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PERSPECTIVE OF ENERGY POLICY IN THE U.S.

by

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U.S. National Energy Policy encourages the expanded use of nuclear energy while emphasizing the need for improved safeguards and proliferation resistance. The National Energy Policy, published in May 2001 cites that *"The National Energy Policy Development (NEPD) Group recommends that the President support the expansion of nuclear energy in the United States as a major component of our national energy policy."* However, the U.S. policy also emphasizes that the expansion of nuclear energy must be supported by the development of advanced safeguards and more proliferation resistant technologies.

U.S. energy policy promotes emission free energy that is sustainable and economically viable. Current carbon dioxide concentrations in the atmosphere are approaching a record levels 0f 380 ppm. It is widely believed that we are quickly approaching a "carbon wall" when the concentrations reach somewhere between 450 ppm and 750 ppm. Further increases in CO_2 concentrations in the atmosphere are likely to result in serious changes in the atmosphere, even though the severity of the consequences may be debatable. Thus, to meet the growing energy demand worldwide, emission free energy sources are needed. At present, nuclear power is the only large-scale energy production technology that is economically competitive with fossil fuels. U.S. energy policy promotes the expansion of nuclear power while continuing research in "renewable energy" forms.

Meeting the growing energy demand of developing nations by clean energy forms is essential for world peace, prosperity and environmental integrity. Energy use will grow as developing countries achieve affluence. Affluence in developing countries will lead to more stable and peaceful world. Note that a world of 10 billion people consuming energy as US citizens do today would raise the world energy demand by 10 fold. Such a growth via the use of fossil fuel will result in resource shortfalls and regional conflicts, and serious environmental impact. Therefore, worldwide expansion of nuclear energy use is a natural development and will occur. However, while for world peace and prosperity, this outcome is encouraged, it is important to recognize that nuclear material management is becoming an important International issue that requires a unified solution.

To promote the growth of nuclear energy, four major programs are ongoing in the U.S. lead by the US Department of Energy (DOE), Office of Nuclear Energy, Science and Technology: (1) 2010 Initiative, (2) Advanced Fuel Cycle Initiative (AFCI), (3) Nuclear Hydrogen Initiative (NHI), and (4) Generation IV (Gen IV) Initiative. 2010 Initiative focuses on exploring new sites, developing the business case for nuclear energy,

developing the Generation III+ technologies, and demonstrating new NRC process for nuclear plat licensing. AFCI is focused on research for recovery of energy value from SNF, reducing the inventory of civilian Plutonium and the toxicity and heat of waste, and more effective use of the repository. GEN IV initiative is conducting research for better, safer, and more economic nuclear power plants with improvements in safety and reliability, proliferation resistance and physical protection, economic competitiveness and sustainability. Finally, NHI is developing technologies for economic, commercial-scale generation of hydrogen.

2010 Initiative is aimed at paving the way toward new plants by breaking through the "next plant barrier". So far, scoping studies for 2 commercial sites and 3 federal sites and an independent business case analysis have been completed. These achievements are the starting point for Congressional considerations of financial assistance. The next step is to usher Generation III+ technologies through NRC design certification process. Also three environmental site permit (ESP) applications filed with NRC and approval is expected mid-2206 for Virginia, Illinois, and Mississippi. The next task is to demonstrate the "one-step licensing" process.

National Hydrogen Fuel Initiative set a far-sighted vision towards an emission-free future. NHI's goal is to develop advanced hydrogen production technology as part of the Next Generation Nuclear Plant (NGNP) to demonstrate economic, commercial-scale hydrogen production. A development plan is developed to complete the designs and to start construction of engineering scale hydrogen production systems in 2012.

Advanced Fuel Cycle Initiative (AFCI) is focused on fuel cycle research for current and future (Gen IV) systems with emphasis on waste management. AFCI's mission is to develop and demonstrate technologies that enable the transition to a stable, long-term, environmentally, economically and politically acceptable fuel cycle. The research is focused on intermediate- and long-term separations, fuels, and transmutation technologies for thermal and fast spectrum systems. A phased approach for transitioning from the current once-through fuel cycle to a closed equilibrium cycle is being pursued.

