



# Hawaii Clean Energy Initiative

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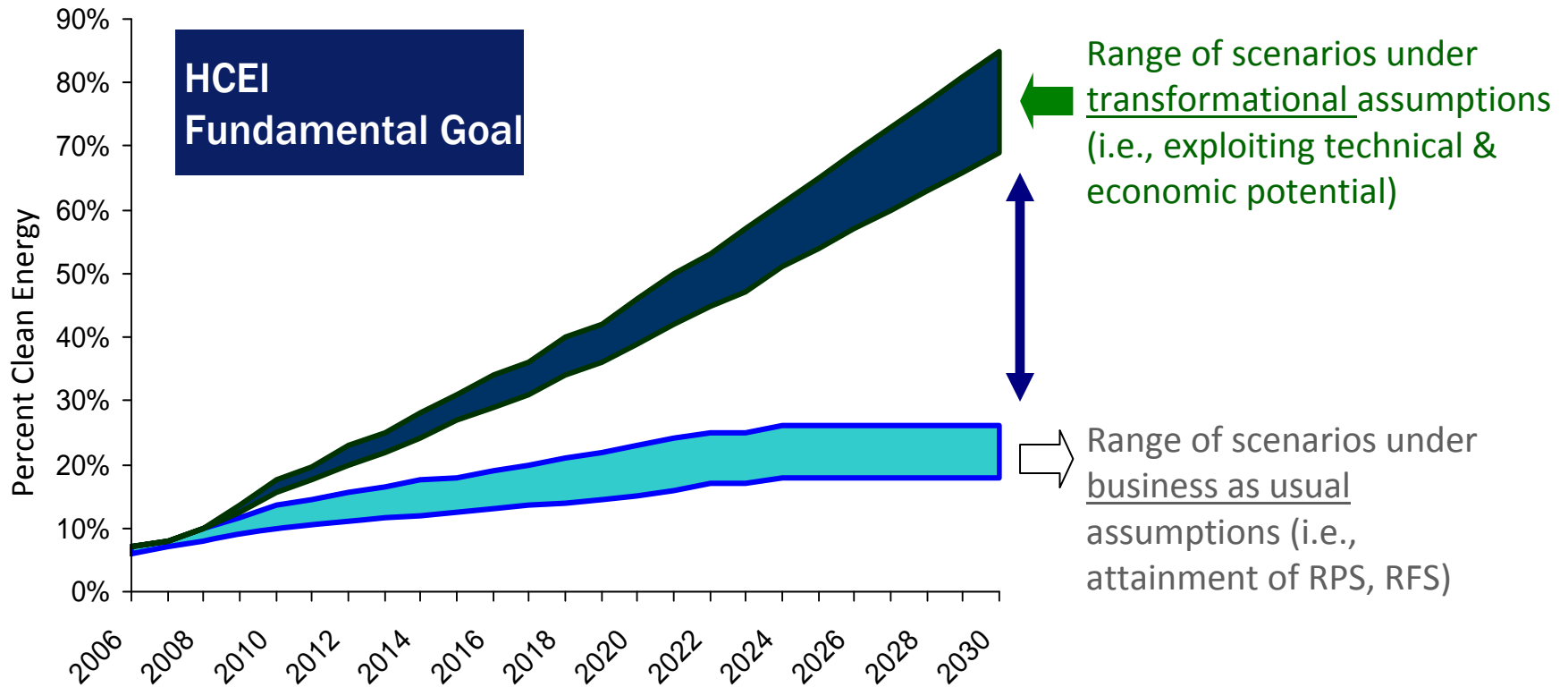
- Purpose was to lay the foundation for a fundamental change from an oil based energy dependency to clean energy
  - 70% goal picked to represent a very difficult but achievable target knowing the complexity of infrastructure change
  - Recognition that policy, regulatory, market (developers and finance), technology and behavioral changes were needed and were interdependent
  - Fundamentally expensive but cost effective and will result in a more secure, sustainable energy ecosystem
  - Security, economic relief, job creation are added benefits

# To accelerate 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% clean energy basis for Hawaii within a generation*
- *Serve as a “open source” learning opportunity:* Make Hawaii a replicable model for achievement of a clean energy-based economy for the world
- *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

Where we are today: Hawaii needs to transition from an economy powered by oil to one based on clean energy...



