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Hawaiian Electric Companies Overview

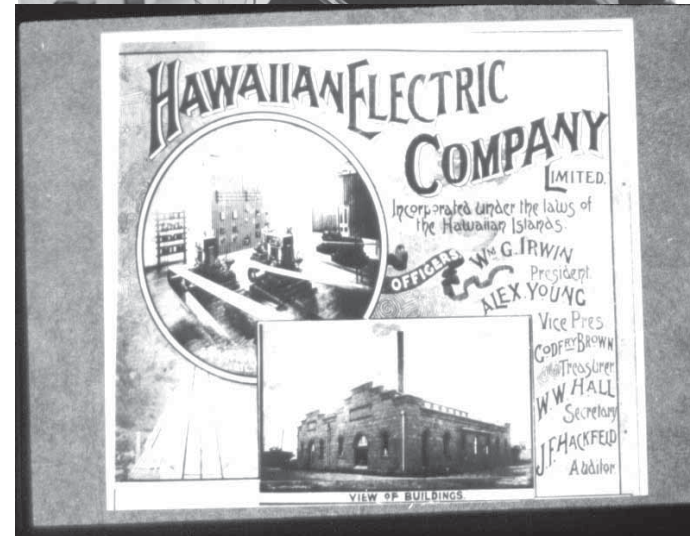
Briefing for World Bank
May 23, 2016

Scott Seu
VP System Operation
Hawaiian Electric Company



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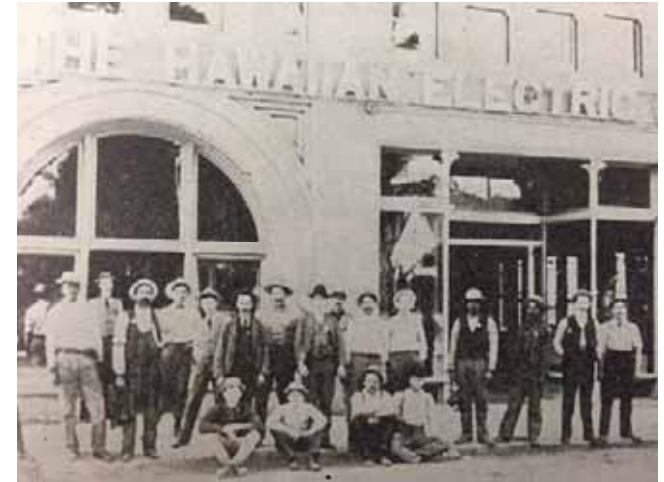
Founded By the Vision of a King



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Hawaiian Electric's Evolution Symbiotic with the Economic Development of the Islands

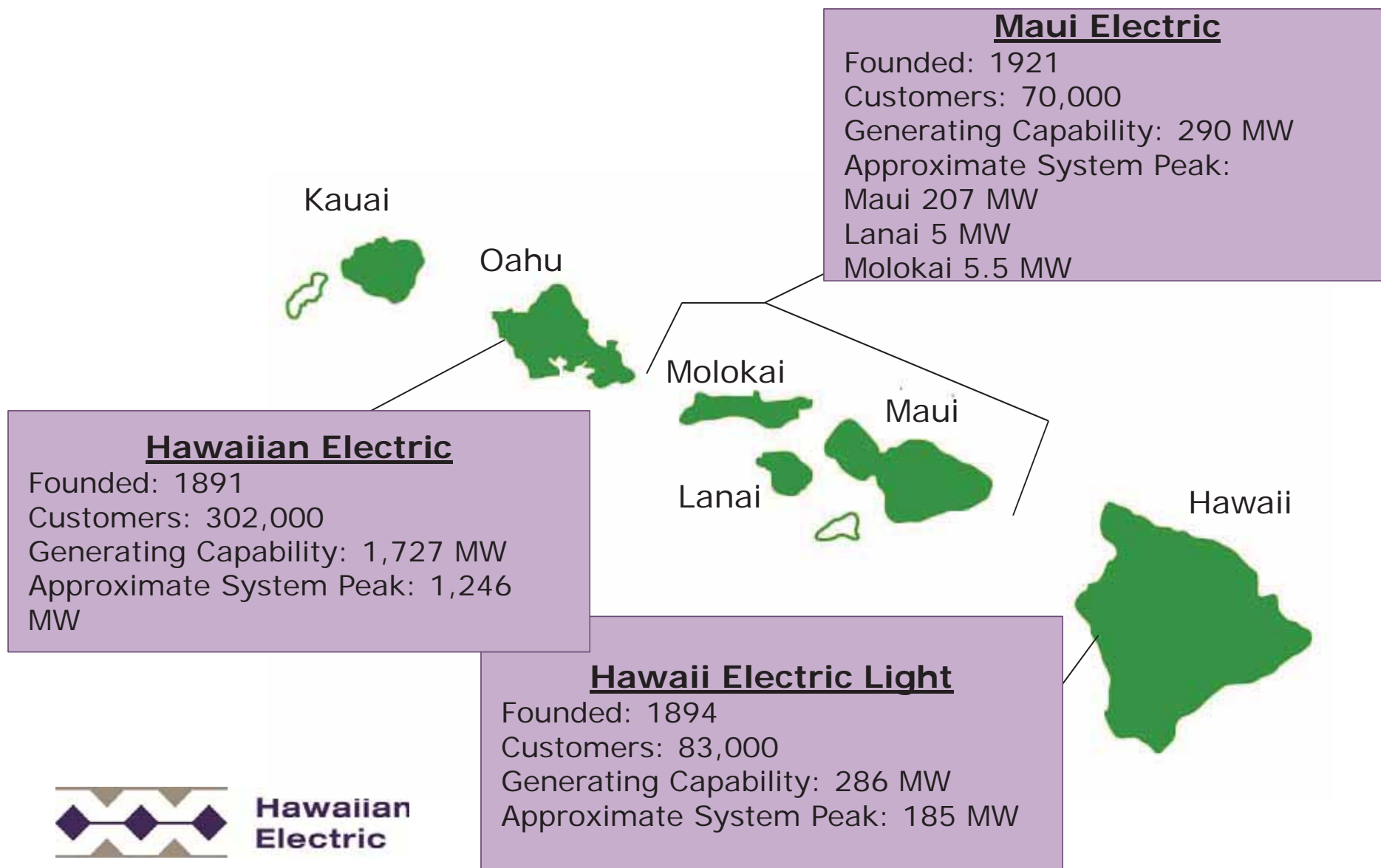
- ◆ Light and power service extended to Waikiki in 1897
- ◆ Ice and refrigeration a major business by start of 20th century
- ◆ Electric appliance sales begin 1915; electric service pushing out to suburbs and rural areas
- ◆ Small electric companies support sugar and coffee plantations on all islands
- ◆ World War II and post-war boom years
- ◆ Continued growth through early 2000s



