Program Review Committee

August 10, 2023; 12-1pm PT

Meeting Objectives

1. Discuss Business Practice Manual 105 - Qualifying Resources
2. Discuss Business Practice Manual 206 – Settlements Pricing

Discussion Topics

I. Agenda Overview
II. WPP New Staff Introduction
III. BPM 105 – Qualifying Resources
IV. BPM 206 – Settlements Pricing
V. Next Steps
    a. Meeting 8/16 9am PT

WESTERN POWERPOOL

Western Resource Adequacy Program

105 Qualifying Resources

100 – Forward Showing

Revision History

Manual Number	Version	Description	Revised By	Date
105	1.0	Qualifying Resources	Rebecca Sexton	6/23/2023
105	1.1	Qualifying Resources	Rebecca Sexton	8/8/2023

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105 Qualifying Resources

1 Introduction

The Qualifying Resources Business Practice Manual (BPM) consists of two sections. The Resource Registration section outlines the processes for Participants to register their Qualifying Resources with the Program Operator (PO) to be included in the Advance Assessment to receive a Qualifying Capacity Contribution (QCC). The Qualifying Capacity Contribution of Resources section outlines the processes that the PO will undertake to calculate QCC values for all registered Qualifying Resources.

1.1 Intended Audience

This BPM is intended for Western Power Pool (WPP) Western Resource Adequacy Program (WRAP) Participants and other interested individuals or entities. This BPM is particularly useful for those individuals that are responsible for their Participant organization's Forward Showing (FS) Submittal and need to ensure that their organization's Qualifying Resources are properly registered, will be included in the Advance Assessment, and will receive QCC values.

1.2 What You Will Find in This Manual

This BPM includes two separate Business Practices: 1) Resource Registration and 2) Qualifying Capacity Contribution of Resources.

1.3 Purpose

To provide an overview of Resource Registration and Qualification processes and the process for determining the QCC for Qualified Resources.

1.4 Definitions

All capitalized terms that are not otherwise defined in this BPM have the meaning set forth in the Tariff. Any capitalized terms not found in the Tariff that are specific to this BPM are defined here.

Cascaded Dual Plant: Two hydro generation resources that are on the same river systems and operated in a coordinated manner.

Capability Test: The demonstration of capability of certain Qualifying Resources by generating at their rated capability under specified test conditions and test duration.

Hybrid Facility: A resource that is composed of two or more resources of different fuel or technology types where one of those resources is an Energy Storage Resource with the same interconnection point.

Long Duration Storage: A resource designed to capture energy produced at one time for use at a later time, and capable of sustained delivery for over 8 hours (such as pumped Storage Hydro facilities or thermal energy storage devices)

Net Generating Capability: The gross maximum output of a Qualifying Resource reduced by any power used for auxiliary power requirements demonstrated through a Capability Test. May be used interchangeably with Installed Capacity when referencing thermal resources.

Operational Test: The annual demonstration of the functional ability of a Qualifying Resource.

Data Instruction Manual: The set of instructions provided by WPP to facilitate Participants filling out the Advance Assessment data request.

ASHRAE Rated Ambient Temperature: The ambient temperature employed for Capability Testing of a resource for the Summer Season, as determined for the resource location on a dry-bulb basis in accordance with the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) Fundamentals Handbook,[1] Climatic Design Information, Cooling and Dehumidification Design Conditions Appendix using the – "Cooling DB/MCWB 0.4%" values. If the resource is located within 30 miles of the nearest weather station reported in the Handbook, then the temperatures employed for the Rated Ambient Temperature will be those reported for the nearest station. For all other resource locations, the Rated Ambient Temperatures shall be determined by interpolating between those reported for appropriate weather stations using the resource location's latitude and longitude.

Hydro QCC Workbook: The workbook that determines the QCC of a single Storage Hydro generation resource.

2 Background

Participant owned and contracted Qualifying Resources capable of providing capacity may be used to meet a Participant's FS Capacity Requirement. In order to receive a QCC for these Qualifying Resources, a Participant must provide the necessary information and data to the PO. The PO will develop and maintain a registration and certification process for all Qualifying Resources identified for the FS Program as outlined in this BPM. This BPM does not cover timelines associated with Participants and

[1] ASHRAE Fundamentals Handbook

the PO completing the registration and QCC assessment process. Timelines for registration can be found in *BPM 101 – Advance Assessment Timeline*.

3 Resource Registration

3.1 Resource Eligibility

A Participant will register all owned resources in its portfolio and all resources acquired in resource specific contracts in order for those resources to receive QCC values, subject to the exceptions described in this BPM.

Resource registrations, including the appropriate modeling data required by the PO, shall be submitted in accordance with deadlines stated in *BPM 101 Advance Assessment*, relating to the timeline for the Advance Assessment.

Participants shall employ the Advance Assessment data request workbook, and the guidance and instructions in the Data Instruction Manual for providing Resource Registration information. The then-effective versions of the Advance Assessment data request workbook and the Data Instruction Manual shall be made available at an appropriate location on the WPP website. The QCC calculations for all Qualified Resources will be updated during each Advance Assessment to be used for the applicable Binding Season.

Resources owned and operated by entities that are not Participants and contracted to Participants with resource specific contracts (i.e., not system sales or block contracts) must be registered with the PO and provide the necessary data in order for Participants to claim the full QCC from these resources toward their FS Capacity Requirements.

Qualified Resources must be 1 MW minimum to qualify for registration (see Section 3.3). The registration process for all Qualifying Resources, other than Storage Hydro Qualifying Resources, will require, but will not be limited to, provision of the information set forth in Table 1 and Table 2 to the PO, by means of the Advance Assessment data request workbook. Registration of Storage Hydro Qualifying Resources will require, but will not be limited to, the provisions of items set forth in Table 3 to the PO, by means of the Advance Assessment data request workbook.

3.2 Late Registration of Resources

Resources that are unable to register by the deadline of the Advance Assessment data request may still be able to register through the following processes. Such resources may include those owned by Participants or those contracted to Participants with resource specific contracts.

A Participant may register a resource after the Advance Assessment deadline and prior to the FS Submittal Deadline (the process and timeline for submitting the FS Submittal can be found in *BPM 108 Forward Showing Submittal*) provided the Participant provides the necessary information in Table 1 and Table 2 of this BPM (or Table 3 for Storage Hydro resources). The QCC that will be allowed for late registered resources will be either the class average of similar resources or will be a discounted QCC based on the circumstances of the data provided as further described in Generator Testing (Section 3.4) and Qualifying Capacity Contribution of Resources (Section 4).

Given that the program has very little information about late registered Qualified Resources, such resources may constitute no more than 10% of the total FS Capacity Requirement for an individual Participant, unless that Participant can demonstrate an increase in the load participating in the WRAP after the Advance Assessment data collection deadline. In the case of increased load, the Participant may provide late registered resources to meet the FS Capacity Requirement for the additional load, as well as 10% of the load anticipated to participate at the time of the Advance Assessment data collection deadline.

Table 1. Information Required for Resource Registration

	Description / Instructions
Facility Name	Plant name of the resources. If possible, utilize the Energy Information Administration (EIA)-860[2] plant name given for U.S. resources.
Unit ID	The unique generator identification commonly used by plant management. If possible, utilize the EIA-860 Generator ID given for U.S. resources.
Prime Mover	Utilize the predetermined dropdown list of EIA-860 Prime Mover identifiers. For combined cycle resources, a prime mover code must be entered for each generator.
Fuel Type	Utilize the predetermined dropdown list in the workbook of fuel types used as the primary energy source to power the generator.
Host Balancing Authority	Provide the Balancing Authority Area (BAA) in which the resource is located.
Ownership or Contracted Percentage for Participant	Enter the percentage of resource capability owned or contracted by the Participant. This should also include the percentage of any power purchase agreement (PPA) where the Participant has fully contracted for the capacity from a facility but would not include a PPA with another Participant. For example, if the Participant has a PPA with a wind developer, solar developer, or city that has local generation for an extended period of time (i.e., 15 years or life of the facility) then the percentage of the offtake of that facility should be listed here.
Summer Max Capacity or Nameplate (MW)	Provide the generator's Net Generating Capability for the primary energy source. This can be i) the net expected capacity, as determined from a summer Capability Test performed in accordance with the procedures on generator testing, Section 3.4 ii) the EIA-860 nameplate capacity for Wind, Solar, Run of River, and Energy Storage Resources (ESR) located in the U.S. and iii) the nameplate capacity for Wind, Solar, Run of River and ESR located outside of the U.S.
Winter Max Capacity or Nameplate (MW)	Provide the generator's Net Generating Capability for the primary energy source. This can be i) the net expected capacity, as determined from a winter Capability Test performed in accordance with the procedures on generator testing, Section 3.4 ii) the EIA-860 nameplate capacity for Wind, Solar, Run of River, and ESR located in the U.S. and iii) the nameplate capacity for Wind, Solar, Run of River and ESR located outside of the U.S.

[2] https://www.eia.gov/electricity/data/eia860/

Description / Instructions	
In-Service Date Month-Year	Provide the month and year of the original in-service date (or commercial operation date) that the resource became operational (if possible, the operating year used in EIA-860 should be submitted for all resources within the U.S.). For details on the format of the submittal, refer to the Data Request Instruction Manual as posted in an appropriate location on the WPP website.
Retirement Date Month-Year	Provide the month and year for resources that have been either formally announced or marked for retirement.
State or Province	Enter the state acronym where the resource is physically located. For resources in Canada, enter the province.
County	For resources in the U.S., enter the county where the resource is located.
Inverter Loading Ratio (Only for Solar and Wind)	For wind and solar only resources, enter the loading ratio of the inverter compared to the nameplate of the resource. As an example, if the nameplate of a solar resource is 150 MW and the inverter is limited to 125 MW (oversizing of solar panels), then the ratio would be 1.2 (150 / 125). If the nameplate of the resource is the same as the inverter, or the loading ratio is not known, the provided loading ratio would be 1.0.
ESR Duration (Only for ESRs)	For ESRs, enter the maximum continuous number of hours for which the ESR can be utilized at its maximum capacity.
Facility Limitation (Only for Hybrid Facilities) MW	For Hybrid Facilities, provide the maximum capability which the combined amount of the component resources can output to the system. This is typically based on the inverter limit before generation is output to the system.
Comments	Enter, if applicable, any additional comments about the submitted information.

Table 2. Additional Information Required for Resource Registration

Description / Instructions
Thermal Resources - North American Electric Reliability Corporation (NERC) Generating Availability Data System (GADS) or equivalent data is required for all thermal resources. For further details on the format of the submittal, refer to the Data Request Instruction Manual as posted on the WPP website.
Wind, Run of River Hydro, Solar Resources – hourly output profiles for the last ten (10) years or as much as is available. For further details on the format of the submittal, refer to the Data Request Instruction Manual as posted on the WPP website.

The registration process for all Storage Hydro Qualifying Resources will require, but will not be limited to, the items in Table 3, as follows:

Table 3. Storage Hydro Qualifying Resource Registration

	Description / Instructions
Facility Name	Plant name of the Storage Hydro Qualifying Resource. If possible, utilize the EIA-860 plant name given for U.S. Storage Hydro Qualifying Resources.
Unit ID	The unique generator identification commonly used by plant management. If possible, utilize the EIA-860 Generator ID given for U.S. Storage Hydro Qualifying Resources.
Prime Mover	Utilize the predetermined dropdown list of EIA-860 prime mover identifiers.
Host Balancing Authority	Provide the BAA location of the Storage Hydro Qualifying Resources.
Ownership or Contracted Percentage for Participant	Enter the percentage owned or contracted by the Participant. This should also include the percentage of any PPA where the Participant has fully contracted for the capacity from a facility but would not include a PPA with another Participant.
Individual Monthly QCC (MW)	QCC values by month (all months of the year) for all Storage Hydro Qualifying Resources. The QCC of the Storage Hydro Qualifying Resources is determined by Section 4 of this BPM.
In-Service Date Month-Year	Provide the month and year of the original in-service or commercial operation date that the Storage Hydro Qualifying Resource became operational (if possible, the operating year used in EIA-860 should be submitted for all Storage Hydro Qualifying Resources within the U.S.). For planned Storage Hydro resources, enter the month and year the Storage Hydro Qualifying Resource is projected to become operational.

	Description / Instructions
Retirement Date **Month-Year**	Provide the month and year for resources that have been either formally announced or marked for retirement.
State or Province	Enter the state abbreviation where the Storage Hydro Qualifying Resource is physically located. For Storage Hydro Qualifying Resources in Canada, enter the province.
County	For Storage Hydro Qualifying Resources in the U.S., enter the county where the Storage Hydro Qualifying Resource is located.
Comments	Enter, if applicable, any additional comments about the submitted information.

3.3 Qualifying Resource Aggregation (Resources <1 MW)

Qualifying Resources that are less than 1 MW in size may be aggregated to obtain the minimum 1MW registration requirement.

Qualifying Resources that are aggregated will need to have a common injection point of capacity to the transmission system. Aggregations of generators at different distribution substations may be allowed provided the generators are in the same BAA, in the same state, same zone (as applicable by resource type), and are the same resource type.

For Qualifying Resources that are requested to be aggregated, the following information should be provided to the PO.

- For the aggregated facility:
  - Quantity of generators being aggregated
  - Combined nameplate of generators being aggregated
  - One-line diagram of the transmission/distribution system at which the generators are located.
- For each generator being aggregated:
  - Nameplate
  - Location of power injection to the transmission system (substation)
  - Supporting information for QCC evaluation.

This information will be provided to the PO in a form that will be provided with the Advance Assessment data request workbook on the WPP website.

3.4 Generator Testing

3.4.1 Background

Qualifying Resources must have Capability Tests and Operational Tests performed and provided by the Participant, as applicable and in accordance with the guidelines contained in this BPM. Capability Tests will be required for resources as detailed below. All Qualifying Resources must perform annual Operational Tests.

3.4.2 Capability Testing

Capability Tests will be required for thermal resources, long duration storage resources, and Demand Response resources (as defined in this BPM) with exceptions as noted in this section.

For units that are required to perform Capability Tests, the Participant may choose whether to use Capability Tests on a unit-by-unit basis or on a plant-level basis; regardless of the approach, all units requiring a QCC must be tested (see bullet 3 below). Capability Test duration shall be a minimum of 1 hour. Once a qualifying Capability Test is submitted to the PO at the FS Submittal Deadline, the 5-year submittal window will be reset. The Capability Test may be performed at the convenience of the Participant and can be completed more often than every 5 years.

For Storage Hydro, Run of River Hydro, Wind, Solar, and Energy Storage Resources, the annual Operational Test will suffice as the Capability Test.

3.4.2.1 Capability Test Requirements for Thermal Resources

Capability Tests conducted for thermal resources are used as the base accredited value to which unforced capacity (UCAP) calculations are applied (see Section 4.2) to determine final QCC values. A thermal resource that is not subject to generator testing requirements (i.e., are not subject to NERC MOD-025 requirements) may have its QCC values determined in accordance with Section 4.2, Option 1, in lieu of performing the Capability Test.

