IGP Forecast Assumption Working Group

Wednesday, January 29, 2020
8:30am - 2:30am
American Savings Bank Tower, Training Room 2

Attendees

In-person	WebEx
Ramsey Brown, Hawaii Energy	Terry Baxter, NV Energy
Marcey Chang, Consumer Advocate	Carl Bonham, UHERO
Rene Kamita, Consumer Advocate	Patrick McCoy, SMUD
Robert Harris, TASC	Calvin Opheim, ERCOT
Binsheng Li, DBEDT	David Parsons, PUC
Melissa Miyashiro, Blue Planet	Jason Prince, RMI
Rocky Mould, City & County Honolulu	Amber Riter, Portland General
Ashley Norman, PUC	Teena Rasmussen, Maui County Community
Ingrid Rohmund, Applied Energy	Steve Rymsha, TASC
Clarice Schafer, PUC	Anand Samtani, PUC
Kylie Wager Cruz, Blue Planet	Pono Shim, Oahu Economic Development Board
Chris Yunker, State Energy Office	Omar Siddiqui, EPRI

Company In-person	Web-Ex
Ken Aramaki	Jennifer Baker
Collin Au	Leland Cockcraft
Paul De Martini, Newport Consulting Group	Mike Ito
Divesh Dhingra	
Anne Fuller	
Cathy Hazama	
Joanne Ide	
Yoh Kawanami	
Therese Klaty	
Sorapong Khongnawang	
Christopher Lau	
Tim Lueking	
Vladimir Shvets	
Thomas Yokota	

Objectives

- Present updated assumptions and preliminary forecasts for DER, EoT, and EE
- Propose sensitivities to address uncertainty
- Gather feedback

Agenda

- Welcome & Housekeeping Items
    - Agenda and objectives overview
        - Don't have the full forecast yet however, will focus on the "layers"
            - DER Forecast
            - Electrification of Transportation (EoT)
            - Preliminary Energy Efficiency Potential Study (EE)
            - Sensitivities and Scenario Discussion
        - Resource Costs
        - Recap from previous meetings
        - Changes to any assumptions discussed in previous meetings will be described as we go through the presentation such as the updated economic forecast from UHERO received in October following our discussion in August.
    - Post-it notes provided to correctly capture feedback

Key Takeaways

Discussion

- Recap of past meetings
    - Started with an overview of the forecasting process last March
        - Who are our customers?
        - What are we forecasting?
        - High level how our forecasts are developed ("layers")
    - Hosted a number of expert panel discussions to help inform/validate assumptions in May
        - Panel members provide perspective from the customer, program administrator/designer, industry, policy and consultancies
        - Topics covered: DER, EE, DR and EoT
    - Methodologies in July
        - How the different components of the forecast developed – underlying, DER, EE, EoT
        - Heard from utility FAWG members how they developed their forecasts
    - Assumptions in August
        - Presented forecast assumptions – economy, DER, EoT, resource costs
        - What type of assumptions are considered?

- Objectives for today
    - Share the forecast for the layers
        - Don't have the full forecast, want to share with you what we do have: DER, EoT and EE (potential study)
    - Any changes in assumptions
    - Propose sensitivities
    - Gather feedback
    - Resource costs used for planning
- DER Forecast
    - Solar PV Cost Projections
        - Main take away is PV cost continues to decline, but at slower rate the further we are into the future
    - Tax Incentives Assumptions Recap
        - Federal tax credits
            - Tax assumptions based on current law
        - State tax credits
            - Tax assumptions based on proposed law
        - Grid services/ demand response
    - Near-term forecast and uptake model assumptions
        - Historical installations, historical applications, and pending applications
        - Trends and market condition data from company program administrator
        - Future market size and economic assumptions drive the uptake model
    - Near-term forecast and uptake model results overview:
        - NEM installations completed by end of 2020 for Oahu, and Lanai, 2021 for Hawaii, Maui and Molokai
        - CGS fully subscribed with installations complete by 2021 for Hawaii and Maui, by 2022 for Lanai and Molokai, Oahu will not be completely installed by end of 2022
        - GSP installations complete by 2021 for Hawaii, not completely subscribed by end of 2022 for all other islands
        - ISE installations complete by 2022 for Hawaii, not completely subscribed by end of 2022 for all other islands
        - SIA projects thru 2022 for all islands
        - NMP installations continue thru 2031 with 10% increase in 2021 and 2022
        - Future programs represent all future programs through 2050 with all rates schedules from the uptake model for Oahu, and all except large commercial for Hawaii and Maui, residential for Lanai and Molokai