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

# Activities

- MOU signed January 28, 2008
- Working Groups established, DBEDT and DOE co-chairs
- Studies and Project Starts
- PUC Regulatory Training/Discussions
- Evaluations to Date
  - Scenario Analysis
  - GHG Analysis
  - First cuts at Economics
  - Regulatory Framework

# Dependence on foreign oil = dependence on foreign political instability

- October 16, 2007 -- **\$87.61/barrel**
  - “**Weak dollar** and **international tensions** (anxieties over northern Iraq, where there is potential for a Turkish strike on Kurdish separatists)”
  - “**Crude options expire tomorrow** and the market was thought to be heading toward \$90/bbl.”
  - “The market, said OPEC, is ‘**very well supplied.**’”
- January 2, 2008 -- **\$100/barrel**
  - “...a **weakening dollar**, the flow of money into commodities from faltering stocks and bonds, and **Nigerian and Kenyan political unrest**...and oncoming Winter storm, apprehension over tomorrow's DOE report”
- July 11, 2008 -- **\$147.27/barrel**
  - “...market watchers pointed to concerns in regards to Nigerian production, the ongoing **tensions with Iran** and an **impending strike of Petrobras workers**. In addition, dollar weakness and an early exodus from equities into oil were also considered factors today.”

# A better measure of cost is to examine the impact on residents of Hawaii

## FACTS:

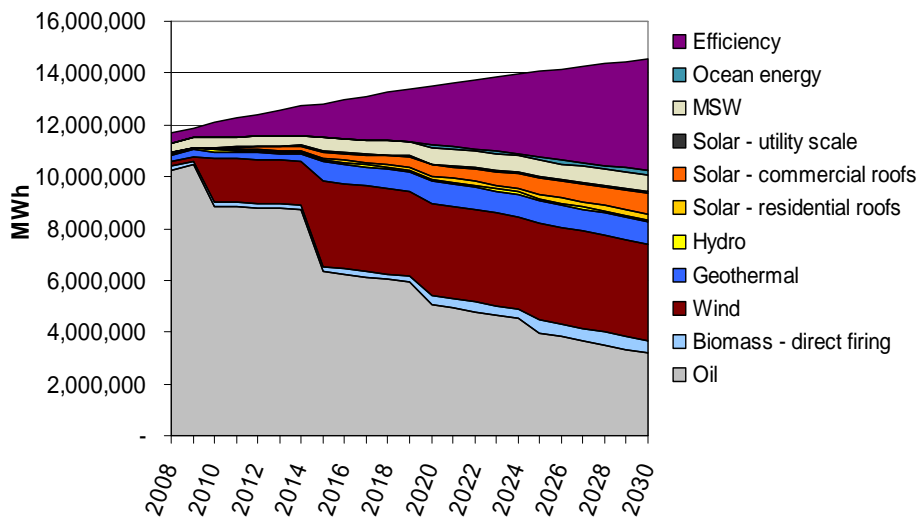
- In 2008, an estimated 41 million barrels of oil were imported into the State (*lower than prior years*)
- The global average price of oil in 2008 was \$100 per barrel (*higher than prior years*)
- Approximately 2/3 of every barrel of oil imported into Hawaii goes to the generation of electricity and for ground transportation (e.g., gasoline)
- The 1.3 million residents of Hawaii shoulder this cost of energy
- **THUS, IN 2008, IN HAWAII, EVERY MAN, WOMAN, AND CHILD “EXPORTED” \$2,100 FOR ENERGY (EXCLUDING AVIATION FUEL)**