Capability Tests for thermal resources will be performed during the Summer Season and must meet the testing requirements specified in this BPM. A resource may use its Summer Season Capability Test value for both the Summer Season and the Winter Season. If a unit has a greater Net Generating Capability for the Winter Season than for the Summer Season, a separate Capability Test will need to be performed during the Winter Season to claim the higher Net Generating Capability value.

The following requirements must be met for a thermal resource Capability Test, documentation of which will be provided to the PO at the time of the FS Submittal Deadline:

1) Summer Capability Tests are to be conducted during a time when the ambient dry-bulb temperature is no more than 10 degrees Fahrenheit below the station ASHRAE Rated Ambient Temperature. At the time of testing, the most recent version of the ASHRAE Fundamentals Handbook shall be utilized. If the dry-bulb temperature exceeds 10 degrees below the ASHRAE Rated Ambient Temperature, a penalty of 5% plus an additional 0.5% per degree for each additional degree below 10 degrees, up to 20 degrees, will be applied to the Capability Test result. A summer Capability Test shall not be performed in excess of 20 degrees below the ASHRAE Rated Ambient Temperature. There is no ambient temperature requirement for Winter Capability Tests.
2) The unit shall be brought to the desired test load and allowed to stabilize. Once the test period has begun, only minor changes in unit controls shall be made as required to maintain the unit in normal, steady-state operation.
3) The unit capability shall be determined separately for each generating unit in a power plant where the input to the prime mover of the unit is independent of the others. Units that are aggregated into a single Resource Registration and prefer testing aligned with their registered resource and/or are dependent upon common systems (i.e., fuel, steam supply, auxiliary equipment, transmission, etc.) which restrict total output shall be tested simultaneously. Each unit shall be assigned an individual capability by apportioning the combined capability among the units.
4) The fuel used during testing shall be the type expected to be used during peak load conditions.
5) The capability of a unit or plant obtained through non-typical operation (i.e., bypassing feedwater heaters, varying steam conditions, alternate control mode, etc.) is acceptable.

3.4.2.2 Capability Testing of Long Duration Storage Resources

Capability Tests for Long Duration Storage resources are used as the base accredited value to which unforced capacity (UCAP) calculations are applied (See Section 4.2) to determine final QCC values. A Long Duration Storage resource that is not subject to generator testing requirements (i.e., are not subject to NERC MOD-025 requirements) may have its QCC values determined in accordance with Section 4.2, Option 1, in lieu of performing the Capability Test. There are no temperature or timing requirements on the Long Duration Storage Capability Test, other than the five year frequency.

1) The unit shall be brought to the desired test load and allowed to stabilize. Once the test period has begun, only minor changes in unit controls shall be made as required to maintain the unit in normal, steady-state operation.

2) The unit capability shall be determined separately for each generating unit in a plant where the input to the prime mover of the unit is independent of the others. Units that are aggregated into a single Resource Registration and prefer testing aligned with their registered resource and/or are dependent upon common systems (i.e., fuel, steam supply, auxiliary equipment, transmission, etc.) which restrict total output shall be tested simultaneously. Each unit shall be assigned an individual capability by apportioning the combined capability among the units.
3) The fuel used during testing shall be the type expected to be used during peak load conditions.
4) The capability of a unit or plant obtained through non-typical operation (i.e., bypassing feedwater heaters, varying steam conditions, alternate control mode, etc.) is acceptable.

3.4.2.3 Capability Testing of Demand Response Programs

A Capability Test for a Demand Response (DR) program registered as a Qualifying Resource will be used to confirm the claimed capability of the DR program, as well as the claimed duration of the load reduction (up to five hours). Capacity testing of the DR program will consist of a sustained reduction in load attributable to the deployment of the controllable and dispatchable program by the Participant for up to five hours. If a DR program fails to achieve the claimed load reduction capability and duration during the Capability Test, the DR program's QCC will be determined using the tested values instead. If the DR resource has a higher capacity value in one of the two Binding Seasons, the Capability Test must be conducted during the Binding Season with the higher capacity value; the DR resource does not need to be re-tested during the season with a lower capacity value. There are no temperature requirements for the DR Capacity Test.

As noted in Section 4.7, new DR programs, or the newly expanded portion of a DR program, will be assigned a QCC of 50% of the expected capability. If the Participant desires a higher QCC than 50% of the expected capability, Participant may conduct a Capability Test outside of the expected peak season of the DR program. Testing outside of the peak season will only be considered a Capability Test during the first year of operation or during the expansion of an existing DR program. An Operational Test shall then be performed during the upcoming Binding Season and reported to the PO (see Section 3.4.3.6).

3.4.2.4 Forced Outages Affecting Capability Testing

If a unit is due for a Capability Test, but unable to perform the Capability Test due to a forced outage, a maintenance outage, or a forced de-rate, the most current Capability

Test results may be used, provided it is used only for the immediately succeeding Summer Season and Winter Season. The unit will be required to perform an Operational Test per the Operational Testing procedures (Section 3.4.3) before the next Summer Season. For example, if a unit enters a forced outage while performing a Capability Test and the repair for the unit cannot be completed until after the Summer Season, then when the unit is repaired, an Operational Test must be completed. In that case, the previous Capability Test will be used to satisfy the generator testing requirements for the upcoming Summer Season FS Capacity Requirement workbook submittal. A Capability Test must be performed in the next Summer Season for the next FS Capacity Requirement workbook submittal. If the unit fails to complete the make-up Capability Test, the unit cannot be claimed on the FS Capacity Requirement Submittal.

3.4.3 Operational Testing

3.4.3.1 Thermal Resources and Long Duration Storage

An Operational Test serves as an annual demonstration of the functional capability of a Qualiying Resource to generate at a high level of its Net Generating Capability in the upcoming Binding Season. This test must be completed in the 12-month period prior to the FS Submittal due date and can be conducted within our outside of a Binding Season (at Participant's discretion). Test data shall be compiled and submitted via the FS Submittal process, as outlined in *BPM 108 Forward Showing Submittal*. The Operational Test must be conducted at a minimum of 90% of the Summer Net Generating Capability. The Operational Test shall be conducted for a minimum of 1 hour , and for thermal resources there are no Rated Ambient Temperature requirements for Operational Tests. Any hour with the unit operating at or above 90% of the Net Generating Capability may be deemed a successful Operational Test. In case of failure to meet 90% of the Net Generating Capability, the resource can only claim what it can achieve on the Operational Test for purposes of determining its QCC for the upcoming FS Submittal.

3.4.3.2 Storage Hydro Resources

An Operational Test serves as a verification that the resource can meet its QCC values on a plant-level basis as determined by the Storage Hydro QCC methodology. This test must be completed in the 12-month period directly prior to the FS Submittal due date and can be conducted within or outside a Binding Season (at Participant's discretion). Test data shall be compiled and submitted via the FS Submittal process, as outlined in *BPM 108 Forward Showing Submittal*. The Operational Test must achieve a minimum of 90% of the plant's highest monthly QCC value from the FS Submittal being submitted. The Operational Test shall be conducted for a minimum of 1 hour and there are no Rated Ambient Temperature requirements for Operational Tests. Any hour with the plant operating at or above 90% of the highest monthly QCC submitted for the current

and previous Binding Season may be deemed a successful Operational Test. In case of failure to meet 90% of the highest monthly QCC, the resource can claim no more than what it achieved on the Operational Test for purposes of determining its QCC for the upcoming FS Submittal.

Given that the Operational Test can be performed on any hour in a 12-month period, the Operational Test should be scheduled (or re-scheduled) for a time when outages/derates are not occurring. If one or more units were on outage or derated at the time of the Operational Test, in order to claim the full QCC value provided by the Storage Hydro QCC methodology, the Participant shall:

1) Demonstrate that the unit(s) out/derated at the time of the Operational Test were offline/derated for more than 90 consecutive days of the 12 months preceding the FS Submittal due date
2) Demonstrate that the unit was out/derated for the entirety of one of the months with the three highest monthly QCC values for the plant
3) Provide operational data demonstrating the unit(s) performance on any hour within the 12 months preceding the FS Submittal due date, or within the Cure Period
4) Add the sustained hour-long operational value from the hour identified in (3) to the Operational Test values.

If 90% of the highest monthly QCC value cannot be achieved after this addition, the Participant can claim no more than the Operational Test (after the addition in (4) above) for any month's QCC value.

3.4.3.3 ESRs

Operational Tests for ESRs should at least be conducted for the claimed duration of the device – i.e., 2-hour, 4-hour, etc. An ESR must be able to achieve its full QCC as determined in the QCC process for ESRs.

3.4.3.4 Run of River Hydro

Operational Tests shall be conducted at a minimum of 90% of the QCC for either Binding Season. Any hour with the resource operating at or above 90% of the QCC may be deemed a successful Operational Test. In case of failure to meet 90% of the QCC, the resource can only claim what it can achieve on the Operational Test for purposes of determining its QCC for the upcoming FS Submittal.

3.4.3.5 Wind and Solar Qualifying Resources

Operational Tests shall be conducted at a minimum of 100% of the seasonal QCC for either Binding Season. Any hour with the resource operating at or above 100% of the

QCC may be deemed a successful Operational Test. In case of failure to meet 100% of the QCC, the resource can only claim what it can achieve on the Operational Test for purposes of determining its QCC for the upcoming FS Submittal.

3.4.3.6 Demand Response Resources

An Operational Test will be conducted yearly during the Participant's peak Binding Season and at a minimum of 50% of the DR program's claimed load reduction capability (to avoid unnecessary disruption to the Participant's customers). The duration of an Operational Test shall be for a minimum of 1 hour.

3.4.4 New or Upgraded Resource Operational Testing

For newly installed resources and resources undergoing a physical or operational modification which could impact the Net Generating Capability, design output may be used for the first FS Submittal of the appropriate Binding Season to allow sufficient time for Operational and Capability Tests to be conducted. For resources required to do so, a Capability/Operational Test shall be performed in the Binding Season addressed by such first FS Submittal, in order to establish the new Net Generating Capability for all succeeding Binding Seasons.

3.4.5 Operational Testing for Late Registered Resources

Late Registered resources will be required to submit applicable generator operational test reports as required by the resource fuel type. If a Participant demonstrates that it has contracted for a resource not previously registered with the WRAP after the Advance Assessment data request deadline for the Binding Season in which capacity is being claimed to meet FS Capacity Requirements, the resource will be treated as if it had tested at 95% of its Installed Capacity. A resource previously registered with the WRAP that does not have any form of generator test results provided will be assumed to have tested at 70% of its Installed Capacity. Resources not owned or operated by a Participant that have test reports provided in a form other than the WRAP format, will be evaluated by the PO and assigned an appropriate testing value based on comparability to testing requirements established in this BPM; testing reports determined not comparable will be assumed to have tested at 70% of Installed Capacity. If the resource is newly installed or upgraded, the applicable section on new and upgraded resources will be followed.

3.4.6 Provision of Test Reports in the FS Submittal

Test reports will be provided to the PO in the FS Submittal (see *BPM 108 Forward Showing Submittal* for more details). The QCC values for resources will be based on the Capability Tests and/or Operational Tests provided in the FS Submittal.

4 Qualifying Capacity Contribution of Resources

4.1 Background

A resource will not be assigned a Resource QCC or counted toward Portfolio QCC unless it is a Qualifying Resource. Qualifying Resources are those that, before they are included in an FS Submittal, are first registered in the WRAP. A Participant seeking registration of a resource must submit a request for registration providing the resource information described in Section 3.

This section describes the methodology used to assign Resource QCCs to Qualifying Resources when resources are registered through the Advance Assessment based on resource type, as well as when Qualifying Resources of each resource type are registered after the Advance Assessment data collection deadline (as a late registered resource).

4.2 Thermal or Long Duration Storage Resources

For dispatchable resources that use conventional thermal fuels such as coal, gas, biofuel, and nuclear, or long duration storage, the FS Program will use an Equivalent Forced Outage Factor (EFOF) methodology to determine the QCC. Accreditation of non-dispatchable thermal resources is covered in Section 4.9.2.

The seasonal QCC will be determined for each resource by applying the $EFOF_{CCH}$ to the Net Generating Capability (or Installed Capacity) as determined in Section 3. The Capacity Critical Hours (CCHs)[3] will be used to determine the hours to be used in calculating the EFOF for each resource. The $EFOF_{CCH}$ calculation, as set forth in the formula in Section 4.2.1 below,will be performed for each year of the most recent six-year historical look-back period. The equivalent outage factor is calculated by removing the worst performing year (for each Summer and Winter Season) and then taking an average of the remaining five years of data. The final calculated $EFOF_{CCH}$ will be applied to the Net Generating Capability to calculate the QCC amount for the thermal generator for the entire Binding Season.

Planned outages and any outage properly reported as "outside management control" are not included in $EFOF_{CCH}$ calculations[4].

For resources new to the FS Program that do not have sufficient data over the historical period used for determining a QCC, class average data for resources of similar size will be used.

[3] CCH are calculated in accordance with *BPM 104 Capacity Critical Hours.*

[4] Appendix K of NERC GADS

4.2.1 $EFOF_{cch}$ Equation

$$EFOF(CCH) = 1 - \frac{\sum FOH_{cch} + EFDH_{cch}}{total_{CCH}} * 100\%$$

Where:

FOH_{cch} is Forced Outage Hours occurring on CCHs,

$EFDH_{cch}$ is Equivalent Forced Derating Hours occurring on CCHs, and

$Total_{cch}$ is total number of CCH for the timeframe of interest.

Definitions of FOH_{cch} and $EFDH_{cch}$ can be found in Table 4.

Table 4. Definitions of FOH and EFDH

Definitions	
FOH_{cch}	Sum of all CCH experienced during Forced Outages (U1, U2, and U3) + Startup Failures[5].
$EFDH_{cch}$	Each forced derating (D1, D2, and D3)[6] transformed into equivalent full outage hour(s). This is calculated by multiplying the actual duration of the derating (hours) by the size of the reduction (MW) and dividing by the net maximum capacity. These equivalent hour(s) are then summed by CCH. $\frac{Derating\ Hours * Size\ of\ Reduction}{Net\ Maximum\ Capacity}$

Additional Thermal QCC calculation considerations:

- Calculation is performed for each resource seasonally and for each historical year. QCC will be assigned to each resource for the entire Binding Season.

[5] See NERC GADS reporting instructions at https://www.nerc.com/pa/RAPA/gads/DataReportingInstructions/GADS_DRI_2023.pdf

[6] Ibid.

- Six years of data will be used for the calculation. The worst performing Winter Season and the worst performing Summer Season will be removed from the calculations, allowing for a five-year average.
- Only forced outages or derates occurring during CCHs will be used to calculate QCC. Outages during hours that are not deemed to be capacity critical will not negatively impact QCC.
- All years (of the five years) will have equal weighting.
- Outside of Management Control outages as reported under NERC GADS Appendix K[7] (or equivalent) will be excluded from the calculation.
- For Participants relying on resource specific transactions external to the FS Program, those Qualified Resources will follow the same QCC calculation for thermal resources and the Participant will be responsible to make sure the information is provided to the PO.
- The PO will break out each event by hour. If the NERC GADS (or equivalent) data is reported in minutes, then the hour that contains the outage will be equalized to account for the minutes. For example: if an outage starts on 6/1/2020 at 4:25, then the hour duration for that hour will be less than one since the outage does not start at the top of the hour. The total hours for 6/1/2020 on hour beginning 4:00 would be 0.583 *([60 Minutes – 25 minutes] / 60 minutes in an hour).*
- Diversity of time zones will be considered. Participants are required to list the time zone that is appropriate for their respective data.
- When comparing the event hours to the CCH hour identification should be consistent.

