

# The Global Nuclear Energy Partnership (GNEP)



**Global Nuclear Energy  
Partnership**

## Presentation to the National Association of Regulatory Utility Commissioners

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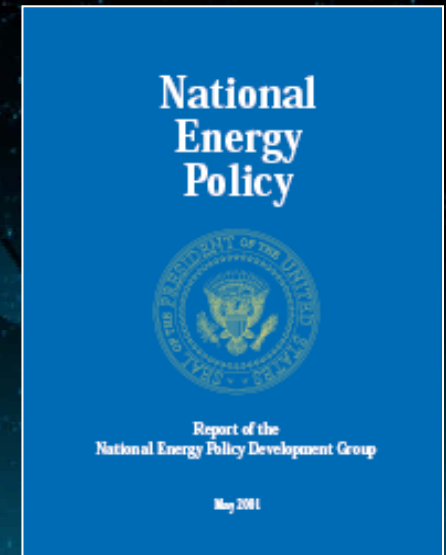
Department of Energy

February 13, 2006

# Implements National Energy Policy

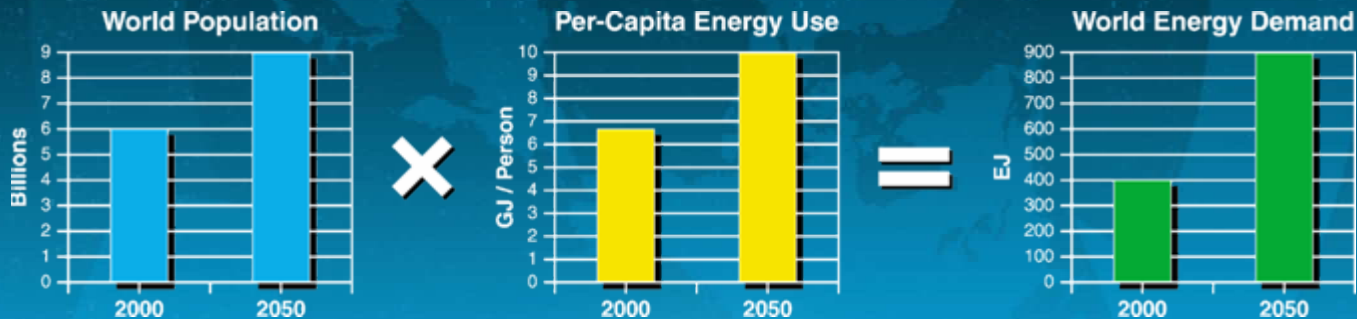
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- Expand nuclear energy in the United States
- **Develop advanced nuclear fuel cycles**
- **Pursue deployment of advanced recycling that reduces waste streams and enhances proliferation resistance**
- **Discourage accumulation of separated plutonium**
- Cooperate with reliable international partners to develop advanced recycling technologies



# Challenges: Global Energy Demand

- A reliable energy supply is the cornerstone of sustained economic growth and prosperity
- World energy demand is expected to more than double by 2050
- An expansion of nuclear energy is a key to meeting this demand while reducing air pollution and greenhouse gases



# Key GNEP Program Elements

- Expand use of nuclear power
- Minimize nuclear waste
- Demonstrate recycle technology
- Demonstrate Advanced Burner Reactors
- Establish reliable fuel services
- Demonstrate small, exportable reactors
- Enhanced nuclear safeguards technology



*“To build a secure energy future for America, we need to expand production of safe, clean nuclear power”*

President Bush, 06/2004



# GNEP Benefits

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- Reduce America's dependence on fossil fuels
- Provide abundant energy without generating carbon emissions or greenhouse gases
- **Recycle used nuclear fuel to minimize waste and curtail proliferation concerns**
- Safely and securely allow developing nations to deploy nuclear power to meet energy needs
- Assure maximum energy recovery from still-valuable used nuclear fuel
- **Reduce the number of required U.S. geologic waste repositories to one for the remainder of this century**



