IGP Forecast Assumption Working Group

Wednesday, March 9, 2020
8:30 am – 11:30 am
American Savings Bank Tower, Training Room 1

Attendees

In-person	WebEx
Ramsey Brown, Hawaii Energy	Robert Harris, TASC
Marcey Chang, Consumer Advocate	Patrick McCoy, SMUD
Jacqui Hoover, Hawai'i Island Economic Development Board	Rocky Mould, City & County Honolulu
Rene Kamita, Consumer Advocate	Calvin Opheim, ERCOT
Binsheng Li, DBEDT	Jason Prince, RMI
Ashley Norman, PUC	Steve Rymsha, TASC
Clarice Schafer, PUC	Michael Schwing, State Energy Office
Pono Shim, Oahu Economic Development Board	Wren Wescoatt, Progression Energy
Kylie Wager Cruz, Blue Planet	Chris Yunker, State Energy Office

Company In-person	**Web-Ex**
Divesh Dhingra	Ken Aramaki
Anne Fuller	Mike Ito
Cathy Hazama	Ellen Nashiwa
Joanne Ide	
Yoh Kawanami	
Therese Klaty	
Sorapong Khongnawang	
Christopher Lau	
Tim Lueking	
Vladimir Shvets	
Robert Uyeunten	
Peter Young	

Agenda

- IGP process and planning sensitivities overview
- Forecasting process recap and feedback
- Forecasting assumptions recap
- Forecasting results overview for Oahu, Hawaii, and Maui County

Discussion

This is the last scheduled in person/WebEx FAWG meeting to discuss the forecasts that will be used at the beginning of the IGP cycle. Thank you for being a part of the FAWG and providing

feedback and suggestions to consider. This is not an end all forecast where there is perfect clarity on outcomes but one that can be used to start the planning process. If there are updates to the forecast to test sensitivities, it will be sent out for your review via email or we may host a WebEx.

IGP Process Workflow

- IGP timeline was presented and a description of how the different parts of the process interact with each and when the forecast will be used.
- Preliminary forecasts will be included in PUC review point.
- Later in the process, the forecasts will be used to assess transmission and distribution needs.

Planning Sensitivities

- Purpose of sensitivity analysis is to inform and stress test cases to develop a robust portfolio.
- The sensitivities were discussed in the Solution Evaluation and Optimization Working Group ("SEOWG"). A sensitivity on DER adoption was described as including a high, market, and frozen DER forecast where no additional DER was added.

FAWG process recap

- The timeline of what was discussed over the past year was covered to arrive at today's meeting that brings all the layers that comprise the forecast together.
    - Overview of what is forecasted and high level how
    - Assumption gathering
    - Presentation of forecasting methodologies including what other utilities do
    - Review of assumptions and forecasts
    - At the last meeting the DER and EoT forecasts were presented. The results of the Statewide Market Potential Study were also presented. Since then an energy efficiency forecast was received which represents savings from a realistic customer adoption of energy efficiency measures through future interventions that are similar in nature to existing interventions or the achievable business as usual potential. A high achievable potential will be provided to use for sensitivities which incorporate future non-program interventions such as new codes and standards and market transformation.

Examples of input from the FAWG

- Some examples of the input gathered at previous meetings and what was done.
    - Question if we considered a warming trend. We now include a warming trend in the forecast models. The trend was reevaluated and adjusted upwards following discussion in the breakout session in August after doing additional research.
    - Based on information provided in the panel of experts meeting in May and from discussions with the DER program administrators the DER forecast reflect most PV systems are now installed with batteries and considers the various drivers and barriers of adopting PV when deriving the uptake or identifying the eligible pool of customers likely to adopt PV.

    - Also heard the need to create DER programs that are simpler to understand and implement.
    - Consider new homes having PV regardless of home ownership. The high DER adoption will consider this.
    - During the breakout session in August the group commented that the light duty forecast looked too aggressive. The forecast of light duty vehicles and light duty EVs were adjusted downwards.
    - Initially only electric buses were considered on Oahu. Following comments received at the assumptions meeting in September electric buses are now include on Maui and Hawai'i islands.
    - Emerging trends in the community e.g. increased amount of dialysis centers popping up. Analysis was done to see if the energy from the increasing number of dialysis centers was large enough to make a line item adjustment such as is done with new large customers. The analysis did not show that the increase was large enough to make a line item adjustment to the underlying forecast.
    - The perspective of all customers should be considered such as how rising costs impact the income constrained.