4.2.2 Late Registered Thermal Resources

If a Participant seeks to claim capacity from a thermal resource not registered at the time of the Advance Assessment data request, the Participant may use the late registered resource options (described generally in Section 3.2), choosing one of the following approaches:

[7] Appendix K of NERC GADS: https://www.nerc.com/pa/RAPA/gads/DataReportingInstructions/Appendix_K_Outside_Management_Control_2021_DRI.pdf

1) Demonstrate that the resource was acquired following the Advance Assessment data request due date for the Binding Season in question, in which case the resource will be permitted to use the class average QCC for thermal resources in the program; or
2) Claim a decremented QCC of 70% of the class average for thermal resources in the program.

4.2.3 Thermal Resources That Are Not Required to Report GADS Data

Certain thermal resources are not required to report GADS data. GADS data applies to Generator Owners who are NERC registered with Qualified Resources that are 1) connected to the Bulk Electric System and 2) are synchronous machines of 20MVA or larger, or distributed generation facilities of 75MVA or larger. Smaller Qualified Resources interconnected to the power system as well as Behind the Meter resources may not be required to report GADS data. For these Qualified Resources, the Participant will have two options to pursue in order to have QCC determined.

Option 1 – Historical Output. The first option will determine QCC based on the monthly average performance of such resource during CCH. The Participant will provide ten (10) years of historical hourly dispatch data. This data will be provided with the data submittal (see *BPM 101 Advance Assessment*). A workbook posted on the WPP website that contains the latest set of CCH will allow the Participant to calcuate their QCC for the FS workbook. The workbook will allow the Participant to calculate the QCC values taking the average of the facility output during the CCH.

Option 2 – Historical Outage Evaluation – The second option will determine QCC based on the monthly outage records provided by the Participant for the resource in question. A workbook detailing what outage information is required for a QCC calculation can be found posted on the WPP website. The Participant will provide five (5) years of outage information as provided in the workbook. The PO will determine the QCC of the resource in question using a methodology similar to the $EFOF_{CCH}$ methodology applied to all thermal resources. An example of the information required in the workbook is shown in Table 5.

Table 5. Sample from Workbook for EFOF Calculation.

Date Time Start	Binding Season (listed if hour is a CCH)	CCH? (if the hour is CCH, value is 'TRUE')	Was resource on forced outage? (1-yes) (0-no)	Was the outage OMC[8]? (1-yes) (0-no)	Was the resource forced de-rated? % derate from generating capability (0-100%) 100% if on full outage	Hourly Forced Outage derate (0-100%)
11/1/2014 0:00	Winter2015	FALSE	1	1	100%	100%
11/1/2014 1:00	Winter2015	FALSE	1	1	100%	100%
11/1/2014 2:00	Winter2015	FALSE	1	1	100%	100%
11/1/2014 3:00	Winter2015	FALSE	1	1	100%	100%
11/1/2014 12:00	Winter2015	FALSE	1	1	100%	100%

[8] Outside of Management Control (OMC)

Once all outage data information has been entered, the workbook calculates the EFOF on the results summary tab.

For all Qualified Resources not providing GADS reporting data, the Participant will be required to provide an attestation (provided in *BPM 108 Forward Showing Submittal*) attesting that the resource is not subject to GADS reporting and the workbooks submitted by the Participant are an accurate depiction of either the historical performance or historical outage data of the resource.

4.3 Variable Energy Resources

The QCC for Variable Energy Resources (VERs), including but not limited to wind and solar resources, will be determined for each month of the Binding Season through the use of an ELCC analysis and a subsequent allocation process. Each Binding Season will have its own ELCC analysis performed during the Advance Assessment and each resource will be assigned a new QCC in advance of each Binding Season. Each Binding Season's ELCC analysis will have a scope document that will detail the study.

4.3.1 Source Data for Resources Under Study

In accordance with Section 3 and the Advance Assessment data submittal described in *BPM 101 Advance Assessement*, the Participant will submit historical output data for wind and solar resources that are requested to have QCC determined. A Participant must submit three (3) and may submit up to ten (10) years of historical output data for wind and solar resources.

For newer resources that do not have 10 years of operational data and historical output, the Participant may provide engineering data from the wind or solar plant operator. The PO will evaluate the data provided and determine its usefulness in the ELCC process. The engineering data will need to provide synthesized outputs for the facility for at least the most recent three (3) years of historical conditions. Otherwise, the PO will use either synthesized data or average output data of other VER resources in the appropriate VER Zone.

4.3.2 Late Registered VERs

If a Participant seeks to claim capacity from a VER not registered at the time of the Advance Assessment data request, the Participant may use options for late registering a resource, choosing one of the following approaches:

1) Demonstrate that the resource was acquired following the Advance Assessment Data Request due date for the Binding Season in question and claim the average ELCC of the VER Zone in which the resource is located, or

2) Claim a decremented QCC of 70% the average ELCC in the VER Zone in which the resource is located.

4.3.3 ELCC Study Process

The ELCC will be determined for the VERs in the WRAP Region. The ELCC study will consist of analyses utilizing Loss of Load Expectation (LOLE) metrics to determine the capacity provided by the VERs being analyzed. The LOLE benchmark metric to be used in the ELCC accreditation study will be a one event in 10-year threshold.The ELCC of VERs will be calculated first on a seasonal basis then later prorated to a monthly QCC value. For the ELCC study, loss of load events will be tabulated during the Binding Season months for determination of the 1-in-10 LOLE. Loss of load events that occur outside of the Binding Season months will not go into the calculation of the capacity value of VERs. Pure Capacity will be applied to the simulation process to derive the 0.1 day per year reliability threshold. If the resulting LOLE is greater than the 0.1 day per year threshold, Pure Capacity will be added until the 0.1 threshold is achieved. If LOLE is less than the 0.1 day per year threshold, negative Pure Capacity will be added until the 0.1 threshold is achieved. The VER of interest will be excluded from the benchmark system. All other VER types will be included. For example, if the wind resource type is being analyzed, only wind will be excluded from the benchmark system.

The capacity calculated is designated in Figure 1 as Pure Capacity 1.

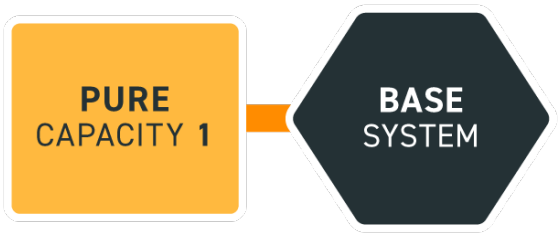

Figure 1. Diagram of system without renewable resources.

Next, a LOLE value for all wind generating resources will be determined, repeating the steps described previously. The Pure Capacity value calculated is designated in Figure 2 as Pure Capacity 2.

Figure 2. Diagram of system with renewable resources.

The difference between the results of these two steps is considered the ELCC QCC value of the resources being studied.

$$ELCC\ of\ VER\ (under\ study) = Pure\ Capacity\ 1 - Pure\ Capacity\ 2$$

These processes are repeated to determine QCC for all weather years that are studied. This process is repeated for summer and winter separately.

Zonal shapes have been developed for the LOLE study based on facility locations in each VER Zone and correlated wind and solar activity with temperatures in those VER Zones dating back to 1980. The ELCC study will be performed using the synthetic shapes dating back to 1980, which are also used in the LOLE studies. The data provided by the Participants will be used in the establishment of the synthetic shapes and used in the allocation process for establishing the QCC of each VER resource as later outlined in this BPM.

The PO will conduct the ELCC study by performing probabilistic simulations in a manner that resources in the WRAP Region will be randomly forced out of service during each hour of the study. Each simulation accounts for a different variation of forced outages and load uncertainty for all hours of the year, similar to the LOLE study utilized to establish the FS Planning Reserve Margin.

4.3.4 Determination of ELCC Within VER Zones

The ELCC study will determine the amount of capacity provided by all VERs (of the specified type, e.g., wind) analyzed in the WRAP Region. The FS Program will employ the VER zones for each VER type set forth in this BPM, as they may be revised from time to time. Each VER of a given type will be assigned to one of the VER zones for that type. ELCC studies will be performed for each VER zone (and VER type), calculating a total capacity value for the resource of interest in that zone. The capacity calculated for each VER zone will be allocated to VERs of that type in that zone on a pro-rata basis.

4.3.5 Determination of System Wide ELCC and Allocation to Individual VER Zones

To avoid over-accreditation of VERs the PO will conduct an ELCC study of the entire WRAP Region and calculate a total capacity value for all VERs in the WRAP Region. Additionally, all ESRs in a Subregion will be studied together. After all VER Zone capacity totals (for each VER type) and the capacity totals of ESRs in each Subregion have been determined, the sum of the VER Zone and ESR Subregion totals will be compared to the regional VER plus ESR total. If the sum of the VER Zones and ESR Subregion is greater than the regional total, all VER Zone and ESR Subregion totals will

be scaled down until the totals match the regional total. Table 6 provides an example of the calculations to determine total VER capacity.

Table 6. Example[9] ELCC Study of WRAP Region to Calculate Total Capacity.

A study of two wind zones and two solar zones reveals the following capacity values for each zone:				
Wind Zone 1	Wind Zone 2	Solar Zone 1	Solar Zone 2	**Total**
1,000 MW	800 MW	700 MW	1,000 MW	**3,500 MW**
A study of the region reveals the following capacity value for the region's wind and solar:				
Regional VERs				
The zones will be recalculated as follows:				
Wind Zone 1	Wind Zone 2	Solar Zone 1	Solar Zone 2	**Total**
1,000 * (3,200/3,500)	800 * (3,200/3,500)	700 * (3,200/3,500)	1,000 * (3,200/3,500)	
914 MW	732 MW	640 MW	914 MW	**3,200 MW**

ESRs, which are discussed in more detail below (Section 4.4), are also included in the system ELCC allocation and study.

4.3.6 VER Zones for Wind and Solar

WPP has established separate VER Zones for wind resources and solar resources, as shown, respectively, in Figure 3 and Figure 4.

[9] These examples are strictly illustrative, and do not set or limit any actual ELCC study results.

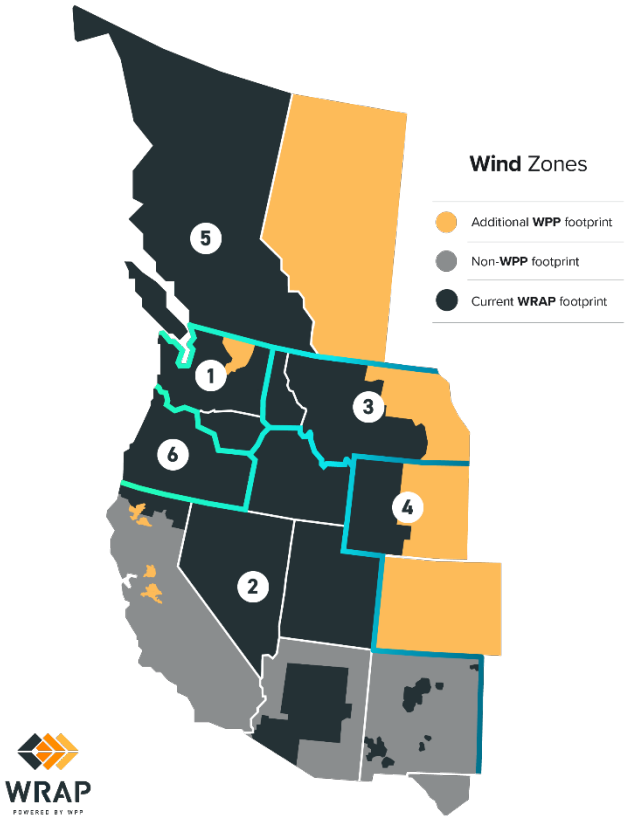

Figure 3. Wind VER Zones

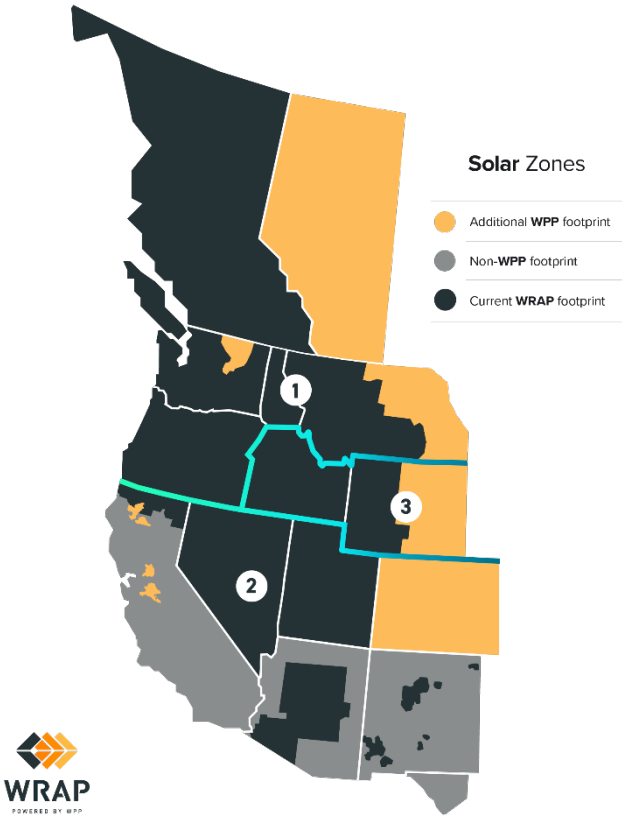

Figure 4. Solar VER Zones

4.3.7 Allocation of ELCCs VERs

4.3.7.1 Allocation of System Wide ELCC On a Resource Basis

Once the ELCC has been determined for each VER Zone for each Binding Season, two additional calculations must occur. The first step, which will occur before the system ELCC adjustment, takes the ELCC seasonal values for each VER Zone and converts them to a monthly basis for monthly QCC. Monthly QCC values for each VER Zone will be calculated by shaping the seasonal ELCC value in accordance with aggregate performance of all resources in the VER Zone during the CCH. Months that have higher resource performance during the CCH will be allocated a higher portion of the ELCC across the Binding Season. The QCC of each month will average to the seasonal ELCC value. An example is given below in Table 7.

Table 7. Example[10] Monthly QCC Calculation for Wind VER Zone

		Summer Season			
		June	July	Aug	Sept
Average Production on CCH per month	Calculated from historical performance data from wind in this VER zone on a monthly basis	120MW	95MW	90MW	130MW
Average Production on CCH across season	Calculated from historical performance data from wind in this VER zone on a seasonal basis	104MW			
Monthly Multiplier	Divides each month's production on CCH by the seasonal average	115%	91%	87%	125%
Seasonal ELCC	Value resulting from ELCC study	100MW			
Monthly QCC	Multiplies the monthly multiplier by the seasonal ELCC value	115MW	91MW	87MW	125MW

The monthly QCC values for each VER Zone are then used to determine the system ELCC value discussed in the section above.

