

# Arctic Sustainable Energy Research Conference

## Renewable Energy Integration & Batteries in Hawaii

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Virtual Conference

SESSION: Sustainable Energy, Session 2: Integration



Hawaii Natural Energy Institute

# Hawaii Natural Energy Institute (HNEI)

*School of Ocean and Earth Science and Technology - University of Hawaii at Manoa*

- Founded as organized research unit in 1974, established in statute in 2007 – serves as the State's lead on energy resource and technology development seeking solutions to renewable generation, transportation fuels, grid integration, and energy policy
- I lead the Energy Policy Practice at HNEI, which supports Hawaii's energy transition and similar initiatives throughout the United States and the Asia-Pacific region through integrated energy and environmental policies and actions. My EEP team includes faculty, consultants and students of the University's Environmental Research and Design Laboratory (ERDL). ERDL helps HNEI conduct research projects with the potential to significantly reduce greenhouse gas emissions and energy costs, improve energy resilience, and address island, remote and underserved communities.
- Featured projects of the Energy Policy Practice are:
  - Regional Partner of the U.S. Department of Energy's Energy Transition Initiative Partnership Program
  - Supporting Vietnam's policies on Renewable Portfolio Standards, energy storage and building an energy innovation economy.
  - The City & County of Honolulu's Healthy & Resilient Buildings Initiative.



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# The Hawaii Clean Energy Initiative (HCEI)

Established in January 2008 via an Energy Agreement between the State of Hawaii and the U.S. Department of Energy

Step 1: Strategic Planning

Step 2: Institutionalize financial, policy and regulatory mechanisms needs for energy transition

Step 3: Convene Strategic Partners



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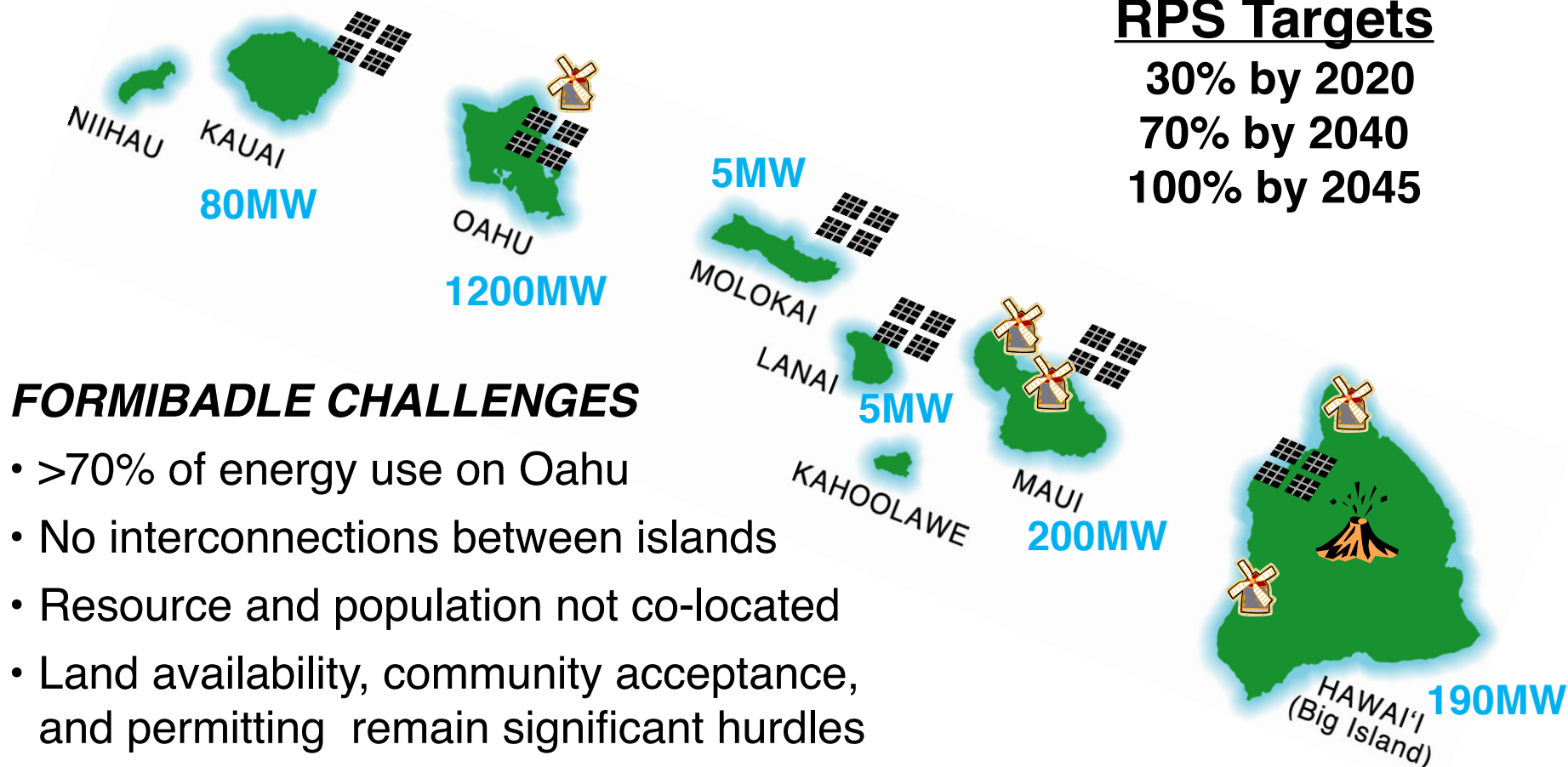
# Affecting Change on Six Isolated Grids