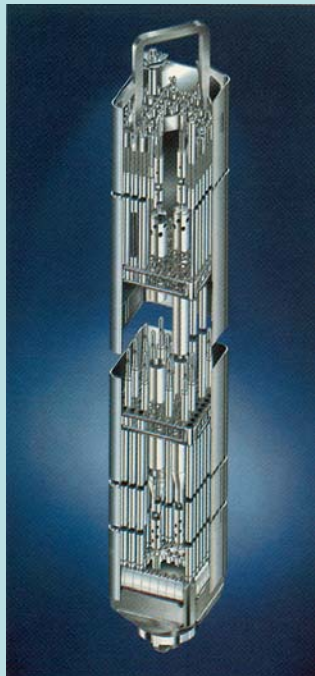
# GNEP Vision

Year:	2000	2050*
<b>Nuclear Energy (GWyr)</b>		
<b>(US)</b>	<b>82</b>	<b>295 - 477</b>
<b>World</b>	<b>255</b>	<b>950 - 1609</b>

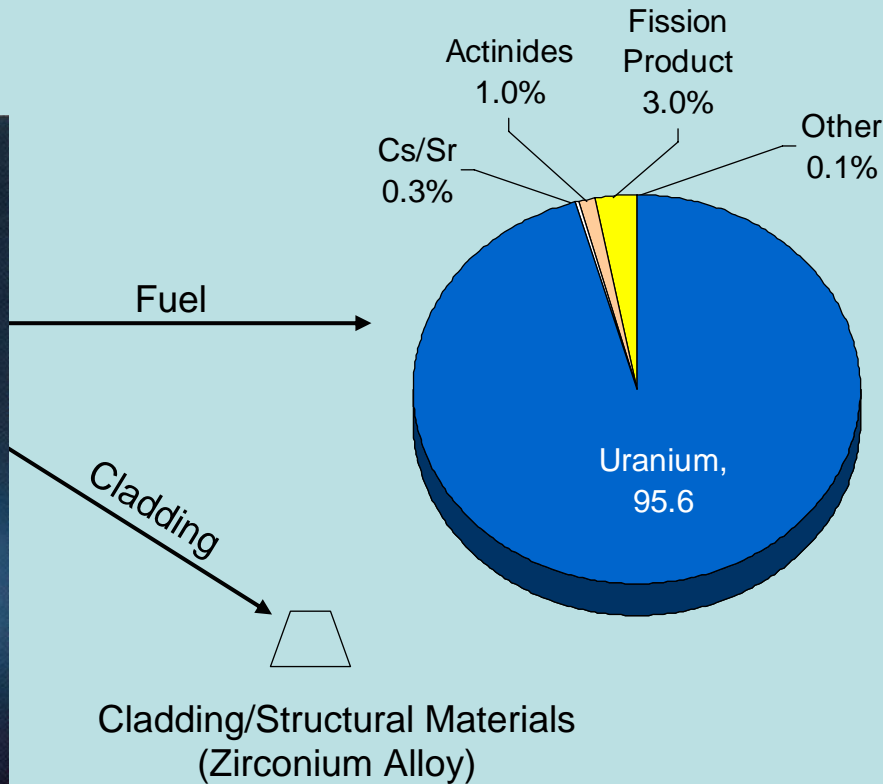
Recycle = separation, burn, dispose

\* Estimates from MIT *Future of Nuclear Power*

# Spent Nuclear Fuel *Composition*



Spent Fuel Assembly  
(Photo courtesy of  
General Electric)



## Composition of Spent Fuel

95.6% Uranium

3.0% Fission Product  
(short lived)

1.0% Actinides:

- 0.9% Plutonium
- 0.1% Americium,  
Long-Lived/High-Heat  
Currium, Neptunium

0.3% Short Lived/High Heat

- Cesium (Cs)
- Strontium (Sr)

