

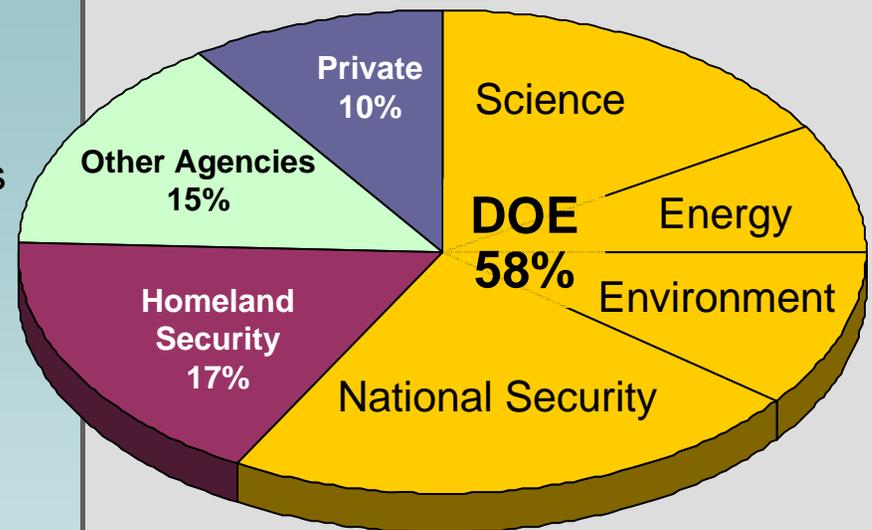
# **The Carbon Journey** ***Understanding Global Climate Effects*** ***and Advancing Solutions***

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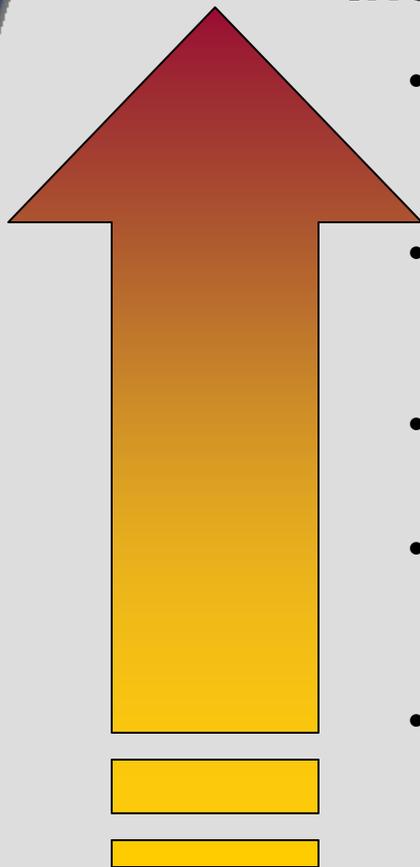
# Pacific Northwest National Laboratory

- Reports to DOE's Office of Science
- \$843 million in sales (FY07)
- 4,000 staff
- Unique feature: fundamental strengths in chemistry and molecular sciences
- Home of Environmental Molecular Sciences Laboratory (DOE national user facility)
- More than 1,400 patents and 250 active licenses with industrial partners
- ▶ Among the top 1% research institutions in publication citations for
  - Chemistry
  - Physics
  - Engineering
  - Geosciences
  - Biology & biochemistry
  - Materials Sciences
  - Environment/ecology
  - Clinical medicine



