

# Managing and Integrating DR in a Clean Energy Grid: The Hawaii Case Study

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# DR Potential Study for Hawaiian Electric Companies

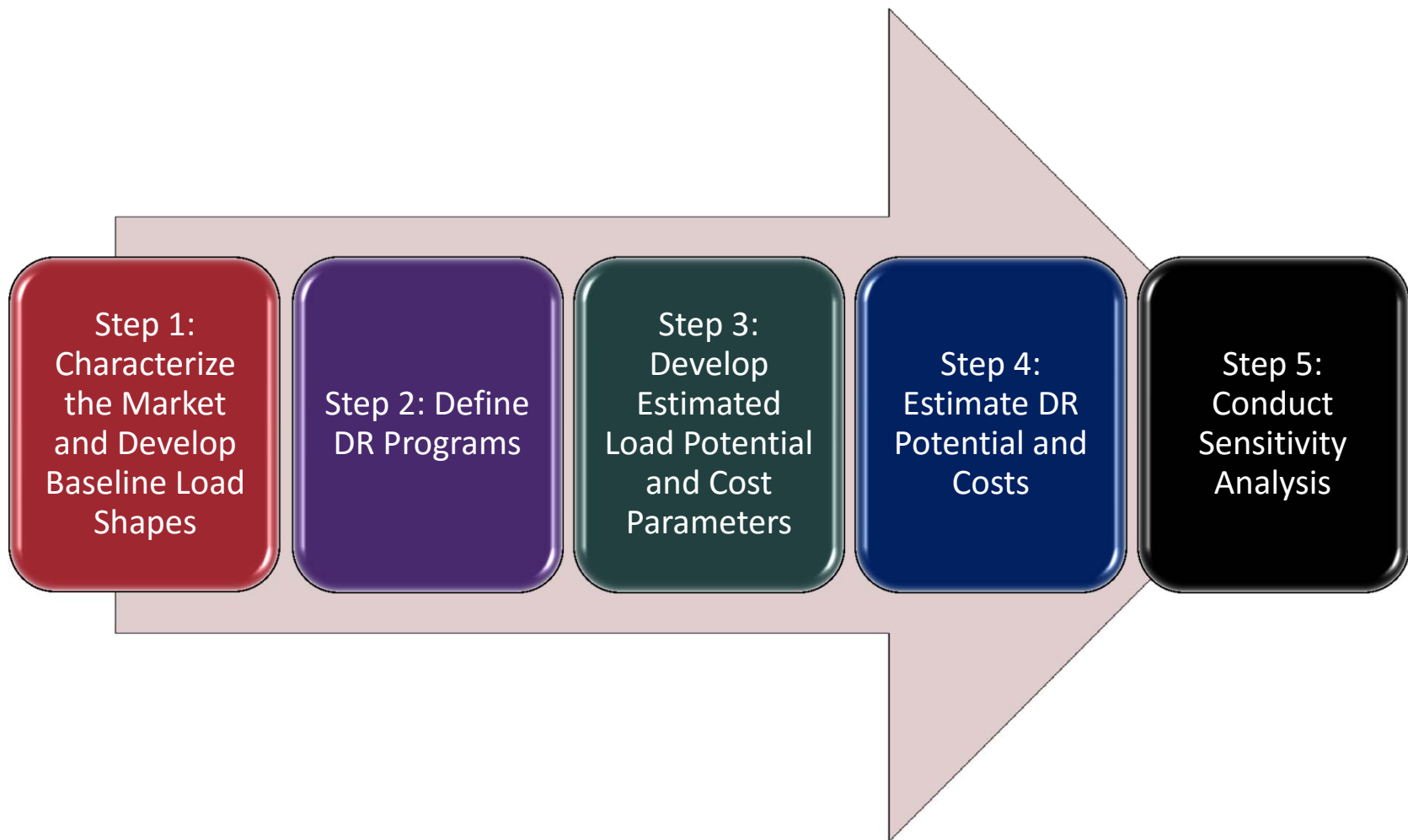
*Study Objective: Develop estimates of DR achievable potential that will guide HECO, HELCO and MECO in their efforts to implement a new generation of DR programs that will help meet the changing needs of Hawaii's electric grid.*



## *Specific Tasks:*

1. Develop hourly load profiles by customer type and end-use for each year in the 20-year time horizon.
2. Estimate the achievable potential and cost for a wide range of DR programs aimed at addressing specific grid service requirements for the companies.
3. Assess the uncertainties associated with the achievable potential estimates and develop range of potential estimates.