*What will the cost/export be in 2009? 2010? 2030?*

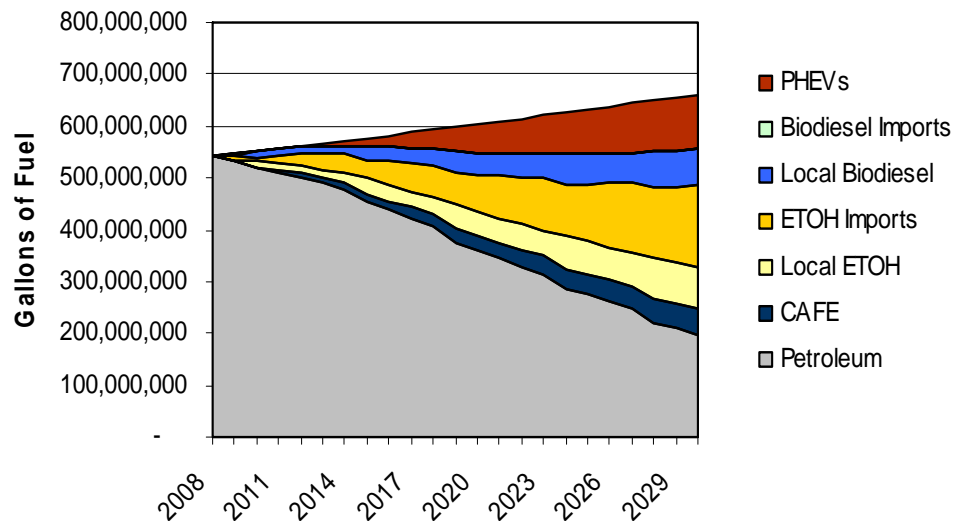
# Scenario Analysis: Information at the State level to inform State leaders on policies and tradeoffs

## State of Hawaii electricity generation

(Delivered capacity)



## State of Hawaii ground transportation



### Summary of 2030 Electricity Results

<b>Clean energy achieved</b>	<b>70%</b>
<b>Oil reduction (million bbl/yr)</b>	<b>17.3</b>
<b>CO2 avoided (million ton/yr)</b>	<b>8.8</b>

### Summary of 2030 Transportation Results

<b>Clean energy achieved</b>	<b>45%</b>
<b>Oil reduction (million bbl/yr)</b>	<b>7.9</b>
<b>CO2 avoided (million ton/yr)</b>	<b>2.7</b>

