



Why Kauai Can and Should Lead the Way on Renewable Energy: A Malihini's Perspective

Presentation to:

*KEDB Renewable Energy Committee:
The Future of Renewable Energy on Kauai*

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Our Nation's Major Energy Problems

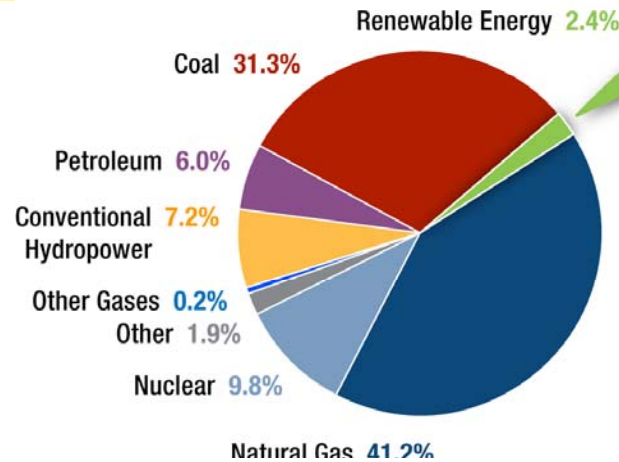
We rely on electricity for convenience, safety, security and economic growth

- Coal, nuclear and natural gas are the primary energy source for producing electricity on the mainland
 - Oil remains primary fuel for producing electricity only in Hawaii
- Renewable energy (wind, solar, geothermal, water) requires higher capital cost but no reliance on fuel
 - Traditionally has been more expensive
- Power Plants (fossil fuel) are major source of greenhouse gas emissions

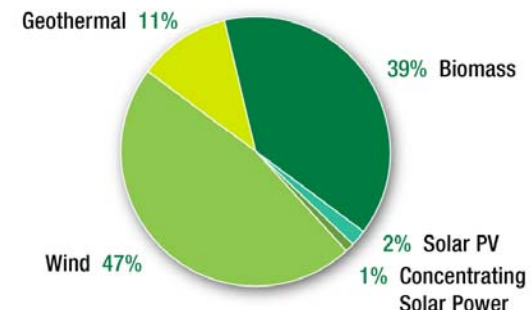


US Nameplate Capacity & Generation

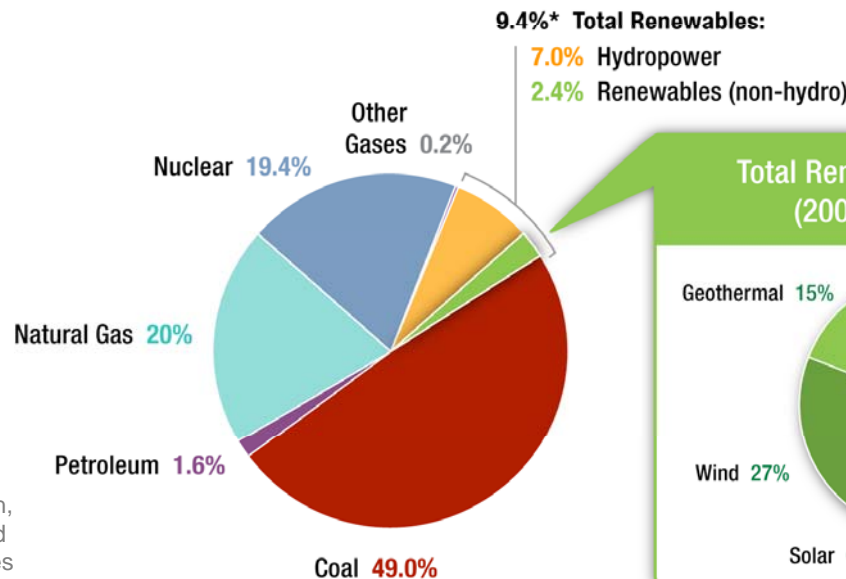
U.S. Electric Nameplate Capacity (2006): 1,074 GW



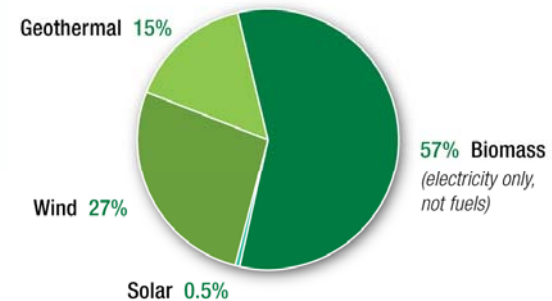
U.S. Renewable Energy Electric Capacity (2006): 25.3 GW



U.S. Electric Net Generation (2006): 4,065 billion kWh



Total Renewable Net Generation (2006): 96.7 billion kWh



Other includes: pumped storage, batteries, chemicals, hydrogen, pitch, purchased steam, sulfur, tire-derived fuels and miscellaneous technologies

