

PRESENTATION

# Hawaii-DOE Clean Energy Initiative

## Strategic Vision and Implementation

Honolulu, Hawaii  
June, 2008

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# Hawaii presents unique opportunities, both immediate and long-term, to fundamentally transform the state's energy sector

- ▶ The state has abundant **local renewable resources**, including sun, wind, geothermal, etc.
- ▶ Hawaii pays the **highest electricity costs** in the nation and among the highest transportation fuel costs
- ▶ Hawaii has large, relatively **unexploited opportunities for efficiency**
- ▶ Oil provides approximately 85% of the state's energy, leaving Hawaii vulnerable to supply disruptions and **energy insecurity**
- ▶ Each island is an **isolated micro-grid** providing an opportunity to focus on whole system solutions

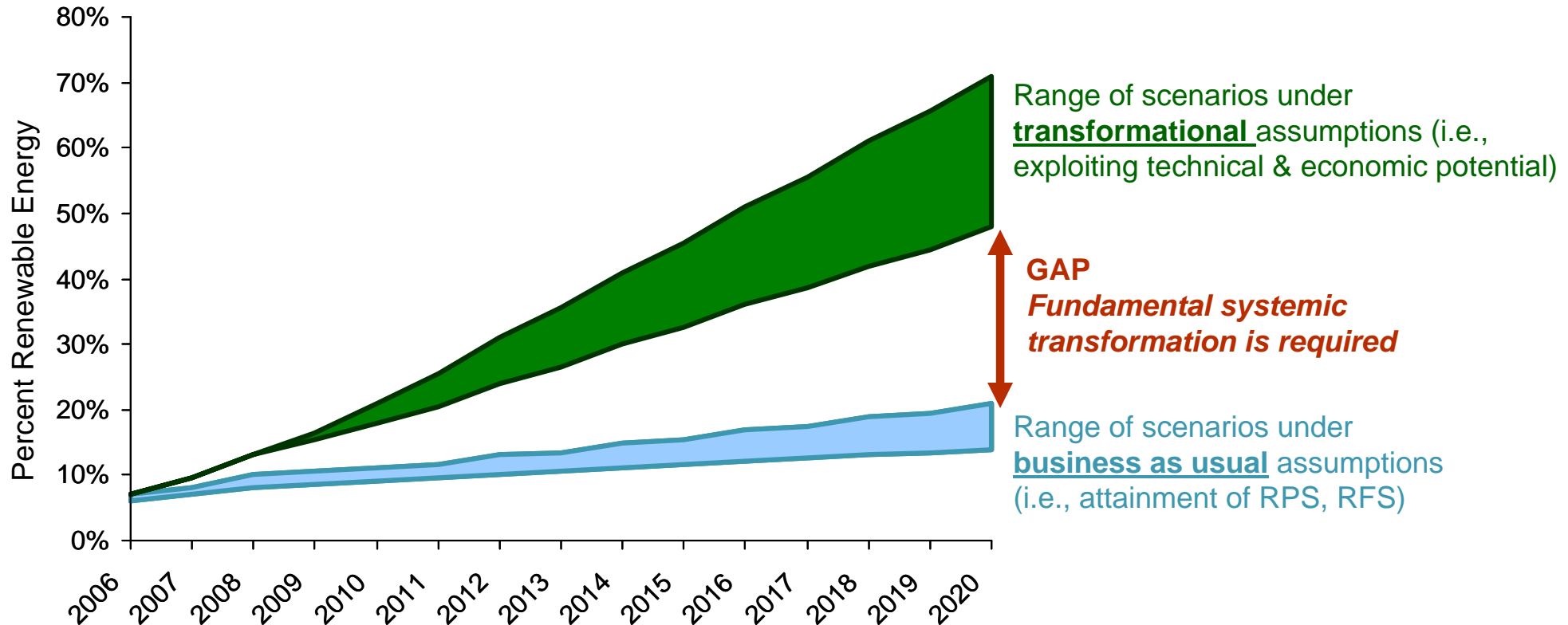
## Vision for Hawaii Clean Energy Initiative