Generation IV Initiative (Gen IV) is primarily focused on advanced reactor concepts for the next generation of power plants. GEN IV's mission is to develop and demonstrate advanced nuclear energy systems that meet future needs for safe, sustainable, environmentally responsible, economical, proliferation-resistant and physically secure energy. In September 2002, Generation IV International Forum (GIF) selected 6 systems for further development. Three of these systems are advanced thermal reactors: Very High Temperature Reactor (VHTR), Supercritical Water Reactor (SWR) and Molten Salt Reactor (MSR). The remaining three reactors are advanced fast reactors: Gas-Cooled Fast Reactor (GFR), Lead-Cooled Fast Reactor (LFR) and Sodium-Cooled Fast Reactor (SFR). The first GEN IV demonstration project, the Next Generation Nuclear Plant (NGNP) is proceeding with the pre-conceptual design, which will be completed in 2005. It is important to not that one NGNP will be able to produce the hydrogen equivalent of 200,000 gallons of gasoline in each day.

The last 50 years saw the realization of Eisenhower's vision of *Atoms for Peace.* We now have a new vision today to establish *Atoms for Prosperity* for future generations. Nuclear power is the energy source of choice worldwide for many decades to come. Clean, safe, reliable and sustainable energy, such as the nuclear energy, is essential for world's peace and prosperity and for environmental integrity. Nationally, U.S. is interested in nuclear energy because it is looking into reducing its dependence on foreign energy sources by increasing its domestic supply of clean energy. Thus, a number of forward-looking nuclear energy initiatives are ongoing in the U.S. These initiatives strongly encourage International collaborations. For instance, AFCI and GEN IV initiatives are enjoying strong International Collaboration. In summary, the U.S. recognizes that it may be an imperative for developed nations to promote the peaceful use of nuclear energy while developing a joint strategy for nuclear material management worldwide.

Perspective of Energy Policy in the U.S.

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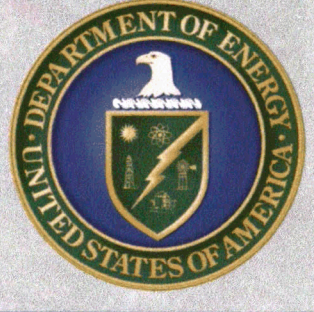
4th Tsuruga International Energy Forum

Tsuruga, Japan

April 26-27, 2004



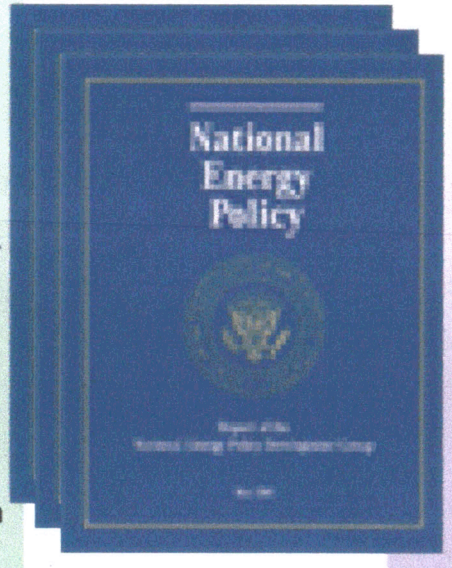
U.S. National Energy Policy encourages the expanded use of Nuclear Energy while emphasizing the need for improved Safeguards and Proliferation Resistance.

"The National Energy Policy Development (NEPD) Group recommends that the President support the expansion of nuclear energy in the United States as a major component of our national energy policy"

(National Energy Policy, May'01)

Recommendations:

- Support expansion of nuclear energy in the U.S.
- Develop advanced nuclear fuel cycles and next generation technologies
- Develop advanced reprocessing and fuel treatment technologies



"The United States should also consider technologies (in collaboration with international partners with highly developed fuel cycles and a record of close cooperation) to develop reprocessing and fuel treatment technologies that are … more proliferation resistant."