## RPS Targets

30% by 2020

70% by 2040

100% by 2045



## **FORMIDABLE CHALLENGES**

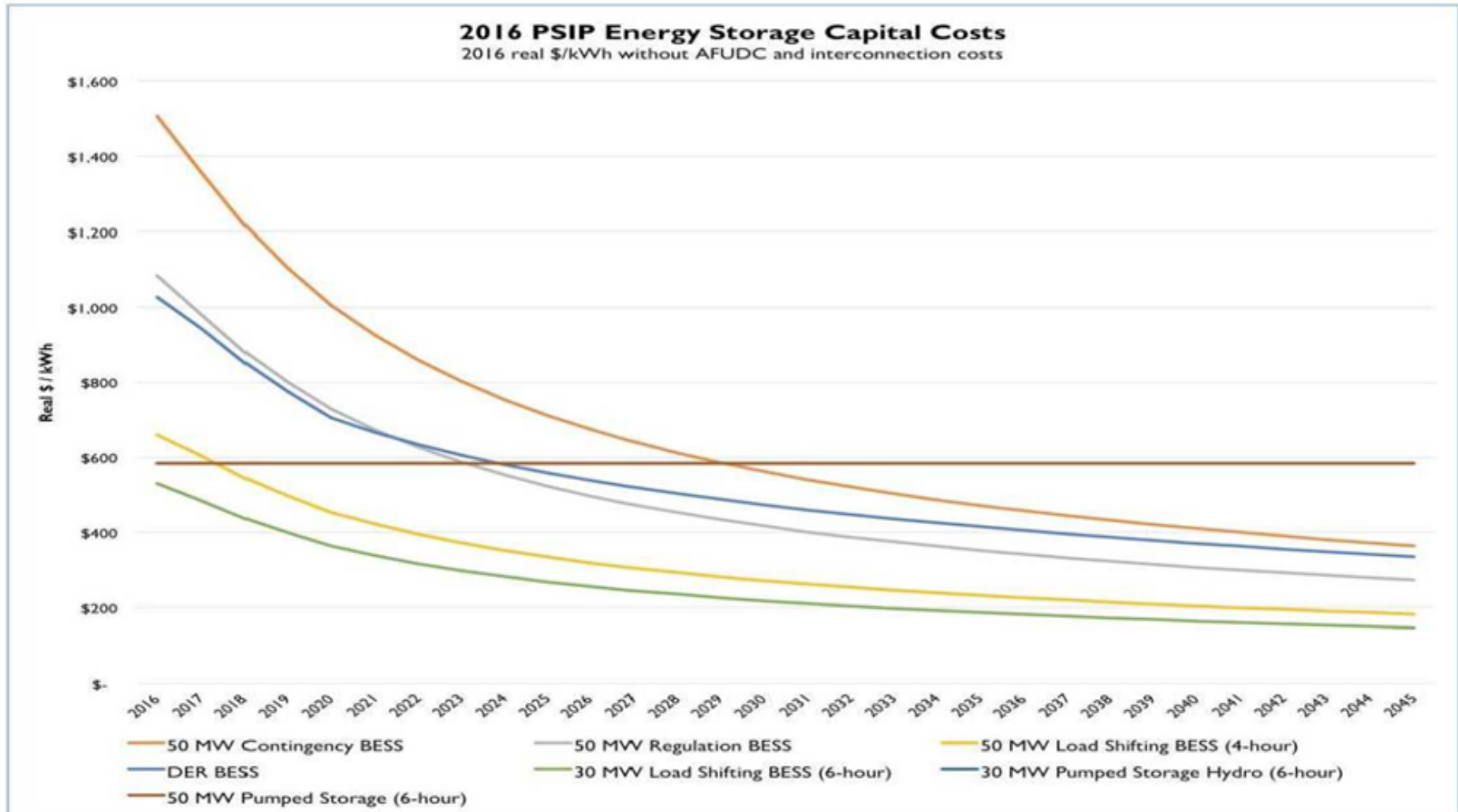
- >70% of energy use on Oahu
- No interconnections between islands
- Resource and population not co-located
- Land availability, community acceptance, and permitting remain significant hurdles