Forecasting Key Assumptions

- Underlying forecast key assumptions
    - Economic forecasts from UHERO
        - Forecasts for each county updated in October 2019
    - Electricity price forecast from corporate energy planning
    - Weather data
        - Various weather variables are used in the forecast, all use a 20-year average (1998-2018); temperature variables or variables calculated from temperature (such as cooling degree days) include a warming trend
- DER forecast key assumptions
    - Economic assumptions – that affect the economic benefit to the customer including: installed costs, electricity price, program structure, and panel degradation, maintenance and replacement
    - Addressable market
        - The number of utility customers that have the potential to install DER behind their meter
    - Solar resource assumptions, that determine how much energy is produced by the DER and when, which include: unitized generation profiles, capacity factors
    - Tax credits (stakeholder question) – How are you modelling the tax credit? Are you still modelling it ending in 2024? Would that make much of an impact? HECO: assumptions are the same as was presented and discussed in the January 2020 and August 2019 meetings. Federal tax credits start ramping down after 2019 and follows the current law. State tax credits start ramping down later as there is no definitive future plan and are based on proposed legislation that did not pass however provides an insight into what legislators are considering.
- EoT (electrification of transportation) forecast key assumptions

    - Number of light duty EVs - based on total light duty vehicle forecast and percentage of EV saturation
    - Number of electric buses
    - Charging
        - Who is charging? (personal vehicles vs commercially owned vehicle)
        - When are they charging? (such as day, evening, night)
        - Where are they charging? (at home, at work, public charging stations)
- Energy efficiency forecast
    - From the Statewide Market Potential Study
    - EE forecast initially used represents savings from a realistic customer adoption of energy efficiency measures which reflect future interventions that are similar to what we see today, "Business as Usual"
    - We will also provide the planners with an achievable high forecast to do a sensitivity on

Hourly Shape Method

- Hourly system level forecast derived using
    - Underlying shapes by rate class from class load studies or system level shapes using historical data
    - Derive hourly regression models with drivers such as weather, month, day of the week
    - Shapes for each layer (DER, EE, EoT), each layer may have multiple shapes (e.g., residential vs. commercial EV charging).
    - Stakeholder Question: is load shifting included?
        - No, but considered in possible resource impacts.
    - Combine all pieces and apply a factor to get to net system level
    - Hourly profiles will vary over the forecast horizon depending on the underlying and layers for that particular hour.

O'ahu Sales and Peak Forecast

- Underlying sales were historically driven by economy, number of customers and weather and are expected to grow in the forecast due to economic gains, customer growth and warming weather
- Sales reached highest level in 2004 and have declined since then.
- Structural change due to the impact of layers.
- DER uptake by customers reduced system sales deepening in 2011 with greater PV adoption.
- Energy efficiency programs started in 1996, but impact from residential lighting changes caused greater sales decreases beginning in 2006. DER and energy efficiency major drivers in the shape of declining sales historically. Forecast uses Hawai'i Statewide Market Potential Study's "business as usual" projections.
- After years of stagnant or falling sales due to energy efficiency and DER, resumption of sales growth is expected due to EoT.
- The forecast shows annual peaks that are a point in time measure for the highest load in the whole year. Influenced by short term weather and customer load.

- Highest peak achieved in 2004, similar to sales, taking away layers, underlying peaks continued to grow over historical period and expected to grow over forecast.
- Trends in residential loads tend to affect peaks more since higher loads in the evenings.
- DER layer didn't affect peaks as much since O'ahu peaks are evening peaks. In the future energy storage will decrease peaks since forecast assumes greater adoption.
- Energy efficiency as the primary driver in dampening peaks, especially residential lighting programs.
- EoT will be a major driver of the peaks because the forecast assumes unmanaged charging during the evening peak hours. With unmanaged charging of EVs, the forecast for peaks reaches almost the underlying peak level by 2050 (offsets energy efficiency and DER).
- Expect sales and peak forecast to grow over the forecast period.
- Performing sensitivities on the layers for IGP
- Questions:
    - Stakeholder: Do we know what the forecast would look like if warming temperatures not included?
        - HECO: Yes, would be slightly flatter with slightly lower growth.
    - Stakeholder: What are we doing to account for changes in demographic? Losing younger generation, elders are becoming larger part of our population with different behaviors (e.g., take a bath by 5:00). Is that being considered at all?
        - HECO: This is difficult to incorporate that type of behavioral change in forecast. We see the population reduction in UHERO's forecast, but not by age group. As we move forward, we'll try to incorporate that.
    - Stakeholder: What year of historical data are you using for load studies?
        - HECO: O'ahu used class load studies field over 2012 - 2013. Maui used 2013 – 2014. Hawai'i used net system profiles that were averaged over 2015 – 2018.
    - Stakeholder: If studies are based on 2018, how do we account for changes in volcanic activities?
        - HECO: We'll apply some factors to adjust our forecast as needed while not affecting any future projection. For Hawai'i island we use net system profiles that were modeled based on 2015-2018 actuals. Models were assessed for reasonableness against actuals. Eruption impacts were largely loss of residential customers which would impact the level of sales under the shape more than the shape itself. No large commercial customers were lost.
    - Stakeholder: When is the next load studies for Maui?
        - HECO: It's in process right now.
    - Stakeholder: Are you able to provide number to us? (Forecasted data, historical data?)
        - HECO: Yes, it will be posted on website.
    - Stakeholder: Is there going to be another review point in a year?