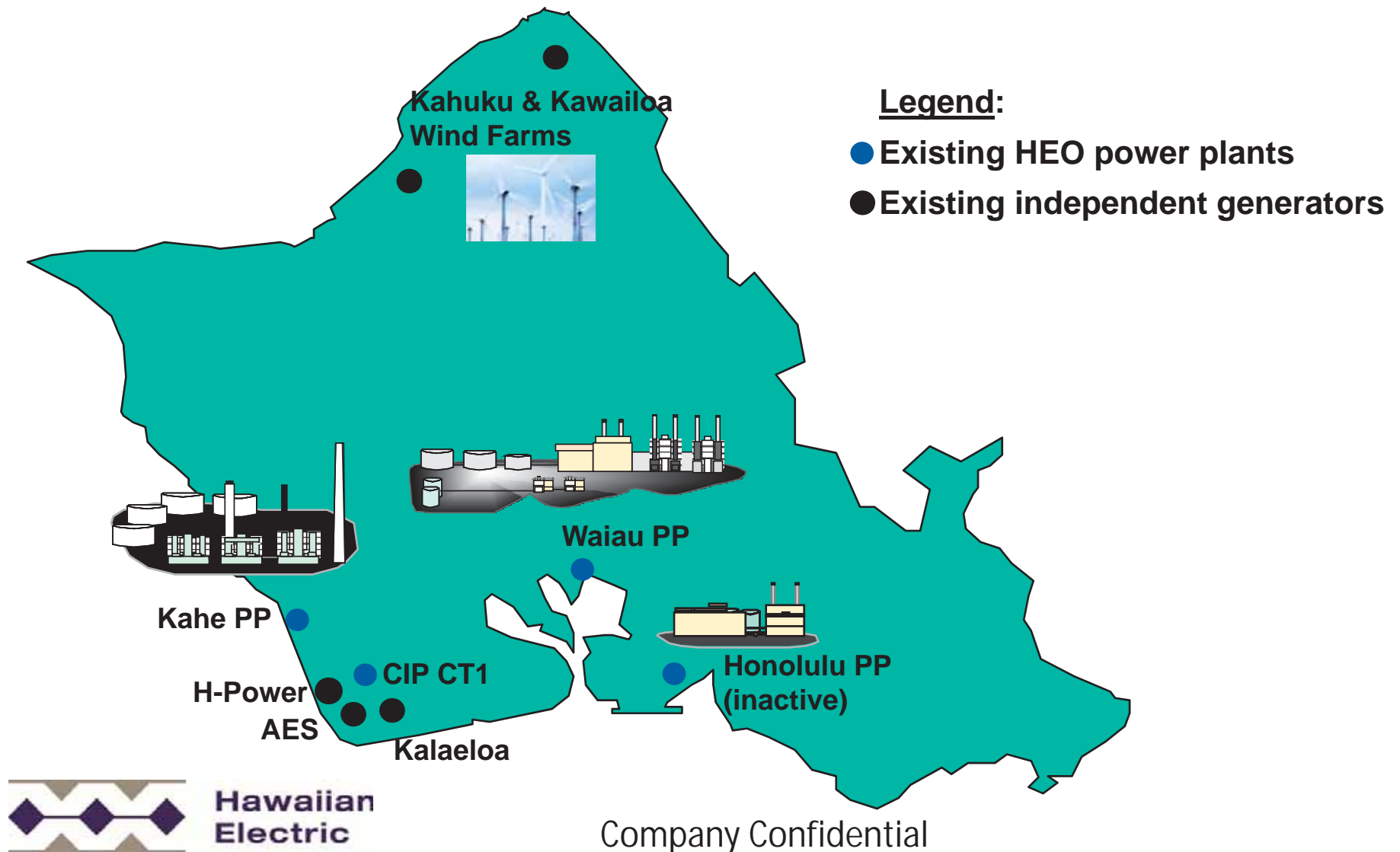
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The Hawaiian Electric Companies:

3 Electric Utilities; 5 Separate Grids

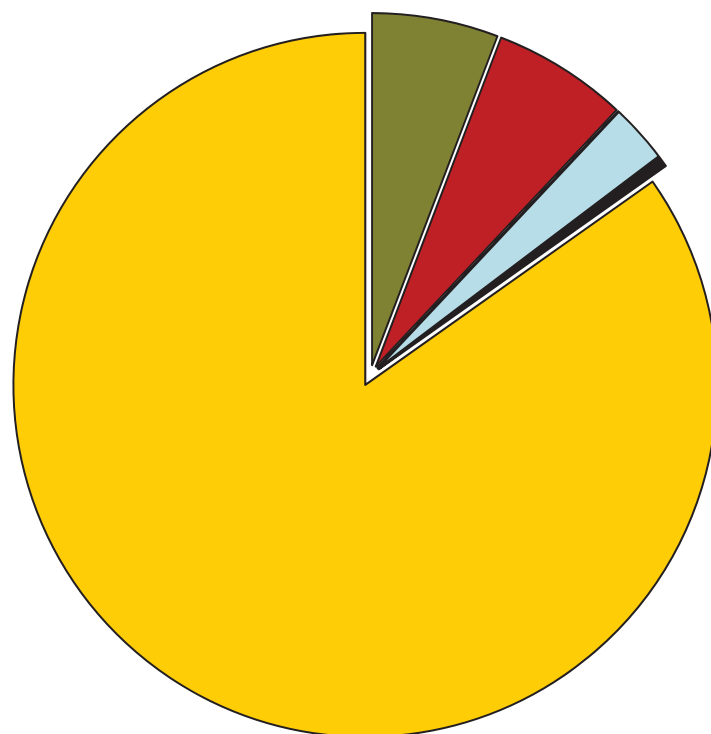


Oahu Generating System



Hawaiian Electric's Energy Mix

2014 Total Sales = 6,781,665 MWhrs



Fossil Fuel	84.8%
Biofuel	0.5%
Wind	2.7%
Biomass	5.8%
PV	6.2%

*Sources of energy for HECO's generation as a % of sales:

Large Power Generation:

Over 40% of energy sold to Oahu customers is produced by Independent Power Producers

