

Planning for Energy in Hawaii

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DBEDT – Energy, Resources, and Technology
Division

<http://www.state.hi.us/dbedt/ert>

Overview

- ◆ DBEDT's Role in Energy Planning
 - Energy Resources Coordinator
 - State Energy Objectives
 - State Energy Policies
- ◆ Hawaii's Energy Situation
- ◆ Existing Plans and Studies
- ◆ Work in Progress
- ◆ Considerations for the Future

The Energy Resources Coordinator

§196-4, HRS, Powers and duties.

- (1) Formulate plans, objectives, criteria, programs, and financial requirements for the optimum development of Hawaii's energy resources;
- (2 & 3) Conduct analysis and recommend programs;
- (4) Assist public and private agencies in energy conservation;
- (5) Coordinate conservation and allocation programs;
- (6) Encourage alternative energy research;
- (7) Conduct public education;
- (8) Consultant to the governor, public agencies and private industry;
- (9) Contract for services when required;
- (10) Review state actions with significant effect on energy use; report to Governor and legislature;
- (11) Annual report and other reports as requested; and
- (12) Adopt rules to be submitted to the legislature for review.

Note: Powers and duties are paraphrased

§226-18, Objectives and policies for facility systems--energy

- (a) Planning for the State's facility systems with regard to energy shall be directed toward the achievement of the following objectives, giving due consideration to all:
- (1) Dependable, efficient, and economical statewide energy systems capable of supporting the needs of the people;
 - (2) Increased energy self-sufficiency where the ratio of indigenous to imported energy use is increased (added 1994);
 - (3) Greater energy security in the face of threats to Hawaii's energy supplies and systems; and
 - (4) Reduction, avoidance, or sequestration of greenhouse gas emissions from energy supply and use (added 2000).

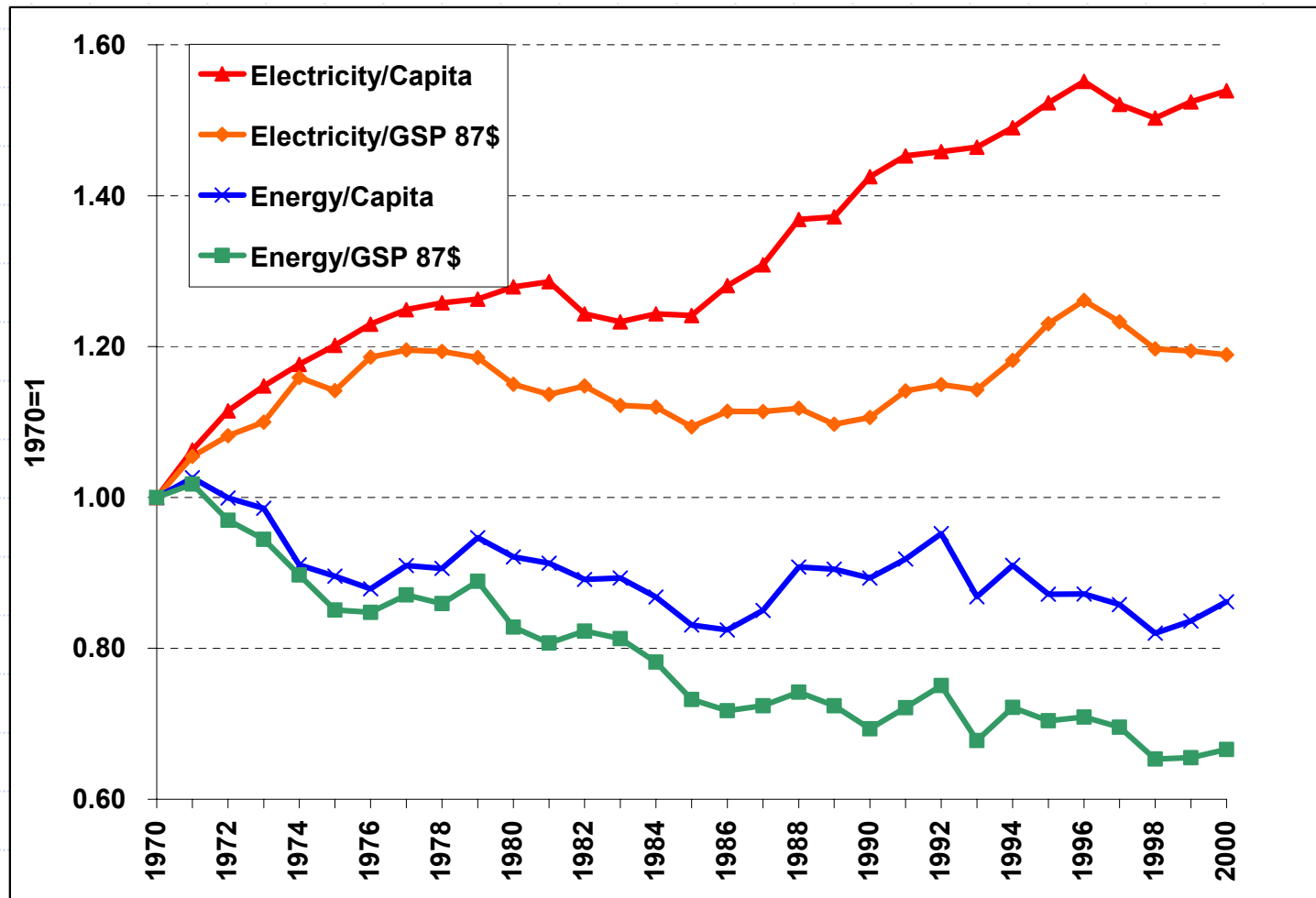
§226-18, Objectives and policies for facility systems – energy (continued)

(b) ensure adequate, reasonably priced, and dependable energy services to accommodate demand.