*To partner with Hawaii and serve as a global model for creating a sustainable, flexible, and economically vibrant path to a carbon-free energy future*



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

In 2004 Hawaii's energy portfolio included 6% renewable energy, a proportion which is set to increase only incrementally under current plans



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



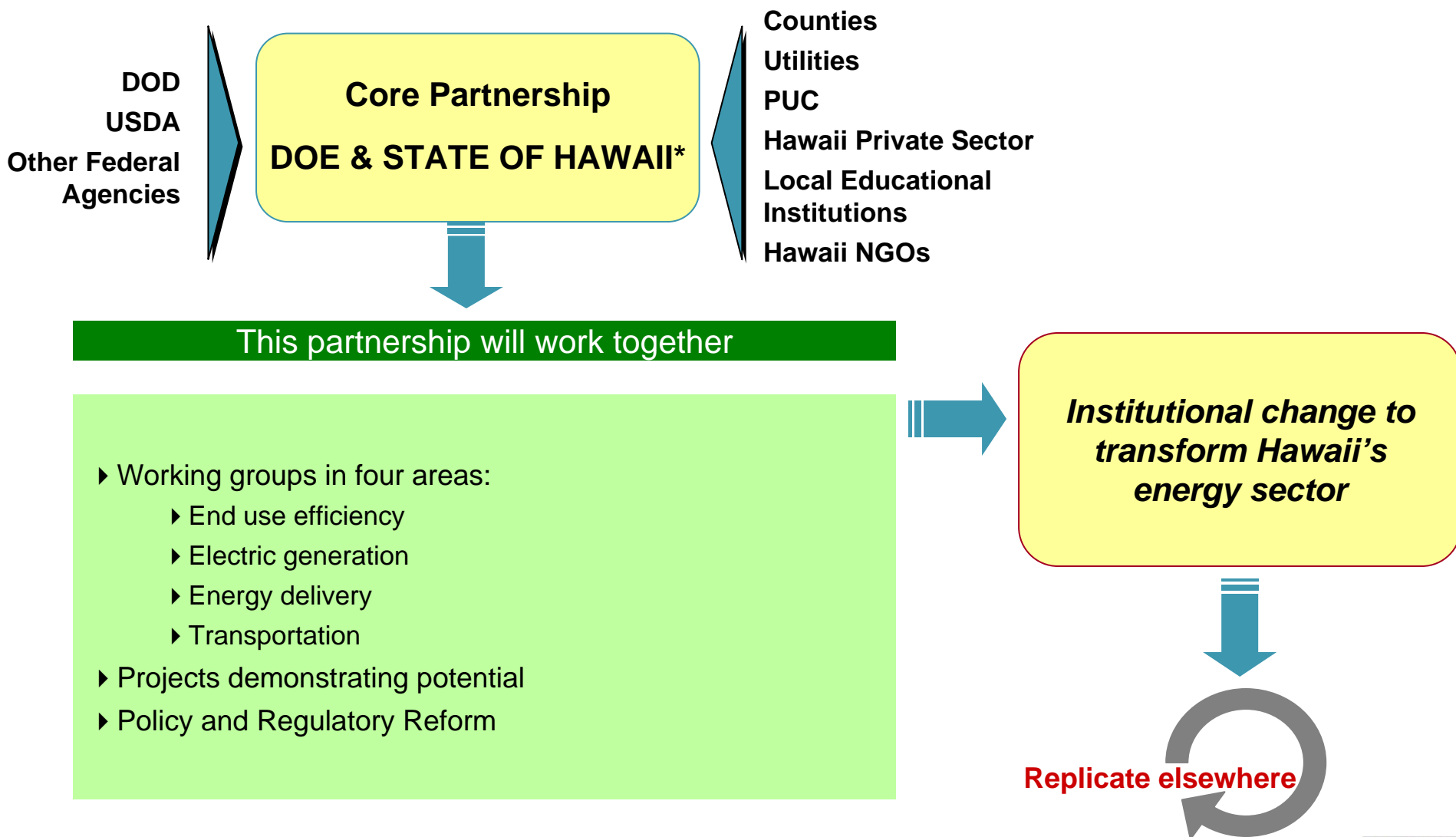
# To create this transformative process, Hawaii and U.S. DOE have joined forces to form the Hawaii Clean Energy Initiative