The second step, which occurs after the system ELCC adjustment, will allocate the monthly QCC values to each resource based on the individual resource's performance during the CCH.

$$Resource\ ELCC = Monthly\ ELCC\ MW * \left(\frac{Resource\ average\ hourly\ net\ power\ output\ on\ top\ 5\%\ of\ net\ load\ hours\ (CCH)}{Zone\ total\ average\ hourly\ net\ power\ output\ on\ top\ 5\%\ of\ net\ load\ hours\ (CCH)}\right)$$

4.3.7.2 QCC Allocations for VERs with 3 Years or More of Operational Data

To allocate the ELCC MW to each resource, the PO will utilize the historical hourly data for each resource provided by the Participant. For resources that have at least 3 years of actual historical data, or at least 3 years of engineered data for newer resources, the

[10] These examples are strictly illustrative, and do not set or limit any actual ELCC study results.

PO will utilize the most recent 3 years (up to 10 years) of data when determining the resource's average hourly net power output.

4.3.7.3 QCC Allocations for New VERs or VERs with less than 3 Years of Operational Data

The PO will utilize the following method for newer VERs when determining the historical average hourly net power output:

1) No less than three years will be utilized; and
2) A Participant (or resource owner) can supply synthesized data if at least 3 years of actual data is not available, using:
    a) Manufacturer's engineering or performance data and actual weather (preferably from on-site, but not from outside of 50-mile radius); or
    b) Historical performance of similar resources within a 50-mile radius.
3) If three years of data is not provided by the Participant, either through synthetic data or actual output, the resource will receive an ELCC value equal to the product of a calculated class average ELCC percentage times the nameplate capacity of the resource at issue. The PO will use the synthesized wind output shape for the appropriate VER Zone to determine the class average ELCC percentage.

As actual data is accrued, it will replace synthesized data as it becomes available (e.g., one year of actuals plus two years of synthesized; two years actuals plus one year synthesized, then eventually three years of actuals). Once a new or repowered facility has a full year of operational data the synthesized data for years two (2) and three (3) will be evaluated for reasonableness. If the synthesized data significantly understated or overstated the forecasted generation of the resource, the year 2 and 3 synthesized data will be adjusted by the PO accordingly.

4.3.7.4 Determination of ELCC for Future VER Resources

It is understood that as VERs are added to a system, the capacity value provided by all similar VERs as a function of the nameplate value of those resources will decrease. It therefore becomes important for Participants to have an understanding of how VER QCC values may change over time as the penetration of similar VERs increases.

After the QCC values of all existing and near-term planned VERs have been calculated and allocated, additional ELCC studies will be performed to account for future VERs of each type. These additional wind and solar resource amounts will be created by scaling up the number of wind turbines (nameplate capacity) or solar photovoltaic panels in each VER Zone. The PO will provide an ELCC curve, useful for guidance purposes on a strictly non-binding basis, that can be used to estimate future capacity values for new resources dependent upon the penetration of resources in that VER Zone.

4.4 Energy Storage

The QCC for ESRs will be determined using the same general ELCC methodology used for wind and solar resources (see Section 4.3) with any specific differences being highlighted in this section and will be limited to ESRs that have the capability to store energy equal to or greater than the energy output by the ESR over four continuous hours (or longer) of operation. The ELCC study for each Binding Season will have a scope document that details the analysis. ESRs with eight-hour or longer durations are considered Long Duration Energy Storage (Section 4.2).

ESRs will be modeled as energy limited devices that will charge and discharge in accordance with their equipment specifications. ESRs will be modeled to charge and discharge in a preserve reliability mode, which means they will only be discharged to mitigate potential loss of load when there is a lack of other resources available to serve load. The dispatch of ESRs will be assumed for this modeling prupose to be scheduled during high net load hours. Because of this schedule there may be hours where there is uncertain generator performance and the ESRs may not be available to meet reliablity needs.

4.4.1 ESR with Four- to Eight-Hour Rating

Based on the four-hour minimum continuous time duration requirement, four-hour ESR or ESRs with longer duration ratings will receive QCC values based on the four-hour curve for the ESR penetration level of all ESR on the system at the time of the ELCC assessment.

4.4.2 ESR with Rating Less than Four Hours

Based on the four-hour minimum continuous time duration requirement, ESRs with ratings less than four hours will receive QCC values based on the four-hour curve for the ESR penetration level of all ESRs on the system at the time of the ELCC assessment. For example, two-hour rated ESRs would receive no more than 50% QCC value of a four-hour ESR with the same maximum output.

4.4.3 Allocation of ELCC for ESRs

All ESRs in a WRAP defined Subregion will be studied together. All ESRs within a Subregion will receive the average ELCC value of ESRs with a four-hour rating in that Subregion, subject to the limitations outlined in Section 4.4.2. To ensure that over-accreditation of ESRs does not occur, ESRs will be included in the ELCC study of all VERs of the WRAP Region and a total combined capacity value for all VERs and ESRs in the WRAP Region will be calculated. After all ESR Subregions and VER Zone capacity totals have been determined, the sum of the VER Zone and ESR Subregion totals will be compared to the WRAP Region VER total. If the sum of the VER Zones and ESR

Subregion is greater than the regional total, all VER Zone and ESR Subregion totals will be scaled down until the totals match the regional total.

4.4.4 Late Registered ESRs

If a Participant seeks to claim capacity from an ESR not registered at the time of the Advance Assessment data request, the Participant may use the late registered resource options (described generally in Section 3.2), choosing one of the following approaches:

1) Demonstrate that the resource was acquired following the Advance Assessment data request due date for the Binding Season in question, in which case the resource will be permitted to use the class average QCC for the ESRs within the Subregion; or
2) Claim a decremented QCC of 70% of the class average for ESRs in the Subregion.

4.5 Hybrid Facilities

Hybrid Facilities are resources that have at least two different fuels or technologies at a common location where one of those resources is an ESR. The QCC for Hybrid resources will be determined by applying the appropriate methodology to each component of the facility and summing them and capping the total at the interconnection limit. While hybrid resources are modeled as they would operate in the LOLE study, determining QCC for combined hybrid resource is not performed due to the inability to perform ELCC analysis for similar type resources.

4.6 Demand Response

DR can be utilized as a Qualifying Resource if it is greater than 1 MW in aggregate (see Section 3.3) and can be demonstrated to be controllable and dispatchable by the Participant or host utility. DR programs that register as Qualifying Resources will be assigned a seasonal QCC value (one value for each Binding Season) and will need to meet testing criteria and demonstrate load reduction (see Section 3.4.2.3) for a period of up to five continuous hours. A DR program may be able to demonstrate load reduction for a period beyond five continuous hours, but reductions of such duration go beyond the typical duration of CCHs in a day, and so would not provide meaningful QCC.[11] Programs that are not able to provide five hours of load reduction will have their load reduction prorated over the course of 5 hours for the determinatoin of QCC value. Participants registering a DR Qualifying Resource must either i) demonstrate that the DR program was not operated historically and has therefore not impacted the historical

[11] WPP, WRAP Detailed Design, March 2023, p113. Available at: 2023-03-10_WRAP_Draft_Design_Document_FINAL.pdf (westernpowerpool.org)

load information provided by the Participant for determination of their P50 load value, or ii) provide historical information about the operations of the DR program such that the load reduction impacts of the DR program can be removed from the historical data prior to determination of the P50 load value.

The QCC value of the DR Qualified Resource is determined by multiplying the maximum load reduction (in MW) the resource is capable of sustaining by the number of hours the resource can demonstrate such sustained load reduction capability (up to five hours, maximum) divided by five.

A DR Qualifying Resource will be reflected in the FS Submittal as a capacity resource by submitting it as a 'Resource' in the FS Submittal. As with all resources, the QCC value of the DR Qualifying Resource will count toward a Participant meeting its FS Capacity Requirement.

If DR does not meet the criteria of a Qualifying Resource, its contribution to the load reduction may be captured in the historical data used to calculate the P50 load in the FS.

4.6.1 New, Expanded, or Late Registered DR Resources

DR programs intended to be used as Qualifying Resources in the first year of operation or expansion of an existing program or DR programs not registered at the time of the Advance Assessment will be reported at 50% of the expected capability, unless validated by testing the program to 100% of the claimed capability prior to the Binding Season. See the section related to DR testing requirements (within Section 3.4.2) for more information.

4.7 Hydro Resources

4.7.1 Storage Hydro (Also see Appendix A – Qualified Capacity Contribution for Storage Hydro Resources)

QCCs for Storage Hydro resources are calculated by the Participant owners and the results are provided to the PO for review, through the provision of the 'results tab' of the workbook. The PO may ask the Participant for information from the Storage Hydro QCC methodology, subject to limitations described in the Tariff, as part of the verification and validation process. The Storage Hydro QCC methodology is based on the ability of Storage Hydro to maximize output during the CCHs each day of the historical record, subject to operational limitations and non-power constraints of each plant. Limitations include available water in storage and all constraints that restrict the use of the Net Generating Capability. These constraints include, but are not limited to, discharge limits, tailrace and forebay elevation limits, and rate of change limits.

The methodology considers each resource's actual generation output, residual generating capability, water in storage, reservoir levels (if applicable), upstream discharge from Cascaded Dual Plants and plant constraints over the most recent 10-year historical period. The QCC of the Storage Hydro resource is determined using a calculation of how much historical actual generation could have been increased during CCHs by increasing generation by utilizing water in storage each day of the historical record, while respecting all operating constraints. The QCC is the monthly average of this hypothetical increased generation during the CCHs, for the same month of the historical record. The resulting QCC is determined as the average contribution to the CCHs for each Winter Season and Summer Season over the previous 10 years. The Storage Hydro QCC Workbook captures the aforementioned Storage Hydro QCC methodology and is available for use by WRAP Participants. If historical data is not available for 10 years, a comparable facility may be utilized or some other reasonable approach that provides similar confidence in the computed QCC may be proposed by the Participant and adopted at the discretion of the WPP. The Participant will provide all required detailed data for the plant.

The detailed Storage Hydro QCC methodology can be found in Appendix A – Qualified Capacity Contribution for Storage Hydro Resources of this BPM.

4.7.1.1 Late Registered Storage Hydro Resources

If a Participant seeks to claim capacity from a Storage Hydro resource not registered at the time of the Advance Assessment data request, the Participant may use the late registered resource options, choosing one of the following approaches:

1) Demonstrate that the resource was acquired following the Advance Assessment data request due date for the Binding Season in question and utilize the established Storage Hydro QCC methodology described above, or
2) Claim a decremented QCC of 70% of the average Storage Hydro QCCs in the program.

4.7.2 Run of River Hydro

Run of River Hydro resources will have their QCC determined on the historical performance of the resources during the CCH over the most recent 10-year period. The data provided by the Participant in the Advance Assessment data submittal (see *BPM 101 Advance Assessment*) will be used for the determination of QCC.

If less than ten years of historical data is available for use in determining the QCC of a Run of River Hydro plant, the PO will utilize the following method when determining the historical average hourly net power output:

1. No less than three years will be utilized.
2. A Participant (or resource owner) can supply synthesized data if at least 3 years of actual data is not available, using:
    a. Manufacturer's engineering or performance data;
    b. Actual water conditions (preferably from on-site, but not from a different river); or
    c. Historical performance of similar resources on the same river system.
3. If three years of data is not provided by the Participant, either through synthetic data or actual output, the resource cannot receive a QCC value.

As actual data is accrued, it will replace synthesized data as it becomes available (e.g., one year of actuals plus two years of synthesized; two years actuals plus one year synthesized, then eventually three years of actuals). Once a new or repowered facility has a full year of operational data, the synthesized data for years two (2) and three (3) will be evaluated for reasonableness. If the synthesized data significantly understated or overstated the forecasted generation of the resource, the year 2 and 3 synthesized data will be adjusted by the PO accordingly.

4.7.2.1 Late Registered Run of River Hydro Resources

If a Participant seeks to claim capacity from a Run of River Hydro resource not registered at the time of the Advance Assessment data request, the Participant may use the late registered resource options, choosing one of the following approaches:

1) Demonstrate that the resource was acquired following the Advance Assessment data request due date for the Binding Season in question and execute the methodology described above for Run of River Hydro Resources (for validation by the PO), or
2) Claim a decremented QCC of 70% of the average Run of River Hydro QCCs in the program.

4.8 Other Resources

4.8.1 Customer Resources

Resources that are generally located on the customer side of the meter can be included in the FS Program. To be eligible as a Qualifying Resource, the customer resource must 1) be controllable and dispatchable by the Participant or host transmission operator, and 2) not have already been used to modify the Participant's load forecast (i.e., serving a portion or all of the load not included in load forecast). The resource shall meet testing criteria applicable for resource type and will be awarded a QCC value based on the appropriate methodolgy for the resource type. Customer resources (behind the meter resources) can be aggregated to the 1 MW requirement to be

considered a capacity resource, granted that they are in the same BAA, controllable and dispatchable, and visible to the Ops Program.

4.8.2 Non-Dispatchable, Must Take Resources

For resources that are either i) not dispatchable; or ii) require the purchaser of energy from the resource to take energy as available from such resource, including but not limited to a qualifying facility as defined under the Public Utility Regulatory Policies Act, the QCC will be determined based on the monthly average performance of such resource during CCH. The Participant will provide ten (10) years of historical hourly dispatch data. This data may be provided within the Advance Assessment data submittal (see *BPM 101 Advance Assessement*) or a workbook will be found at an appropriate location on the WPP website that contains the latest set of CCH. The workbook will allow the Participant to calculate the QCC values taking the average of the facility output during the CCH.

4.8.2.1 Late Registered Non-Dispatchable, Must Take Resources

If a Participant seeks to claim capacity from a non-dispatachable, must take resource not registered at the time of the Advance Assessment data request, the Participant will be required to execute the methodology described above for such resource (for validation by the PO).

Appendix A – Qualified Capacity Contribution for Storage Hydro Resources

5.1 Time Period Approach for Summer and Winter Season Requirements

Storage Hydro resources will use a "time period" approach to determine the QCC. A time period approach consists of a historical look-back of the generation output during CCH to determine how much capacity should be expected to be available during high load periods in the future. While this approach is limited to a daily window for determining available capacity, it does establish a common and transparent method for determining the QCC for Storage Hydro Resources.

The following methodology would be used to determine the QCC value using the time period approach described above, and Table A-1 summarizes the resource information required to apply the methodology.:

- For each day found to contain one or more CCHs, the Storage Hydro resource will be evaluated to determine the maximum available capacity for each CCH, based on the conditions of the storage associated with the hydro resource on that day.
- For each Storage Hydro resource, for each CCH, determine:
    - Maximum generation output during the CCH.
    - Useable water in storage at the end of the CCH.
    - QCC for each hour, which would be the historical generation output plus additional generation for capacity, up to the maximum generation capability (adjusted for reservoir elevation head as applicable), taking into account plant or unit-specific limitations (e.g., units on a common penstock, transformer limitations, etc.) and the resource's Equivalent Demand Forced Outage Rate (EFORd).
    - For calendar days with multiple CCHs, the QCC will be limited to the actual historical generation, plus the useable energy in storage over that day.