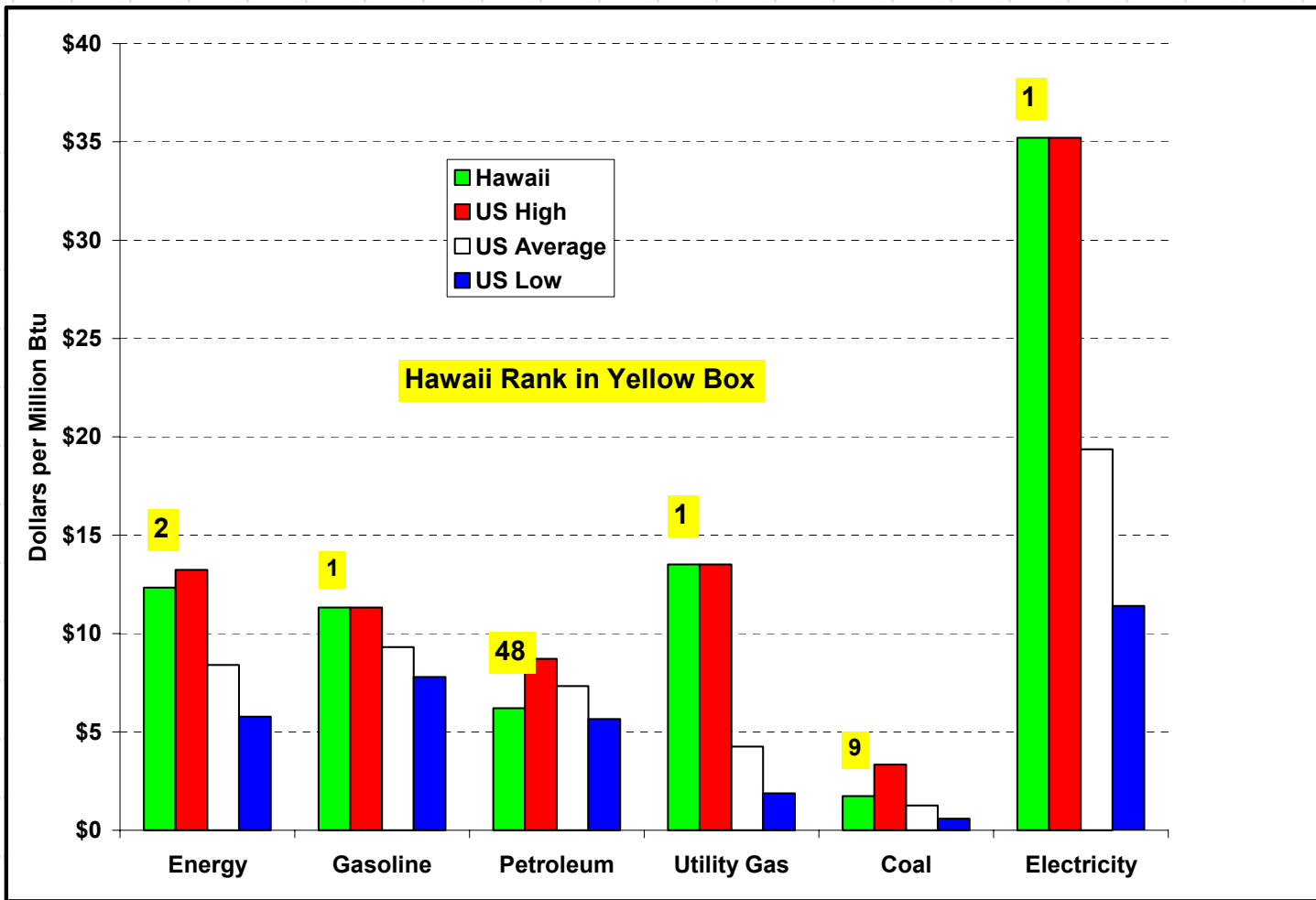
- ◆ (c) (1) Support R&D and use of renewable energy;
- ◆ (2) Ensure sufficient energy to support growth;
- ◆ (3) Base decisions on economic, environmental, social, cultural, and public health costs and benefits;
- ◆ (4) Promote all cost-effective conservation
- ◆ (5) Ensure least-cost, efficient new supply;
- ◆ (6) Support RD&D of efficiency and DSM;
- ◆ (7) Promote alternate fuels & efficient transportation;
- ◆ (8 & 9) Support actions that reduce, avoid, or sequester greenhouse gases in various sectors.

