



WESTCARB Annual Business Meeting

Hawaii's Act 234 and Related Activities

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Summary of Discussion

- Overview of energy differences in Hawaii versus the mainland
- Specific aspects of Act 234
- Some current activities related to greenhouse gas reductions

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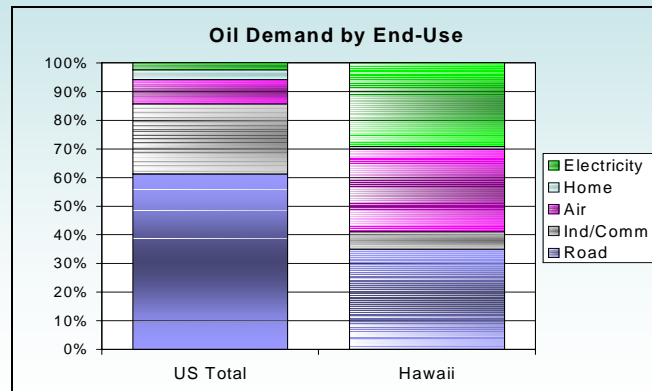
Hawaii Renewable Resource Mix and Energy Issues Provides Unique Opportunities for Deployment of New Technologies

- Varied and substantial mix of renewable resources
- Substantive transmission and distribution issues – impacts of renewable energy systems on grid stability, sparse population/long distances
- Unique nature of utility (HECO) to the state
- Small grid systems with no interconnections between islands
- Highly dependent on petroleum for electricity – ~86%
- Very high cost of electricity – up to \$0.40/kWh
- Generally the highest in nation for gasoline costs
- New construction and other housing requirements leading to need for linking solar/efficiency
- State government focused on contributing to energy solutions – 70% renewable energy by 2030
- Enhanced interest of Economic Development Boards

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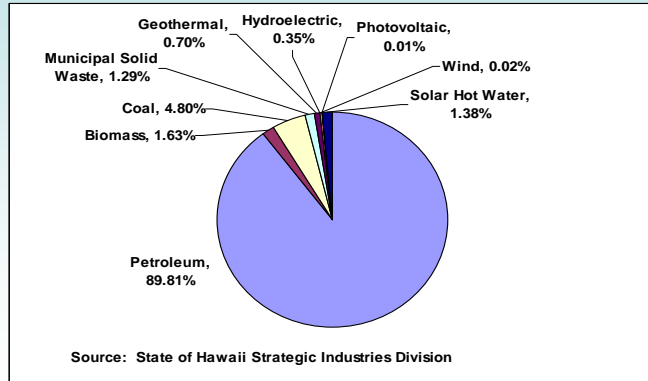
Comparison of US and Hawaii Petroleum Demand



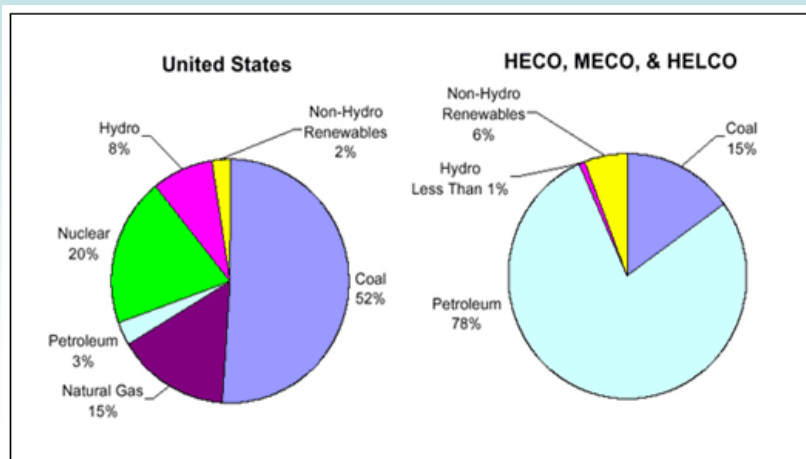
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Hawaii Is Heavily Dependent on Petroleum for Energy Use



