Technical Advisory Panel (TAP) Meeting #3

Tuesday, September 10, 2019
9:00am – 12:00pm
WebEx

Attendees

Anderson Hoke, NREL	Christopher Lau, HE	Everett Lacro, HE
Elijah Pack, AEMO	Robert Uyeunten, HE	Henry Lee, HE
John Cole, HNEI	Ken Aramaki, HE	Jeff Burke, APS
Rick Rocheleau, HNEI	Dean Arakawa, HE	Alan Hirayama, HE
Julia Matevosjana, ERCOT	Collin Au, HE	Troy Uyehara, HE
Marisa Chun, HE	Dean Oshiro, HE	Roderick Go, E3
Mike DeCaprio, HE	Peter Young, HE	Daniel Lum, HE
Matt Richwine, Telos Energy	Isaac Lum, HE	Sorapong Khongnawang, HE
Derek Stenclik, Telos Energy	Christopher Kinoshita, HE	Vladimir Shvets, HE
Paul De Martini, Newport Consulting		

Objective

- Provide a status update on revisions made to the three planning criteria introduced in the last TAP meeting along with an update on IGP Soft Launch activities.

Agenda

- Introductions and Overview
- Regulating Reserve and Ramp Requirements
- Transmission Planning Criteria
- Capacity Planning Criteria
- Soft Launch Update

Key Takeaways:

- Regulating reserve and ramp requirements to include gross load as an input and consider the impact of shorter intervals (<30 minute) in determining regulating reserve requirements.
- Transmission planning criteria will need to meet new challenges such as:
    - Displacement of synchronous generation;
    - Interconnecting renewable resources;
    - Non-wires alternative analysis;
    - Probabilistic transmission planning; and
    - Accounting for transmission constraints in resource planning.
- Capacity planning criteria to consider the dynamic nature of variable resources and the impacts from load shifting storage.

Discussion

I. Regulating Reserve and Ramp Requirements

a. HECO: Methodology has been updated to consider the variability of load using minutely data.
    i. HECO: A 30-minute interval window is used for all islands except Hawaiʻi Island, which uses a 20-minute interval. The island of Hawaiʻi has more responsive units allowing for a 20-minute window to be used. In contrast, it may take around 30 minutes to start Waiau 9 CT on Oʻahu.
    ii. HECO: Minutely data was recorded by SCADA.
    iii. HECO: Rooftop PV based on irradiance data that was fit through a power curve.
b. TAP: In reference to slide 9, the 20-minute interval makes sense, as Hawaiʻi Island has faster starting/ ramping units. It seems like a reasonable change and should reduce the reserve requirement.
c. TAP: As generation portfolio changes, the intervals may have to change, e.g., batteries would result in shorter intervals.
d. TAP: In reference to Slide 8, do you think your estimates of DER power are accurate enough for the purposes of this study? Would it be useful to have better visibility into DER generation? Also, how will you have data for utility PV when most of it is not built yet?
    i. HECO: We are using the variability observed for the current PV projects to estimate the variability of future projects. As more projects are installed and recorded generation data made available, we can update the regulating and ramp reserve requirements to reflect the additional diversity.
e. HECO: Total requirements for regulating and ramping reserves are the sum of the 4 resource categories – Solar, Wind, DER, and Load.
f. HECO: The regulation and ramp requirements were then used in a production simulation model to assess cost and curtailment impacts.
    i. TAP: Are there any curtailment concerns?
        1. HECO: The ramp requirements may cause future curtailment, but energy storage may help to alleviate those concerns (to either provide additional load shift capability or provide the required reserves).
    ii. HECO: Paired resources are self-regulating and self-ramping:
        1. Do not add to system requirement.
        2. But also, cannot serve requirements.
        3. TAP: How are they considered in other utilities?
g. TAP: Why are the "existing units" coming on during the middle of the day? Is it to provide reg or ramp? Couldn't the curtailed utility PV do this?
    i. HECO: Curtailed PV may help to provide regulation and ramping, but the extent of the response may be limited by contractual requirements.
h. HECO: The battery can freely arbitrage resulting in a "spikey" profile shape, as the battery charges and discharges.