Note: Policies are paraphrased

Objective 1: Dependable, Efficient, and Economical Energy Systems



Objective 1: Dependable, Efficient, and Economical (?) Energy Systems

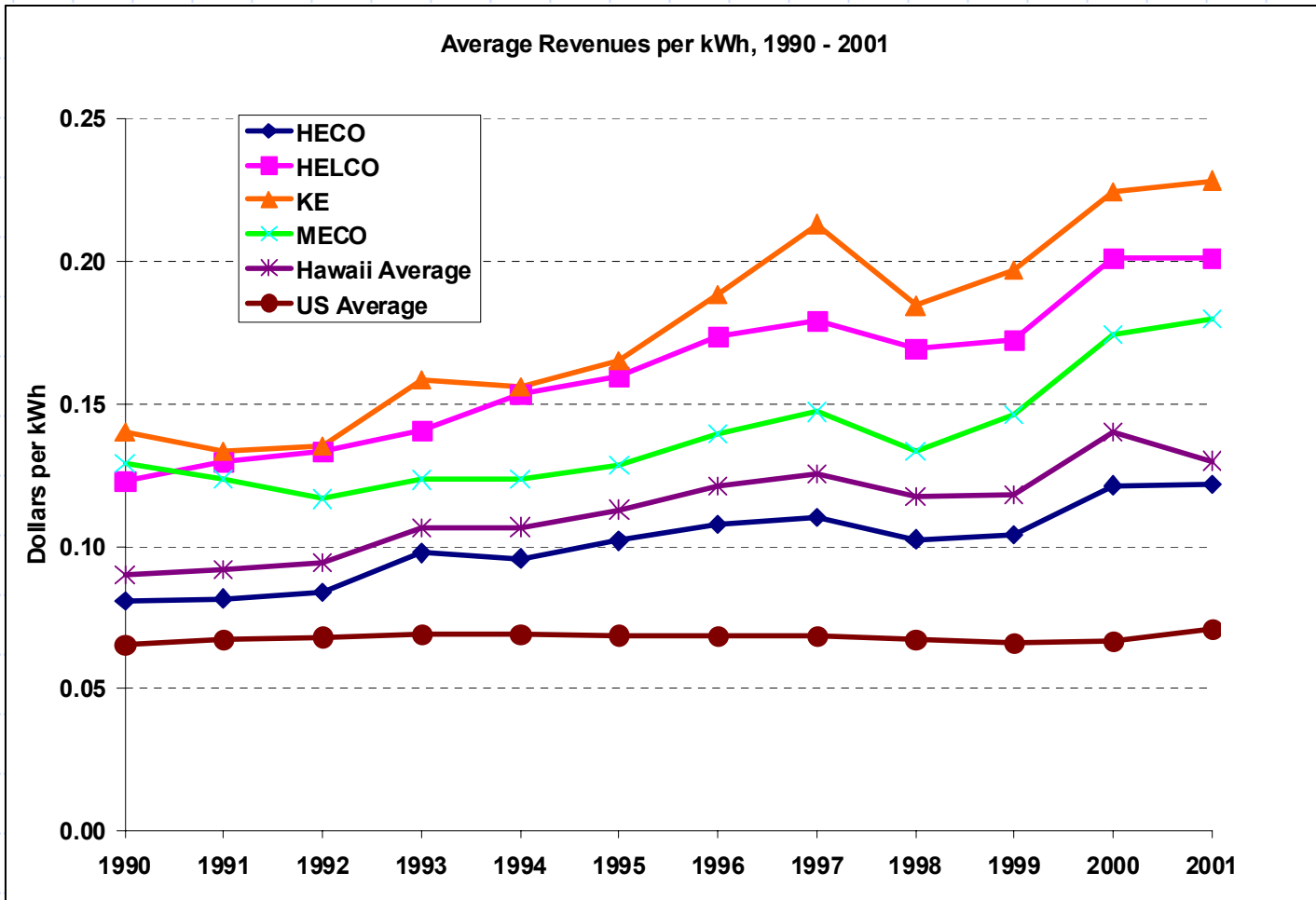


1999 Data, Energy Information Administration

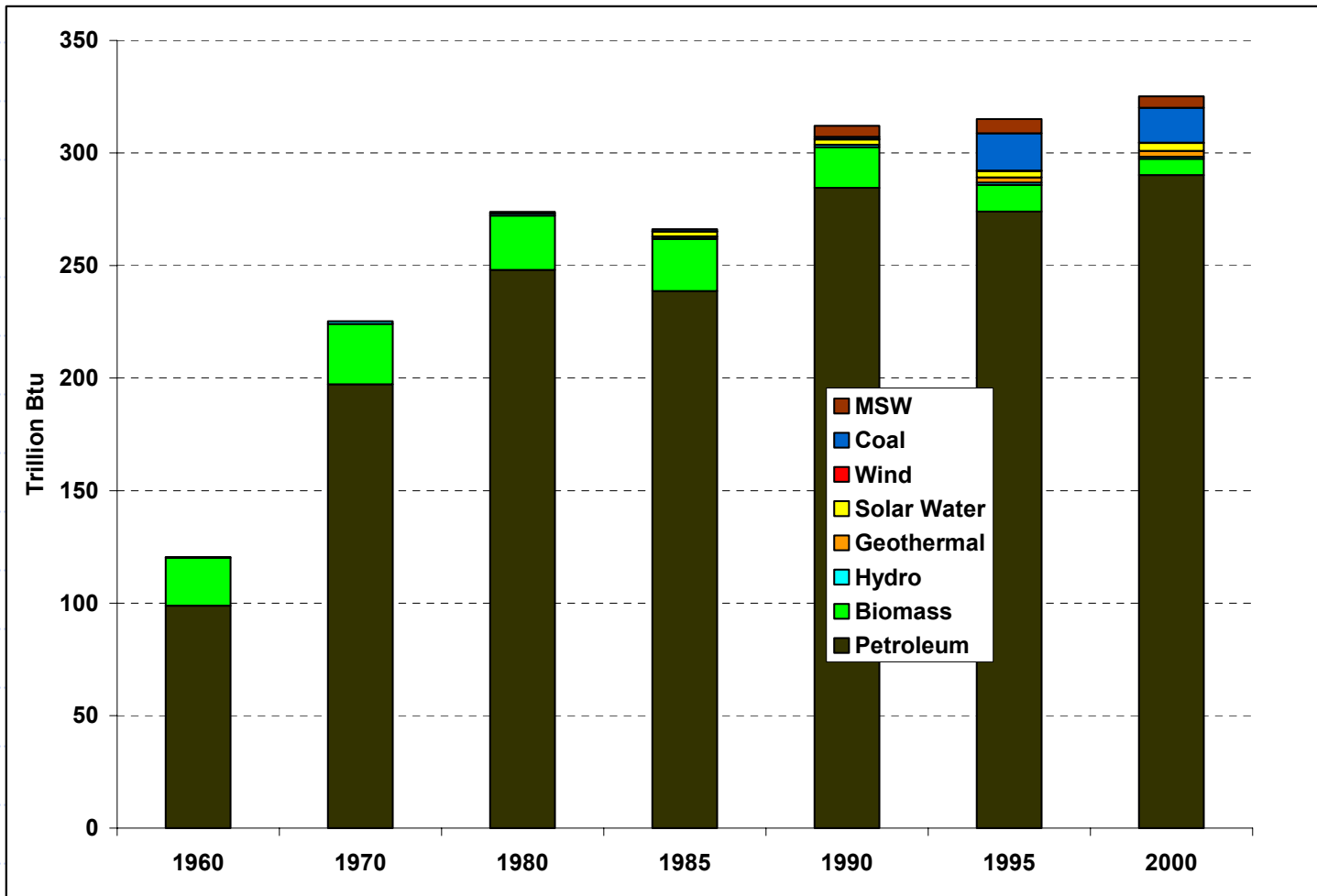
Objective 1: Dependable, Efficient, and Economical Energy Systems

