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Energy Opportunities

(and challenges, too)

Perry Wong

Senior Managing Economist,

Milken Institute

Carbon Emissions by Sector

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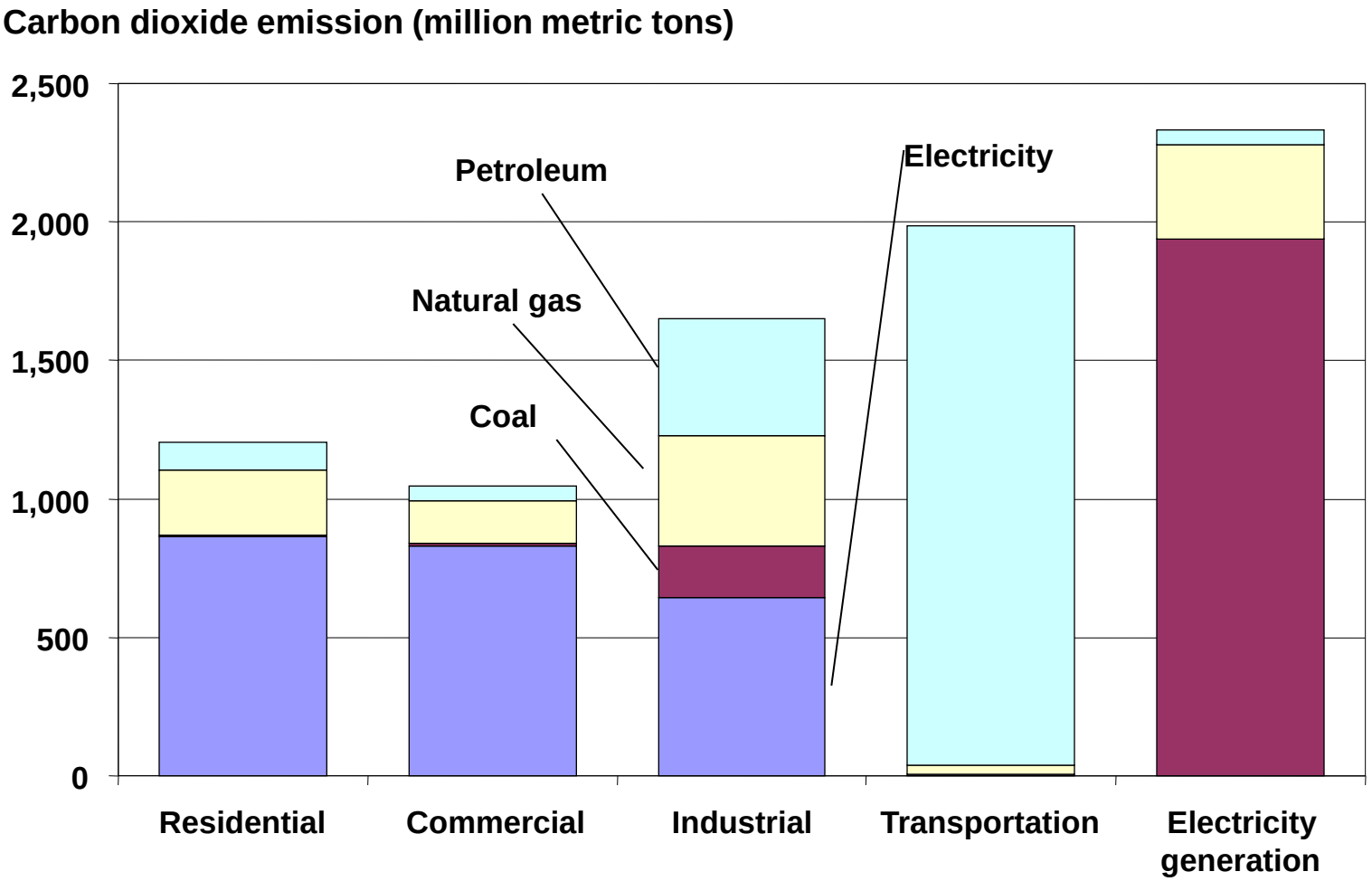

Source: Energy Information Administration, 2008 full report.

Relative Per Barrel Cost of Various Clean Fuel Technologies

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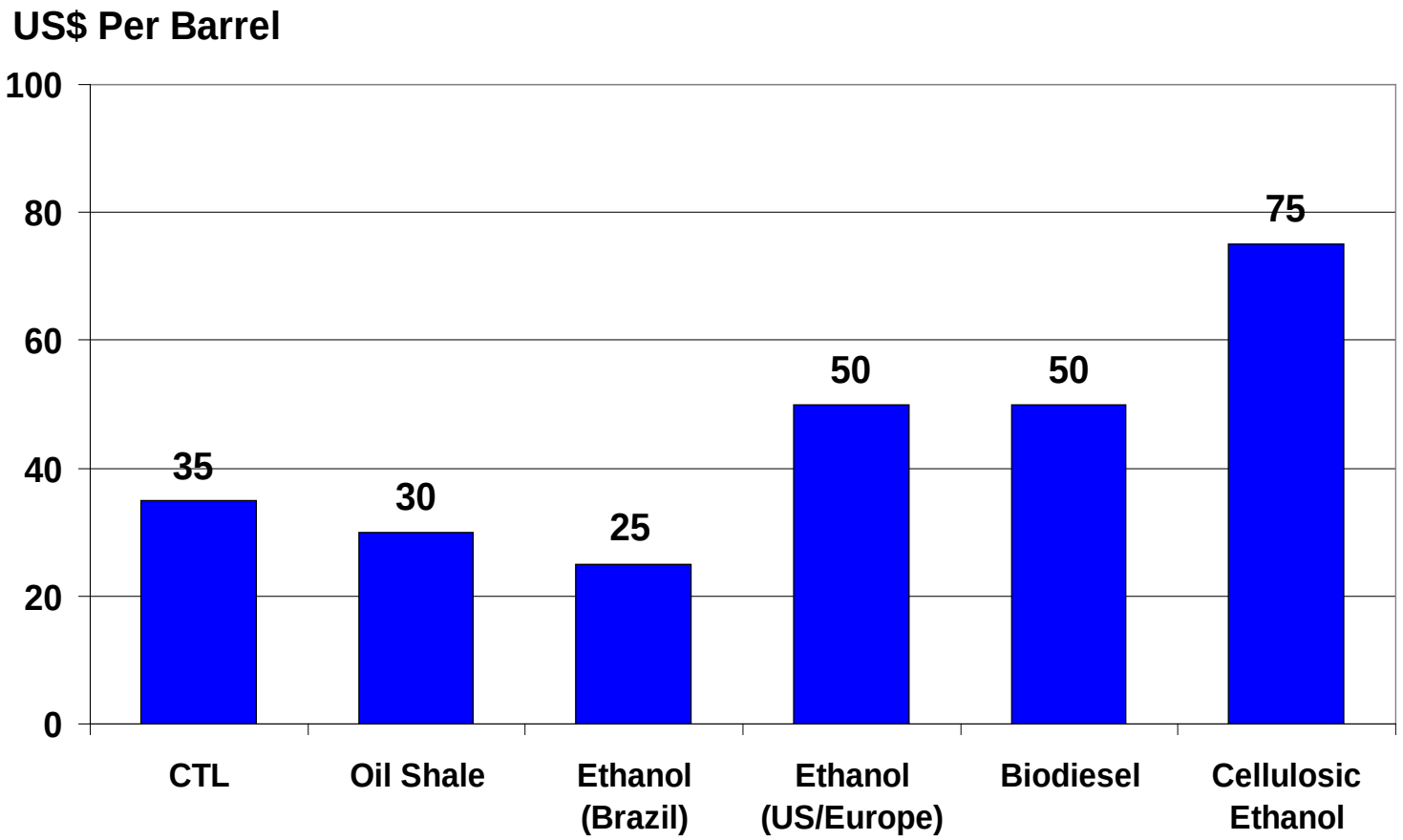