- Panel Degradation and Replacement:
  - Degrade at rate of 0.5% per year
  - Battery replacement after 15 years
- Oahu Incremental
  - Short term forecast by program through 2022, then uptake model takes over
  - Loss of most tax credits after 2021 creates a slowdown in installations which remains lower over forecast horizon
    - Stakeholder: For PSIP market and high, where is market line on graph before 2021?
    - HE: PSIP market and high were the same in the ST
- Oahu Cumulative
  - PV installed capacity remains below PSIP forecast in long term because actual activity since PSIP developed was lower than expected
    - Stakeholder: Past models assumed on PSIP forecast, is that shortfall made-up somewhere else?
    - HE:
- Oahu BESS Cumulative
  - BESS installations slowly building
  - Future programs assume BESS paired with PV for all residential and most small to medium commercial customers
- Hawaii Island Incremental

- DER Discussion
  - Any shortfall from the 2016 PSIP will potentially be made up with participation in programs such as CBRE.
  - Installs used owner occupied properties as past records have indicated that renters have a more difficult time enacting permanent projects and are less likely to do so. Stakeholder suggested that could change in the future if new developments of single-family and multi-family housing is built with PV. A sensitivity to assume a higher addressable market in the future could address this.
  - Concerns over whether or not forecasting is addressing the technical limits that is currently limiting adoption of non-controllable programs on Molokaʻi were raised.
  - Base assumptions do not include grid service incentives due to the lack of information on potential program participation.

- The impact of different technology such as load banks to allow higher adoption on Molokaʻi were not modeled as not enough historic data is available for those systems. This could be addressed in a sensitivity on this forecast layer.
- There is a need for the responsibilities of each working group to be clearer. Some working group members are currently unsure of which assumptions/tasks belong to which group.
- Stakeholder pointed out that the Federal commercial tax credit can be taken by companies that lease DER systems to residential customers. This was not taken into consideration and will be researched to possibly implement or consider in sensitivity. Some questions would have to be answered such as how much of the credit goes to the developer versus the customer.
- Load profile for customers are modeled assuming that they will serve their own load first. If there is excess energy after that they will charge their batteries and consume the batteries as soon as they have load to serve above what is being served by their PV.

- EoT Forecast
  - Light Duty EV's
  - Light Duty Vehicle (LDV) Forecast
    - Recap from past couple of presentations
    - What consultant Integral Analytics developed for EoT roadmap
  - Model inputs
  - Model Impact
  - LDV Results
    - Used population and jobs to extrapolate light duty vehicle forecast
    - LDV forecast lower than EoT roadmap due to lower population forecast from UHERO
    - Showed slides by island/county – comparison of IGP and EoT roadmap LDV forecasts
  - EV Results
    - Once LDV forecast derived, then apply EV saturation
    - Historical EV saturation (from DBEDT)
    - Forecast % EV saturation by island to 2050
    - Number of EV's on the road – take LDV forecast and apply % EV saturation to get # of EV's on the road
    - Comparison of EV count forecast from EoT roadmap vs IGP forecast
    - Scenario examples for high/low as % EV saturation
    - Hawaii Island a little lower % than Oahu and Maui
  - EV forecast into energy forecast