Hawaiian Electric Plants



Kahe

Kalaeloa Renewable Energy Park

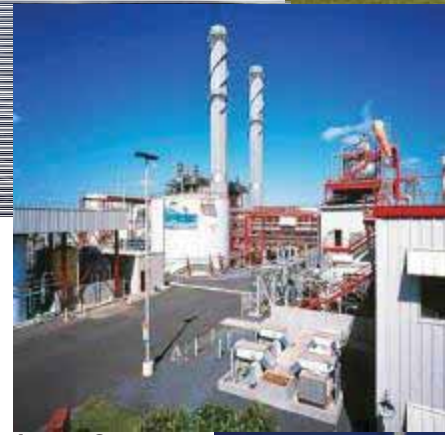


AES



IPPs

CIP



Kalaeloa Cogen



Kahuku Wind

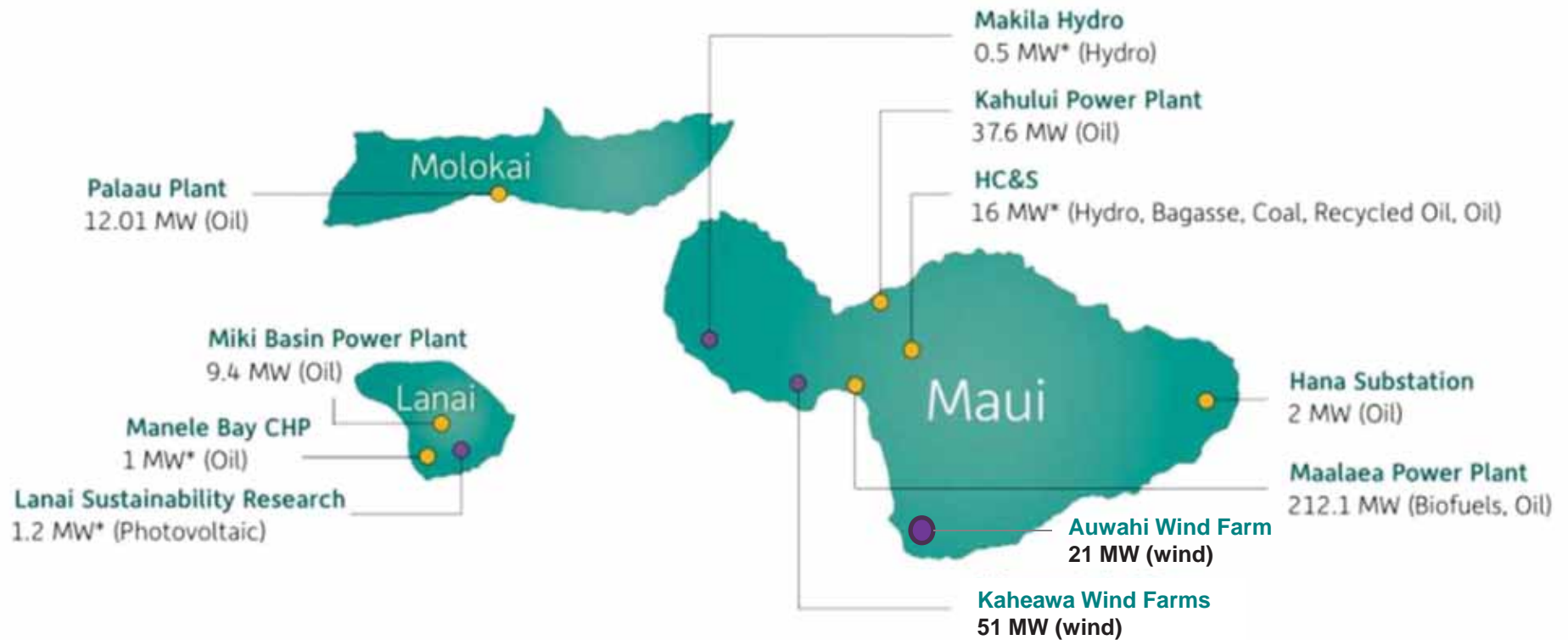


Waiau

H-Power



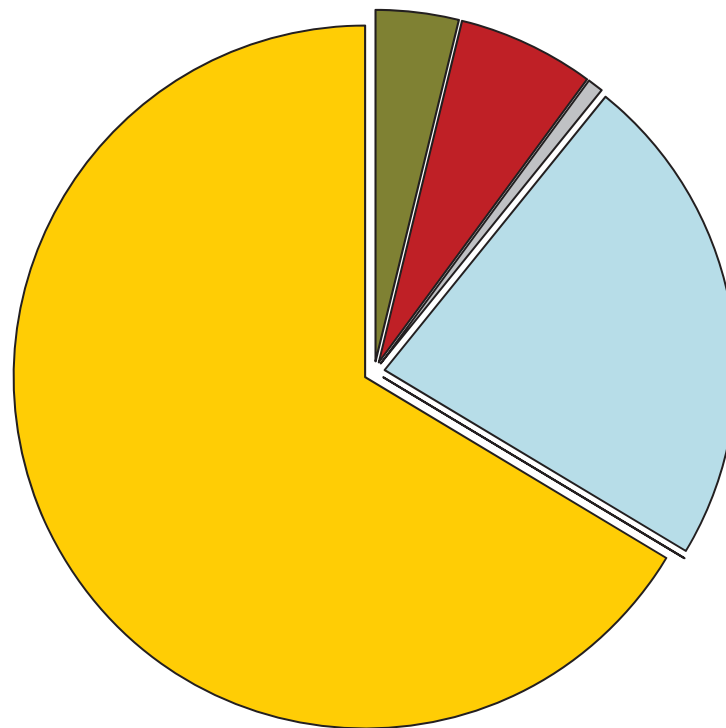
Maui Electric Generation



*Net generation capability

Maui Electric's Energy Mix

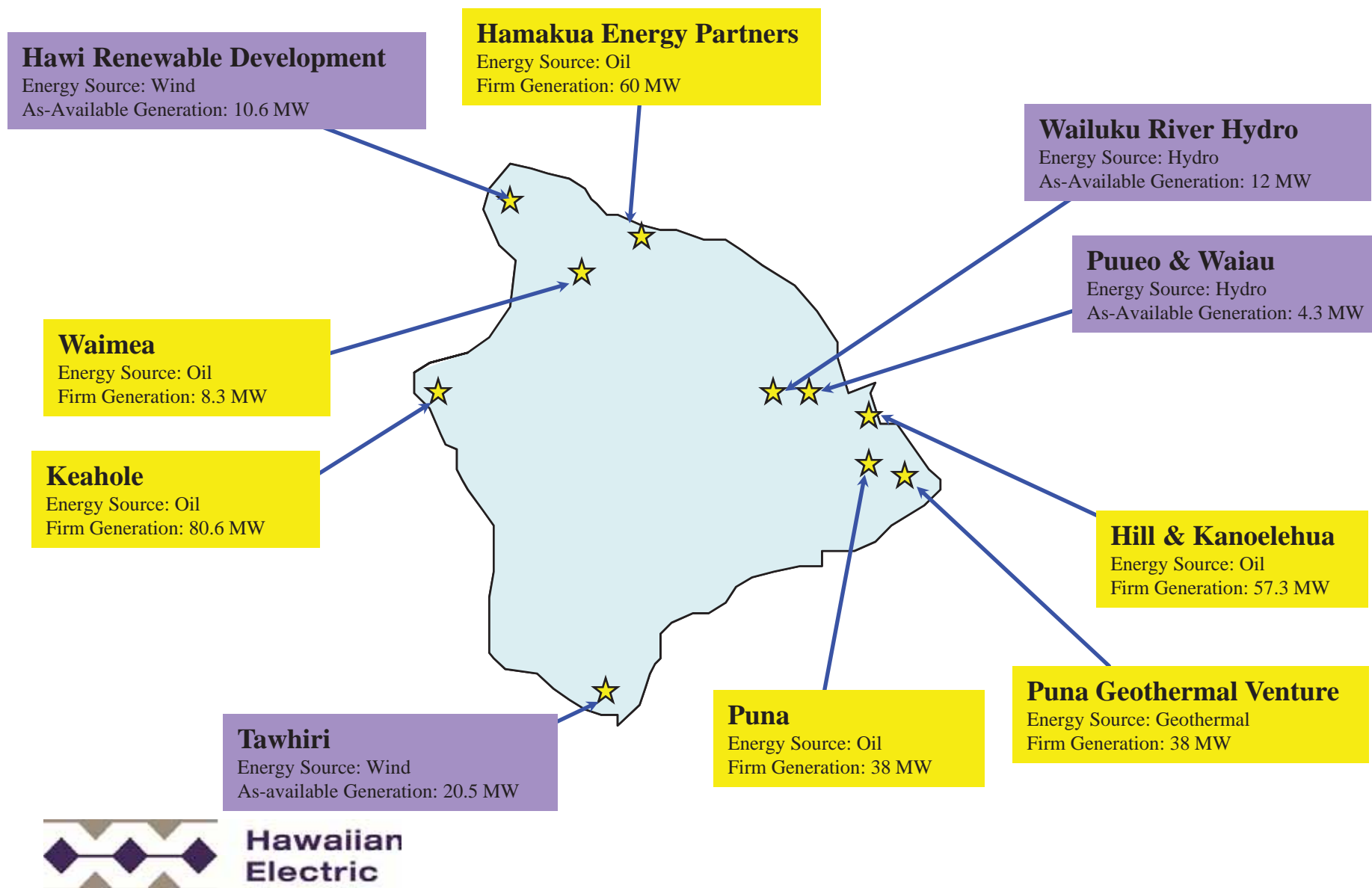
