



Hawai'i Clean Energy Initiative

2009 Engineer's Week luncheon
February 17, 2009



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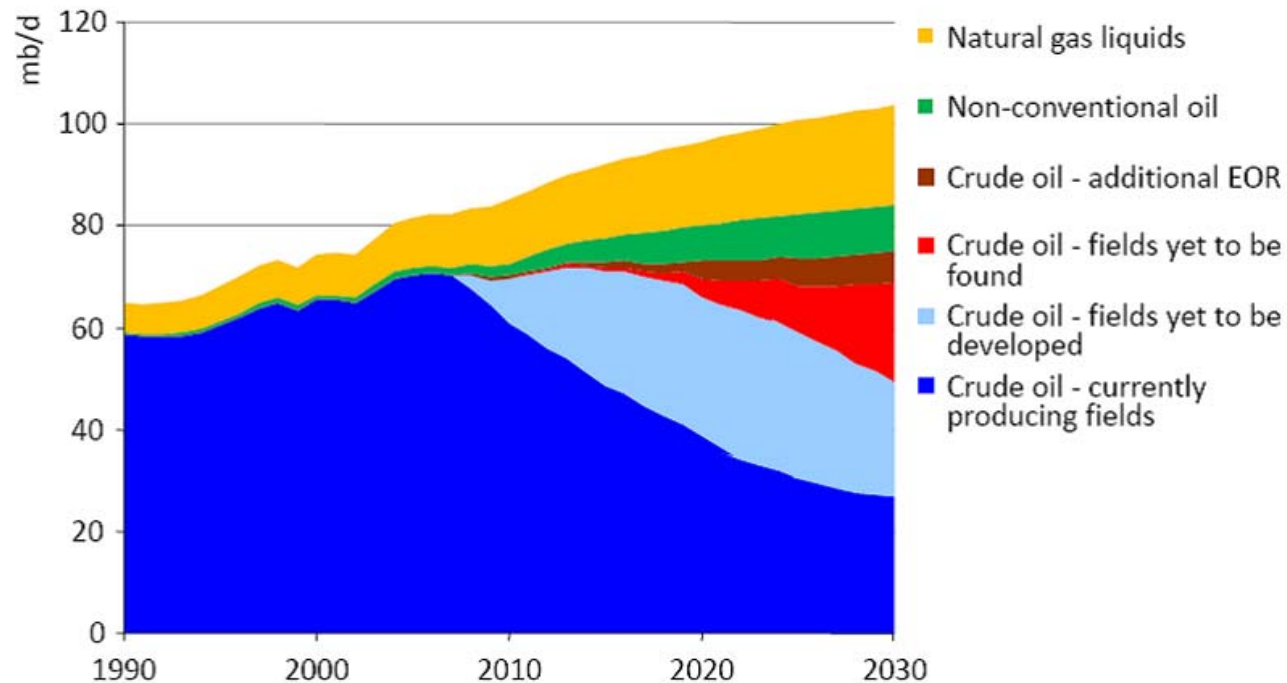
- ▶ Hawaii's Energy Context – A Somber Reality
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- ▶ 2009 Legislative Recommendations – A Major Step Forward



World oil production in the Reference Scenario

World
Energy
Outlook
2008

Source: International Energy Agency



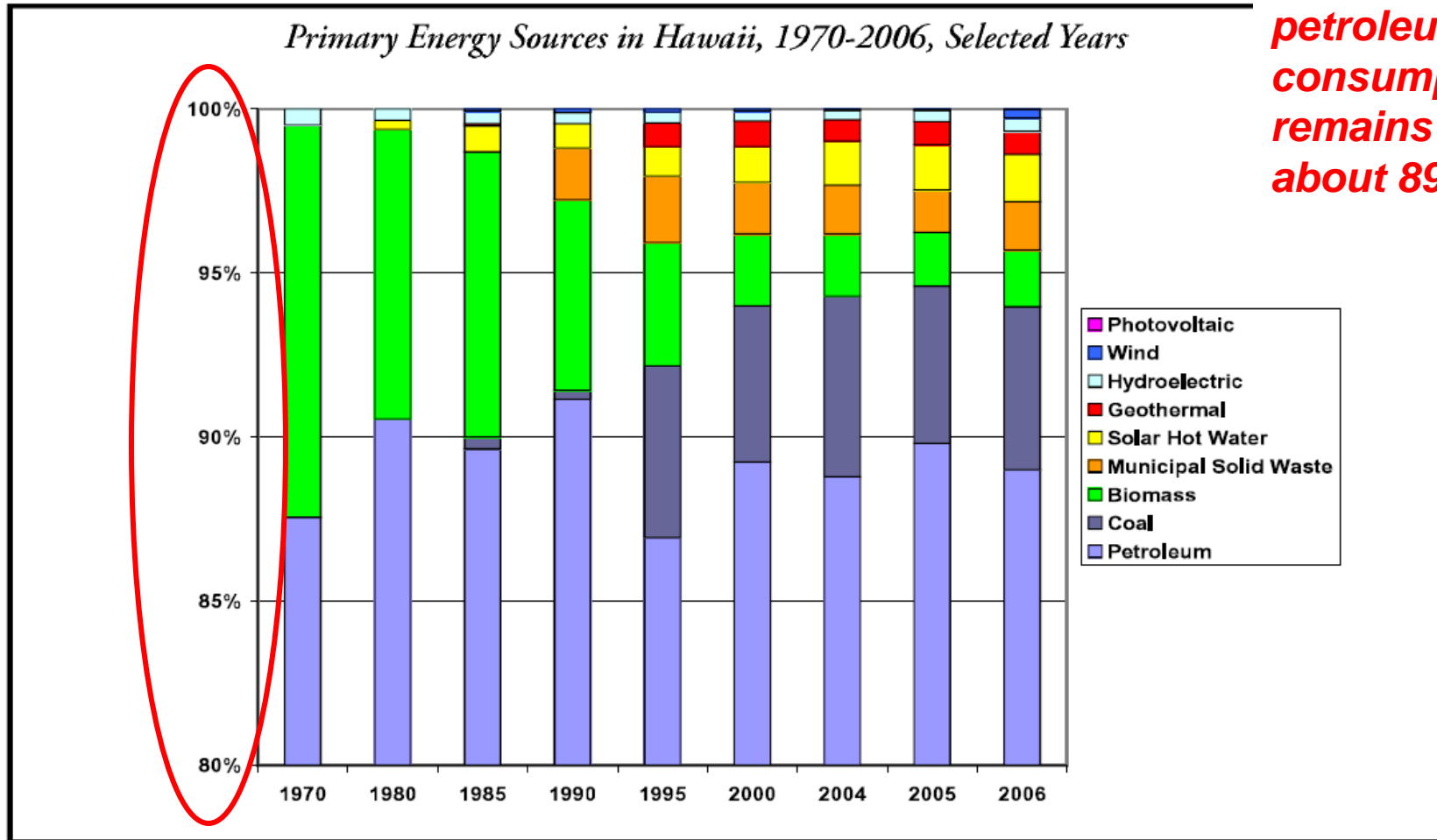
To generate the energy required worldwide by the 2030s would require us to find an additional 1.4 MBD every year until then.

Can Hawaii assume this will happen, and base our future on it?



