

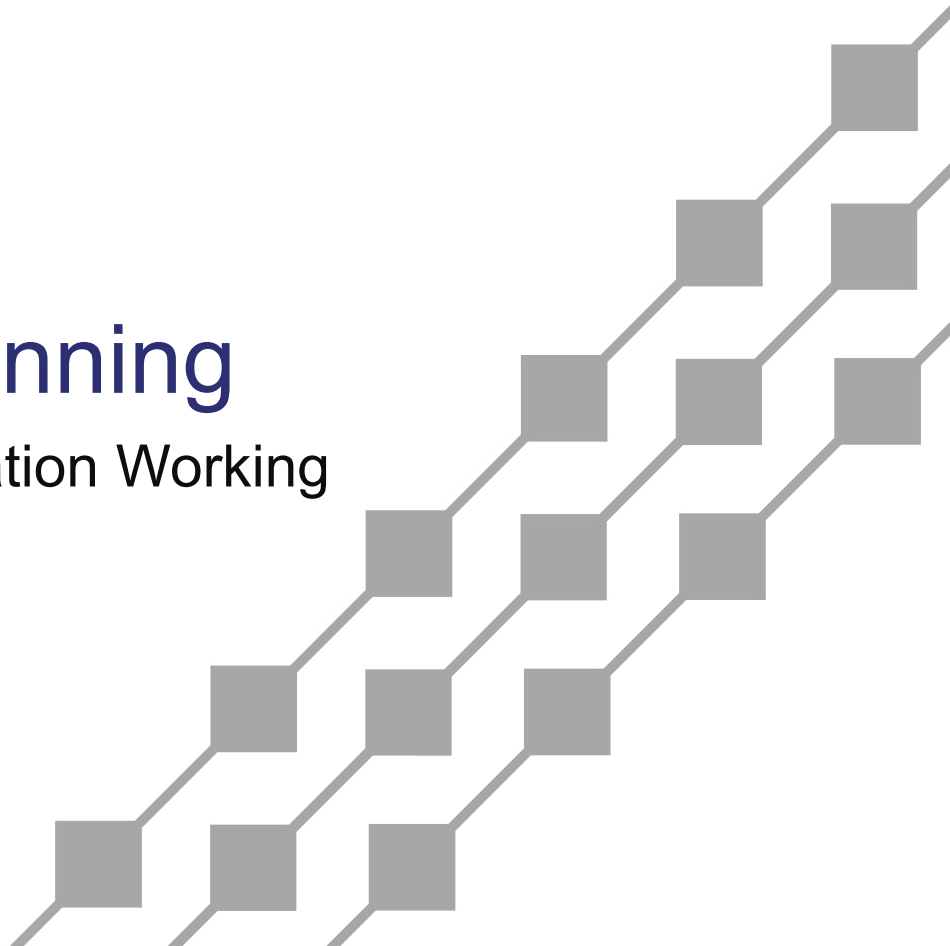


**Hawaiian  
Electric**

# Integrated Grid Planning

Solution Evaluation & Optimization Working  
Group Meeting

April 20, 2020



# Meeting Agenda

---

- ◆ Welcome and Ground Rules
- ◆ Fuel Forecast Update
- ◆ Resource Cost Forecast Update
- ◆ Grid Needs Assessment Review
- ◆ Next Steps



# Ground Rules

---

- ◆ Chatham House Rule will apply – no personal or organizational attribution will be made to any comments/feedback provided during the meeting by any participant nor in written documentation.
- ◆ Working group meetings, and other information exchanges are intended solely to provide an open forum or means for the expression of various points of view in compliance with antitrust laws.
- ◆ Under no circumstances shall engagement activities be used as a means for competing companies to reach any understanding, expressed or implied, which tends to restrict competition, or in any way, to impair the ability of participating organizations to exercise independent business judgment regarding matters affecting competition or regulatory positions.
- ◆ Proprietary information shall not be disclosed by any participant during any industry engagement meeting or information exchange. In addition, no information of a secret or proprietary nature shall be made available to industry engagement participants.
- ◆ All proprietary information which may nonetheless be publicly disclosed by any participant during any industry engagement meeting or information exchange shall be deemed to have been disclosed on a non-confidential basis, without any restrictions on use by anyone, except that no valid copyright or patent right shall be deemed to have been waived by such disclosure.