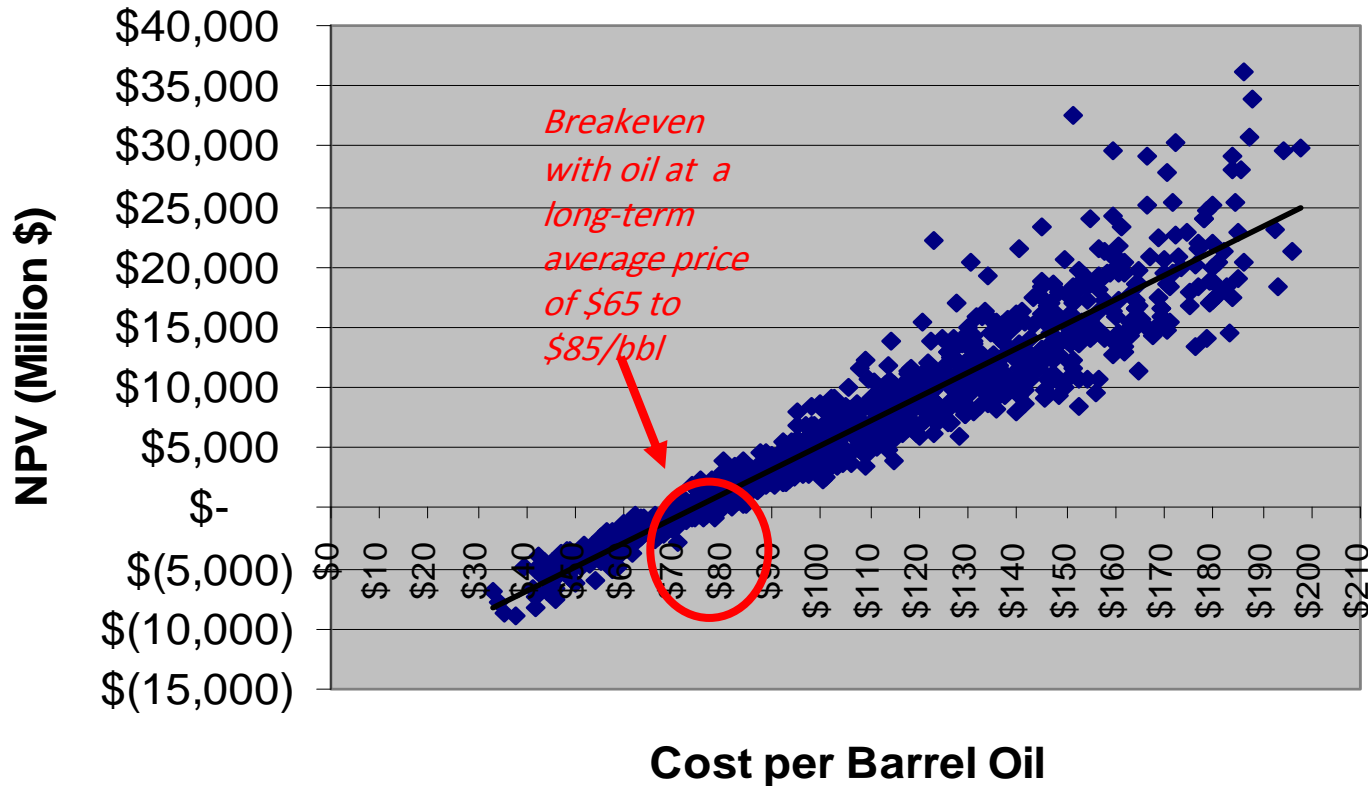


## Results – Achieving 70% clean energy in Hawaii is possible, but will require aggressive action in a number of areas

- **Renewable resources:** All types of electricity generating technologies need to be deployed to reach 70% (geothermal, hydropower, biomass, wind, solar, etc.)
- **Efficiency:** Aggressive energy efficiency measures are critical to achieving the 70% clean energy goal
- **Inter-island cable:** The state cannot reach 70% clean energy for electricity and maintain high levels of clean energy for transportation unless there is a cable to Oahu from the outer islands; the cable explored in this analysis is a shallow cable to Oahu from Lanai and Molokai
- **Electric vehicles:** High levels of electric vehicles are needed if the transportation sector is to reach high clean energy goals

