U.S. DEPARTMENT OF ENERGY

2009 Energy Conference

April 7, 2009

www.eia.doe.gov

Energy Information Administration

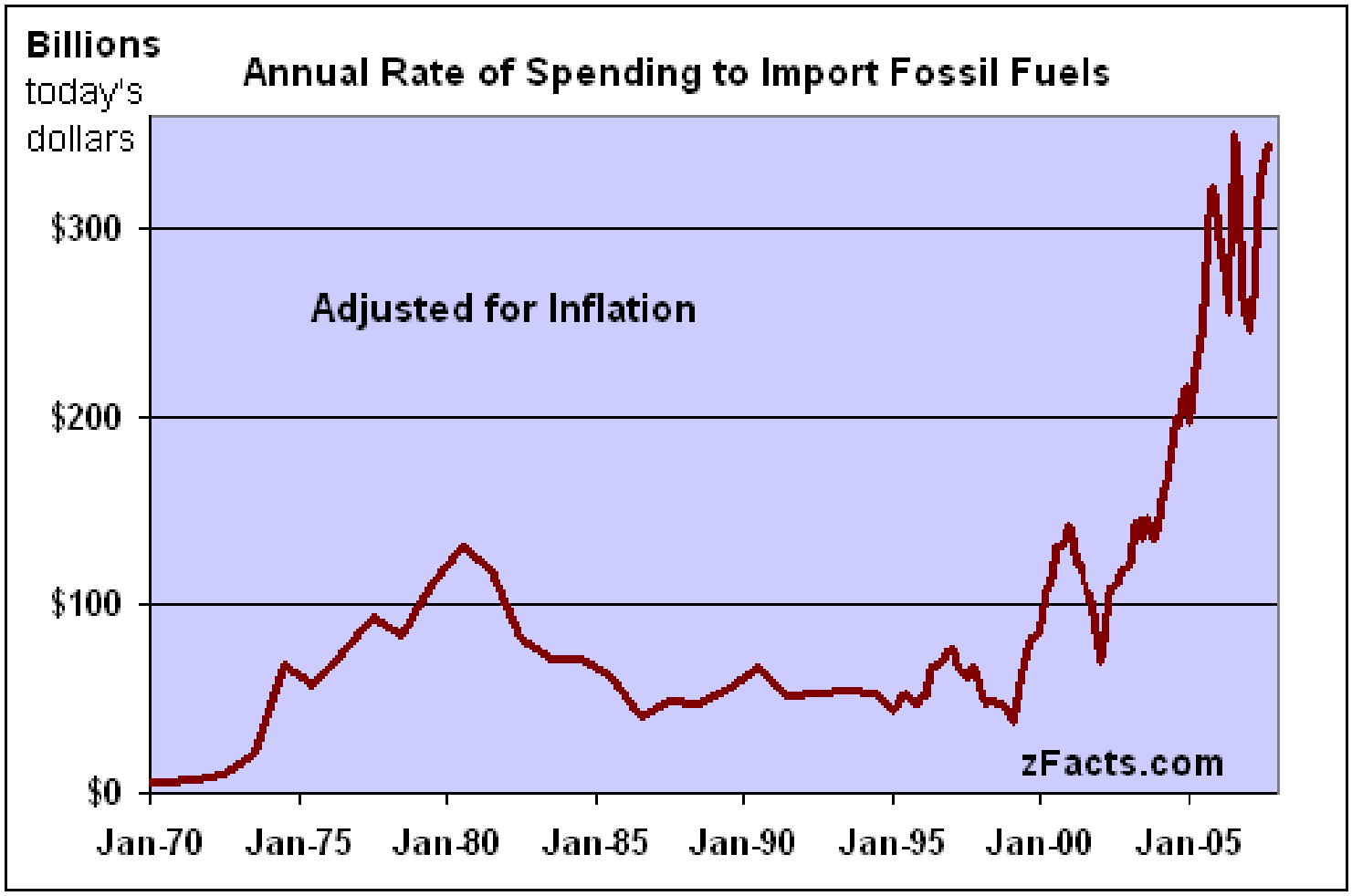
The Energy Problem

(1) Economic prosperity is intimately tied to affordable energy.

(2) There is potential for geopolitical conflict due to escalating competition for energy resources.

(3)The risk of adverse Climate Change.

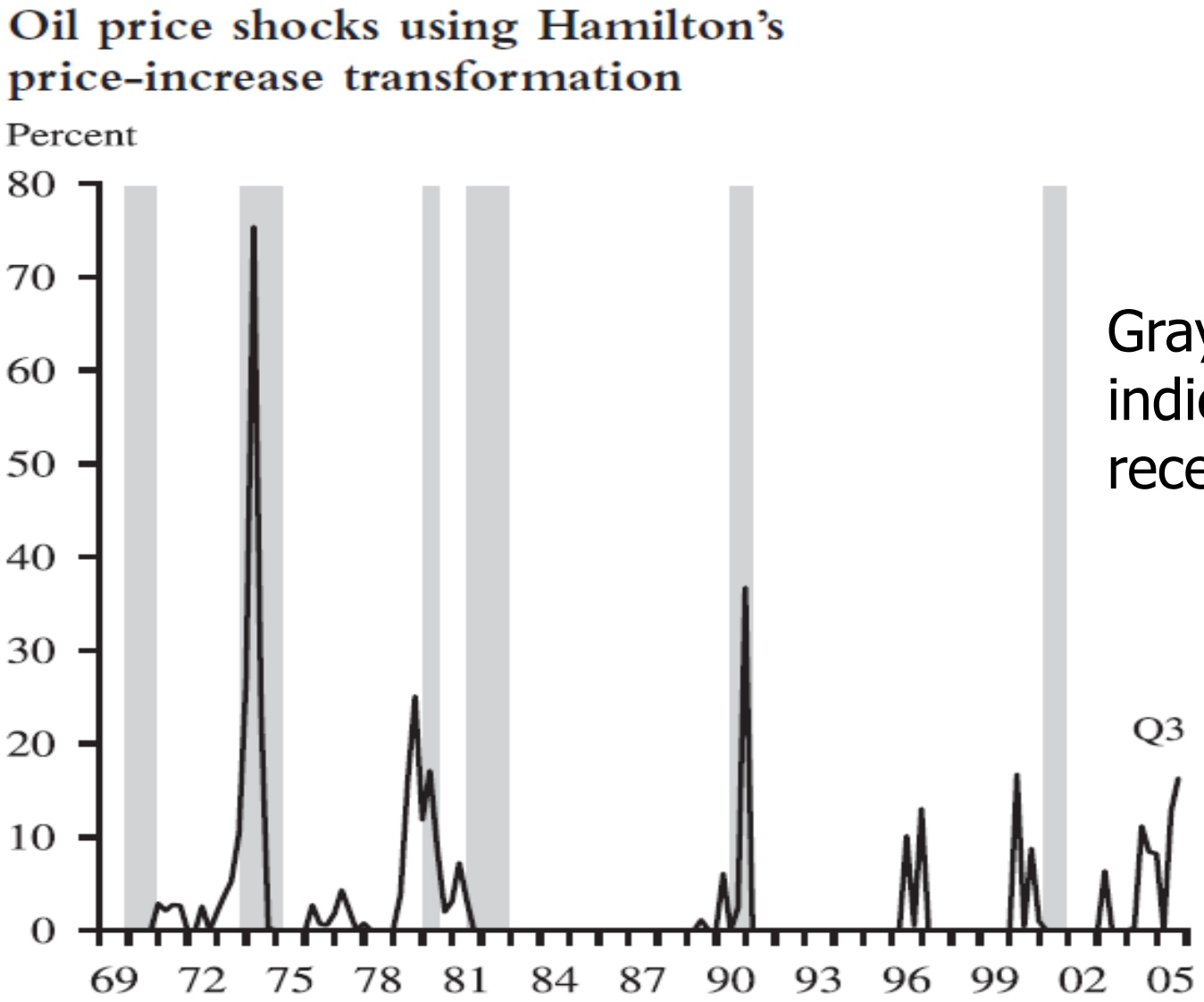
Oil Dependency is a Drain on our Economy



(Using EIA data)

