Nuclear Power Is Sustainable and Supports Sustainable Development

When evaluated in light of impact on climate, land use, waste disposal, fuel availability, safety (occupational, environmental and personal), internalized environmental costs, and technology transfer, nuclear power is an energy option that is itself sustainable and can help nations achieve widely held goals of sustainable development.

Nuclear power must be included in the list of energy options available for use by nations seeking to achieve UNFCCC targets and fulfill the promise of the Rio Declaration on Environment and Development and Agenda 21.

Nuclear Power is Part of the Solution

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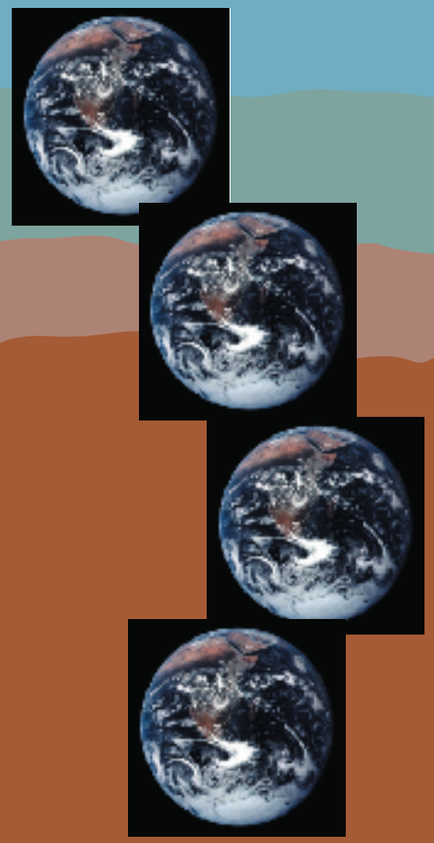


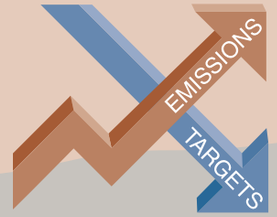
Nuclear Power: A Sustainable Source of Energy

ALL segments of the steadily growing world population have rising aspirations for better economic conditions and a higher standard of living. Both the growing population and rising aspirations have helped fuel an already burgeoning demand for energy worldwide. Most of that energy has been and is still being derived from fossil fuels. Current estimates suggest that demand for electricity will double between 2000 and 2020.

Nuclear power already contributes 17% of the world's electricity without producing greenhouse gases (GHG). The increased demand for energy and the increased use of fossil fuels, however, have run headlong into obstacles.

Problems Encountered by Carbon-based Energy

Concerns about constantly rising levels of GHG and their potential for serious negative impact on the world's climate led to development of the United Nations Framework Convention on Climate Change (UNFCCC). During the 1997 Kyoto conference of those States involved in UNFCCC, targets were established for GHG emission reductions. As a result, developed nations are called upon to reduce their GHG emissions below 1990 levels by 2008-2012. Each country's target is slightly different; however, developed nations have a collective commitment to reduce GHG emissions below 1990 levels. Yet, in 1998 and 1999, GHG emissions were actually greater than in 1990.



Discussions about the methods allowed for achieving the required reductions have included procedures for trading emission "credits," rules on Clean Development Mechanisms, and other approaches to encourage an increase in the use of energy technologies that minimize GHG emissions.

The discussions of new ways to supply energy have been carried out in the context of the Rio Declaration on Environment and Development and have involved the principles of Sustainable Development set forth in Agenda 21.

Sustainable Development

Throughout the discussions, sustainable development has been a key consideration. *What is sustainable development?* It is seen as development that meets the needs of the present generation without compromising the ability of future generations to meet their needs.