Source: Newsweek, 2007

U.S. Renewable Energy Consumption

Only 6% of Consumption

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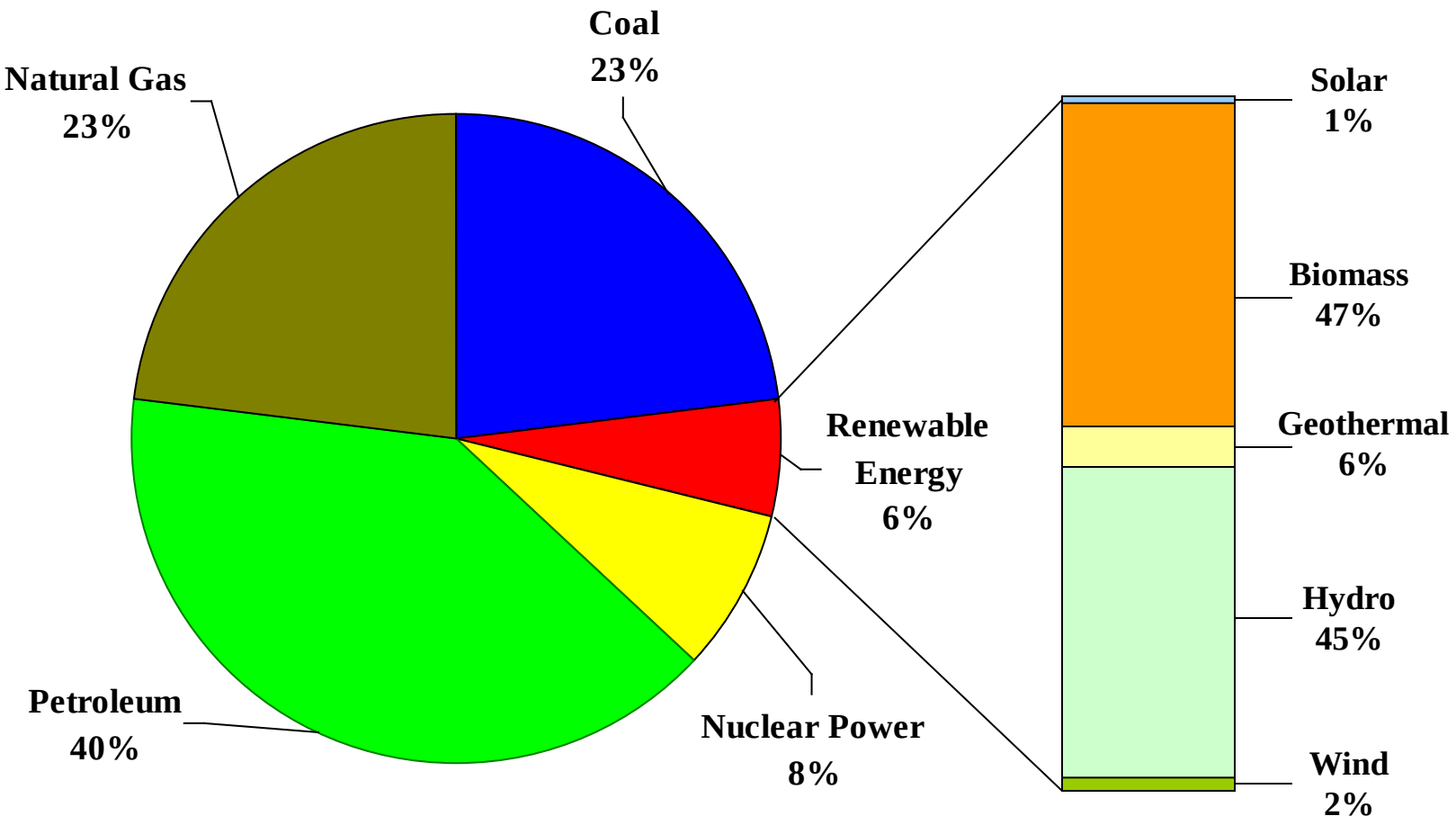

Source: US Department of Energy

Transportation: Leading User of U.S. Crude Oil Supplies

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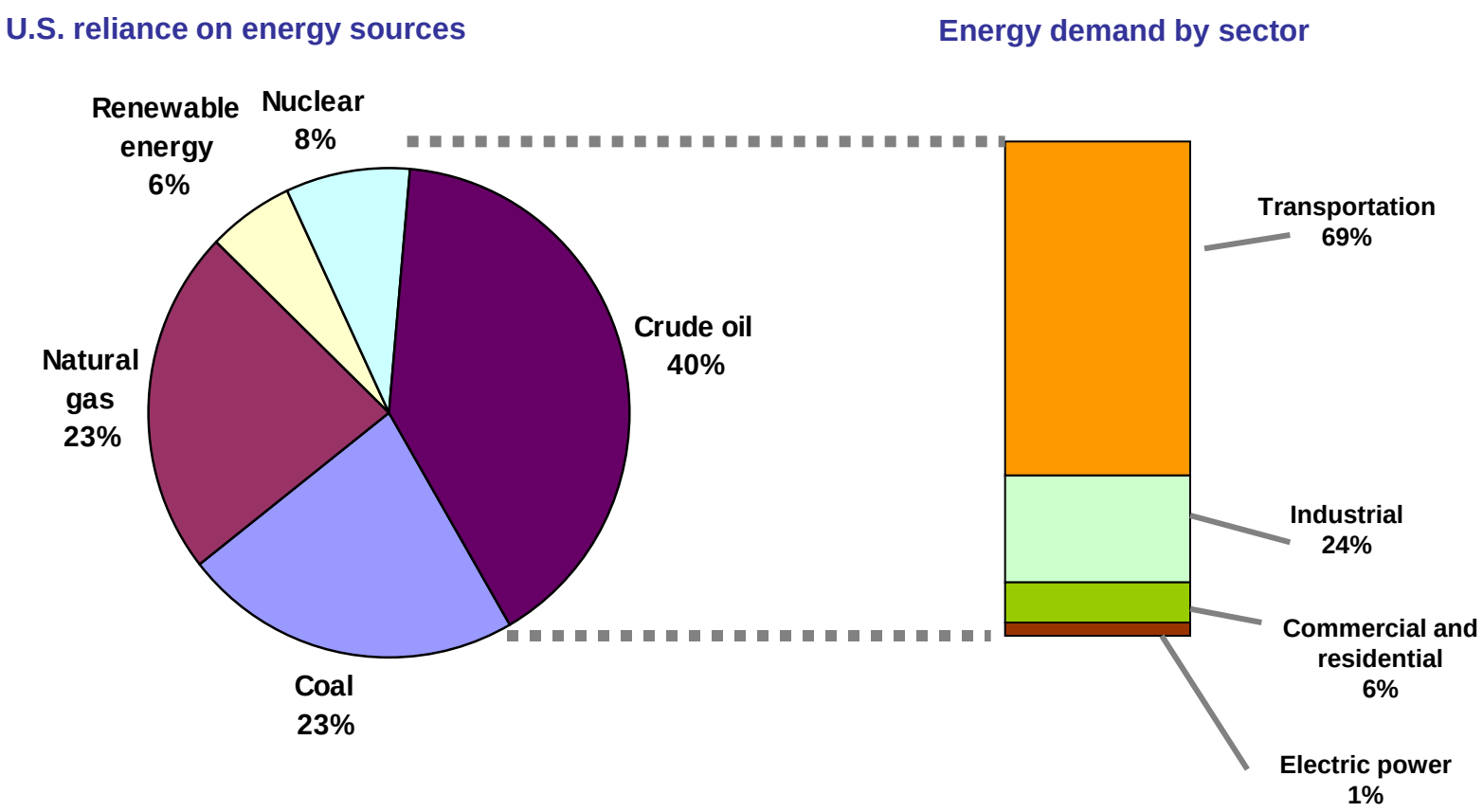