- HECO: Yes, as was shown in the IGP timeline. One-year review point primarily for Distribution Planning. Overall planning process is on a two year cycle.

Maui Sales and Peak

- Maui's historical underlying sales show strong growth throughout the 80's and 90's driven by the growing visitor industry developments in west and south Maui, which attracted significant offshore investment and supported strong job, income and population growth, and accompanying residential housing development.
- You can see the leveling-off in the mid 1990's as the effects of the economic downturn in Hawaii impacted growth
- Underlying growth picks up again in the late 90's continuing relatively unhampered until the economic downturn in 2008, which brought negative growth rates in jobs, income and visitor arrivals. Of the relevant sales drivers, only population growth remained positive in 2009 on Maui.
- Recovery was slow and in particular, declines in construction and real estate affected Maui significantly. Concurrent with the dampening pressure from the economic crisis, Maui County's workforce housing ordinance, "show me the water" bill, and stricter regulations on short-term vacation rental properties were added constraints on construction. Maui also experienced a trend of cooling and lessening humidity from 2005 through 2012, which was also a contributing factor to dampened sales during the economic downturn.
- We see a positive underlying growth trend begin again in 2013, as growth in visitor arrivals, jobs and income strengthened along with various commercial and residential construction projects moving forward once again. A warmer, more humid trend/cycle started in 2013 with notable impact to sales during the extreme El Nino cycle year in 2015 and record-breaking heat on Maui in 2019. Similar to what Cathy mentioned for Oahu, the effect of warmer weather on sales has increased as the amount air conditioning equipment on island has increased.
- Although there has been recovery in the economic drivers, we do not expect to return to the same growth rates in any of those drivers as were experienced pre-2009. Maui does not have another master-planned resort area in the works like Kaanapali or Wailea-Makena. We are currently seeing in-fill hotels being built off the coast and luxury condo developments in south and west Maui. There has also been moderate activity in residential housing developments. But nothing that will result in the sustained strong growth that was experienced previously.
- The underlying sales growth rates over the forecast period are driven primarily by growth in real personal income, resident population and visitor arrivals. The average future growth rates of those drivers are anywhere from 1/5th to ½ of what they were on average in the historical period. So, the underlying sales growth rates follow a similar pattern and are on average around 1/3rd of the average over the historical period. To a lesser degree than the economic drivers, there is also some lift from the increasing temperature trend and some influence of the trends and fluctuations in the electricity price forecast as well.

- When we take the impact of customer sited DER into account, you can see the reduction to sales, which essentially flattens out the post-economic crisis recovery. Although people were still consuming that energy, utility sales are lower.
- Then, layering on the effects of energy efficiency programs, you can see the significant impact resulting in a declining sales trend since the peak in 2007.
- And finally, layering on the electrification of transportation creates positive growth rates in the long-term final forecast.
- While the peak trends result from shaping the sales forecast, the peaks differ from sales in a couple ways:
- There is more volatility in the peak load because the annual peak load is the single highest momentary peak in the year as opposed to sales, which is the cumulative sum of usage over the course of the year in which high and low months can potentially offset each other, resulting in a smoother trend for sales.
- Like Oahu, the peak loads occur in the evening, so DER do not reduce the evening peak until battery storage is paired with PV, so there is almost no historical impact and the impact over the long term is less than the DER impact to sales.
- Adding on the EE layer, you can see the impact to peak is larger than DER, more so than sales
- Then layering on the electrification of transportation with unmanaged charging, the impact to peaks is very significant.
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- Question:
    - Stakeholder: Visitor growth wasn't the only driver on Maui. Some of that growth, was also driven by support brought to the island from Senator Inouye and that is no longer the case.
        - HECO: Yes, that funding and business development was a contributor. We do not see that type of impact going forward. For example, there has been a contraction in activity and occupancy in the Maui Research and Technology Park in Kihei.
    - Stakeholder: Do you see any reduction in mileage driven due to walkable spaces and increase in public transportation?
        - HECO: Mainly increase in miles driven. But rate of growth is decreased due to services like ride sharing.