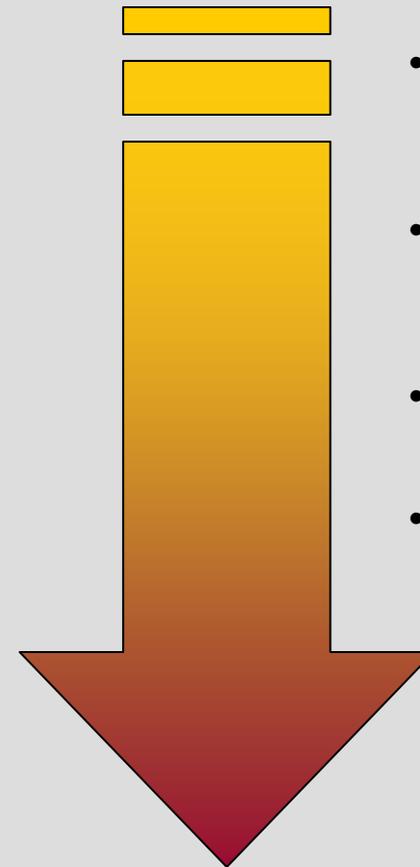
# Two National Challenges

## Carbon Emissions Increasing



- Total U.S. energy-related CO<sub>2</sub> emissions increased 17.9% (1990- 2006)
- 98% of CO<sub>2</sub> emissions result from combustion of fossil fuels
- U.S. contributes ~22% of world's CO<sub>2</sub> emissions
- U.S. CO<sub>2</sub> emissions from electricity production increased 32% (1990-2005)
- U.S. CO<sub>2</sub> emissions from petroleum consumption increased ~21% (1990-2005)

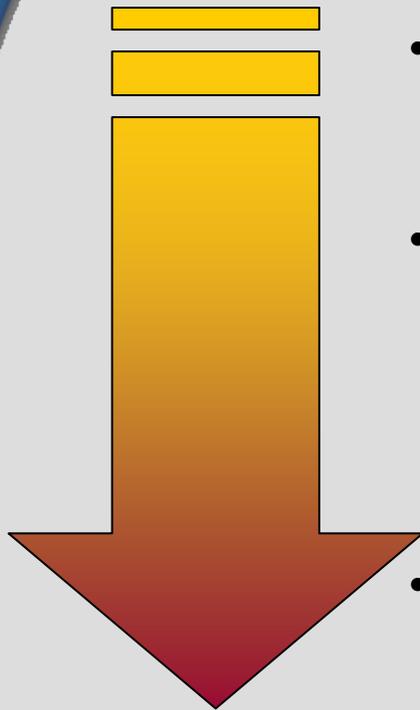
## Domestic Content of Energy Portfolio Decreasing



- 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
- U.S. imports 84% of its nuclear fuel
- No physical or institutional infrastructure in place for carbon capture

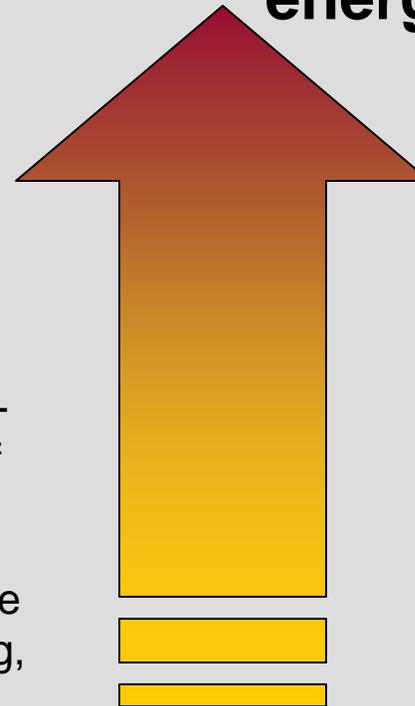
# How do we get these vectors in the right direction?

## 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
- Carbon emissions into the atmosphere stop climbing, eventually decline

## Domestic content of energy portfolio



- “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*

# Today's speakers

- ▶ Tony Janetos, Joint Global Change Research Institute (for Jae Edmonds)
- ▶ Bob Marlay, U. S. Climate Change Technology Program
- ▶ Mike Mudd, FutureGen Alliance
- ▶ Key points from Xinhe Bao, Dalian Institute of Chemical Physics
- ▶ V. Ramanathan, University of California San Diego
- ▶ Doug Ray, Pacific Northwest National Laboratory