Source: Energy Information Administration, 2006

Trade-offs for Transportation Fuel Alternatives

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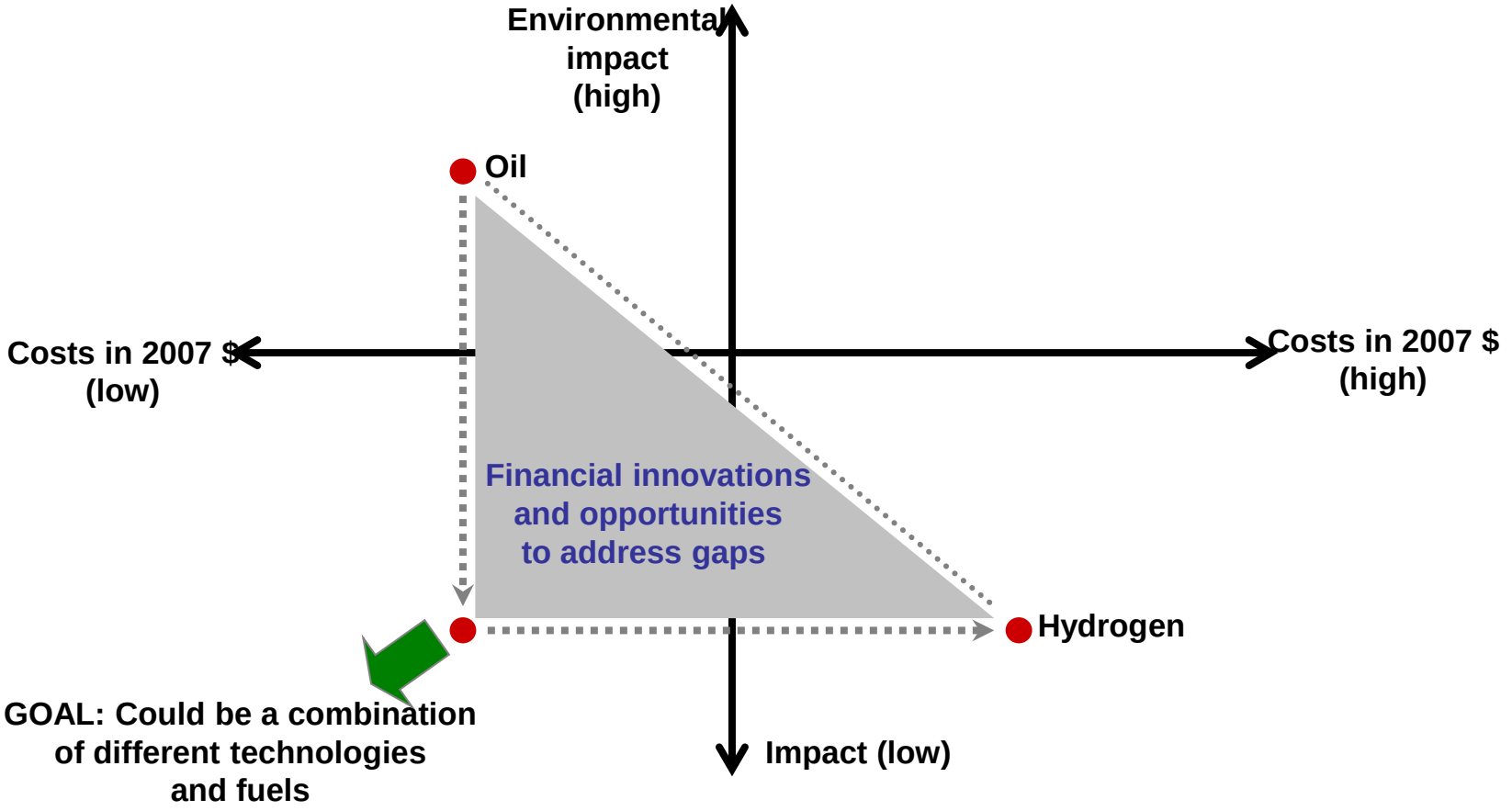