Reducing Hawaii's dependence on fossil fuels is a long-standing objective

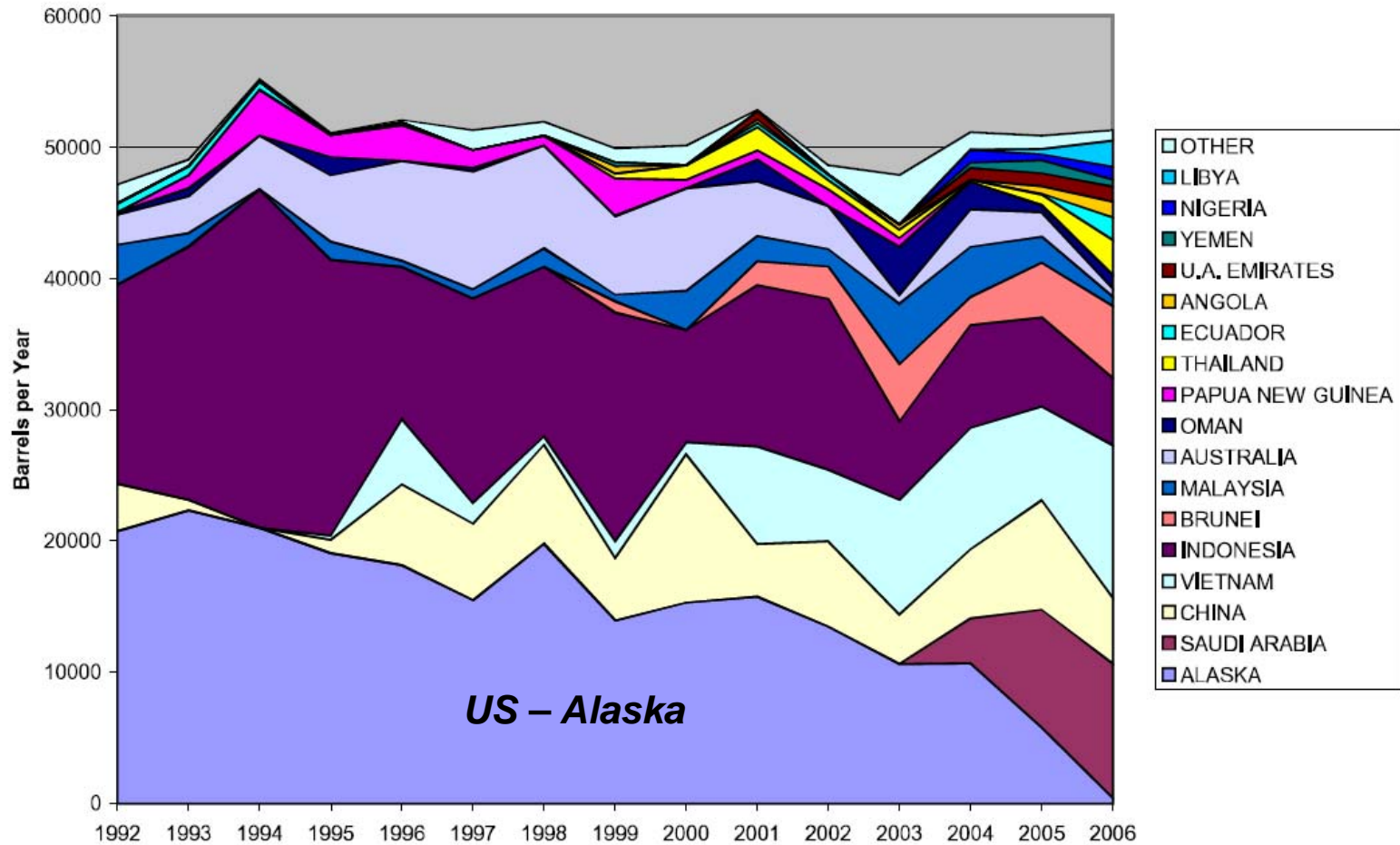
Over 36 years, petroleum consumption remains at about 89%



Despite objective, little progress made – the needle has not moved



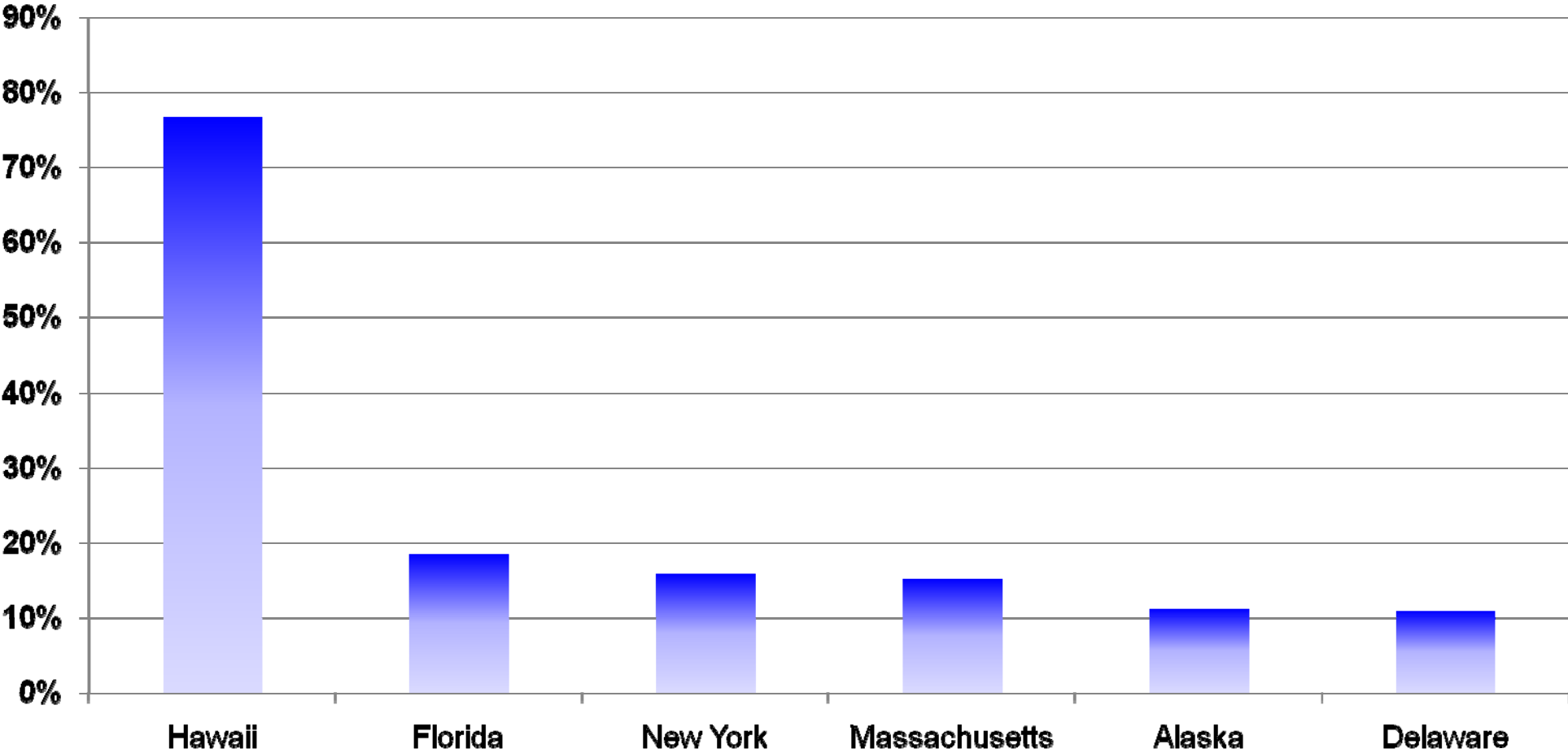
Alaska North Slope oil, the basis for the design of our refineries, is no longer available