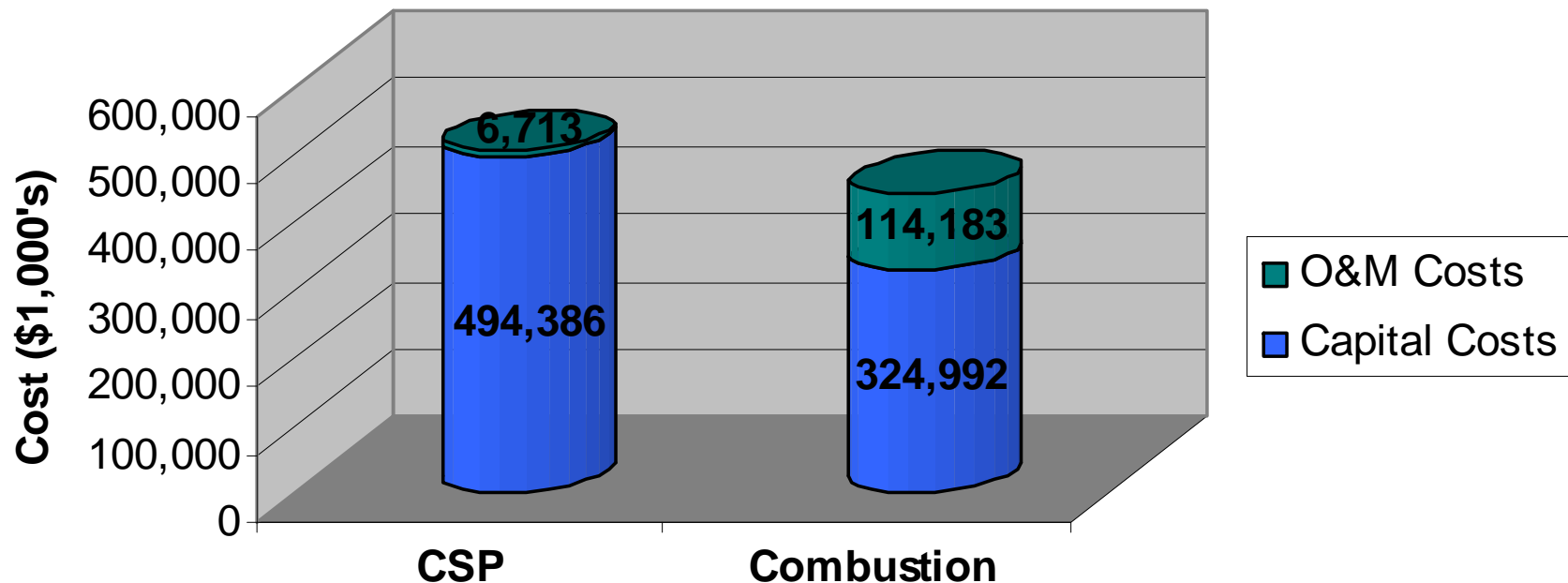
* Sources: EIA, AWEA, IEA, NREL, GEA



Renewable Power Plants: Higher Capital Costs

Cost Comparison: Concentrating Solar Power Plant vs. Natural Gas Combustion Plant

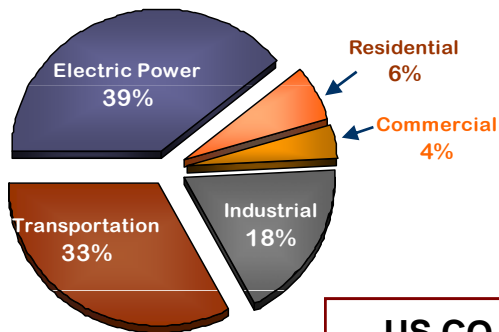
(100 MW CSP w/ 6 hrs storage vs. 85 MW Simple Cycle Combustion Turbine Plant)





Emissions sources

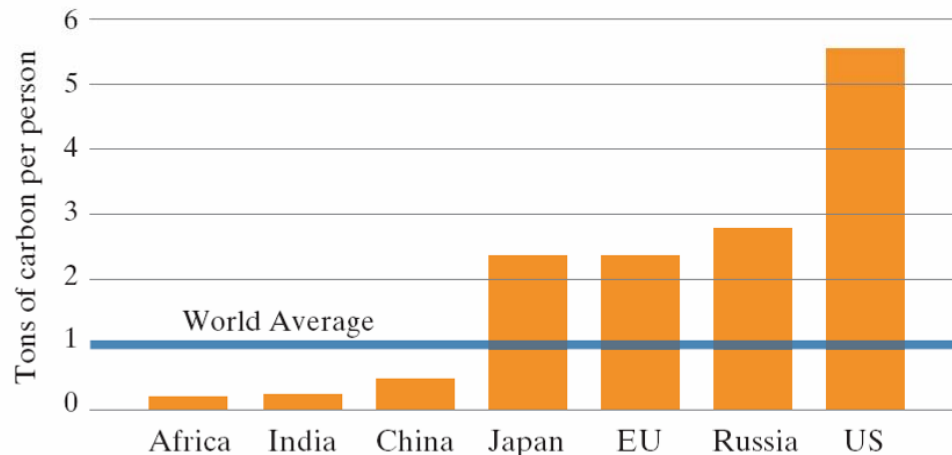
U.S. CO2 Emissions by Sector



**US CO₂ emissions:
5.9 gigatons/year**
(Global CO₂ : 27 gigatons/year)

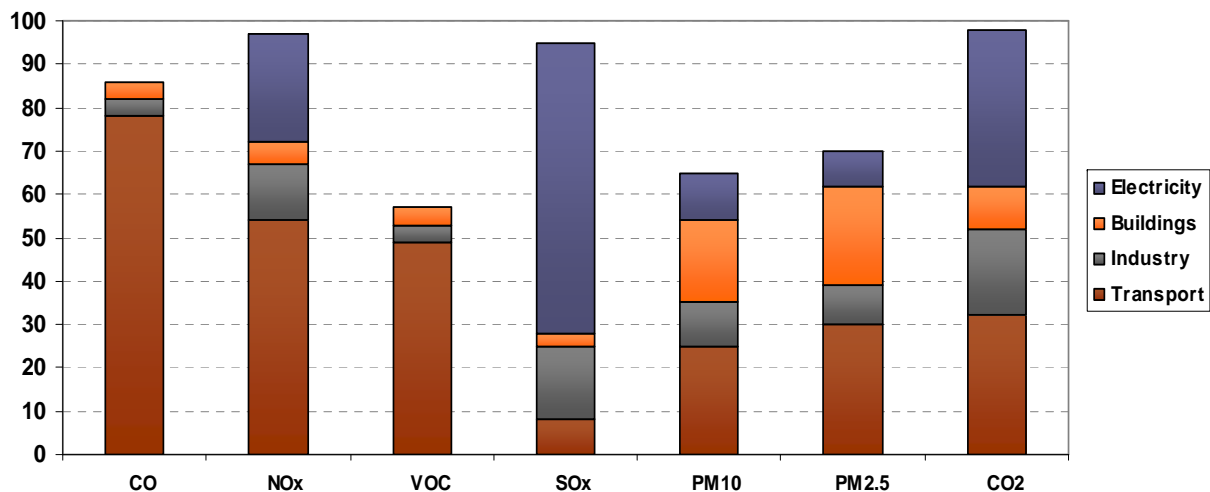
Source: EIA, Annual Energy Review, 2005.