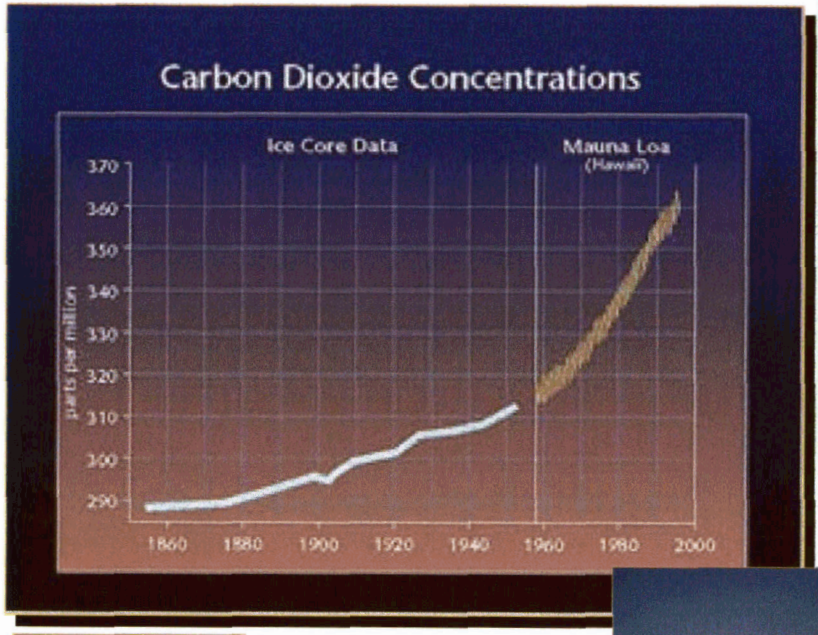
(National Energy Policy, May'01)

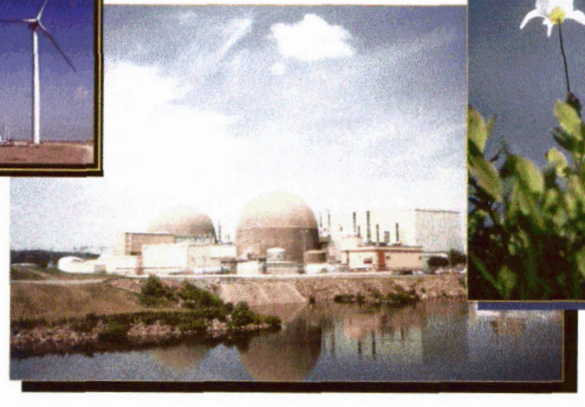
"…A new era awaits. It is an era of nuclear energy marked by … improved physical security and proliferation resistance… Meeting it will go a long way towards safeguarding each of our nations from the perils posed by those seeking to acquire dangerous nuclear materials."

(Secretary of Energy Abraham, Tokyo, Sept'03)

4th Tsuruga International Energy Forum, Tsuruga, JAPAN

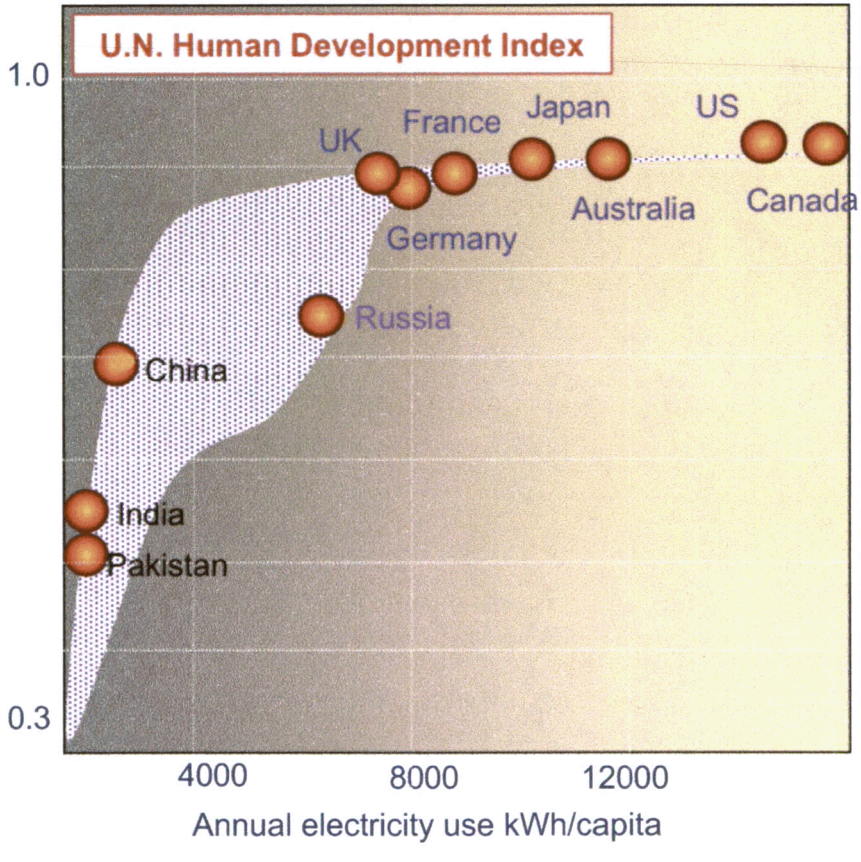
U.S. energy policy promotes emission free energy that is sustainable and economically viable.