Oil Dependency is a Drain on our Economy

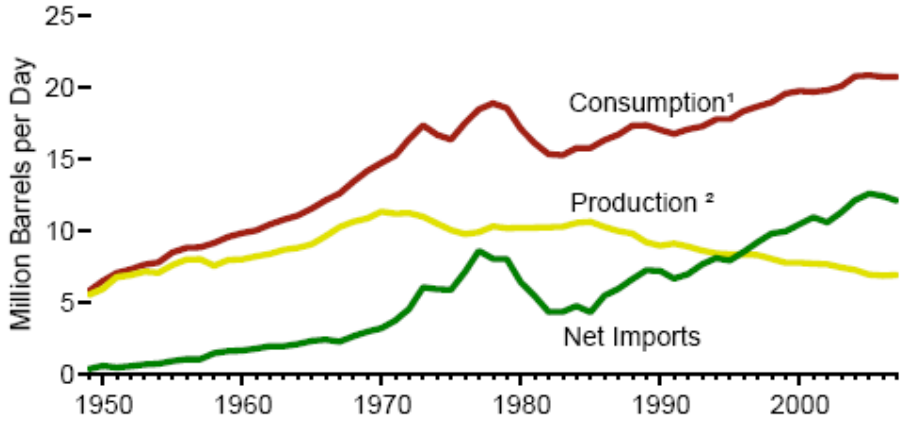
Percentage price increase



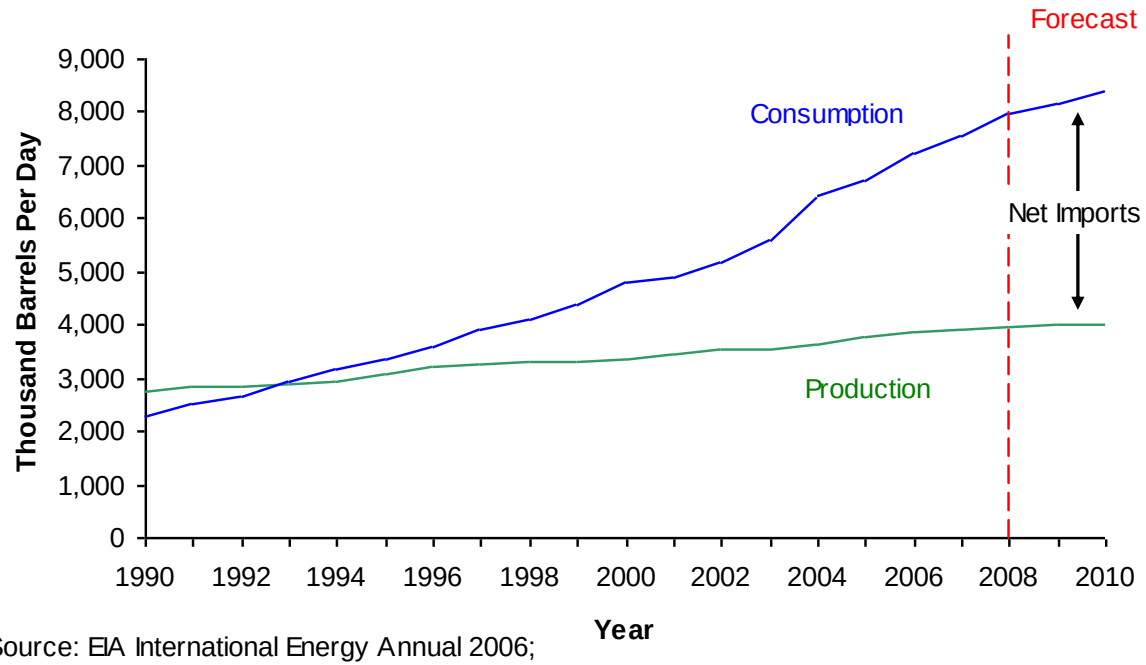
Gray bars indicate a recession

FRBSF Economic Letter 11/18/05

US oil became a net oil importer in the 1940s



China's Oil Production and Consumption, 1990-2010*



Source: EIA International Energy Annual 2006;
Short-Term Energy Outlook (March 2009)