Annual Carbon Emissions Per Person



Source: World Resources Institute

U.S. Energy-Linked Emissions as Percentage of Total Emissions





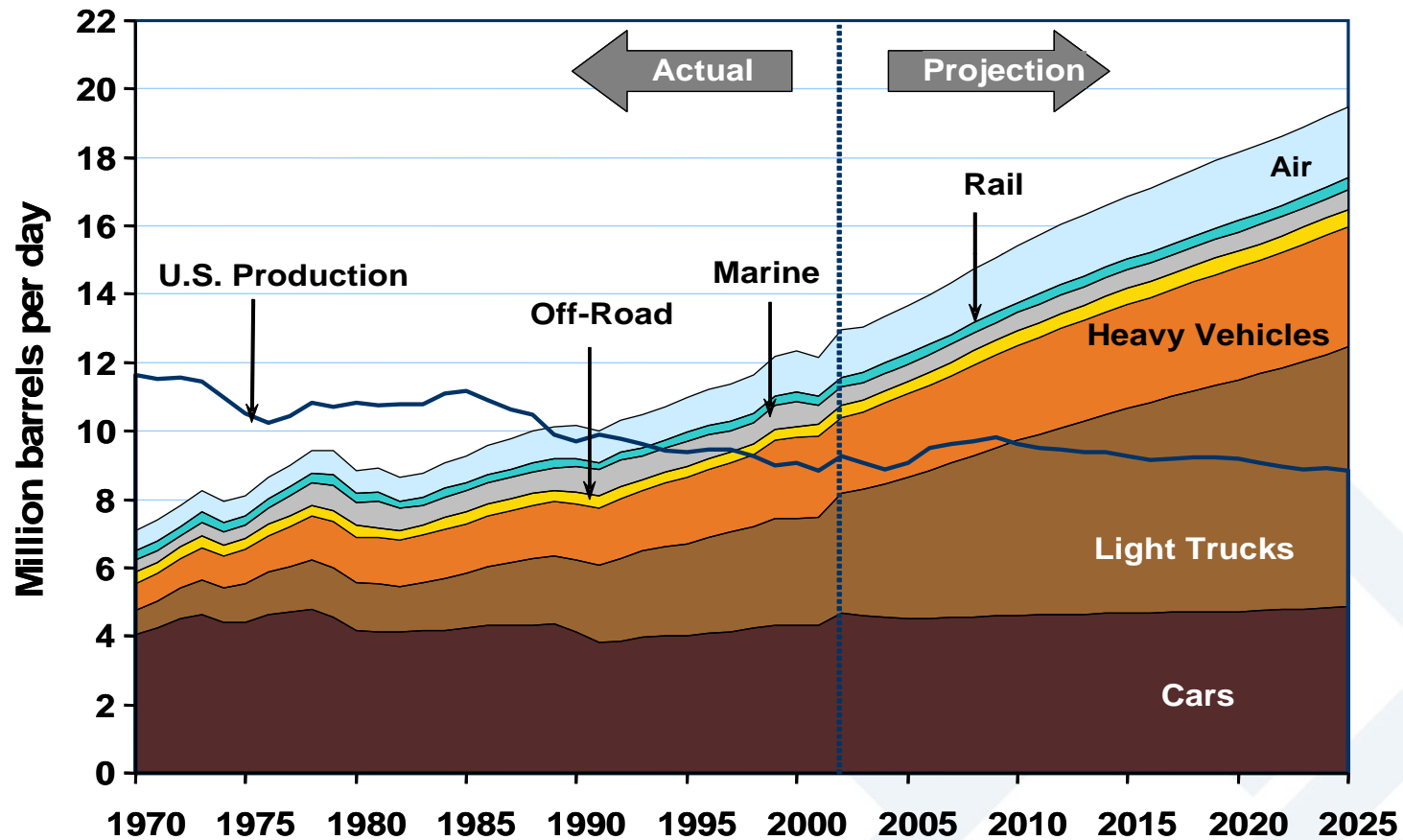
Our Nation's Major Energy Problems

We rely on automobiles for our economy and personal freedom

- Gasoline is our only source of fuel for our automobiles
- Gasoline refined from crude oil and we currently import more than 65% of crude oil
- Smog and greenhouse gas emissions also result from reliance on our gasoline internal combustion engines



US Energy Dependence

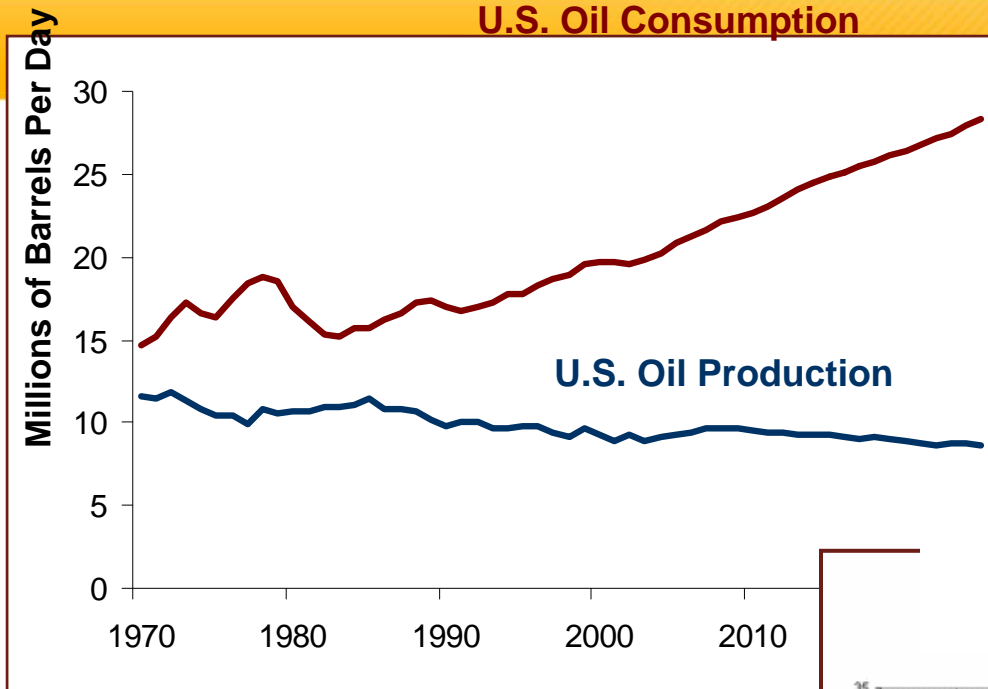


- *Transportation accounts for 2/3 of the 20 million barrels of oil our nation uses each day.*
- *The U.S. imports 55% of its oil, expected to grow to 68% by 2025 under the status quo.*
- *Nearly all of our cars and trucks currently run on either gasoline or diesel fuel.*