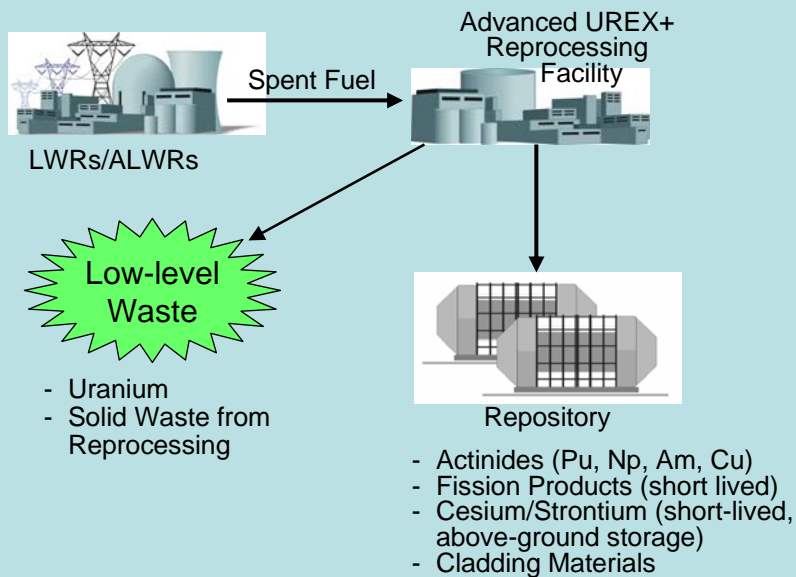
0.1% Other

- Iodine, Technetium

# Spent Nuclear Fuel

## Advanced Waste Management Options

### Reprocessing



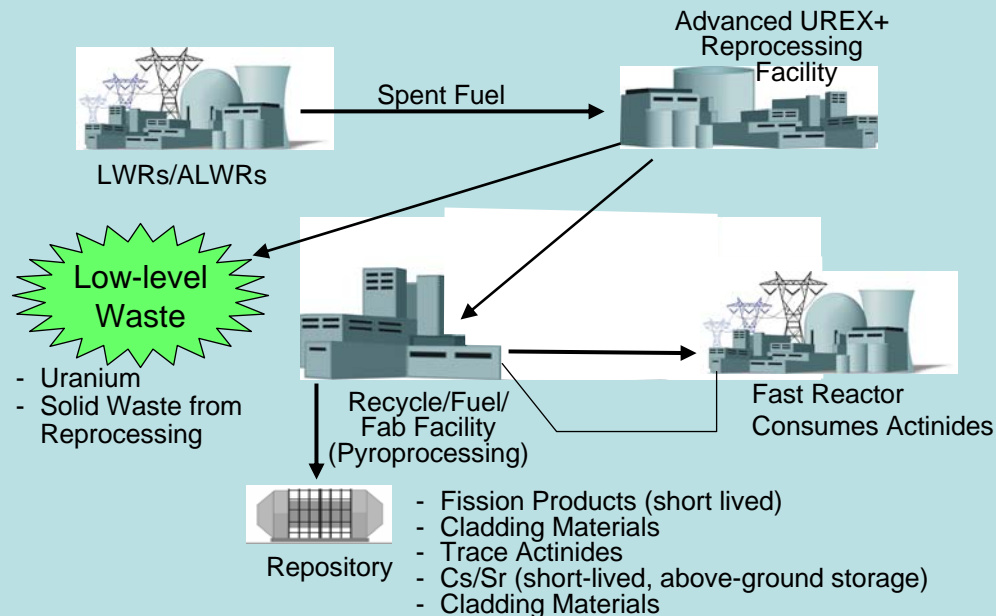
#### Pros

- Reduction in volume of spent fuel (approx. 5X)
- Eliminates short-term heat load for Yucca Mountain