Non-power operational constraints that limit the use of energy in storage.

Table A-1. Resource information required to apply the methodology.

Information Needed	Notes
Reservoir Elevation Range	Min and Max – this may be seasonally adjusted
Reservoir Storage Curve	Indicating volume of water in storage based on the reservoir elevation
Capacity as a Function of Elevation	Plant maximum capacity at a given forebay elevation
CCH Adjusted $EFOF_{CCH}$ or Historical Outage Evaluation Equivalent	Historical forced outage factor
Power as a Function of Discharge	For the "discharge method"
H/K as a Function of Elevation	For the "elevation method"
Hourly Historical Data	– Actual generation – Starting reservoir elevation – Ending reservoir elevation – –

From the information in Table A-1, the hourly values in Table A-2 can be estimated for each CCH:

Table A-2. Hourly values that can be estimated.

Estimated Values	Notes
Actual water in storage	Using the elevation and storage (kcfsh or cmsh) tables
Additional capacity available beyond the actual generation	Subject to forebay elevation restrictions
Cumulative additional generation	The running total of the additional generation claimed in each CCH for the day, used to deplete the elevation of the reservoir to validate the feasibility of using additional capacity in each CCH on each calendar day
Hourly QCC	The sum of the actual generation plus the additional capacity available

The Storage Hydro capacity contribution towards the FS Capacity Requirement is calculated by the resource owner as the simple average of the hourly QCC values in each CCH over the ten years studied. These QCC values are averaged over each month in each Binding Season to determine final monthly QCC values.

5.2 Treatment of Planned Outages

In addition to accounting for forced outages, the UCAP values used in the FS workbooks may (at the Participant's option), be reduced for planned outages. Planned outages that are not included in the UCAP values will need to be planned in a manner similar to thermal resources, meaning those planned outages will be taken from the Participant's surplus capacity in excess to the Participant's FS Capacity Requirement.

Table A-3 and Table A-4 below illustrate the QCC calculation over a four-hour consecutive period using the UCAP methodology and the UCAP + planned outages methodology.

Table A-3. Calculating QCC using UCAP = 125 MW.

Consecutive CCHs	Historical Generation	Historical Storage	UCAP (125 MW)	Draft to Maximize Capacity	Storage After Draft	QCC
	MW	MWh	MW	MWh	MWh	MW
1	50	250	125	75	175	125
2	50		125	75	100	125
3	50		125	75	25	125
4	50		125	25	0	75
Storage empty after 25 MW draft				4-hour average		113

Table A-4. Calculating QCC using UCAP + Planned Outages = 100 MW.

Consecutive CCHs	Historical Generation	Historical Storage	UCAP + Planned Outages (100 MW)	Draft to Maximize Capacity	Storage After Draft	QCC
	MW	MWh	MW	MWh	MWh	MW
1	50	250	100	50	200	100
2	50		100	50	150	100
3	50		100	50	100	100
4	50		100	50	50	100
A 25 MW planned outage decreased QCC by 13 MW				4-hour average		100

The four consecutive CCHs in Table A-3 illustrate how the QCC is limited due to insufficient storage. In Table A-4, the UCAP is reduced by a 25 MW planned outage. This reduced capacity requires less draft from storage in CCHs 1-3 to maximize the QCC in those hours. This reduction in draft provides sufficient storage in CCH 4 to maximize the QCC.

For FS purposes, planned outages may be included or excluded in the QCC calculation at the choice of the Participant pursuant to the requirements in Section 16.2.8 of the Tariff.

5.3 Treatment of Non-Power Constraints

Each Participant is asked to review the methodology and incorporate the specific non-power constraints that are applicable to the individual plants, thus reducing the QCC value of each plant to a level that is believed to reflect the plants operational capability for the upcoming Binding Season. This is done through creating additional constraint logic in the spreadsheet that adds current and future non-power constraints to all 10 years' worth of evaluation.

It is expected that Participants will include such non-power constraints that accurately reflect their forecasted QCC capability, to facilitate reliance on Storage Hydro Resource QCC values in the Operations Program and for other purposes.

5.4 Treatment of Cascaded and Coordinated Hydro Systems

A Cascaded Dual Plant methodology was also developed specifically for cascaded and coordinated hydro systems. For cascaded hydro resources on the same river systems that are operated in a coordinated manner, when determining the QCC, the useable water in storage at the downstream resource could be enhanced by the operations at the upstream resource, thereby maximizing the contribution of the combined cascaded systems. The Cascaded Dual Plant methodology does not attempt to optimize use of the upstream storage to maximize the combined QCC, but it does allow the downstream plant to utilize the discharge from the upstream plant.

5.5 Form To Complete Storage Hydro Resource QCC

The Hydro QCC Workbook will be completed by the Participant. The workbook will be located at an appropriate location on the WPP website.

~~DRAFT~~

WESTERN POWERPOOL

Western Resource Adequacy Program

105 Qualifying Resources

100 – Forward Showing

Revision History

Manual Number	Version	Description	Revised By	Date

Table of Contents

105 Qualifying Resources

1 Introduction

The Qualifying Resources Business Practice Manual (BPM) consists of two sections. The Resource Registration~~Resource Registration~~ section outlines the processes for Participants to register their Qualifying Resources with the Program Operator (PO) to be included in the Advance Assessment to receive a Qualifying Capacity Contribution (QCC). The Qualifying Capacity Contribution of Resources~~Qualifying Capacity Contribution of Resources~~ section outlines the ~~process~~processes that the PO will undertake to calculate QCC values for all registered Qualifying Resources.

1.1 Intended Audience

This BPM is intended for Western Power Pool (WPP) Western Resource Adequacy Program (WRAP) Participants and other interested individuals or entities. This BPM is particularly useful for those individuals that are responsible for their Participant organization's Forward Showing (FS) Submittal and need to ensure that their ~~organizations~~organization's Qualifying Resources are properly registered, will be included in the Advance Assessment, and will receive QCC values.

1.2 What You Will Find in This Manual

This BPM includes two separate Business Practices: 1) Resource Registration and 2) Qualifying Capacity Contribution of Resources.

1.3 Purpose

To provide an overview of Resource Registration and Qualification processes and the process for determining the QCC for Qualified Resources.

1.4 Definitions

All capitalized terms that are not otherwise defined in this BPM have the meaning set forth in the Tariff. Any capitalized terms not found in the Tariff that are specific to this BPM are defined here.

Cascaded Dual Plant: Two hydro generation resources that are on the same river systems and operated in a coordinated manner.

Capability Test: The demonstration of capability of certain Qualifying Resources by generating at their rated capability under specified test conditions and test duration.

Hybrid Facility: A resource that is composed of two or more resources of different fuel or technology types where one of those resources is an Energy Storage Resource with the same interconnection point.

Long Duration Storage: A resource designed to capture energy produced at one time for use at a later time, and capable of sustained delivery for over 8 hours (such as pumped Storage Hydro facilities or thermal energy storage devices)

Net Generating Capability: The gross maximum output of a Qualifying Resource reduced by any power used for auxiliary power requirements demonstrated through a Capability Test. May be used interchangeably with Installed Capacity when referencing thermal resources.

Operational Test: The annual demonstration of the functional ability of a Qualifying Resource.

Data Instruction Manual: The set of instructions provided by WPP to facilitate Participants filling out the Advance Assessment data request.

ASHRAE Rated Ambient Temperature: The ambient temperature employed for Capability Testing of a resource for the Summer Season, as determined for the resource location on a dry-bulb basis in accordance with the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) Fundamentals Handbook,[1] Climatic Design Information, Cooling and Dehumidification Design Conditions Appendix using the ~~–~~ "Cooling DB/MCWB 0.4%" values. If the resource is located within 30 miles of the nearest weather station reported in the Handbook, then ~~these~~the temperatures employed for the Rated Ambient Temperature will be those reported for the nearest station. For all other resource locations, the Rated Ambient Temperatures shall be determined by interpolating between those reported for appropriate weather stations using the resource location's latitude and longitude.

Hydro QCC Workbook: The workbook that determines the QCC of a single Storage Hydro generation resource.

2 Background

Participant owned and contracted Qualifying Resources capable of providing capacity may be used to meet a Participant's ~~Forward Showing~~FS Capacity Requirement. In order to receive a QCC for these Qualifying Resources, a Participant must provide the necessary information and data to the PO. The PO will develop and maintain a registration and certification process for all Qualifying Resources identified for the ~~Forward Showing Program as outlined in this Business Practice~~FS Program as outlined in this BPM. This BPM does not cover timelines associated with Participants and the PO

[1] ASHRAE Fundamentals Handbook

completing the registration and QCC assessment process. Timelines for registration can be found in *BPM 101 – Advance Assessment Timeline*.

~~2.1 Form To Complete To Register Resource~~

~~Participants shall employ the Advance Assessment data request workbook, and the guidance and instructions in the WPP Data Instruction Manual for providing resource registration information. The then-effective versions of the Advance Assessment data request workbook and the WPP Data Instruction Manual shall be made available at an appropriate location on the WPP website.~~

3 Resource Registration

3.1 Resource Eligibility ~~and Timelines~~

A Participant will register all owned resources in its portfolio and all resources acquired in resource~~-~~ specific contracts~~. These~~ in order for those resources ~~will be required to register with the PO in order~~ to receive ~~a~~ QCC ~~value~~values, subject to the exceptions described in this ~~section~~BPM.

Resource registrations, including the appropriate modeling data required by the PO, shall be submitted in accordance with deadlines stated in *BPM 101 ~~Advanced Assessment,~~* relating to the timeline for the Advance Assessment. ~~Resource registrations shall be submitted by January 31 of a Year to be eligible to receive a QCC for the Summer Season of the succeeding year and the Winter Season of the succeeding year. For example, for a resource to receive a QCC value for the 2026 Summer Season, the resource information would need to be provided no later than January 31, 2025~~*Advance Assessment,* relating to the timeline for the Advance Assessment.

Participants shall employ the Advance Assessment data request workbook, and the guidance and instructions in the Data Instruction Manual for providing Resource Registration information. The then-effective versions of the Advance Assessment data request workbook and the Data Instruction Manual shall be made available at an appropriate location on the WPP website. The QCC calculations for all Qualified Resources will be updated during each Advance Assessment to be used for the applicable Binding Season.

Resources owned and operated by entities that are not Participants and contracted to Participants with ~~unit or~~ resource specific contracts (i.e., not system sales or block contracts) must be registered with the PO and provide the necessary data in order for Participants to claim the full QCC from these resources toward their ~~Forward Showing~~FS Capacity Requirements.

Qualified Resources must be 1 MW minimum ~~size~~ to qualify for registration~~;~~ (see ~~the Qualifying Resource Aggregation section below.~~Section 3.3). The registration process for all Qualifying Resources, other than Storage Hydro Qualifying Resources, will require, but will not be limited to, ~~the items set forthin Table 1, Table 2, and Table 3 , which~~ provision of the information ~~must be provided~~set forth in Table 1 and Table 2 to the PO, by means of the Advance Assessment data request workbook. Registration of Storage Hydro Qualifying Resources will require, but will not be limited to, the provisions of items set forth in Table 3 to the PO, by means of the Advance Assessment data request workbook.

3.2 Late Registration of Resources

Resources that are unable to ~~be registered~~ register by the deadline of the ~~Advanced~~Advance Assessment ~~Data Request~~data request may still be able to ~~be registered~~register through the following processes. Such resources may include those owned by Participants or those contracted to Participants with resource specific contracts.

A Participant may register a resource after the Advance Assessment deadline and prior to the FS Submittal Deadline (the process and timeline for submitting the FS Submittal can be found in *BPM 108 Forward Showing Submittal*) provided the Participant provides the necessary information in Table 1 and Table 2 of this BPM (or Table 3 for Storage Hydro resources~~) and Table 2 of this Business Practice.~~). The QCC that will be allowed for late registered resources will be either the ~~'~~class ~~average'~~ average of similar resources or will be a ~~'discounted'~~ discounted QCC based on the circumstances of the data provided as further described in ~~the section on~~Generator Testing (Section ~~Generator Testing and Qualified Capacity Contribution of Resources.~~3.4) and Qualifying Capacity Contribution of Resources (Section 4).

~~Awards of discounted QCC values are indicative of~~ Given that the program ~~having~~has very little information about ~~the~~ late registered Qualified ~~Resource; as~~Resources, such ~~late registered~~ resources ~~receiving discounted QCC values~~ may constitute no more than 10% of the total ~~Forward Showing~~ FS Capacity Requirement for an individual Participant~~.~~, unless that Participant can demonstrate an increase in the load participating in the WRAP after the Advance Assessment data collection deadline. In the case of increased load, the Participant may provide late registered resources to meet the FS Capacity Requirement for the additional load, as well as 10% of the load anticipated to participate at the time of the Advance Assessment data collection deadline.

Table 1. Information Required for Resource Registration

	Description / Instructions
Facility Name	Plant name of the resources. If possible, utilize the Energy Information Administration (EIA)-860[2] plant name given for U.S. resources.
Unit ID	The unique generator identification commonly used by plant management. If possible, ~~Utilize~~utilize the EIA-860 Generator ID given for U.S. resources.
Prime Mover	Utilize the predetermined dropdown list of ~~(~~EIA~~)~~ 860 Prime Mover identifiers~~.~~. For combined cycle resources, a prime mover code must be entered for each generator.
Fuel Type	Utilize the predetermined dropdown list in the workbook of fuel types used as the primary energy source to power the generator.
Host Balancing Authority	Provide the Balancing Authority Area (BAA) in which the resource is located.
Ownership or Contracted Percentage for Participant	Enter the percentage of resource capability owned or contracted by the Participant. This should also include the percentage of any power purchase agreement (PPA) where the Participant has fully contracted for the capacity from a facility but would not include a PPA with another Participant. For example, if the Participant has a PPA with a wind developer, solar developer, or city that has local generation for an extended period of time (i.e., 15 years or life of the facility) then the percentage of the offtake of that facility should be listed here.
Summer Max Capacity or Nameplate (MW)	Provide the generator's Net Generating Capability for the primary energy source. This can be i) the net expected capacity, as determined from a summer Capability Test performed in accordance with the procedures ~~in Generator Testing~~ on generator testing, Section 3.4 ii) the EIA-860 nameplate capacity for Wind, Solar, Run of River, and Energy Storage Resources (ESR) located in the U.S. and iii) the nameplate capacity for Wind, Solar, Run of River and ESR located outside of the U.S.
Winter Max Capacity or Nameplate (MW)	Provide the generator's Net Generating Capability for the primary energy source. This can be i) the net expected capacity, as determined from a winter Capability Test performed in accordance with the procedures ~~in Generator Testing~~ on generator testing, Section 3.4 ii) the EIA-860 nameplate capacity for Wind, Solar, Run of

[2] https://www.eia.gov/electricity/data/eia860/

	Description / Instructions
	River, and ESR located in the U.S. and iii) the nameplate capacity for Wind, Solar, Run of River and ESR located outside of the U.S.
In-Service Date Month-Year	Provide the month and year of the original in-service date (or commercial operation date) that the resource became operational (~~If~~if possible, the operating year used in EIA-860 should be submitted for all resources within the U.S.). For details on the format of the submittal, refer to the ~~WPP~~ Data Request Instruction Manual as posted in an appropriate location on the WPP website.
Retirement Date Month-Year	Provide the month and year for resources that have been either formally announced or marked for retirement. ~~Reliability must run status and other issues may conflict with this proposed/requested retirement or conversion. Examples may include:~~ ~~• Resources that have submitted a request for a generator deactivation request that have either been approved or waiting on approval.~~ ~~• Resources expected to retire based on the result of a generator survey or resource adequacy study.~~
State or Province	Enter the state acronym where the resource is physically located. For resources in Canada, enter the province.
County	For resources in the U.S., enter the county where the resource is located.
Inverter Loading Ratio (Only for Solar and Wind)	For wind and solar only resources, enter the loading ratio of the inverter compared to the nameplate of the resource. As an example, if the nameplate of a solar resource is 150 ~~MWs~~MW and the inverter is limited to 125 ~~MWs~~MW (oversizing of solar panels), then the ratio would be 1.2 (150 / 125). If the nameplate of the resource is the same as the inverter, or the loading ratio is not known, the provided loading ratio would be 1.0.
ESR Duration (Only for ESRs)	For ESRs, enter the maximum continuous number of hours for which the ESR can be utilized at its ~~Max Capacity~~maximum capacity.
Facility Limitation (Only for Hybrid Facilities) MW	For Hybrid Facilities, provide the ~~max~~maximum capability which the combined amount of the component resources can output to the system. This is typically based on the inverter limit before generation is output to the system.
Comments	Enter, if applicable, any additional comments about the submitted information.