2014 Total Sales = 1,132,056 MWhrs



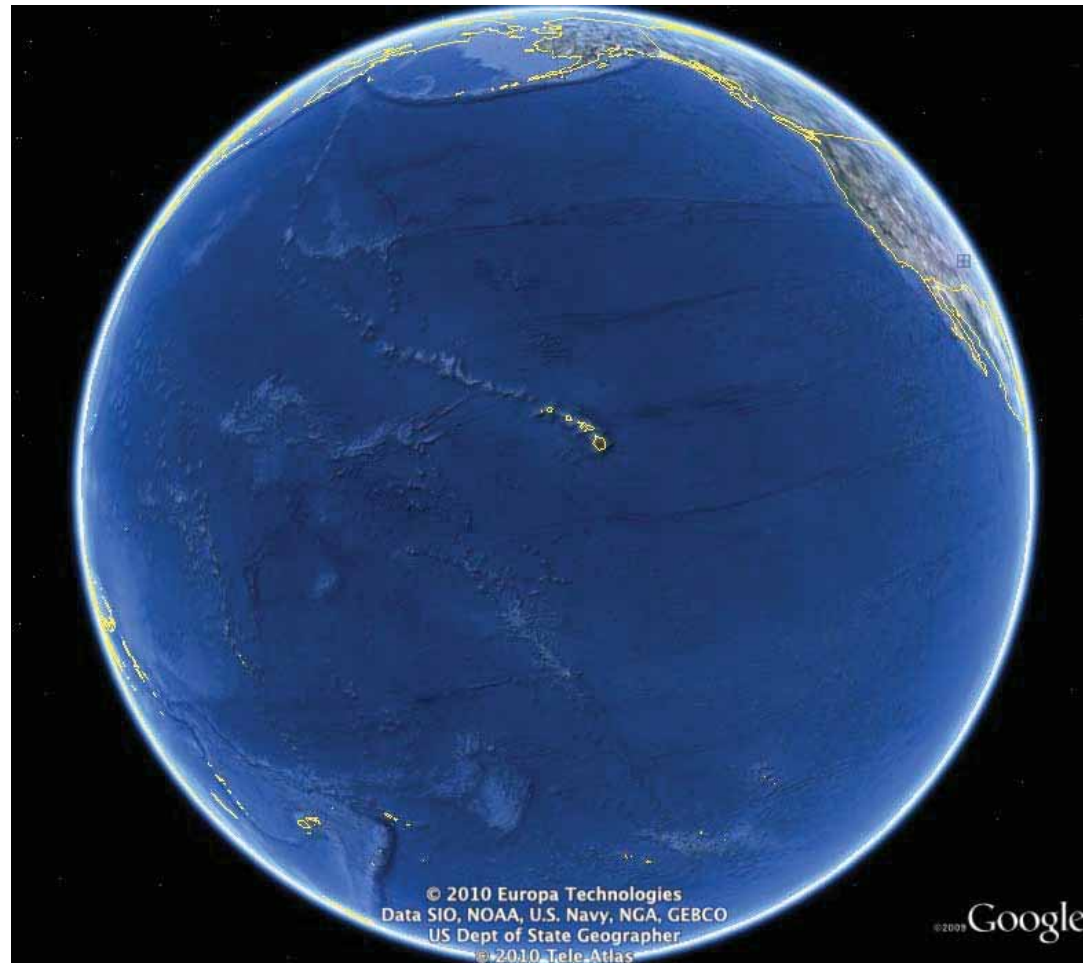
Fossil Fuel	66.4%
Wind	22.8%
Biomass	3.8%
Hydro	0.7%
PV	6.3%

*Sources of energy for MECO's generation as a % of sales:

Hawaii Island Electricity Generation



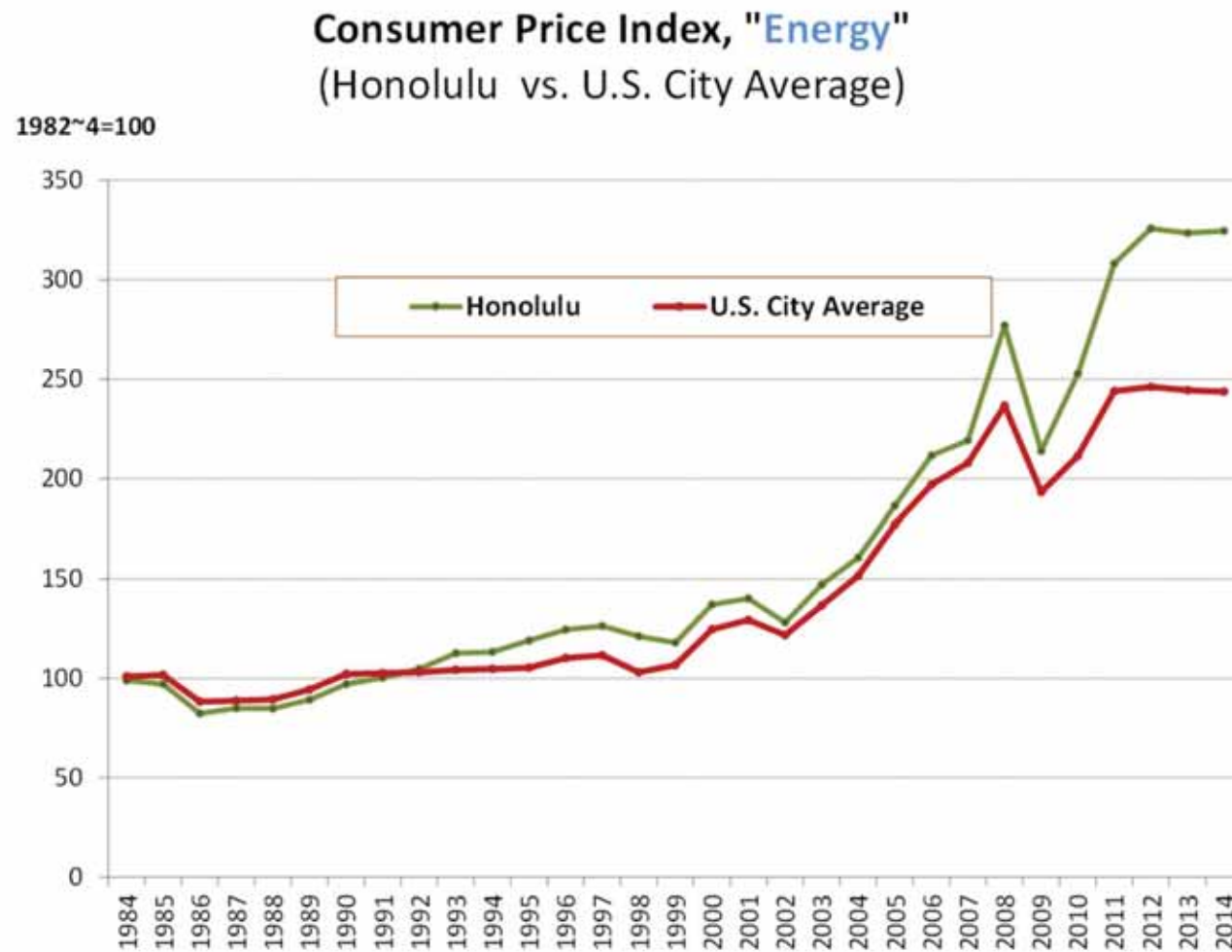
Challenges and Opportunities



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Our Dependence on Oil Drives High Energy Prices