- ◆ Hawaii **Energy Use**
Ranked **48** at 241.4 TBtu
- ◆ Hawaii **Energy Use per Capita**
Ranked **51** at 203.7 MMBtu/year (US Average 351 MMBtu/year; US High 1,121 MMBtu/year in Alaska)
- ◆ Hawaii **Energy Expenditure per Capita**
Ranked **46** at \$1809/year (US Average \$2049 /year; US High \$3861/year in Wyoming)
- ◆ Hawaii **Electricity Use per Capita**
Ranked **47** at 663 kWh/year (US Average 949 kWh/year; US High 2203 kWh/year in Wyoming)
- ◆ Hawaii **Electricity Expenditure per Capita**
Ranked **13** at \$914/year (US Average \$869; US High \$1358 in District of Columbia)
- ◆ Hawaii **Gasoline Expenditure per Capita**
Ranked **49** at \$445/year (US Average \$547/year, US High \$797/year in Wyoming)

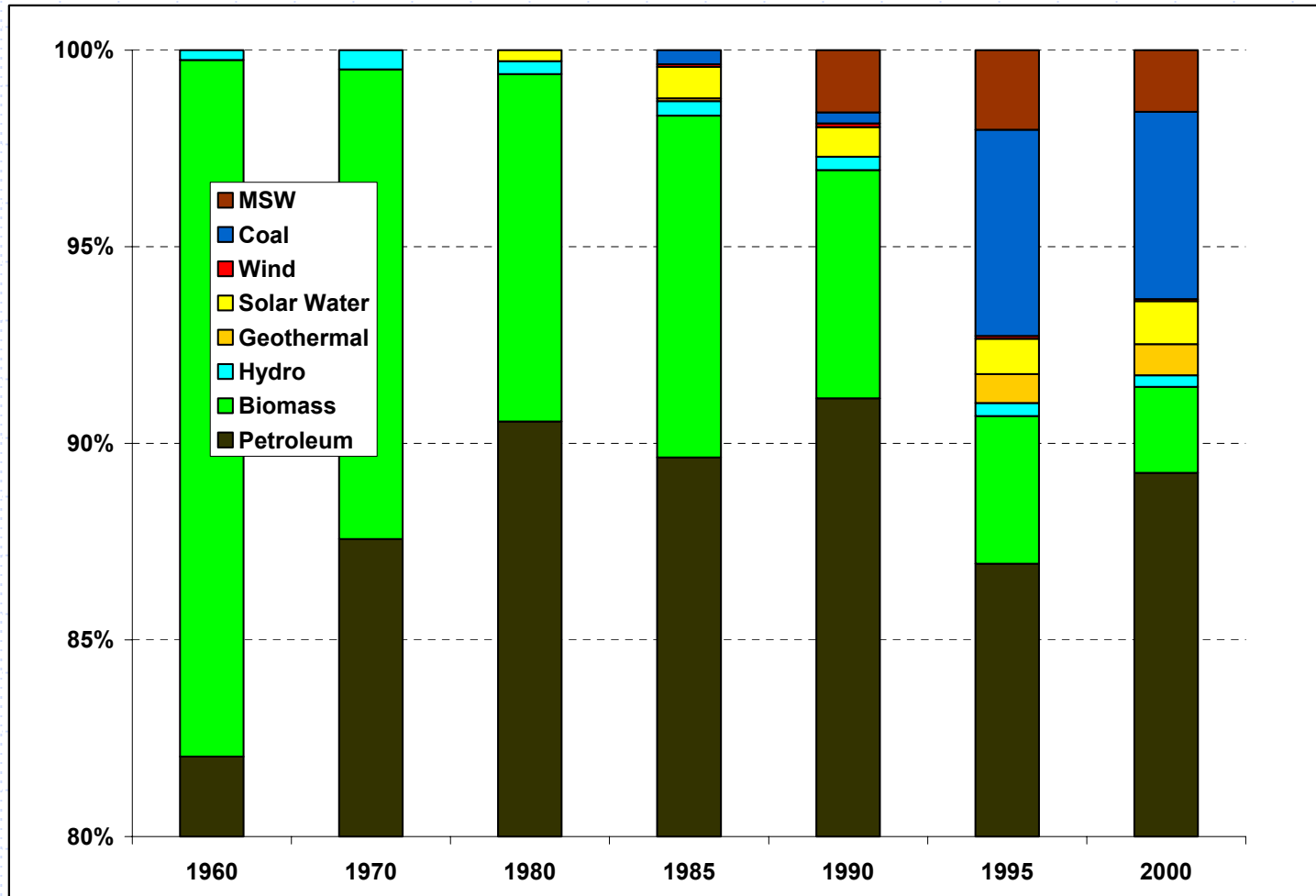
Objective 1: Economical? – Hawaii Electricity Costs Grew 1.5 times CPI since 1990 (44% vs. 29%)



