

# 100% Renewable Energy in Hawaii: It's No Longer A Matter of When

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*Presented By:*



# THE HAWAII RENEWABLE EXPERIENCE: WHAT CAN BE REPLICATED NATIONALLY AND INTERNATIONALLY?

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# The Hawaii Renewable Experience – What Can be Replicated Nationally and Internationally

Colton K. Ching  
Vice President Energy Delivery  
Hawaiian Electric



**Hawaiian Electric**  
**Maui Electric**  
**Hawai'i Electric Light**

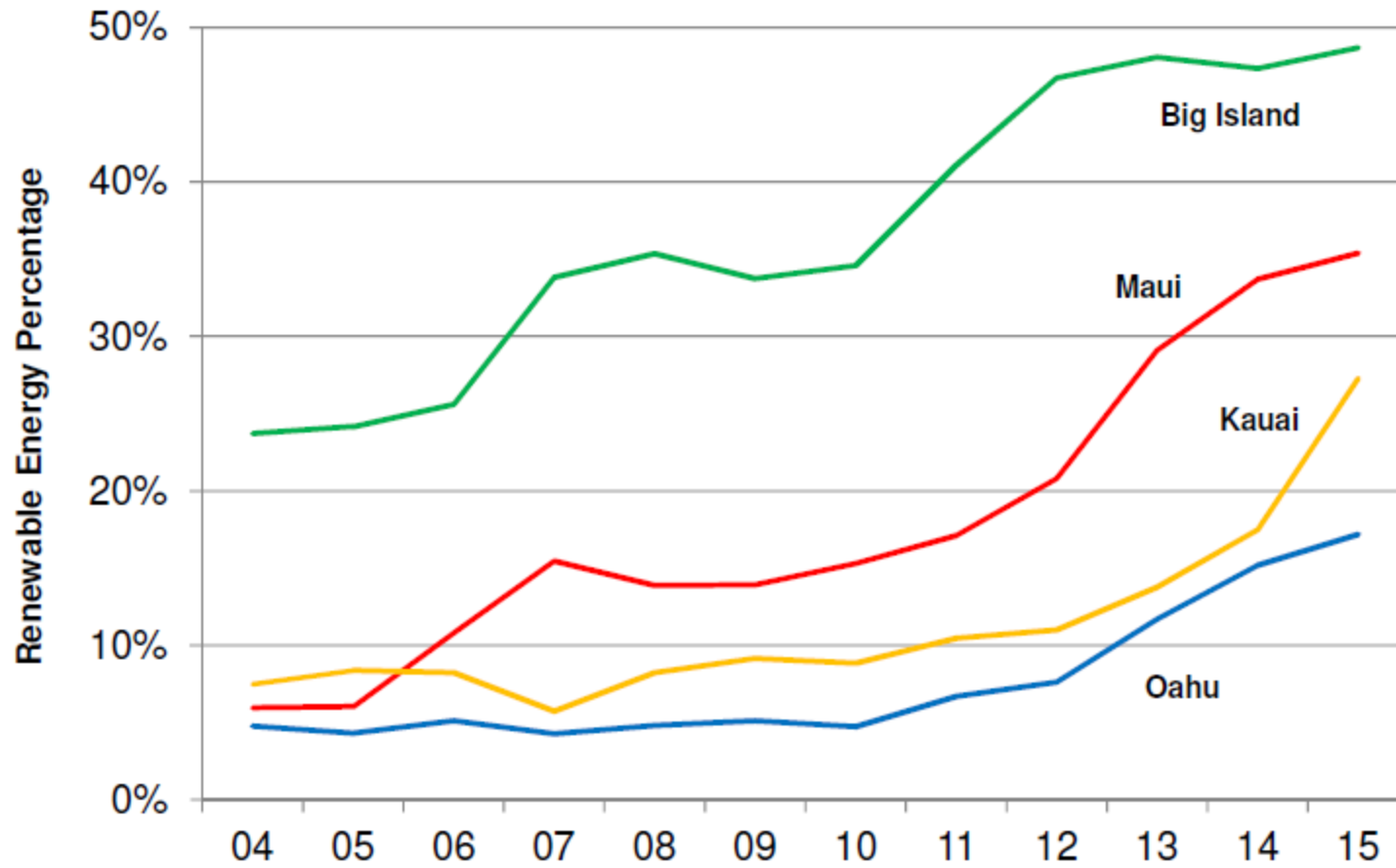


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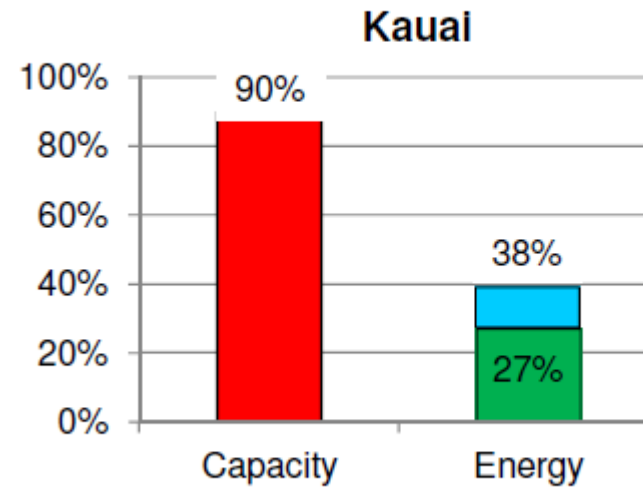
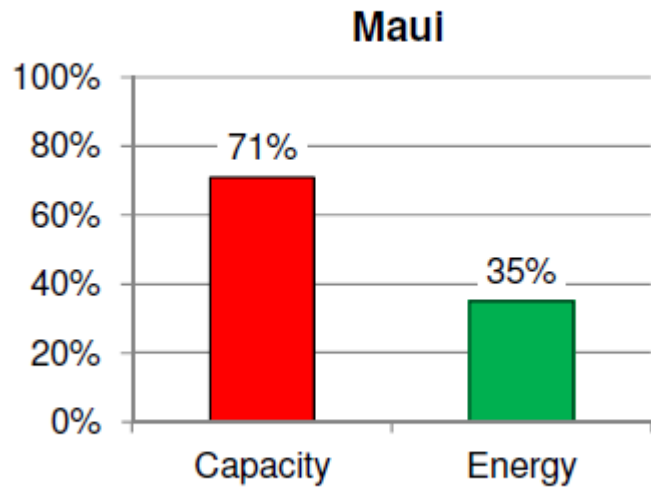
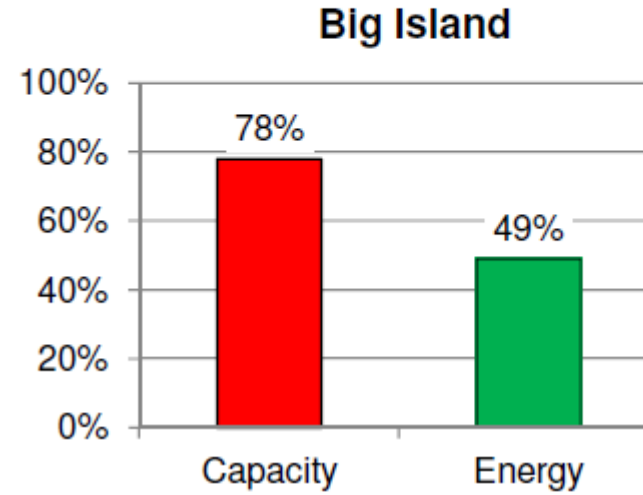
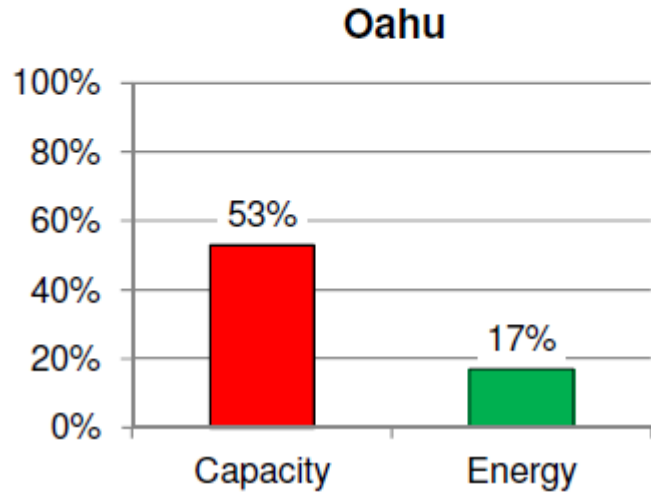
# Hawaii's Renewable Energy Trends