This concept is expanded in the stated principles of the Rio Declaration. Human beings are said to be at the center of concerns for sustainable development; they are entitled to a healthy and productive life in harmony with nature. States are seen as having the right, within the principles of international law, to exploit their own resources and the responsibility to ensure that any activities within their jurisdiction do not cause damage to the environment or other States. In addition, the right to development must be fulfilled so as to equitably meet the developmental and environmental needs of present and future generations. Eradication of poverty is seen as a required element of sustainable development.

It is generally held that sustainable development requires attention to:

- infrastructure such as schools, factories and transportation
- disease prevention and medical treatment
- food availability and protection
- water in adequate quantities
- sewage treatment
- steady and abundant supply of energy, specifically, electricity

Nuclear technologies contribute significantly to all of these needs.* In addition, electricity generated from the use of nuclear power satisfies the economic and environmental protection goals in the Rio Principles.

**The many contributions of nuclear technologies to sustainable development are explored in a separate brochure, "Nuclear Science & Technology: Crucial to Sustainable Development," available from the American Nuclear Society and viewable on its web site.*

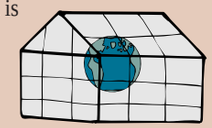
But, the question remains: Is nuclear power itself a sustainable energy source?

To answer, we must examine this question, "Can nuclear power be used to help meet the current energy needs of our society without compromising the ability of future generations to meet their needs?"

We believe the answer to **both** questions is clear and simple – YES!

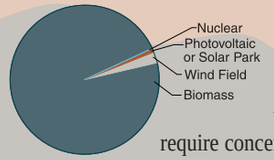
Greenhouse Gases and UNFCCC

Using nuclear power helps move nations toward compliance with their commitments under the UNFCCC. Nuclear power plants do not produce greenhouse gases. In fact, they have helped several nations to reduce their GHG emissions significantly.* Moreover, it is possible for nations with greater utilization of nuclear power to meet the demand for increased energy while still reducing emissions of greenhouse gases.



Land Use

Compared to other non-carbon-based and carbon-neutral energy options, nuclear power plants require far less land area. For a 1000-MW plant, site requirements are estimated as follows: nuclear, 1-4 km^2; solar or photovoltaic park, 20-50 km^2; a wind field, 50-150 km^2; and biomass, 4,000-6,000 km^2.

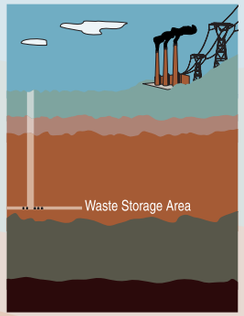


Projections suggest that in 2050, half of the world's population will live in large cities. This will require concentrated energy production systems in proximity to those population masses. Use of large land areas for energy production will be impractical.

**Refer to the brochure, "Reducing Carbon Dioxide Emissions: Moving Toward the Targets," available from the American Nuclear Society and viewable on its web site.*

Waste Disposal

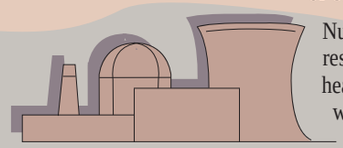
Rather than disperse massive quantities of waste products over wide areas, as is the case with emissions from fossil fuel plants (sulfur oxides, nitrogen oxides, carbon dioxide, and toxic metals such as arsenic and mercury contained in the fly ash), nuclear power plant operators are able to consolidate the waste and sequester it safely while its radiation level drops. By comparison, some of the waste dispersed into the air from fossil fuel plants is toxic and will remain so forever. The record of the civilian nuclear power industry in safely isolating both low-level and high-level nuclear wastes has been excellent. There have been no significant releases of nuclear waste to the environment, and improved repositories such as the recently licensed Waste Isolation Pilot Plant (WIPP) in the U.S. offer promise of an even more secure future.



Preservation of Fossil Resources

Controlled fission of small amounts of uranium fuel can be used to generate large amounts of electricity without burning carbon-based fuel sources. The amount of fuel (mass and volume) required for nuclear power is significantly less than that required for a fossil-fueled plant.