Wind, Solar Real Estate and Electricity Grid

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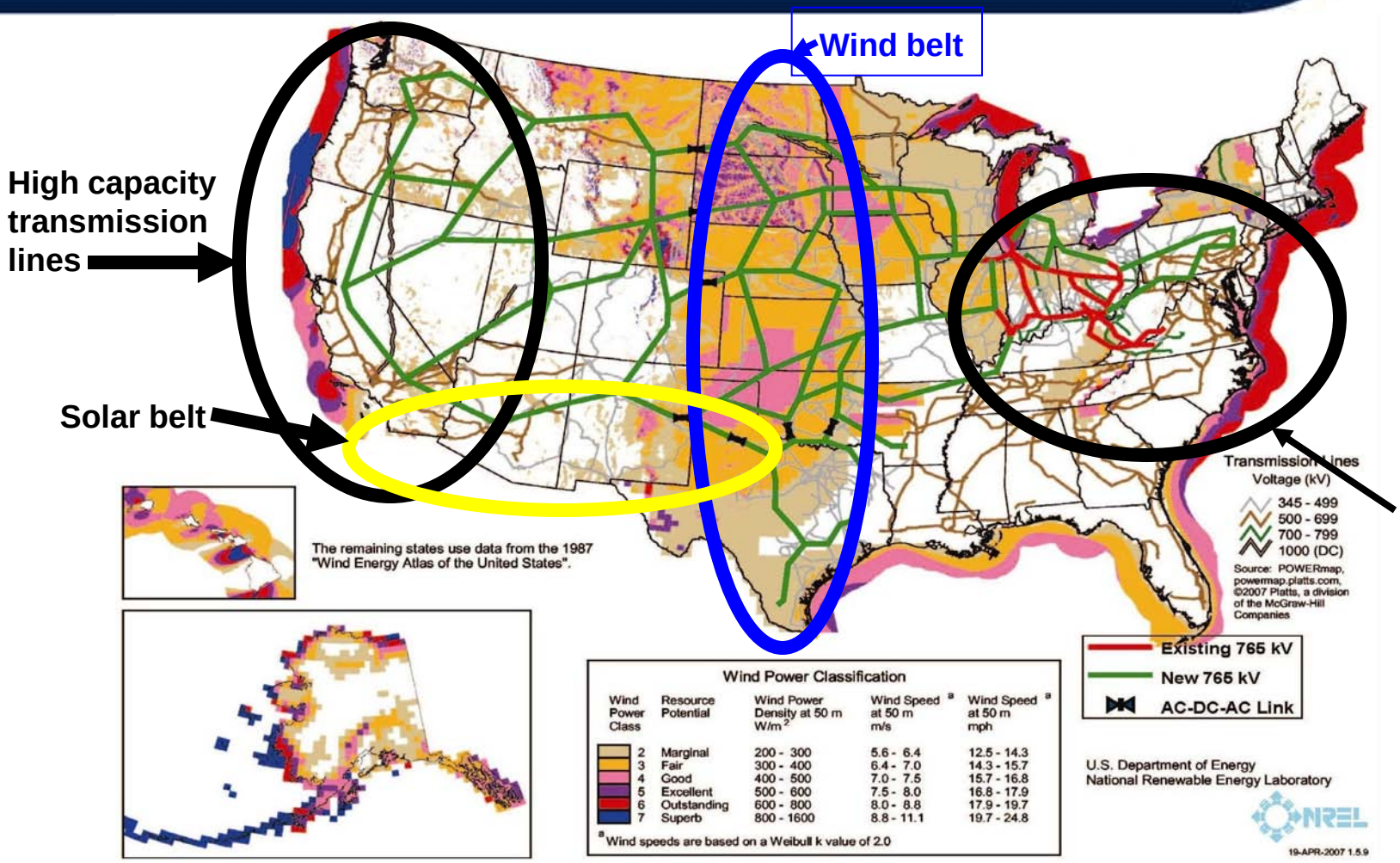

Source: National Renewable Energy Laboratory.

Solar Real Estate

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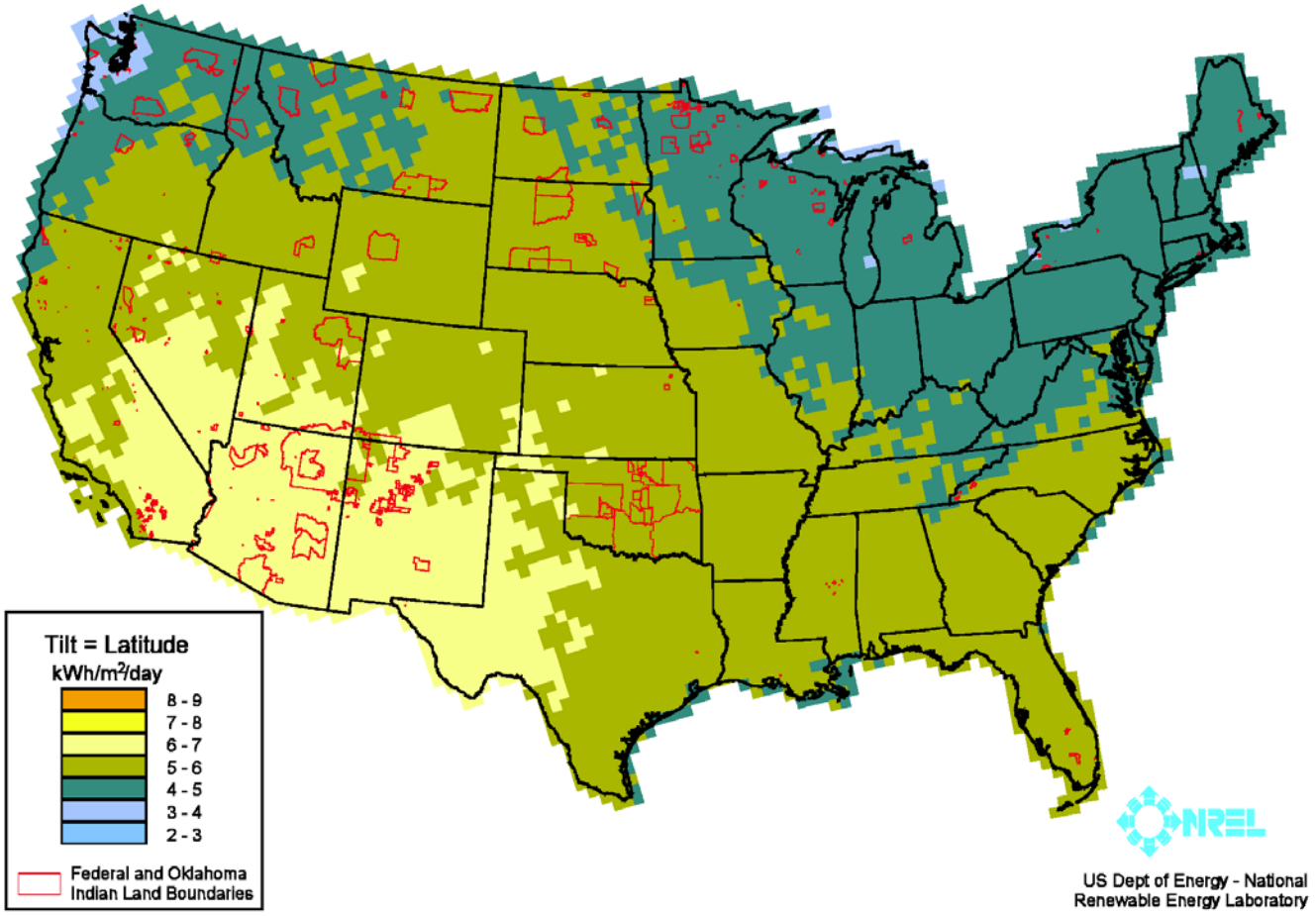

Source: National Renewable Energy Laboratory.

Renewable Incentives Programs in the United States

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- New Solar Homes Partnership - California Energy Commission
  - Provides incentives for solar production from PV installations applicable to custom homes and small developments
- California Solar Initiative – California Public Utilities Commission
  - Performance based incentives focused on reaching 3000 MW Solar capacity by 2016 applicable to non-residential buildings and existing homes
- Wisconsin
  - Has four solar buy back programs offered by utilities to electricity consumers to purchase renewable energy
- Green Tag Purchase - Northwest Solar Cooperative
  - An agreement by the NWSC to purchase solar and wind power at $0.02/kWh through December 31, 2009
- Alternative Energy Investment Tax Credit - Montana
  - Alternative energy investments greater than $5000 receive a tax credit of 35% on corporate income tax

Principles for Energy Policy

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Question: How do we best address risks from oil disruptions/volatilities and CO_2 emissions?

