Analyzing Hawaii's Energy Eco-system

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DBEDT HAWAII STATE Energy Office

Hawaii's Energy Choice

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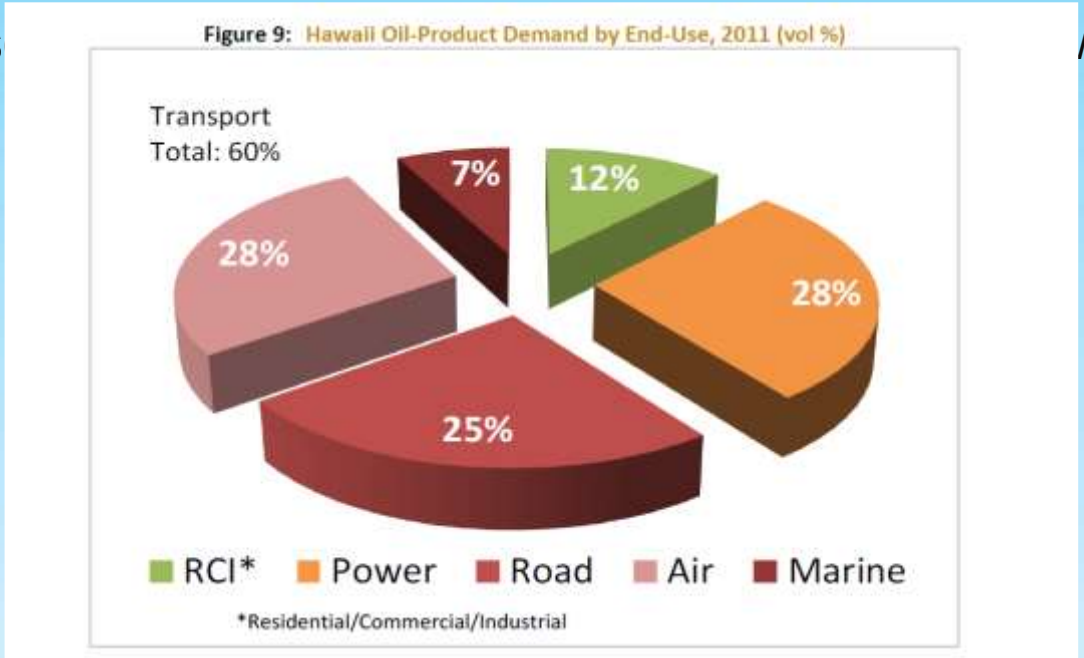

Our vision for Hawaii's energy Landscape is a Hawaii that is energy independent, environmental and culturally sound, and adds value to Hawaii's people and businesses.

Energy independence means breaking our addiction on imported fossil fuels.

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Hawaii's Energy Roadmap

However the road to energy independence is not easily navigated

Cohesive Strategy Needed

"The legislature has set an ambitious agenda for clean energy. But an agenda is not an action plan.

While California boasts separate policies for energy efficiency, green house gas emissions, renewable energy, demand response initiatives and other environmental regulations, it has failed to take the important step of integrating and coordinating these policies."

Little Hoover Commission "Rewiring California: Integrating Agendas for Energy Reform"

The energy eco-system is a highly complex interdependent system

A decision on any one policy can have a ripple effect across the entire system

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Hawaii State Energy Office
Energy Systems & Planning Branch (ESP)

Comprehensive Energy Eco-System Roadmap:

Our goal is to put the whole energy eco-system into perspective

In order to prioritize high impact, cost effective activities to achieve energy independence ESP assess' and reports the impact of existing and potential energy policies and projects on Hawaii's energy eco-system.

We then look to enable high value activities through demonstrations and programs, legislation and regulatory proceedings.

