Balancing Reserve Capacity Business Practice

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Discussion Draft

Version 1

BPA makes capacity for Balancing Reserves available to meet the Customer's Balancing Reserve needs. This Business Practice describes the methodology for determining the amount of capacity for Balancing Reserves that BPA will supply.

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BPA Policy Reference

- Open Access Transmission Tariff (OATT): Schedules 3, 4, 9, and 10
- Transmission, Ancillary, and Control Area Service Rate Schedules and General Rate Schedule Provisions

A. General Criteria

1. BPA Transmission Services holds capacity for Balancing Reserves to meet the North American Electric Reliability Corporation (NERC) standards and OATT requirments to maintain load-resource balance within its Balancing Authority Area (BAA) boundaries.

2. Balancing Reserve capacity is made available to load and generation resources in the BPA BAA.

3. Energy Imbalance Service (OATT Schedule 4) and Generation Imbalance Service (OATT Schedule 9) are energy services (MWh) and addressed in their respective

Business Practices and in the Ancillary and Control Area Service Rate Schedule (ACS Rate Schedule).

4. Regulation and Frequency Response Service (OATT Schedule 3) and Capacity for Generator Balancing Service (OATT Schedule 10) of BPA's Transmission Tariff describe the various forms of Balancing Reserve capacity that BPA will supply.

5. Balancing Reserve capacity requirements apply to either Ancillary Services or Control Area Services that Customers with load or generation located within BPA's BAA are required to obtain.

6. Generators operating in the BPA BAA that provide power through an interconnected system without a transmission agreement with BPA Transmission Services must obtain Balancing Services.

7. Generators may contact BPA to discuss alternative arrangements for self-supply.

B. Acquiring Service

1. Customers must make arrangements for the provision of Balancing Services to meet their Balancing Reserve capacity requirements.

2. A Customer may purchase Balancing Reserve capacity to cover its Balancing Reserve capacity requirements from BPA.

3. A Customer may self-supply balancing reserve capacity to cover its Balancing Reserve capacity requirements (a) from its own generation, or (b) from a third-party supplier. See BPA's Self-Supply of Balancing Services Business Practice.

C. Level of Balancing Reserve Capacity held on a Planning Basis

1. BPA will use reasonable efforts to supply sufficient Balancing Reserve capacity to cover a 99.7 percent planning standard of balancing error events (the difference between scheduled and actual generation or forecasted and actual load).

2. Any material changes to the service defined in this Business Practice, that would result in an impact to rates, will not take effect until the start of the next rate period, unless needed to comply with NERC or WECC requirements.

~~2.~~3. If BPA determines that the Federal Columbia River Power System (FCRPS) cannot meet the incremental (INC) capacity amount consistent with the planning standard, BPA will use reasonable efforts to acquire capacity

supplied by non-federal sources to meet the planning standard for INC capacity.

~~3.~~4. If BPA determines that the FCRPS cannot meet the decremental (DEC) capacity amount consistent with the planning standard, BPA will not make any DEC balancing reserve capacity acquisitions unless BPA determines DEC balancing reserve capacity acquisitions are necessary to maintain system reliability.

D. Resource Service Elections

1. Before each rate period, Dispatchable Energy Resources must make a balancing service election consistent with BPA's Balancing Service Election for Dispatchable Energy Resource Balancing Service (DERBS) and Variable Energy Resource Balancing Service (VERBS) Business Practice

2. Before each rate period, Variable Energy Resources must make a balancing service election and a scheduling election consistent with BPA's Balancing Service Election for Dispatchable Energy Resource Balancing Service (DERBS), and Variable Energy Resource Balancing Service (VERBS) Business Practice.

Appendix A

A. Determining the Amount of Balancing Reserves to be Supplied

1. BPA provides Balancing Reserve capacity for Regulation and Frequency Response Service, Variable Energy Resource Balancing Service (VERBS), and Dispatchable Energy Resource Balancing Service (DERBS). Incremental and decremental capacity amounts consistent with the planning standard are calculated pursuant to the methodology specified in this business practice.

2. The calculation of the Balancing Reserve capacity needed to provide the quality of service specified in section C.1 of the business practice is based primarily on the following factors:
    a. A forecast of the variable and dispatchable energy resources expected to be on line in the BPA BAA;
    b. A historical dataset of individual generation resources, actual load and load forecasts within the BPA BAA, and;
    c. As needed, historical meteorological data used to forecast variable energy resources.