More than 96% of petroleum in Hawaii now comes from foreign sources



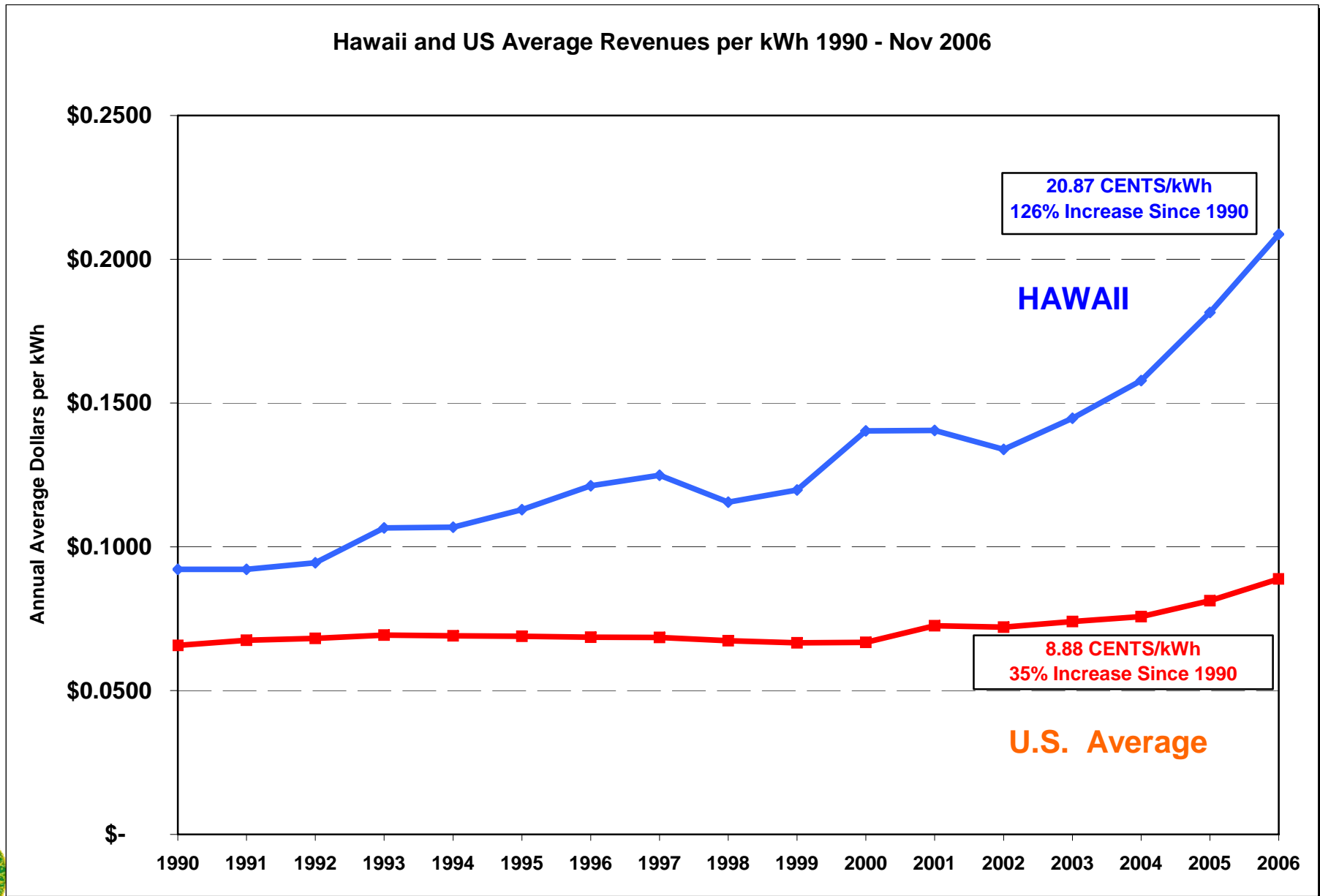
Hawaii is the most petroleum dependent state



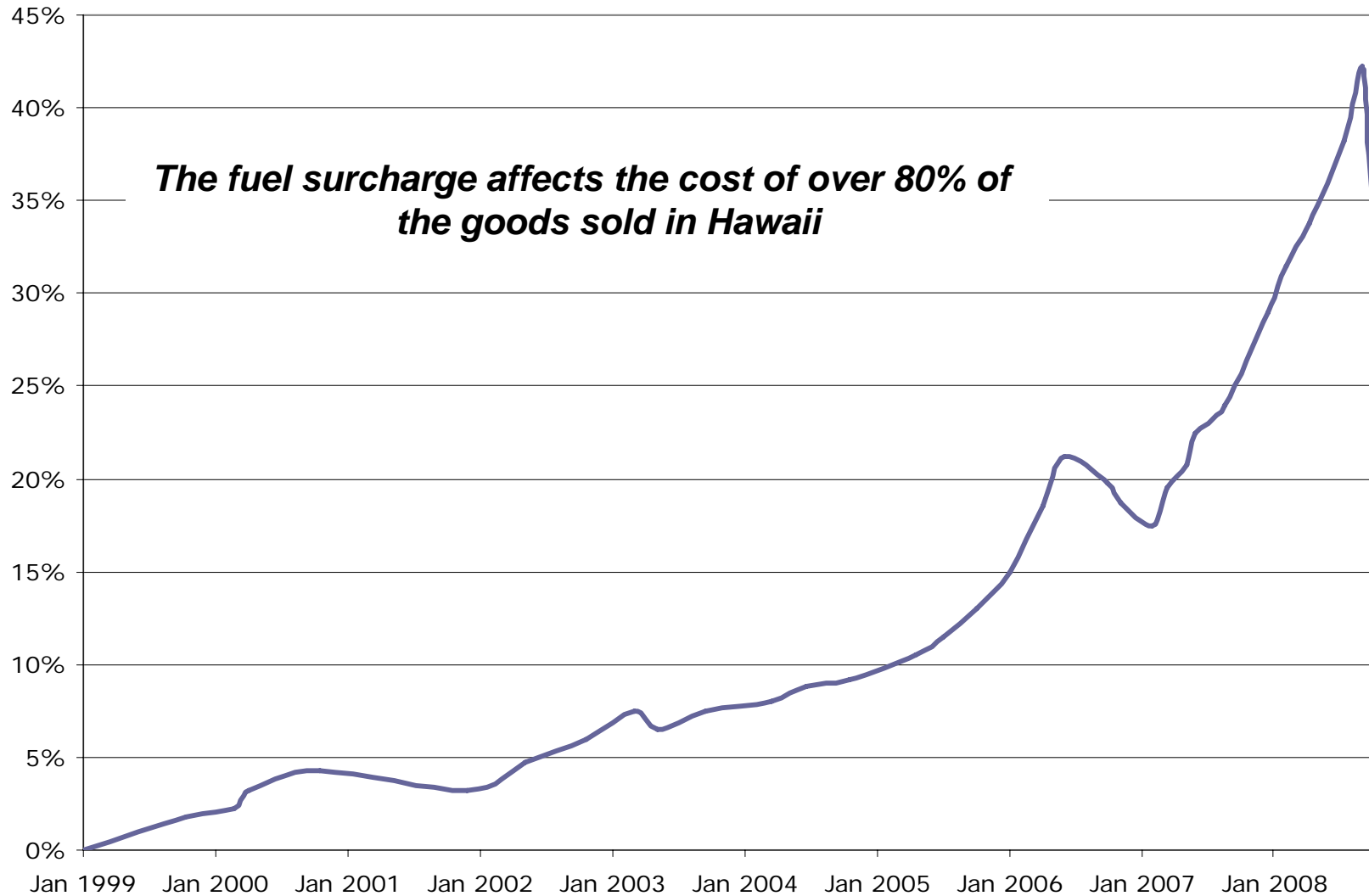
Petroleum dependence for electricity – top six states



Hawaii has the highest electricity prices in the U.S.