#### Cons

- Long-term heat load and radiotoxicity associated with actinides still exists

### Recycling



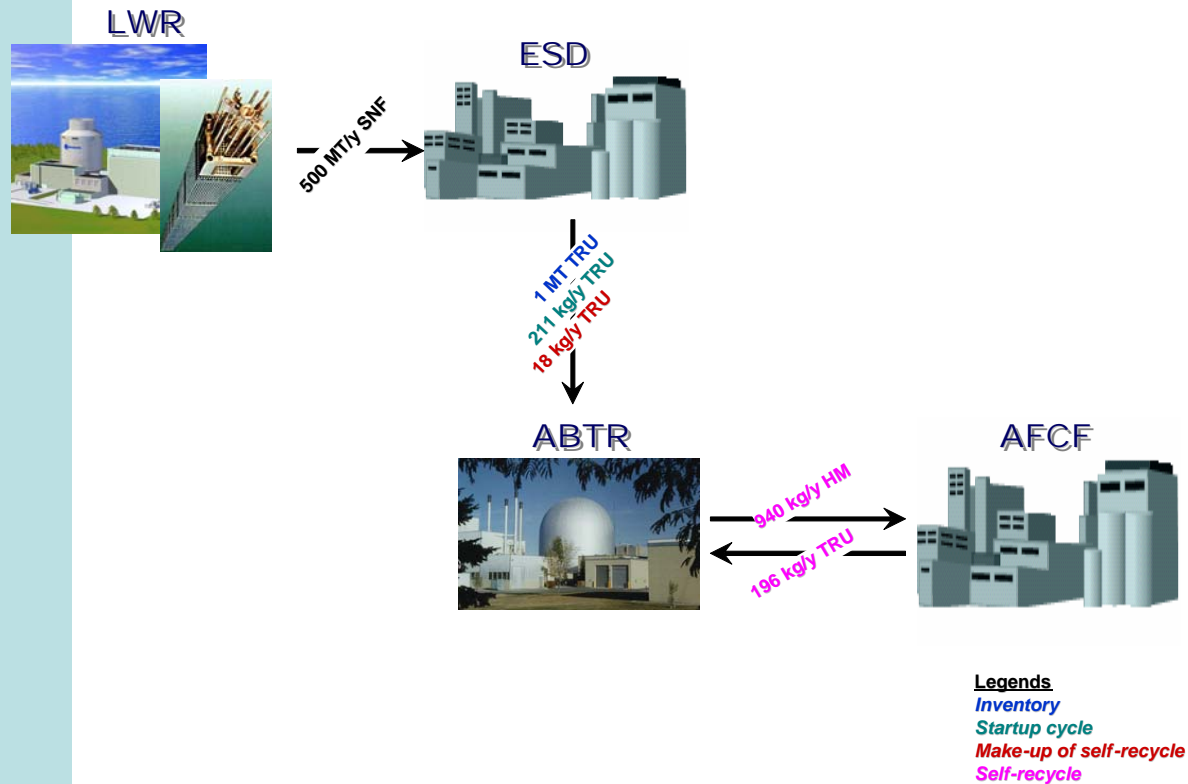
#### Pros

- Significant reduction in waste volume (approx. 20-60X)
- Long-term heat-producing waste (Am) eliminated, as well as Pu, Np, and Cu
- Fast reactor generates electricity by consumption of actinides as fuel

#### Cons

- Fast reactor for actinide consumption adds to the cost

# Demo Mode of Global Nuclear Energy Initiative



# Demonstrate Advanced Recycling

Demonstrate and deploy new technologies to recycle nuclear fuel that do not result in separated plutonium

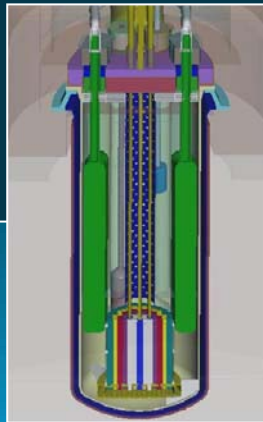


- Demonstrate with advanced fuel cycle states, not for export
- Encourage transition to a fuel cycle that does not separate plutonium
- Provides fuel for advanced reactors
- Rest of recycled products become easier to deal with for waste management



# Demonstrate Burner Reactors

Demonstrate and deploy Advanced Burner Reactors that use the latest technology to produce energy from recycled nuclear fuel



- Fast spectrum reactor can burn plutonium & other fissile isotopes
- Recovers energy from spent fuel
- Repeated cycles transforms waste
- Build on operating experience
- Define new safeguards standards
- Prove for commercial scale



# Minimize Nuclear Waste

**Significantly reduce the volume of nuclear waste to be disposed of in Yucca Mountain, making disposal less complex and minimizing the need for additional repositories**



- Repository needed in all cases
- Aggressive plan to proceed
- One repository can meet U.S. needs this century with GNEP



# Next Steps

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- Expand nuclear energy in the U.S.
  - Administration and Congress have taken steps to encourage new nuclear power plants
  - Address spent fuel issue and Yucca Mountain
- Demonstrate advanced recycling
  - Work in GNEP consortium to prove technologies needed to close fuel cycle, minimize waste, and obtain more energy benefit
- Build global consensus on GNEP vision
  - Enlist partners to limit the spread of sensitive nuclear technologies in a way that enables nuclear power to meet global challenges