i. TAP: What is over-generating in the graph?
    i. HECO: It is most likely a combination of PV and Wind resources. Curtailment is shown as an aggregated total across all renewables.
j. TAP: What is your assumption on paired storage?
    i. HECO: Currently, we are assuming that the battery component of a paired resource provides the required reserves for regulation and ramp caused by the PV component of a paired resource. We do not want to double count the reserves provided by those systems.
k. TAP: (Slide 13) Since most new DGPV is being installed with storage, how will you account for that in the ramping and reserve calculations? Do you need to separate DERs into systems that have only PV and those that also have storage, and account for those separately? (Perhaps AMI data could be used to do this? Though of course only limited AMI data is available.)
    i. We could use the same assumption applied to the grid-scale paired projects in that they are self-regulating and self-ramping.
l. TAP: What is the difference between a paired battery and a controllable grid-scale battery that is paired?
    i. HECO: A paired battery is the battery component for a paired PV+BESS whereas a controllable grid-scale battery could be a standalone BESS.
m. HECO: AC/DC coupling and inverter rating limitations were implemented through constraints in the model.
n. TAP: Is there any incentive to have the projects regulate themselves?
    i. HECO: The modeling is based on the fixed price contract structure. We pay for the resource availability and can dispatch the resource to meet what is needed.
    ii. TAP: Noted that counting on projects to regulate themselves will depend on incentives.
o. TAP: Are you sure you are not double counting the ramp limit?
    i. HECO: Each generator can contribute to the ramp reserve, constrained by its MW/min ramp limit.
p. HECO: In determining these reserve requirements, one approach considered the requirements for each resource type independently. The other approach was to consider a portfolio of resources so that opposing requirements would net-out and the net requirement would not be as large. However, accounting for each resource type independently allows us to scale the requirements forward to reflect a changing portfolio mix, different from what we have today e.g., a predominantly PV portfolio or predominantly wind portfolio.
q. TAP: (Slide 16) How do you plan to ramp controllable DERs in practice?
r. TAP: (Slide 40) What causes the new ramp and reg criteria to have a much bigger impact on Oʻahu than on Maui?
    i. The existing portfolio of resources to meet the reserve requirements as well as the existing portfolio of resources that define those requirements both play a role.

II. <u>Transmission Planning Criteria</u>

a. HECO: Our objective for this Criteria is to preserve the integrity of the existing transmission system, as well as ensure public safety, provide reliable service, and ensure the efficient transfer of bulk energy.
    i. HECO: Revised the old planning criteria that was based on an old system (pre-renewables).
    ii. HECO: Under the new planning environment, we plan to add necessary transmission infrastructure and resources to support an optimized resource plan.
    iii. HECO: In procurements, targeting for capacity projects to meet peak demand is done without site review, and as a result, the solution may not always be in the best location. Through past RFP's there have been no upgrades to transmission infrastructure. We want the upgrades to support the optimized resource plan.
    iv. HECO: Example problem: a lot of renewable energy potential is in northern Oʻahu, but the transmission infrastructure there is lacking.
b. TAP: Where does the utility plan to put new synchronous condensers and flywheels?
    i. HECO: Looking at Oʻahu and Maui as potential sites, where land is limited.
c. TAP: Can you elaborate on what are the thresholds for weak grids? Can you identify where they show up on system?
    i. HECO: Primarily if you look at original PSIP, it has to do with reduction of must-run generation that is required for system security.
        1. By turning off units in the modeling, we can identify what needs to be done for system security.
        2. In addition, we look at short circuit current for relays to operate correctly, as well as looking at potential transient voltage stability.
d. TAP: Looking at short circuit current, is there a potential for mis-operation?
    i. HECO: Perhaps. Oʻahu might not experience the same impacts as the neighbor islands.
    ii. HECO: Hawaiʻi Island has long transmission lines and a relatively weak system. The location and characteristics of resources make a bigger difference.
e. TAP: What kind of models are you collecting from the proposers?
    i. HECO: Requiring what NERC has recommended which is PSCAD and PSS/E. However, it is challenging to obtain the models from the proposers.
f. TAP: There are some models that you can use for sensitivities. You won't get advanced single-phase faults in PSS/E. Having the 3-phase representation is something important to look at.
g. TAP: If you have the infrastructure, it is easier to tie in other resources such as synchronous condensers.
h. Transmission Challenges