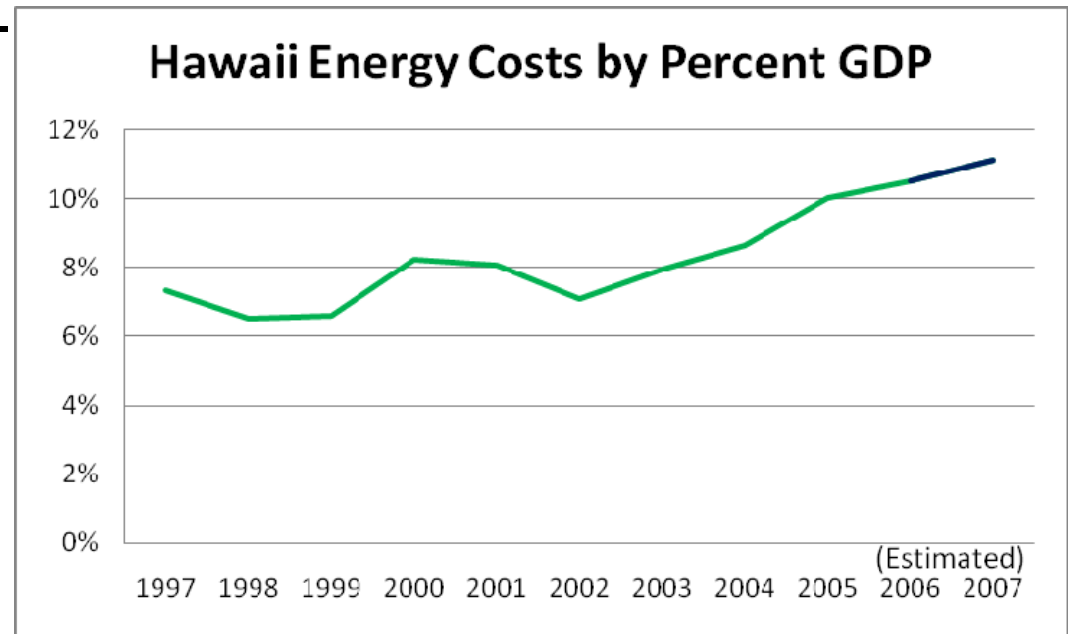


High energy costs multiply throughout the economy

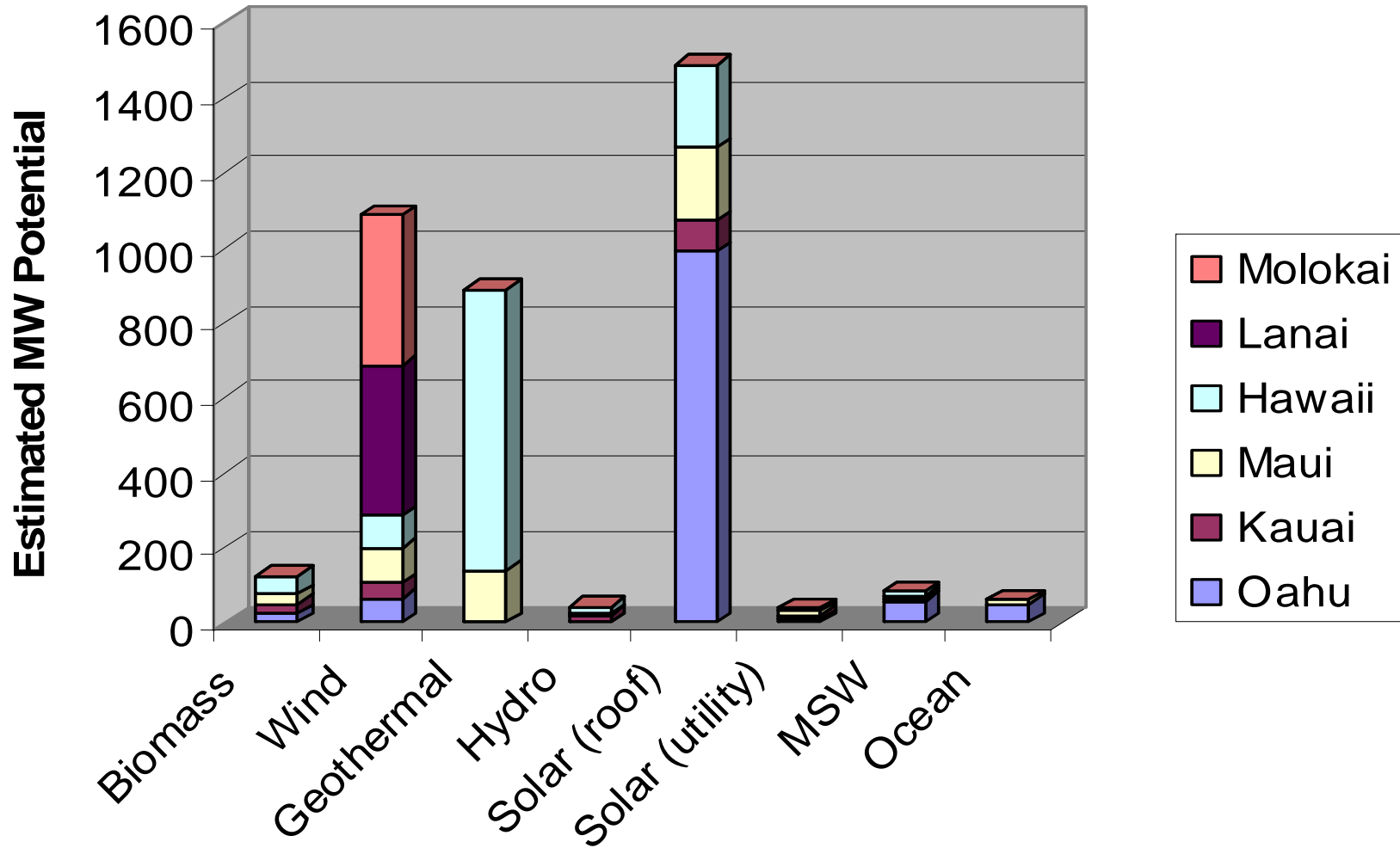


Economic impact of dependence on expensive energy

- ▶ Household fuels and utilities **costs rose 36.4 percent**, year-over-year, in the Honolulu CPI during 2Q'08
- ▶ Mainland energy costs are 4% of a state's Gross Domestic Product; in Hawaii, it approaches 11%, **almost 3 times as much**