1. Reduce exposure by reducing fuel consumption
   - CO_2 price, oil or gas tax, CAFE standards, “fee-bate”
   - remove policies that subsidize oil
2. Diversify supply sources and types
   - remove barriers to alternative fuel sources/types
   - RD&D on clean fuels and technologies
3. Buy insurance against disruptions
   - wise use of Strategic Petroleum Reserves
4. Technological flexibility in face of policy uncertainty

Oil Markets Are Volatile, Event Driven

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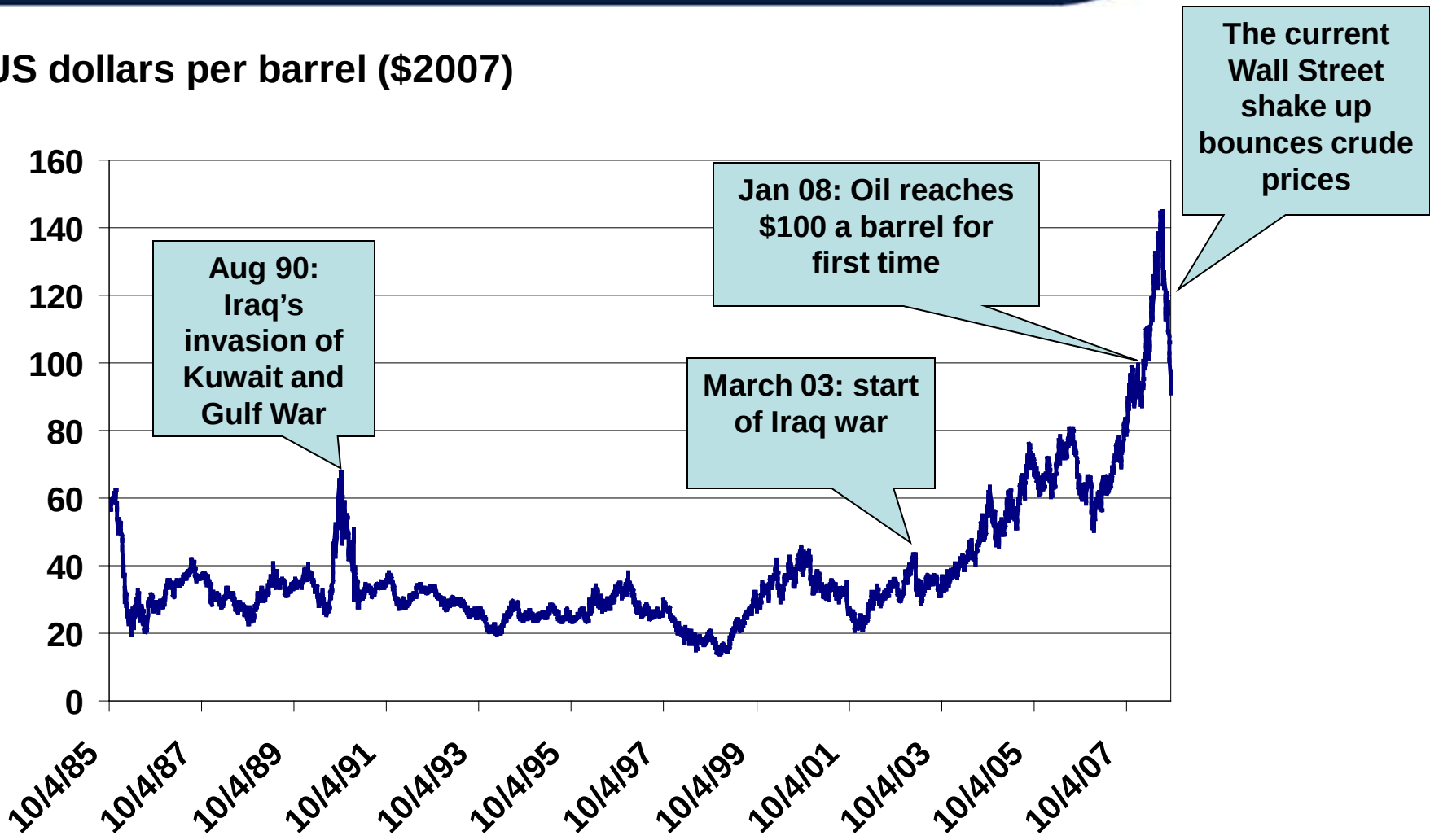

Fungibility Factor: *Fuels don't equal energy*

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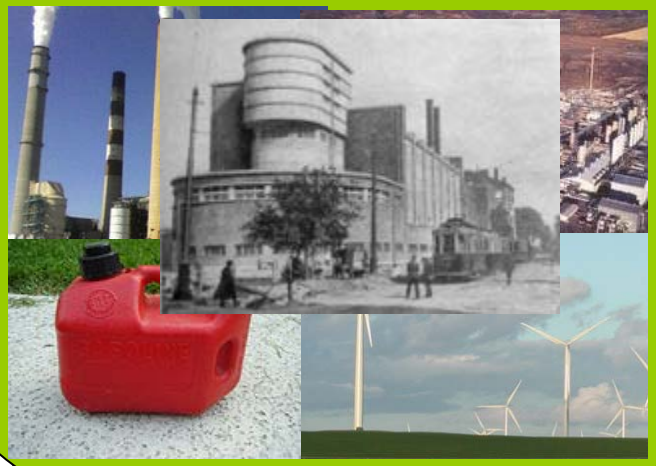

It’s a Plug-in Future

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Chevy Volt

Tesla

Plug-in Prius

Plug-ins can deliver 100 mpg. Hybrids can also run on “flex fuels” (gasoline, E85, CNG) to extend range