Molokai Sales and Peak

- Growth throughout the 90s reflects development of visitor accommodations and golf course operation, with overall energy consumption holding fairly steady between 2000 and 2007
- In 2008, Molokai Ranch shut down the majority of their operations
- In the years following, the trends are primarily driven by residential and commercial pumping, with some influence from warmer weather in the most recent years
- In the future, the upward trend in underlying energy sales is primarily due to residential customer count growth

- Future underlying growth expectations follow a very slow upward trend because there is no indication that major development in either the residential or commercial sectors is planned
- The community has consistently communicated a desire to maintain the character of the island and this forecast reflects that.
- You can see the impact DER have had on utility sales. In the most recent years, DER installations have slowed while solutions are being sought to address technical issues of maintaining reliability with very high PV penetration.
- When we add the EE layer, you can see an overall declining trend over the long term
- And then similar to the other islands, adding electrification of transportation with creates positive growth rates in the long-term final forecast
- Note the scale of the peak load for Molokai is 1 MW increments, and the range from the low point of 5.5 MW in 2014 to the highest point in 2050 of 6.5 MW.
- Also, for Molokai and Lanai, these peak slides are a slightly different view, only showing the future impact of the layers. The historical peak impact from DER and EE is very small.
- While we do forecast a decline out to the late 2020's followed by increases driven by electric vehicles, the overall changes aren't dramatic. By 2050, future reductions from DER and EE are offset by the growth in EoT

Lanai

- Similar to Molokai, commercial pumping on Lanai is a significant portion of the overall energy use. But in contrast to Molokai, the resorts on Lanai are the largest driver of the overall energy consumption on the island and much of the story of historical energy consumption on Lanai is due to those large customers
- You can see the sharp increase in sales following the purchase of majority of the island in 1985 by Castle & Cooke led by David Murdock, which began the transition from agriculture to tourism
- The Lodge at Koele and the Manele Bay resort first opened in the early 1990's, while the last pineapple harvest was in 1992
- Additional development of luxury homes and villas continued, with impacts to sales peaking in 2007, followed by the impact of the great recession, which is evident in the sales data
- The portion of the island owned by David Murdock was sold to Larry Ellison in 2012, with renovations of the resorts beginning in earnest in 2015.
- The first subsequent increase after that marks the renovation and relaunch of the Four Seasons Resort at Manele Bay in 2016
- The most recent increase reflects additional sales from the reopening of the Four Seasons Resort at Koele, as well as ramping up of aquaponics operations in late 2019. 2020 reflects full-year operation of all of these commercial loads. Future growth beyond 2020 is expected to come primarily from newly built residential homes
- Of all the islands, the impacts of DER and EE have been the least on Lanai due to the customer mix, ownership of the large IPP PV array by the same entity that owns the

resorts, lower commercial building ownership, the low residential use per customer in Lanai City due to moderate climate and use of gas appliances by many residents.

- And here is the forecast including electrification of transportation. Lanai has the fewest number of vehicles and the lowest miles traveled of the islands, which is reflected in the impact of EoT.
- There have been a couple public announcements recently that could change this outlook dramatically. Pulama Lanai is considering purchasing the utility on Lanai, which would presumably transfer the ownership of this forecast and plan to them. Pulama Lanai also announced that they are considering micro grids at the two resorts, which would reduce the forecasts. There is currently no design, impact or timing information available on that. No impact of potential micro grids is included in this forecast. As information develops and becomes available on either of those possible futures, we will have to consider impacts and possible revisions accordingly.
- Note that like Molokai, the scale of the peak load for Lanai is 1 MW increments, with the historical peak prior to Larry Ellison's purchase being 5.6MW in 2006, increased to just over 7MW in 2020 with the re-launched resorts at full operation, followed by long term growth maxing out in 2050 at just over 8MW.
- Future reductions from DER and EE are offset by the growth coming from EoT