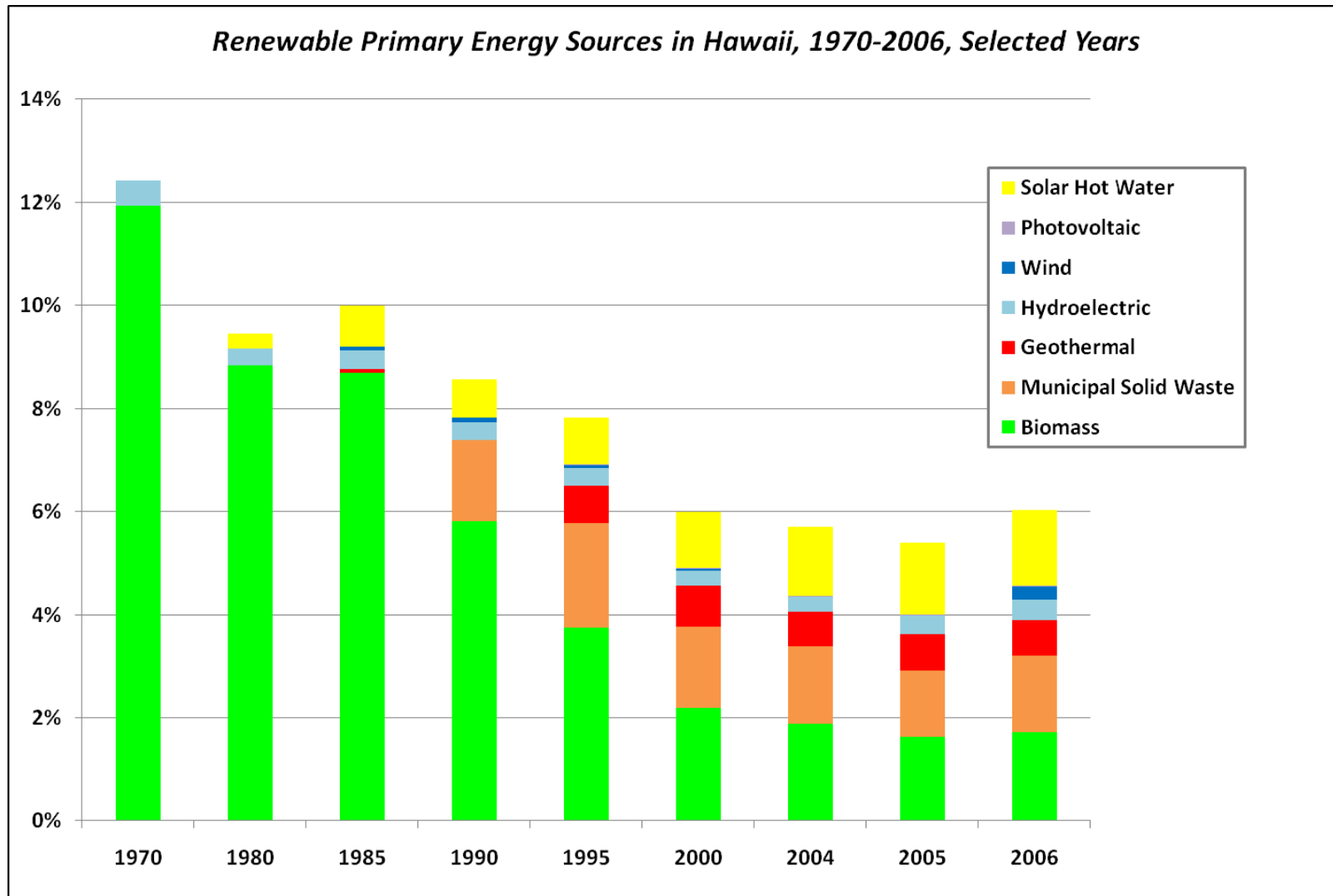
Hawaii has a wealth of renewables: estimated @ 150% of current installed capacity



<http://hawaii.gov/dbedt/info/energy/>



What has held back renewable penetration?



Barriers must be removed for Hawaii to realize energy independence and economic stability



Problem: Four legacy drivers support the status quo and represent barriers to be overcome

Policy/Regulatory Framework

- Utilities compensated for increased electricity sales; pass-through of fuel price increase is renewable disincentive
- IPPs need transparent “rules of the road,” certainty and predictability
- No clear policy support or incentives for significant new investment and technology upgrades in renewable generation, advanced transmission and distribution
- Need policy on net metering, interconnection, wheeling, and utility protocols for integrating variable generation which will impact transmission and distribution systems

Technology Development & Integration at System Level

- Solutions needed for reliable integration of high levels of variable renewable generation with traditional baseload generation and with existing grid
- Energy storage and “firming” technologies are probably part of the solution, but which technologies will be most effective and how much storage is needed to effectively manage the grid is under development
- Few incentives for advanced metering, dynamic rates, load management, demand response or distributed generation

Financing/Capital

- Need a healthy and financially viable utility to make necessary investments
- Significant new public and private investments required to support the magnitude of system changes needed for a clean energy future: Open up Hawaii’s markets to private capital
- Costs have to be understood and rate structures designed to balance utilities’ financial and consumers’ rate needs

System Planning

- Hawaii’s energy system is built on the assumption of consistent supply of low-cost oil, central power plants, grids that could be continually adjusted to meet load needs; utilities are structured to control transmission and distribution as well as generation



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Hawaii Clean Energy Initiative