*forecasted

Energy is a security issue

Russia to cut Ukraine gas supply

Monday, 5 January 2009

BBC NEWS

Iran uses oil to woo allies abroad

By TAREK EL-TABLAWY , 04.02.09, 12:55 PM EDT

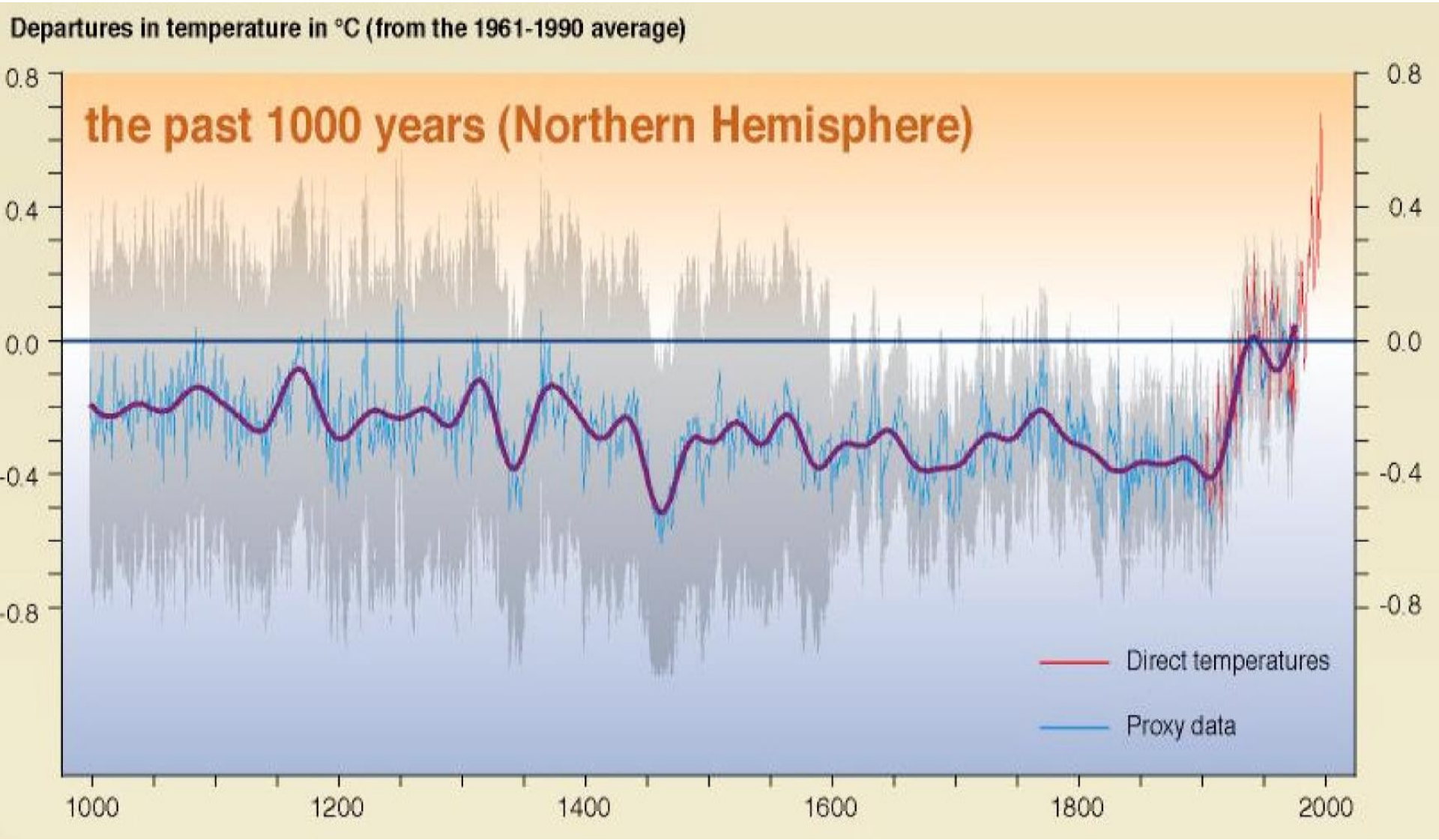
AP Associated Press

Iraq and China Sign $3 Billion Oil Contract

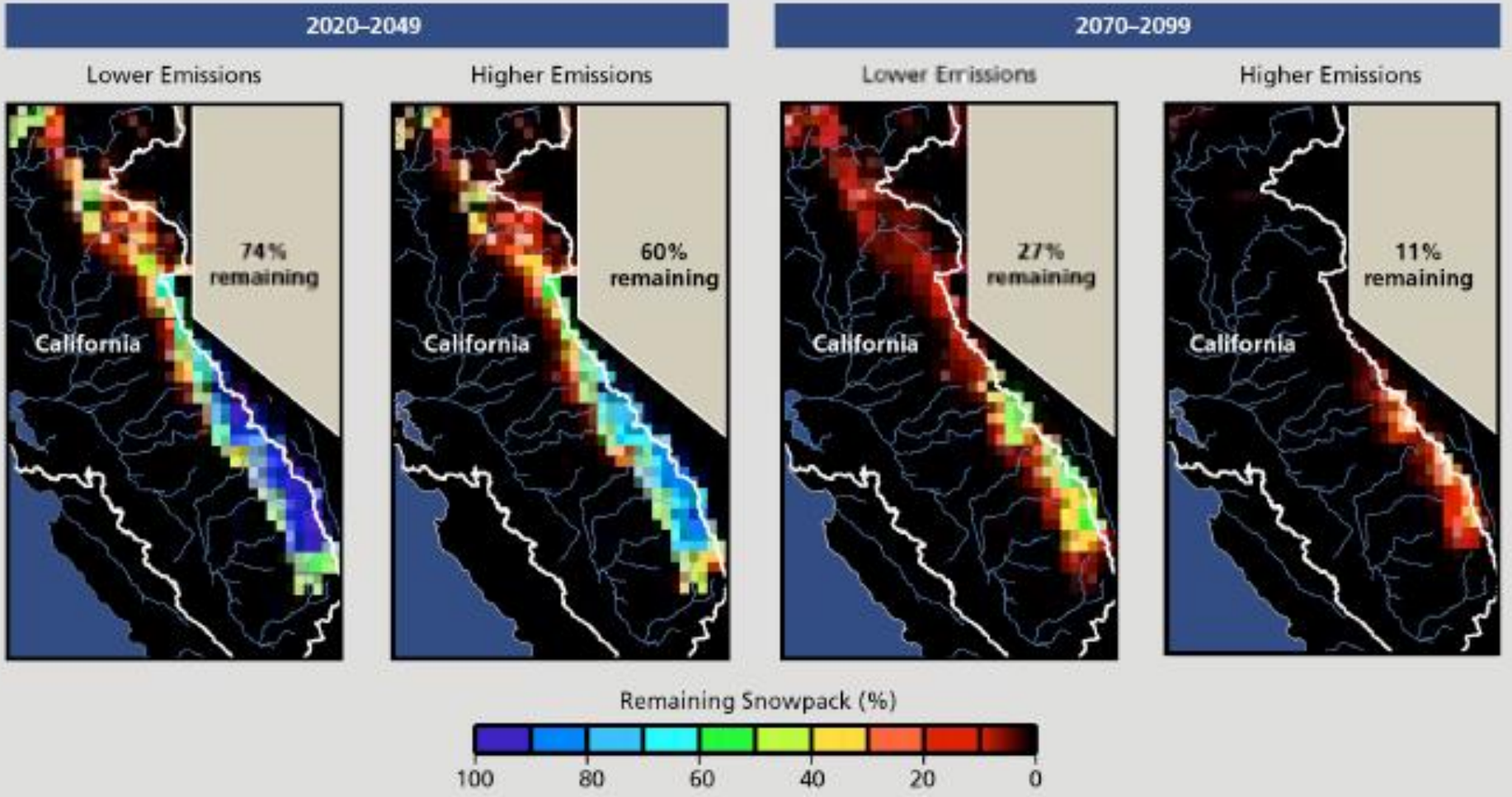
Deal Is First of Its Kind Since Invasion