# SEOWG Deliverables and Schedule

---

- ◆ Draft of SEOWG deliverable reviewed by stakeholders
- ◆ Draft of Sensitivities appendix routed for stakeholder review
  - No comments received
- ◆ SEOWG methodology to evaluate proposals that address multiple grid needs under development
  - Due 6/1/2020 (to be informed by Stage 2 RFP)



# Objectives for Today's Meeting

---

- ◆ Review Fuel Forecast for IGP
- ◆ Review Resource Cost Forecast for IGP
- ◆ Review updates for Grid Needs Assessment



# Fuel Forecast for IGP



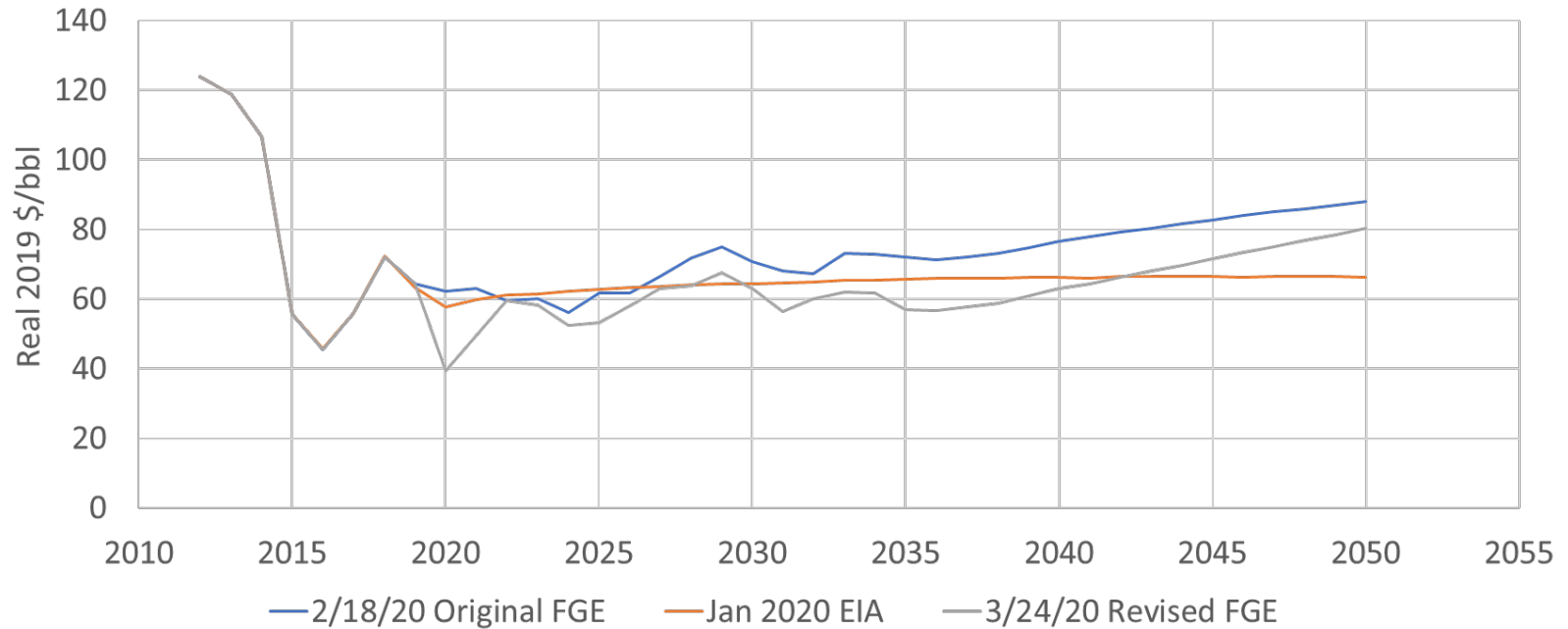
# 2020 Fuel Price Forecast

---

- ◆ Similar process to 2019 forecast. Correlation developed between historical actual fuel prices and Brent North Sea Crude Oil Benchmark (Brent) from 1983-2019.
- ◆  $R^2$  for petroleum fuels  $> 0.93$ .
- ◆ Dramatic changes since the beginning of the year
  - Global oil demand is expected to decrease over 2MMbbls/day due to COVID-19.
  - Production cuts and capital spending and overall drop in prices. Demand is expected to increase in 2021-2025, outpacing production which will result in a rebound of prices.
- ◆ EIA forecast released in January. Brent forecast provided by Facts Global Energy (FGE) in February, revised in March due to COVID-19 and OPEC's recent pricing disagreements.
- ◆ Hawaiian Electric's 2020 forecast is based on FGE's revised Brent price forecast with near term lower prices reflecting current oil situation