- Vehicle miles traveled (VMT)
    - Historical from DBEDT report; forecast using Federal Highway Administration's outlook; 20 year = +1.1%, 30 year = +0.7%
    - Daily VMT is higher than EoT roadmap
- Daily kWh per vehicle
    - Considered that future EV's may be larger and have longer ranges
    - Comparison to EoT roadmap – refined assumptions of vehicle miles traveled and kWh per vehicle
- Charging profiles
    - Are the vehicles residential or commercially owned?
    - Where they charge?
    - What type of rate?
    - What rate schedule?
    - Use PV installations as proxy for residential/commercial split
    - Updated res/comm split and comm rate schedule split using lates PV forecasts
    - Removed TOU midnight profile (update from EoT roadmap)
    - 8760 profiles for each island
    - Reflects unmanaged charging
- Total energy sales impact
    - Lower LDV forecast, but vehicles travel more miles and need more energy to charge
    - Generally higher energy sales compared to EoT roadmap

- EoT Discussion
    - Stakeholder asked how EV sales compare percentage wise to overall sales. Will have to calculate and get back to you.
    - Stakeholder asked if we have geographic adoption. Geographical information on EV's are hard to obtain and may not be too important. The location of where the charging is happening is more important than where they are registered. Working with T&D planning who will be looking at EV charging using LoadSEER to try to get down to geographic area.
    - Stakeholder asked about recently introduced bill to possibly ban gas vehicles. Bills that have not yet passed are not in the model but could be potential sensitivities.
    - Stakeholder asked about Slide 64 showing unmanaged charging and will we show scenarios with managed charging? When the charging study was first done

for the EoT team, it was just for unmanaged charging. Managed charging will be examined in the resource planning stage.

- EBus Forecast
    - Developed through collaboration through EoT group and bus operators in all three counties
        - Collaborative discussions
        - Data analysis and forecasting
            - Look at real data that may be publicly available, i.e. bus routes or time tables and stop locations
            - Using GIS data and Google metrics data to determine distances and time it takes to travel between points
            - Also look at bus manufacturers and bus specs
        - Assumptions
            - Route information, miles traveled
            - Location of chargers (bulk/opportunity)
            - Operating Hours
            - Technical Specifications (battery size, charging rate, kWh/mile)
        - Forecast process
            - EoT works with bus operators to develop EBus forecast (counts of buses)
            - Charts by county/island
            - Showed # of buses by user/owner type (airport, school bus, county, visitor shuttles)
            - Still trying to get more information from Hawaii county, iterative process with EoT group
            - Once we have forecasts and technical assumptions
            - Built charging profiles (don't necessarily exist)
            - Looked at literature, talk to forecasters in NY, worked with planner at one of the bus operators and an engineer and together developed simulation
            - Simulation looks at each bus in forecast and shifts
            - Shift starts→state of battery updated every hour (efficiency & duration/distance)→ state of battery evaluated (does the battery need to be charge or is the shift completed (see slide)
            - Example of charging time for one operator
            - Typical week charging profile with all bust operator types
- Energy Efficiency Forecast

- Sharing preliminary results of market potential study for State of Hawaii
- Review period just finished and will be making changes
- Will present finally results at TWG meeting in February
- Presentation is focused on EEPS framework and EEPS targets; ancillary delivery is forecast for Hawaiian Electric
- Definitions
    - Initial forecast does not include codes and standards and naturally occurring energy efficiency; then layers are added in
    - Start with HECO's assumptions on DER, electricity price, customer forecast; trying to align as much as possible
    - Layers
        - Codes and standards
        - Naturally occurring
        - Programs – energy efficiency potential
            - Technical – everyone chooses most efficient option
            - Economic – only cost-effective measures
            - Achievable – likely adoption in the market
- Energy Efficiency potential
    - Technical potential out to 2030 (when EEPS targets need to be met)
        - 35% potential savings
        - 30% economic potential
        - 17% achievable
    - There is headroom between achievable and economic potential
    - Results look purely from cost effectiveness using TRC but not costs to achieve these targets
    - Avoided costs in Hawaii are high which helps to achieve potential
- Energy efficiency portfolio standards
    - Slide showing energy savings towards achieving EEPS
    - Aligned in near term with Hawaii Energy savings, but not necessarily aligned with where savings come from
    - Layers
        - Solar PV (prior to 2014?)
        - Codes & Standards (federal rollback of XX, will reduce savings)
        - 2009-2019 savings
        - Naturally occurring
        - Future achievable
        - Future economic
        - Future technical