Objective 2: Increased Indigenous Energy - Renewable Energy Use Diversified, but Oil and Coal Met Most of Growing New Demand



Objective 2: Increased Indigenous Energy - Renewable Energy Diversification Failed to Offset Decline in Sugar Bagasse



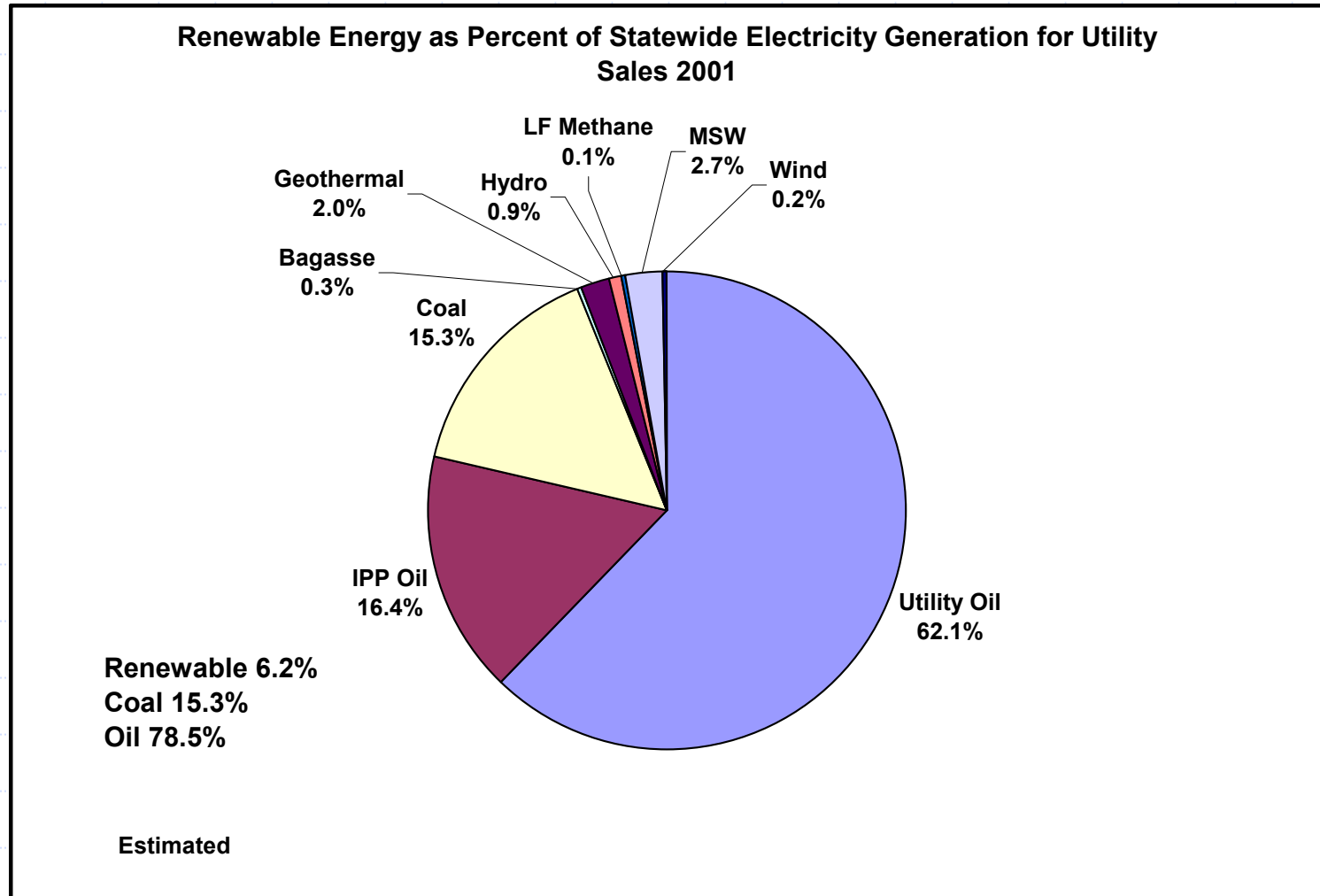
Objective 2: Increased Indigenous Energy - Renewable and Fossil Energy in Hawaii 2001

- ◆ 62 MW biomass
 - Fuels used include biomass, MSW, landfill gas, oil, and coal
- ◆ 30.3 MW hydroelectric
- ◆ 30 MW geothermal
- ◆ 10.9 MW wind
- ◆ 460 kW on-grid PV systems
- ◆ Over 70,000 solar water heaters
- ◆ 2000-5000 residential off-grid PV systems