Hawai'i Island Sales and Peak Forecast

- In the historical sales you can see that in the 1980's there was strong growth in sales with lesser growth in the 1990's up through 2007 at the end of which was the start of the "great recession", with declines since then
- Easier to see and understand what is impacting sales by looking at the layers starting with the underlying
    - History
        - Underlying sales is primarily economic driven
        - In the 1980's to mid-90's there was significant resort development on the Kohala Coast with the opening of the Waikoloa Marriott, Mauna Lani, Hilton Waikoloa, Fairmont Orchid, Hapuna Prince and Four Seasons Hualalai hotels
        - Job growth on the island was very high in this time frame at over 5% per year in 1985 and 1987-1991 with 1989 and 1990 in the 10% range (Job growth has not reached 5% since then and is not forecasted to reach those levels)
        - Looking at the 1990's you see the slope flatten
            - Although Hawaii was in the economic doldrums in the early to mid-90's and for Hawaii county, there were declines in jobs and real per capita income in the early to mid-90's with visitor arrivals flat with slight declines, there was continued growth in electric sales during that time but at a slower rate and hitting a low

growth point in 2001 (with another US recession and then 9/11 impacts)
        - Big Box stores such as Costco, Kmart and Walmart came in the mid to late 90's
        - With a second wave of big box stores in 2000's (Home Depot, Lowes, Target)
    - In the 2000's after 9/11 and prior to the "great recession" job growth, population growth, income growth and visitor arrivals all picked up and you can see the higher growth rates in sales with a higher slope reaching a high point in 2007
    - In this historical time frame starting in the early 80's up through 2008-9, population growth averaged around 2.5% per year; with similar growth in each decade looking at the 80's, 90's (higher in the early years and lower in the later years) and 2000's up to 2009. Population growth has slowed to an average of 1% since then.
    - Putting this into perspective, population on the island essentially doubled in the historical time frame shown; which would drive residential electricity sales as well as commercial sales supporting the needs of residents
    - As I mentioned we reach a historical high in electricity sales in 2007, then we hit the "great recession" with a visible dip in underlying sales before resuming growth but at a lesser pace
    - Also, important to note that Hawai'i island has also been impacted by natural disasters that have had lingering effects including the Kiholo Bay earthquake in October 2006, the Japan earthquake and tsunami in March 2011, and the 2018 Kilauea volcano eruption in Leilani Estates that destroyed the Kapoho and Vacationland communities
- Forecast for underlying sales
    - Total underlying sales forecast which is developed separately by rate classes (residential, small/medium commercial, large commercial, street lighting)
    - The forecast is driven by the following:
        - Economic variables – such as jobs (large commercial), population, income per capita, visitor arrivals (small/medium commercial and residential)
        - Weather is a variable in residential and small/medium commercial models
        - Electricity Price
    - Predominant drivers of the forecast are the economic variables which results in the slower future growth

        - For example, population goes from 100,000 to 200,000 in the 35 historical years shown, but grows to only 235,000 in the next 30 or so forecast years (at a rate of less than 1%, averaging about 0.5% per year)
    - DER/BESS impact
        - Historically you can see the line start to diverge from the "underlying" around 2011-2012 as PV adoption really started to pick up
        - As we move into the forecast, based on the DER forecast presented in last meeting you see continued adoption as the yellow line gets further away from the turquoise line; showing a dampening of sales
    - Energy Efficiency impacts
        - Historically this gets you pretty much to our historical sales
        - The forecast sales impacts are from the "Business as Usual" case from the Statewide Market Potential Study
        - With ongoing adoption of Energy Efficiency measures the forecast trajectory continues downward
    - Electrification of transportation impacts
        - Red line represents the resulting overall sales impacts
    - Sales decline until 2030, then are roughly flat until 2035 then ramp up with increase in adoption of EV
    - In 2047 forecasted to pass the previous high point in sales from 2007
- Peak forecast
    - Annual net peak (highest single MW demand on the system during the year)
    - Similar to sales, peak hit highest in 2007.
    - Since 2010 annual peak has remained fairly steady
    - System peak is an evening peak and historically has tended to occur during month of December. Historically has been less weather sensitive than other islands with lower air conditioning saturation, but we are slowly seeing this change
    - Forecast Layers
        - The peak forecast is a result of adding up the hourly profiles for each layer to then identify the highest load over the whole year
        - Each layer on this chart reflects the contribution of that layer to the annual peak value at the time of the annual peak (the maximum hourly load)
        - Historically, the underlying is slightly higher than the actual peak and starts to diverge further in 2009 as EE programs started to ramp up
        - The underlying peak forecast like the underlying sales forecast shows continued slow growth
        - Add in the DER/BESS impact
            - Since the system peak is in the evening, the impact of DER really comes in from the energy storage impacts
        - Add in the Energy Efficiency impact