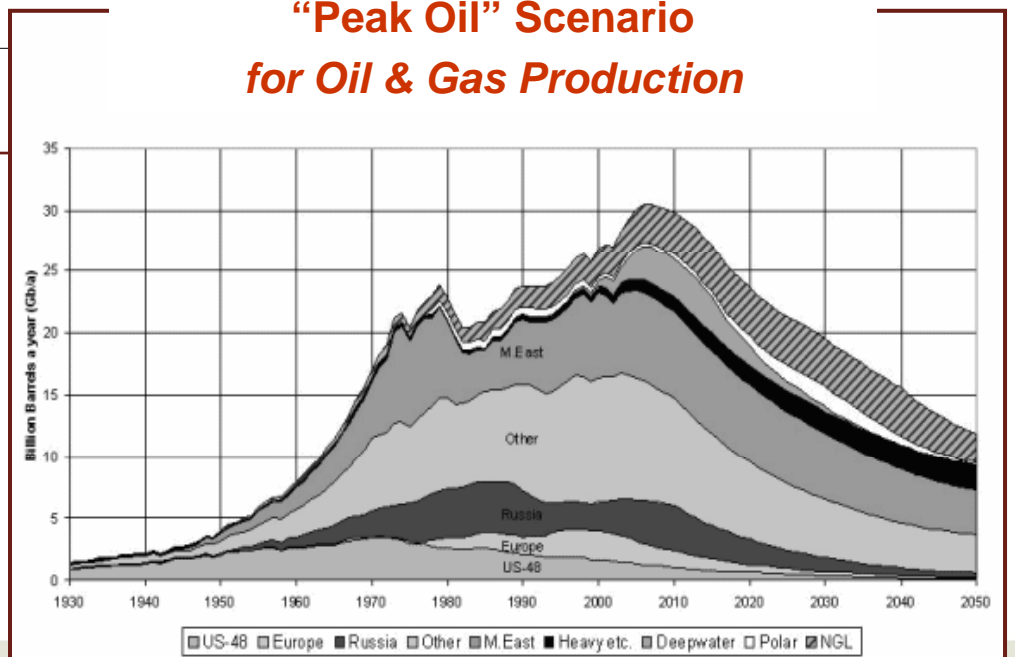
U.S. Oil Consumption

The problem of oil



Growing Import Gap

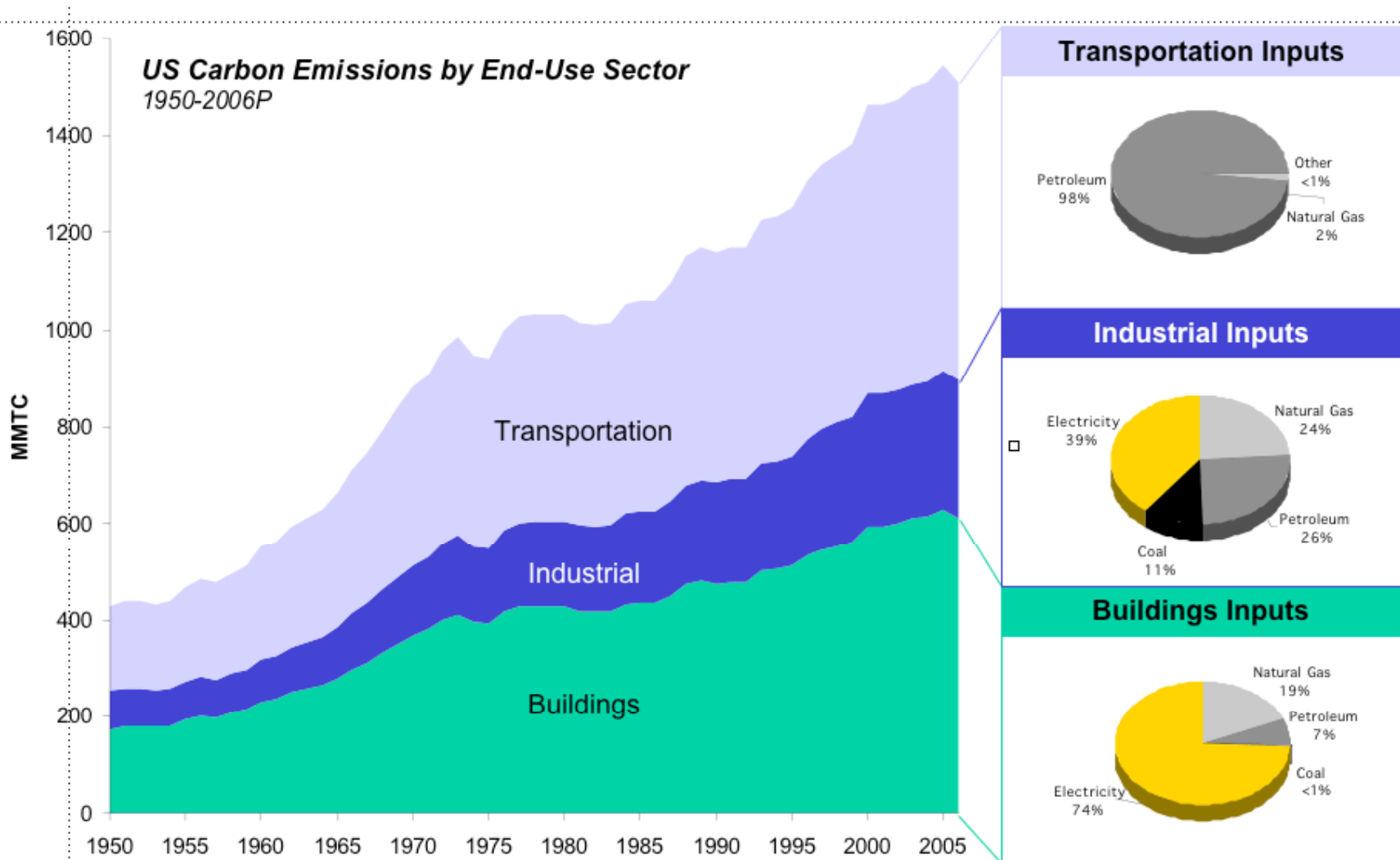
“Peak Oil” Scenario for Oil & Gas Production



Sources: EIA, Annual Energy Review 2005, and the Association for the Study of Peak Oil & Gas (UK)



Carbon Emissions Footprint





Our Nation's Major Energy Problems

We take energy for granted and waste too much energy

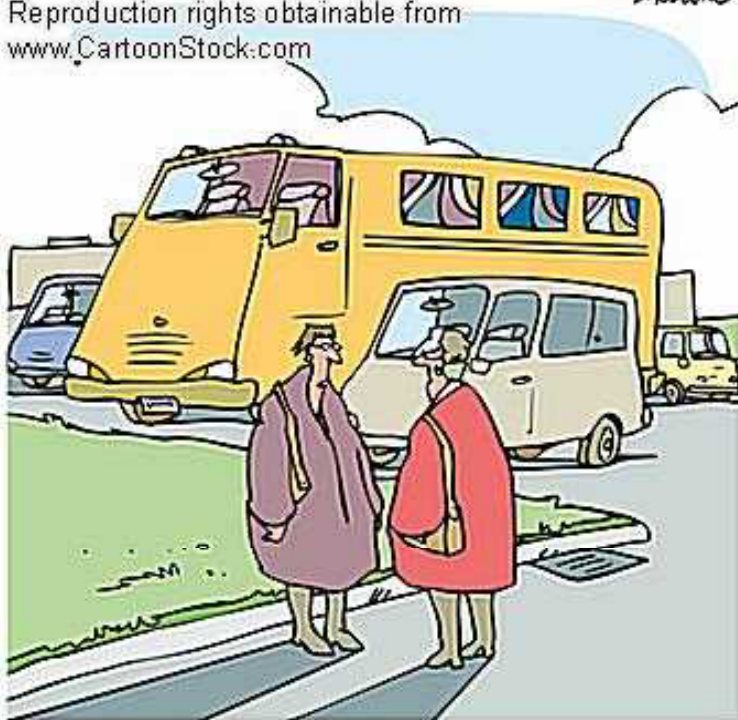
- Personal behavior does not factor energy waste
 - Shut off lights
 - Purchase gas guzzlers
 - Drive short distances
- Build buildings at lowest cost without regard for energy waste



Wasting Energy: A Bad Habit that Feeds Our Addiction to Oil

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"Love the motor home. I just never felt safe driving around in a little van."

