R.17-09-020 WORKING GROUPS

EFC Value of Storage Resources

Background

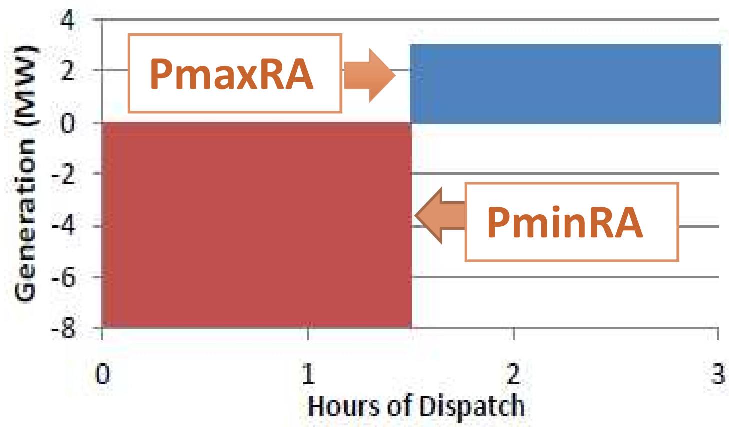
- D.14-06-050 adopted a QC & EFC methodology for storage
  - QC=MW at which resource can discharge for 4 hrs=PmaxRA
  - All EFC values based on currently-adopted definition of flexibility (per D.13-06-024): “ability to ramp and sustain output over 3 hours”
  - EFC incorporates dispatchable charging, but QC does not; thus, frequently, EFC > QC
  - EFC for bi-directional storage was previously capped at the NQC; D.14-06-050 modified this, capping EFC at greater of NQC and (NQC – PminRA)

EFC of Bidirectional Storage

- PmaxRA=QC of 4 hr discharge
- PminRA=height of a rectangle where base is 1.5 hours of discharge and area is the battery's available energy (MWh)

Example: 3 MW/12 MWh bi-directional storage resource opting for sustainable (i.e. flat) output:

- PmaxRA (height)= 12 MWh (area)/4h (base)= 3 MW
- PminRA (height)= -12 MWh (area)/1.5h (base)= -8 MW
- EFC= PmaxRA – PminRA= 3 MW – (-8 MW)= **11 MW**



- **PminRA is not capped so EFC=11 MW (> 3 times the battery's total capacity)**

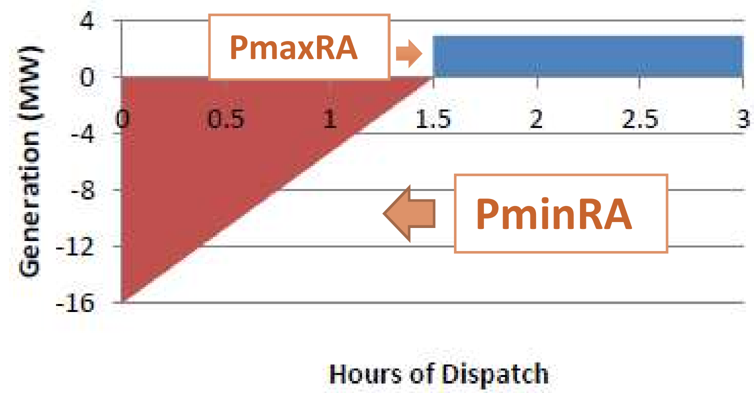
EFC of Bidirectional Storage cont.

- Continuing with this example, but using a 3 MW/12 MWh bi-directional storage resource opting for <u>upward ramping</u>:

PmaxRA remains the same

PminRA=height of a <u>triangle</u>

(where height = PminRA)



PmaxRA = 12 MWh (area)/4h (base)= 3 MW

PminRA = 2 * [-12 MWh (area)/1.5h (base)]= -16 MW

EFC= PmaxRA – PminRA= 3 MW – (-16 MW)= 19 MW

- **With PminRA remaining uncapped EFC = 19 MW (>6 times the battery's total capacity!)**

Proposed Update to EFC Methodology

- Given that current CPUC methodology assigns a 3 MW battery an EFC of either 11 MW or 19 MW (for sustainable output vs. upward ramping, respectively), *staff views this methodology as significantly over-valuing bi-directional storage*
  - Suggest capping both PminRA and PmaxRA at the QC of a 4-hour dispatch
  - This would equate to an EFC of 2 x QC (encompassing 1.5 hours of both charging and discharging)
    - This methodology is applicable to bi-directional storage resources with both a Pdemandmin and Psupplymin of zero (meaning they can ramp continuously up to and down from 0 MW)

CAISO's EFC Methodology

- CAISO uses the MW output range (accounting for both charge & discharge) that a resource can provide over 3 hours while constantly ramping for EFC value
- Each segment is capped at Pmax, but measured as it ramps (rather than flat output)- thus using a triangle formula
    - As such, using a 3 MW/12 MWh bi-directional storage resource opting for upward ramping:
        - On positive side: Minimum of the QC (3 MW) and [(12 MWh (area) *2) / 1.5h (base)], which = 16 MW;
            - Minimum = 3 MW
        - On negative side: Maximum of the QC (- 3 MW) and [(-12 MWh (area) *2) / 1.5h (base)], which = -16 MW;
            - Maximum = -3 MW
        - EFC= PmaxRA – PminRA= 3 MW – (-3 MW)= 6 MW
- This appears synonymous with staff's proposed simplified EFC methodology of 2 x QC
- However, CAISO proposes to slightly amend this formula going forward

Questions for Discussion

- Do Parties agree with Staff's interpretation of the adopted methodology?
- Are we correct that it overvalues the ramping capability of storage resources?
- Does capping EFC at twice the NQC value make sense?
- How do we best align CPUC and CAISO methodologies?