**Meeting RPS goals requires innovation and community commitment**



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# Energy Storage Costs





# Oahu Near-Term Resource Plan

(Source: Hawaiian Electric Company)

Year	O'ahu Resource Plan
2017	72.3 MW DG-PV
2018	41.2 MW DG-PV 6 x 8.14 MW Schofield Plants 24 MW Na Pua Makani Wind 109.6 MW Grid-Scale PV 10 MW Grid-Scale Wind (CBRE) 15 MW Grid-Scale PV (CBRE)
2019	45.5 MW DG-PV 70 MW Contingency FFR I 20 MW West Loch PV
2020	40.5 MW DG-PV 30 MW Grid-Scale Wind 180 MW Grid-Scale PV 100 MW 1-hour Regulation BESS
2021	55.6 MW DG-PV Convert H8 & H9 to synchronous condenser

# Recent PV Plus Storage PPAs in Hawaii

Project name	Island	Developer	Size	Storage	Cost per KWh
Waikoloa Solar	Hawaii	AES	30 MW	120 MWh	\$0.08
Hale Kuawehi	Hawaii	Innergex	30 MW	120 MWh	\$0.09
Kuihelani Solar	Maui	AES	60 MW	240 MWh	\$0.08
Paeahu Solar	Maui	Innergex	15 MW	60 MWh	\$0.12
Hoozana	Oahu	174 Power Global	52 MW	208 MWh	\$0.10
Mililani I Solar	Oahu	Clearway	39 MW	156 MWh	\$0.09
Waiawa Solar	Oahu	Clearway	36 MW	144 MWh	\$0.10

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# HECO Solar + BESS projects approved by the Hawaii PUC

(Source: HECO website)