- Atmospheric CO_2 concentration approaching a record level of 380 ppm
- Tolerable levels estimated to be between 450 ppm and 750 ppm.
- Quickly approaching a "carbon wall" crisis with unknown, perhaps irreversible, consequences.
- Emission-free energy sources needed to meet the growing energy demand.
  - In the near future, nuclear power is the only large-scale technology that can compete with fossil fuels.
- U.S. energy policy promotes the expansion of nuclear power while continuing research in "renewable energy" forms.

Meeting the growing energy demand of developing nations by clean energy forms is essential for world peace, prosperity and environmental integrity.



- Energy use will grow as developing countries achieve affluence.
- Affluence in developing countries will lead to more stable and peaceful world.
- 10 billion people consuming energy like us result in world energy demand by 10 fold.
- Increased use of fossil fuel will result in
  - Resource shortfalls and regional conflicts,
  - Serious environmental impact
- Worldwide expansion of nuclear energy use is a natural development.
- Nuclear material management is becoming an important International issue.

U.S. DOE initiated a number of initiatives to promote the growth of nuclear energy.

2010 Initiative

- Explore new sites
- Develop business case
- Develop Generation III+ technologies
- Demonstrate new NRC process

Advanced Fuel Cycle Initiative (AFCI)

- Recovery of energy value from SNF
- Reduce the inventory of civilian Pu
- Reduce the toxicity & heat of waste
- More effective use of the repository

Nuclear Hydrogen Initiative (NHI)

Develop technologies for economic, commercial-scale generation of hydrogen.

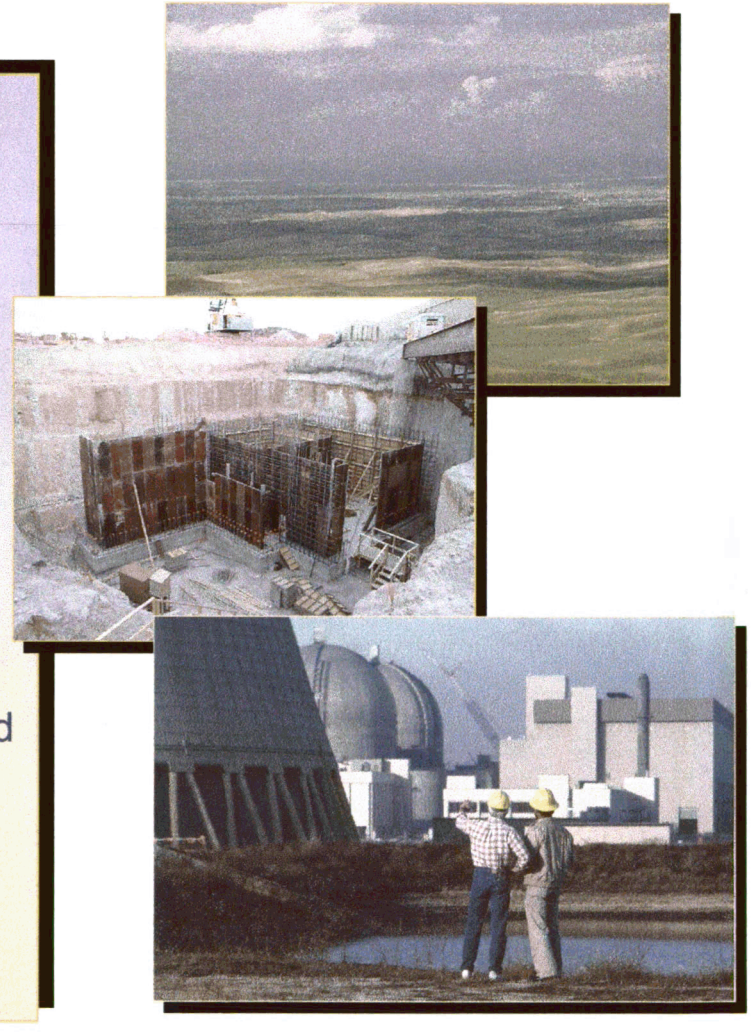
Generation IV (GEN IV)