# Steps in the Analysis



# Market Characterization Levels

## Level 1

- By Island
- (Oahu, Maui, Hawaii, Molokai, Lanai)

## Level 2

- By Rate Schedule
- (Residential, SMB, Large C&I)

## Level 3

- By Building Type
- (Retail, Hotel, Hospital, etc.)

## Level 4

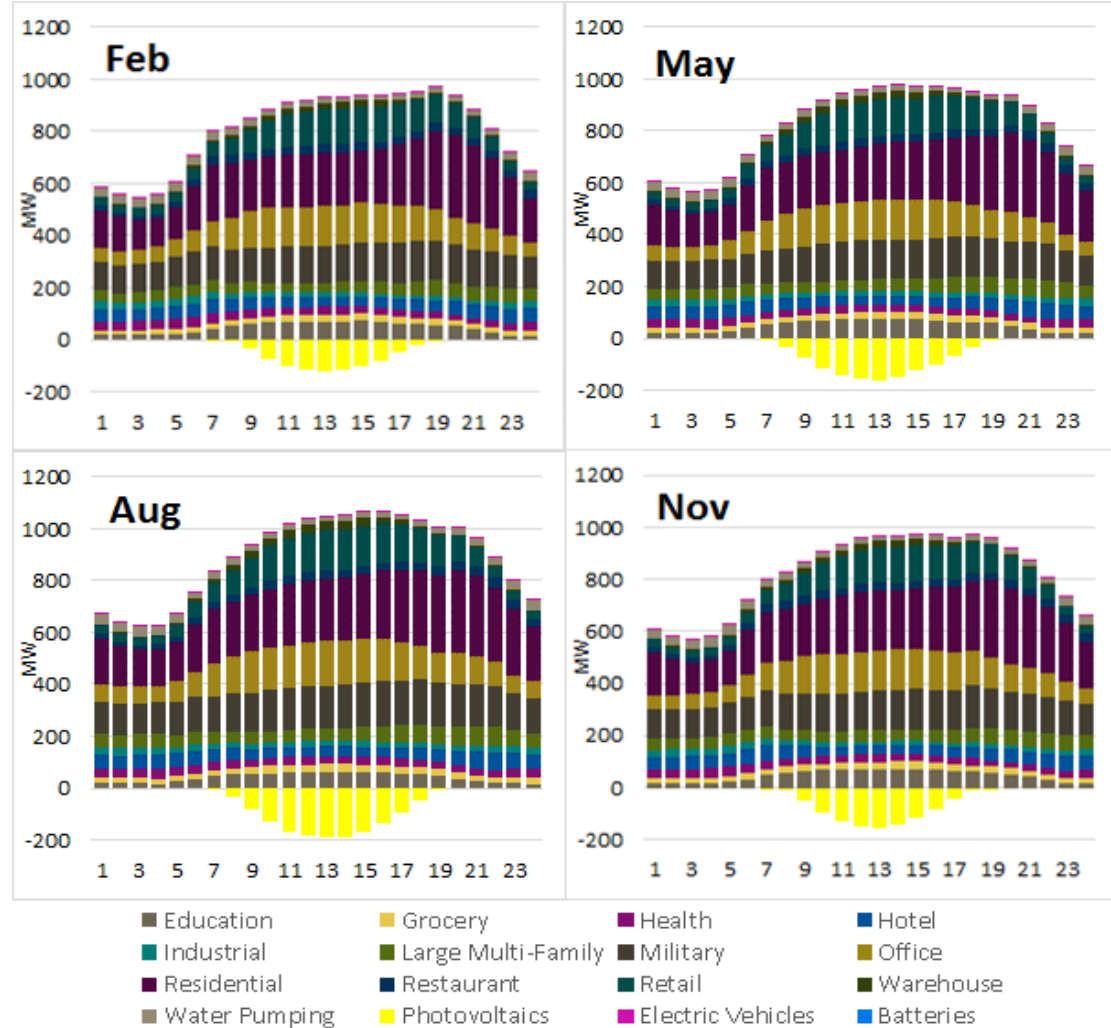
- By End-Use
- (Cooling, Lighting, Water Heat, etc.)