The goals of the initiative are as follows:

- ▶ *Achieve a 70% or greater clean energy basis for Hawaii within a generation*
- ▶ *Increase the security of Hawaii:* Diversify Hawaii's energy supply and increase the security of its energy delivery and defense capabilities
- ▶ *Create economic opportunity at all levels of society:* Develop and diversify Hawaii's economy through innovative, market-based mechanisms that allow every sector to benefit from the transition to clean energy
- ▶ *Foster and demonstrate innovation:* in the technology, financial, organizational and policy models used to achieve a clean energy future
- ▶ *Build the workforce of the future:* help Hawaii create educational and employment opportunities necessary to sustain a clean energy economy
- ▶ *Serve as a "open source" learning opportunity:* Make Hawaii a replicable model for achievement of a clean energy-based economy for the world



# DOE and Hawaii will coordinate the Initiative, drawing on the critical input and expertise of local stakeholders and other Federal agencies



\* Hawaii's Department of Business, Economic Development and Tourism has the primary lead for the partnership



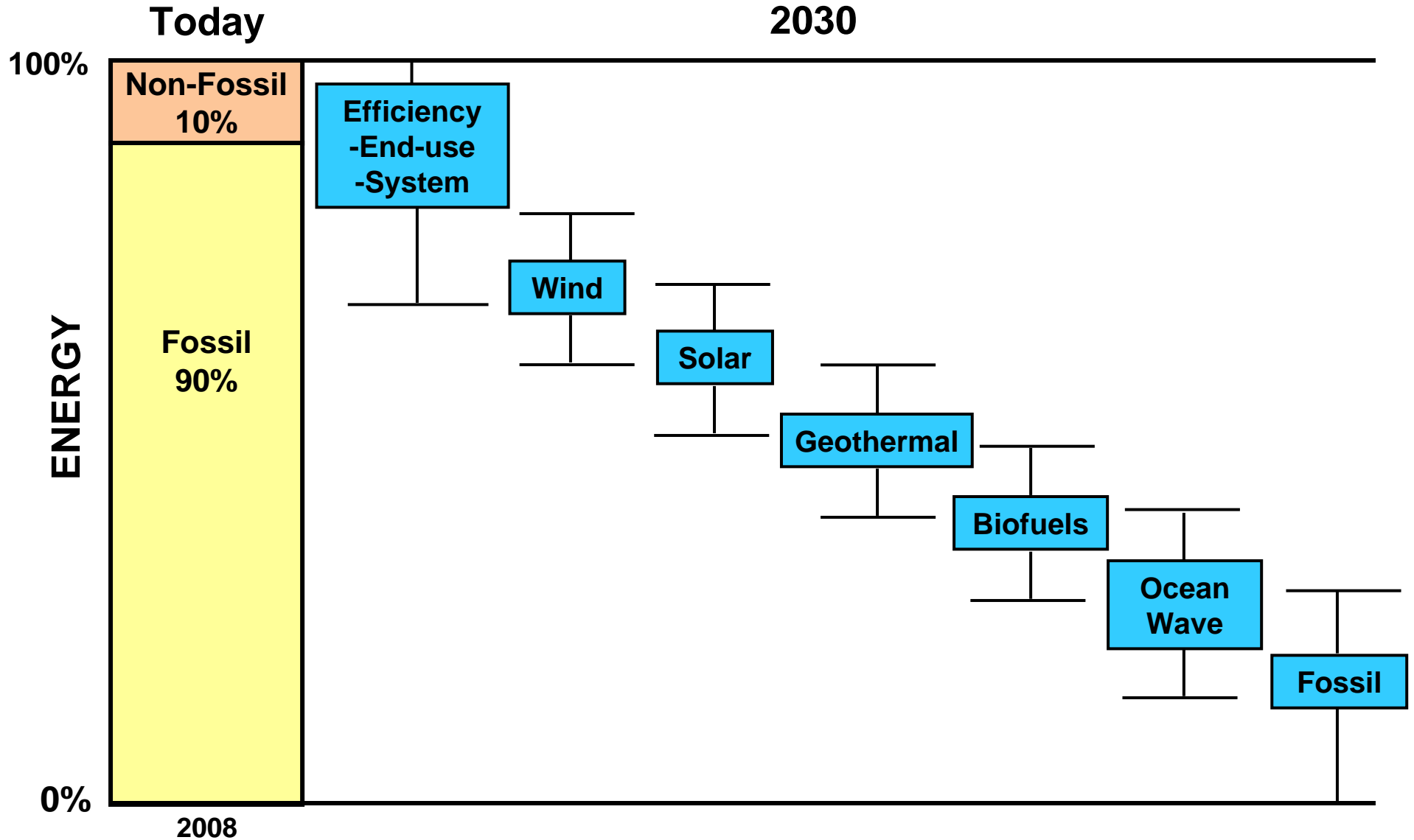
# HCEI Projects/Actions

- ▶ Electricity Grid Modeling and Tool Development
- ▶ Maui Smart Grid (controls, storage)
- ▶ Renewable Lanai
- ▶ Sustainable Communities-Forest City Military Housing
- ▶ Plug-in Hybrid Electric Vehicle Demonstrations
- ▶ GHG Impacts-McKinsey
- ▶ Scenario Options- Booz Allan
- ▶ Regulatory Training

