Welcome
The National Academies
Committee on Development and Implementation of a Cleanup Technology Roadmap

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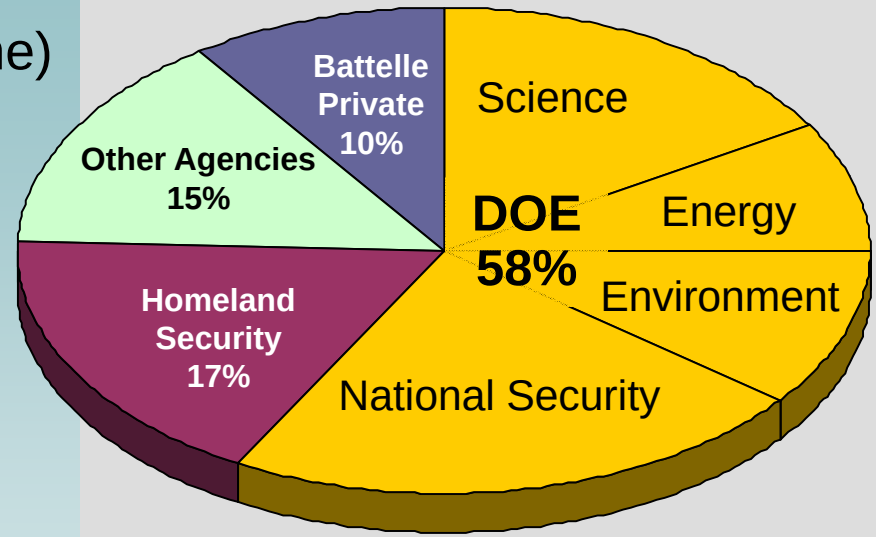
October 31, 2007

Battelle

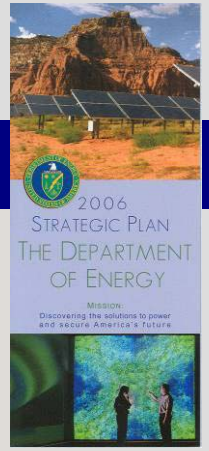
Pacific Northwest National Laboratory
Operated by Battelle for the U.S. Department of Energy

Pacific Northwest National Laboratory

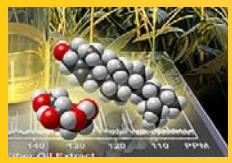
- Reports to DOE's Office of Science
- $760 million (FY07 business volume)
- 4,200 staff
- Unique feature: fundamental strengths in chemistry
- Home of DOE national user facility for environmental molecular sciences (EMSL)
- More than 1,400 patents and 250 active licenses with industrial partners



PNNL solves national challenges by delivering science, technologies, and leadership to:



Mission Outcomes



Strengthen U.S. scientific foundations for innovation

Prevent and counter acts of terrorism and the proliferation of weapons of mass destruction

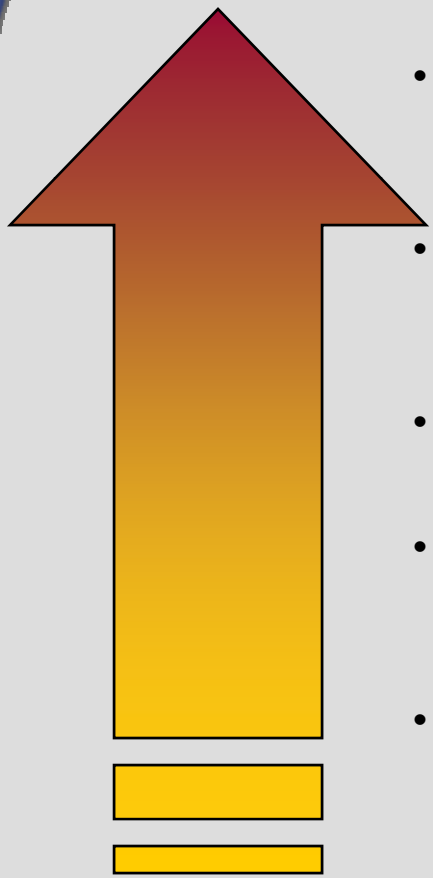
Increase U.S. energy capacity and reduce dependence on imported oil