Engine Efficiency Comparison

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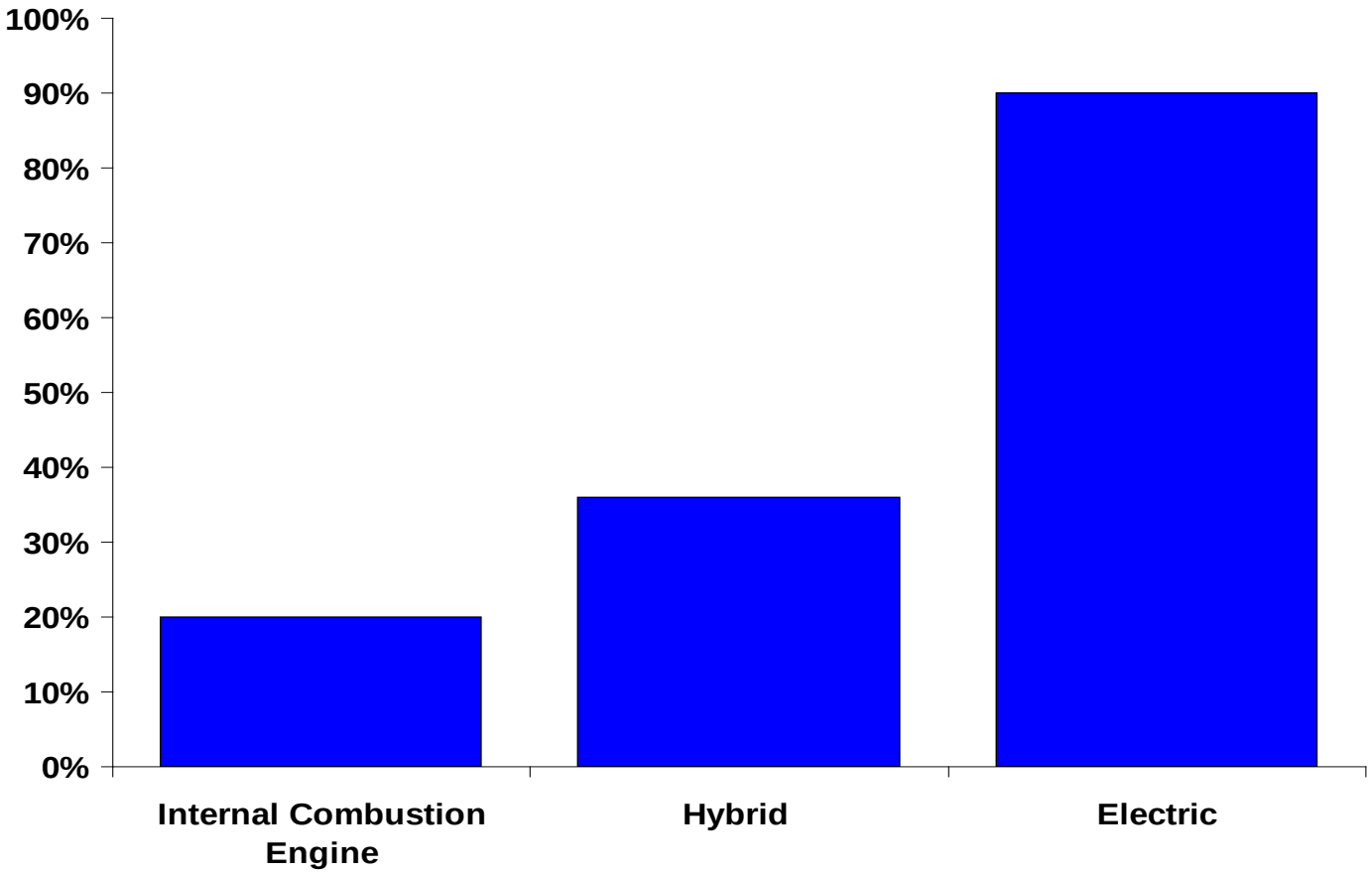

Source: Electricauto.com, University of Washington

The Grid Is Key

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- The United States Electrical Grid provides power necessary to the operation of business and residential infrastructure.

- Each year, America's 131 million energy customers pay $247 billion a year at an average of 7 cents per KwH.

Electricity Accounts for 40 Percent of Energy Used in US

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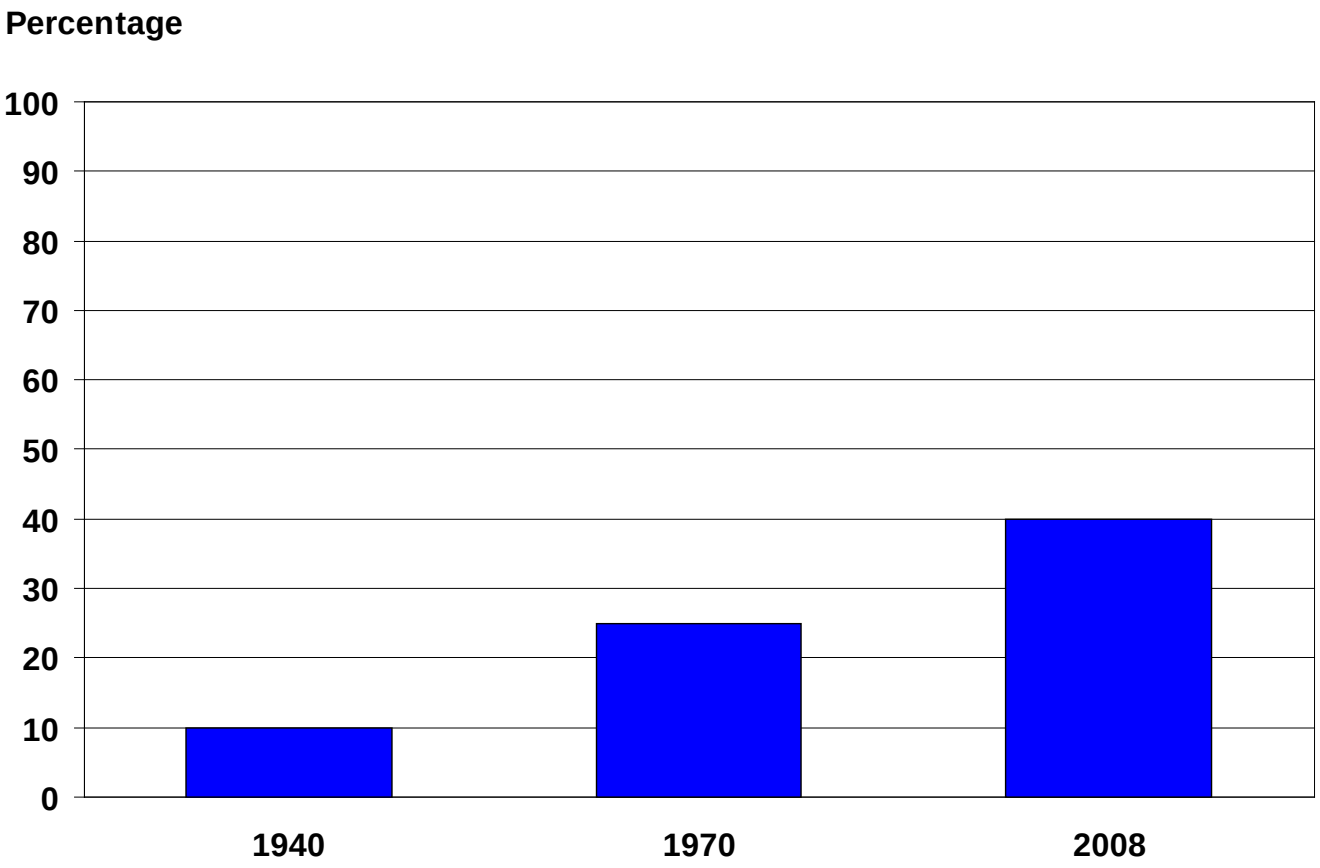

Source: Department of Energy.