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Source: U.S. Bureau of Labor Statistics



Electric

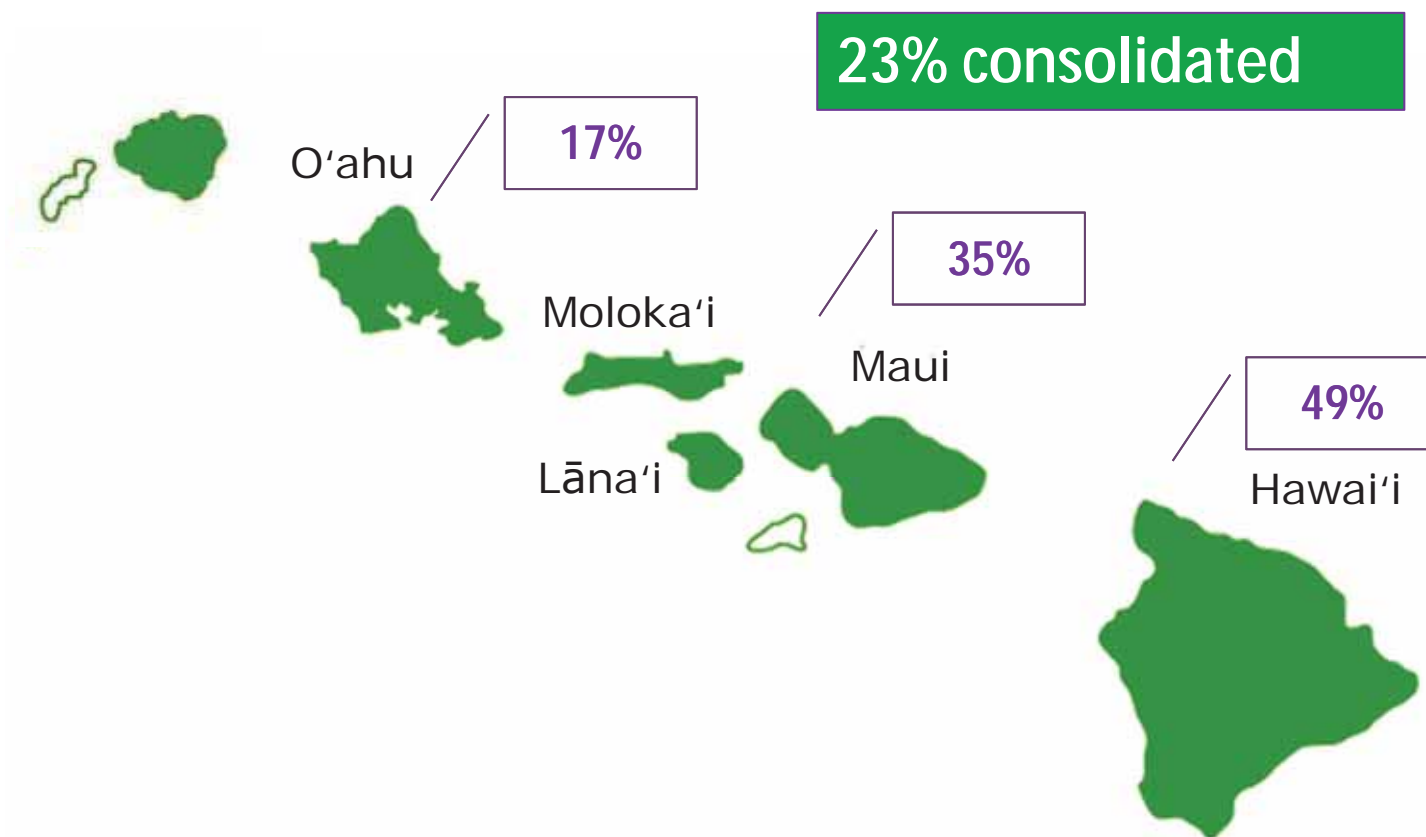
Moving our Electric System to the Future

100%
Renewable Energy
by 2045



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Renewable progress – Hawaiian Electric Companies' RPS



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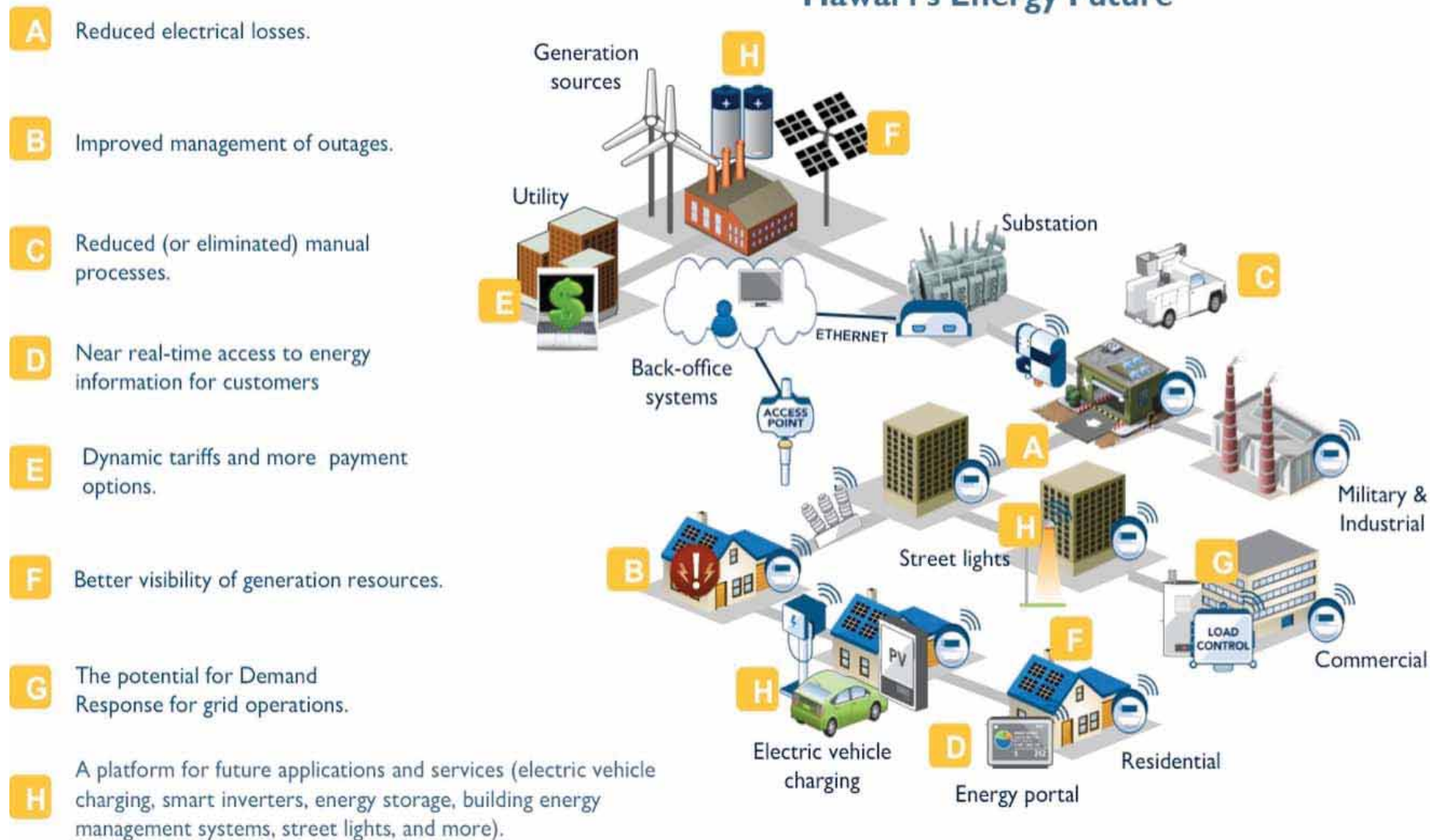
	2015				2014
	Hawaiian Electric	Hawai'i Electric Light	Maui Electric	TOTAL	TOTAL
Electrical Energy Generated Using Renewable Energy Sources					
Biomass (including municipal solid waste)	385,846		30,870	416,716	433,164
Geothermal		230,495		230,495	255,027
Photovoltaic and Solar Thermal ¹	40,750	2,557	7,904	51,212	44,255
Hydro ¹		63,275	9,823	73,098	51,155
Wind ¹	216,197	132,293	264,291	612,782	577,868
Biofuels	52,424		988	53,412	37,093
Subtotal	695,218	428,620	313,877	1,437,715	1,398,561
Electrical Energy Savings Using Renewable Displacement Technologies					
Customer-Sited, Grid-Connected ²	464,412	89,691	88,956	643,060	514,999
Subtotal	464,412	89,691	88,956	643,060	514,999
TOTAL	1,159,630	518,311	402,833	2,080,775	1,913,561
TOTAL SALES	6,754,083	1,064,785	1,137,630	8,956,498	8,976,242
RPS PERCENTAGE					
(Not Counting Energy Efficiency and Solar Water Heating)	17.2%	48.7%	35.4%	23.2%	21.3%