i. HECO: In most cases, developers decide where the projects will go, not the utility.
ii. TAP: Do NWAs' apply to all transmission infrastructure?
    1. How do you scope that work for a generating site?
    2. How does ERCOT or AEMO deal with NWAs?
iii. HECO: Most people are looking at wires plus solution(s). One utility was looking at the possibility of using storage to defer transmission needs. However, they were told that it was not possible in current market conditions.
iv. TAP: Does anyone do a probabilistic transmission planning?
    1. HECO: In production cost modeling, we use a Monte Carlo simulation for generation.
    2. TAP: For ERCOT we do something similar. When running generation cost for long term planning, we do multiple runs.

i. TAP: (Slide 46) Hawaiʻi is truly forging a new path, with the power system changing from rotating generation to inverter-coupled generation, especially with respect to the maximum instantaneous levels of inverter-based generation. This will inevitably require significant investment, research/analysis, patience, and cooperation between stakeholders.
j. TAP: (Slide 46) How do you plan to maintain/ensure stability margins? What metrics do you use to evaluate this? These are fairly difficult questions since Hawaiʻi is pushing the limits of integration of inverter-based resources. A lot of work is needed in this area.
k. TAP: (Slide 47) How are the additional costs to interconnect accounted for when proposed resources are not ideally located? Does this cost fall on the developer, or on the utility/ ratepayers? Is there an opportunity to developer substations/ switching stations in locations where costs could be spread across multiple projects?

III. <u>Capacity Planning Requirement</u>

a. HECO: The objective of this criteria is to develop resource planning criteria to minimize the risk of insufficient generation capability from a diverse generating portfolio.
b. TAP: What is defined as peak load? Peak solar PV?
    i. HECO: When we use rule 1 (slide 51), we look at daily load peaks, so it is a value of a daily peak.
c. HECO: Future planning criteria takes into consideration:
    i. Dynamic nature of variable resources;
    ii. Impacts from load shifting storage.
d. HECO: Energy Reserve Margin (ERM) is a method to ensure that load can be met when unexpected generation failures occur, regardless of resource type. Types of resources include:
    i. Conventional resources;
    ii. Interruptible load contribution;

iii. Variable resources;
iv. Storage; and
v. Higher than forecasted load conditions.

e. HECO: Hourly available energy is compared to the hourly load increased by the ERM to identify at-risk hours with insufficient generation.
f. TAP: (Slides 55-56) ERM is perhaps a “metric” rather than a “method”, though there’s an associated method too. Where do these ERM “Target Percentage” numbers come from?
    i. HECO: The Energy Reserve Margin target numbers were derived such that all hours should have enough generation to cover the loss of the largest generating unit as well as forced outages. The target will vary depending on the island’s largest unit compared to its demand.
g. HECO: Hourly Dependable Capacity (HDC) is a statistically dependable output from a variable generation resource based on empirical data.
    i. Calculation (in MW):
        1. $HDC = X – N * \sigma$
        2. X = Hourly mean of a variable generation source
        3. N = Number of standard deviations
        4. σ = The standard deviation
h. TAP: (Slide 60) It would be helpful to have a sample HDC calculation.
    i. What value are you using for “N” in the HDC calculation?
        1. HECO: The value for N is 2 for solar and 1 for wind resources.
    ii. It seems the hourly probability of availability would depend on the characteristics of the generator (e.g., age, type, etc.).

IV. <u>Soft Launch NWA Opportunity</u>

a. HECO: Objective: The IGP Soft Launch is intended to demonstrate the sourcing process and evaluation methods for distribution-level NWAs in 2019.
b. TAP: Objective is to solve for all overloads. Does the contingency include times when the transformer is out for maintenance?
    i. HECO: Contingency could be planned or unplanned. It is hard to say how many times a year it occurs but when it does, it could be short OR long-term.
c. TAP: (Slide 72) 2024 Hoʻopili Needs, appears to be a fairly robust NWA opportunity. It will be very interesting to see the types of projects that are proposed.

Next Steps

- Two meetings remaining for 2019, one in-person and the other through WebEx:
    - October (date TBD)
    - November 19
- Please let us know which date you prefer to attend in-person, and which dates to avoid.
- Discussion on the deliverables and incorporating TAP feedback.