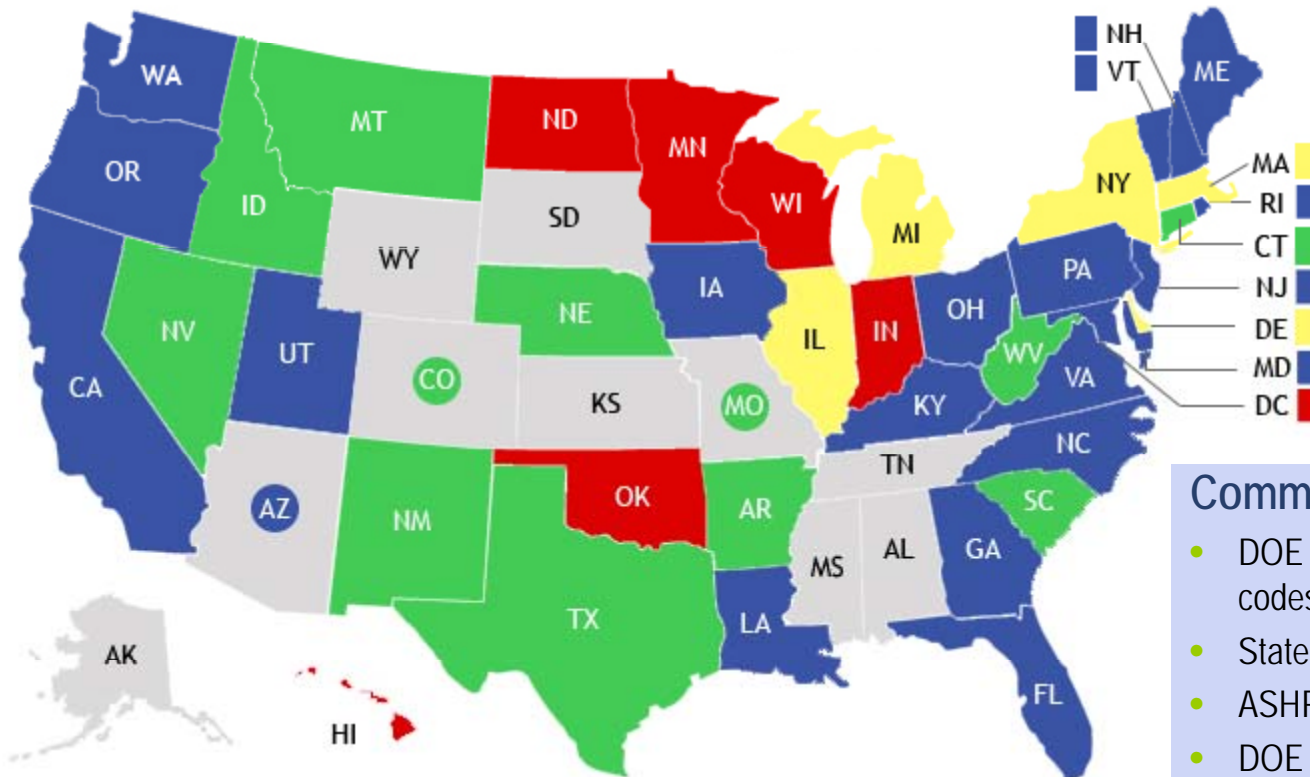
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"I PAY FOR MY ENERGY, AND IF I WANT TO WASTE IT, I'LL WASTE IT."



Commercial State Energy Code Status - AS OF AUGUST, 2007



- Adopted code meets or exceeds 2006 IECC / ASHRAE 90.1-2004 or equivalent
- Meets 2003 IECC / ASHRAE 90.1-2001 or equivalent
- Meets 2001 IECC / ASHRAE 90.1-1999 or equivalent (meets EPCA)
- Precedes ASHRAE 90.1-1999 or equivalent (does not meet EPCA)
- No statewide code
- New code soon to be effective
- Significant adoption in jurisdiction

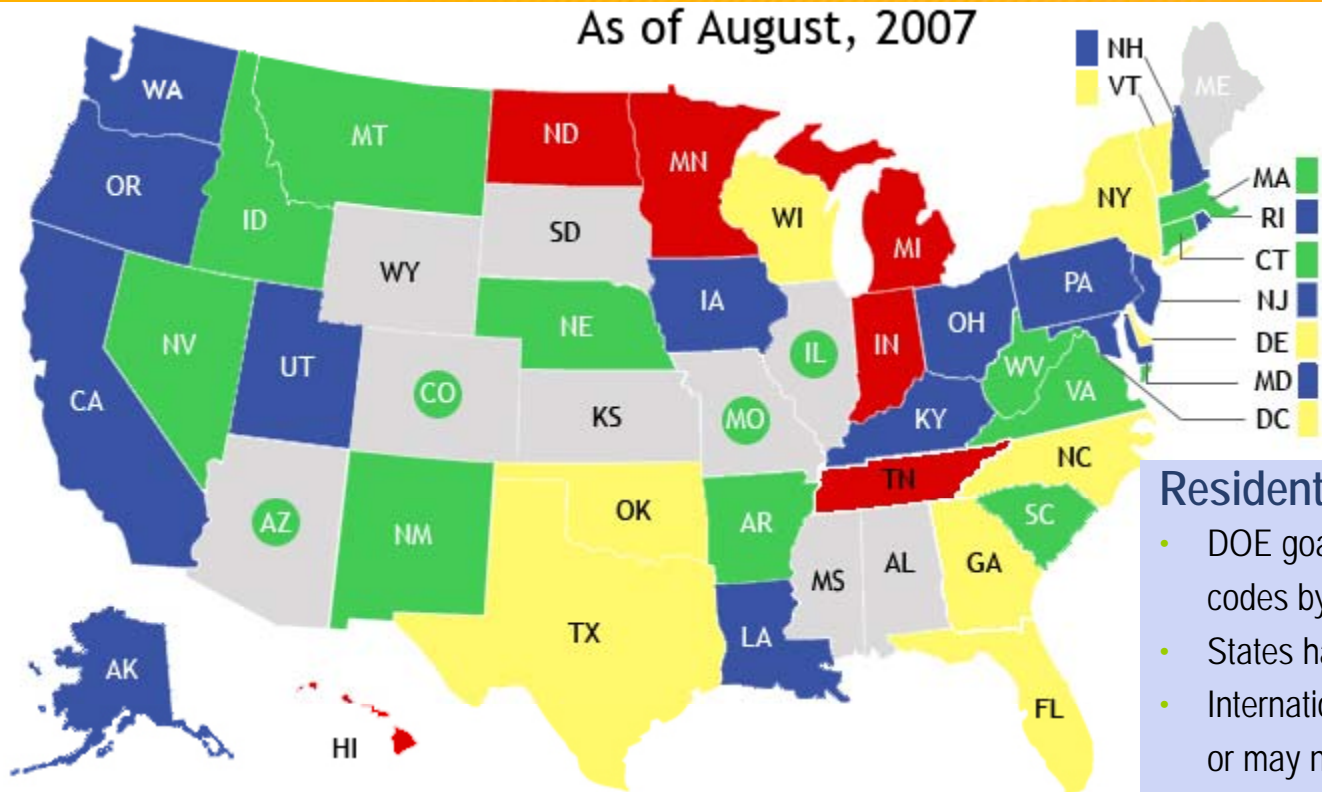
Commercial

- DOE goal: 30% improved codes by 2010
- States have announced support
- ASHRAE is strongly supportive
- DOE & ASHRAE also launching long-term code development for Zero Energy Buildings.