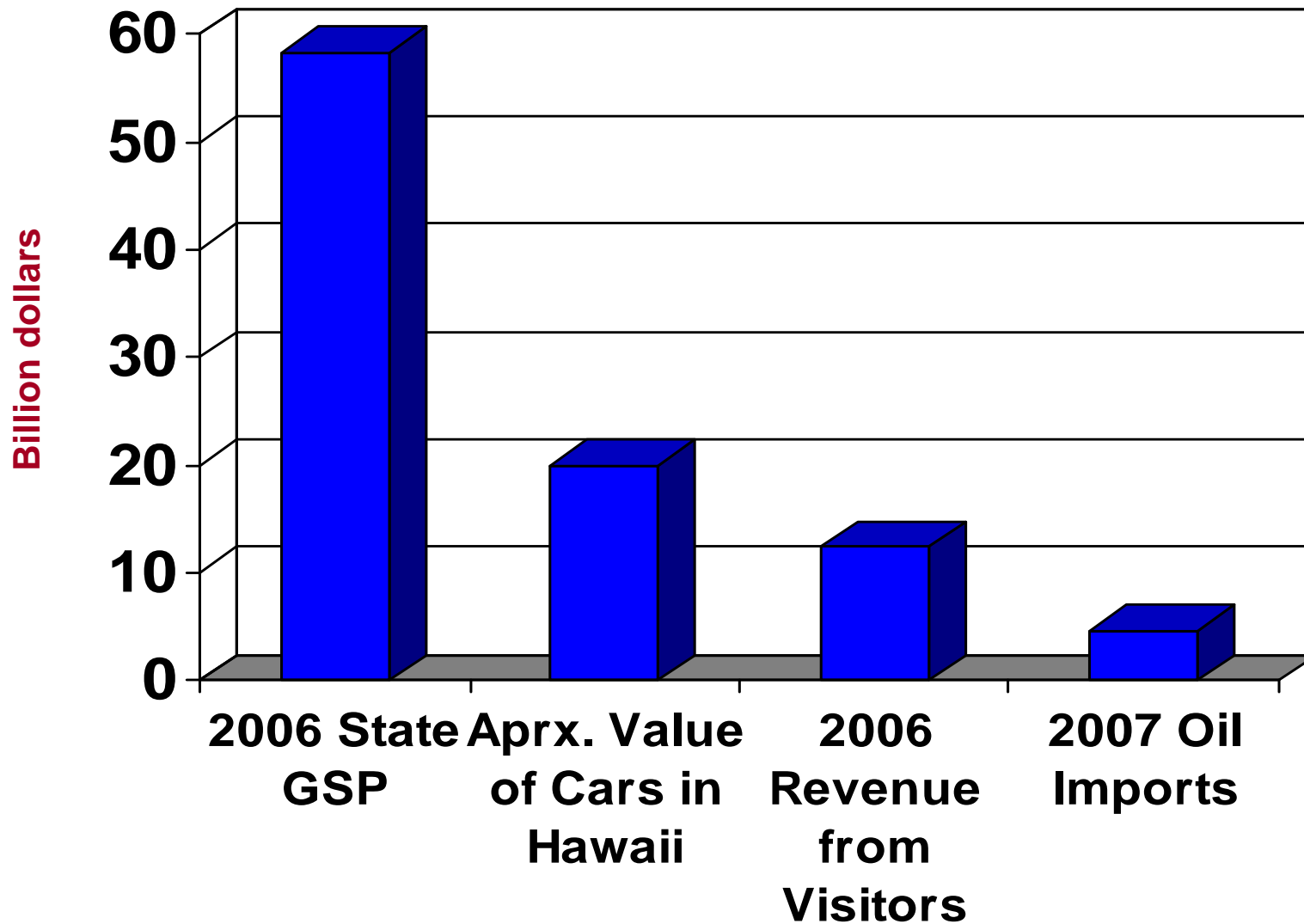


# HAWAII CLEAN ENERGY INITIATIVE

## Envisioning Energy Options – Requires a Portfolio Approach



# Comparative Scale of Funding



Sources: Hawaii Databook, DBEDT, other estimates



# Preliminary Estimate of Hawaii's Greenhouse Gas Emissions in 1990 and 2005 Expressed as Global Warming Potential

Tons Carbon Dioxide Equivalent (Tons CO<sub>2</sub>E)

	1990	2005	Percentage Change 1990- 2005
<b>ENERGY SECTOR</b>			
Residential Commercial Industrial	1,182,631	2,297,520	94.3%
Electric Utility	7,884,515	9,037,987	14.6%
<b>Stationary Subtotal</b>	<b>9,067,146</b>	<b>11,335,507</b>	<b>25.0%</b>
Domestic Transportation Subtotal	7,776,389	8,709,843	12.0%
International Transportation Subtotal	6,432,255	4,722,044	-26.6%
Military Aviation Fuel	677,100	832,815	23.0%
<b>Transportation Subtotal</b>	<b>14,885,744</b>	<b>14,264,702</b>	<b>-4.2%</b>
<b>Energy TOTAL</b>	<b>23,952,890</b>	<b>25,600,209</b>	<b>6.9%</b>
<b>NON-ENERGY SECTOR</b>	<b>1990</b>	<b>2005</b>	
Industrial Processes: Oil/Gas Transportation, Refining, Storage	4,977	5,157	3.6%
Industrial Processes: Cement Manufacturing	109,274	Ended 1995	
<b>Industrial Processes Subtotal</b>	<b>114,251</b>	<b>5,157</b>	<b>-95.5%</b>
MSW Management	1,161,291	1,701,100	46.5%
Wastewater Treatment	21,563	23,923	10.9%
Domestic Animals	273,879	192,119	-29.9%
Manure Management	129,768	56,774	-56.2%
Sugarcane Burning	31,958	10,797	-66.2%
Fertilizer Use	60,850	62,310	2.4%
<b>Non-Energy TOTAL</b>	<b>1,793,559</b>	<b>2,052,180</b>	<b>14.4%</b>
<b>TOTAL</b>	<b>25,746,449</b>	<b>27,652,389</b>	<b>7.4%</b>