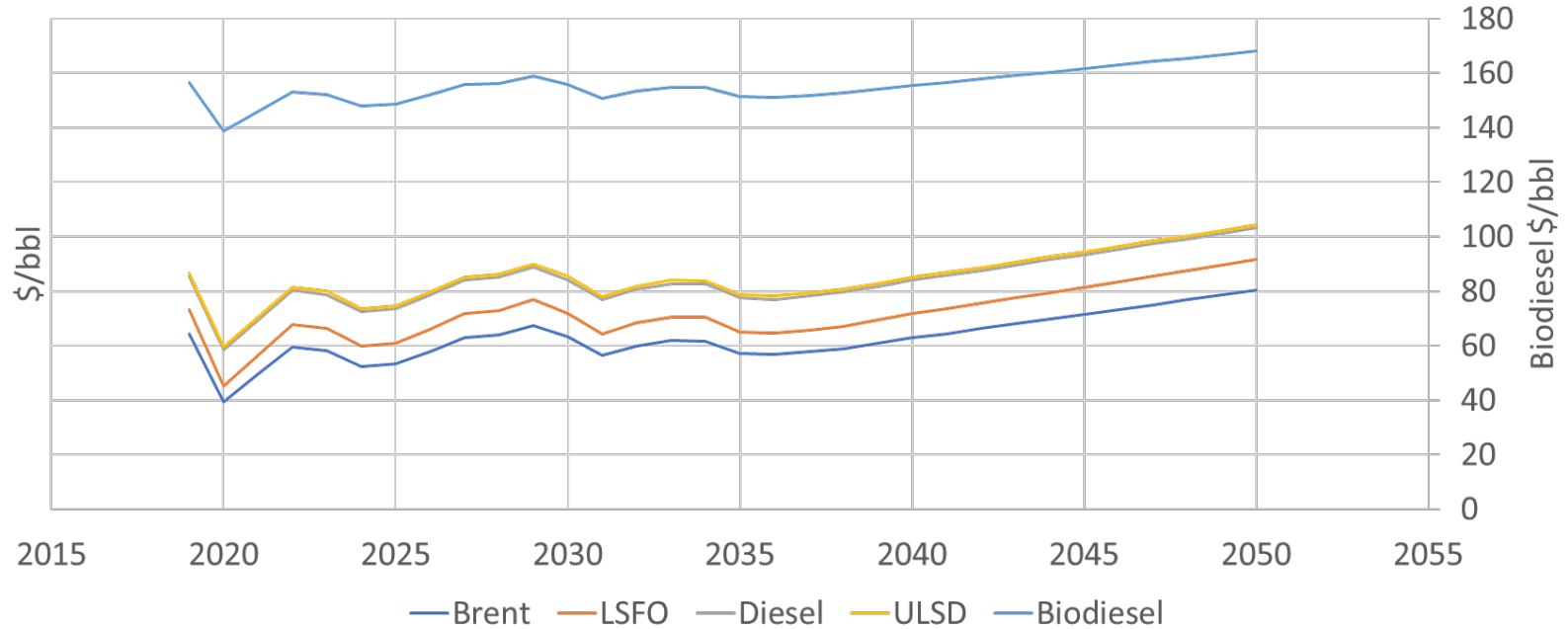


# Brent Forecast Comparison

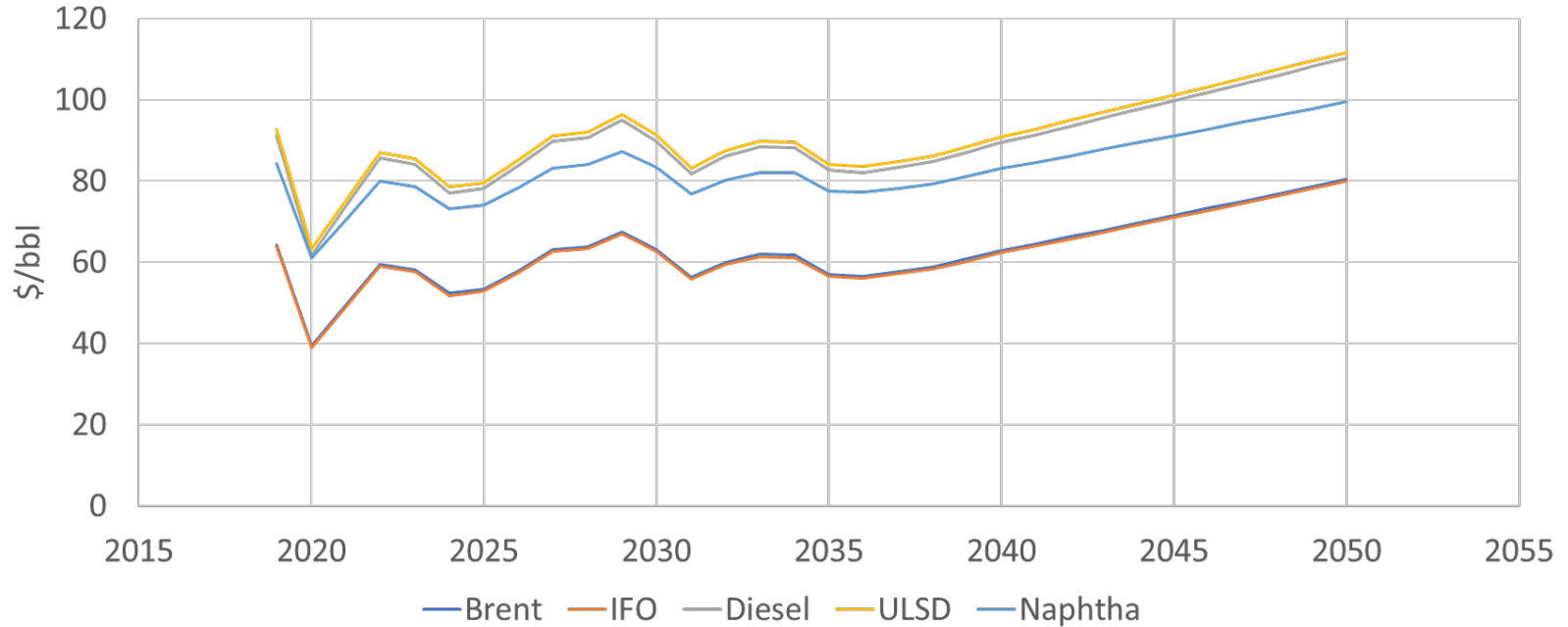




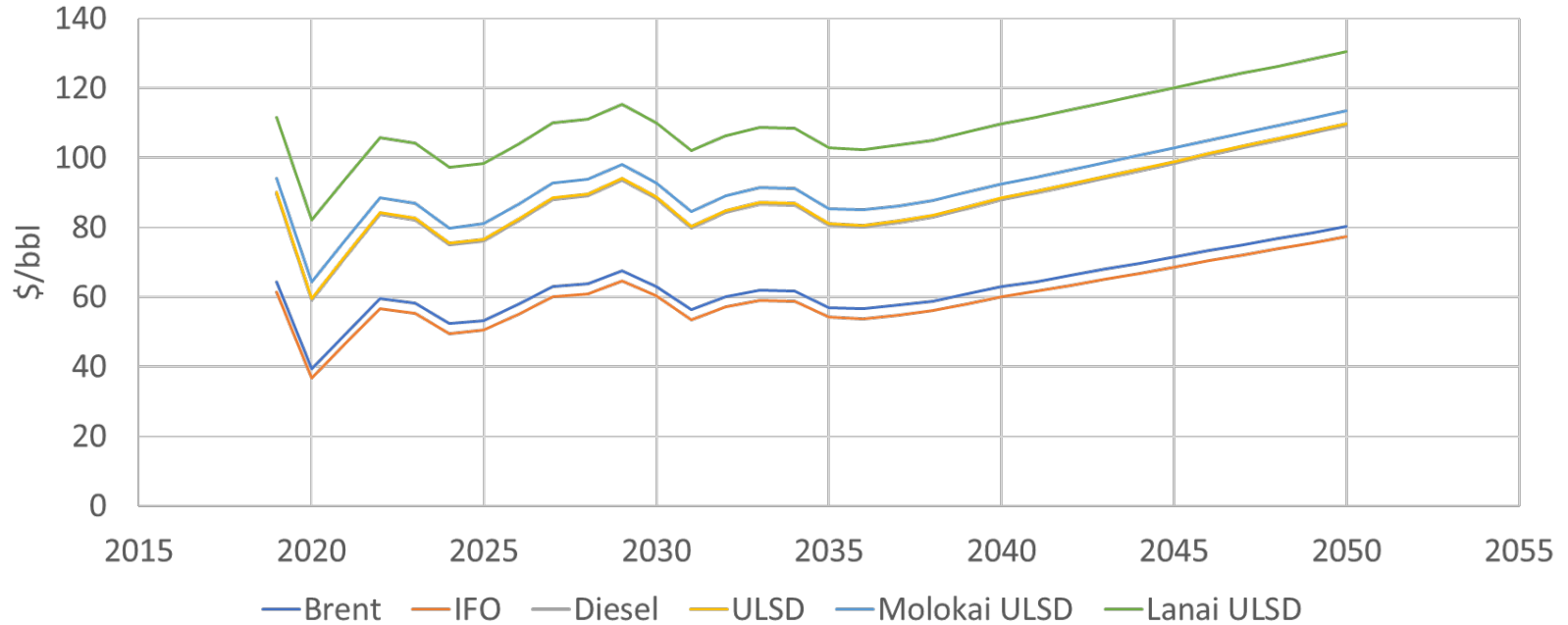
# Oahu Fuels Forecast



# Hawaii Island Fuels Forecast



# Maui County Fuels Forecast



# Resource Cost Forecast for IGP



# Updates to Resource Costs

---



## Stakeholder feedback received

- Feedback on current forecast
- Proposed technologies