Reduce the environmental effects of legacy waste and energy use

The problem with the nation's energy portfolio

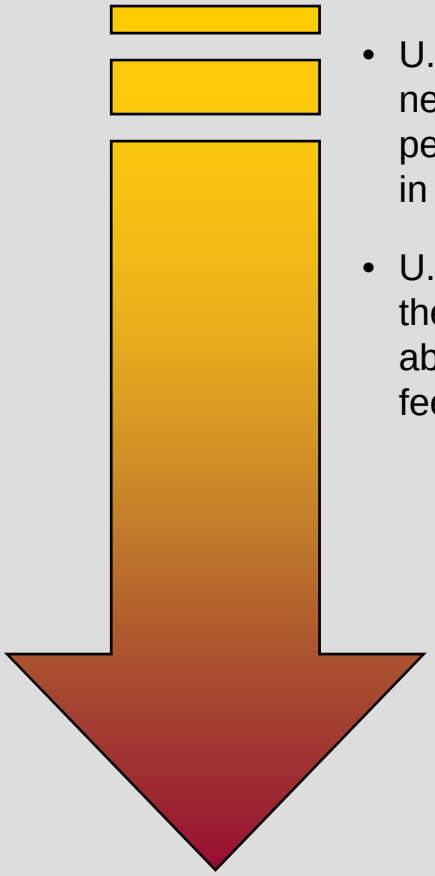
(Two key vectors in the wrong direction)

Carbon emissions



- Total U.S. energy-related CO_2 emissions increased 17.9% (1990- 2006)
- 98% of CO_2 emissions result from combustion of fossil fuels
- U.S. contributes ~22% of world's CO_2 emissions
- U.S. CO_2 emissions from electricity production increased 32% (1990-2005)
- U.S. CO_2 emissions from petroleum consumption increased ~21% (1990-2005)

Domestic content

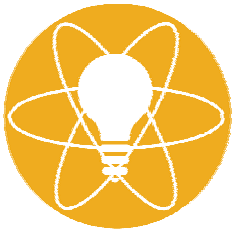


- U.S. imports nearly 60% of its petroleum, up from 46% in 1996
- U.S. imports ~15% of the natural gas we use, about 3,400 billion cubic feet/yr

Source: Energy Information Administration

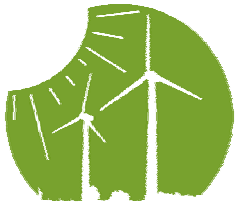
A snapshot of today's reality

Nuclear Energy



- Provides 8% of primary energy
- Source for 20% of electricity
- Current plants done by 2030

Renewable Energy



- Provides about 6% of primary energy
- Source for 9% of electricity
- Source for 1% transportation fuels

Hydrocarbon Energy

- Provides 85% of primary energy
- Source for 65% of nation's electricity
- Provides 96% of transportation fuel

Electric Infrastructure

- 40% of primary energy converted to electricity
- Electricity demand projected to double by 2050

Energy Efficiency

- Reducing end-use by one unit saves at least three units of source energy

Source: Energy Information Administration

How do we get these vectors in the right direction?

Carbon emissions

- Immediate action on opportunities other than utility plant stacks
- Immediate action to develop carbon capture and sequestration technology to enable “air- and water-neutral” use of hydrocarbons possible
- Carbon emissions into the atmosphere stop climbing, eventually decline

Domestic content

- “Air- and water-neutral” use of domestic hydrocarbon resources
- Renewables scale to begin offsetting fossil fuel consumption
- New nuclear power addresses safety, waste, proliferation and economics

We need to transition to a renewable, nuclear, and hydrogen energy base while reducing dependence on imported oil

Increase U.S. energy capacity and reduce dependence on imported oil

PNNL will provide science, technologies and leadership to:

Transitioning to a renewable, nuclear, and hydrogen energy base while reducing dependence on imported oil. . .

- Enable sustainable "air and water" neutral Hydrocarbon Energy production and conversion and carbon capture and sequestration
- Improve Electric Infrastructure reliability and productivity
- Enable expansion of Nuclear Energy through a viable closed nuclear fuel cycle
- Increase the Energy Efficiency of vehicles and buildings

Reduce Environmental Effects of Human Activity and Create Sustainable Systems

PNNL will provide science, technologies and leadership to:

- Reduce the long-term environmental effects and accelerate cost-effective cleanup of contaminated nuclear sites
- Predict the response and prevent the impact of environmental stress and climate change on human and ecosystem health.
- Promote sustainable systems that reduce our environmental footprint