Estimated June 2007



# The Hawaii Greenhouse Gas Emissions Reduction Task Force - Objectives

1. Reduce, by January 1, 2020, greenhouse gas emissions in the State to levels at or below the best estimations and updates of the inventory of greenhouse gas emissions estimates for 1990
2. Establish a task force to prepare a work plan and regulatory scheme for implementing the **maximum practically and technically feasible and cost-effective reductions** in greenhouse gas emissions from sources or categories of sources of greenhouse gases to achieve the statewide greenhouse gas emissions limits by 2020.



# McKinsey Analysis of Abatement Costs

## POTENTIAL ABATEMENT ROADMAP

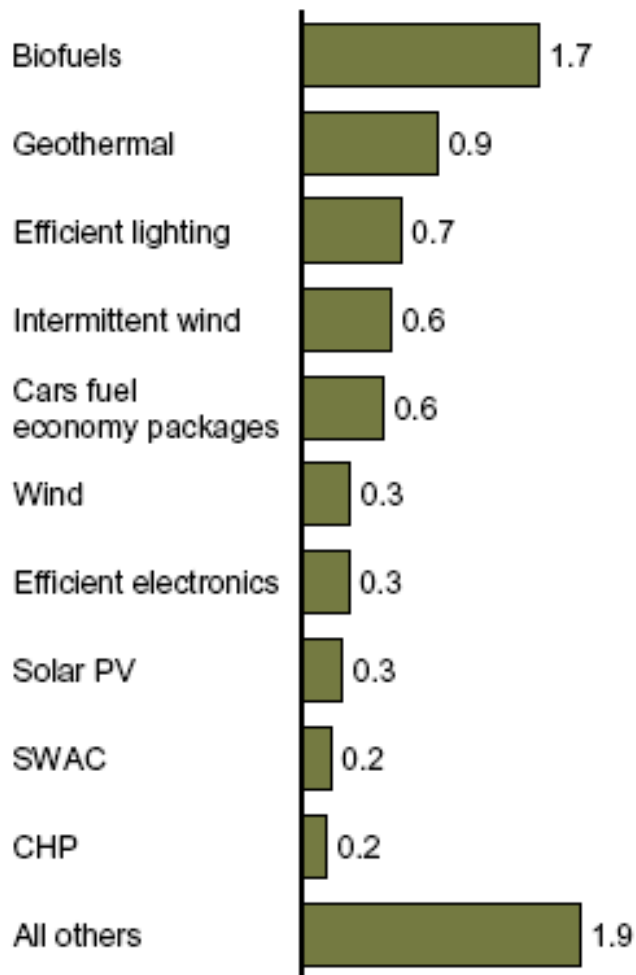
ILLUSTRATIVE

	Phase 1	Phase 2	Phase 3
Biofuels	<p><b>Ethanol 1<sup>st</sup> wave</b></p> <ul style="list-style-type: none"> <li>Convert existing sugarcane to ethanol production</li> </ul> <p><b>Biomass 1<sup>st</sup> wave</b></p> <ul style="list-style-type: none"> <li>Build dedicated co-firing and bagasse plants</li> </ul>	<p><b>Ethanol 2<sup>nd</sup> wave</b></p> <ul style="list-style-type: none"> <li>Expand ethanol production to 1969 sugarcane peak</li> </ul> <p><b>Biomass 2<sup>nd</sup> wave</b></p> <ul style="list-style-type: none"> <li>Expand biomass capacity with ethanol production</li> </ul>	<p><b>Ethanol 3<sup>rd</sup> wave</b></p> <ul style="list-style-type: none"> <li>Develop cellulosic production facilities on the Big Island</li> </ul> <p><b>Biomass 3<sup>rd</sup> wave</b></p> <ul style="list-style-type: none"> <li>Build cellulosic firing plants</li> </ul>