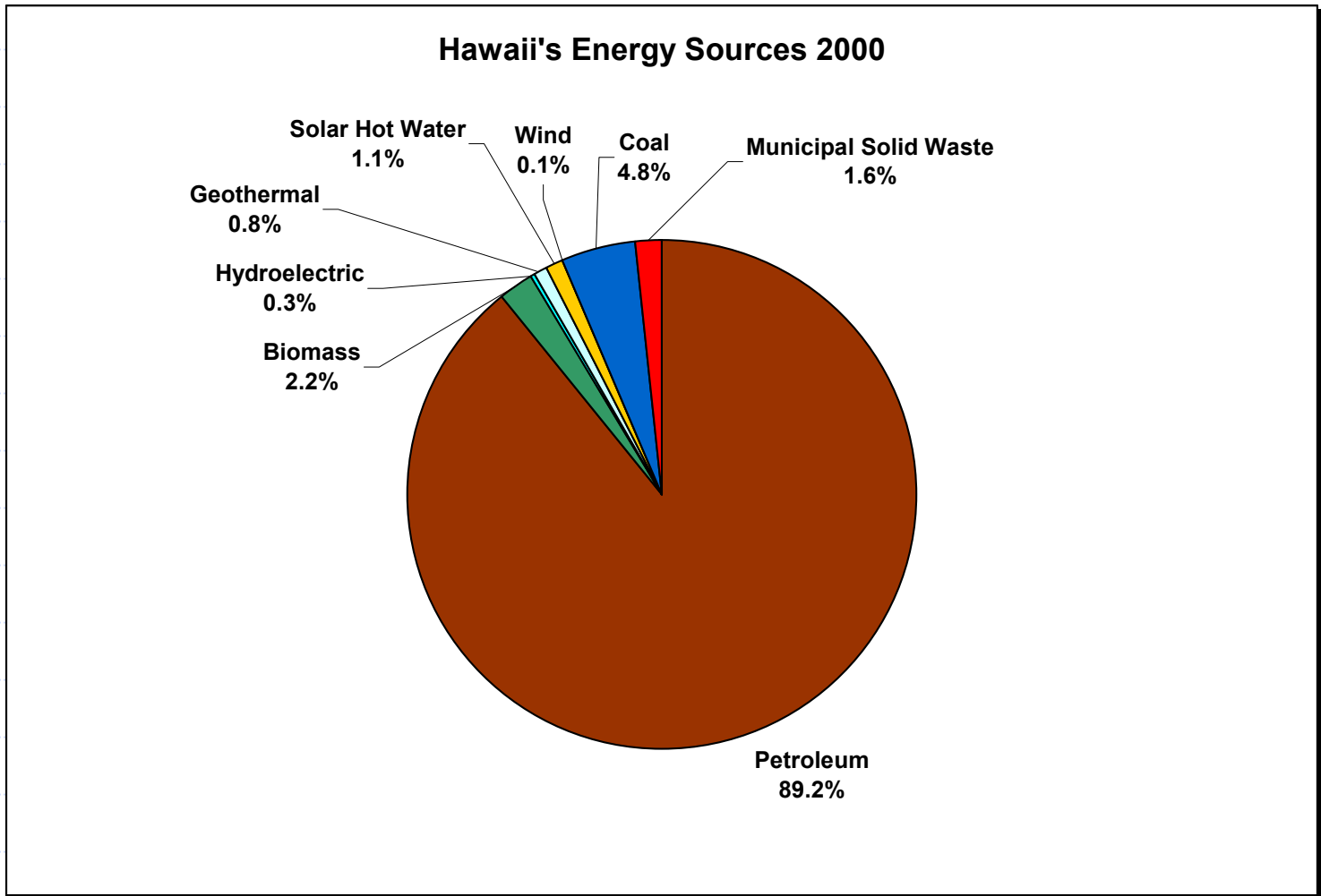
- ◆ **Planned:** ~ 40 MW new wind; 6 MW hydro; 30 MW increase in geothermal

**Hawaii has over
2,230 MW of Fossil-
Fueled Generation
and 133 MW of
Renewable
Generation**

Objective 2: Increased Indigenous Energy – Renewable Energy in Electricity Generation



Objective 3: Energy Security - Coal and New Renewables Improve Diversity of Supply



Objective 3: Energy Security – Majority of Hawaii's Fossil Fuel Imports in 2000 from Foreign Sources

Crude Oil Imports to Hawaii 2000

Source	Barrels	% of Total
United States	15,303,000	30.7%
China	11,493,000	23.0%
Indonesia	8,557,000	17.1%
Australia	7,415,000	14.9%
Malaysia	2,975,000	6.0%
Thailand	1,103,000	2.2%
Argentina	1,072,000	2.1%
Vietnam	936,000	1.9%
Papua New Guinea	651,000	1.3%
Venezuela	403,000	0.8%
Total	49,908,000	