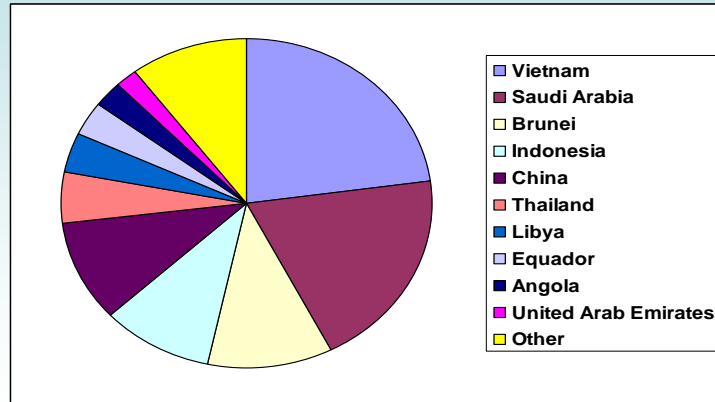
Electricity Resource Mix Is Substantively Different from the Mainland



Source: www.heco.com

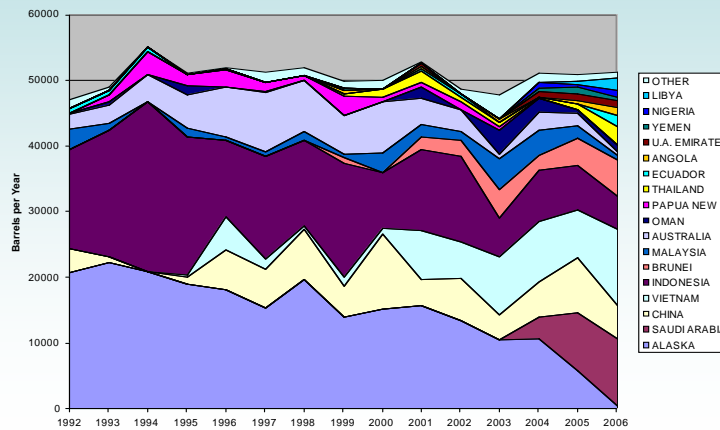


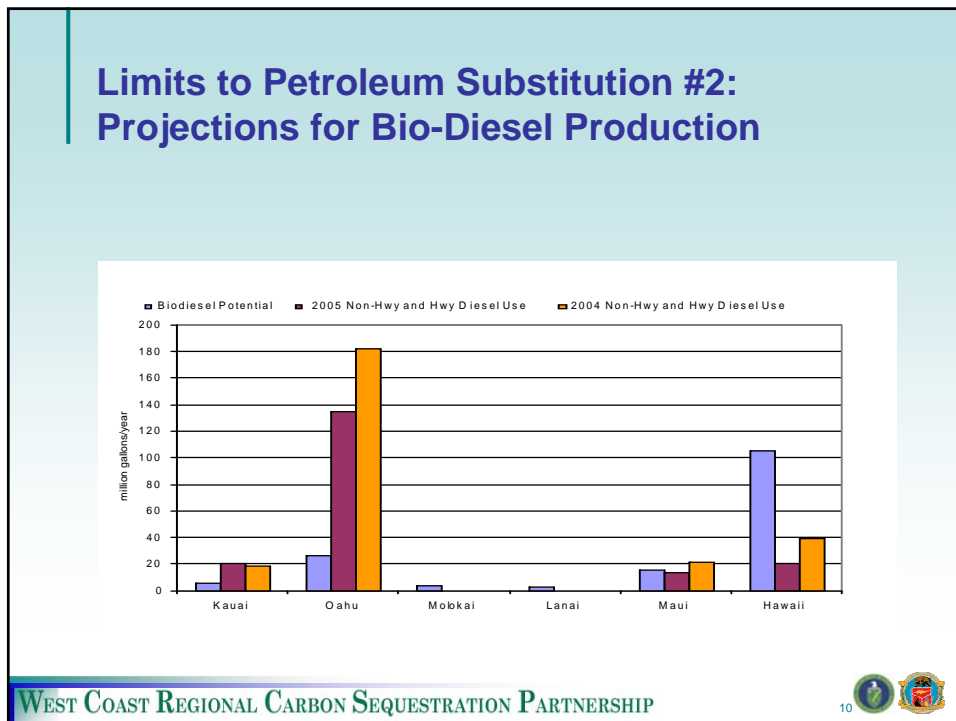
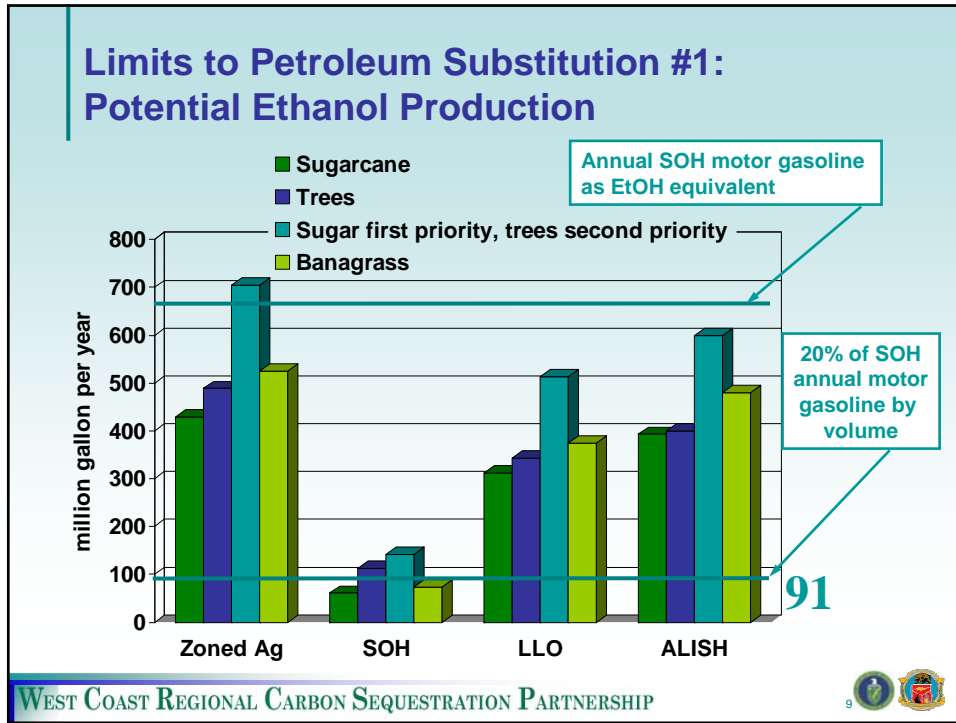
Hawaii's Import Mix—2006