        - Brings down the peak quite a bit over time
    - Finally, we add in the EoT impact to get to the resulting peak forecast
        - It is important to note that the EV impacts to peaks in this forecast reflect unmanaged charging

- Questions:
    - Stakeholder: Hawai‘i island population growth is locational, with future growth predominantly in Puna and Ka‘u, where infrastructure is lacking. In order to address for changes in population, how are infrastructure upgrades factored into this?
        - HECO: Any distribution needs to specific areas will be analyzed by distribution planning area.
    - Stakeholder: Does the EV forecast take rental vehicle into consideration?
        - HECO: Yes, it is included in the commercial fleet.
    - Stakeholder: Part of population impact is due to in/out migration from shifts in job opportunities. Next generation doesn't want to travel for work. Hawai‘i island may be last place that is affordable to buy a home however it could be second homes.
    - Stakeholder: Why is the assumption that EV charging will occur in the evenings? Is it due to customer behavior? Rate design? No workplace charging during the middle of the day? Are there any assumptions about how rates are going to change over time to modify this EV charging behavior? What about medium and heavy duty vehicles? What are their assumed charging patterns?
        - HECO: Most of the EVs are personally owned vehicles and assumed to charge at home when it's convenient after coming home from work or school in the evening. The company had pilot time-of-use rates for EV charging however most EV owners did not sign up for the rates. The forecast includes a share of workplace charging however it remains fairly small compared to unmanaged charging. The forecast includes medium size vehicles such as cross overs, SUVs and light duty trucks. Except for buses, which makes up a small share of the EoT, it does not include heavy duty vehicles. The bus charging profiles are based on discussions with operators of bus fleets and assume the commercial electric bus charging facility pilot tariffs would be utilized.
          A managed charging sensitivity will be evaluated in the planning analysis downstream of the forecast.
    - Stakeholder: Are there policies that could be put in place to manage the EV charging? What if there was an app for charging?
        - HECO: There could be policies that would address unmanaged charging.
    - Stakeholder: What about Time-of-Use rates?
        - HECO: Will be reviewed under other dockets. Managed charging sensitivity will be done in the planning analysis downstream of the forecast.
    - Stakeholder: Is mass transit linked to the EV forecast?
        - HECO: The two forecasts are not linked.

- Stakeholder: Is there an assumption regarding more battery storage to absorb more of the PV generation during the midday period? Why wouldn't the BESS discharge patterns be against the peak period?
    - HECO: This could be evaluated in the resource planning analysis. The pairing of PV and BESS in the forecast was done from evaluating the customer's own needs. The BESS does discharge during the evening peak period as can be seen on the peak forecast charts.
- Stakeholder: What's the reality of the impact due to EE being greater than the impact of more PV? Is there that much EE potential regarding existing structures, buildings and homes? We have to push kinda hard to get 1% of annual energy sales to be reduced by EE measure adoption. What's the potential trade-off between EE and PV? We pushed for EE measures when we provided incentives for solar PV and didn't see much uptake if any. Customer behavior seemed to convey the notion that solar PV had a better economic outcome than EE, which can have high upfront costs.
    - HECO: The impacts of energy efficiency on sales have been greater than PV and are assumed to continue being greater based on the results from the Statewide Market Potential Study. The EE forecast include impacts from codes and standards in addition to interventions from energy efficiency programs.

Next Step

- Presentation and forecasts will be posted on to the website
- Question:
    - Stakeholder: Have the fuel forecast been released?
        - HECO: Not yet. Targeted in mid-March. Fuel Price forecasts and resource costs in SEOWG meeting.
    - Stakeholder: Can you share the timeline? In the process of evaluating and sensitivity testing, when will the results be shared with the group?
        - HECO: Needs assessment will start after final award group of stage 2. Six months after May is when we'll have results that can be shared. Results will be shared in SEOWG meeting. Joanne/Chris can invite FAWG to that meeting.
    - Stakeholder: Take into consideration EV battery size. This will affect how or when people charge their EV.
    - Stakeholder: EoT is such a big part of load growth, need to get arms around the charging patterns with a higher degree of confidence. Is it worth setting up a study?
        - Unmanaged and managed charging will be considered in the sensitivity analysis.

Feedback may be submitted to – IGP@hawaiianelectric.com, or Joanne Ide joanne.ide@hawaiianelectric.com by March 27.