3. For purposes of the calculation of the Balancing Reserve capacity, all Variable Energy Resource (VER) plant schedules are modeled on a per plant basis consistent with that plant's scheduling election, except for VERs that use "Uncommitted" scheduling for which a 45/60 persistence schedule is used as a proxy.

B. Methodology for calculating Balancing Reserve Capacity

1. BPA will analyze Balancing Reserve capacity in accordance with BPA's automatic generation control (AGC) methodology required to meet the NERC Resource and Demand Balancing (BAL standards.
2. The methodology for calculating Balancing Reserve capacity relies on the following historical one-minute average data sets:
    a. actual BAA load,
    b. BAA load forecast,
    c. total actual dispatchable generation,
    d. total dispatchable schedules,
    e. total actual solar generation,
    f. total solar generation schedules,
    g. total actual wind generation, and
    h. total wind generation schedules.

3. For VER plants forecasted to come online, data must be appropriately synthesized as follows for inclusion in the applicable dataset from the list above, as historical data is not available.

a. For wind plants, an algorithm is employed to time-shift and scale data from an existing highly correlated generator.

b. For solar plants, an algorithm is employed to use measured irradiance and meteorological data from a nearby location. The algorithm uses a rolling average calculation to scale the data based on plant size.

4. Using these data sets, the actual load net generation is determined on a minute-by-minute basis as the difference between BAA actual load and the summation of actual generation from all resource types.

    a. $Load\ Net\ Gen_{Actual} = Load_{Actual} - \sum Gen_{Actual}$

5. Similarly, the load net generation forecast is determined on a minute-by-minute basis as the difference between BAA load forecast and the summation of schedules for all resource types.

6. Two post-processing calculations on the data are then applied:

    a. A "perfect" schedule for each hour is developed for actual load and actual generation for each of the resource types by averaging each hour and including a 20-minute ramp across the top of the hour.

    b. Similarly, ten-minute average datasets are developed for each of the data sets in the previous step without ramps between the ten-minute segments.

7. For purposes of calculating the Balancing Reserve capacity, an error dataset for the total Balancing Reserve capacity is calculated using the difference between the minute-by-minute actuals and the forecast schedules of the load net generation dataset, also known as balancing error.

8. Three components make up the total Balancing Reserve capacity: regulating reserves, following reserves, and imbalance reserves. The error dataset for the total Balancing Reserve capacity is divided into error datasets for each of the three components.

    a. The regulating reserves component is defined by the minute-by-minute variations around the ten-minute average of the load net generation dataset.

    b. The following reserves component is defined by the difference minute by minute between the ten-minute average of the load net generation dataset and the associated perfect schedule dataset.

    c. The imbalance reserves component is defined as the incremental amount of additional reserve that results from using forecast schedules instead of perfect schedules.

9. Using percentile distribution, incremental and decremental requirements are calculated for the total Balancing Reserve capacity, and the regulating reserves, following reserves, and imbalance reserves components.

    a. Percentile distribution identifies the values at the upper and lower 0.15 percent, producing values that provide for 99.7 percent coverage of the Balancing Reserve capacity required for the BAA to meet the planning standard.

    b. Percentile distribution is done to calculate the total Balancing Reserve capacity, the total regulation capacity, and the total following capacity. The total imbalance capacity is calculated as the remainder of the total Balancing Reserve capacity minus the total regulation capacity minus the total following capacity. The equations below describe these calculations.

    Total Balancing Reserve Capacity

    Total inc = $p_{99.85}$(Total balancing reserve error data)

    Total dec = $p_{00.15}$(Total balancing reserve error data)

    Total Regulation Capacity (Reg)

    Total Reg inc = $p_{99.85}$(Total Regulation error data)

    Total Reg dec = $p_{00.15}$(Total Regulation error data)

    Total Following Capacity (Fol)

    Total Fol inc = $p_{99.85}$(Total Following error data)

    Total Fol inc = $p_{00.15}$(Total Following error data)

    Total Imbalance Capacity (Imb)

    Total Imb inc = Total inc – Reg inc – Fol inc

    Total Imb dec = Total dec – Reg dec – Fol dec

    where

    $p_{99.85}$ is the 99.85% percentile distribution

    $p_{00.15}$ is the 0.15% percentile distribution