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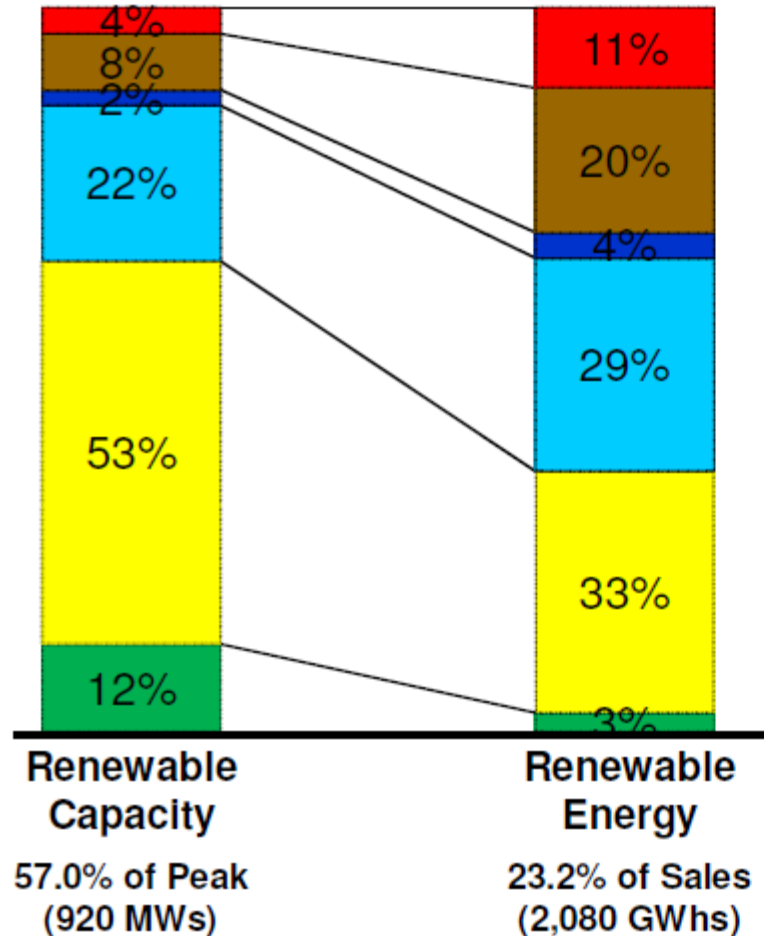
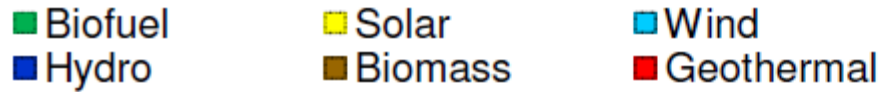


# Renewable Capacity vs Energy Penetration -- 2015

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# Hawaiian Electric Companies – 2015 Renewable Portfolio Composition