Imported Coal Used in Hawaii, 2000

Source	Tons	% of Total
Indonesia	658,000	89%
Australia	77,486	11%
	735,486	

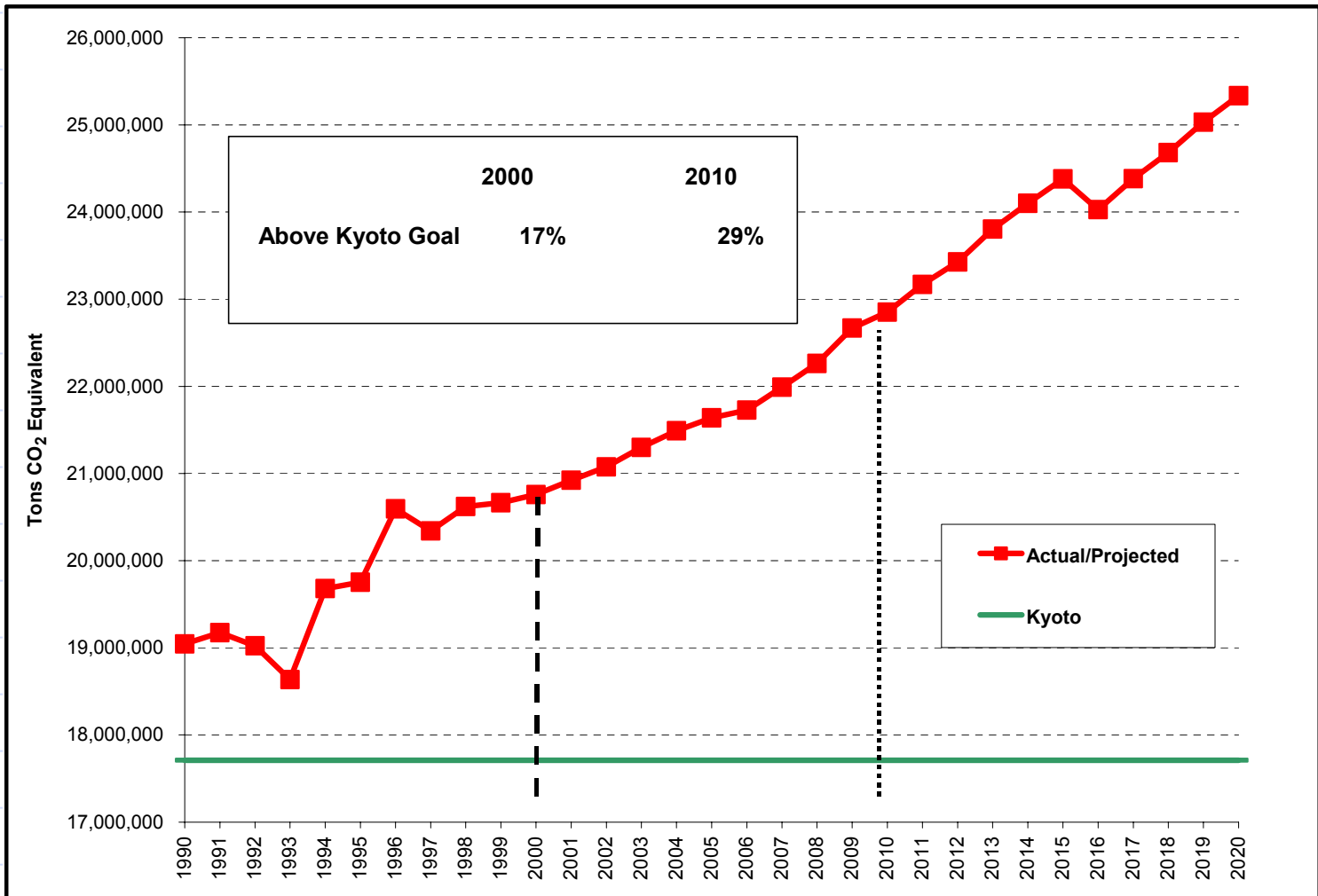
Refined Oil Product Imports to Hawaii 2000

Source	Barrels	% of Total
United States	3,402,000	39.7%
South Korea	1,986,000	23.2%
Japan	1,810,000	21.1%
Indonesia	840,000	9.8%
Saudi Arabia	294,000	3.4%
Singapore	168,000	2.0%
Netherlands Antilles	75,000	0.9%
Total	8,575,000	

Objective 3: Energy Security – State of Hawaii Energy Emergency Preparedness

- ◆ Hawaii has priority access to National Petroleum Reserve
- ◆ Plans and materials in place for shortage management
- ◆ Emergency planning kept updated
- ◆ Energy Council, led by DBEDT, coordinates emergency actions – shortages, natural disasters, terrorism
- ◆ Diversity of supply reduces risk

Objective 4: Reduced GHG Emissions – Without Change, Kyoto Goal Remains Illusive



DBEDT Comprehensive Plans

- ◆ *Hawaii Integrated Energy Assessment (1981)*
- ◆ *Hawaii Integrated Energy Plan (1991)*
- ◆ *Hawaii Energy Strategy (1995)*
- ◆ *Hawaii Climate Change Action Plan (1998)*
- ◆ *Hawaii Energy Strategy 2000 (2000)*

Example RD&D Activities Financially Supported by DBEDT

- ◆ Initial wind deployment
- ◆ Ocean Thermal Energy Conversion
- ◆ Geothermal tests and assessments
- ◆ Development of interisland cable
- ◆ Wind-diesel, photovoltaics, and biomass gasifier R&D
- ◆ Hydrogen infrastructure development

DBEDT Plans and Studies on Hydrocarbons Outlook

◆ *Hawaii Energy Strategy 1995, Project 2: Fossil Energy Review (Dec 1993) (5 volumes)*

1. World and Regional Fossil Energy Dynamics
2. Fossil Energy in Hawaii
3. Prospects for LNG Use
4. Assessment of Coal Technology Options
5. Scenario Development and Analysis

◆ *Hawaii Energy Strategy 2000, Chapter 3 (2000)*

DBEDT Plans and Studies on Renewable and Unconventional Energy

- ◆ *Nurturing a Clean Energy Future in Hawaii: Assessing the Feasibility of the Large-Scale Utilization of Hydrogen and Fuel Cells in Hawaii (2002)*
- ◆ *Wave Energy Feasibility Study for Hawaii (2002)*
- ◆ *Analysis of Renewable Portfolio Standard Options for Hawaii [Appendix 1 updates Renewable Energy Cost and Performance Estimates](2001)*
- ◆ Presentations from the “Renewable Energy and Utility Project Financing Workshop” (2001)
- ◆ *Siting Evaluation for Biomass-Ethanol Production in Hawaii (1999)*
- ◆ *Hawaii Energy Strategy Project 3 Renewable Energy Resource Assessment (1995)*