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Integrated Energy Modeling
Inputs and Assumptions

ALLOCATION BY ISLAND BY TECHNOLOGY

RPS SCENARIO OVERVIEW

EXISTING GENERATION	OAHU		HAWAII		MAUI	
Technology	Capacity (MW)	Generation (MWH)	Capacity (MW)	Generation (MWH)	Capacity (MW)	Generation (MWH)

ALLOCATION BY ISLAND BY TECHNOLOGY

	SCENARIO OVERVIEW	Total MWh w/o DGPV	-	OAHU			HAWAII			MAUI		
RE Technology	% of remaining RPS to be filled	Total Capacity (MW)	Total Generation (MWh)	% of remaining RPS to be filled	Additional Capacity (MW)	Generation (MWh)	% of remaining RPS to be filled	Additional Capacity (MW)	Generation (MWh)	% of remaining RPS to be filled	Additional Capacity (MW)	Generation (MWh)
DG PV		-	-		235,963	-		155,214	-		45	-
Utility Solar	25%	626	1,423,054	13%	246	711,527	5%	155	284,611	8%	226	426,916
Wind	30%	6,288	1,707,665	5%	89	284,611	13%	107	711,527	13%	6,092	711,527
Geothermal	25%	199	1,423,054	0%	-	-	20%	160	1,138,444	5%	38	284,611
Biomass	20%	113	842,785	10%	49	361,492	5%	38	284,611	5%	26	196,683
Biofuel	0%	-	-	0%	-	-	0%	-	-	0%	-	-
Biogas	0%	-	-	0%	-	-	0%	-	-	0%	-	-
Hydro	0%	-	-	0%	-	-	0%	-	-	0%	-	-
Ocean Tidal	0%	-	-	0%	-	-	0%	-	-	0%	-	-
Ocean Thermal	0%	-	-	0%	-	-	0%	-	-	0%	-	-
Ok-->	100%	7,226	5,396,560		384	1,357,630		460	2,419,193		6,382	1,619,737

Generation Characteristics

Island	Type/Fuel	Scenario Capacity (MW)	Resource Adequacy (%)	Resource Adequacy (MW)	Minimum Load (MW)	Scenario CF
Heat Rate (btu/kWh)	Fixed O&M	Variable O&M	Fuel/Variable Cost	Fuel ($/MWh)	Total Costs	Total Cost for Energy ($/MWh)