By Amit R. Paley
Washington Post Foreign Service
Friday, August 29, 2008; A08

Global average temperature

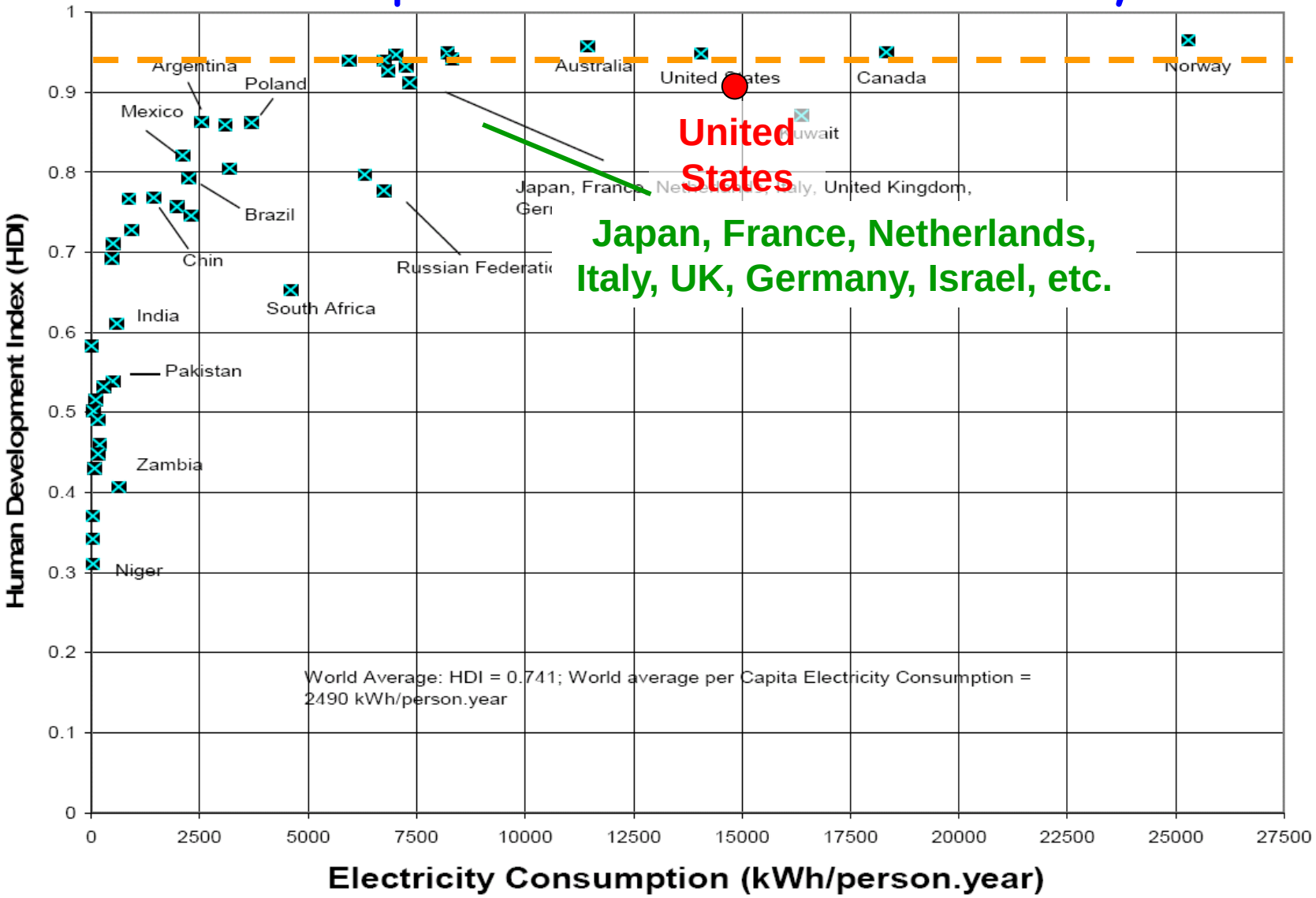


Projections of Sierra snow-pack and implications for water

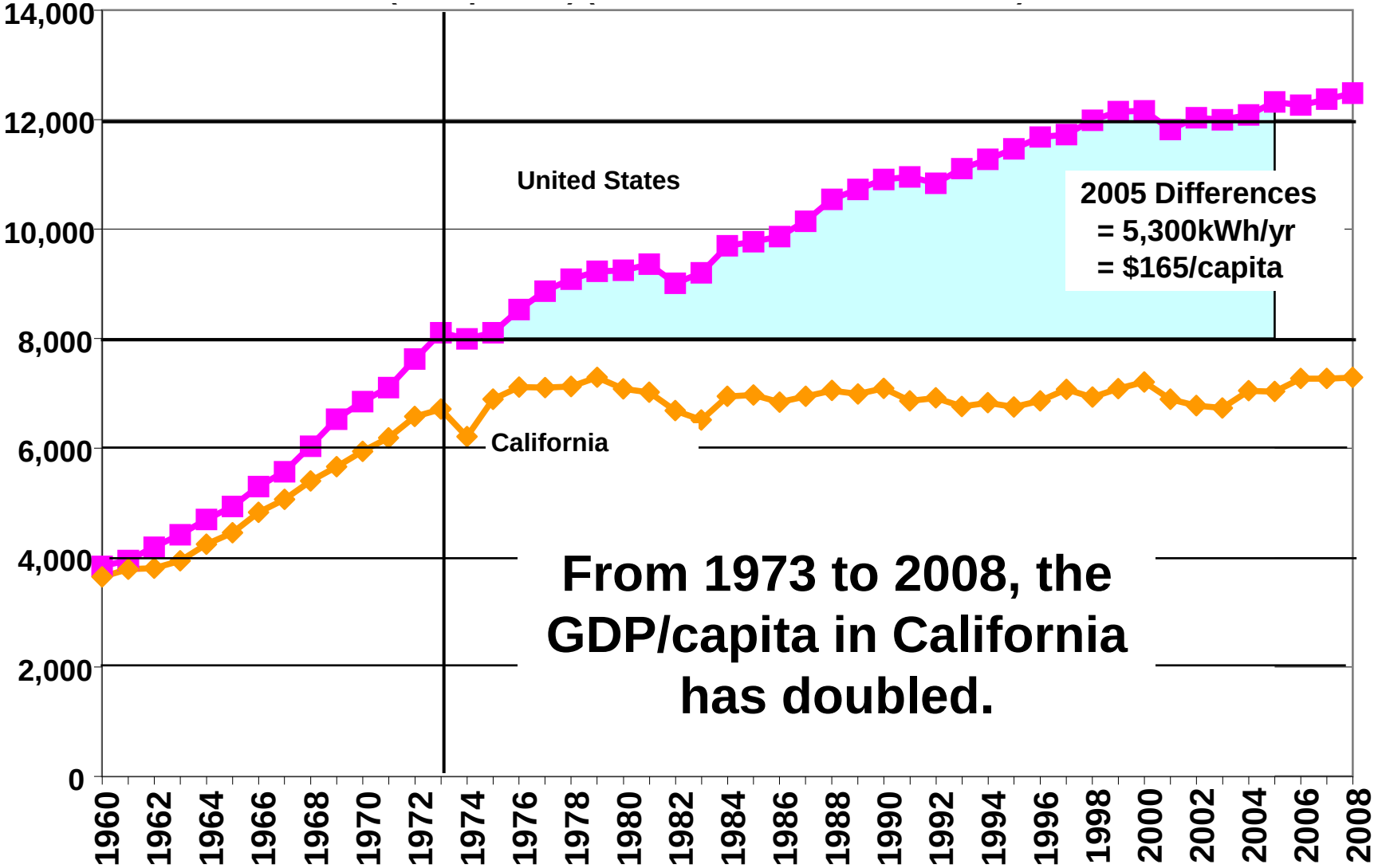


The standard of living of a country is *not* proportional to its energy consumption:

Human Development Index vs. Electricity use



Electricity use per person (1960 – 2008)



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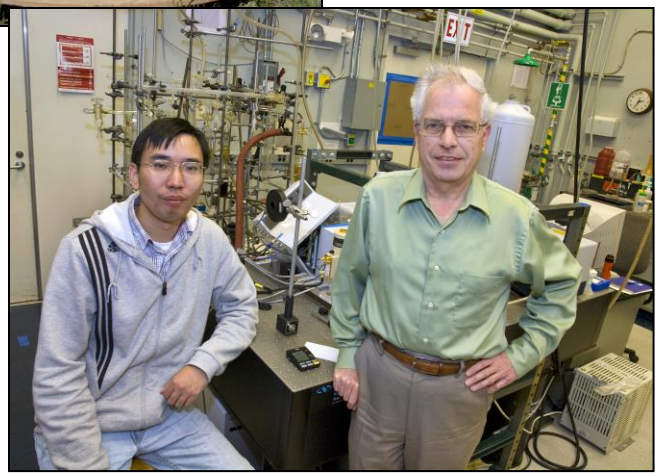
Clean Energy Economy

President Obama's plan:

Create new green jobs that can't be outsourced

and

add to America's future competitiveness



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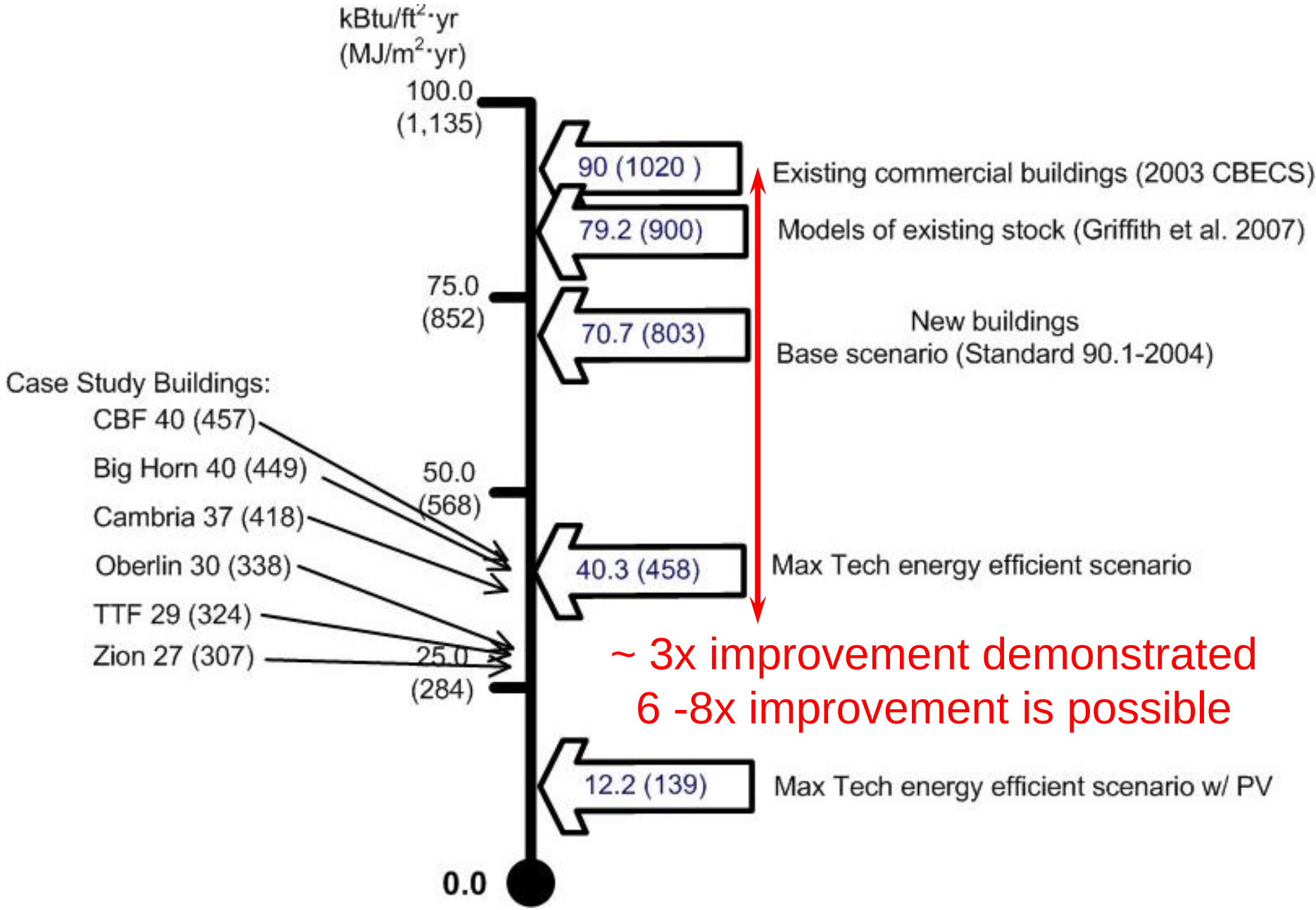
American Competitiveness

Building Efficiency: Where we are & where we ***can*** be.



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An energy efficient economy requires:

- Federal investments to promote efficiency
- Strong and sensible standards
- Research, development, and deployment of new technologies
- The collective will of the American people.