## Updates made to cost forecasts

- Storage
- PV
- Off-shore wind
- Distributed wind
- Pumped storage hydro



# Stakeholder Feedback Received

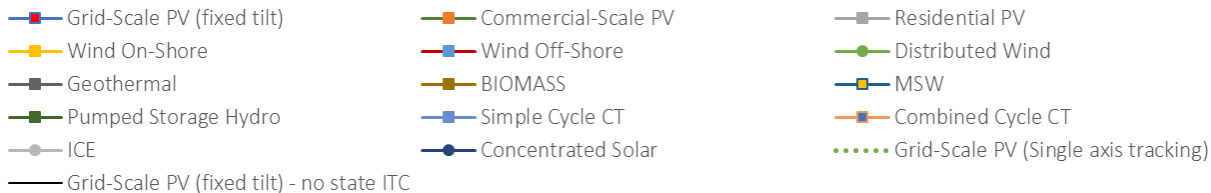
---

- ◆ **Feedback:** Land cost component may vary depending on the location
- ◆ **Update:** Land costs were removed to treat all resources the same regardless of location
  
- ◆ **Feedback:** Concentrated solar should be added as a potential resource
- ◆ **Update:** Concentrated solar was added to the cost forecast
  
- ◆ **Feedback:** Consider an updated NREL study as the cost basis for off-shore wind <sup>1</sup>
- ◆ **Update:** A hybrid forecast was developed to use the NREL study and ATB projections



<sup>1</sup> <https://www.nrel.gov/docs/fy20osti/75618.pdf>

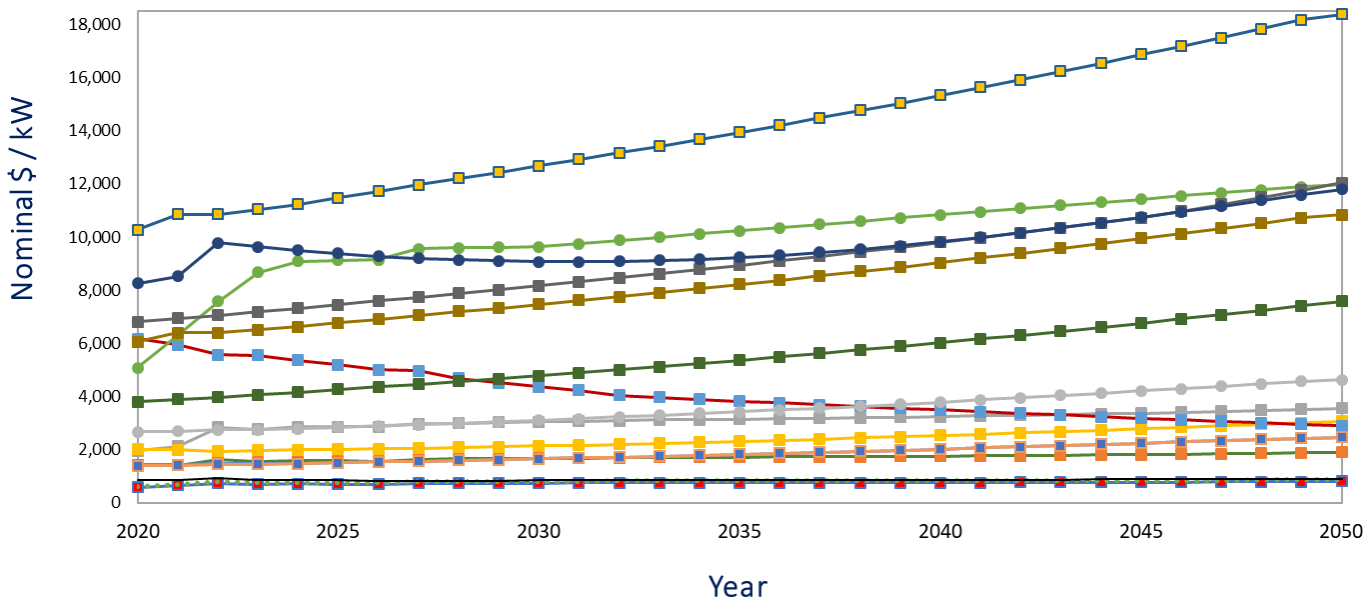
# Generating Resource Cost Forecast (\$/ kW)



