TAP Resource Adequacy and Modeling Subgroup
4/28/2022

This feedback to HECO is based on HECO's slides and presentation on 4/28/2022.

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Sub-committee chair summary, Aidan Tuohy:
HECO provided an update to the TAP subgroup, based on slides sent in advance,on the latest work related to resource adequacy. These focused on draft results for probabilistic RA testing for O'ahu's proposed renewable firm RFP. The general agreement was that good progess has been made on the modeling, with adoption of many previous recommendations for TAP. Much of the discussion, detailed in the notes from the meeting, was around the input data and assumptions used
For the time series weather year data, there was feedback that longer datasets may be helpful – while it is acknowledged that there is less data for wind, TAP provided suggestions to either use uncorrelated wind data, or longer datasets using offshore wind to calibrate or wind speed data, as well as ensuring to use correlated DER. Several TAP members will follow up with datasets or sources.
For outage rates, HECO used actual rates for the base case, which reflect increased recent outage rates post MATS compliance and with increased aging and cycling, but for the 2029 case reverted closer to long run average outage rate. This needs further examination and TAP suggested some potential methods to address the uncertainty in outage rates – at least HECO should run some additional sensitivities for 2029 cases with the increased outage rates observed in recent years. TAP also suggested that outage periods could be used to understand thermal contribution to ERM and include that as a contributor to ERM rather than including in the need for ERM.
HECO were requested to clarify EUE normalization and compare with other regions as well as compare results with HNEI. The last main area of discussion was around the potential need for examining long duration storage as the system becomes more energy constrained. Some suggestions were made around the potential value and benefit of looking at this.

TAP feedback and comments are divided into three categories:

1. Informational, no action needed
2. Action required, expected in coming months
3. Concern or suggestion, for future discussion or consideration
4. Clarification needed

TAP Comments During the Meeting and HECO Responses

- Weather years (slide 5)
    - Could you use more solar years even with less wind years. While keeping the consistency between the solar and wind data is certainly best practice, given that Hawaii (especially Oahu) will be so solar-centric (1200 MW+ of solar, 125 MW of wind), I believe the use of additional solar years outweighs the limitations of uncorrelated wind and solar. The offshore wind dataset provides a long history of wind to align with solar.
    - Take wind speed data for longer periods that are available and model further years
    - Are you using hourly shapes from 2015-2019 for DER?
        - HECO – no, just using monthly historic capacity factor
        - May be overly optimistic for DER if using monthly data
        - NREL potential study was for utility-scale PV, no profiles for DPV
        - Matthias has modeled data from NSRDB w/SAM
        - Telos has similar model using 12 locations, maybe look at more granularity
        - Action: Matthias to send data, Telos also doing calibration

    - TAP members agree with the discussion above. DER should be modeled with the same weather datasets as the solar, as it is currently the largest resource on the system and could significantly change the daily load pattern.
- Cases studied
    - Kalaeloa may be extended but looking at eventual expiration in this model – noted that it is in the other studies
    - Maybe make firm replacements of equal 100 MW increments (400 MW and 500MW) to have linear scenarios
    - HECO to add "Existing 2029 case" to slide 6 as per slide 7 for future presentations
    - RESOLVE does add solar+storage but not until later
- Results
    - Slide 10 – add net capacities relative to 2021
    - Slide 10 – 1.2 LOLE days/year seems high compared to Telos/HNEI work
    - HECO showed additional materials – calibration factor database has very high outages on Kahe 1, 3, 5, Waiau 3, 4, etc. May want to add summary of this when discussing in future
    - Those high outages were used as input to draws
        - Question on why use one year rather than longer term outage rate?
        - Comment - do not put Existing (2021) case w/others on slide 10 – need to redo the analysis with the outage rates used in 2029. It makes it unclear that the starting point is assuming less reliable units than the future scenarios.
        - Question/comment– is 2029 using long term average the fair approach? This introduces significant risk to long-term planning. There is a notable increase in forced outage rates on the steam units post-MATS compliance, and with increased age, degradation, and cycling duty. The units have struggled significantly from 2018-2021 and assuming the forced outage rates go back to the long-term average for modeling could lead to significant reliability shortfalls in the future, at a time when the system is transitioning to solar+storage to provide firm capacity.
        - EPRI has work on cycling and impacts on outage rate
        - TAP indicates it might be worth looking into outage rates further and make sure you make fair comparison
        - Also potentially look at what the solar/wind output was during outages?
        - If there is a trend in thermal unit outages, adjust ERM?
        - One idea proposed would be to calculate thermal, renewables contribution to ERM based on performance during risk periods (outages), then assign that as their capacity credit toward ERM (possibly a single value for the year for each resource), and then ERM gets pushed up until system is adequate
    - HECO mentioned need to consider operational aspects – renewable/storage outages, actual patterns observed, etc.
        - TAP member - these are considered with synchronized wind/solar/load data
- Results
    - Normalize EUE based on annual load? As a part per million of native load (not including charging) – might be useful to compare to other systems

- Comparison w/HNEI
    - Seems reasonable, likely some differences
        - Outage rates likely similar? Load also?
        - HECO to add notes on these differences
- Different resource types
    - Results showing that solar+storage do not provide the same capacity value as thermal resources should be put in context. The initial system being studied in 2029 is already at a point with a very large addition of solar + storage in place, so there are already diminishing returns.
    - Short duration batteries are very likely causing some of the low contribution from renewables –
        - HECO: can't change this in RESOLVE, but additional capacity could be done for batteries vs PV
        - HECO to look at different BESS durations?
        - In the future 2029 system is actually more energy constrained than capacity constrained. Sometimes this is energy constrained for discharge of the batteries (ie longer duration batteries will help), but most times there are multi-day events where there just isn't enough energy to charge the batteries – so we would need really long duration storage or a reserve product that retains some storage charge just in case.
    - What about wind profiles being complementary?
    - TAP feedback that it might be worth looking at longer duration, but may not make much difference as PV is likely sized to provide just enough energy to meet daytime plus evening peak demand, so there isn't spare energy to charge bigger batteries.
- Renewable Firm RFP
    - Does it make sense to procure more capacity?
        - Already seeing increased outages
        - May want to look at sensitivities around the outage rates to examine benefits of capacity and use that with RESOLVE
        - Also, keep in mind other technologies that might come along