Better, safer, more economic nuclear power plant with improvements in

- safety & reliability
- proliferation resistance & physical protection
- economic competitiveness
- sustainability

2010 Initiative is aimed at paving the way toward new plants by breaking through the "next plant barrier" .

- Completed scoping studies for 2 commercial sites and 3 federal sites.
- Completed Independent Business Case analysis.
  - Starting point for Congressional considerations of financial assistance.
- Next step is to usher Generation III+ technologies through NRC design certification process.
- Filed 3 environmental site permit (ESP) applications with NRC
  - Approval expected mid-2206 for Virginia, Illinois, and Mississippi.
- Next step is to demonstrate the "one-step licensing" process.



National Hydrogen Fuel Initiative set a far-sighted vision towards an emission-free future.

Conduct laboratory testing of candidate hydrogen production processes

Complete design and initiate construction of two hydrogen production pilot plants - (200 kW) high temperature electrolysis plant and (500 kW) thermochemical plant

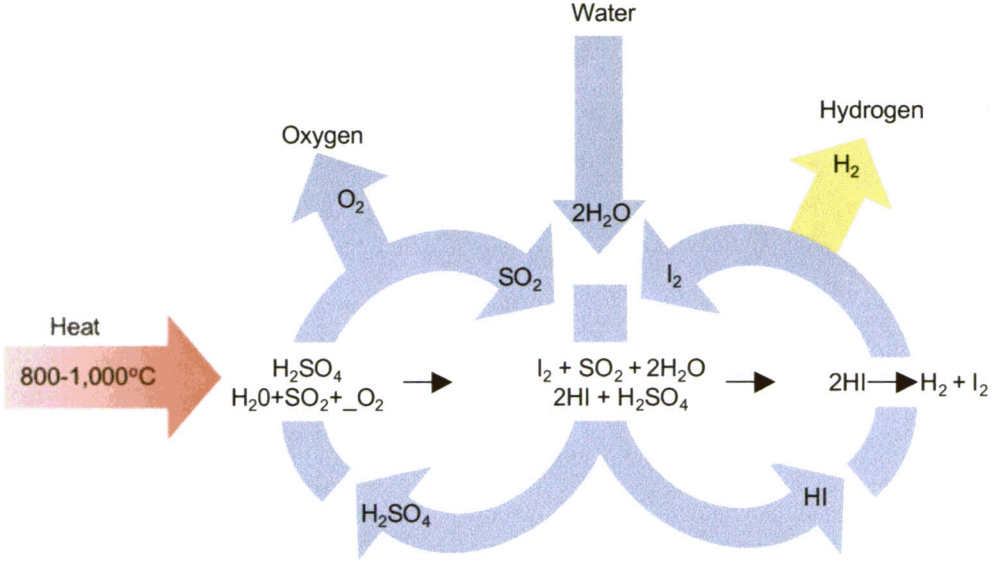
Begin operation of the initial pilot plants

Begin system optimization and scaling of thermochemical pilot plant

Complete process improvements and scaling of thermochemical pilot plant to MW class