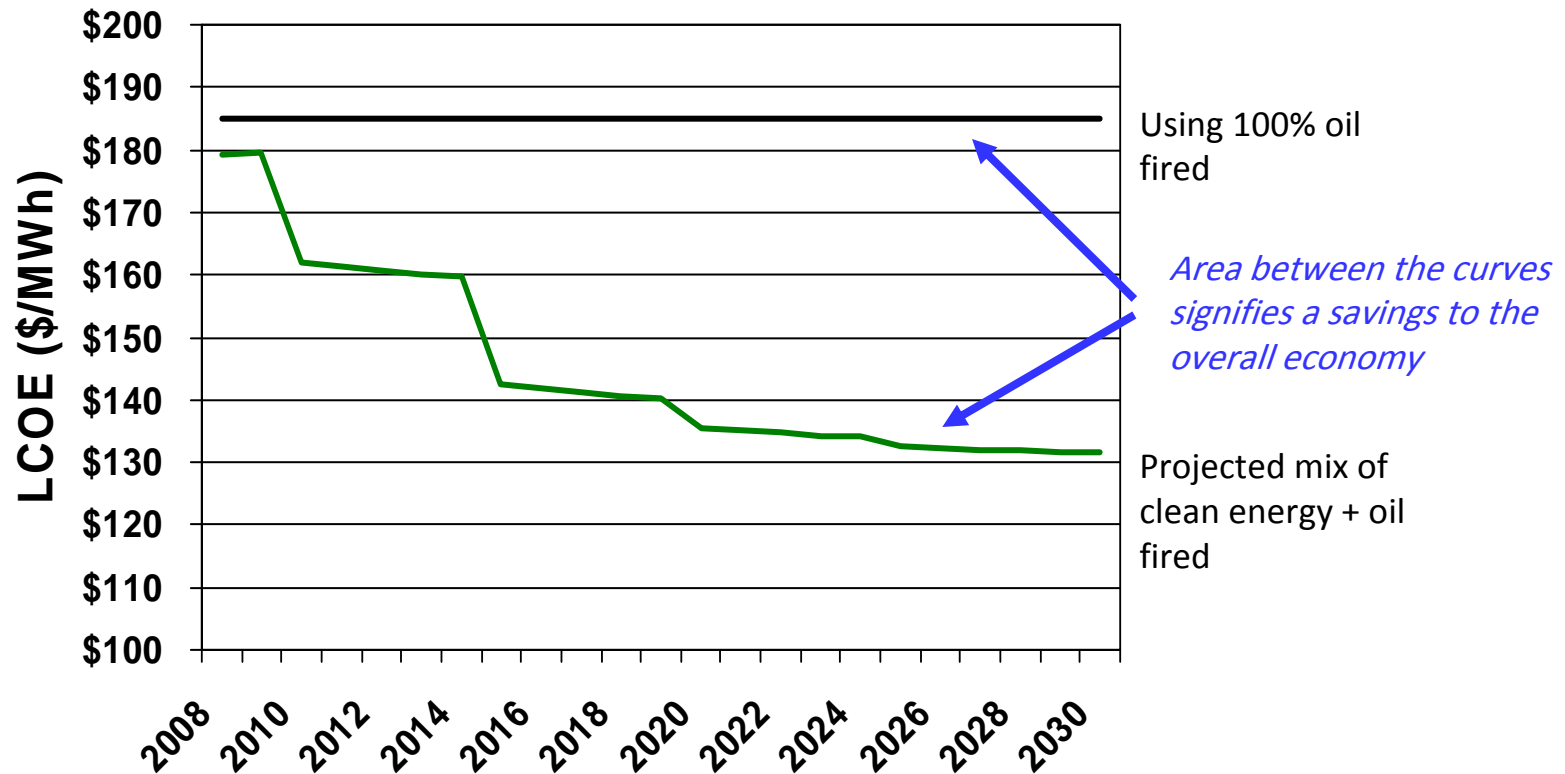


Long-term total investments are likely to approach \$16 billion—But investment in clean energy will lead to significant savings from oil avoided over time



*For context, note that in 2008 Hawaii "exported" over \$4 billion for crude oil*

Example: Savings in the Levelized Cost of Electricity (LCOE) over time based on a long-term average price of oil of \$100/barrel and one of the scenarios in the analysis

