Slice-of-Day Workshops on Resource Counting

10/20/21

Safety

Earthquake

Know the safest places to drop, cover, and hold, such as under sturdy desks and tables.

Fire

Know your exits, escape routes, and evacuation plan. If safe to do so, use your compliant fire extinguisher. Exit the house and call 911.

Active Shooter

Get out, hide out, take out, and call 911.

Medical Emergency

Know who can perform first aid and CPR. Call 911 if you're alone or share your location with the call leader to send help. If you have an AED, ensure you and others in your household know where it's located and how to use it.

Psychological Safety

- ✓ We care for each other.
- ✓ Look out for one another.
- ✓ Create a safe space for all.
- ✓ Welcome new ideas from everyone.
- ✓ Practice self-care.

Ergonomics

- ✓ Practice ***30/30*** (every 30 minutes, move & stretch for 30 seconds).
- ✓ Ensure proper ergonomics.

COVID-19

- ✓ Wash hands frequently
- ✓ Wear a mask when required
- ✓ Get vaccinated if you are able to
- ✓ Follow current CAL-OSHA regulations and local county health orders.

PG&E's Desired Outcomes for Workshop #3

1. Common understanding of the current RA resource counting rules – also known as the qualifying capacity (QC) methodology
2. Common understanding of how the current RA resource counting rules align with the broader RA reform principles
3. Identify factors affecting RA resource counting rules for specific resource types

Commission-Adopted Principles

1. Balance a Reliable Electrical Grid with Minimizing Costs to Customers
2. Balance Addressing Hourly Energy Sufficiency with Advancing Environmental Goals
3. Balance Granularity in Meeting Hourly Needs with Simplicity and Transactability
4. Implementable in the Near-Term (2024)
5. To be Durable and Adaptable to a Changing Electric Grid

PG&E's Key Objectives for Resource Counting

1. **Provide a reasonable measurement of a resource's ability to create energy in particular times of the day**
    - Address the need for more than one monthly value for solar and wind resources
    - Address capacity needs to charge storage under slice-of-day framework
    - Consider and incorporate physical characteristics (e.g., hybrid and co-located, fixed PV, tracking PV, etc.) to the extent possible
    - Align with CAISO's objectives behind the UCAP proposal, including data to use for determining exceedance values

2. **Simplify resource counting rules**
    - Create a framework that allows for easy identification of a specific resource's value at any time of the year

3. **Use resource counting rules to inform the design of the slice-of-day framework**

Current RA Counting Rules

Resource Type	Current Approach	September 2022 Net Qualifying Capacity (NQC)
Dispatchable[1]	PMax	29,940
Storage	PMax measured over a 4-hour output	1,500
Solar	Effective load carrying capability (ELCC)	1,730
Wind	Effective load carrying capability (ELCC)	890
Hybrid/Co-located	Renewable resource's energy to charge storage + excess energy at ELCC	-
Non-dispatchable[1]	Average generation output during measurement hours (HE17-21) from previous 3-years	1,320
Storage-Based Hydroelectric	Monthly exceedance based on market bids from previous 10-years	6,190
Imports	Contracted amount	4,000-6,000

[1] Includes biogas, biomass, geothermal, thermal, hydroelectric, waste-to-power

“Dispatchable” Resources

- Generally, “dispatchable” resources are natural gas-based and are not energy limited
- “Dispatchability” is based on the dispatchable flag in the CAISO’s master file, which is determined by the scheduling coordinator
- Scheduling coordinators also have the option to reduce the RA value from the PMax during the annual NQC review process
- There are a number of options for “dispatchable” natural gas-based RA counting rules in the slice-of-day framework:
    1. PMax
    2. PMax & accounting for ambient temperature conditions
    3. Exceedance based on generation output
    4. Exceedance based on market schedules/bids
    5. Unforced capacity (UCAP)