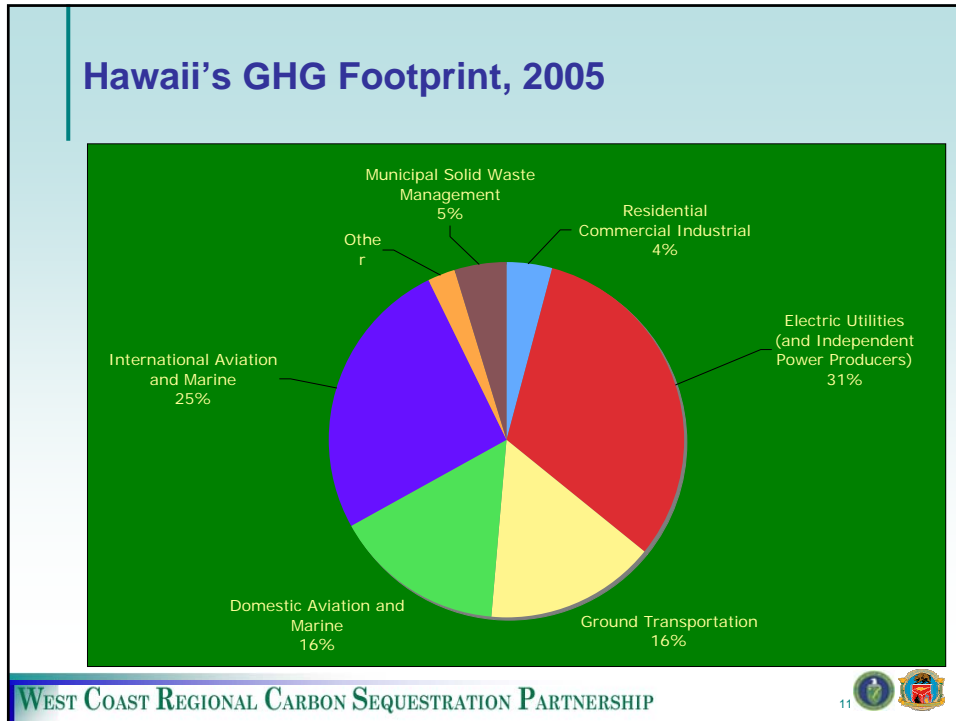


Hawaii's Dependence on Foreign Oil Is Headed in the Wrong Direction

Figure 2 Hawaii's Crude Oil Sources 1992-2006







- Top Threats to Hawaii Related to Climate Change – and the Wrong Set of Regulations
 - Increased Social and Economic Isolation
 - Energy, Tourism & Food
 - Sea Level Rise
 - Ecosystem Collapse
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- 12

- Economic Aspects - Tourism
 - About 13% of the State's daily population is comprised of tourists
 - Tourism activities account for about 30% of the State's total economic activity
 - Air transportation emissions account for about 25% of all Hawaii emissions
 - Tourism may be limited because of oil prices, climate mitigation strategies, moral persuasion, and less attractive destination
- Food Supplies
 - "Over 80% of what we consume is imported" - *Hawaii 2050 Issue Book, Agriculture*
 - Food vs. Fuel - Bioenergy Master Plan

Sea Level Rise

- Key Infrastructure at Risk with a One-Meter Rise
 - International airport
 - Barbers Point industrial complex
 - Roads
 - Already flooding during high tides in certain areas
- Need to build into infrastructure planning process
 - Ex: where should the rail line be built?
- Water
 - Better understanding of water table
 - Need to increase conservation, permeability, and better community planning

Act 234 Passed in 2006 Has Following Provisions

- Caps State GHG Emissions to 1990 Levels by 2020
- Establishes a Task Force to recommend a regulatory scheme for implementing “technically feasible and cost-effective reductions”
- Emphasis on market-based mechanisms
 - Direct emissions reduction: command and control
 - Market based mechanisms: cap and trade, carbon taxes
 - Development of appropriate state-specific analytical tools
- State to update emissions inventory last done in 1990
- Rules to be adopted by Department of Health by 1/1/12 establishing emissions limits
 - Associated reporting, verification, compliance mechanisms
 - Additional mitigation and adaptation measures to be proposed by the legislature

Other Issues to be Considered

- Regressive effects for lower income groups— environmental justice and equity issue
- Revenue recycling if taxes
- Synthesis with national legislation, given some of the state’s unique attributes
 - Issues related to state: aviation and marine emissions and relationship to economy
- Counting offsets, credits, and sequestration
- Must be aware of “dangling impacts and unintended consequences”

Hawaii Uniqueness Will Affect the Development and Implementation of Policies

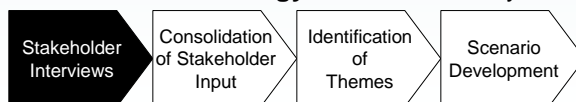
Unique GHG emission pattern because of unique economy and geographical situation

- There are limited opportunities for the trading of carbon permits. Limited land and water resources place limitations on ability to provide competitive carbon credits.
- Virtually no industrial base
- Economy highly dependent on the military and tourism
 - Tourism impacted if air transport emissions targeted nationally or by state
 - May not be responsive to regulations
- Significant oil dependency, little use of coal and gas (few options for fuel switching)
- Relatively short driving distances (different solution from Mainland)
- Cannot import power from outside each island
- Island state and have large demand for air and marine fuels
 - Transportation and commerce between islands is inter-modal and thus energy intensive
 - Easier to model energy system

Fragile ecosystem that is being affected by global warming (coral bleaching in NW Hawaiian islands) and vulnerable to coastal inundation (sea level rise)

Looking at Change: Stakeholder Interviews – Developing Buy-in

- What are your key energy-related **metrics**?
- What are your **energy goals** for 2020?
- Is 2020 an appropriate **target** for the study?
- What do you see as **key global influences**?
- What do you see as key **energy technologies**?
- What **policies** should Hawaii implement?
- What other **energy issues** concern you?