National Partnership to Accelerate System Transformation

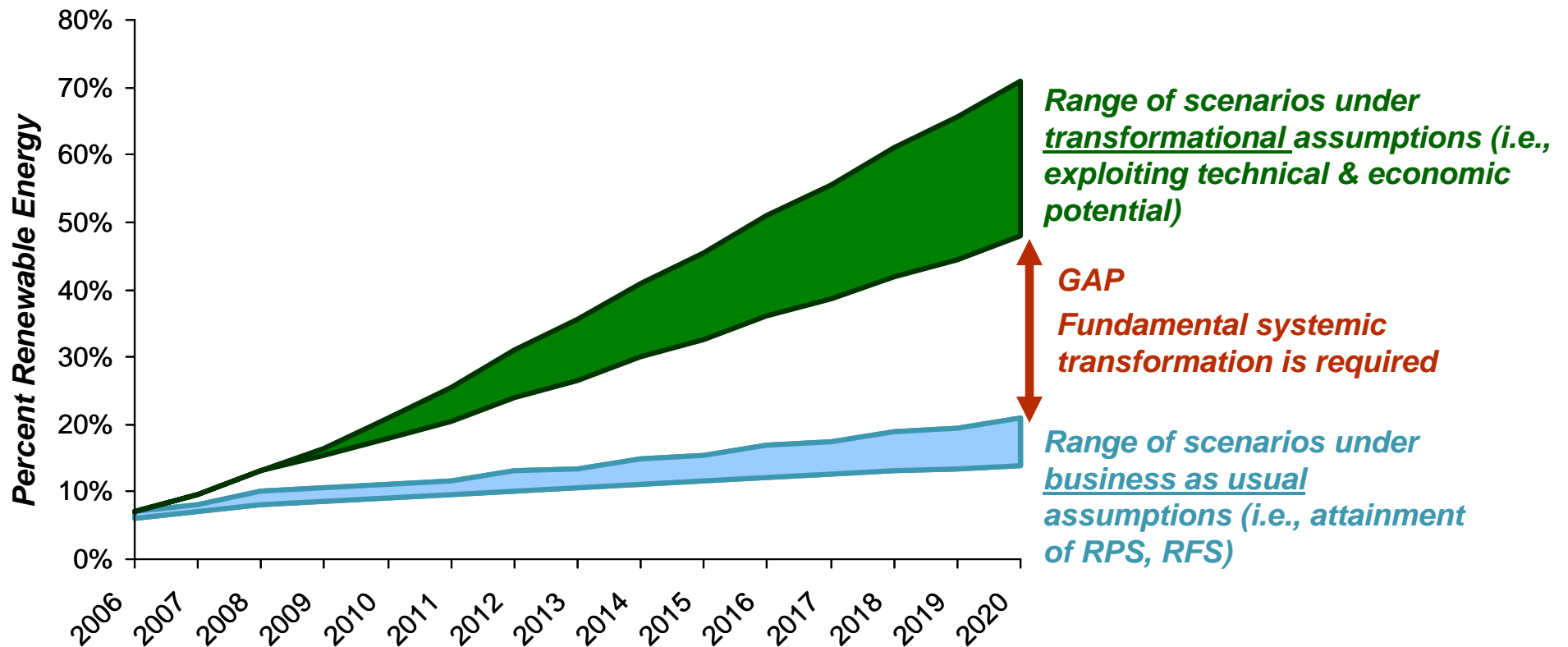
The goals are:

- ▶ Achieve a **70% clean energy economy** for Hawaii within a generation
- ▶ Increase Hawaii's **security**
- ▶ Capture **economic benefits** of clean energy for all levels of society
- ▶ Foster and demonstrate **innovation**
- ▶ Build the **workforce** of the future
- ▶ Serve as a **model** for the US and the world



Hawaii urgently needs to transition to an economy powered by clean energy, instead of imported foreign oil

In 2004, Hawaii's RPS included 6% renewables, which would increase only incrementally



...but doing so will require a substantive transformation of regulatory, financial, and institutional systems



HCEI analysis & project activities

- ▶ **70% Clean Energy scenario analysis (Booz Allen Hamilton)**
- ▶ **Hawaii greenhouse gas carbon tax/abatement analysis (McKinsey & Company)**
- ▶ **Economic modeling of energy system**
- ▶ **Inter-island cable: feasibility and cost/benefit studies**
- ▶ **Technical and economic assessment of plug-in hybrid and electric vehicles**
- ▶ **100% Renewable Lanai**
- ▶ **Forest City Highly Efficient Communities**
- ▶ **Modeling electricity grids on all islands**
- ▶ **Maui grid integration**
- ▶ **Bioenergy Master Plan**
- ▶ **Wind resource and storage testing**
- ▶ **Regulatory framework development**

World class studies and expertise leading to projects with a broad base of partners



HCEI-related events & milestones

- ▶ **State Renewable Energy Facilitator authorized**
- ▶ **First year of GHG Emission Reduction Task Force**
- ▶ **Marine Renewable Energy Center**
- ▶ **Hawaii, Taiwan, and Lockheed OTEC partnership**
- ▶ **Feed-in Tariff and Decoupling Dockets open and in progress**
- ▶ **HECO Smart meter initiative**
- ▶ **Third Party Administrator contract in negotiations**
- ▶ **Solar Water Heater Mandate for new construction homes became law**
- ▶ **DOE-Hawaii hospitality roundtable for energy efficiency**
- ▶ **Better Place announced first statewide initiative in Hawaii – HECO MOU**
- ▶ **Phoenix Motorcars announced EV testing on Maui with MECO**
- ▶ **Hawaii Renewable Energy Development Venture kicked off**

Broad base of activities across the state on a systemic level



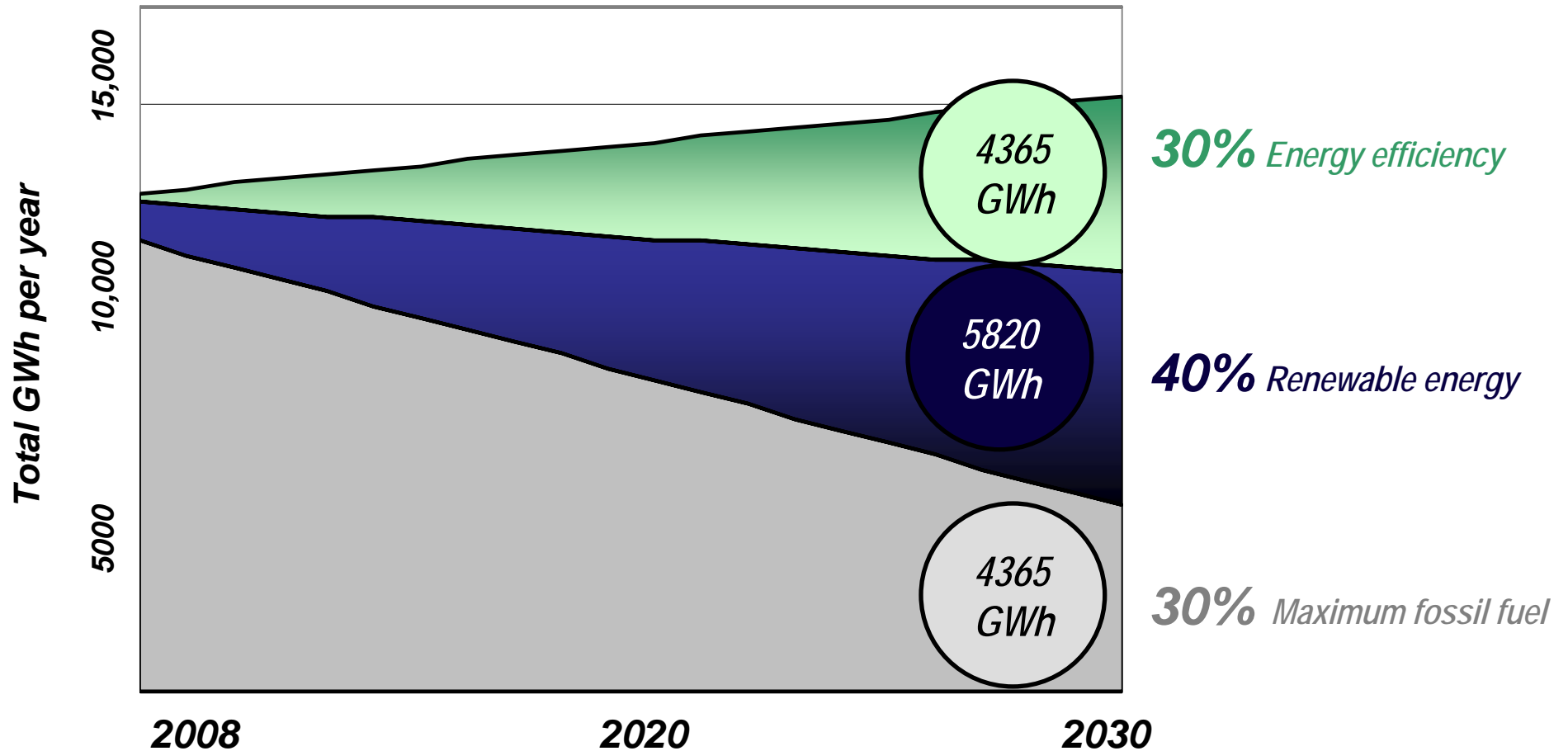
HCEI Scenarios: Can we achieve 70% clean energy? *Really?*

- ▶ First cut at order of magnitude requirements and impacts
- ▶ Evaluated sensitivity to several factors
- ▶ No absolutes defined in this evaluation
- ▶ Most work on electricity, some on transportation, little on jet fuel
- ▶ Based on **current commercially viable technologies**; potential game changers like OTEC and algae to energy are not considered
- ▶ All scenarios are presented **without imported biofuels**; all scenarios can hit the goals with imported biofuels
- ▶ Follow-up economic and cost/benefit impacts, refinements in progress.