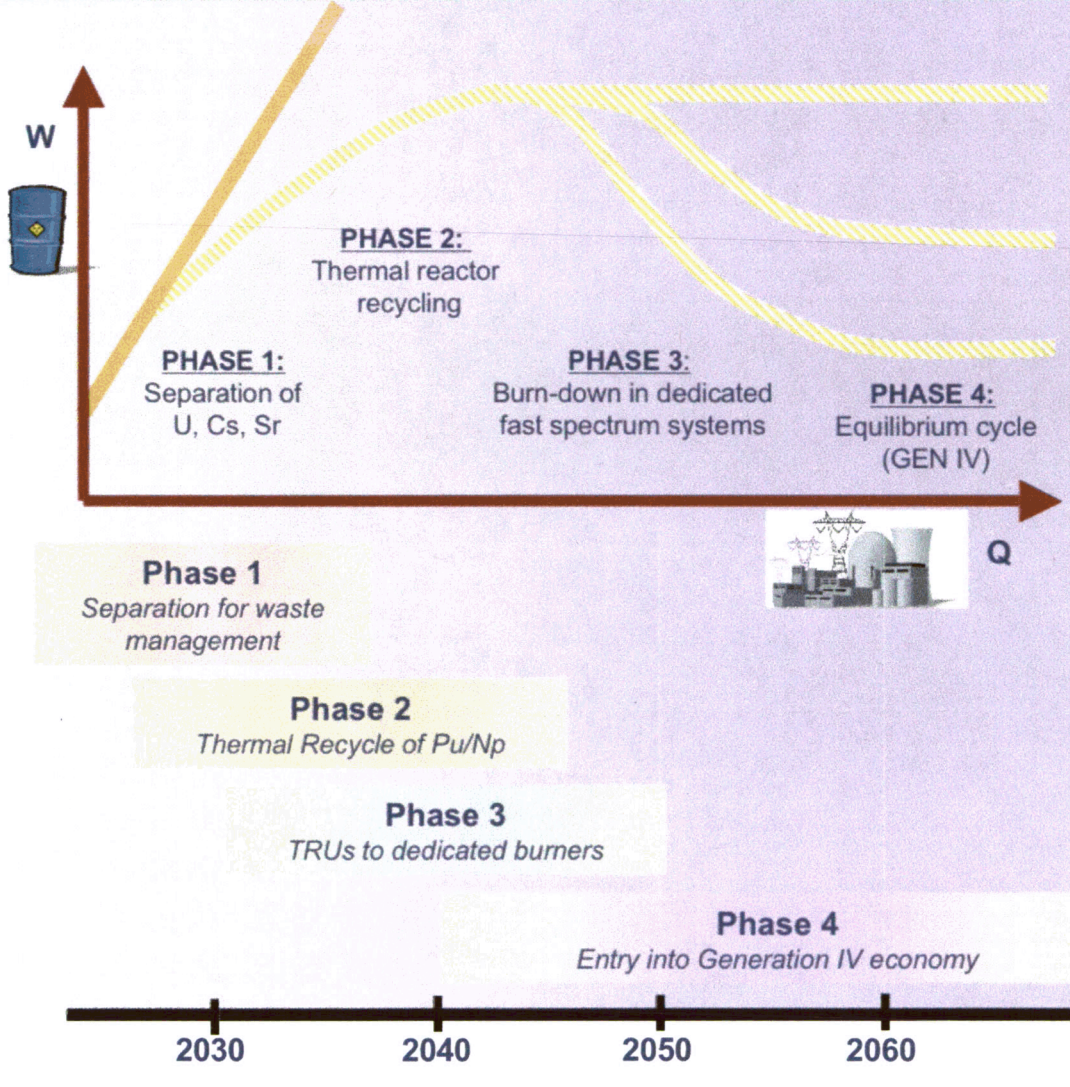
Complete designs and start construction of engineering scale hydrogen production systems

2005 2006 2007 2008 2009 2010 2011 2012 2015



NHI's goal is to develop advanced hydrogen production technology as part of the Next Generation Nuclear Plant (NGNP) to demonstrate economic, commercial-scale hydrogen production.