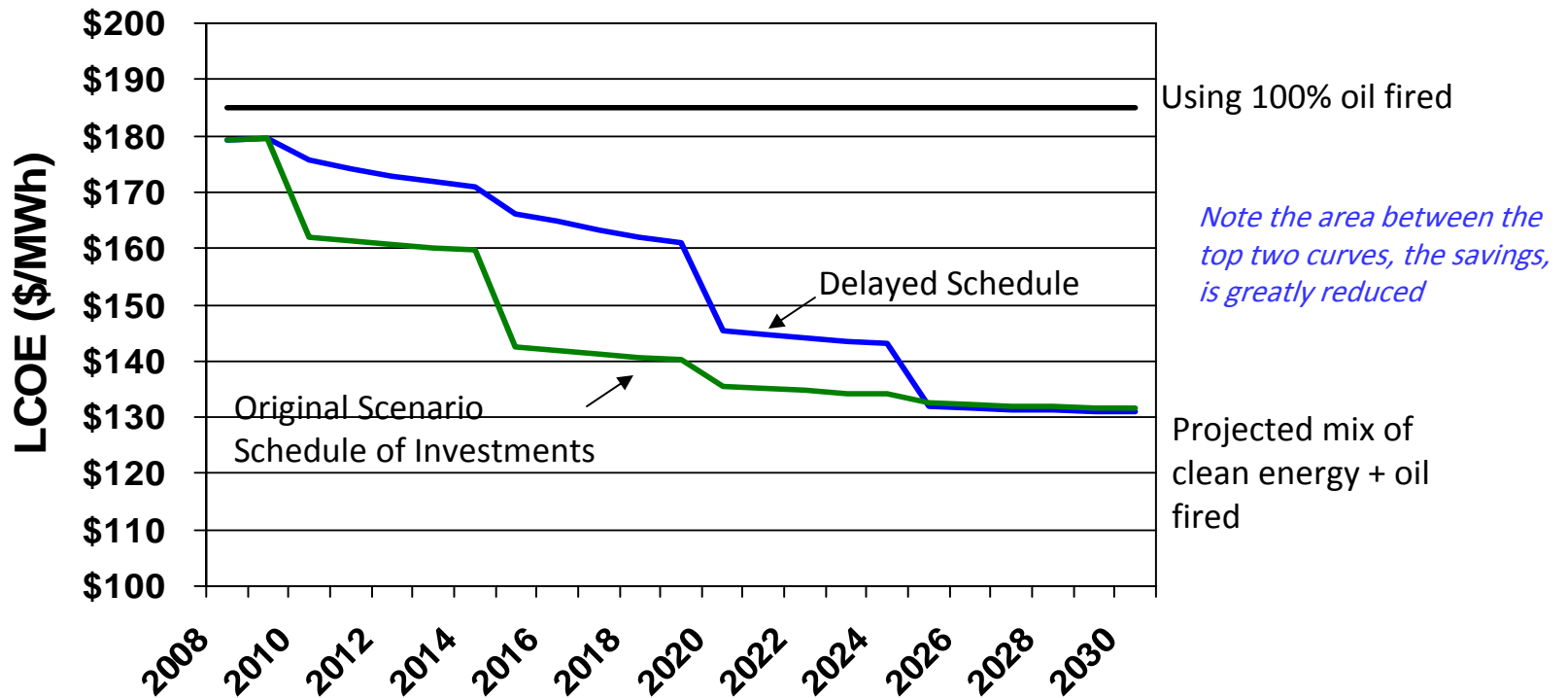


*IMPORTANT: Retail electricity rates include other factors beyond LCOE*

*Figures in 2008 dollars*

*PV figures based on discount rate of 7%*

# Example: Early action is crucial—a ten year delay in the deployment of major clean energy systems impacts the savings to the overall economy



Figures in 2008 dollars  
 Crude oil assumed as \$100/bbl long-term  
 average PV figures based on discount rate  
 of 7%

