

**TAP Resource Adequacy and Modeling Subgroup
Feedback on Additional Evaluation of Hourly Dependable Capacity (HDC) Values
1/20/2022**

This feedback to HECO is based on HECO's slides and presentation on 1/20/2022 related to the additional evaluation of Hourly Dependable Capacity (HDC) values for solar and wind resources. The calculations covered the use of a monthly grouping of similar hours, an increase of data samples using NREL data, and the use of percentile to segregate data instead of exceedance probability.

As with all TAP feedback, please consider these comments as recommendations – the final choices are yours of course. And some of these topics are quite complex, so the few sentences included here just scratch the surface and hopefully point in a direction we think might be helpful.

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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

1. How do you define percentile?
 - For example, 95th percentile is equal to or greater than 95 percent of the values recorded. 95th percentile is the same as 5th percent exceedance. [HECO, please check/elaborate.]
 - [Hawaiian Electric] Yes, percentile as discussed during this meeting is the same as the percent exceedance i.e. the 80th percentile HDCs have an 80% probability of exceedance or 20th percentile exceedance.
2. Is the shortfall both due to thermal outages and variable renewable energy resources (VREs)? Or does one have a more significant impact than the other? If the main cause of shortfall is VREs, RESOLVE may be making wrong choices when misguided.
 - The results indicate the shortfall is due to both thermal outages and VREs.
 - As a recap, HDC applies a reduction in VREs. The reduction will be covered in the Energy Reserve Margin (ERM), which is determined in RESOLVE.
 - From an operational perspective, HDC will capture the risk of (solar and wind) resources not being there. The way to characterize VREs is using a statistical approach (to come up with the HDC).
 - Retirements are driving the need.
3. The question what is the average performance of VREs during extreme events is a concern. The right contribution of variable renewables toward adequacy is another concern.
 - These questions will be answered from resource adequacy analysis. Full run (RESOLVE + PLEXOS) based on 80th percentile HDC is not yet done.
4. 80th percentile is not representative of the worst case. Related to item no. 2, RESOLVE may be making wrong choices when misguided.
5. The 80th percentile calculation aligning with the 1 sigma HDC is a useful information. TAP has a good starting point to represent HDC in RESOLVE (80th percentile HDC presented on 1/20/22). What is the next plan of HECO? Does HECO plan to test the 80th percentile HDC in the probabilistic resource adequacy model?
 - HECO and TAP agreed to do a full probabilistic RA run using a resource plan developed in RESOLVE using the 80th percentile HDC. The resource plan will then be evaluated in PLEXOS using historical profiles in a probabilistic RA methodology.
6. How are batteries modeled in RESOLVE?
 - Batteries are paired with PVs as candidate options in RESOLVE.
7. Percentiles are more representative of HDC than standard deviation (or sigma). Percentiles capture the most occurrences based on the distribution, while sigma is an arbitrary assumption.
8. Daily percentiles instead of hourly percentiles is suggested. Daily percentiles is more representative of weather variation and captures variation within the day

- HECO will consider the use of daily percentiles after the full run using the 80th percentile HDC.