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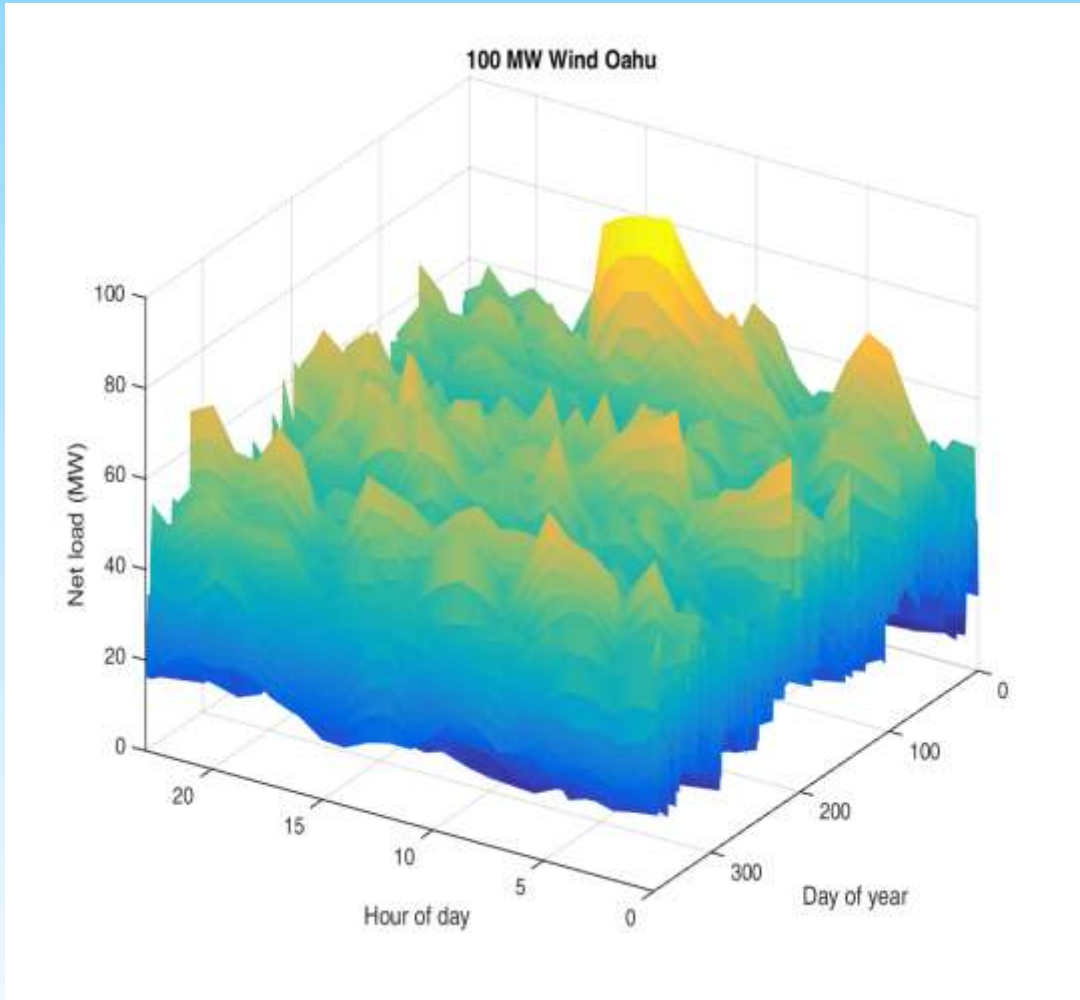
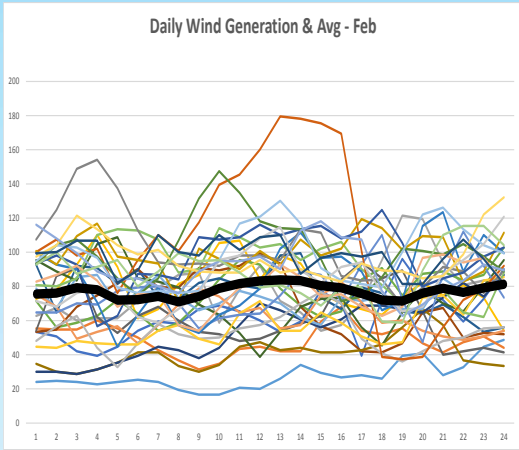
Resources Differ By Island





