Leveraging DERs as a Grid Resource:
A Hawaii Perspective

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Hawaii Public Utilities Commission
Hawaii Electric Systems
4 Electric Utilities; 6 Separate Grids; % Renewable

Kaua’i Island Utility Cooperative
System Peak: 78 MW
52.6 MW PV / 7 MW Biomass / 9 MW Hydro
(+6.6 MW PV Under Review)
Installed PV: 67% of System Peak

Maui Electric
Maui System Peak: 202 MW
74 MW PV / 72 MW Wind
(+40 MW PV Approved or Under Review)
Installed PV & Wind: 72% of Sys. Peak
Lana’i System Peak: 5.1 MW
1.33 MW PV (27% of Sys. Peak)
Moloka’i System Peak: 5.6 MW
2 MW PV (36% of Sys. Peak)

Hawaiian Electric
System Peak: 1,206 MW
329 MW PV / 99 MW Wind 69 MW WTE
(+138.5 MW PV & Wind Approved to Install / +88.5 MW PV Under Review)
Installed PV & Wind: 35% of System Peak

Hawai‘i Electric Light
System Peak: 192 MW
75 MW PV / 30 MW Wind / 38 MW Geothermal / 16 MW Hydro
(+31 MW PV Approved or Under Review)
Installed PV & Wind: 55% of System Peak

% Renewable

A National Town Meeting
Hawaii Is A Leader in Renewable Integration

- Customer-Sited, Grid-Connected Renewable Solar and Wind: 34%
- Biomass (including municipal solid waste): 19%
- Geothermal: 11%
- Wind: 29%
- Biofuels: 2%
- Photovoltaic: 3%
- Hydro: 2%
Exponential DER Growth

Cumulative Installed Capacity (MW)

<table>
<thead>
<tr>
<th>Year</th>
<th>Cumulative Capacity (MW)</th>
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<tbody>
<tr>
<td>2006</td>
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<tr>
<td>2007</td>
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<td>12</td>
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<td>24</td>
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<td>2012</td>
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<td>2013</td>
<td>301</td>
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<td>2014</td>
<td>389</td>
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<td>2015</td>
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Oahu Locational Value Map

%DG Available Capacity of Hosting Capacity
- Up to 5%
- 5 up to 50%
- 50% and greater

*published as of 7/19/2017
DER Philosophy Progression

Minimize Harm

Help Where Possible

Play an Integral Role

0-10%

10-30%

> 30%

Past/Present

Near-Term

Medium-Term

Adapted from Strategen Consulting, LLC
Services Provided by DER by Category

- **Fast Frequency Response**
  - FFR 1
  - FFR 2

- **Regulating Reserves**
  - RegUp
  - RegDown

- **Replacement Reserves**
  - Non-spin Auto Response

- **Capacity**
  - Minimum Load
  - PV Curtailment
  - Critical Peak Incentive
  - Real-time Pricing
  - Non-spin Auto Response
  - TOU
  - Day-ahead Load Shift

**FFR 1** – respond to contingency events in 12 cycles
**FFR 2** – respond to contingency events in 30 cycles
**Regulating Reserves** – An amount of reserve capacity responsive to automatic generation control that is sufficient to provide normal regulating margin to maintain system frequency
**Replacement Reserves** – spinning reserve or non-spinning reserve (e.g., batteries)
Mahalo!

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