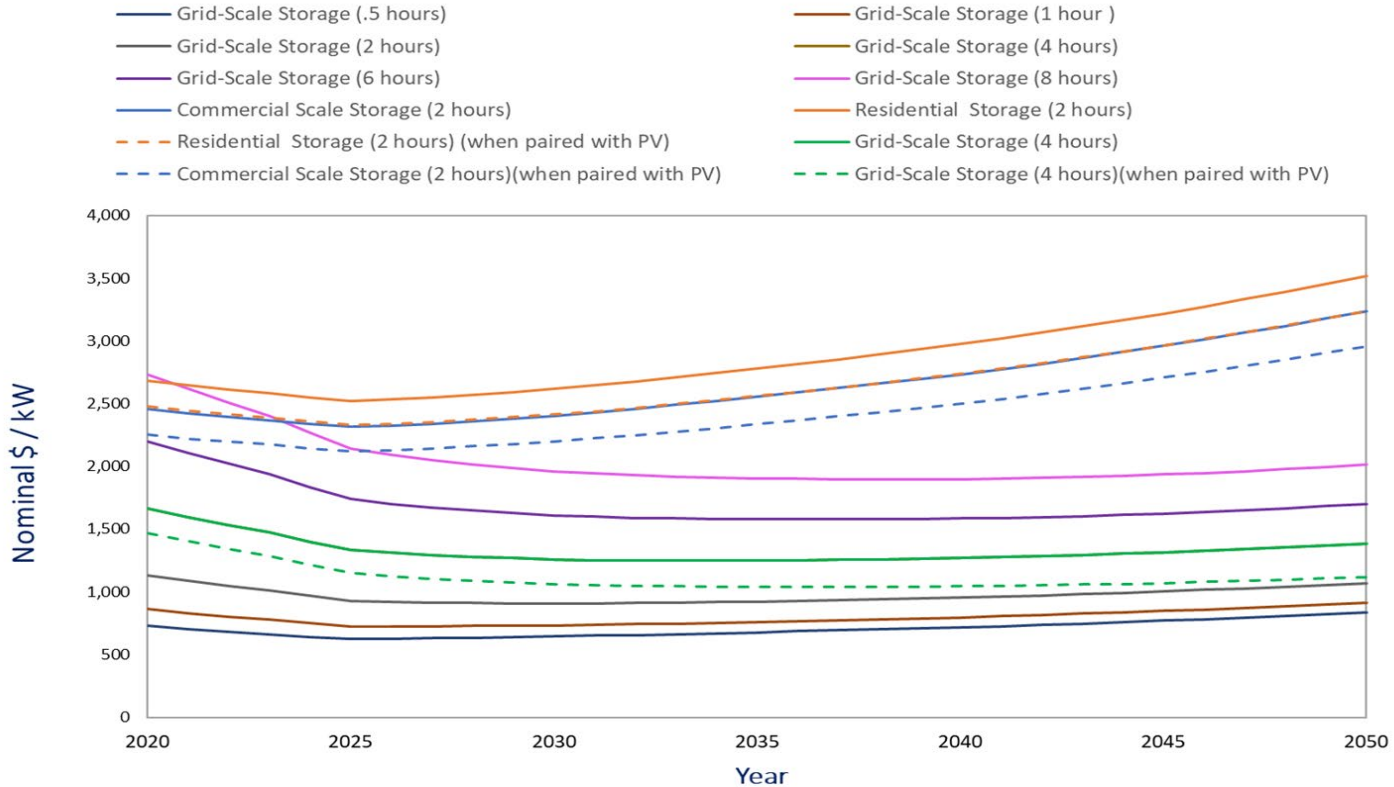
\*Grid-Scale PV cost does not include land cost component

\*The location-specific interconnection costs are not included

\*Off-Shore wind estimate includes minimal run of 1 kilometer (km) on dry land.