Table 2. Additional Information Required for Resource Registration ~~for Resources~~

Description / Instructions
Thermal Resources - North American Electric Reliability Corporation (NERC) Generating Availability Data System (GADS) or equivalent data is required for all thermal resources. For further details on the format of the submittal, refer to the ~~WPP~~ Data Request Instruction Manual as posted on the WPP website.
Wind, Run of River Hydro, Solar Resources – ~~Hourly Output Profiles~~hourly output profiles for the last ten (10) years or as much as is available. For further details on the format of the submittal, refer to the ~~WPP~~ Data Request Instruction Manual as posted on the WPP website.

The registration process for all Storage Hydro Qualifying Resources will require, but will not be limited to, the items in Table 3~~Table 3~~, as follows:

Table 3. Storage Hydro Qualifying Resource Registration

Description / Instructions	
Facility Name	Plant name of the Storage Hydro Qualifying ~~Resources~~Resource. If possible, utilize the ~~Energy Information Administration (~~EIA~~)~~ 860 plant name given for U.S. Storage Hydro Qualifying Resources.
Unit ID	The unique generator identification commonly used by plant management. If possible, ~~Utilize~~utilize the EIA-860 Generator ID given for U.S. Storage Hydro Qualifying Resources.
Prime Mover	Utilize the predetermined dropdown list of EIA-860 prime mover identifiers.
Host Balancing Authority	Provide the BAA location of the Storage Hydro Qualifying Resources.
Ownership or Contracted Percentage for Participant	Enter the percentage owned or contracted by the Participant. This should also include the percentage of any PPA where the Participant has fully contracted for the capacity from a facility but would not include a PPA with another Participant.
Individual Monthly QCC (MW)	QCC values by month (all months of the year) for all Storage Hydro Qualifying Resources. The QCC of the Storage Hydro Qualifying Resources is determined by ~~the Qualifying Capacity Contribution of Resources section of this BPM.~~ Section 4 of this BPM.
In-Service Date Month-Year	Provide the month and year of the original in-~~-~~service or commercial operation date that the Storage Hydro Qualifying ~~Resources~~Resource became operational (~~I~~if possible, the operating year used in EIA-860 should be submitted for all Storage Hydro Qualifying Resources within

	Description / Instructions
	the U.S.). For planned Storage Hydro resources, enter the month and year the Storage Hydro Qualifying Resource is projected to become operational.
Retirement Date **Month-Year**	Provide the month and year for resources that have been either formally announced or marked for retirement. ~~Reliability must-run status and other issues may conflict with this proposed/requested retirement or conversion. Examples may include:~~ • ~~Resources that have submitted a request for a generator deactivation request that have either been approved or waiting on approval.~~ ~~Resources expected to retire based on the result of a generator survey or resource adequacy study.~~
State or Province	Enter the state abbreviation where the Storage Hydro Qualifying Resource is physically located. For Storage Hydro Qualifying Resources in Canada, enter the province.
County	For Storage Hydro Qualifying Resources in the U.S., enter the county where the Storage Hydro Qualifying Resource is located.
Comments	Enter, if applicable, any additional comments about the submitted information.

3.3 Qualifying Resource Aggregation (Resources <~~1MW~~1 MW)

Qualifying Resources that are less than 1 MW in size may be aggregated to obtain the minimum 1MW registration requirement.

Qualifying Resources that are aggregated will need to have a common injection point of capacity to the transmission system. Aggregations of generators at different distribution substations may be allowed provided the ~~substations are located within either a 10-mile radius or two electrical buses, whichever distance is shorter.~~generators are in the same BAA, in the same state, same zone (as applicable by resource type), and are the same resource type.

For Qualifying Resources that are requested to be aggregated, the following information should be provided to the PO~~:~~.

- For the aggregated facility:
  - Quantity of generators being aggregated
  - Combined nameplate of generators being aggregated
  - One-line diagram of the transmission/distribution system at which the generators are located.

- For each generator being aggregated~~, the following shall be provided~~:
  - Nameplate
  - Location of power injection to the transmission system (substation)
  - Supporting information for QCC evaluation.

This information will be provided to the PO in a form that will be provided with the Advance Assessment data request workbook on the WPP website.

3.4 Generator Testing

3.4.1 Background

~~Each~~ Qualifying Resources must have Capability Tests and Operational Tests performed and provided by the Participant, as applicable and in accordance with the guidelines contained in this BPM. Capability Tests will be required for resources as detailed below. All Qualifying Resources must perform annual ~~operational tests~~Operational Tests.

3.4.2 Capability Testing

Capability Tests will be required for thermal resources, long duration storage resources, and Demand Response resources (as defined in this BPM) with exceptions as noted in this section.

For units that are required to perform Capability Tests, the Participant may choose whether to use Capability Tests on a unit-by-unit basis or on a plant-level basis; regardless of the approach, all units requiring a QCC must be tested (see bullet 3 below). Capability Test duration shall be a minimum of 1 hour. Once a qualifying Capability Test is submitted to the PO at the FS Submittal Deadline, the 5-year submittal window will be reset. The Capability Test may be performed at the convenience of the Participant and can be completed more often than every 5 years.

For Storage Hydro, Run of River Hydro, Wind, Solar, and Energy Storage Resources, the annual Operational Test will suffice as the Capability Test.

3.4.2.1 Capability Test Requirements for Thermal Resources

Capability Tests conducted for thermal resources are used as the base accredited value ~~for~~to which unforced capacity (UCAP) calculations are applied (~~See~~see Section ~~Qualified Capacity Contribution of Resources – Thermal Resources section)~~4.2) to determine final QCC values. A thermal resource that is not subject to generator testing requirements (i.e., are not subject to NERC MOD-025 requirements) may have its QCC values determined in accordance with ~~Qualified Capacity Contribution of Resources – Thermal Resources section,~~Section 4.2, Option 1, in lieu of performing the Capability Test.

~~For units that are required to perform~~ Capability Tests~~, the Capability Tests~~ for thermal resources will be ~~used to establish the Net Generating Capability of a unit or plant at the Participant option. Capability Tests are to be~~ performed ~~every 5 years~~ during the Summer Season and must meet the testing requirements specified in this BPM. A resource may use its Summer Season Capability Test value for both the Summer Season and the Winter Season ~~and the Summer Season~~. If a unit has a greater Net Generating Capability for the Winter Season than for the Summer Season, a separate Capability Test will need to be performed during the Winter Season~~. Test duration shall be a minimum of 1 hour. Once a qualifying Capability Test is submitted, the 5-year submittal window will be reset~~ to claim the higher Net Generating Capability value.

~~For Storage Hydro, Run of River Hydro, Wind, Solar, and ESR units, the Operational Test will suffice as the Capability Test.~~

~~*3.4.3 Capability Test Requirements for Thermal Units*~~

The following requirements must be met for a thermal resource Capability Test, documentation of which will be provided to the PO at the time of the FS Submittal Deadline:

1) Summer Capability Tests are to be conducted during a time when the ambient dry-bulb temperature is no more than 10 degrees Fahrenheit below the station ASHRAE Rated Ambient Temperature. At the time of testing, the most recent version of the ASHRAE Fundamentals Handbook shall be utilized. If the dry-bulb temperature exceeds 10 degrees below the ASHRAE Rated Ambient Temperature, a penalty of 5% plus an additional 0.5% per degree for each additional degree below 10 degrees, up to 20 degrees, will be applied to the Capability Test result. A summer Capability Test shall not be performed in excess of 20 degrees below the ASHRAE Rated Ambient Temperature. There is no ambient temperature requirement for Winter Capability Tests.
2) The unit shall be brought to the desired test load and allowed to stabilize. Once the test period has begun, only minor changes in unit controls shall be made as required to maintain the unit in normal, steady-state operation.
3) The unit capability shall be determined separately for each generating unit in a power plant where the input to the prime mover of the unit is independent of the others. Units that are aggregated into a single ~~resource registration~~Resource Registration and prefer testing aligned with their registered resource and/or are dependent upon common systems (i.e~~.~~., fuel, steam supply, ~~aux~~auxiliary equipment, transmission, etc.) which restrict total output shall be tested simultaneously. Each unit shall be assigned an individual capability by apportioning the combined capability among the units.

4) The fuel used during testing shall be the type expected to be used during peak load conditions.
5) The capability of a unit or plant obtained through non-typical operation (i.e., bypassing feedwater heaters, varying steam conditions, alternate control mode, etc.) is acceptable.

~~3.4.3.1~~3.4.2.2 ~~Out of Season~~ Capability Testing of Long Duration Storage Resources

Capability Tests for Long Duration Storage resources are used as the base accredited value to which unforced capacity (UCAP) calculations are applied (See Section 4.2) to determine final QCC values. A Long Duration Storage resource that is not subject to generator testing requirements (i.e., are not subject to NERC MOD-025 requirements) may have its QCC values determined in accordance with Section 4.2, Option 1, in lieu of performing the Capability Test. There are no temperature or timing requirements on the Long Duration Storage Capability Test, other than the five year frequency.

1) The unit shall be brought to the desired test load and allowed to stabilize. Once the test period has begun, only minor changes in unit controls shall be made as required to maintain the unit in normal, steady-state operation.
2) The unit capability shall be determined separately for each generating unit in a plant where the input to the prime mover of the unit is independent of the others. Units that are aggregated into a single Resource Registration and prefer testing aligned with their registered resource and/or are dependent upon common systems (i.e., fuel, steam supply, auxiliary equipment, transmission, etc.) which restrict total output shall be tested simultaneously. Each unit shall be assigned an individual capability by apportioning the combined capability among the units.
3) The fuel used during testing shall be the type expected to be used during peak load conditions.
4) The capability of a unit or plant obtained through non-typical operation (i.e., bypassing feedwater heaters, varying steam conditions, alternate control mode, etc.) is acceptable.

3.4.2.3 Capability Testing of Demand Response Programs

A Capability Test for a Demand Response (DR) program registered as a Qualifying Resource will be used to confirm the claimed capability of the DR program, as well as the claimed duration of the load reduction (up to five hours). Capacity testing of the DR program will consist of a sustained reduction in load attributable to the deployment of the controllable and dispatchable program by the Participant for up to five hours. If a DR program fails to achieve the claimed load reduction capability and duration during the Capability Test, the DR program's QCC will be determined using the tested values

instead. If the DR resource has a higher capacity value in one of the two Binding Seasons, the Capability Test must be conducted during the Binding Season with the higher capacity value; the DR resource does not need to be re-tested during the season with a lower capacity value. There are no temperature requirements for the DR Capacity Test.

As noted in Section 4.6, new DR programs, or the newly expanded portion of a DR program, will be assigned a QCC of 50% of the expected capability. If the Participant desires a higher QCC than 50% of the expected capability, Participant may conduct a Capability Test outside of the expected peak season of the DR program. Testing outside of the peak season will only be considered a Capability Test during the first year of operation or during the expansion of an existing DR program. An Operational Test shall then be performed during the upcoming Binding Season and reported to the PO (see Section 3.4.3.6).

3.4.2.4 Forced Outages Affecting Capability Testing

If a unit is due for a Capability Test, but unable to perform the Capability Test due to a forced outage, a maintenance outage, or a forced de-rate, the most current Capability Test results may be used, provided ~~that~~ it is used only for the immediately succeeding Summer Season and Winter Season. The unit will be required to perform an Operational Test ~~following~~per the ~~Operational Test~~Operational Testing procedures~~,~~ (Section 3.4.3) before the next Summer Season. For example, if a unit enters a forced outage while performing a Capability Test and the repair for the unit cannot be completed until after the Summer Season, then when the unit is repaired, an Operational Test must be completed. In that case, the previous Capability Test will be used to satisfy the generator testing requirements for the upcoming Summer Season ~~Forward Showing~~FS Capacity Requirement workbook submittal. A Capability Test must be performed in the next Summer Season for the next ~~Forward Showing~~FS Capacity Requirement workbook submittal. If the unit fails to complete the make-up Capability Test, the unit cannot be claimed on the FS Capacity Requirement Submittal.

~~3.4.4~~3.4.3 *Operational Testing*

~~3.4.4.1~~3.4.3.1 Thermal Resources and Long Duration Storage

An Operational Test serves as an annual demonstration of the functional capability of a ~~resource~~Qualiying Resource to ~~output~~generate at a high level of its Net Generating Capability in the upcoming ~~operating seasons~~Binding Season. This test must be completed in the 12-month period prior to the FS Submittal due date and can be conducted ~~in any season.~~within our outside of a Binding Season (at Participant's

discretion). Test data shall be compiled and submitted via the FS Submittal process, as outlined in ~~*BMP*~~*BPM 108 Forward Showing Submittal*. The Operational Test must be conducted at a minimum of 90% of the ~~summer~~Summer Net Generating Capability. The Operational Test shall be conducted for a minimum of 1 hour ~~and~~, and for thermal resources there are no Rated Ambient Temperature requirements for Operational Tests. Any hour with the unit operating at or above 90% of the Net Generating Capability may be deemed a successful Operational Test. In case of failure to meet 90% of the Net Generating Capability, the resource can only claim what it can achieve on the Operational Test for purposes of determining its QCC for the upcoming FS Submittal.