One ton of uranium produces as much energy as 17,000 tons of coal.

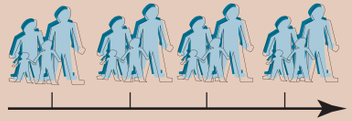


Nuclear power plants utilize resources of fissionable heavy metal (uranium) which has no other major use. Using uranium in this way slows the depletion rate of fossil resources and helps preserve fossil fuel resources to meet future development needs. Further, it frees fossil resources so they can be used for other critical applications, such as feed stocks for chemical processes, personal transportation, and residential heating and cooking. Lowering the demand for fossil fuels in developed countries contributes to environmental equity by allowing developing countries to have vital energy supplies at lower cost.

Long-lasting Reserves

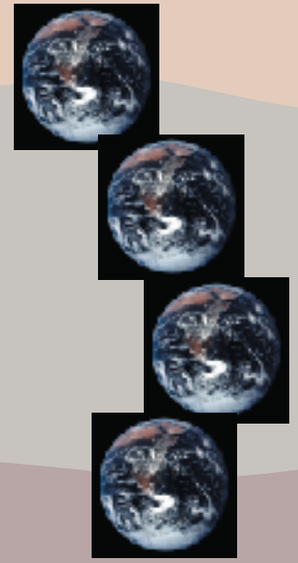
Known fuel resources for nuclear power plants are estimated to provide for 250 years of consumption using current "once through" commercial reactor technology. The technology exists (though it is not yet significantly deployed), with multi-pass fuel usage and fast reactors, to utilize even more energy from each fuel sample. Recycling of uranium and plutonium could extend the fuel supply for up to 10,000 years of consumption. Uranium is available in relative abundance in politically stable countries. In addition, research on extracting uranium from seawater shows promise of a virtually inexhaustible future supply.

These known resources clearly provide for many future generations without competing for limited fossil fuel materials or for the air and land required for waste disposal and deployment of extensive decentralized generating systems.



Internalized Environmental Costs

For nuclear power, environmental costs are already internalized as a result of stringent regulations. Yet, nuclear power remains competitively priced. Other energy sources do NOT have their environmental costs internalized, as called for in the Rio Declaration.



Environmental and Personal Safety

Potential environmental impacts from nuclear power operations are carefully controlled and regulated. When operated according to current stringent safety standards, nuclear plants pose no threat to workers, to society or to the environment. In the U.S., no deaths have ever resulted from radiation in the operation of a commercial nuclear power plant and no significant radiation releases have taken place.

By contrast, accidents, injuries, illnesses and deaths related to other energy sources are common. Yet, they receive relatively little attention from the media or the public, especially when compared with even minor events involving radioactive materials.

Over the long term, the fission of nuclear fuel resources and safe isolation of the radioactive wastes generated in that process actually reduce the exposure of the biosphere to nuclear radiation. (The quantity of fossil fuel, such as coal, required to provide equivalent amounts of energy would release particulates and gases containing radioactive materials that result in greater exposure to radiation than would be the case using nuclear power.)

Non-Proliferation of Nuclear Weapons

From the early days of nuclear power development there has been widespread concern that increased use of nuclear power would lead to the diversion of nuclear materials to clandestine weapons production. The system of international safeguards implemented by the IAEA, however, has been effective in preventing diversions of nuclear materials from commercial power reactors or reprocessing plants. The effectiveness of the safeguard program is aided by the extreme technical difficulties inherent in converting nuclear material produced in power reactors to weapons-grade material.

Technology Transfer

Transfer of technology to developing countries has made a major contribution to energy production in developing countries, such as Brazil, China, India, Korea, Argentina, and South Africa. This ongoing technology transfer continues to build technical capacities to manage nuclear material and the ability to regulate, oversee, and ensure its safety. As a result, the foundation is being built in the developing world for additional use of nuclear energy and promotion of the beneficial uses of nuclear science and technology in the future.