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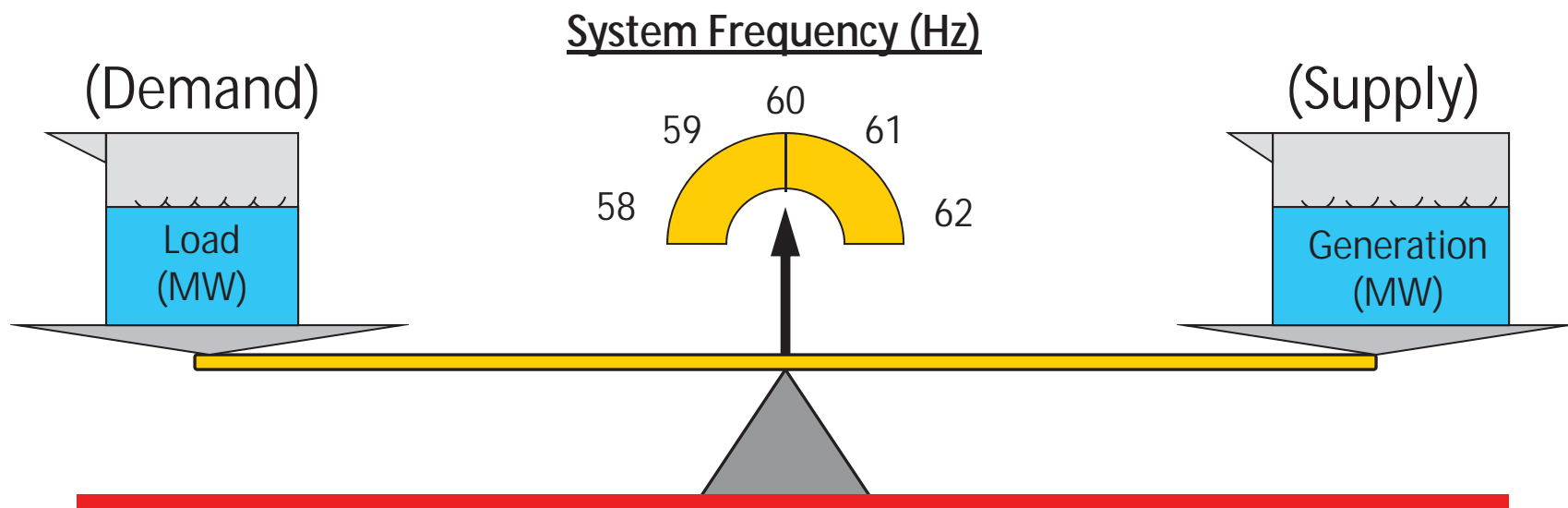
Ref. 2015 RPS Status Report

A 100% Renewable Future That is Affordable and Reliable¹⁶ Hinges on the Entire System, not Just Generators