DBEDT Plans and Studies on Regulatory, Taxation, and Incentives

- ◆ *Report of Energy Tax Credit Task Force (2002)*
- ◆ *Summary of Financial Incentives (2000)*
<http://www.state.hi.us/dbedt/ert/incentives.html>
- ◆ *Presentations from the "Renewable Energy and Utility Project Financing Workshop" (2001)*
- ◆ *Tax Credits for Energy (1999)*
- ◆ *Hawaii Integrated Energy Plan (1991)*
- ◆ *Hawaii Integrated Energy Assessment (1981)*

Recent Legislative Actions

- ◆ Renewable Portfolio Standard and Net Metering
- ◆ City and County of Honolulu adopted residential Model Energy Code
- ◆ Fuel tax adjustment to reflect energy content of alternative fuels

State Financial Incentives

- ◆ Commercial Solar and Wind income tax credits
 - Tax credit for investment in non-fossil fuel energy "qualified high technology businesses"
 - ◆ New wind energy production in State "Enterprise Zones" may be eligible for a variety of incentives
- ◆ Residential solar and wind income tax credits
- ◆ Tax incentives for alternative transportation fuels
- ◆ Corporate income tax credit for ethanol production
- ◆ Reduction of alternative fuels tax rate
- ◆ 4% state excise tax exemption for alcohol fuels
- ◆ Electric vehicle incentives

DBEDT's Current Activities 1

- ◆ Introducing hydrogen infrastructure into state in preparation for fuel cell use. Includes Hydrogen Power Park at the Natural Energy Laboratory of Hawaii Authority.
- ◆ Continuing to advance energy efficiency with Hawaii Rebuild America Program, Model Energy Codes, performance contracting, and support of utility DSM.
- ◆ Completing "Creating Distributed Energy (DE) Opportunities for Hawaii" project. Working with HELCO to evaluate battery storage to relieve transmission congestion and in developing ways to manage high saturations of DE and renewable energy.

DBEDT's Current Activities 2: Hawaii Energy Strategy 2003

- ◆ The State's Energy Plan
- ◆ Produced in 1995 and 2000
- ◆ Next edition scheduled for 2003
- ◆ Outlines Hawaii's energy situation
- ◆ Includes modeling and forecasting
 - ENERGY 2020 Energy System & REMI Economic Model
- ◆ Public and stakeholder involvement
 - Technical and data input from public and private sectors
 - Public workshops
- ◆ Offers recommendations for Hawaii's energy future

Hawaii's Energy Challenges

- ◆ 89% dependence on oil for energy in 2000
- ◆ 93.8% fossil fuel electricity generation in 2001
- ◆ Utility Integrated Resource Plans call for fossil units
- ◆ Six, separate electricity systems
- ◆ DBEDT Renewable Energy Resource Assessment shows
 - Ample wind and solar resources
 - Potential for biomass energy
 - Potential for additional geothermal on Island of Hawaii
- ◆ Need for more efficient ground transportation vehicles
- ◆ State can primarily influence electricity and ground transportation sectors

Considerations for Future Action

- ◆ Hawaii has lowest per capita energy use in USA -- people are already very efficient
- ◆ Hawaii has highest electricity prices and very high other energy prices – energy use appears inelastic
- ◆ Solutions should emphasize economical energy efficiency and cost-effective increased use of renewable energy

General Recommendations to Improve Hawaii's Energy Future

◆ Electricity

- Energy Efficiency/Demand-Side Management First
- Increase Use of Renewable Energy
- Greater Efficiency in Central Station Generation
- Deploy Distributed Generation
- Prepare Infrastructure for Hydrogen Fuel Cells
- Changes in Electricity Regulation

◆ Ground Transportation – Encourage Use of:

- More Efficient Gasoline and Diesel Vehicles
- Hybrid Vehicles
- Electric Vehicles
- Alternative-Fueled Vehicles
 - ◆ Biodiesel
 - ◆ Alcohol Fuels
 - ◆ Hydrogen

Challenges in the Electricity Sector

- ◆ Utility controls market conditions
 - Private renewable energy projects compete with utility projects
 - Contracts must be secured from regulated monopoly
- ◆ Project funding difficult
 - Funding for new technology hard to obtain
 - State actively seeking partnerships and assistance
- ◆ Siting and permitting present major obstacles
- ◆ Changes in electricity regulation may be needed
 - Current cost of service regulation offers little incentive for reducing costs or greater efficiency
 - Renewable energy may be encouraged through Renewable Portfolio Standards and Net Metering Legislation passed in 2001

Increasing Efficiency and Use of Renewable Energy in Transportation

- ◆ Consumers do not necessarily consider fuel use or fuel cost in vehicle purchase decisions
- ◆ Hawaii depends on international vehicle market as source of vehicles -- efficient and alternative fueled vehicles must become available
- ◆ Biodiesel in use on Maui and Oahu
- ◆ Electric vehicles offer potential benefits for Hawaii
- ◆ Large capital investments required for alcohol fuels production, but State offers production tax credit
- ◆ Large investments in production, distribution, and fueling infrastructure needed for hydrogen fuels

Conclusions

- ◆ Hawaii remains highly dependent on petroleum for energy
- ◆ Hawaii has diversified its energy supply with coal, MSW, biomass, geothermal, wind, landfill methane, hydropower, and solar – but renewable percentage may decline without an aggressive push
- ◆ Renewable energy must be complemented by demand-side and supply-side energy efficiency in reaching for the long-term goal of reducing reliance on imported fossil fuels
- ◆ Many challenges remain to be met in the quest for more renewable energy, distributed energy, and a move toward hydrogen