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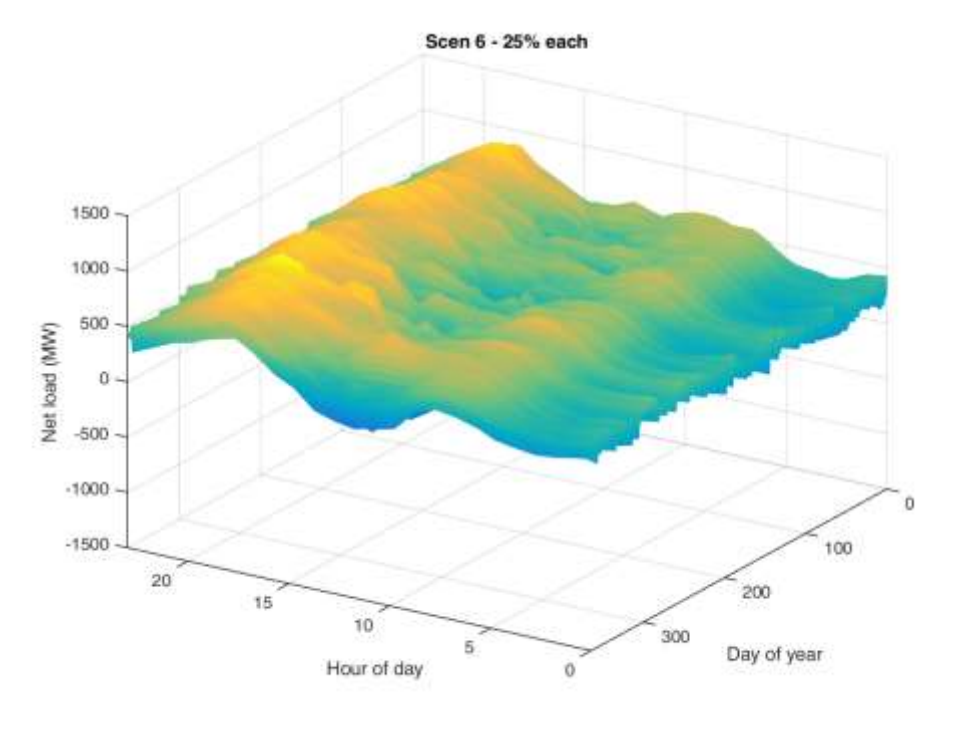
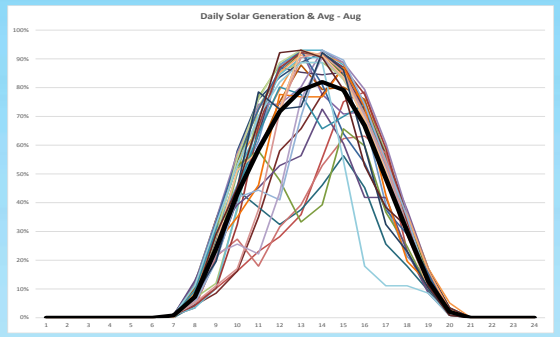
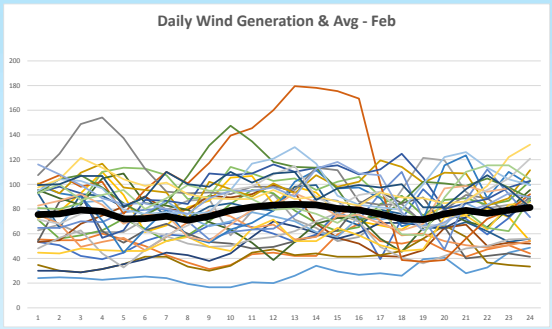
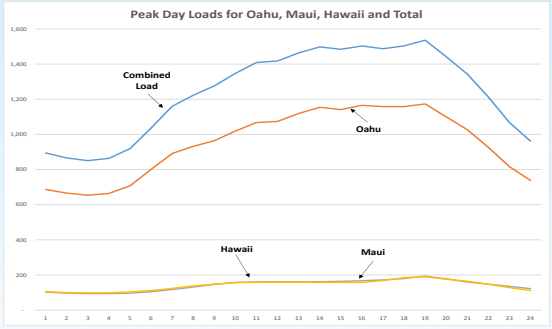
Resource Diversity









	Scenario	1	2	3	4	5	6
Renewable Mix	Util PV	100%			50%	33%	25%
	Wind		100%		50%	33%	25%
	Geothermal			100%		17%	25%
	Biofuel					17%	25%
Other Metrics	Peak Load (MW)	1,425	1,194	901	1,302	1,165	1,101
	Min Load (MW)	(1,364)	(586)	(5)	(735)	(442)	(304)
	Storage (MWh)	6,224	2,764	5	2,785	1,466	913