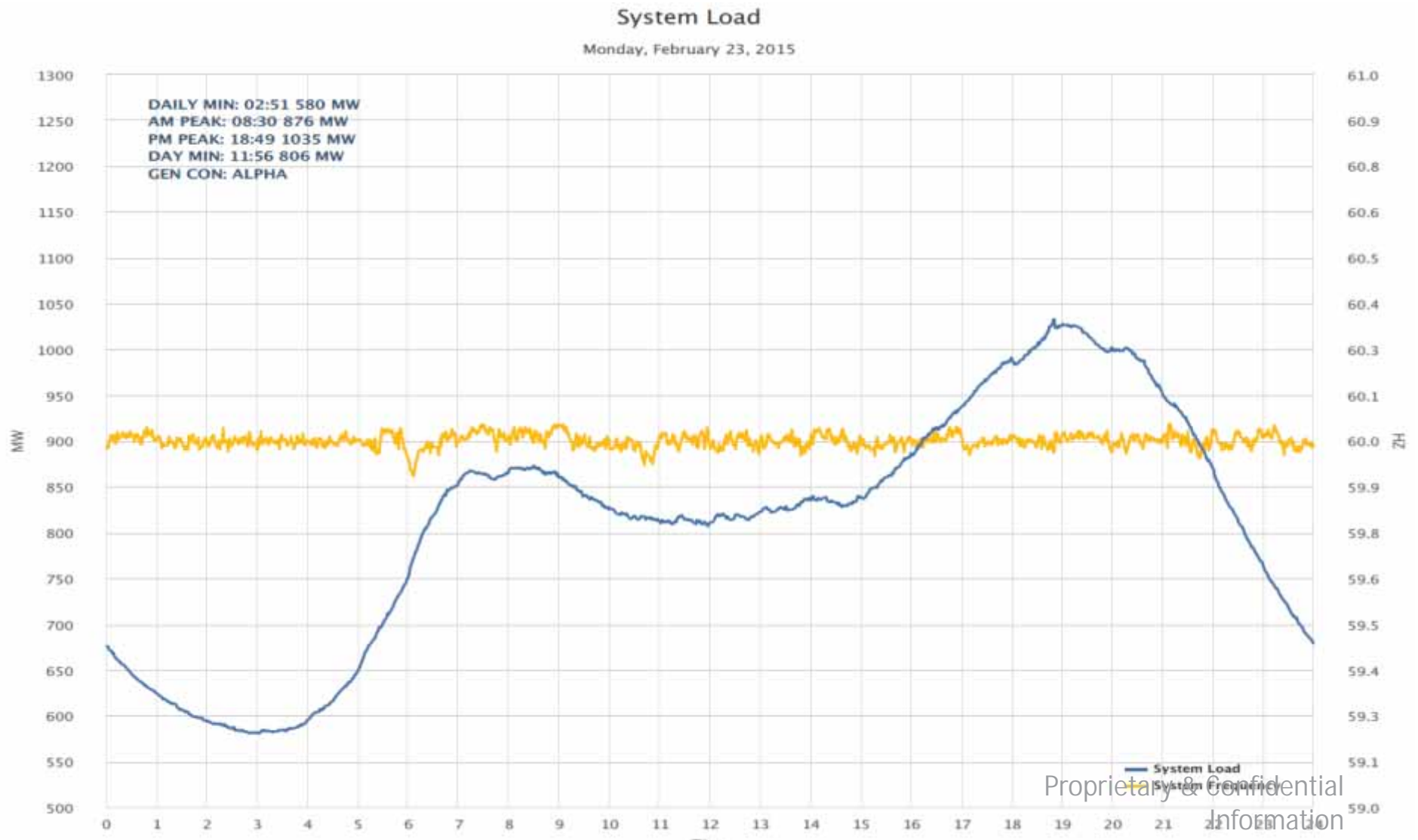
Hawai'i's Energy Future



For stable operation of the grid, supply and demand across the island must be in perfect balance at all times



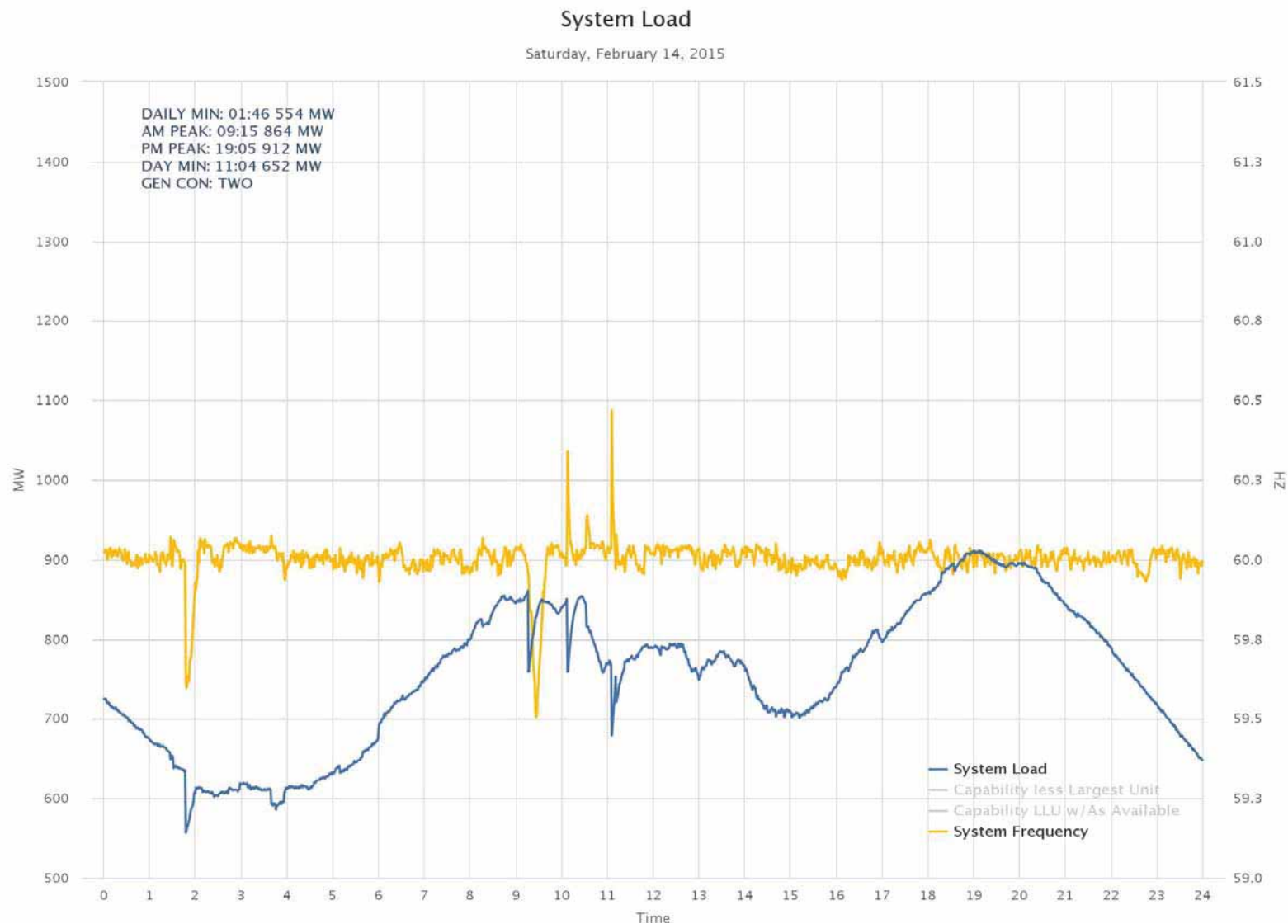
Oahu System Load & Frequency on a Typical Day



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Changes in Loads and Generating Resources Have Greater Effect on Small Island Grids

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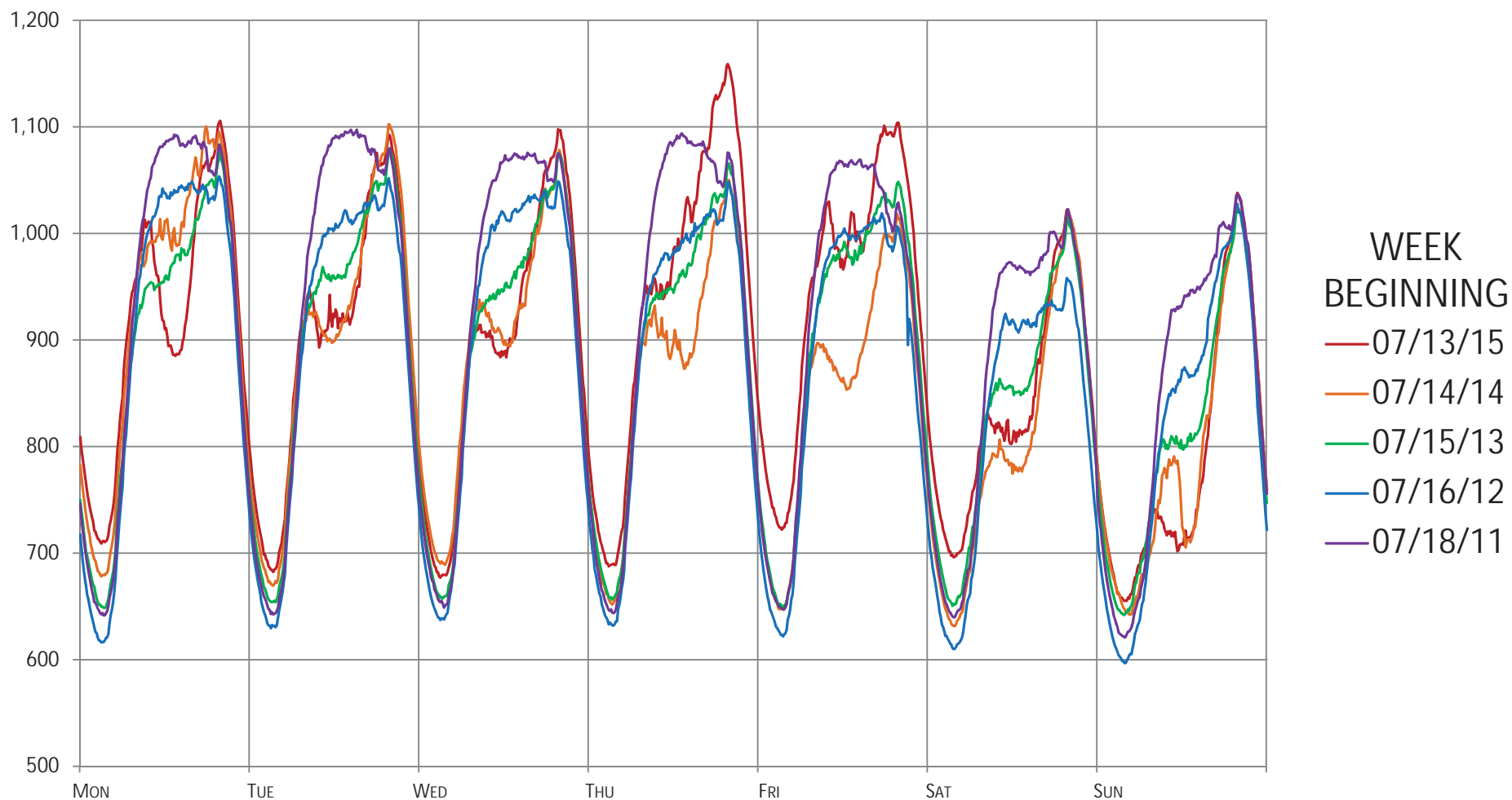