Electricity is Capital Intensive

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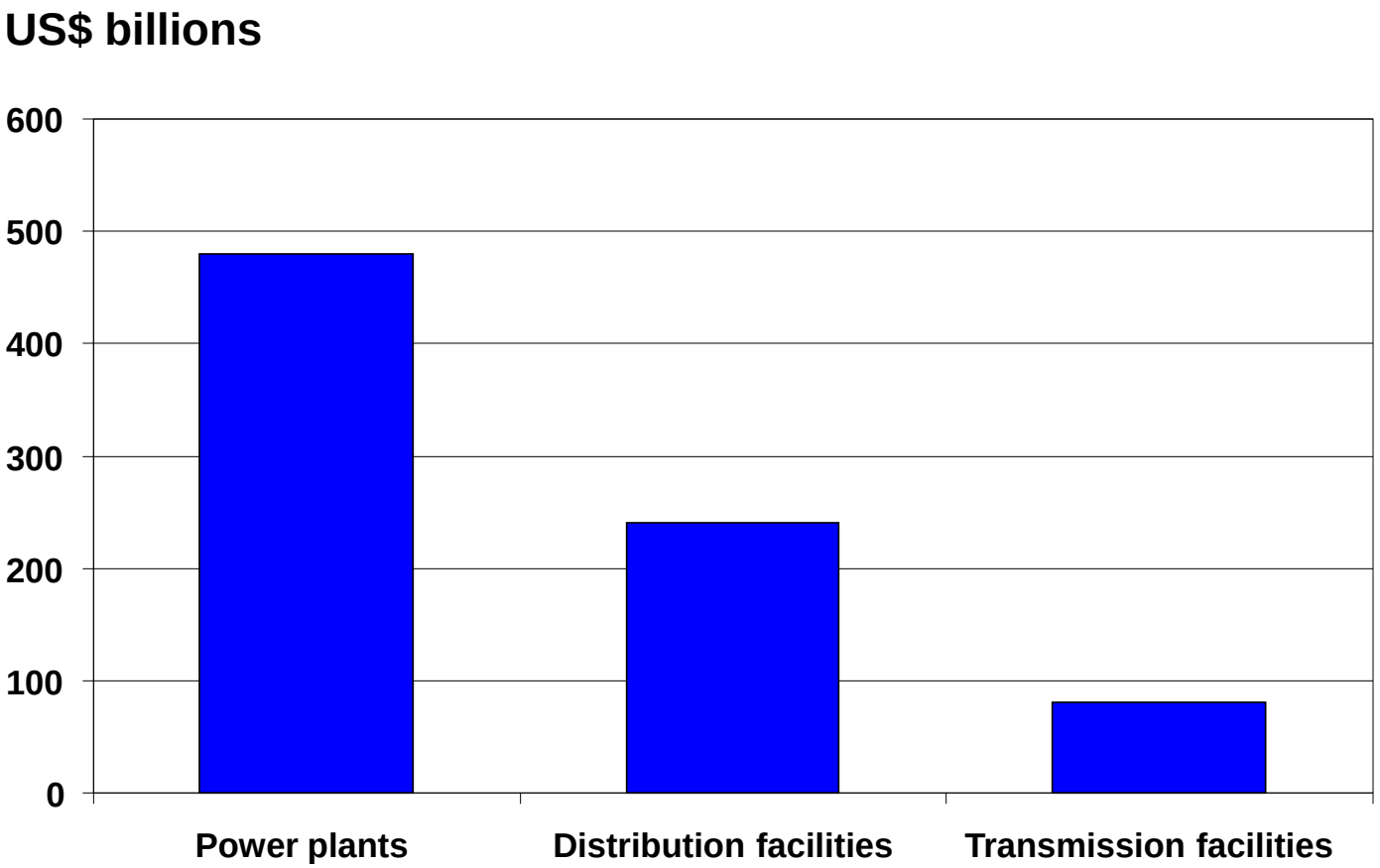
Total value: $800B



Source: Department of Energy.

Distribution Losses Increasing due to Antiquated Technology

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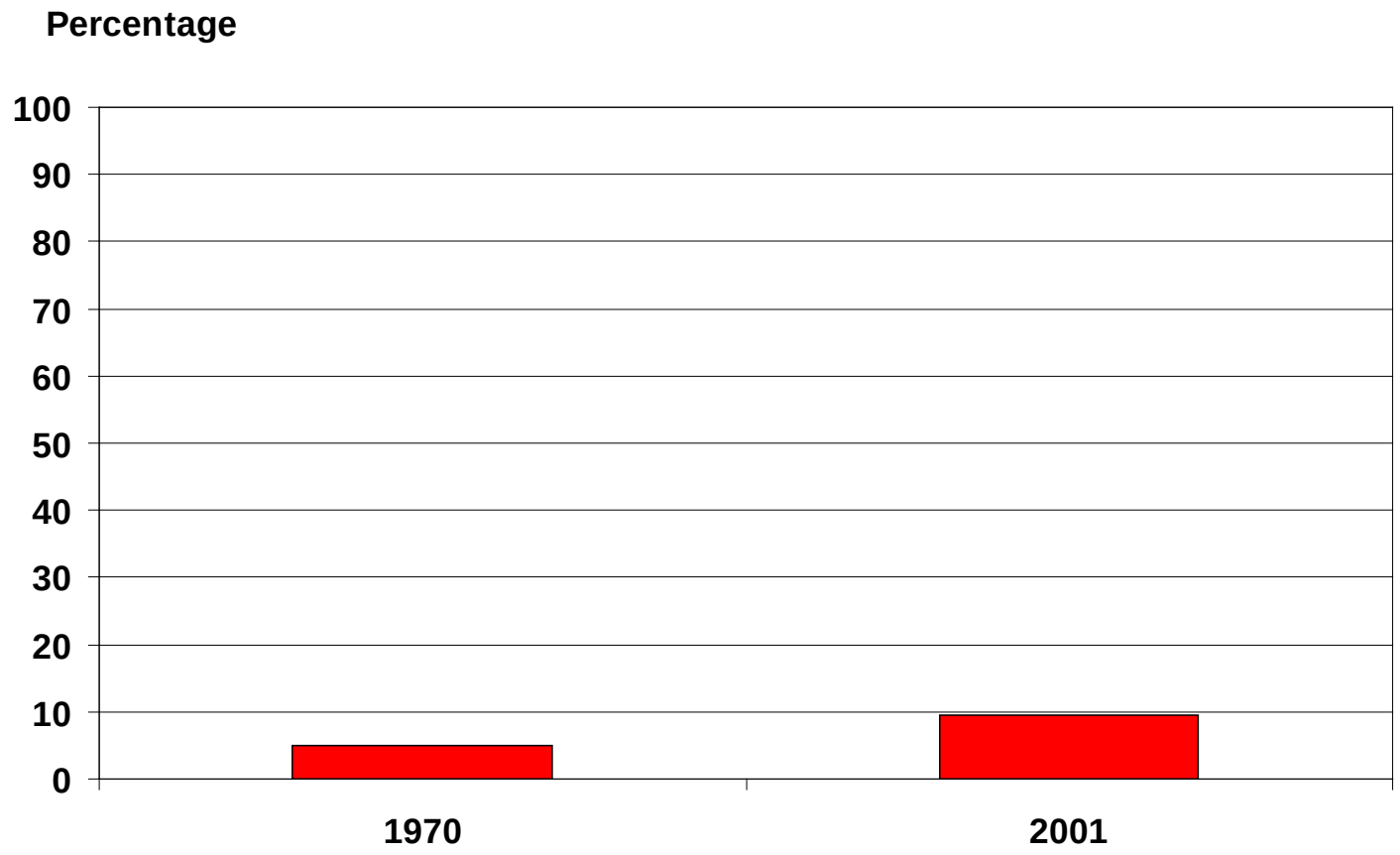

Source: Department of Energy.