# DR Options Included in the Study

DR Option	Type of Grid Service Product
Fast Frequency Response	Contingency Reserves
Non-Spin Auto Response	10 min Reserves
Regulation Reserves	Regulation Reserves
Critical Peak Incentive	Capacity
Time-Of-Use	Capacity
Day Ahead Load Shift	Capacity
Real Time Pricing	Capacity
Minimum Load	Capacity
PV Curtailment	Capacity

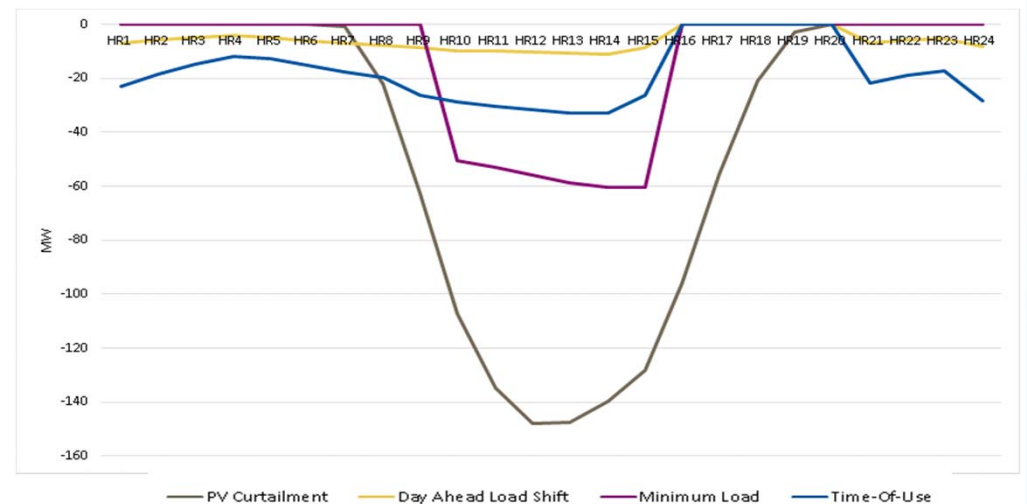
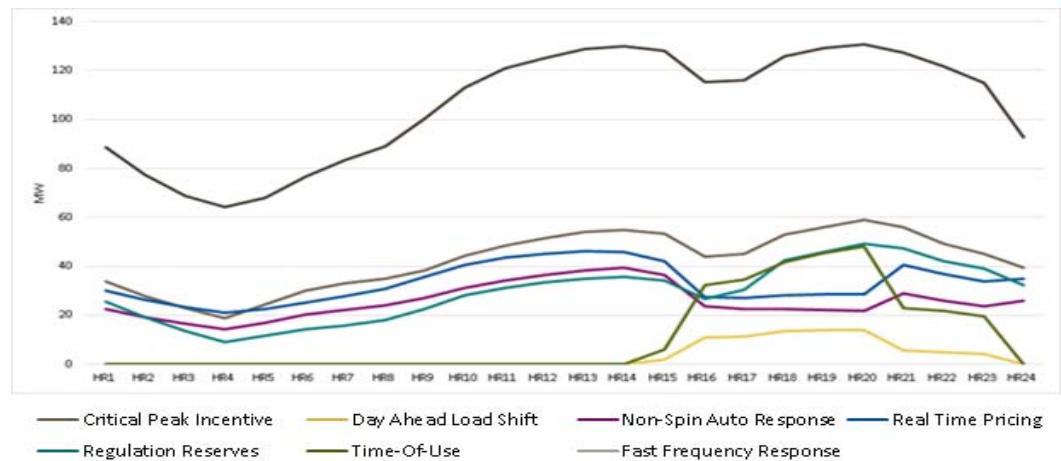
# Estimated Base Year Loads by Sector for Average weekdays in 4 Months – Oahu