~~3.4.4.2~~3.4.3.2 Storage Hydro Resources

An Operational Test serves as a verification that the resource can meet its QCC values on a plant-level basis as determined ~~in~~by the Storage Hydro QCC methodology. This test must be completed in the 12-month period directly prior to the FS Submittal due date and can be conducted ~~in any season.~~within or outside a Binding Season (at Participant's discretion). Test data shall be compiled and submitted via the FS Submittal process, as outlined in ~~*BMP*~~*BPM 108 Forward Showing Submittal*. The Operational Test must achieve a minimum of 90% of the plant's highest monthly QCC value from the ~~Participant's current and previous seasons~~ FS ~~Submittals.~~ Submittal being submitted. The Operational Test shall be conducted for a minimum of 1 hour and there are no Rated Ambient Temperature requirements for Operational Tests. Any hour with the plant operating at or above 90% of the highest monthly QCC submitted for the current and previous ~~season~~Binding Season may be deemed a successful Operational Test. In case of failure to meet 90% of the highest monthly QCC, the resource can claim no more than what it achieved on the Operational Test for purposes of determining its QCC for the upcoming FS Submittal.

Given that the Operational Test can be performed on any hour in a 12-month period, the Operational Test should be scheduled (or re-scheduled) for a time when outages/derates are not occurring. If one or more ~~unit(s) was~~units were on outage or derated at the time of the Operational Test, in order to claim the full QCC value provided by the Storage Hydro QCC methodology, the Participant shall:

1) Demonstrate that the unit(s) out/derated at the time of the Operational Test were offline/derated for more than 90 consecutive days of the 12 months preceding the FS Submittal due date
2) Demonstrate that the unit was out/derated for the entirety of one of the months with the three highest monthly QCC values for the plant
3) Provide operational data demonstrating the unit(s) performance on any hour within the 12 months preceding the FS Submittal due date, or within the Cure Period

4) Add the sustained hour-long operational value from the hour identified ~~hour~~in (3) to the Operational Test values.

If 90% of the highest monthly QCC value cannot be achieved after this addition, the Participant can claim no more than the Operational Test (after the addition in ~~iv~~(4) above) for any month's QCC value.

~~3.4.4.3~~3.4.3.3 ESRs

Operational Tests for ESRs should at least be conducted for the claimed duration of the device – i.e., 2-hour, 4-hour, etc. An ESR must be able to achieve its full QCC as determined in the QCC process for ESRs.

~~3.4.4.4~~3.4.3.4 Run of River Hydro

Operational Tests shall be conducted at a minimum of 90% of the QCC for either ~~season.~~Binding Season. Any hour with the ~~unit~~ resource operating at or above 90% of the QCC may be deemed a successful Operational Test. In case of failure to meet 90% of the QCC, the resource can only claim what it can achieve on the Operational Test for purposes of determining its QCC for the upcoming FS Submittal.

~~3.4.4.5~~3.4.3.5 Wind and Solar Qualifying Resources

Operational Tests shall be conducted at a minimum of 100% of the seasonal QCC for either ~~season.~~Binding Season. Any hour with the ~~unit~~ resource operating at or above 100% of the QCC may be deemed a successful Operational Test. In case of failure to meet 100% of the QCC, the resource can only claim what it can achieve on the Operational Test for purposes of determining its QCC for the upcoming FS Submittal.

3.4.3.6 Demand Response Resources

An Operational Test will be conducted yearly during the Participant's peak Binding Season and at a minimum of 50% of the DR program's claimed load reduction capability (to avoid unnecessary disruption to the Participant's customers). The duration of an Operational Test shall be for a minimum of 1 hour.

~~3.4.5~~3.4.4 New or Upgraded ~~Unit~~Resource Operational Testing

For newly installed ~~units~~resources and ~~units~~resources undergoing a physical or operational modification which could impact the ~~net generator output~~Net Generating Capability, design output may be used for the first FS Submittal of the appropriate Binding Season to allow sufficient time for Operational and Capability Tests to be conducted. For ~~units~~resources required to do so, a Capability/Operational Test shall be performed in the ~~succeeding~~ Binding Season addressed by such first FS Submittal, in order to establish the new Net Generating Capability for all succeeding Binding Seasons.

~~3.5 Provision of Test Reports in the FS Submittal~~

~~Test reports will be provided to the PO in the FS Submittal (see *BPM 108 Forward Showing Submittal* for more details). The QCC values for resources will be based on the Capability Tests and/or Operational Tests provided in the FS Submittal.~~

3.4.5 Operational Testing for Late Registered Resources

Late Registered resources will be required to submit applicable generator operational test reports as required by the resource fuel type. If a Participant demonstrates that it has contracted for a resource not previously registered with the WRAP after the ~~Annual~~Advance Assessment ~~Data Request~~data request deadline for the ~~season~~Binding Season in which capacity is being claimed to meet ~~Forward Showing~~FS Capacity Requirements, the resource will be treated as if it had tested at 95% of its Installed Capacity. A resource previously registered with the WRAP that does not have any form of generator test results provided will be assumed to have tested at 70% of its Installed Capacity. Resources not owned or operated by a Participant that have test reports provided in a form other than the WRAP format, will be evaluated by the PO and assigned an appropriate testing value based on comparability to testing requirements established in this ~~business practices~~BPM; testing reports determined not comparable will be assumed to have tested at 70~~&~~% of ~~installed capacity.~~Installed Capacity. If the ~~unit~~resource is newly installed or upgraded, the applicable section on new and upgraded resources will be followed.

3.4.6 Provision of Test Reports in the FS Submittal

Test reports will be provided to the PO in the FS Submittal (see *BPM 108 Forward Showing Submittal* for more details). The QCC values for resources will be based on the Capability Tests and/or Operational Tests provided in the FS Submittal.

4 Qualifying Capacity Contribution of Resources

4.1 Background

A resource will not be assigned a Resource QCC or counted toward Portfolio QCC unless it is a Qualifying Resource. Qualifying Resources are those that, before they are included in an FS Submittal, are first registered in the WRAP. A Participant seeking registration of a resource must submit a request for registration providing the resource information described in ~~the Resource Registration section.~~Section 3.

~~The QCCs will be determined for Qualified Resources submitted to the PO through the Advanced Assessment Data Submittal described in *BMP 101 Advanced Assessment*. Upon determination for that season's Advanced Assessment, the QCC of that resource may be used to meet the Participant's Forward Showing Capacity Requirement for the~~

~~applicable Binding Season. The QCC calculations for all Qualified Resources will be updated during each Advanced Assessment to be used for the applicable FS season.~~

~~4.2 Qualified Resources Included in FS Submittal That Have No QCC Previously Calculated~~

~~The QCCs will be determined for Qualified Resources submitted to the PO through the Advanced Assessment Data Submittal described in *BMP 101 Advanced Assessment*. Treatment of Qualified Resources that were not submitted through the Advanced Assessment Data Submittal will vary depending upon circumstances as outlined in this Business Practice.~~

~~4.3 Thermal Resources~~

This section describes the methodology used to assign Resource QCCs to Qualifying Resources when resources are registered through the Advance Assessment based on resource type, as well as when Qualifying Resources of each resource type are registered after the Advance Assessment data collection deadline (as a late registered resource).

4.2 Thermal or Long Duration Storage Resources

For dispatchable resources that use conventional thermal fuels such as coal, gas, biofuel, and nuclear, or long duration storage, the ~~Forward Showing~~FS Program will use an Equivalent Forced Outage Factor (EFOF) methodology to determine the QCC. Accreditation of non-dispatchable thermal resources is covered in Section 4.8.2.

The seasonal QCC will be determined for each resource by applying ~~a forced outage rate~~ the $EFOF_{CCH}$ to the Net Generating Capability (or Installed Capacity) as determined in ~~the Resource Registration section. The~~ Section 3. The Capacity Critical Hours (CCHs)[3] will be used to determine the hours to be used in calculating the EFOF for each ~~unit~~resource. The ~~EFOF~~$EFOF_{CCH}$ calculation~~,~~ , as set forth in the formula in Section 4.2.1 below, will be performed for each year of the most recent six-year historical look-back period. The equivalent outage ~~rate~~factor is calculated by removing the worst performing year (for each ~~summer~~Summer and Winter ~~Seasons~~Season) and then taking an average of the remaining five years of data. The final calculated ~~EFOF~~$EFOF_{CCH}$ will be applied to the Net Generating Capability ~~as~~to calculate the QCC amount for the thermal generator for the entire Binding Season.

Planned outages and any outage properly reported as "outside management control" are not included in ~~EFOF~~$EFOF_{CCH}$ calculations[4].

[3] CCH are calculated in accordance with *BPM 104 Capacity ~~Critical~~Critical Hours*.

[4] Appendix K of NERC GADS

For ~~units~~resources new to the ~~Forward Showing~~FS Program that do not have sufficient data over the historical period used for determining a QCC, class average data for ~~units~~resources of similar size~~,~~ will be used.

4.2.1 $EFOF_{cch}$ Equation

$$EFOF(CCH) = 1 - \frac{\sum FOH_{cch} + EFDH_{cch}}{total_{CCH}} * 100\%$$

Where:

FOH_{cch} is Forced Outage Hours occurring on CCHs,

$EFDH_{cch}$ is Equivalent Forced Derating Hours occurring on CCHs, and

~~$Total_{cch}$~~ $Total_{cch}$ is total number of CCH for the timeframe of interest.

Definitions of ~~FOH~~FOH_{cch} and ~~EFDH~~$EFDH_{cch}$ can be found in Table 4~~Table 4~~.

Table 4. Definitions of FOH and EFDH

Definitions	
~~FOH~~FOH_{cch}	Sum of all CCH experienced during Forced Outages (U1, U2, and U3) + Startup Failures[5].
~~EFDH~~$EFDH_{cch}$	Each forced derating (D1, D2, and D3)[6] transformed into equivalent full outage hour(s). This is calculated by multiplying the actual duration of the derating (hours) by the size of the reduction (MW) and dividing by the net maximum capacity. These equivalent hour(s) are then summed by CCH. $\frac{Derating\ Hours * Size\ of\ Reduction}{Net\ Maximum\ Capacity}$

[5] See NERC GADS reporting instructions at https://www.nerc.com/pa/RAPA/gads/DataReportingInstructions/GADS_DRI_2023.pdf

[6] ~~See NERC GADS reporting instructions at https://www.nerc.com/pa/RAPA/gads/DataReportingInstructions/GADS_DRI_2023.pdf~~

Ibid.

Additional Thermal QCC calculation considerations:

- Calculation is performed for each resource seasonally and for each historical year. QCC will be assigned to each resource for the entire Binding Season.
- Six years of data will be used for the calculation. The worst performing ~~year~~Winter Season and the worst performing Summer Season will be removed from the calculations, allowing for a five-year average.
- Only forced outages or derates occurring during CCHs will be used to calculate QCC. Outages during hours that are not deemed to be capacity critical will not negatively impact QCC.
- All years (of the five years) will have equal weighting.
- Outside of Management Control outages as reported under NERC GADS Appendix K[7] (or equivalent) will be excluded from the calculation.
- For Participants relying on resource specific transactions external to the ~~Forward Showing~~FS Program, those Qualified Resources will follow the same QCC calculation for thermal resources and the Participant will be responsible to make sure the information is provided to the PO.
- The PO will break out each event by hour. If the NERC GADS (or equivalent) data is reported in minutes, then the hour that contains the outage will be equalized to account for the minutes. For example: if an outage starts on 6/1/2020 at 4:25, then the hour duration for that hour will be less than one since the outage does not start at the top of the hour. The total hours for 6/1/2020 on hour beginning 4:00 would be 0.583 *([60 Minutes – 25 minutes] / 60 minutes in an hour).*
- Diversity of time zones will be considered. Participants are required to list the time zone that is appropriate for their respective data.
- When comparing the event hours to the CCH hour identification should be consistent.

[7] Appendix K of NERC GADS: https://www.nerc.com/pa/RAPA/gads/DataReportingInstructions/Appendix_K_Outside_Management_Control_2021_DRI.pdf

~~4.3.1~~4.2.2 *Late Registered Thermal Resources*

If a Participant seeks to claim capacity from a thermal resource not registered at the time of the ~~Advanced~~Advance Assessment ~~Data Request~~data request, the Participant may use the ~~'~~late registered ~~resource'~~resource options~~,~~ (described generally in Section 3.2), choosing one of the following approaches:

1) Demonstrate that the resource was acquired following the ~~Advanced~~Advance Assessment ~~Data Request~~data request due date for the ~~season~~Binding Season in question ~~and claim~~, in which case the resource will be permitted to use the class average QCC for thermal resources in the program; or
2) Claim a ~~'~~decremented ~~QCC'~~QCC of 70% of the class average for thermal resources in the program. ~~Note that awards of discounted QCC values are indicative of the program having very little information about the late registered Qualified Resource; as such late registered resources receiving discounted QCC values may constitute no more than 10% of the total Forward Showing Capacity Requirement for an individual Participant.~~

~~4.3.2~~4.2.3 ~~*Qualified*~~*Thermal Resources That Are Not Required to Report GADS Data*

Certain ~~Qualified Resources~~thermal resources are not required to report GADS data. GADS data applies to Generator Owners who are NERC registered with Qualified Resources that are 1) connected to the Bulk Electric System and 2) are synchronous machines of 20MVA or larger, or distributed generation facilities of 75MVA or larger. Smaller Qualified Resources interconnected to the power system as well as Behind the Meter resources may not be required to report GADS data. For these Qualified Resources, the Participant will have two options to pursue in order to have QCC determined.

Option 1 – Historical Output. The first option will determine QCC based on the monthly average performance of such resource during CCH. The Participant will provide ten (10) years of historical hourly dispatch data. This data ~~may~~ will be provided with the ~~Advanced Assessment Data Submittal~~data submittal (see *BPM 101 ~~Advanced~~Advance Assessment*). A workbook posted on the WPP website that contains the latest set of CCH will allow the Participant to calcuate their QCC for the FS workbook. The workbook will allow the Participant to calculate the QCC values taking the average of the facility output during the CCH.

Option 2 – Historical Outage Evaluation – The second option will determine QCC based on the monthly outage records provided by the Participant for the resource in question. A workbook detailing what outage information is required for a QCC calculation can be found posted on the WPP website. The Participant

will provide five (5) years of outage information as provided in the workbook. The PO will determine the QCC of the resource in question using a methodology similar to the $EFOF_{CCH}$ methodology applied to all thermal resources. An example of the information required in the workbook is shown in Table 5~~Table 5~~.

Table 5. Sample from Workbook for EFOF Calculation.

Date Time Start	Binding Season (listed if hour is a CCH)	CCH? (if the hour is CCH, value is 'TRUE')	Was ~~unit~~resource on forced outage? (1-yes~~)~~ (0-no)	Was the outage OMC[8]? (1-yes~~)~~ (0-no)	Was the ~~unit~~resource forced de-rated? % derate from generating capability (0-100%) 100% if on full outage	Hourly Forced Outage derate (0-100%)
11/1/2014 0:00	Winter2015	FALSE	1	1	100%	100%
11/1/2014 1:00	Winter2015	FALSE	1	1	100%	100%
11/1/2014 2:00	Winter2015	FALSE	1	1	100%	100%
11/1/2014 3:00	Winter2015	FALSE	1	1	100%	100%
11/1/2014 12:00	Winter2015	FALSE	1	1	100%	100%

[8] Outside of Management Control (OMC)

Once all outage data information has been entered, the workbook calculates the EFOF on the results summary tab.