Standalone Energy Storage

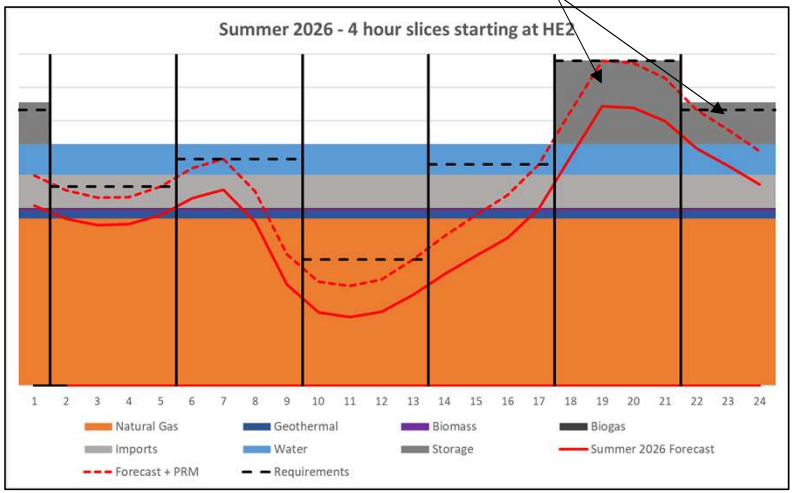
Options for Counting Rules

1. Status quo (PMax measured over a 4-hour output)
2. Exceedance based on market schedules/bids

Items to Consider:

- Showing storage in slice-of-day framework under different slice designs
  - Important technology characteristics: interconnection limit, charging status, charge and discharge rate, energy
  - Storage can fit into many different slice designs
- Ensuring sufficient energy to charge storage

- 4-hour storage fits into 4-hour slice
- 6-hour storage could fit into two 4-hour slices - one at full capacity and the remainder could fit into another slice at 50% of its capacity



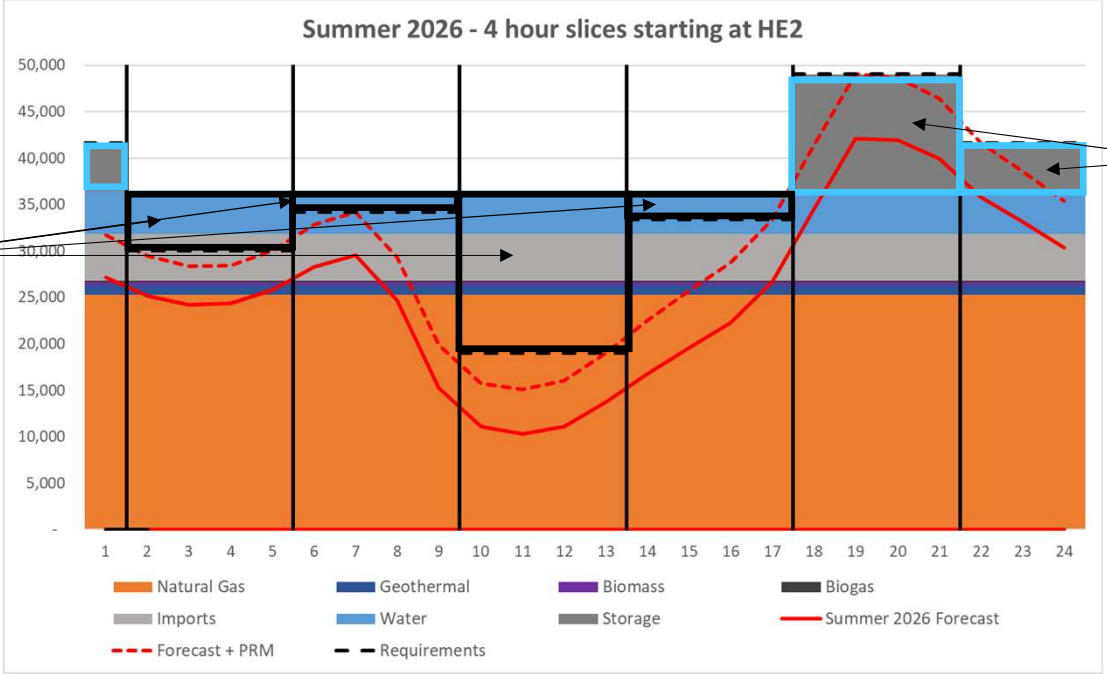
Standalone Energy Storage

Considerations when accounting for charging needs

- PG&E proposed a framework in which LSEs that have storage would need to show sufficient capacity in other slices to charge the storage

Total capacity available to charge the storage:
- ~29 GWs

<u>Since there is more charging capacity relative to the requirement, sufficient charging capacity exists</u>



Net load 2026 (using PSP solar / wind data)

Storage shown in slices 5 and 6:
- ~20 GWs

Total requirement for charging storage:
- 24 GWs (20 GWs with 20% efficiency losses)

Solar & Wind

- **Effective Load Carrying Capability (ELCC)** is the current RA counting rule for solar and wind resources.
  - Current approach:
    - Develops a monthly RA value at the aggregate level for solar and wind
    - Uses an average-based calculation
    - Does not distinguish between different technology types (e.g., fixed or tracking PV) or geographic location
    - Is required by current statute