APPROVED BY REGULATORS						
Name	Island	Developer	Tech	Size	Estimated Completion	RPS % Points Contribution
Molokai Island Energy Project	Moloka'i (Kaunakakai)	Molokai New Energy Partners LLC	Solar + BESS	2.6 MW 15 MWh (BESS)	2020	0.1
AES Kuihelani	Maui (Central Maui)	AES Kuihelani Solar, LLC	Solar + BESS	60 MW 240 MWh (BESS)	2021	1.9
AES Waikoloa Solar, LLC	Hawai'i Island (Waikoloa)	AES Waikoloa Solar, LLC	Solar + BESS	30 MW 120 MWh (BESS)	2021	0.8
AES West Oahu Solar, LLC	O'ahu (West O'ahu)	AES West Oahu Solar, LLC	Solar + BESS	12.5 MW 50 MWh (BESS)	2021	0.4
Ho'ohana Solar 1, LLC	O'ahu (Kunia)	Hanwha Energy USA Holdings Corp (174 Power Global)	Solar + BESS	52 MW 208 MWh (BESS)	2021	1.4
Mililani I Solar, LLC	O'ahu (Mililani)	Mililani I Solar, LLC (Clearway)	Solar + BESS	39 MW 156 MWh (BESS)	2021	1.2
Waiawa Solar Power LLC	O'ahu (Waiawa)	Waiawa Solar Power LLC (Clearway)	Solar + BESS	36 MW 144 MWh (BESS)	2021	1.2
Hale Kuawehi Solar LLC	Hawai'i Island (Waimea)	Hale Kuawehi Solar LLC (Innergex)	Solar + BESS	30 MW 120 MWh (BESS)	2022	0.8



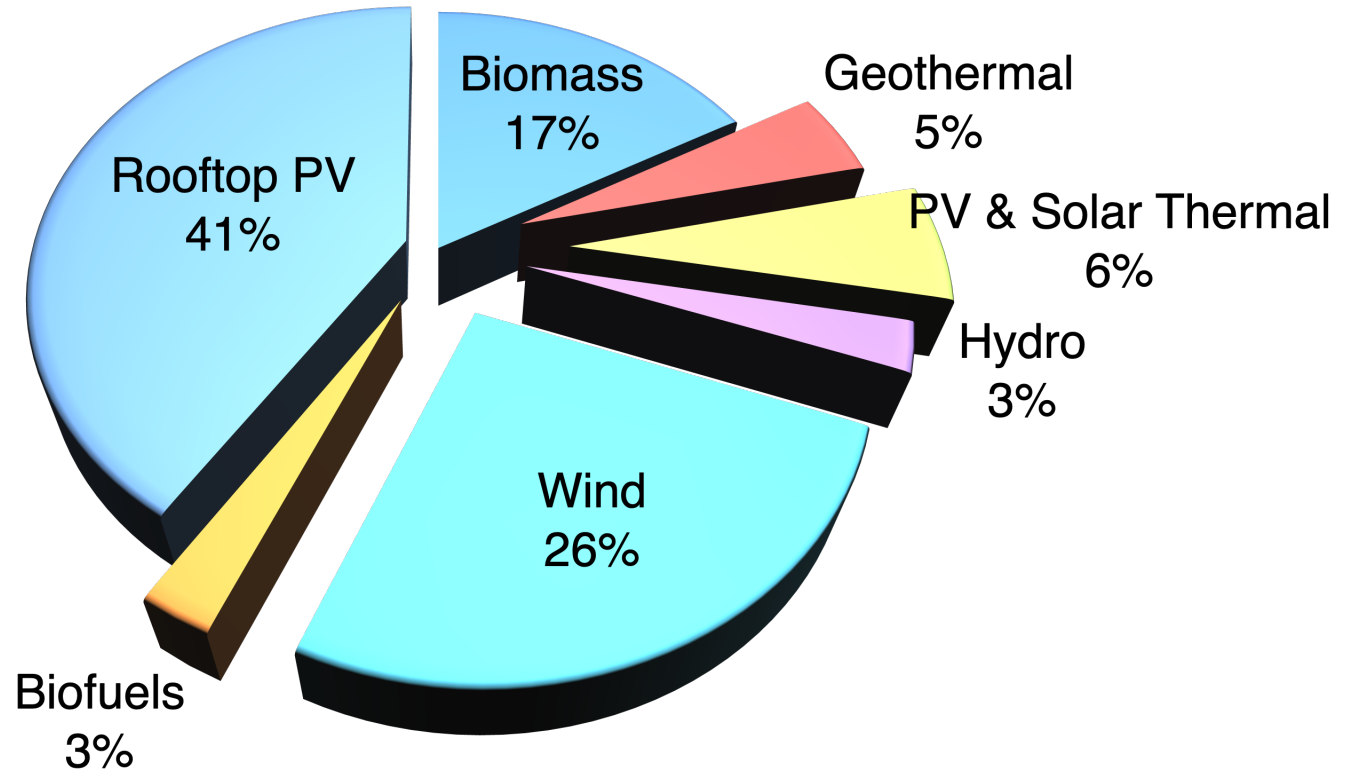
# Hawaiian Electric Companies - 2020 RPS (4th Quarter)