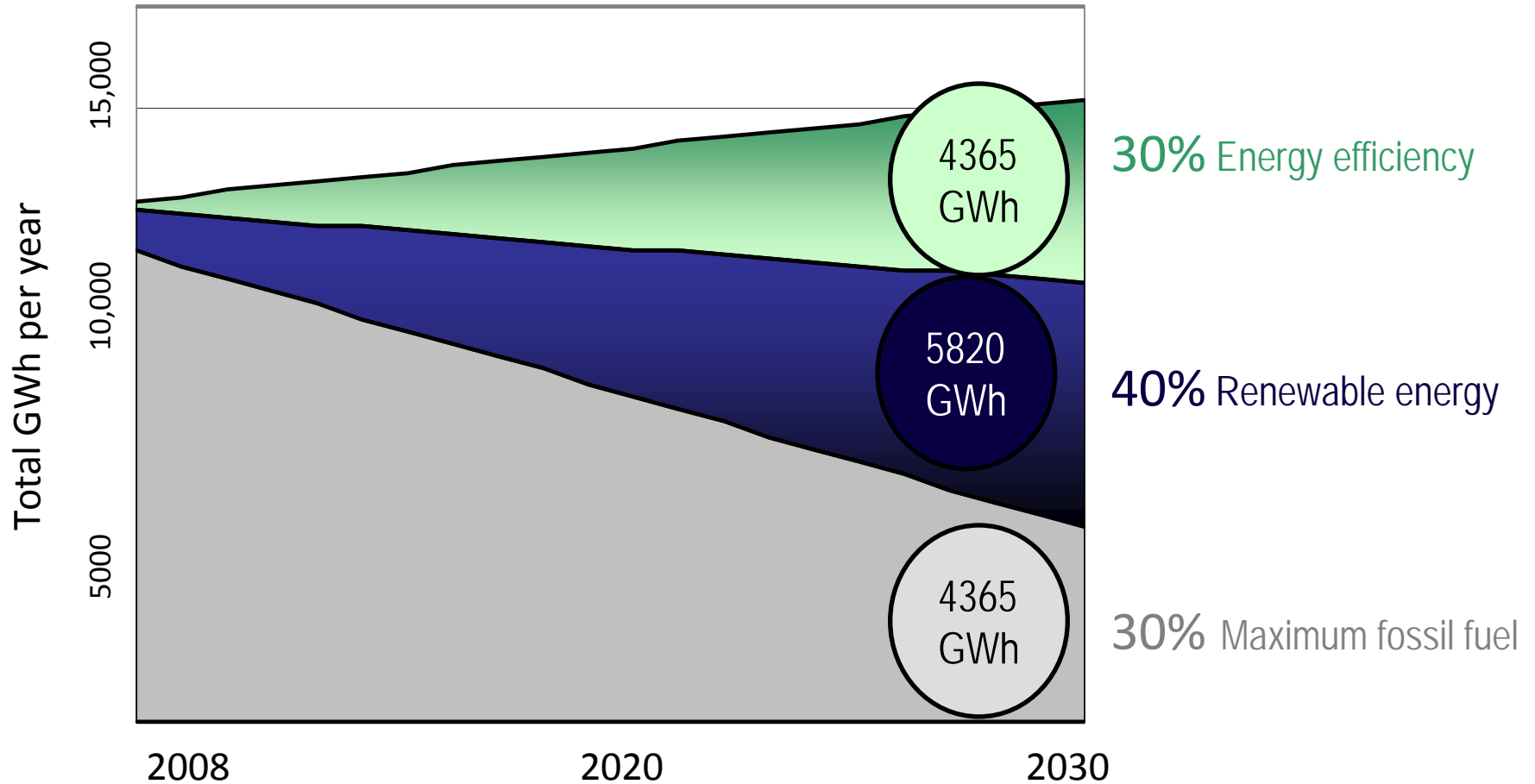
*IMPORTANT: Retail electricity rates include other factors beyond LCOE*

# More importantly, a clean energy future as envisioned by HCEI will create a *broad suite of benefits* for Hawaii

	Current oil-based situation	Future HCEI Clean Energy Scenario	Description/Comment
▶ Price Volatility “Index”	92%	37%	▶ Percent of generation tied to oil prices in the long term, including petroleum products, ethanol and biodiesel
▶ Percentage of Clean Energy consumed in State	7%	70%	▶ The current situation is 7% renewables, and the current RPS calls for 20%
▶ Trend in CO <sub>2</sub> emissions Statewide	▶ Flat with steady, high emissions	▶ Emissions decreasing rapidly over time	▶ With over 90% of energy based on fossil fuels, CO <sub>2</sub> reductions will be quite limited. Clean energy sources will dramatically reduce CO <sub>2</sub> emissions
▶ Potential for Energy Sector investment	▶ Low	▶ High	▶ Large investments will be needed for grid upgrades, energy efficiency, renewable energy supply, biofuel production, etc.
▶ Potential for new Job Creation	▶ None	▶ High	▶ While the number of new jobs may not be extraordinarily high, the quality of the jobs will be high