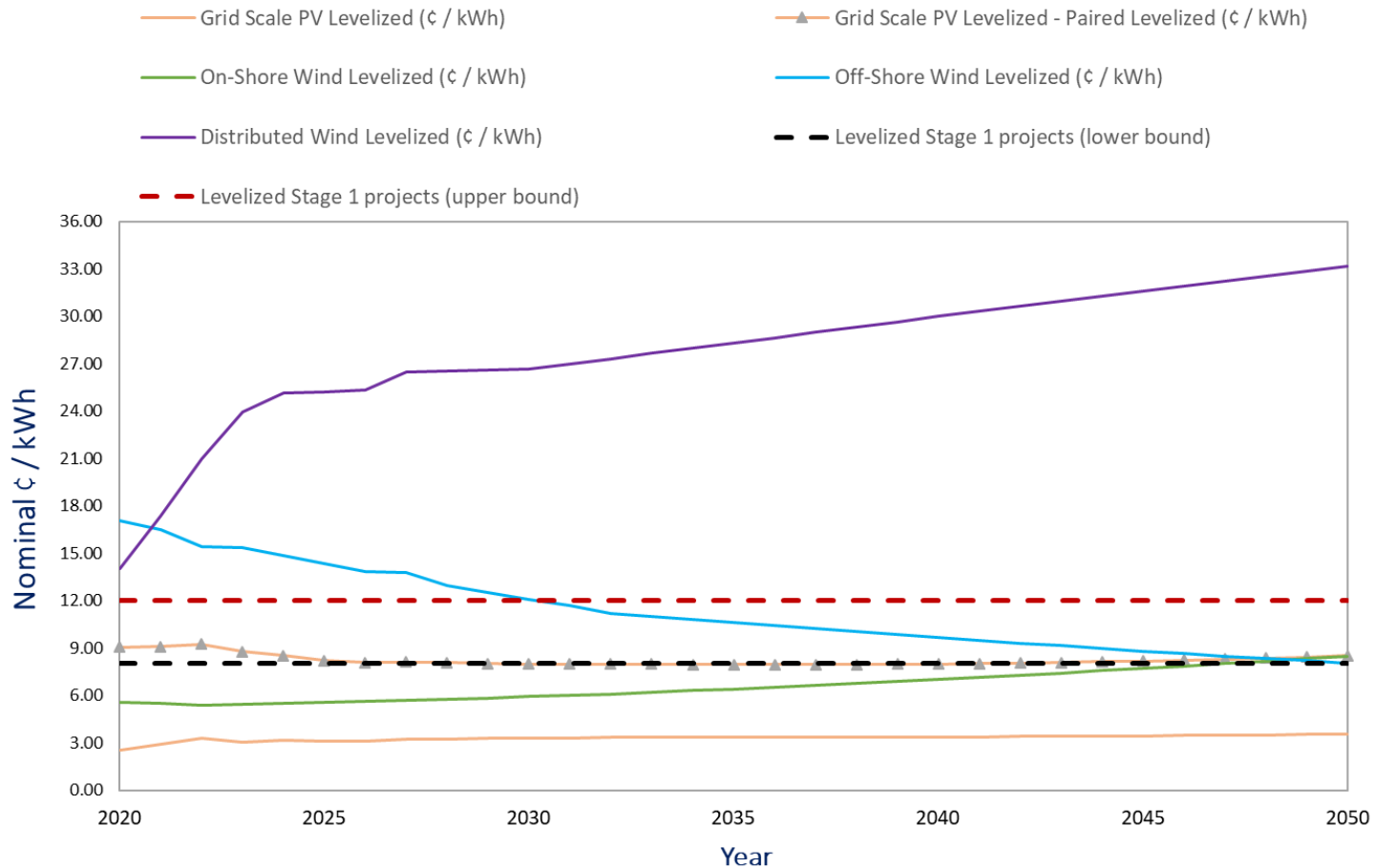


# Storage Resource Cost Forecast (\$ / kW)





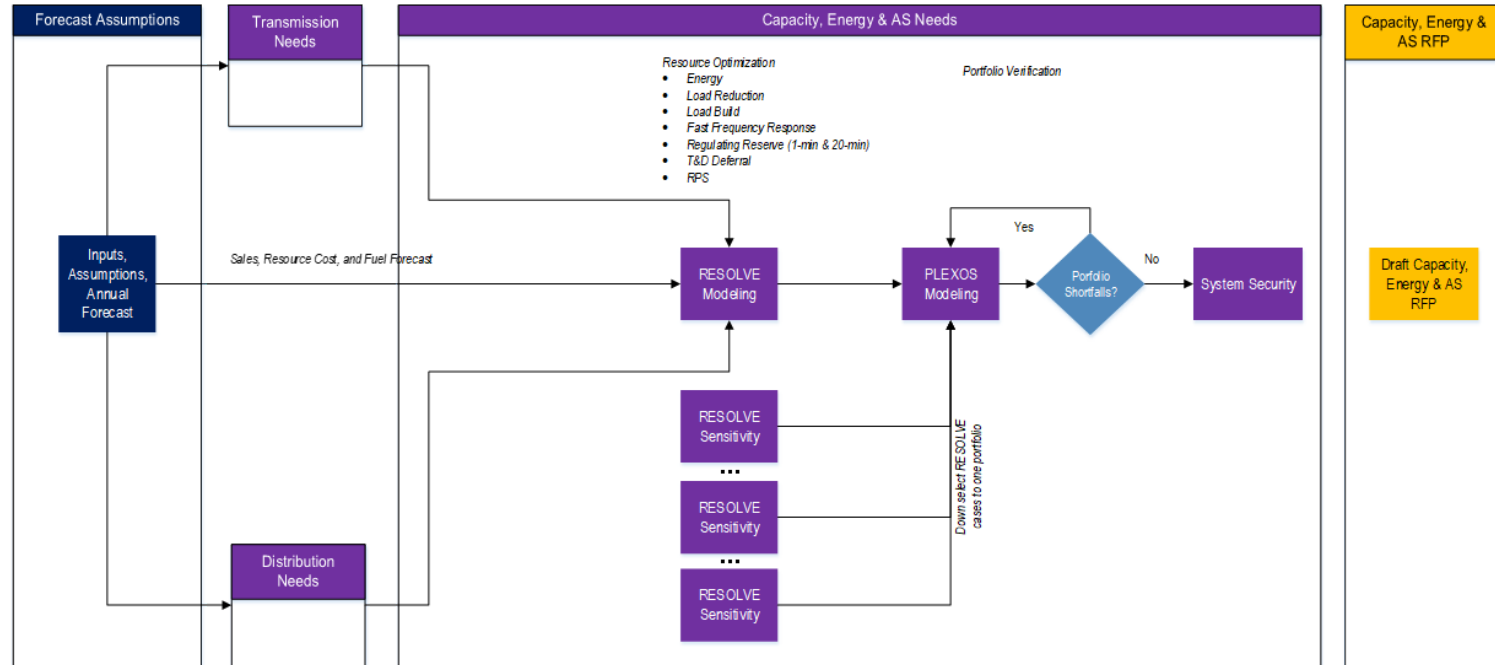
# Levelized Resource Cost Estimates (Variable Resources)



# Grid Needs Assessment



# Grid Needs Assessment Overview



# Grid Service Values

---

Grid Service	Quantity Units	Time Granularity	Avoided Cost Units
Energy	MWh	Hourly	\$/MWh
Load Reduce	MW-year	Seasonal/Annual	\$/MW-year
Load Build	MW-year	Seasonal/Annual	\$/MW-year
Fast Frequency Response (FFR1)	MW-hour	Hourly	\$/MW-hour
Regulating Reserves	MW-hour	Hourly	\$/MW-hour
RPS	MWh	Annual	\$/MWh
Transmission Deferral	MW-year	Annual	\$/MW-year
Distribution Capacity	MW-year	Annual	\$/MW-year
Distribution Reliability	MW-year	Annual	\$/MW-year



Voltage Support, Inertia, and Short-Circuit Current will be evaluated in the system security analysis

# Grid Service Quantity

- The amount of grid service required to support the grid
- Provided as a megawatt-hour or megawatt-year

Grid Service	Quantity Units
Energy	MWh
Load Reduce	MW-year
Load Build	MW-year
Fast Frequency Response (FFR1)	MW-hour
Regulating Reserves	MW-hour
RPS	MWh
Transmission Deferral	MW-year
Distribution Capacity	MW-year
Distribution Reliability	MW-year



# Grid Service Timing

- ◆ The timing of when a grid service is needed
- ◆ Provided as an hourly or annual value