- **Items to Consider:**
  - ELCC is dependent on the aggregate portfolio of resources and is becoming increasingly difficult to administer and predict as different configurations of resources types are added
  - ELCC may not fit well under a slice-of-day framework with more granular procurement obligations
  - Individual resources may be under/over performing relative to the aggregate level

The increase in complexity and administrative burden associated with determining more granular and frequent ELCC values is the primary reason for PG&E's proposal to shift to an exceedance-based framework

Solar & Wind

- Currently, an **exceedance-based methodology** is PG&E's recommended approach for solar and wind under the new RA framework
  - An exceedance methodology:
    - Is currently used for hydroelectric resources and was previously used for solar and wind resources
    - Can account for resource-specific performance
    - Is a more reasonable measurement of a resource's ability to produce energy during different times of the day
    - Can be chosen based on a data-driven risk tolerance and balanced with a planning reserve margin (PRM)
    - Allows for more frequent updates based on the latest data

Example: Exceedance vs ELCC in the RA Program

2018 CAISO Solar Data

Solar (HE18)	MW
9/1/2018	5,872
9/2/2018	5,572
9/3/2018	5,550
9/10/2018	5,519
9/8/2018	5,482
9/9/2018	5,458
9/11/2018	5,457
9/6/2018	5,431
9/4/2018	5,404
9/5/2018	5,391
9/7/2018	5,361
9/12/2018	5,325
9/13/2018	5,118
9/14/2018	5,089
9/15/2018	4,933
9/16/2018	4,805
9/17/2018	4,790
9/18/2018	4,751
9/20/2018	4,268
9/19/2018	4,241
9/23/2018	4,062
9/24/2018	4,019
9/25/2018	3,935
9/21/2018	3,932
9/28/2018	3,479
9/29/2018	3,422
9/26/2018	3,377
9/27/2018	3,263
9/22/2018	3,076
9/30/2018	2,070

5,438 MWs
75% percentile = 25% exceedance

4,869 MWs
50% percentile = 50% exceedance

3,934 MWs
25% percentile = 75% exceedance

HE	Sept 2018 50% Exceedance	2022 NQC (ELCC)
1	0	1,730
2	0	1,730
3	0	1,730
4	0	1,730
5	0	1,730
6	0	1,730
7	33	1,730
8	2,345	1,730
9	6,502	1,730
10	8,387	1,730
11	9,011	1,730
12	9,225	1,730
13	9,314	1,730
14	9,272	1,730
15	9,160	1,730
16	8,763	1,730
17	7,816	1,730
18	4,869	1,730
19	978	1,730
20	0	1,730
21	0	1,730
22	0	1,730
23	0	1,730
24	0	1,730

- The current method overcounts the contribution in some hours and overcounts the contribution in others.
- The current RA program attempts to address this gap through MCC bucket restrictions:
  - Bucket #4 includes solar and wind, but ~56% of bucket #4 resources must have 24-hour availability.

Sources: 2018 CAISO OASIS solar data using a 50% exceedance; 2022 CAISO NQC List; note that the percentage applied to solar in the 2022 NQC list is 14%, the Joint IOU ELCC study shows this dropping to 4.5% fixed PV, 6.2% tracking PV, and 10.1% for wind by 2030.

Hybrid and Co-located

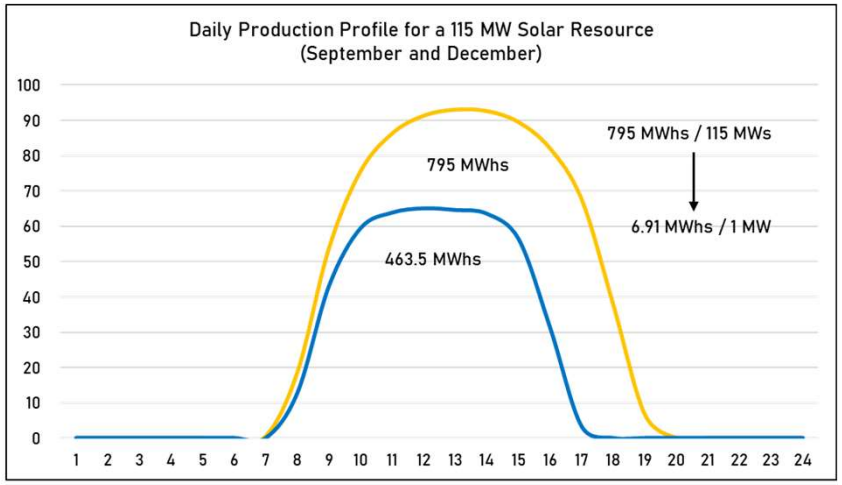
Background:

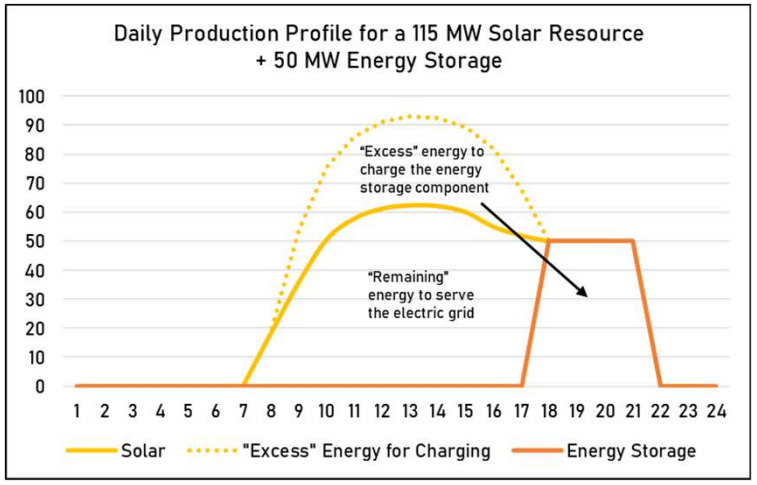
- In D.20-06-031 and through a CAISO initiative, definitions for hybrid and co-located resources were established by the CPUC and CAISO, respectively:
  - **Hybrid:**
    - CPUC: Two or more resources (one of which is a storage project) located at a single point of interconnection with a single [CAISO] resource ID.
    - CAISO: A Generating Unit, with a unique Resource ID at a single Point of Interconnection, with components that use different fuel sources or technologies.
  - **Co-located:**
    - CPUC: Two or more resources (one of which is a storage project) located at a single point of interconnection with two or more [CAISO] resource IDs.
    - CAISO: A Generating Unit with a unique Resource ID that is part of a Generating Facility with other Generating Units.
- Other differences include on-site charging restrictions, ITC requirements, among other things.

Hybrid and Co-located

Current Counting Rules:

- Daily production profiles for each month are used to determine how much energy output can be expected from the solar or wind resource. The profile is based on the period from two hours after net peak to two hours before net peak (e.g., for April-August production from HE 23 through HE 19 is used).
- If the solar or wind resource has sufficient energy to fully charge the battery then the QC of the storage is given its full RA value (e.g., PMax).
  - Any remaining expected daily production is then converted back to a capacity value and the ELCC factor is applied.





[1] For new solar and wind resources, Energy Division establishes daily production profiles to be applied to these new resources.

Hybrid and Co-located

Current Counting Rules (Cont'd):

- Hybrid resources sum the values (renewable and storage), subject to the interconnection limit, at the same facility and are treated as a single resource in the CAISO market.
- Co-located resources are assigned separate values and are treated as separate resources in the CAISO market (e.g., submit separate bids and receive separate dispatch instructions).
  - While the co-located resources are assigned separate values, the sum of the values are also subject to the interconnection limit.
  - If co-located resources are subject to on-site charging restrictions, they are effectively treated in a similar manner as CPUC-defined hybrid resources.

Items to Consider in Slice-of-Day Framework:

- Translating the resource-level requirement for co-located resources to the portfolio-level requirement.
  - In other words, ensuring a hypothetical "co-located portfolio" of solar and energy storage has sufficient energy to charge the storage and meet needs across all hours.
- Accounting for any charging restrictions or grid charging (configurations that do not get the ITC).
- Accounting for efficiency losses (resource-specific or aggregate-level).

Imports

- If an import resource is non-resource-specific, then there may be no need to change the existing counting rules based on contracted amount

- If an import resource is resource-specific (e.g., wind or solar) then the updated counting rules can be applied (e.g., exceedance)

- Considerations:
  - Import resources are historically transacted for:
    1. All hours; or
    2. High load hours (HE7-22); or
    3. Low load hours (HE1-6 and HE23-24)
  - Import / contracting hours may not align with slices, at least at first, and may need to be considered in a final framework

Resource Counting and the PRM

- Currently, the planning reserve margin captures operating reserves, forced outages and load forecasting error.
  - The PRM does not account for variations in resource counting rules. Depending on the risk tolerance of the exceedance level, resource counting variation may need to be an additional component in setting the PRM.
  - There will likely need to be tradeoffs between exceedance levels and the PRM to ensure reliability.

- Under a net load approach, exceedance levels may have to be higher to account for variation in setting the requirements. Alternatively, the PRM would likely need to be higher to make up for lower exceedance levels.
  - Another option may be to move away from a 1-in-2 load forecast.