Source:
Building Codes Assistance Project
www.bcap-energy.org



Residential State Energy Code Status - AS OF AUGUST, 2007



Residential

- DOE goal: 30% improved codes by 2010
- States have announced support
- International Code Council may or may not support

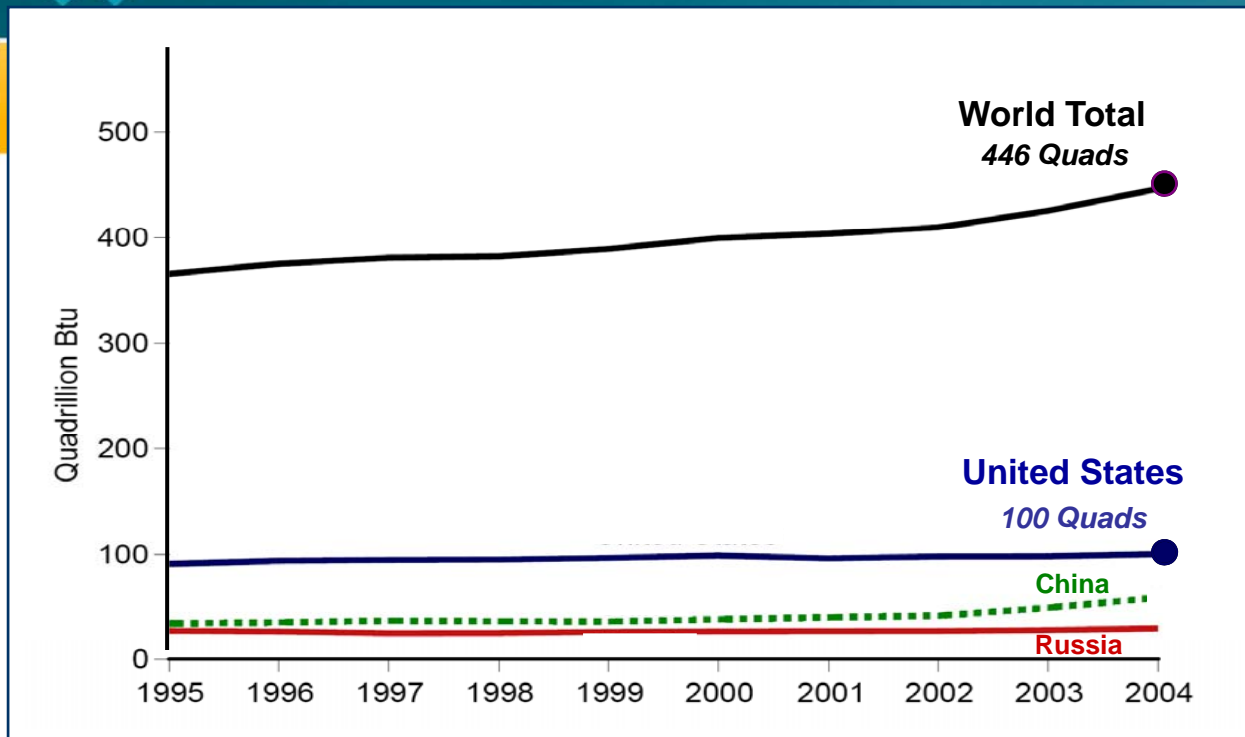
- Adopted code meets or exceeds 2006 IECC or equivalent
- Meets 2003 IECC or equivalent
- Meets 1998-2001 IECC or equivalent (meets EPCA)
- Precedes 1998 IECC or equivalent (does not meet EPCA)
- No statewide code
- New code soon to be effective
- Significant adoptions in jurisdictions

Source:
 Building Codes Assistance Project
www.bcap-energy.org



Consequences of Our Nation's Energy Problems

- US has 4% of population and currently uses 25% of the world's oil US Greenhouse gas concentration exceeds 380 ppm
- Transfer of Wealth - \$700 billion annually to import nearly 70% of our oil requirements
- Economic development – US has been losing manufacturing jobs for more than