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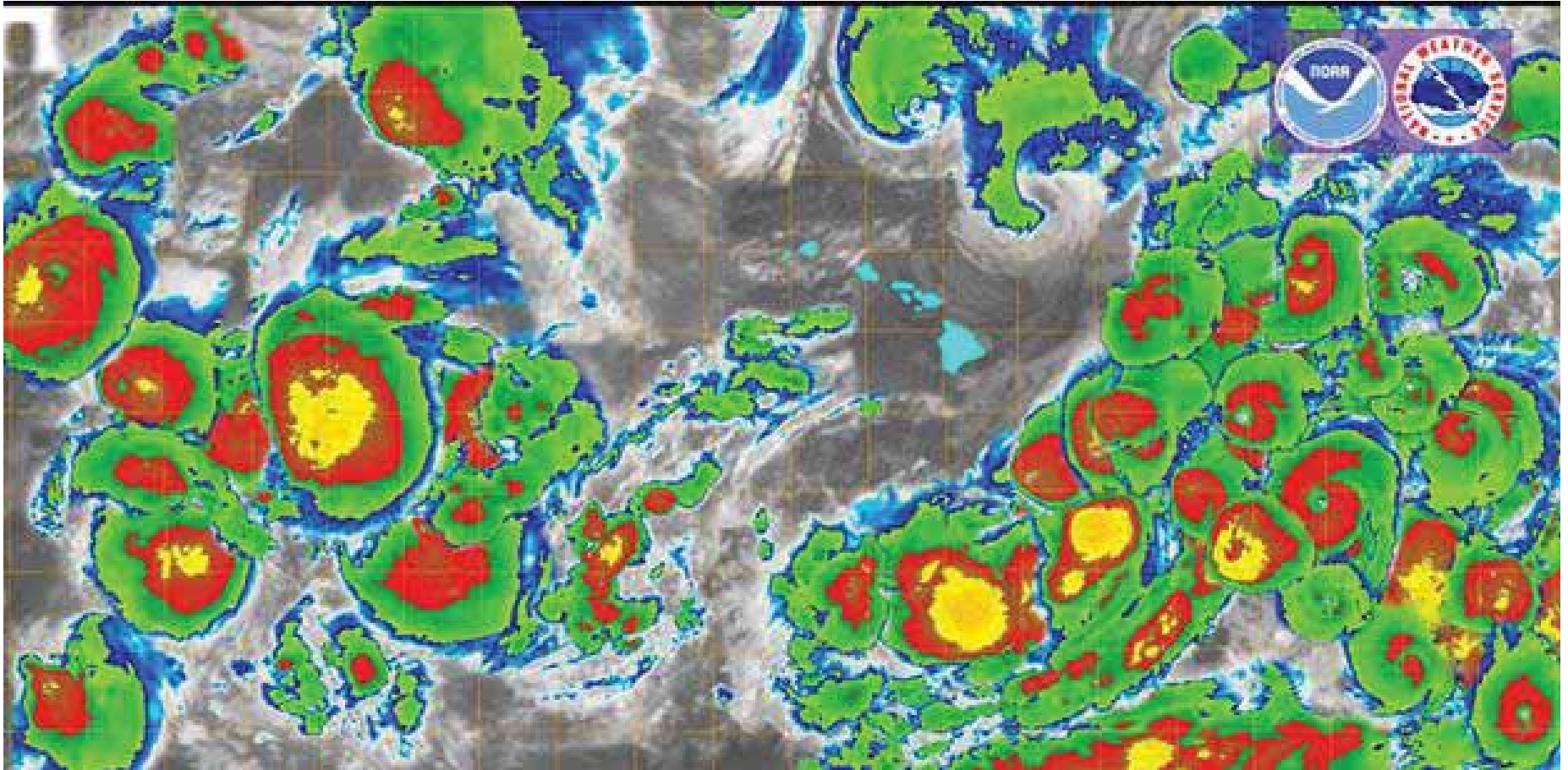
Our Transition Has Been Dramatic: Oahu System Load Curve



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Other Challenges: Resiliency

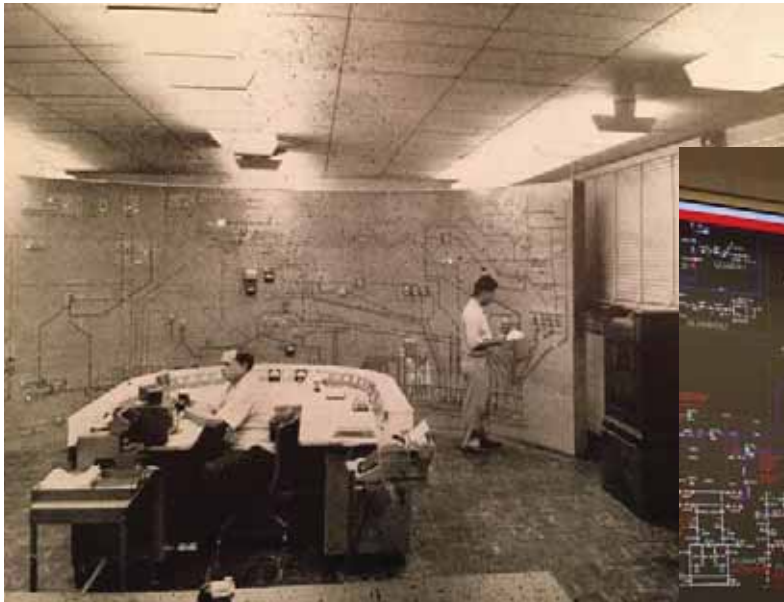


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Hawaiian Electric: Embracing Our Energy Future!



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