New Energy for America's Economy

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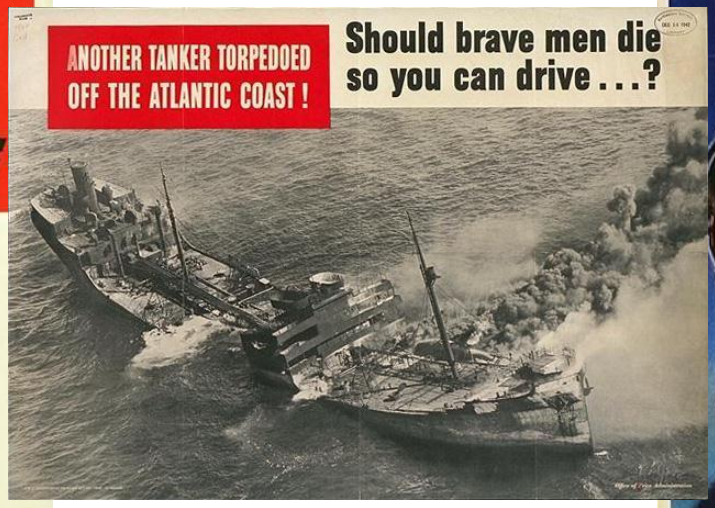
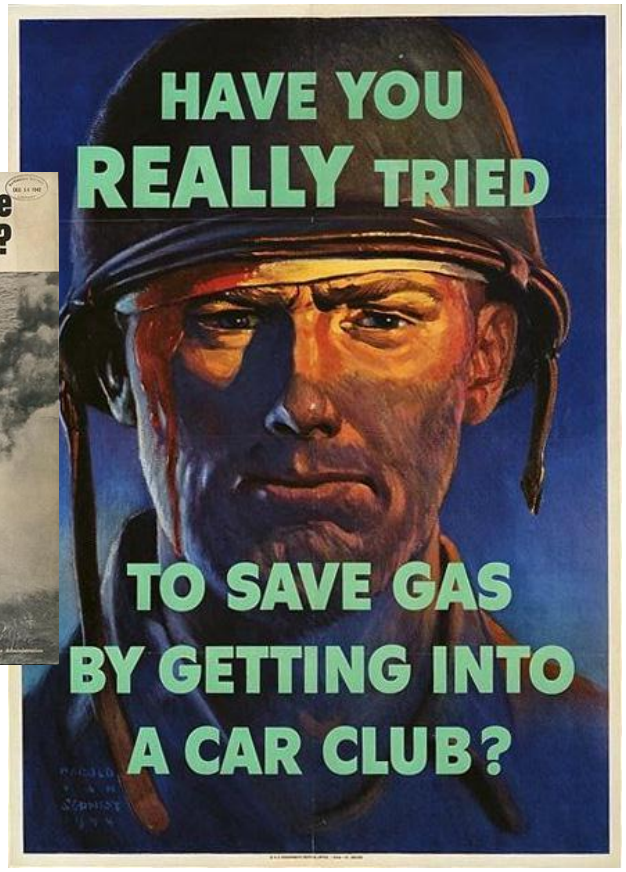




Step 1: Federal investments to promote efficiency

President Obama's American Recovery and Reinvestment Act

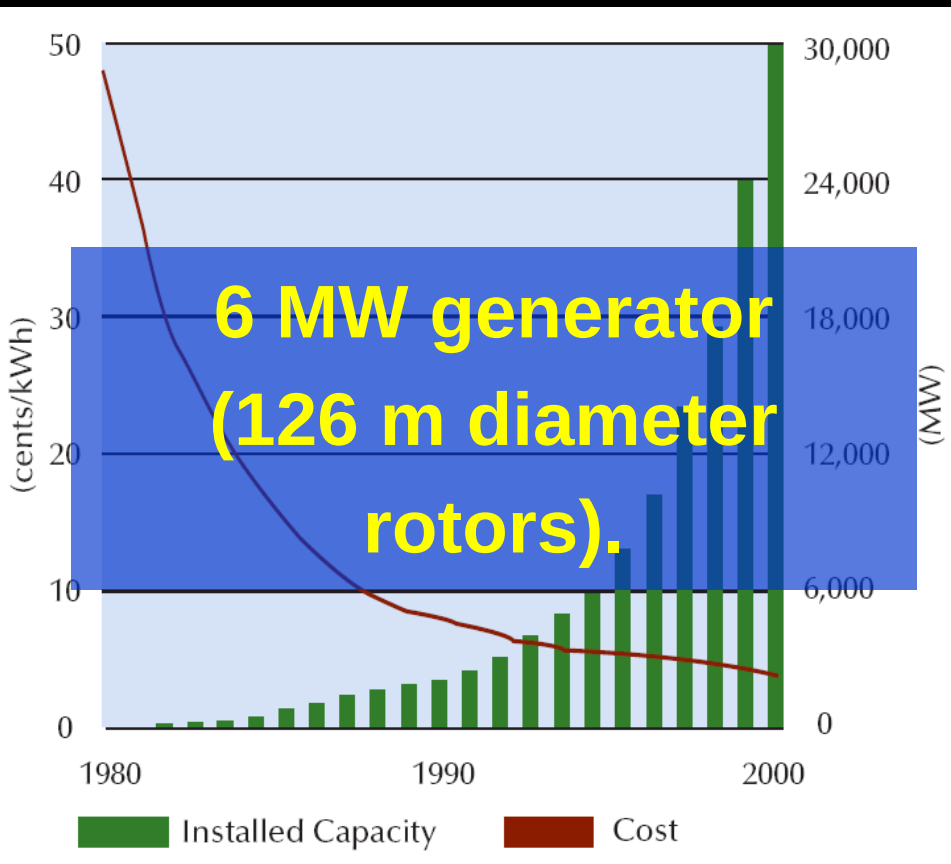
Double alternative energy production over three years

- $6 billion in loan guarantees
- $8.2 billion for weatherization and energy efficiency
- $3.1 billion for state energy efforts
- $11 billion for smart grid

President Obama wants R & D tax credit to be permanent

Modest but **stable** fiscal incentives were essential to stimulate long term development. Energy transmission/storage is also needed.