        - Believe that there are enough savings to meet the EEPS target in 2030; looks like a reasonably comfortable margin to get to the target
    - Potential impacts, EEPS perspective; projections of savings potential from 2019 to 2030
    - Shows charts where savings are coming from by end-uses (res/comml)
        - Res – opportunity in cooling and water heating
        - Comml – opportunity from cooling, interior lighting
    - Objective to look at annual energy savings and to some extent peak savings; commission also interested in understanding the hourly impact
    - Down the road will develop 8760's by end use
    - As part of study are looking at DR and grid-services
    - AEG's approach to market assessments
        - Market characterization
            - Break out by segment
        - Identify demand side resources
        - Baseline projection – 3 baselines; without C&S, with C&S, with C&S and naturally occurring
        - Estimate impacts
        - Program assessments
    - Residential sector market characterizations
        - 8 segments – estimated utility sales and consumption
        - Estimates amount of energy used and amount of energy purchased
        - Water heating is no longer largest use, cooling and appliances have exceeded water heating (% end use)
    - Cooling saturation has increased
    - Lighting has large penetration
    - Commercial sector – segment by building type
        - Cooling is largest end use
        - Lighting is 2nd largest, but not as big as it used to be
    - Military Modeling Assumptions
        - Modeled separately due to size of presence and different activity
        - Higher incremental costs
        - Early year achievability is lower
    - Current estimate of achievable potential represents 85%
    - How these results could support HECO foreasting process
        - If you look at achievable potential, what HECO wants is what is the most likely outcome going to be

        - What might come through programs down the road; which will be a smaller number than achievable potential
        - One case may be hitting the EEPS target (that might be a conservative way to go about this)
            - Need to disaggregate by island, sector and rate schedule and needs to be on an hourly basis
    - End use load shapes
        - Used a variety of sources to estimate load shapes
        - Calibrated energy market profiles; end use consumption data from the MPS calibrated to the HECO peak-hour forecast for 2018
        - Trying to take the best of everything that you can find and then put it all together in the way that makes the most sense
        - Shared slide at highest level of end-use load shapes
    -
- Energy Efficiency Discussion
    - The study assumes current codes and standards, however there are a few that are close to passing that are under consideration.
    - How much of the savings are "hard to reach"?. The limited income and not limited customers could be used as a proxy to determine how much is "hard to reach". Some commercial sectors would also be considered, for example restaurants do not usually participate in programs.
    - Only the NEM tariff was considered as the others will be reflected in HECOs forecast.
    - The data will be made publicly available.
- Sensitivities Discussion
    - Proposing forecast sensitivities on the layers
    - Presentation of modeling sensitivities downstream of the forecast; asked if there are other sensitivities that should be looked at from a resource modeling perspective
    - Possibility of freezing energy efficiency looked at as well.
    - Suggestion to consider sensitivities similar to DER for energy efficiency.
    - Will discuss modeling the sensitivities at the February 12th SEOWG meeting
- Cost estimates
    - Confirm that the resource costs do use nominal dollars
    - As part of the IGP process, the actual procurement step is in the middle that will provide approximate costs that will inform the grid needs and actual market pricing to reduce reliance on federal and/or national models/data.

- The bearer of costs depicted in the slide 81 depend on the technology. In the case for grid scale projects, that would be the price the utility would pay. As for small, distributed systems, that would be the price the customer who is purchasing the system will pay.
- The resolve model will pick up costs associated with overbuilding a system so that when it is compared to a reference case, the cost difference can be identified and be considered part of the risk of overbuilding.

FAWG Deliverables

- Will post actual numbers to assumptions and forecasts on website.
- February 26th, will come back with the rest of the forecast and any assumptions that have changed between now and then.
- Moving towards delivering the full forecast to the commission for their review in beginning to middle of March.

Feedback may be submitted to – IGP@hawaiianelectric.com, or Joanne Ide joanne.ide@hawaiianelectric.com