We now know what it will take to reach 70% clean energy in 2030

Hawaii Electricity Portfolio



Note: This just reflects the 2030 targets; still need to determine/set interim targets

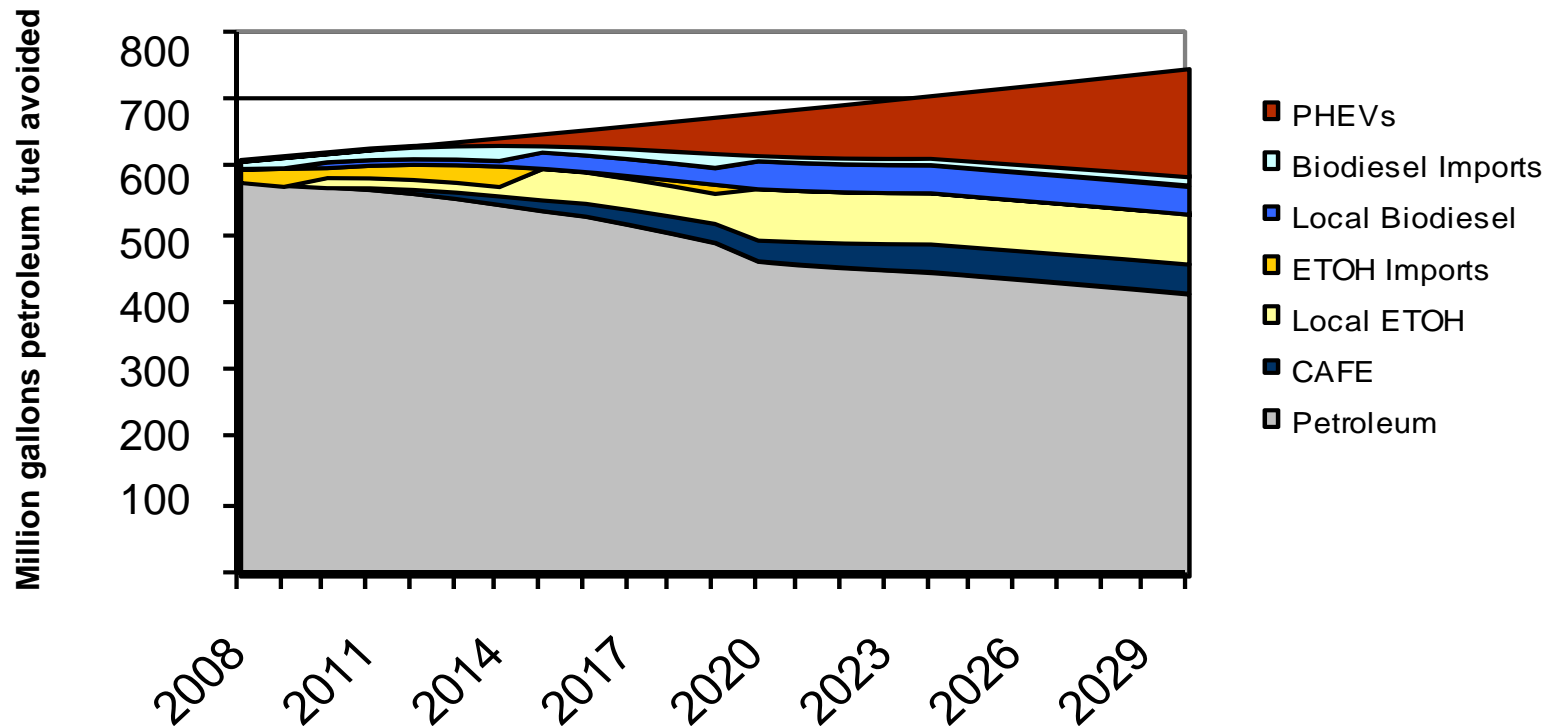


Scenario 8 Transportation

High PHEV penetration, local biodiesel and ethanol production

Summary of 2030 Transportation Results

Clean energy achieved	63%
Oil reduction (million bbl/yr)	9.9
CO2 avoided (million ton/yr)	4.2