747- 400
64.5 m

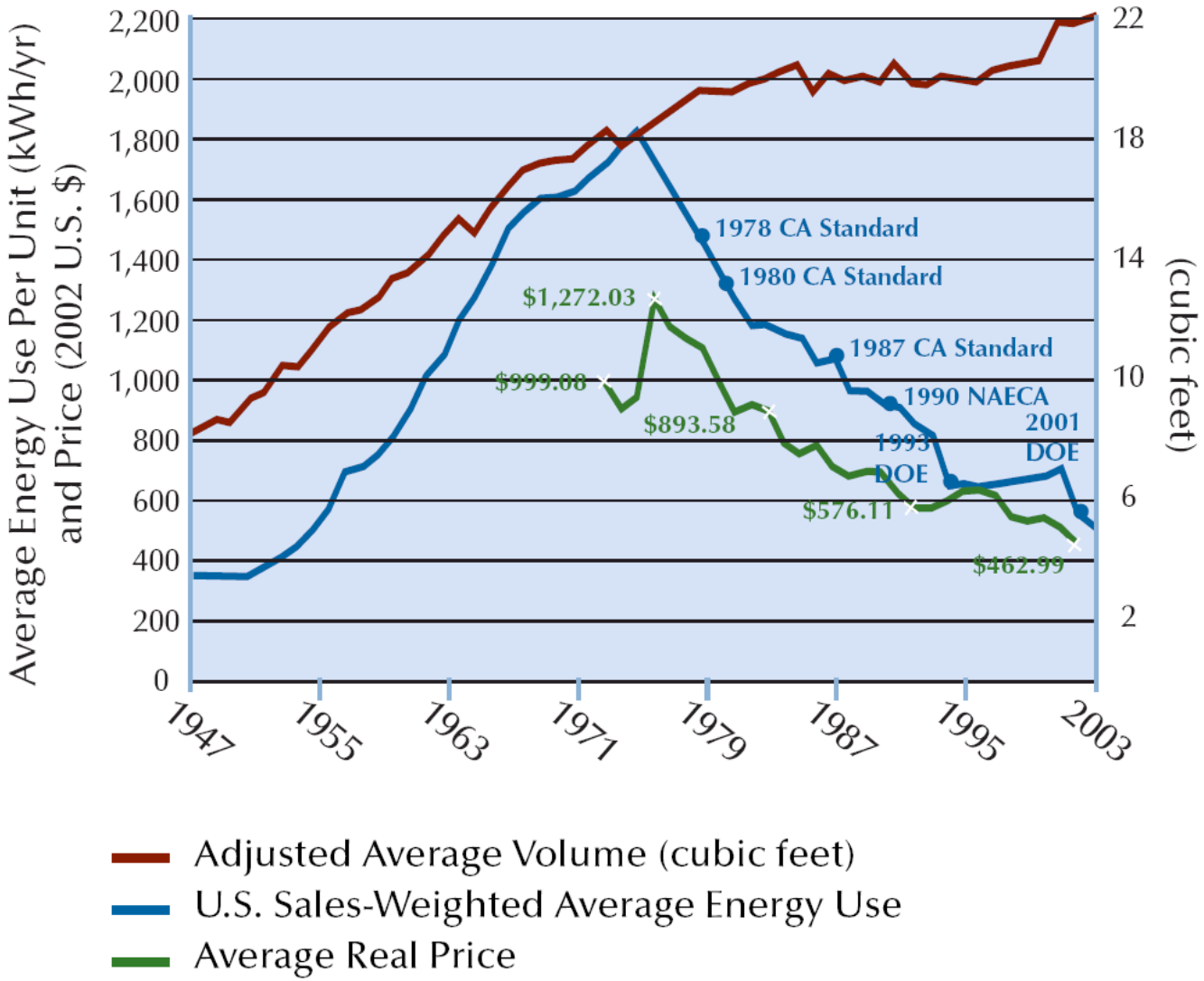


6 MW generator (126 m diameter rotors).

Step 2: Strong and sensible standards

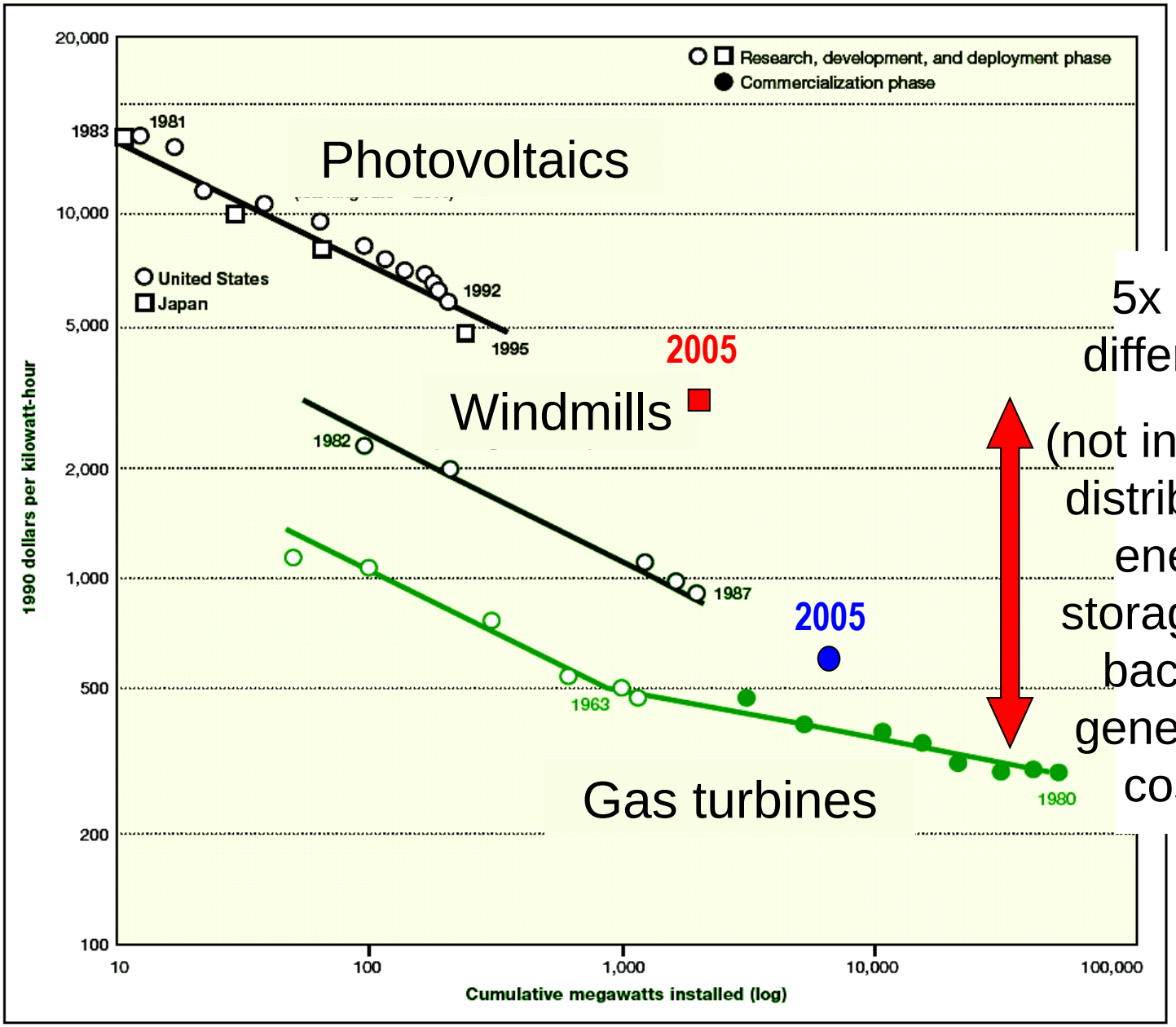
Higher standards stimulate technology and innovation:

Refrigerator efficiency

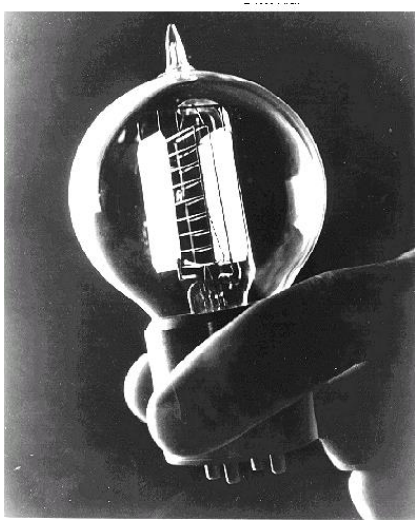


Step 3: Research, development, and deployment of new technologies

Cost of electricity generation vs. installed capacity (1990 dollars / installed Megawatt hour)

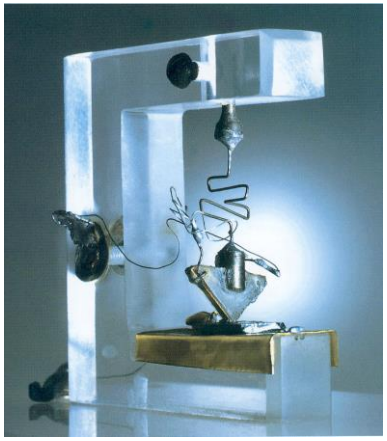


A transformative technology



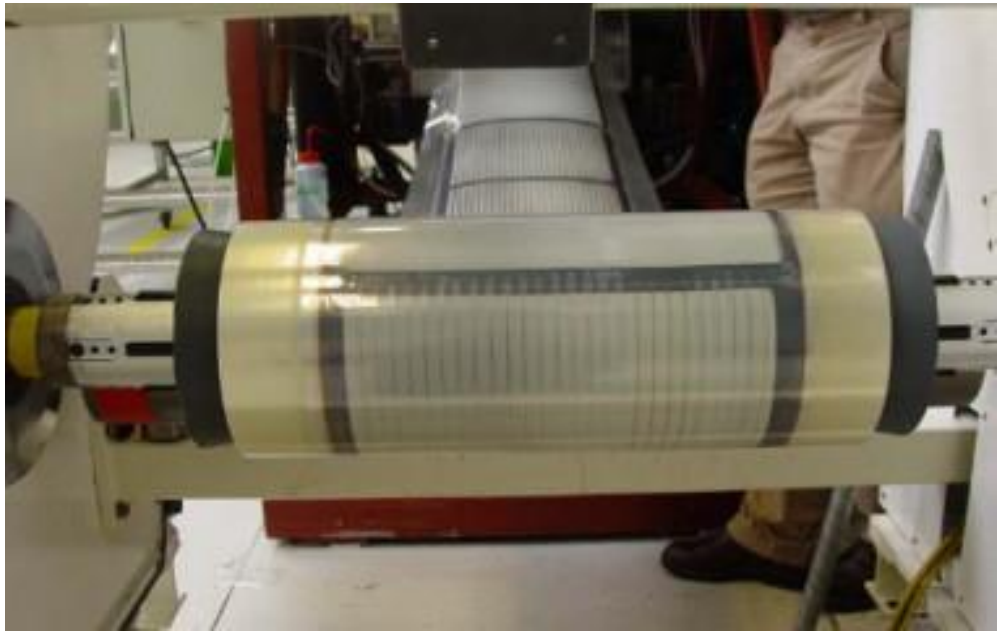
•An essential component transcontinental telephone line was the vacuum tube.

• Vacuum tubes generated a lot of heat and burned out.



• AT&T Bell Laboratories invested heavily in improving vacuum tubes. They ***also*** embarked on a research program to develop a solid state replacement to the vacuum tube.

Reel-to-reel mass production of *efficient* solar cells based on rapidly developing nano-technology may be possible.