**34.5% Total**

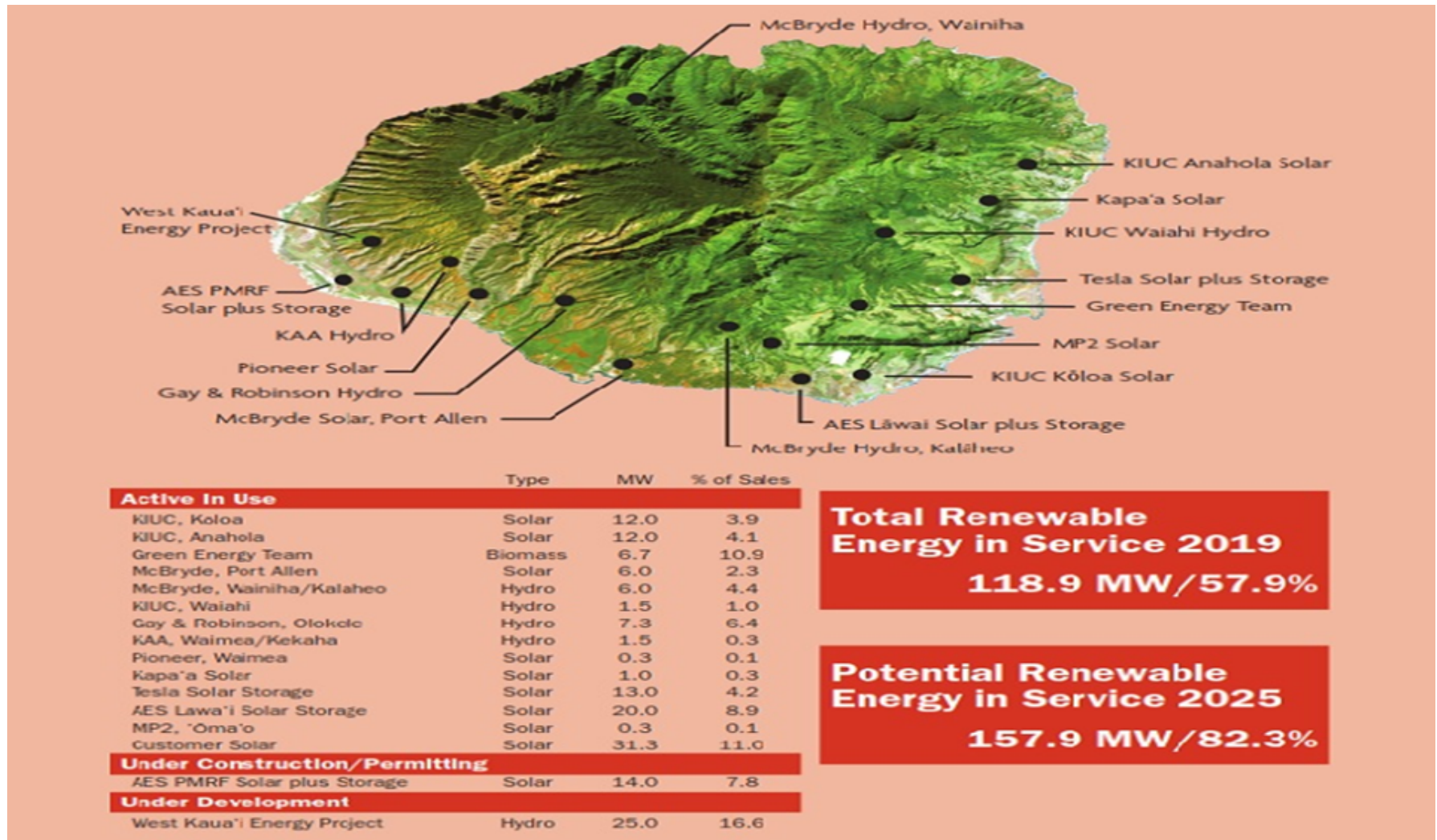
**30.5% HECO**  
(Oahu –  
Honolulu)