Scenario 8

Invest \$16 billion, achieve \$46.1 billion savings @ oil costs \$100/barrel

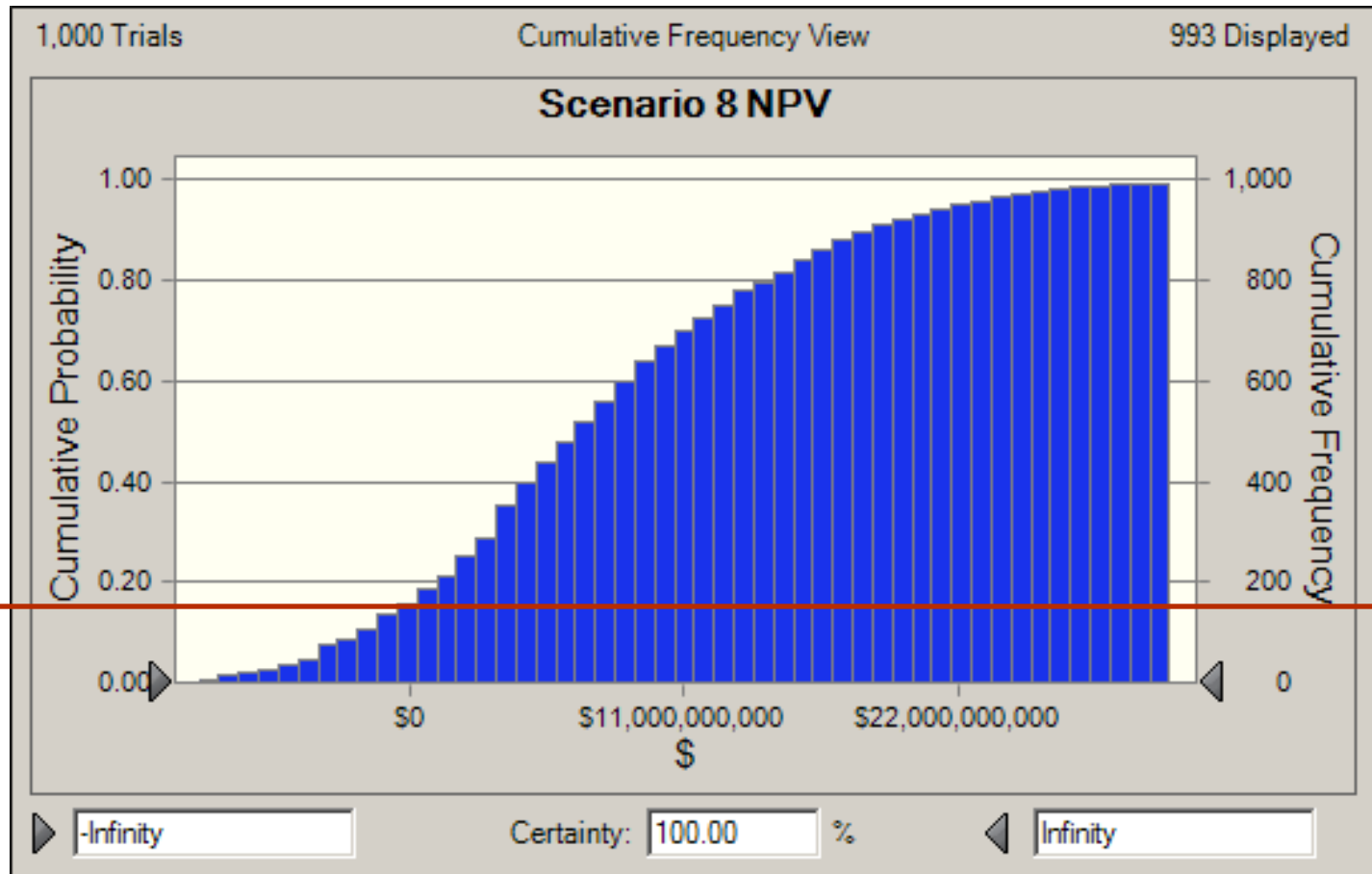
Avg. Crude Oil Price (2008-2030) per Barrel	Investment Cost	PV of Investment Cost	Savings from Oil Displaced	PV of Savings from Oil Displaced
\$40	\$ 16.0	\$ 7.7	\$ 18.5	\$ 7.6
\$50	\$ 16.0	\$ 7.7	\$ 23.1	\$ 9.6
\$60	\$ 16.0	\$ 7.7	\$ 27.7	\$ 11.5
\$70	\$ 16.0	\$ 7.7	\$ 32.3	\$ 13.4
\$80	\$ 16.0	\$ 7.7	\$ 36.9	\$ 15.3
\$90	\$ 16.0	\$ 7.7	\$ 41.5	\$ 17.2
\$100	\$ 16.0	\$ 7.7	\$ 46.1	\$ 19.1
\$110	\$ 16.0	\$ 7.7	\$ 50.1	\$ 21.0
\$120	\$ 16.0	\$ 7.7	\$ 55.4	\$ 23.0
\$130	\$ 16.0	\$ 7.7	\$ 60.0	\$ 24.9
\$140	\$ 16.0	\$ 7.7	\$ 64.6	\$ 26.8

Figures in billion 2008 dollars (except per barrel cost)

PV figures based on discount rate of 7%



Scenario 8: The probability of a negative NPV is less than 20%



▶ **Approx. 18% probability of a negative NPV result**

Simulation based on 1,000 runs



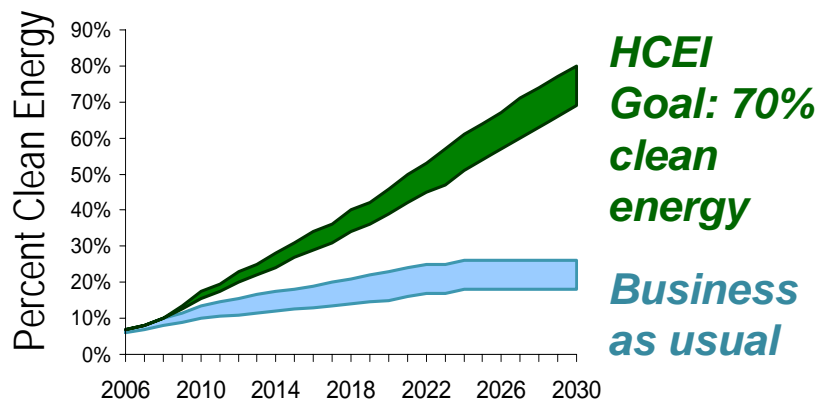
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The 2009 legislative package is one step toward the 70% clean energy goal, and it sends the message that Hawaii is serious about being a leader

- ▶ **PREMISE:** The primary barriers to reaching 70% clean energy are not technical or financial; they are policy-driven: *change incentives and behavior by changing established framework of rules*



- ▶ This legislative package is one step in the process of changing the rules—to do so it's important to view the package whole, as a comprehensive approach to energy policy, and in the context of other HCEI initiatives

- ▶ *How far does the 2009 legislative package go toward HCEI efficiency, generation and transportation? **Indicatively:***

		HCEI Goal	Expected results 2009 package
Electricity	Efficiency	30%	} 70% — 9%-17%
	Electric Generation	40%	
Transportation (ground)		70%	~30%

▶ **Future Steps:**

- **Efficiency:** *In the next years, the State will need to be aggressive on 1) public buildings, 2) a sizable energy efficiency program for commercial buildings, 3) zero net energy building code by 2015. Promotion and implementation of efficiency programs—e.g., on-bill financing—will be critical to realize goals*
- **Electric Generation:** *The PUC will be shouldering responsibility for setting rules for feed-in tariffs, electricity decoupling, etc. PUC's timely implementation will be extremely important*
- **Transportation:** *The 2009 package is designed to catalyze a market—e.g., create infrastructure for Alternative Fuel Vehicles—so the legislative package starts the process to deliver the transformation needed to hit 70%. In 2010, we will propose policies to ensure adequate supplies of biofuels, critical to using AFVs; also we will analyze clean energy options for aviation/marine transportation*



Efficiency

- ▶ Energy Efficiency Portfolio Standard – 4300 GWH (30%) by 2030
- ▶ Analysis that Building Codes provide expected payback
- ▶ Public Buildings Lead By Example - up to 20 year payback
- ▶ On-bill Financing for Energy Efficiency and Renewable Energy expanded
- ▶ Tax Credits for Net Zero Energy Homes
- ▶ Renewable Energy & Energy Efficiency Tax Credit Provisions
- ▶ Consumer Information on home energy profile



Electricity Generation and Delivery

- ▶ Renewable Portfolio Standard – 40% by 2030
- ▶ No new fossil generation allowed to be permitted
- ▶ Net Energy Metering Caps Removable by PUC
- ▶ Renewable Energy Zones (business and transmission enabler)
- ▶ Renewable Energy Facilitation Process for 5-200 MW available



Transportation

- ▶ Infrastructure incentives to support electric vehicles
- ▶ Facility size cap for biofuel facilities removed for tax credit
- ▶ Incentives for leading edge adopters of Electric, Alternative and Fuel Economy Leader Vehicles
(GET tax and registration fee waiver, EV grants)
- ▶ State and county vehicle fleet mandates
- ▶ Non-government fleet mandates - alternative fuel vehicle standard



Our Metric for Success...

Working with agencies, businesses, and communities as partners, we achieve together what none of us could do alone.

“Our performance is measured by the successful transition of the state energy system to clean and secure sources with stable costs, a skilled workforce, healthy businesses, and a strong economy.”