Advanced Fuel Cycle Initiative (AFCI) is focused on fuel cycle research on current and future systems with emphasis on waste management.



AFCI's mission is to develop and demonstrate technologies that enable the transition to a stable, long-term, environmentally, economically and politically acceptable fuel cycle.

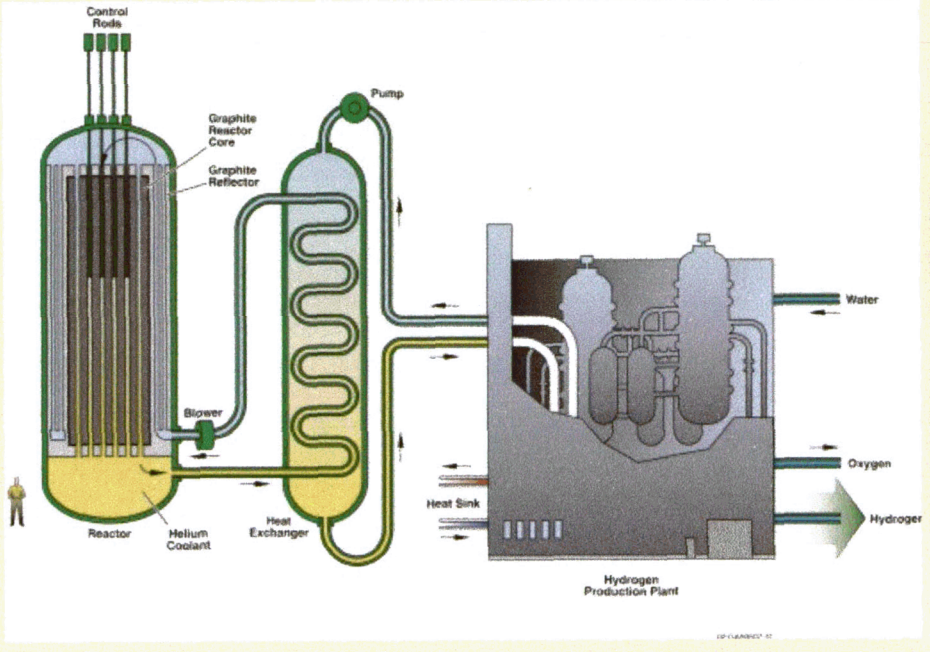
Intermediate- and long-term

- separations,
- fuels, and
- transmutation

technologies for thermal and fast spectrum systems.

Generation IV Initiative (Gen IV) is primarily focused on advanced reactor concepts for the next generation of power plants.

NGNP pre-conceptual design completion in 2005



One NGNP will be able to produce the H_2 equivalent of 200,000 gallons of gasoline in each day.

GEN IV's mission is to develop and demonstrate advanced nuclear energy systems that meet future needs for safe, sustainable, environmentally responsible, economical, proliferation resistant and physically secure energy.

In Sept'02, GIF selected 6 systems for further development:

- Very High Temperature Reactor (VHTR)
- Supercritical Water Reactor (SWR)
- Molten Salt Reactor (MSR)
- Gas-Cooled Fast Reactor (GFR)
- Lead-Cooled Fast Reactor (LFR)
- Sodium-Cooled Fast Reactor (SFR)

We have a new vision today to establish *Atoms for Prosperity* for future generations.

The last 50 years saw the realization of Eisenhower's vision of *Atoms for Peace*

"Peaceful power from atomic energy is no dream of the future. That capability, already proved, is here now - today."
-President Eisenhower

- Nuclear power: the energy source of choice worldwide for many decades to come.
- Clean, safe, reliable and sustainable energy essential for world's peace and prosperity and for environmental integrity.
- U.S. is looking into reducing its dependence on foreign energy sources by increasing its domestic supply of clean energy.
- In the U.S., a number of forward-looking nuclear energy initiatives are ongoing.
- AFCI and GEN IV initiatives are enjoying strong International Collaboration.
- *It may be an imperative for developed nations to promote the peaceful use of nuclear energy while developing a joint strategy for nuclear material management worldwide.*