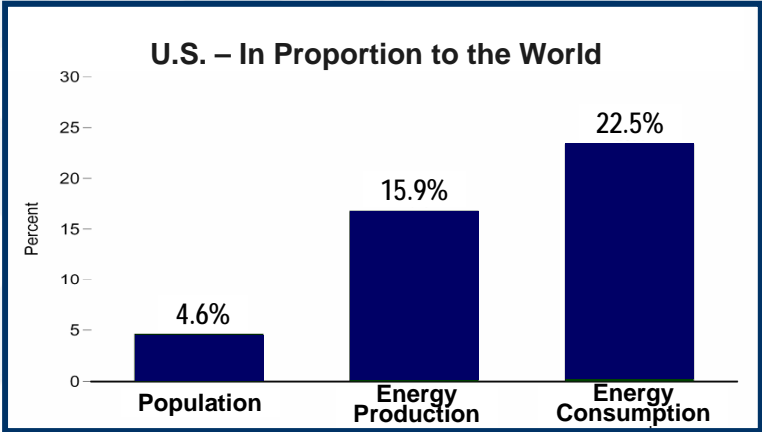


Global Consumption Accelerating

U.S. Consumption Out of Proportion with Population and Production

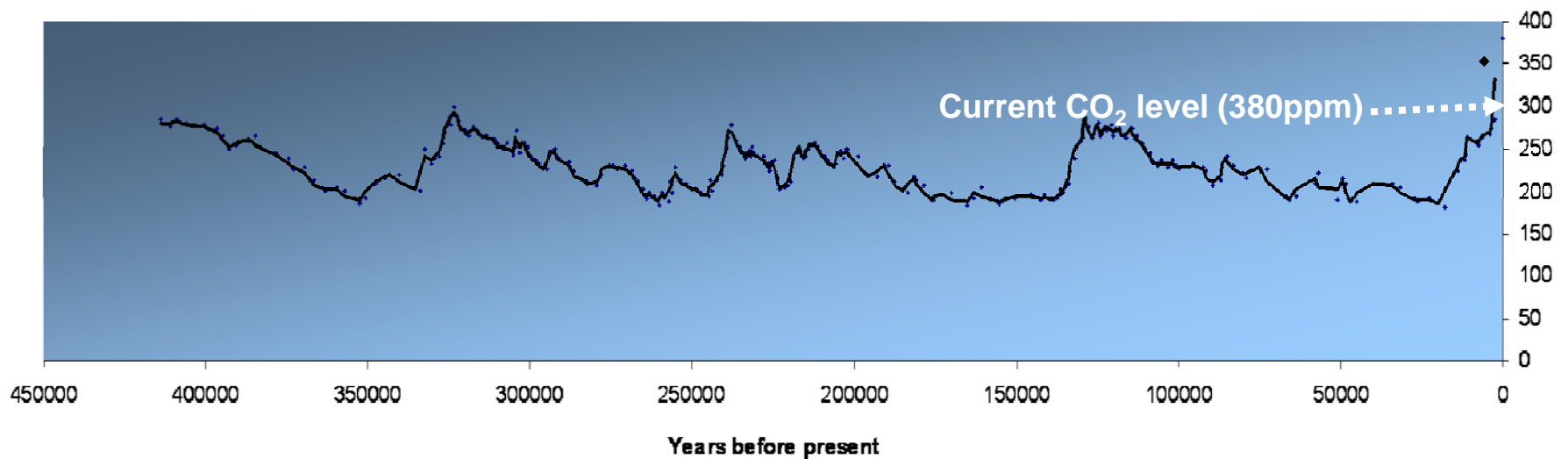
BASIC ENERGY CONVERSIONS
 100 quadrillion British Thermal Units (Quads) equals:

- 105.5 exa Joules (EJ)
- 3.346 terawatt-years (TW-yr)
- 3,346 gigawatt-years (GW-yr)
- 3,346,000 megawatt-years (MW-yr)



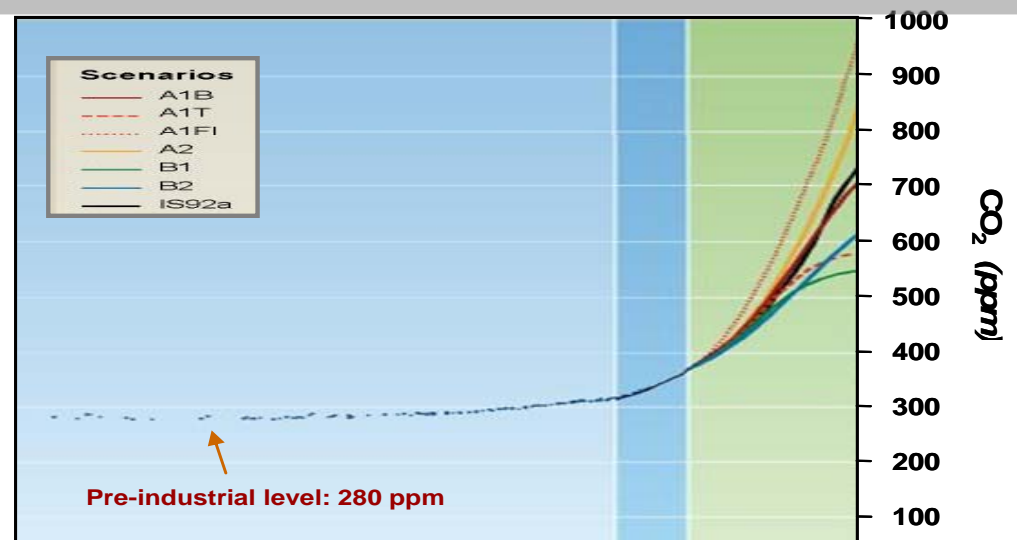


CO₂ levels



"...the Review estimates that *if we don't act, the costs and risks of climate change will be equivalent to 5% of global GDP each year... If a wider range of risks and impacts is taken into account, damage could rise to 20% of GDP or more. In contrast, the costs of action ... can be limited to around 1% of global GDP each year.*"