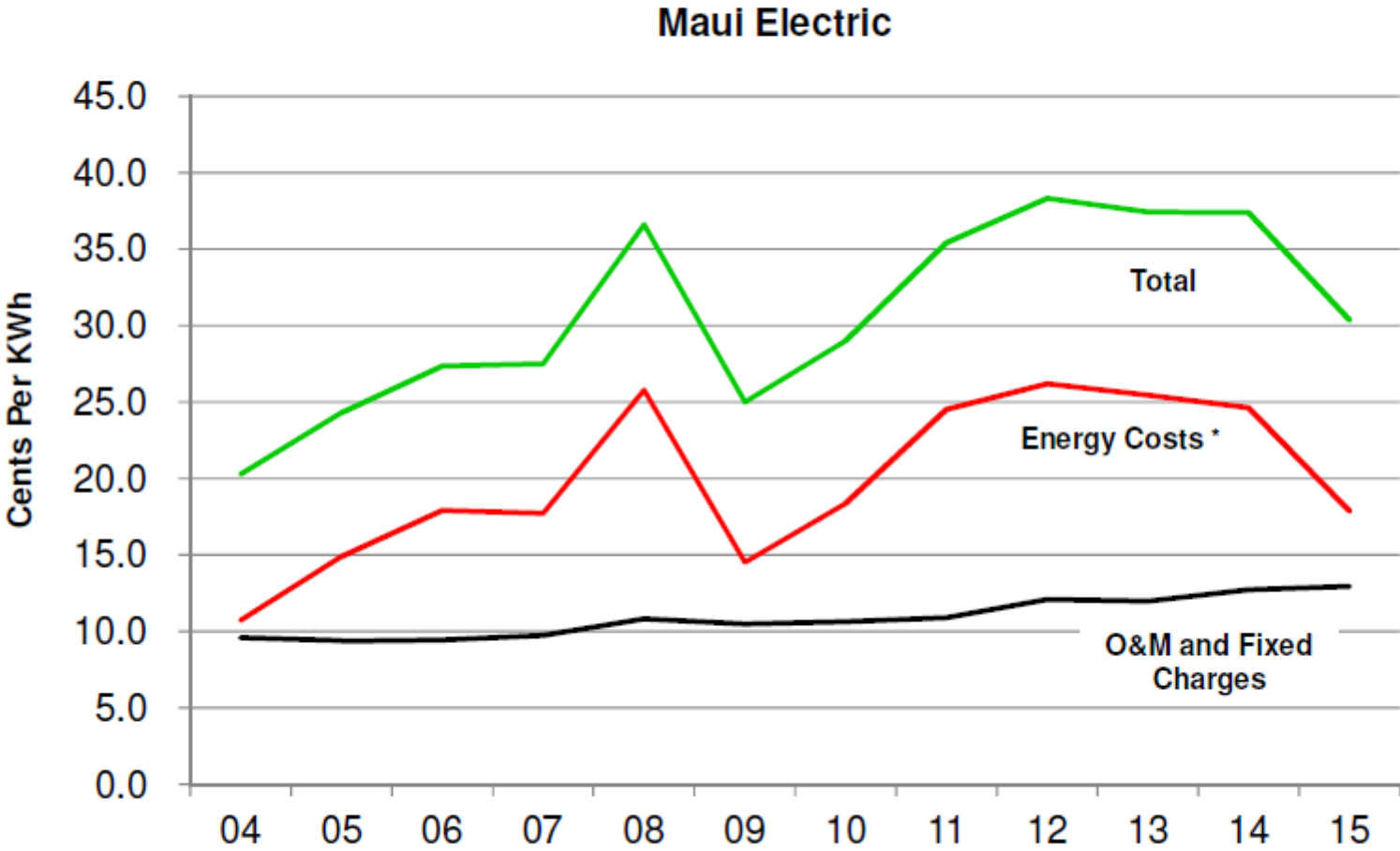
## Implications

- Installed renewable resource capacity equivalent to 2 – 3 times system peak demand may be required to achieve 100% RPS
- Installed solar resource capacity represents 31% of total system peak; however, solar provided 8% of total electrical energy
- Substantial bulk energy storage capacity and dynamic load shifting likely required at higher renewable penetration levels

Renewable technology price, capacity factor and grid integration requirements are important.

