Integrated Grid Planning
Forecast Assumptions Working Group
March 9, 2020
Meeting agenda

8:30
• Welcome
• Objectives & Agenda

8:40
IGP Process Flow

8:55
Planning Sensitivities

9:10
Process Recap and Feedback

9:50
Recap Assumptions

10:20
Oahu Forecast

11:00
Working lunch (20 mins)

11:20
Maui County Forecast

12:05
Hawaii Forecast

12:45
Wrap up
Objectives for today

1. Review of the IGP process and modeling sensitivities
   - Describe IGP process workflow and interactions
   - How the forecast is used in the process

2. Review the forecasts developed at the beginning of the planning process
   - Forecasts for all islands
   - Gather feedback
IGP Process Work Flow
IGP Bi-Annual Procurement Timeline

1 month | 6 months | 1 month | 6 months | 5 months | 2 months | 3 months

Independent Evaluation Provided By TAP

Transmission Needs
- Qualified Projects for Procurement
  - Capacity Energy & AS Needs

Distribution Needs
- Qualified Projects for DER Programs

NWA Opportunity Evaluation

Near Term Needs
(5 Yr or Less)

Draft Capacity Energy & AS RFP
- Final Capacity Energy & AS RFP
- Capacity Energy & AS Evaluation
- Contract Negotiations

Draft T&D NWA RFP
- Final T&D NWA RFP
- T&D NWA RFP Evaluation

Long Term Needs
(Greater than 5 Yr)

Draft Long Term RFP
- Final Long Term RFP
- Tentative – Further Discussion Needed

Qualified Projects for DER programs
as inputs to next annual forecast

Stage 2 RFP Results
- IGP RFP Results
  - Inputs Assumptions Annual Forecast
    - PUC Review Point
      - DER Rates/Programs

IGP Annual Planning Timeline

12 Months | 12 Months

Distribution Investments

Qualified Projects for DER programs

Planning Sensitivity Discussion
Modeling Sensitivities Discussion

- Sensitivities will inform and stress test cases to develop a more robust portfolio. Hawaiian Electric proposes to conduct additional analyses that can augment its initial case. To that end, sensitivities that are largely similar from a modeling perspective will be excluded to focus on more meaningful sensitivities.

- Stakeholders originally provided 10 potential sensitivities for consideration as part of the CEAS needs analysis.
Planning Sensitivities

Understand the upper bound of the DER by limiting the expansion of transmission infrastructure and shifting the generation options to the DER resources to meet RPS system needs.

Determine the system value of the forecasted market DER uptake by running a case where no incremental DERs are added beyond 2020 levels.
Process recap

Overview
Who are our customers?
What are we forecasting?
High level "how"

Gather assumptions
Economic outlook
Behind the meter technologies
Electricity price
Weather…

Present methods
To derive the “layers”
Shaping the forecast
Other utilities

Review assumptions and forecasts
Present assumptions and forecasts
Gather feedback
Refine assumptions
Sensitivities
Update as needed
Examples of your input…

Weather
• Included warming trend in the weather

Distributed Energy Resources
• Most PV systems are now installed with batteries
• Drivers: installed costs, incentives, program structure/rate design
• Barriers: lack of or shared roof space, short term lease, home ownership, should make financial sense
• Outlook: new homes having PV regardless of home ownership. Programs that are simpler to understand and implement.

Electrification of Transportation
• Light duty EVs: forecast for total light duty vehicles looked too aggressive
• Electric buses: on the neighbor islands not just Oahu
• Drivers: cost parity, variety, increased charging opportunities, incentives

Consider all perspectives when developing forecasts and plans
• Increasing amounts of dialysis centers
• Income constrained
Key Assumptions

Underlying
• UHERO Economic Forecasts Updated October 2019
• Electricity Price Forecast from Corporate Energy Planning
• Weather

DER
• Economic assumptions (installed costs, electricity price, program structure, panel degradation, maintenance and replacement)
• Addressable market
• Solar resource assumptions (unitized generation profiles, capacity factors)

EoT
• Light duty EVs and buses
• Charging – who, when and where

Energy Efficiency
• Statewide Market Potential Study - Business As Usual and High Achievable Forecasts
Key Assumptions – Hourly Shape Method

**Determine Class Shapes**
- Class load study hourly shapes by rate class, no impact of PV
- Hourly regression models using independent variables: weather, month, day of the week, holidays
- Simulate future shapes for each rate class with independent variable assumptions

**Layers**
- Layer shapes: DER (PV), Battery load shift, EE, EoT, future layers?
- Possible to have multiple shapes by layer

**Future Hourly System Load**
- Input: monthly energy, future load shapes, loss factor
- Result: hourly net system load for entire forecast period
Hourly Profile By Layer
Wednesday, June 29, 2050
Hourly Profile Changes Over Forecast Horizon Due To Layer Impacts
Oʻahu
O‘ahu Sales Forecast By Layer

GWh Sales

% YOY Chg Fct % YOY Chg Recorded Underlying With DER/BESS With DER & EE With DER,EE & EoT


0 2,000 4,000 6,000 8,000 10,000 12,000 14,000

0% 5% 10% 15% 20% 25% 30%
O‘ahu Peak Forecast By Layer

![Chart showing peak forecast by layer from 1991 to 2049. The chart includes lines for percent change (YoY) and actual values, with different scenarios such as DER/BESS and DER & EE added. The y-axis represents Net MW (MW) and the x-axis represents years from 1991 to 2049.](image-url)
Maui County
Maui Sales Forecast By Layer
Maui Peak Forecast By Layer
Moloka`i Sales Forecast By Layer
Moloka`i Peak Forecast By Layer

% YOY Chg Fct % YOY Chg Actual Inst. Gross MW Underlying with Acquired

With Future DER/BESS With Future DER & EE With Future DER, EE & EoT

-10% 0% 10% 20% 30%

0 1 2 3 4 5 6 7 8


Gross MW

Moloka`i Peak Forecast By Layer
Lāna`i Sales Forecast By Layer

[Graph showing historical and forecasted sales data for Lāna`i, with various layers of data including % YOY Change, Fct % YOY Chg, Recorded, Underlying, With DER/BESS, With DER & EE, and With DER, EE & EoT.]
Lāna`i Peak Forecast By Layer
Hawai`i
Hawai’i Island Peak Forecast by Layer
Deliverables and feedback

Presentation and forecasts will be posted to the website

Provide feedback on today’s or any prior meeting’s material and discussion by March 27
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