**43.4% HELCO**  
(Hawaii  
Island)

**50.8% MECO**  
(Maui,  
Molokai,  
Lanai)

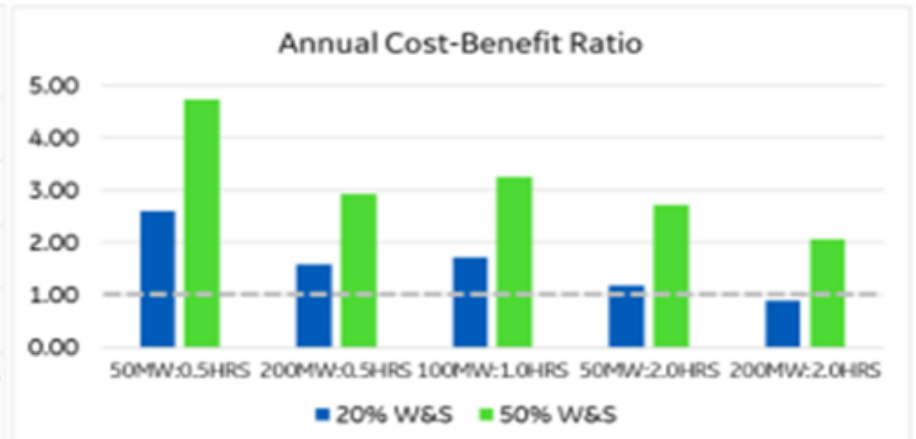
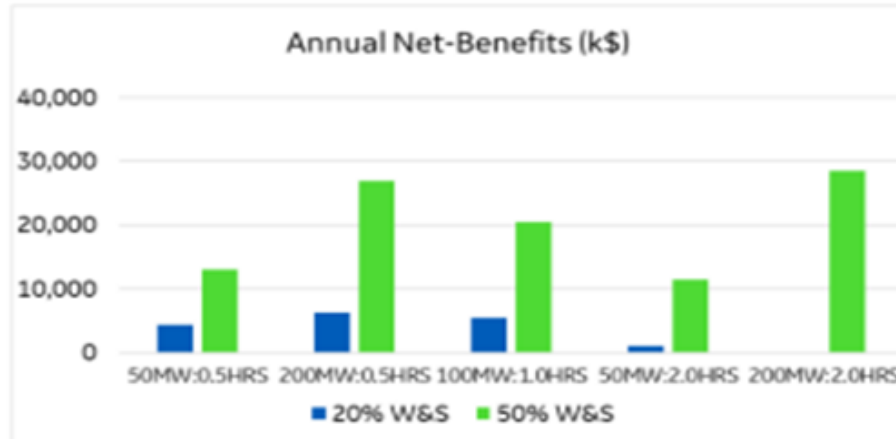


# Hawaii – Energy Storage Policies, Regulations & Market



**Kauai Island Utility Cooperative (KIUC) Current  
& Under Development Generation & BESS**

# Two Distinctive Policy Approaches



# Thank you!



# HNEI

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