What's Wrong with the Grid?

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- Majority of electricity capacity infrastructure *30 years old or more*, resulting in bottlenecks for transmission.
- Since 1990, demand for electricity up 25%, construction of transmission facilities down 30%.
- Renewable energy opportunities are limited due to the grid's age and distance from consumers.
- The "deregulated" electricity market has given rise to a trend of energy brokers gaming the market, the most notable of which being Enron.

Source: Department of Energy.

To Meet Future Electricity Needs the US Must:

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- “Federalize” grid with a single regulator like the highway system
- Adjust regulations to allow new investments in high-capacity transmission
- Expand transmission and distribution infrastructure (transformers, etc)
- Move from analog to digital energy management
- Focusing on “Smart Grid” technology

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Market Based Solutions to a Global Issue

Optimum U.S. Policy

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- The system that best incents developing world participation should win
- The system that best manages initial abatement cost volatility may win
- A hard cap on emissions and a global trading system is the most effective, and efficient, policy option.

Government Action: Create a Tax that Sets a Floor Price for Oil

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- A tax that would only kick in if oil prices fell to a level that undercut viability of alternative fuels/other energy producing sources
- For example, tax would have to be paid when oil is $38-40/barrel but it would go away if oil prices rose
- The function of this tax is not revenue, rather, it would be to create a downward limit for oil prices thereby dampening volatility

Key Design Features of a Carbon Cap-and-Trade Program

Stark Investments, Baker & McKenzie, Milken Institute

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- No price cap
- Auctioning of permits
- Early action credit
- Long-term (until 2050)
- Economy-wide and includes all greenhouse gases
- Banking and borrowing allowed
- Offsetting allowed
- Linking/trading with other schemes

Market-based Approach

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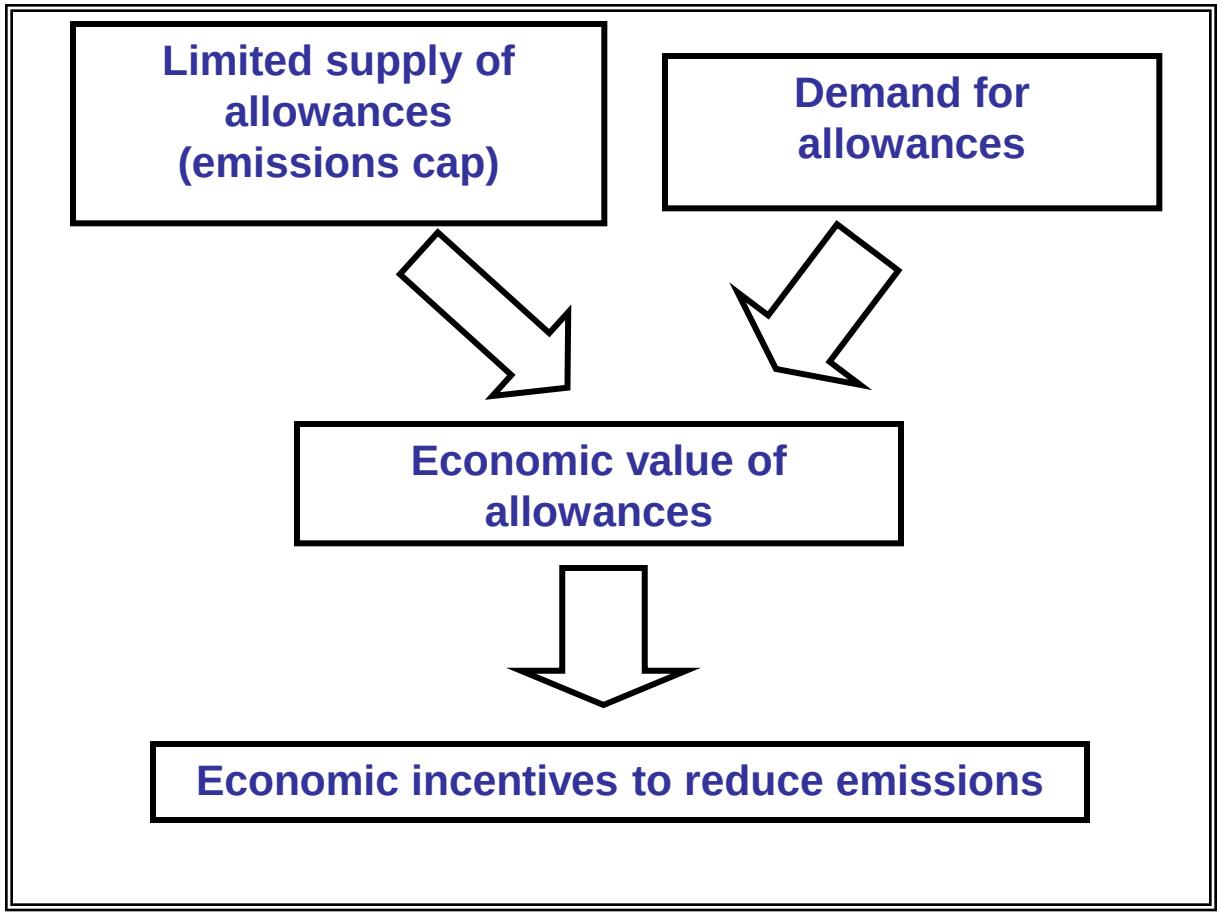

Source: Burtraw 2006

Effectively Reduce Emissions

Cap and trade reduces emissions when properly designed

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- Artificial price caps are not “safety valves.”
  - This so-called “safety valve” is an artificial price cap.
  - Half a market is not a market.
  - Artificial price caps don’t support new technology development.
  - The NCEP’s computer model, with artificial price caps, only reduces half of the emissions that other models, without price caps or “safety valves” do by the year 2020.
  - Effective alternatives to price caps are rewarding creditable early action, linking to global markets to reduce price volatility, and allowing offsets.

- Absolute reduction targets is the key to stabilizing carbon dioxide concentrations
  - Absolute targets increase accountability to the public
  - Emissions are a global problem and an effective cap and trade program must link to global markets

Invest in New Technologies

An effective cap and trade program will foster American creativity

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- New technologies are needed to smooth long-term adjustment to meet increasing emissions targets
  - The market, not the government, should pick the winners in the evolution of new technologies
- U.S. depth in low-carbon technology R&D, with the right investment incentives, will help us maintain global competitiveness
  - China, the U.K., Denmark and Spain are beginning to export clean technologies
  - New technology industries will minimize economic dislocation and create and sustain high-value jobs here in the United States

Conclusion

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- The world is changing and America's energy investment must take leaps forward
- An effective energy policy should work in concert with environmental needs and regulations
- In this transition, many opportunities will arise for the entrepreneur to find their place in renovating and building the foundation of America's energy infrastructure