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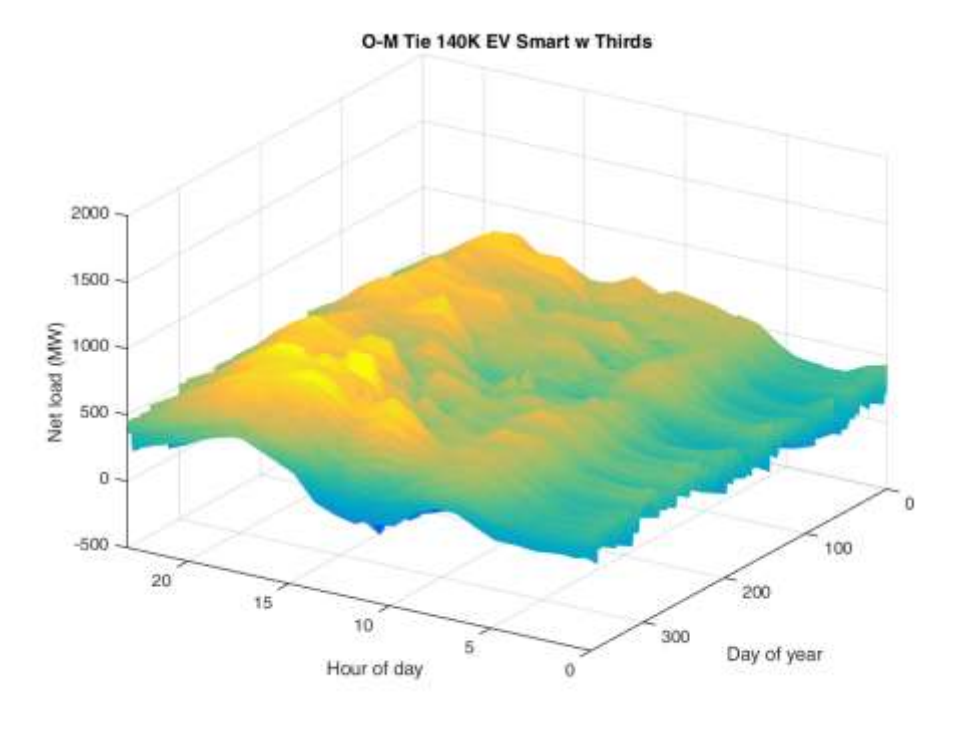
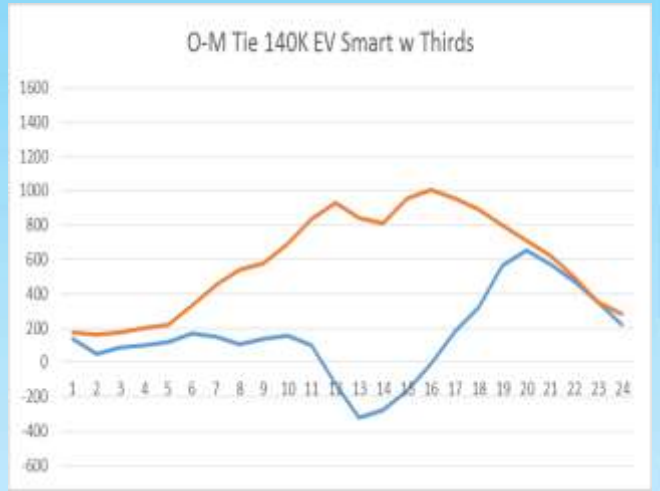
Energy Transfer Between Sectors

Electric and Ground Transportation





	Peak Load (MW)	Min Load (MW)	Storage (MWh)
Base	1272	509	0
70% RPS	1014	-420	1454
70% w/ EV Evening Charge	1153	-492	1682
70% w/ EV Smart Charge	1005	-323	940

RPS modeled with 1/3 wind, 1/3 solar and 1/3 geothermal/biomass

Assumes 140k Evs on Oahu and Maui combined

Questions for Stakeholders

What scenarios do you want to see?

- Renewable % levels?
- Renewable mixes?
- How investments optimized for 50% compare at 70% or 100% Renewable?
- What penetration levels of DG, Batteries, E-drive vehicles?

What programs, technologies and policies do you want assessed?

- How do Electric drive vehicles impact load, benefits and costs?
- How does TOD impact load, benefits and costs?
- Demand Response from traditional uses
    - Air conditioning – Load shifting (precooling)
    - Electric water heaters – Storage

What metrics do you want reported on?

- Total energy imports / Total fossil fuel imports
- $/MGY petroleum reduction
- Average electric rates ($/kWh – all in)
- Energy rates ($/kWh)
- Effective grid rates ($/kW)
- $/GHG reduction