclear technology for agriculture, medicine, hydrology, industry, ecology, and energy in support of sustainable development around the world.

Applied nuclear technologies satisfy essential sustainable development needs: disease prevention and cure, food availability and protection, fresh water supply, and electricity. Enhanced supplies of these resources are available around the world because of the successful development, use, and transfer of nuclear technology such as safely operated research and power reactors, medical equipment, and measuring devices. Foremost among these vital technologies that support global sustainable development is the safeguarded use of uranium to produce nuclear energy.

As 17 percent of the world's electricity, and with future fuel supplies assured, nuclear energy is poised to expand its contribution to sustainable development as developed and developing countries strive to supply basic electricity to those without, and sufficient electricity to those looking to better their quality of life.

Future sustainable development is guided by the principles set out in the 1992 Rio Declaration on Environment and Development (the Rio Principles). The successful operation of nuclear energy plants around the world, along with the myriad health and environmental benefits of other nuclear technologies, are the embodiment of the key concepts contained in those principles.

Economic Development and Environmental Protection

The Rio Principles focus on the need to place human beings at the center of development concerns. Eradication of poverty is identified as an "indispensable requirement" for sustainable development.

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History has demonstrated that economic development sufficient to combat poverty and improve standards of living depends on the reliable and affordable delivery of sufficient amounts of energy. Delivering energy in the most environmentally compatible manner ultimately requires electrification. Infrastructure such as schools, factories, or public transport, and services like sewage treatment, water supply and purification, medical treatment, and food preservation—almost every critical element of a sustainable economy—all require steady and sufficient supplies of electricity.

To continue fulfilling this role, electricity supplies will become more adaptable, more efficient, and grow. Almost ten billion people are expected to live on the earth by 2050. All electricity sources will be needed to meet the basic needs of this population. Expanding electricity availability in a manner that wisely uses all natural resources and production methods to maximize economic development and protect the environment includes expanding the use of nuclear resources.

Nuclear electricity satisfies both economic and environmental protection goals identified in the Rio Principles. Controlled fission of small amounts of uranium fuel creates large volumes of electricity without combusting carbon-based fuel sources. This avoids the release of both residual carbon gases and other combustion byproduct emissions such as nitrogen oxides. Nuclear fuel handling in accordance with international safety standards prevents harm to human health. Improved production techniques have actually reduced the amounts of used fuel created while increasing electricity output. Notably, waste management practices in place since the industry's inception over four decades ago have successfully prevented or mitigated significant adverse impacts to the environment, making nuclear energy an excellent example of how environmental protection can be successfully integrated into the development process.

Moreover, unlike many other forms of generation, the costs of preventing environmental degradation or pollution from nuclear electricity are usually internalized in its price to the consumer, as called for in the Rio Principles. Even with such additional internalized costs, nuclear electricity remains competitively priced as electricity markets deregulate.

Resource Protection and Demographic Response

The inclusion of uranium in the global energy portfolio slows the depletion rate of fossil resources, sustaining the availability of energy supplies to meet the development needs of future generations. Moreover, in contrast to fossil fuels, reserves of fissionable heavy metals have no other major use. Dedicating uranium fuel to the central-station production of electricity frees fossil resources for other critical applications—chemical process feed stocks, residential heating and cooking, personal transportation—for which direct use of nuclear fuels would not be appropriate. Expanding reserves, redirected use of weapons material, and technology improvements mean that nuclear fuel supplies are assured for many decades to come.

Historically, using nuclear energy has promoted appropriate demographic policies envisioned by the Rio Principles by meeting the electricity needs of concentrated population centers without contributing additional pollution or consuming limited land resources. Demographic trends show higher percentages of the global population moving to urban areas, a condition expected to continue into the future. Restraining sprawl and its attendant environmental impacts requires sustainable living conditions be established and maintained in cities. Concentrated energy sources able to deliver large volumes of electricity are needed to respond to this changing settlement pattern without creating more pollution in limited land areas. Nuclear energy remains an effective tool

in crafting appropriate demographic policies as urban areas adapt to growing populations and development demands.

Technology Transfer and Differentiated Responsibilities

Technology transfer is a primary element of sustainable development, especially where applications assist countries in adapting to or mitigating climate change effects. The transfer of nuclear electricity technology creates a quasi-indigenous energy source with price and supply security that helps stabilize expanding economies against international price and supply swings in fossil alternatives. Transferred nuclear electricity technology is already a major component of energy production in many developing countries such as Brazil, China, India, Argentina, and South Africa. Nuclear technology transfer continues to build technical capacity to manage nuclear material and regulatory capacity to oversee and ensure its safety, providing foundations in the developing world for future additional use of nuclear energy.

In addition, unsafe or inadequate food and water supplies, along with the spread of disease, are significant potential adverse impacts from climate change of concern to countries with particular vulnerabilities to these effects. For decades, the developed world, with oversight from the United Nations through the IAEA, has transferred adaptive nuclear technology in many diverse forms—research reactors, medical sterilization equipment, medical diagnostic and treatment technology, and food protection technology—to address these impacts. Training and teaching programs for these transferred technologies have provided capacity building in the many developing countries where they are used.

Globally, the nuclear electricity produced by uranium comprises 17 percent of the electricity supply. In developed countries, it ranges from 17 to 78 percent, a disproportionately higher use that responds to the differentiated responsibilities they hold under the Rio Principles. To meet their vast energy requirements and prevent further environmental degradation, developed nations, with the technological and financial resources they command, have an obligation to use advanced, more capital intensive, and emission-free energy systems like nuclear fission. All nations possess the sovereign right to choose energy sources for their own development needs. But not all countries in need of large-scale electricity production will use nuclear energy from among the available options, so more accessible fossil or renewable options must remain available to the developing world in adequate supply.

By continuing to use uranium, the developed world fulfills its differentiated responsibility in the international pursuit of sustainable development in two ways. First, other potentially limited fuel sources in the energy portfolio remain available to those nations that do not choose the nuclear option. Second, domestic use of nuclear energy by nations of the developed world is a proven policy measure that avoids carbon and other emissions into the environment, ensuring developed nations can comply with international environmental commitments.

Moreover, developed nations created this technology and supported its expanded, peaceful use around the world. Those same countries are responsible for maintaining the intellectual and technological resources needed to support and improve the nuclear option for countries that now, or will, need nuclear energy to meet converging environmental, economic, and energy needs.

Sovereign Rights and Energy Choices

The Rio Principles expressly reiterate the right of all nations to exploit resources and make choices within their borders needed for environmental and developmental policies. The

decision to use nuclear technology carries with it the special responsibility to prevent harm to other nations and all citizens—a responsibility understood and fulfilled by the industry's dedication to safety, international safeguards, and environmental protection.

International agreements, and the activities undertaken to implement them, must recognize and respect such sovereign choices. Decisions regarding technology transfer, fuel use, and the development they support must be left to the individual nation, and not usurped by the actions of international bodies where those nations are acting in concert with international standards and requirements. Actions to limit the use of nuclear energy, especially where such use furthers international actions to protect the environment, are inconsistent with the basic tenets of the Rio Principles.

Conclusion

"Development that meets the needs and aspirations of the present generation without compromising the ability of future generations to meet their own needs" is a daunting task. Since its introduction over four decades ago, the peaceful use of nuclear technology, particularly nuclear energy, has successfully applied the principles of the Rio Declaration in contributing to sustainable development in many parts of the world. This vital technology must continue to be available as all nations strive for a healthy and productive life in harmony with nature.

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