Stern Review, HM Treasury, UK





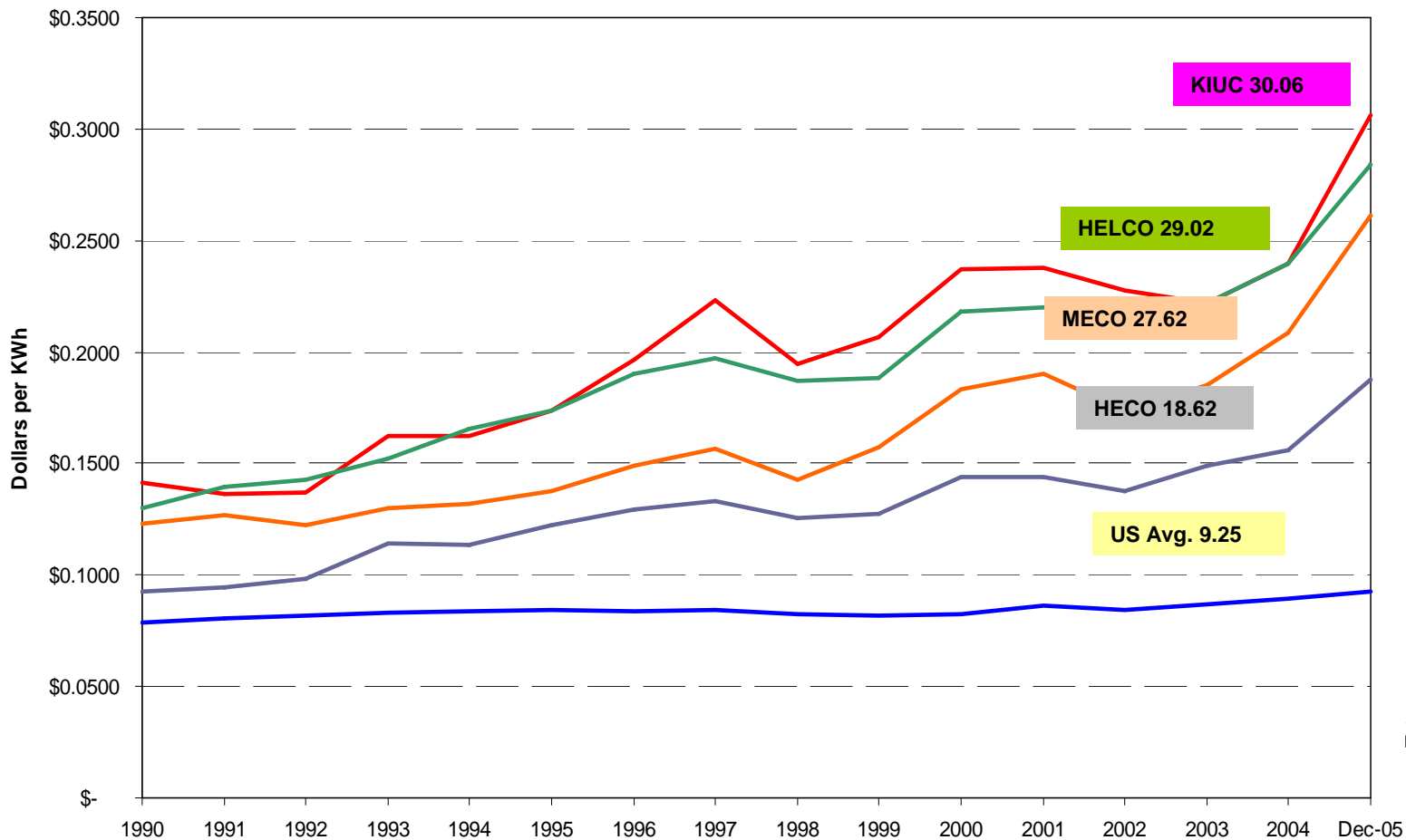
Hawaii and Kauai Energy Challenges

- Hawaii suffers from the highest energy prices in the nation, Kauai has the highest energy prices in Hawaii
- Hawaii is totally (> 90%) reliant on imported oil, more than \$3 billion annually leaves the island
 - 8% of Hawaii's GDP (2005) consumed in energy
- Hawaii needs to diversify its economy away from tourism and agriculture – clean energy is a good option
- Hawaii and Kauai are blessed with rich renewable resources that can be harvested to serve its energy needs



Hawaii's Electricity Prices

Comparison of Hawaii and US Residential Electric Utility Rates
1990-2005



Cents per kWh
December 2005
and
Percent Increase
1990 to Dec 2005

KIUC 30.06 cents
116%

HELCO 29.02 cents
118%

MECO 27.62 cents
113%

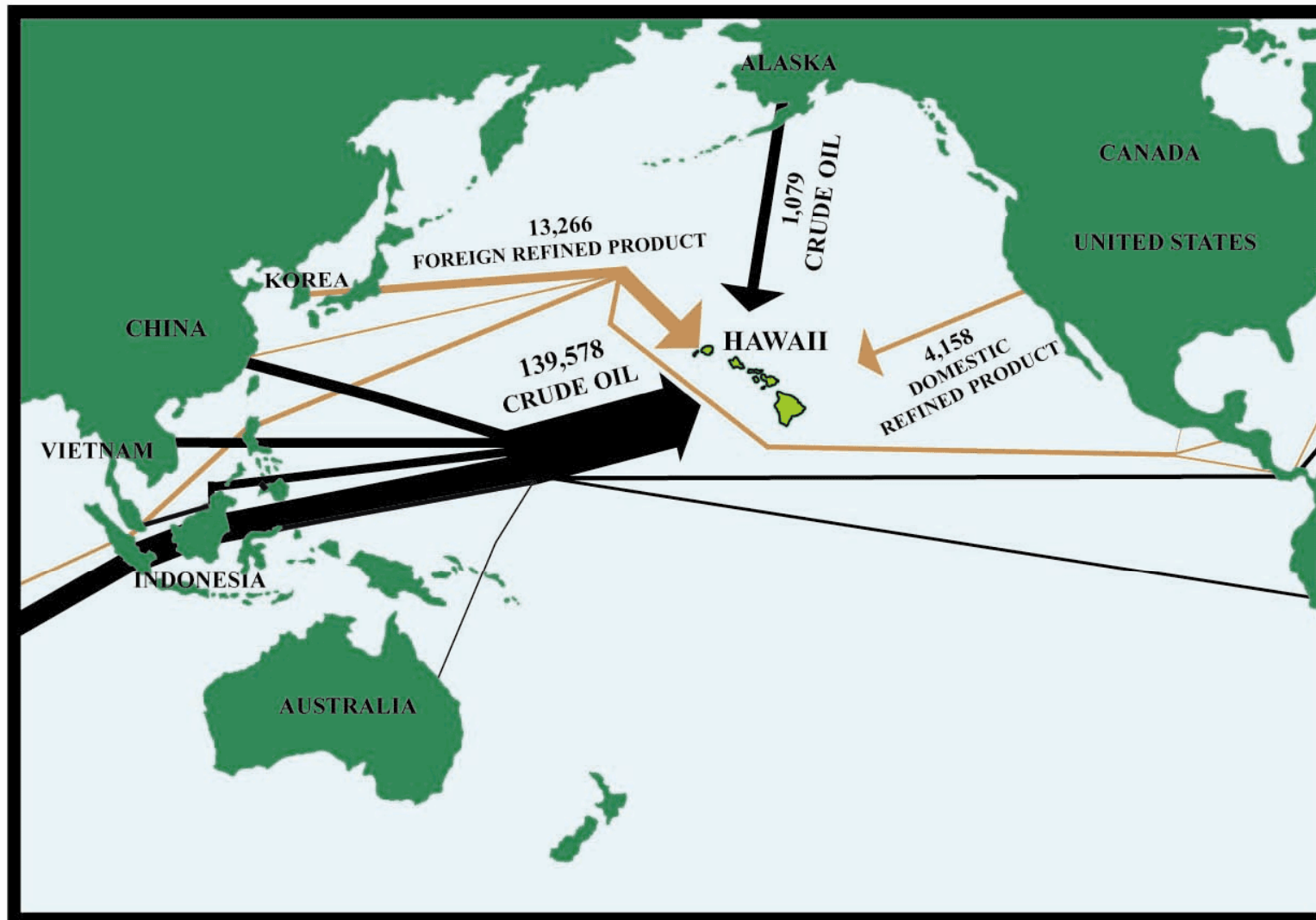
HECO 18.62 cents
103%

US Avg 9.25 cents
18%

NOTE
Rates for 1990 to 2004 are
annual averages. Rates for
December 2005 are for that
month only. 2005 annual
average will be lower.



Movement of Petroleum to Hawaii - 2006



CRUDE OIL

Vietnam	22.9%
Saudi Arabia	19.9%
Brunei	10.7%
Indonesia	10.0%
China	9.8%
Thailand	5.2%
Libya	3.9%
Equador	3.4%
Angola	2.3%
U.A.E	2.2%
Oman	2.0%
Other Foreign	7.4%
USA-Alaska	0.8%

REFINED PRODUCT

S. Korea	26.8%
USA	23.9%
India	14.3%
El Salvador	11.1%
Singapore	7.8%
Mexico	3.8%
Indonesia	3.4%
Jamaica	3.3%
Trinidad	2.0%

Num



Our Nation's Energy Solutions

- Efficiency must be first
 - Education and Behavioral Change
 - Building Codes and Standards
- Diversify Our Transportation Fuel Mix via Evolution
 - Hybrid engine electrics
 - All electrics with limited range
 - Natural gas vehicles
 - Hydrogen and Fuel Cells
- Develop as much cost-effective renewable electricity as possible
- Invest in Electric Grid Modernization
- Eventually - bring back a nuclear option as baseload backbone



Projected U.S. Energy Demand with Building, Industry, and Vehicle Efficiency Potential