- Loads by market segment and end-use were estimated at the segment and end-use level
- Utilized total net load forecasts provided by HECO and disaggregated based on HECO customer data and analysis to fill gaps
- Projections were carried out for subsequent years in the forecast (2015-2035)
- Similar datasets were prepared for the 4 neighbor islands (Maui, Hawaii, Molokai, and Lanai)



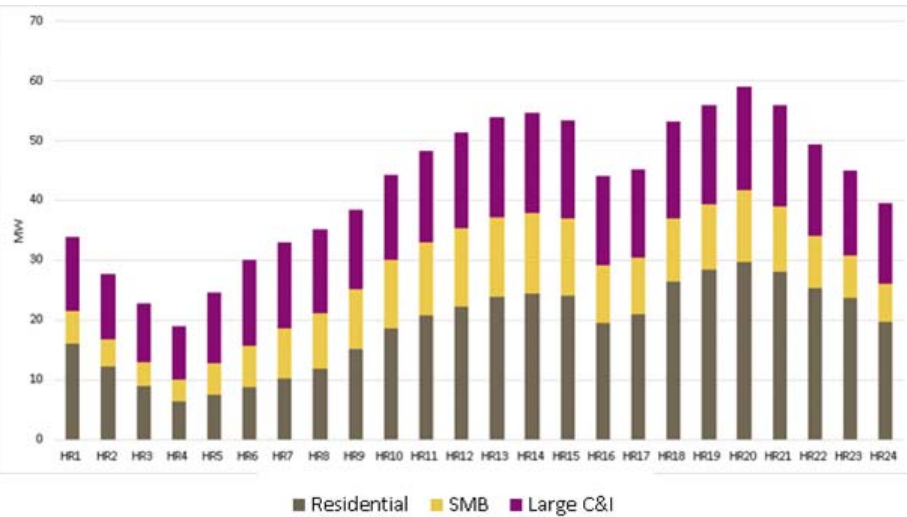
# DR Potential on a September 2025 Weekday – Oahu

- A total of 9 DR programs were considered – 7 aimed at reducing loads; 2 aimed at increasing loads; and 2 that could achieve both reductions and increases
- Fast Frequency Response had the highest load reduction potential at 130 MW around the middle of the day
- Load reduction potential from all other DR programs was less than 10% of the net load at any given hour
- The PV Curtailment option has highest load increase potential at approximately 150 MW during the midday hours