- ◆ Certain services may indicate a seasonal or monthly need

Grid Service	Time Granularity
Energy	Hourly
Load Reduce	Seasonal/Annual
Load Build	Seasonal/Annual
Fast Frequency Response (FFR1)	Hourly
Regulating Reserves	Hourly
RPS	Annual
Transmission Deferral	Annual
Distribution Capacity	Annual
Distribution Reliability	Annual



# Grid Service Avoided Costs

- ◆ The marginal cost of each grid service
- ◆ Defined on an hourly or annual basis, aligns with grid service timing
- ◆ Similar to the approach proposed by the California PUC in their Integrated Distributed Energy Resources proceeding

Grid Service	Avoided Cost Units
Energy	\$/MWh
Load Reduce	\$/MW-year
Load Build	\$/MW-year
Fast Frequency Response (FFR1)	\$/MW-hour
Regulating Reserves	\$/MW-hour
RPS	\$/MWh
Transmission Deferral	\$/MW-year
Distribution Capacity	\$/MW-year
Distribution Reliability	\$/MW-year



# Resource Cost and Benefit

---

## ◆ Costs

- Calculated using resource cost forecasts for the capacity identified in the resource plans

## ◆ Benefits

- Calculated as the sum of each grid service provided by and taken from the resource multiplied against its avoided cost



















# Next Steps

---

- ◆ Feedback may be submitted to Chris Lau at [christopher.lau@hawaiianelectric.com](mailto:christopher.lau@hawaiianelectric.com) and [IGP@hawaiianelectric.com](mailto:IGP@hawaiianelectric.com)