Renewable electricity	<p><b>Baseload geothermal</b></p> <ul style="list-style-type: none"> <li>Expand reliable geothermal production on the Big Island</li> </ul> <p><b>Intermittent wind</b></p> <ul style="list-style-type: none"> <li>Deploy wind capacity on top of existing grid infrastructure</li> </ul>	<p><b>Solar CSP</b></p> <ul style="list-style-type: none"> <li>Develop utility scale solar</li> </ul> <p><b>Firm wind</b></p> <ul style="list-style-type: none"> <li>Connect Maui county and Oahu via cable</li> <li>Develop pumped storage</li> </ul>	<p><b>Wind and geo for PHEVs</b></p> <ul style="list-style-type: none"> <li>Deploy PHEV fleet and power with renewable resources</li> </ul> <p><b>Distributed solar</b></p> <ul style="list-style-type: none"> <li>Encourage residential / commercial adoption of PV</li> </ul>
Efficiency	<p><b>Efficient lighting</b></p> <ul style="list-style-type: none"> <li>Encourage adoption of high efficiency lighting (e.g., CFLs)</li> </ul>	<p><b>Sea water AC and CHP</b></p> <ul style="list-style-type: none"> <li>Create distributed generation and cooling capacity</li> </ul>	<p><b>Efficient electronics and LEDs</b></p> <ul style="list-style-type: none"> <li>Expand penetration of LEDs, efficient electronics</li> </ul>
Incremental annual impact in 2030*	<p>3.6 MMt CO<sub>2</sub>e 7.4 MMB oil</p>	<p>6.4 MMt CO<sub>2</sub>e 12.7 MMB</p>	<p>5.4 MMt CO<sub>2</sub>e 10.4 MMB</p>

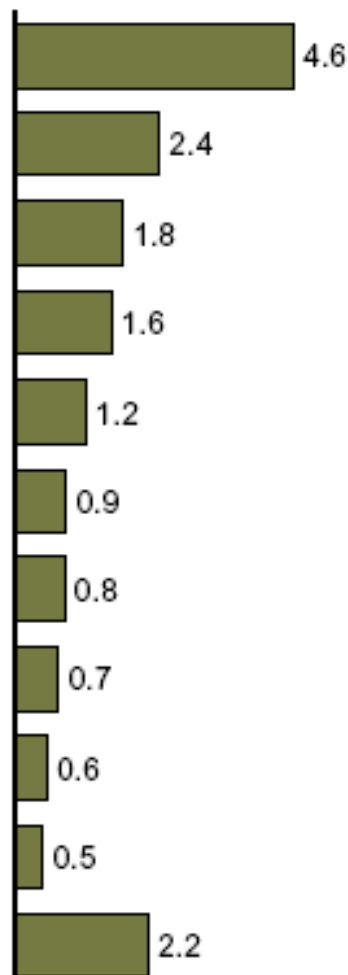


## 75% OF GHG ABATEMENT POTENTIAL (AND NEARLY 90% OF OIL ABATEMENT) CAN BE ACHIEVED FROM TOP TEN INITIATIVES

Top 10 GHG Abatement Initiatives for Hawaii  
MMt CO<sub>2</sub>e



Oil abatement  
MMB



- Top 10 initiatives account for 5.9 MMt abatement and 15.0 MMB
- Hawaii has benefit of being able to focus on fewer, higher-impact initiatives than the U.S.
- Ensuring progress against these initiatives is critical to capturing full abatement potential