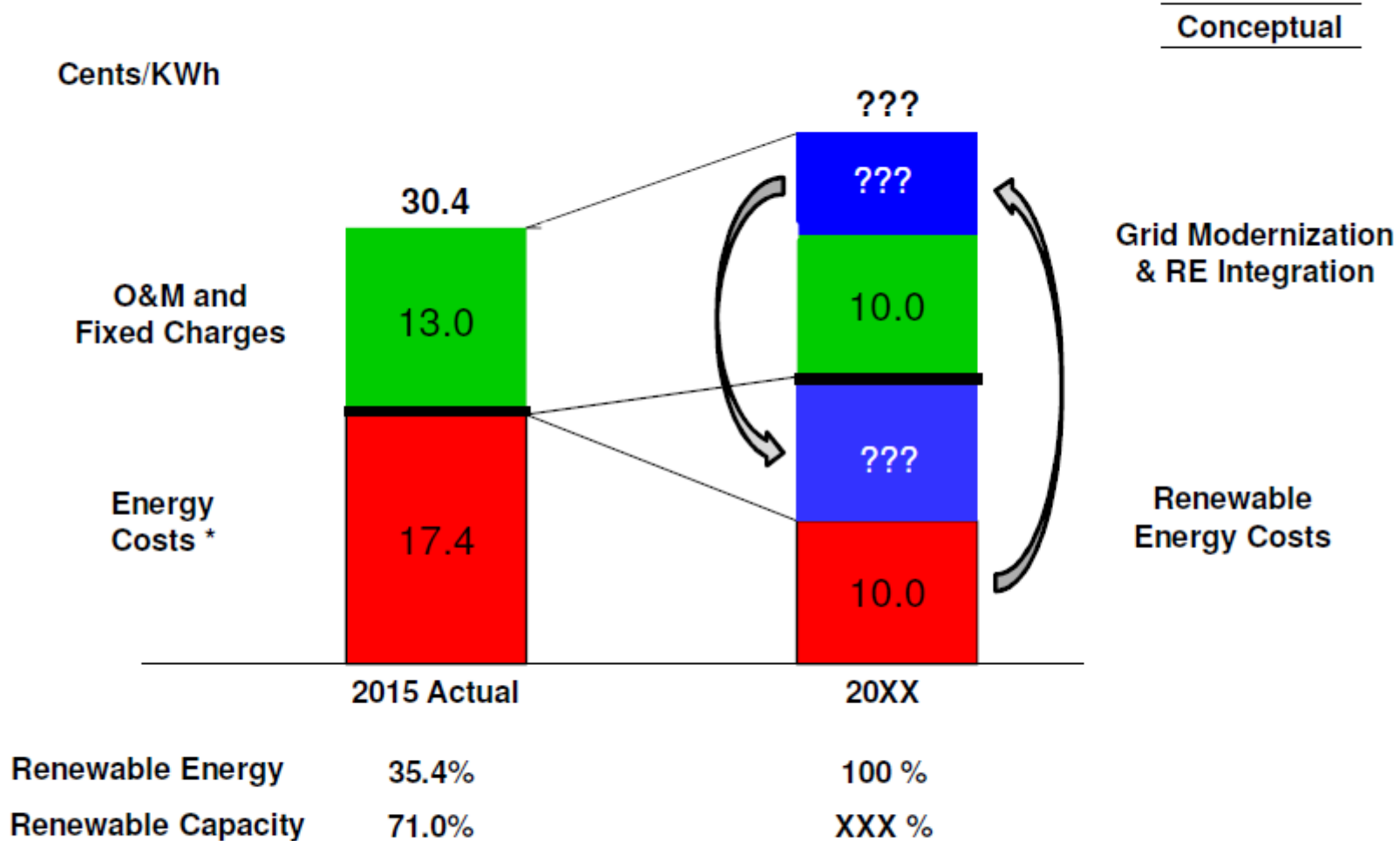


# Maui – Average Electric Rate and Major Cost Drivers



\* Energy costs include applicable revenue taxes.

# Maui Electric's Clean Energy Transformation



\* Energy costs include applicable revenue taxes.

# Hawaii Clean Energy Transformation – Major Challenges

- **Affordable electric rates** – ensure clean energy transformation is cost-effective
  - Portfolio risk management -- avoid renewable energy immediately, at any cost, mindset
  - Transition and eventual exit strategy from fossil resources (fuel supply and assets)
  - Alignment among stakeholders regarding major technical and economic challenges and trade-offs
- **Sustainable, market-based, DER structure** -- enable customer choice that is equitable to non-participant customers
  - Migrate from “dumb” to ‘smart” DER systems -- innovative utility service offerings and pricing options to enable grid-friendly DER
  - Responsibility of distributed renewable resources to provide essential grid support services
- **Least-cost, diversified portfolio of renewable energy resources** – considering renewable prices, grid integration challenges, community acceptance, opportunity costs and avoided costs
  - Robust wholesale market competition does not exist in Hawaii -- renewable energy bid prices substantially higher than comparable PPA prices on mainland
  - Wind, solar and energy storage costs continue to decline – deferral may lead to lower costs
- **Grid modernization and renewable energy integration investments** – minimize amount of required capital investment
  - Customer energy solutions (DG, DR, EE, storage & EVs) provide cost-effective T&D solutions
  - Ability of energy storage, DR and load shifting to provide flexible “supply” and other grid services
  - Manage technical risks associated with new technologies and alternative grid solutions