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

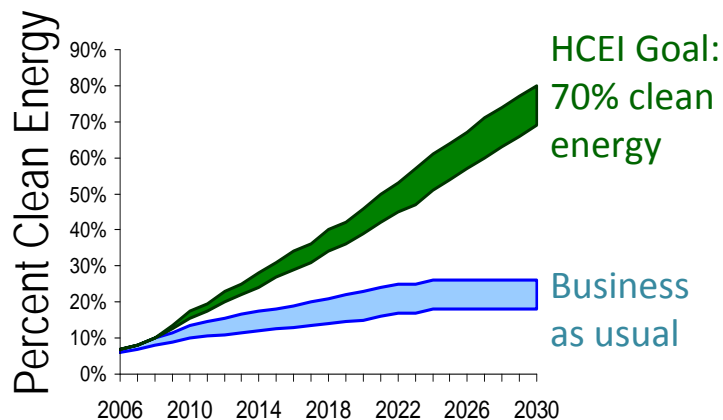
Hawaii Electricity Portfolio



Note: This just reflects 2030 electricity targets; still need interim targets and transportation targets

# 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%	9%-17%
	Electric Generation	40%	-35%
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

# New Regulatory Framework

- De-Coupling
- Renewable Portfolio Standard
- Feed-in Tariffs
- Energy Efficiency, Demand Response, Distributed Generation
- TOU rates, Automatic meters, net metering
- Creating an Energy Scenario Planning process that replaces the current IRP.
- Green energy tariff and/or Renewable Energy Credits
- Revising transmission planning processes to include identification of Renewable Energy Zones with preferred renewable generation development sites, with expedited transmission planning, siting, permitting and interconnection for new renewables.
- Creating a Clean Energy Infrastructure Surcharge



# What is needed in the next 12 months

- IMPLEMENTATION!!!!!!!!!!
- Sense of urgency
  
- Big efficiency push
- Initial transportation actions
- Electricity regulatory and statutory actions
  - New regulatory framework
  - Certainty of Market rules to bring in private investment
- T and D system improvements started
- More renewable projects in the pipeline

What about Kauai?

# Electricity

- KIUC 2008 IRP
- For individuals and companies, you need to
  - Decide your own energy fate or live with the consequences
  - You collectively control
    - How much efficiency/building codes
    - How much renewable energy
    - How much bioenergy/biofuels
    - How much small scale generation
    - Integration of those systems
- Any help can augment what you do

# Kauai Renewable Build-out Limitations

- MW scale Wind-Shearwater interactions
- Solar-Still high costs
- Bioenergy- cost effective?
- OTEC/Wave- not commercial
- Geothermal-low temp unexplored
- Small systems- high costs today
- Land/water access/acceptability
  
- Efficiency still most cost effective solution

# Kauai Grid Study

- Joint KIUC-HCEI effort,
  - Model the system
  - Run scenarios to see what is rational
    - High Solar build-out
  - System Integration

# Transportation

- For transportation, your control is limited, but you can act
  - Local Electric Vehicle credits and incentives
  - Fuel Flexible Vehicle's
  - Local Biofuel Development
  - Personal buying choices

# Kauai Coordination

- County Sustainability Plan
- KIUC 2008 IRP
- KIUC/Consumer Advocate/DBEDT/DOE Agreement
- KEDB Energy Committee and Conferences
- HCEI, Congressional delegation and State Support

# Summary

- What does Kauai want to do about energy dependency?
- When?
- How?
  
- It's up to you
  - But we can help (HCEI, Federal Stimulus Package)