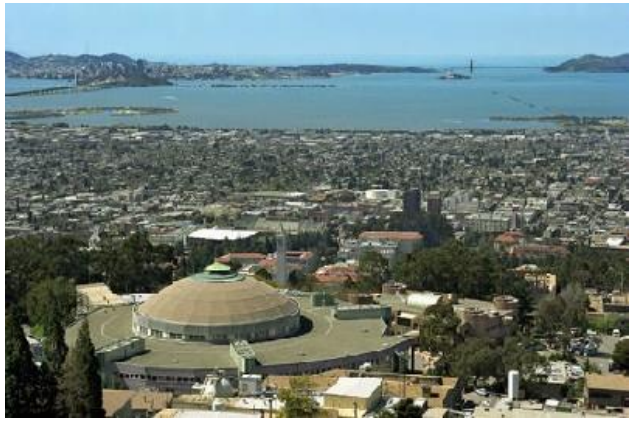


The Department of Energy must become the modern Bell Labs

Argonne National Laboratory

Oak Ridge National Laboratory

National Renewable Energy Laboratory



Berkeley National Laboratory

Department of Energy

Largest science funder

17 National Laboratories

Researchers at 300 universities

88 Nobel Prize winners

Time to harness our intellectual horsepower

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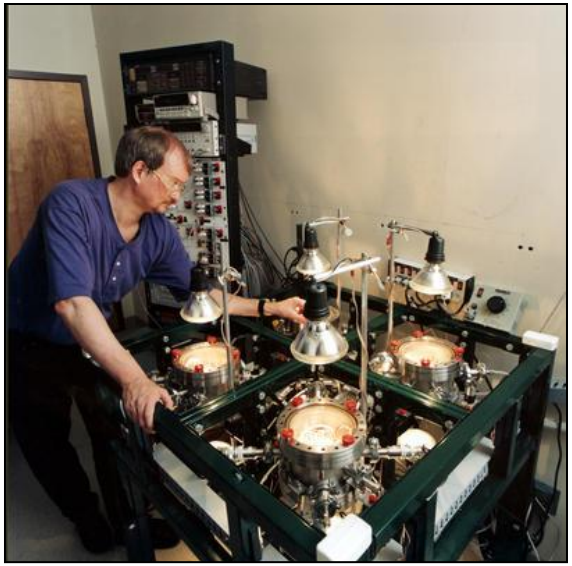
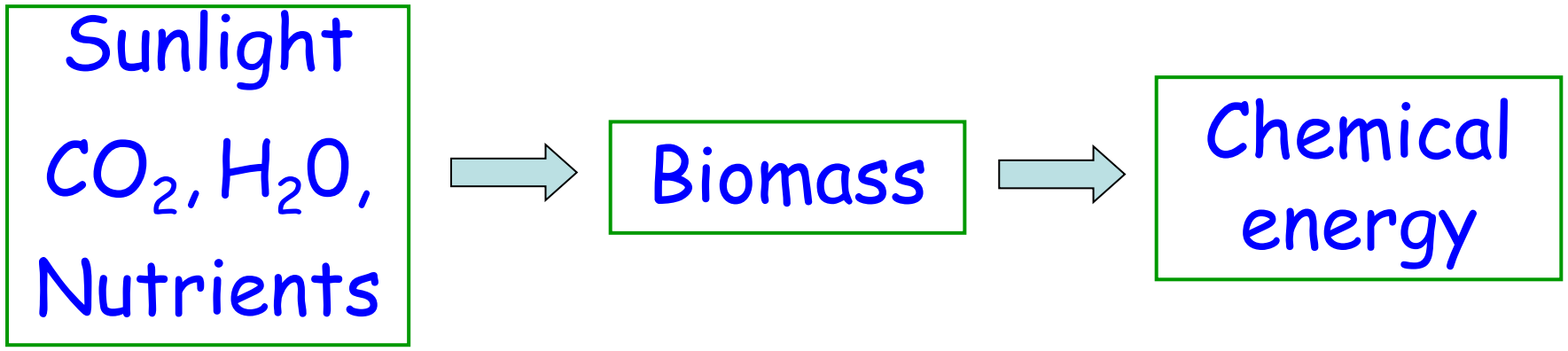
President Obama: Double investment in science over 10 years



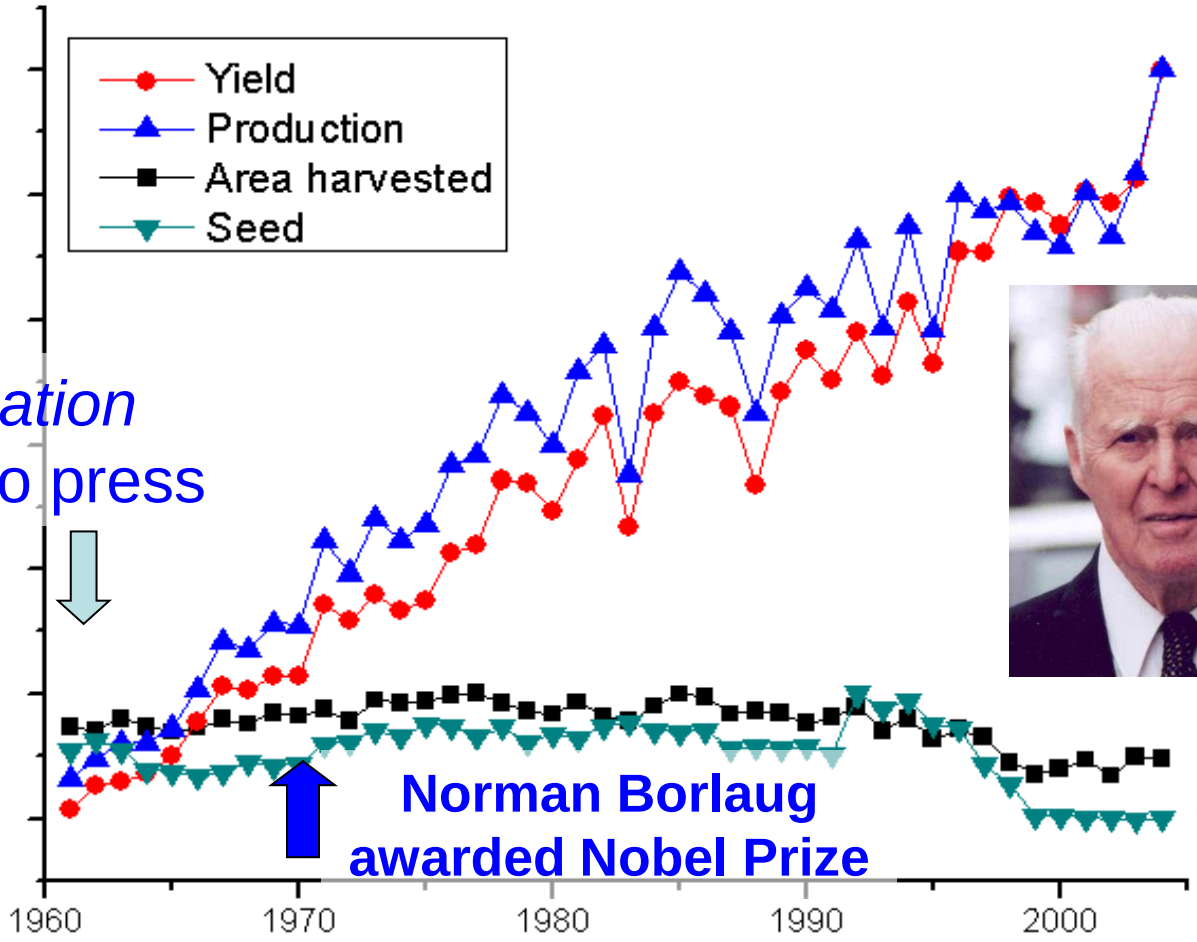
Sunlight to energy via Bio-mass



Develop **energy** plants that can use marginal agricultural land, need less nutrients, water, and are easier to breakdown into simple sugars

Improved conversion of cellulose into fuel. New organisms for biomass conversion.

World Production of Grain (1961 – 2004)



The Population Bomb goes to press

Norman Borlaug awarded Nobel Prize

1960:
Population = 3 B

2005:
Population = 6.5 B

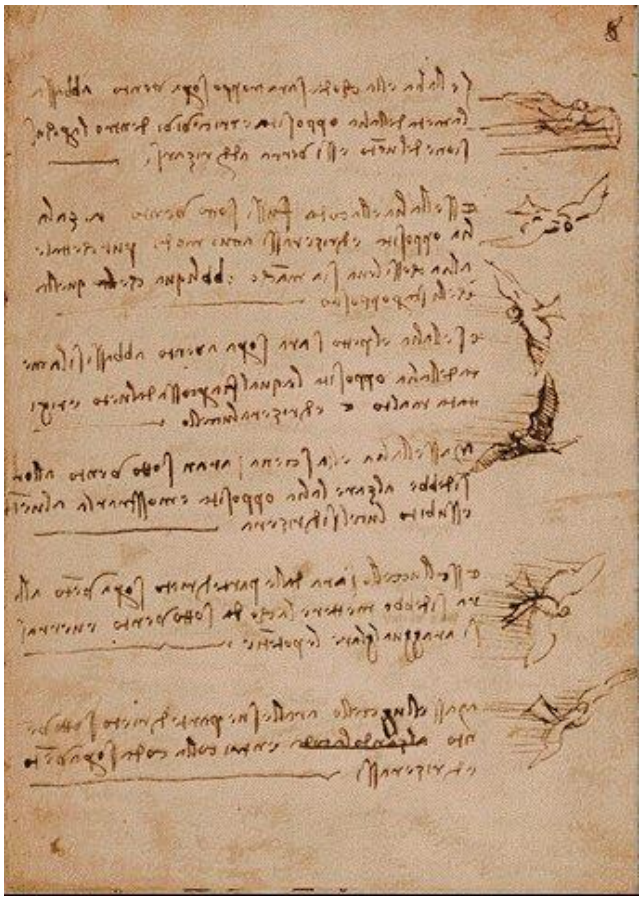
Source: Food and Agriculture Organization (FAO), United Nations