# The Hawaii Renewable Experience – What Can be Replicated?

**Mark Glick**

Hawaii State Energy Administrator

Maui Energy Conference & Exhibition

March 17, 2016



HAWAII STATE  
Energy Office

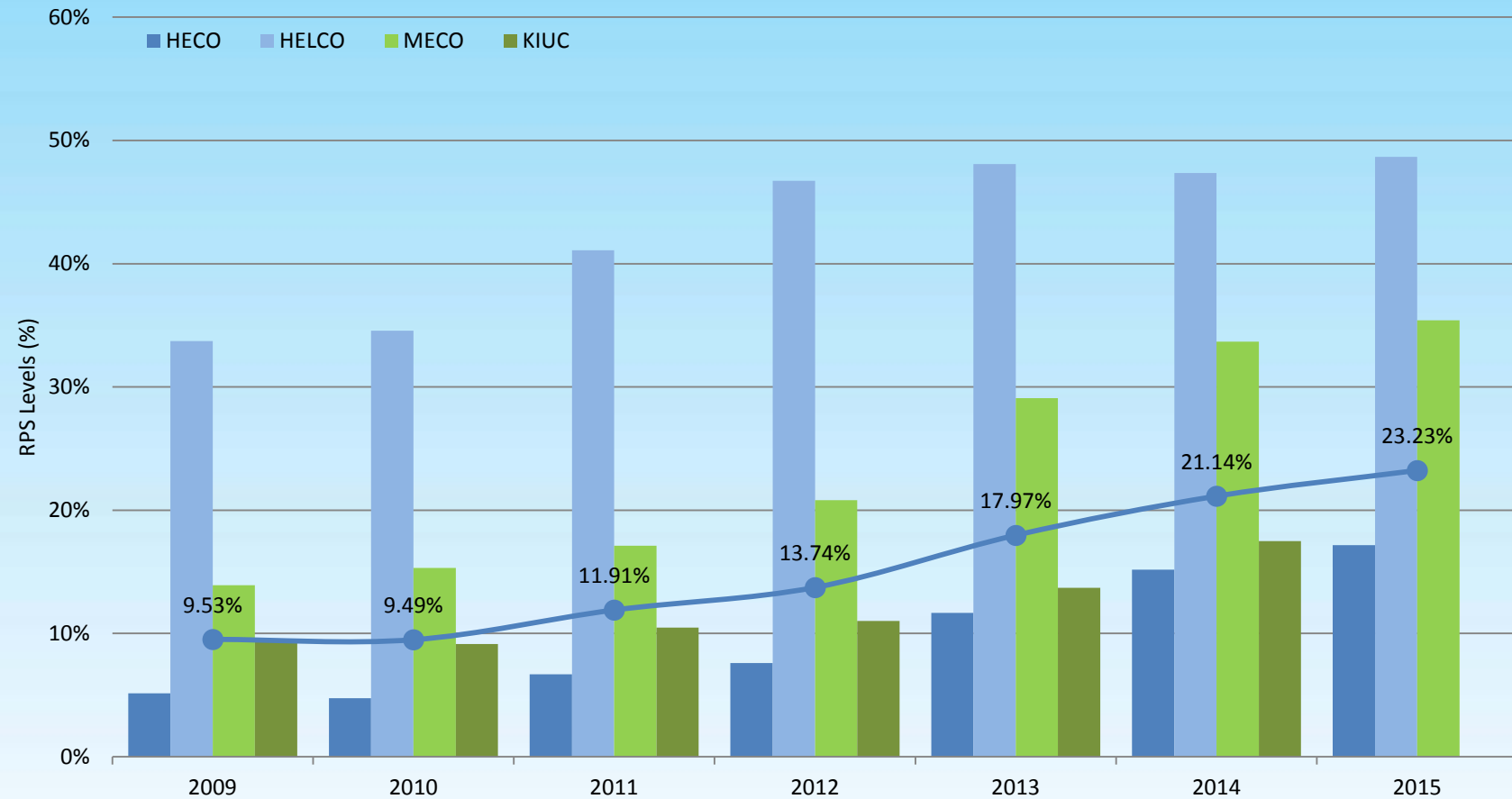
# Driving Force: Hawaii Clean Energy Initiative (HCEI)

- 100% Renewable (electricity sector) by 2045
- Reduce 4,300 Gwh by 2030 - EEPS
- New Energy in Transportation Road Map



# RPS: A Clean Energy Driver

## Hawaii Renewable Portfolio Standard (RPS) Levels 2009-2015



Source: *Renewable Portfolio Standards Status Reports, 2009-2015* (Hawaii Public Utilities Commission). KIUC results not included for 2015 pending KIUC's annual RPS status report.



# Balanced Approach



- Diversifying our energy portfolio.
- Connecting the islands through integrated, modernized grids.
- Balancing technical, economic, environmental and cultural considerations.
- Leveraging our position as a test bed to launch an energy innovation cluster.
- Creating an efficient marketplace that benefits producers & consumers.





# Mahalo

## *Clean Energy Innovation & Deployment for a Better Hawaii!*



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