- County of Hawaii Energy Office**
Bob Arrigoni
- Economic Development Alliance of Hawaii**
Paula Helfrich
- Enterprise Honolulu**
Mike Fitzgerald and John Strom
- Fairmont Orchid**
Ed Andrews
- Hamakua Energy Partners**
Joe Clarkson
- Hawai'i County Council**
Pete Hoffmann
- Hawai'i Island Economic Development Board**
Mark McGuffie
- Hawaiian Electric Company, Ltd.**
Karl Stahlkopf
- Hawai'i Electric Light Company, Inc.**
Hal Kamigaki, Chengwu Chen, Art Russell, Lisa Dangelmaier
- Hawi Renewable Development**
Jim Nestman, Raymond Kanehaikua
- Hilton Waikoloa Village**
Rudy Habelt (Director of Property Operations)
- Kohala Center**
Betsy Cleary-Cole (Deputy Director)
- Life of the Land**
Henry Curtis (Executive Director)
- Office of Hawaiian Affairs**
Mark Glick Yuko Chiba
- Powerlight**
Riley Saito
- State of Hawaii, Department of Business, Economic Development & Tourism**
John Tantlinger, Steve Alber, Priscilla Thompson
- State of Hawaii, Public Service Commission, Division of Consumer Advocacy**
Catherine Awakuni
- Tesoro Hawaii Corporation**
Carlos De Almeida
- University of Hawaii at Manoa**
Makena Coffman

Wind Resources for Electricity—Stakeholder Consultation

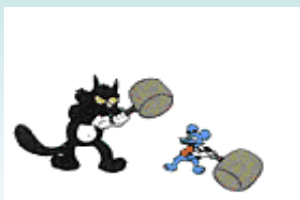


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Big Island Stakeholder Summit

What we expected:



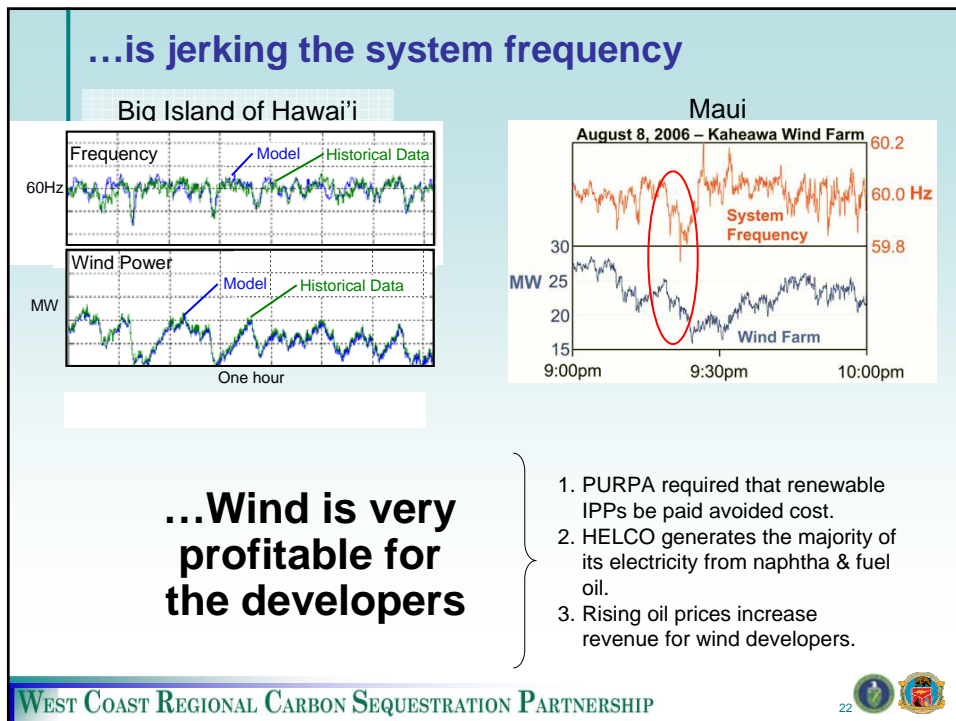
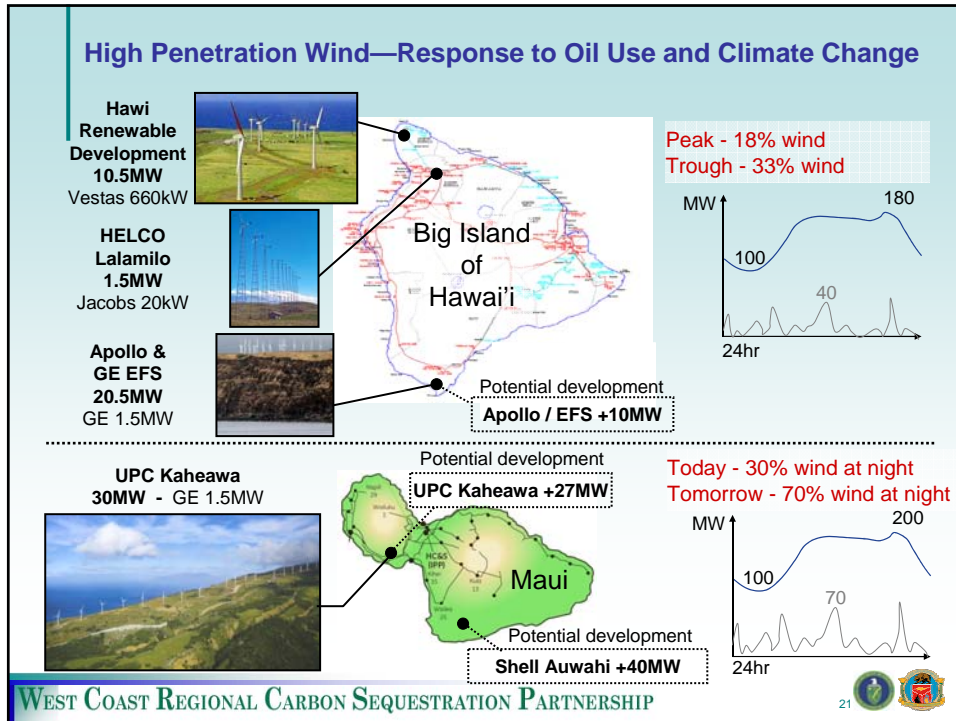
What we got:



While there were clear areas of disagreement, we found a surprising amount of consensus on objectives, concerns, and desire for cooperation.

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What if 1MW of wind power is added to Apollo wind farm?

	Fuel Use		Emissions (tons)		
	GWh	MMBtu	NOx	SOx	CO ₂
Combined Cycle	-2.1	-15545	0	-2	-1352
Combustion Turbine	-1.3	-13905	-1	-2	-1245
Diesel	0.0	-341	0	0	-29
Puna Geothermal	0.0	0	0	0	0
Small Hydro	0.0	0	0	0	0
Steam Oil	-0.6	-7582	-1	-1	-726
Wind	4.1	0	0	0	0
Solar	0.0	0	0	0	0
Grand Total	0.1	-37374	-2	-6	-3352

- With no other changes to the system, an increase in wind power offsets fossil fuel generation and reduces emissions
- But, HELCO must maintain their system frequency at 60 Hz
- Sudden changes in wind power output will affect the frequency, therefore increasing wind power requires some additional considerations

Is there more to this story?

Cost Adders



?

Wind power reduces the island's carbon footprint, and reduces the amount of imported petroleum, but...

- 1) More spinning reserve will be needed** - More oil must be burned so some generation is ready to quickly meet changes in the system load or wind farm output, and/or
- 2) New technologies** can be used to mitigate the intermittency of wind power.
- 3) Price paid to wind producers** matters. If HELCO pays a wind producer more than it costs them to produce electricity from fossil fuel generation, more wind power will cost the island more.

Public/Private Partnerships in Hawaii, Including Analysis of RPS Goals for PUC

- **Kauai Energy Roadmap**
 To develop possible roadmap for increasing the penetration of renewable energy
- **Oahu Wind Study**
 To evaluate wind projects that could impact the Island
- **Maui Grid Modernization**
 Deploy energy storage, generation and demand-side management technologies to reduce peak load and enable further expansion of renewable energy
- **Maui Grid Study**
 Development of power systems model to understand the economic & performance impacts of more wind and the mitigation technologies needed to increase wind power
- **Big Island Energy Roadmap**
 Evaluate scenarios to identify the performance of various technology approaches to increase energy security and the penetration of renewable energy

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