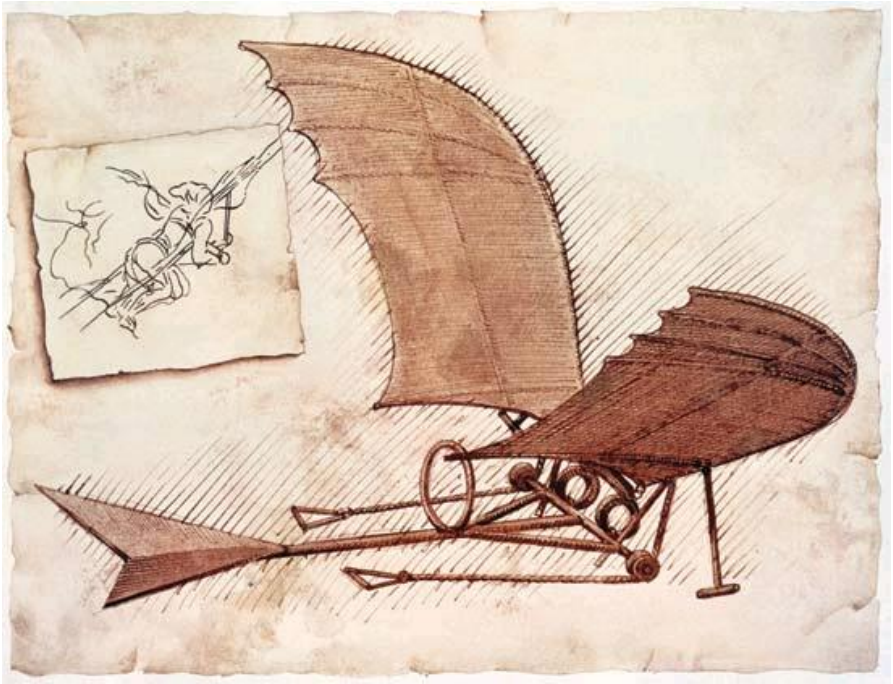
The invention of ammonia synthesis by Haber and Bosch made possible artificial fertilizers.

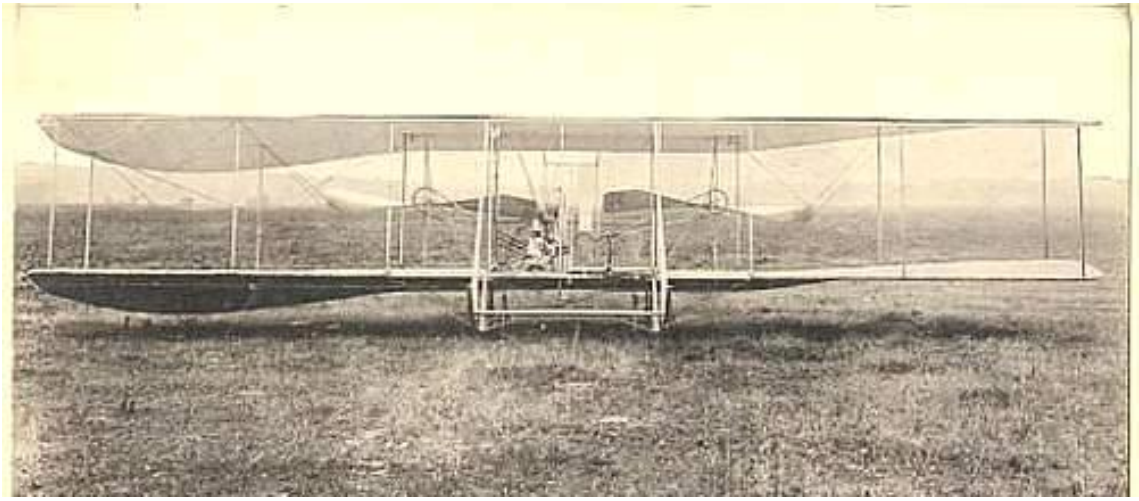
Fritz Haber

Carl Bosch

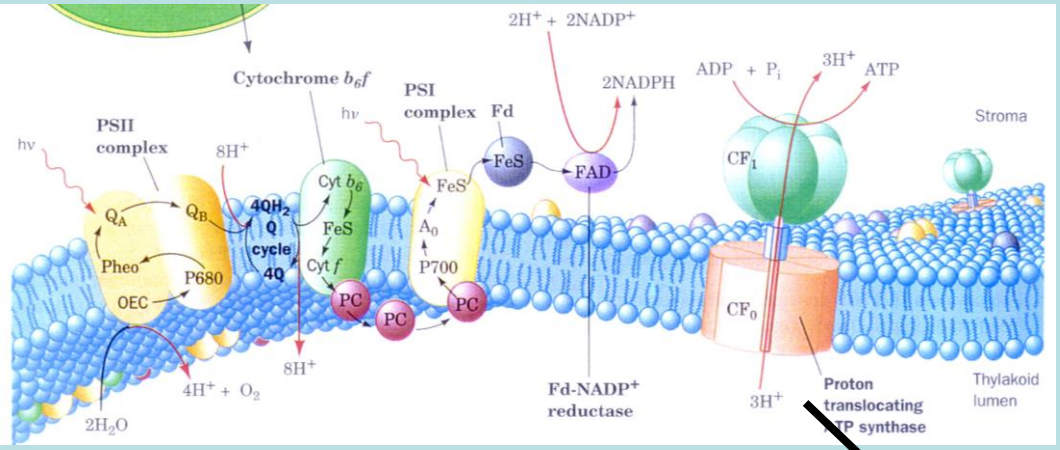
Man first learned to fly by imitating nature

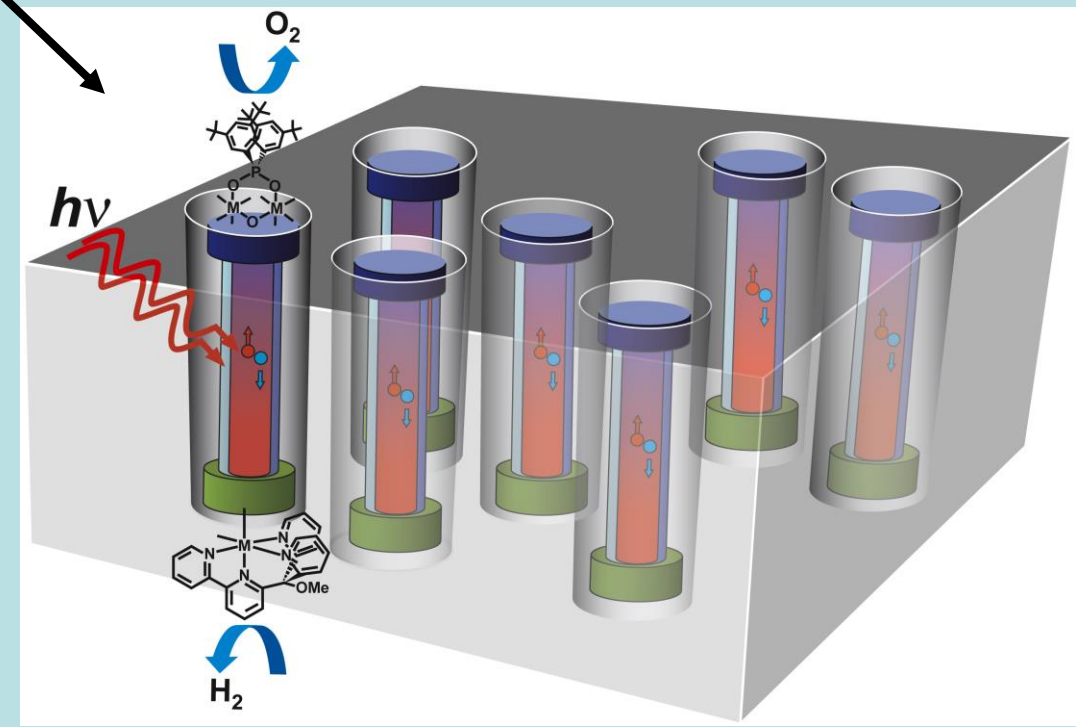






Helios Artificial Photosynthesis Project





The first important step:

Sunlight + $2H_2O$
$\rightarrow O_2 + 4H^+ + 4e^-$

Earthrise from Apollo 8 (December 24, 1968)