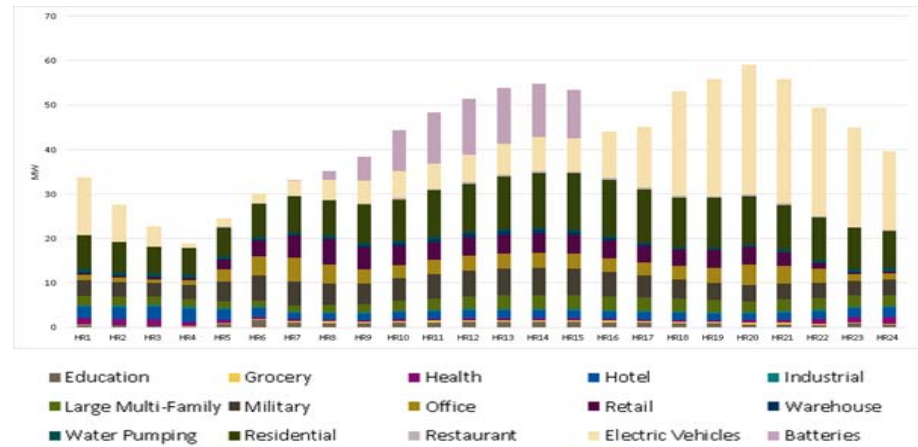


# Oahu Potential – A Detailed Look by DR Option

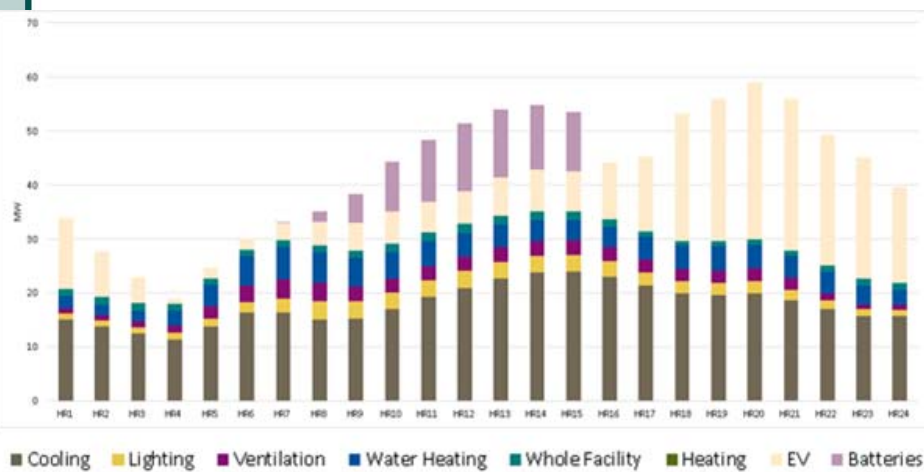
CPI Load Reduction Potential on an Average Weekday in September, 2025 (by customer class)



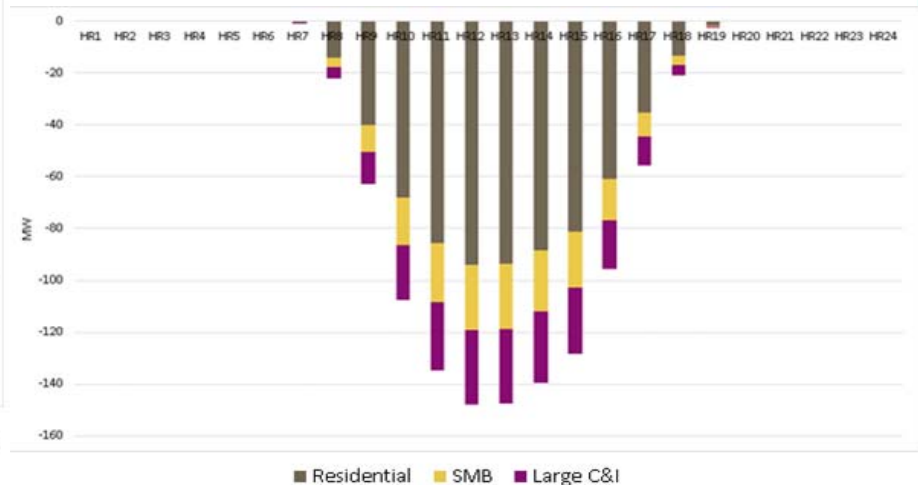
CPI Load Reduction Potential on an Average Weekday in September, 2025 (by building type)



CPI Load Reduction Potential on an Average Weekday in September, 2025 (by enduse)



Load increase potential from PV Curtailment Option on an average weekday in September, 2025





# Key Observations

- Significant DR potential exists in the HECO service territories
- DR will increasingly play an important role in managing variable renewable resources
- Changes in the DR program designs will have significant impacts on the DR potential:
  - A doubling of customer incentives led to a significant increase in DR potential
  - Increasing market expenditures will increase customer awareness and thus bring about a bump-up in participation
- Changes in the market adoption of other distributed energy resources had varying effects on the DR potential:
  - PV adoption rates did not significantly affect the DR potential either way
  - EV adoption rates significantly affected the DR potential