~~Attestation Required~~ For all Qualified Resources not providing GADS reporting data, the Participant will be required to ~~fill out the~~provide an attestation ~~posted on the WPP website~~(provided in *BPM 108 Forward Showing Submittal*) attesting that the resource is not subject to GADS reporting and the workbooks submitted by the Participant are an accurate depiction of either the historical performance or historical outage data of the resource.

~~4.4~~4.3 Variable Energy Resources

~~The QCC for VERs, for purposes of the Qualifying Capacity Contribution of Resources section,~~The QCC for Variable Energy Resources (VERs), including but not limited to wind and solar resources, will be determined for each month of the Binding Season through the use of an ELCC analysis and a ~~subsquent allocatoin~~subsequent allocation process. Each Binding Season will have its own ELCC analysis performed during the Advance Assessment and each resource will be assigned a new QCC in advance of each Binding Season. Each Binding Season's ELCC analysis will have a scope document that will detail the study.

~~4.4.1~~4.3.1 Source Data for Resources Under Study

In accordance with ~~the~~Section ~~Resource Registration section~~3 and the ~~Advanced~~Advance Assessment ~~Data Submittal~~data submittal described in *BPM 101 ~~Advanced~~Advance Assessement*, the Participant will submit historical output data for wind and solar resources that are requested to have QCC determined. A Participant must submit three (3) and may submit up to ten (10) years of historical output data for wind and solar resources.

For newer resources that do not have 10 years of operational data and historical output, the Participant may provide engineering data from the wind or solar plant operator. The PO will evaluate the data provided and determine its usefulness in the ELCC process. The engineering data will need to provide synthesized outputs for the facility for at least the most recent three (3) years~~.~~ of historical conditions. Otherwise, the PO will use either synthesized data or average output data of other VER resources in the appropriate VER ~~zone~~Zone.

~~4.4.2~~4.3.2 Late Registered VERs

If a Participant seeks to claim capacity from a VER not registered at the time of the ~~Advanced~~Advance Assessment ~~Data Request~~data request, the Participant may use ~~the 'late registered resource'~~ options for late registering a resource, choosing one of the following approaches:

1) Demonstrate that the resource was acquired following the ~~Advanced~~Advance Assessment Data Request due date for the ~~season~~Binding Season in question and claim the average ELCC of the VER ~~zone~~Zone in which the resource is located, or
2) Claim a ~~`~~decremented ~~QCC'~~QCC of 70% the average ELCC in the VER ~~zone~~Zone in which the resource is located. ~~Note that awards of discounted QCC values are indicative of the program having very little information about the late registered Qualified Resource; as such late-registered resources receiving discounted QCC values may constitute no more than 10% of the total Forward Showing Capacity Requirement for an individual Participant.~~

~~4.4.3~~4.3.3 *ELCC Study Process*

The ELCC will be determined for the VERs in the WRAP Region. The ELCC study will consist of analyses utilizing Loss of Load Expectation (LOLE) metrics to determine the capacity provided by the VERs being analyzed. The LOLE benchmark metric to be used in the ELCC accreditation study will be a one event in 10-year threshold.The ELCC of VERs will be calculated first on a seasonal basis then later prorated to a monthly QCC value. For the ELCC study, loss of load events will be tabulated during the Binding Season months for determination of the 1-in-10 LOLE. Loss ~~o~~ of load events that occur outside of the Binding Season months will not go into the calculation of the capacity value of VERs. Pure Capacity will be applied to the simulation process to derive the 0.1 day per year reliability threshold. If the resulting LOLE is greater than the 0.1 day per year threshold, Pure Capacity will be added until the 0.1 threshold is achieved. If LOLE is less than the 0.1 day per year threshold, negative Pure Capacity will be added until the 0.1 threshold is achieved. The VER of interest will be excluded from the benchmark system. All other VER types will be included. For example, if the wind resource type is being analyzed, only wind will be excluded from the benchmark system.

The capacity calculated is designated in Figure 1**Error! Reference source not found.** as Pure Capacity 1.

Figure 1. Diagram of system without renewable resources.

Next, a LOLE value for all wind generating ~~units~~resources will be determined, repeating the steps described previously. The Pure Capacity value calculated is designated in Figure 2~~Figure 2~~ as Pure Capacity 2.

Figure 2. Diagram of system with renewable resources.

The difference between the results of these two steps is considered the ELCC QCC value of the resources being studied.

$$ELCC\ of\ VER\ (under\ study) = Pure\ Capacity\ 1 - Pure\ Capacity\ 2$$

These processes are repeated to determine QCC for all weather years that are studied. This process is repeated for summer and winter separately.

Zonal shapes have been developed for the LOLE study based on facility locations in each ~~zone~~VER Zone and correlated wind and solar activity with temperatures in those ~~zones~~VER Zones dating back to 1980. The ELCC study will be performed using the synthetic shapes dating back to 1980, which are also used in the LOLE studies. The data provided by the Participants will be used in the establishment of the synthetic shapes and used in the allocation process for establishing the QCC of each VER resource as later outlined in this ~~Business Practice~~BPM.

The PO will conduct the ELCC study by performing probabilistic simulations in a manner that resources in the WRAP Region will be randomly forced out of service during each hour of the study. Each simulation accounts for a different variation of forced outages and load uncertainty for all hours of the year, similar to the LOLE study utilized to establish the ~~Forward Showing~~FS Planning Reserve Margin.

~~4.4.4~~4.3.4 *Determination of ELCC Within VER Zones*

The ELCC study will determine the amount of capacity provided by all VERs (of the specified type, e.g., wind) analyzed in the WRAP Region. The ~~Forward Showing~~FS Program will employ the VER zones for each VER type set forth in this ~~Business Practice~~BPM, as they may be revised from time to time. Each VER of a given type will be assigned to one of the VER zones for that type. ELCC studies will be performed for

each VER zone (and VER type), calculating a total capacity value for the resource of interest in that zone. The capacity calculated for each VER zone will be allocated to VERs of that type in that zone on a pro-rata basis.

4.3.5 Determination of System Wide ELCC and Allocation to Individual VER Zones

To ~~ensure that~~avoid over-accreditation of VERs ~~does not occur,~~ the PO will conduct an ELCC study of the entire WRAP ~~Regions~~Region and calculate a total capacity value for all VERs in the WRAP ~~footprint.~~Region. Additionally, all ESRs in a Subregion will be studied together. After all VER ~~zone~~Zone capacity totals (for each VER type) and the capacity totals of ESRs in each Subregion have been determined, the sum of the VER ~~zone~~Zone and ESR Subregion totals will be compared to the regional VER plus ESR total. If the sum of the ~~zones~~VER Zones and ESR Subregion is greater than the regional total, all VER ~~zone~~Zone and ESR Subregion totals will be scaled down until the totals match the regional total~~.~~. Table 6~~Table 6~~ provides an example of the calculations to determine total VER ~~(in this case: wind)~~ capacity.

- ***Table 6. Example[9] ELCC Study of WRAP Region to Calculate Total Capacity.***

A study of two wind zones and two solar zones reveals the following capacity values for each zone:				
Wind Zone 1	Wind Zone 2	Solar Zone 1	Solar Zone 2	**Total**
1,000 MW	800 MW	700 MW	1,000 MW	**3,500 MW**
A study of the region reveals the following capacity value for the region's wind and solar:				
Regional VERs				
The zones will be recalculated as follows:				
Wind Zone 1	Wind Zone 2	Solar Zone 1	Solar Zone 2	**Total**
1,000 * (3,200/3,500)	800 * (3,200/3,500)	700 * (3,200/3,500)	1,000 * (3,200/3,500)	
914 MW	732 MW	640 MW	914 MW	**3,200 MW**

ESRs, which are discussed in more detail below (Section 4.4), are also included in the system ELCC allocation and study.

[9] These examples are strictly illustrative, and do not set or limit any actual ELCC study results.

~~4.4.5~~4.3.6 *VER Zones for Wind and Solar*

WPP has established separate VER ~~zones~~Zones for wind resources and solar resources, as shown, respectively, in ~~Figure 3~~Figure 3 and ~~-~~Figure 4~~Figure 4~~.

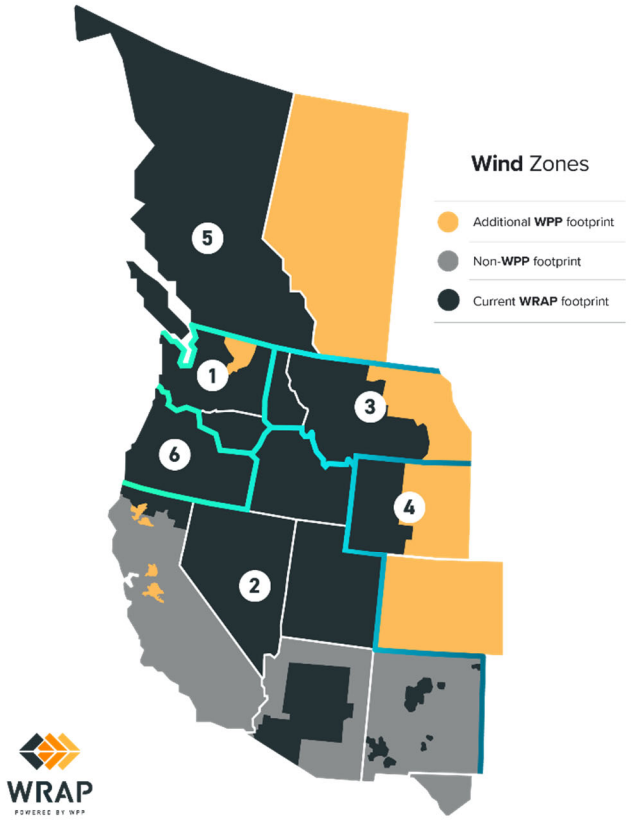

Figure 3. Wind VER Zones

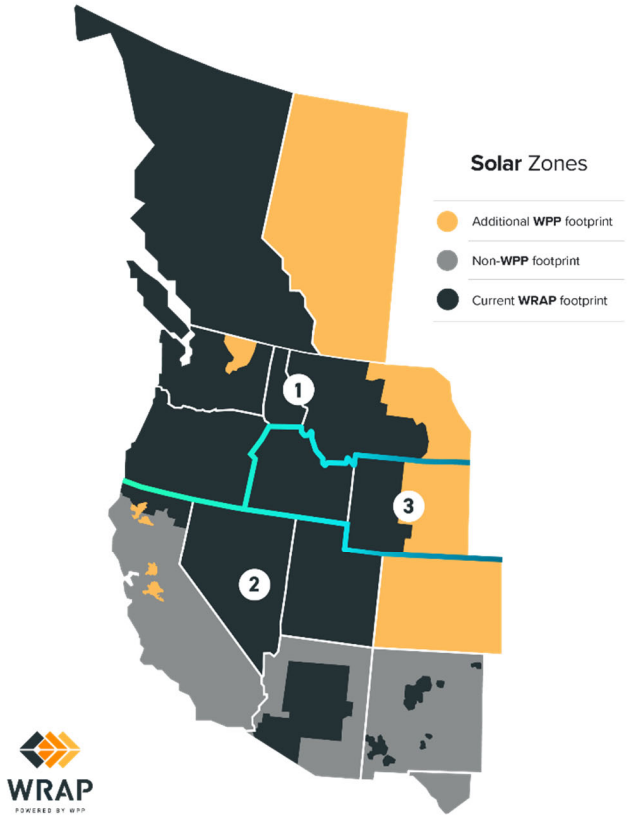

Figure 4. Solar VER Zones

~~4.4.6~~4.3.7 *Allocation of ELCCs VERs*

~~4.4.6.1~~4.3.7.1 Allocation of System Wide ELCC On ~~A~~a Resource Basis

Once the ELCC has been determined for each VER ~~zone on a seasonal basis~~Zone for each Binding Season, two additional calculations must occur. ~~First,~~The first step, which will occur before the system ELCC adjustment, takes the ELCC seasonal values for each VER ~~zone will be converted~~Zone and converts them to a monthly basis for monthly QCC.~~-~~ Monthly QCC values for each ~~zone~~VER Zone will be calculated by shaping the seasonal ELCC value in accordance with aggregate performance of all resources in the VER ~~zone~~Zone during the CCH. Months that have higher resource performance during the CCH will be allocated a higher portion of the ELCC across the ~~season.~~Binding Season. The QCC of each month will average to the seasonal ELCC value. An example is ~~taken from the analysis from the 2022 Assessment.~~given below in Table 7.

Table 7. Example[10] Monthly QCC Calculation for Wind VER ~~Zones~~Zone

-	~~Season~~	~~June~~	~~July~~	~~August~~	~~September~~
~~Wind VER1~~	~~18%~~	~~19%~~	~~22%~~	~~18%~~	~~13%~~
~~Wind VER2~~	~~17%~~	~~18%~~	~~18%~~	~~16%~~	~~16%~~
~~Wind VER3~~	~~13%~~	~~13%~~	~~12%~~	~~13%~~	~~14%~~
~~Wind VER4~~	~~15%~~	~~15%~~	~~16%~~	~~14%~~	~~14%~~
~~Wind VER5~~	~~20%~~	~~18%~~	~~17%~~	~~21%~~	~~22%~~

-		Summer Season			
		June	July	Aug	Sept
Average Production on CCH per month	Calculated from historical performance data from wind in this VER zone on a monthly basis	120MW	95MW	90MW	130MW
Average Production on CCH across season	Calculated from historical performance data from wind in this VER zone on a seasonal basis	104MW			
Monthly Multiplier	Divides each month's production on CCH by the seasonal average	115%	91%	87%	125%
Seasonal ELCC	Value resulting from ELCC study	100MW			
Monthly QCC	Multiplies the monthly multiplier by the seasonal ELCC value	115MW	91MW	87MW	125MW

~~Second, the allocation of resource specific~~The monthly QCC ~~will be calculated from the zonal monthly QCC value. After the total monthly QCC is calculated~~values for each ~~zone~~

[10] These examples are strictly illustrative, and do not set or limit any actual ELCC study results.

(VER Zone are then used to determine the system ELCC value discussed in Step 1), the section above.

The second step, which occurs after the system ELCC adjustment, will allocate the allocationmonthly QCC values to each resource will be calculated based on the individual resource's performance during the CCH.

$$Resource\ ELCC = Montly\ Monthly\ ELCC\ MW * \left(\frac{Resource\ average\ hourly\ net\ power\ output\ on\ top\ 5\%\ of\ net\ load\ hours\ (CCH)}{Zone\ total\ average\ hourly\ net\ power\ output\ on\ top\ 5\%\ of\ net\ load\ hours\ (CCH)}\right)$$

4.4.6.24.3.7.2 QCC Allocations for ResourcesVERs with 3 Years or More of Operational Data

To allocate the ELCC MW to each resource, the PO will utilize the historical hourly data for each resource provided by the Participant. For resources that have at least 3 years of actual historical data, or at least 3 years of engineered data for newer resources, the PO will utilize the most recent 3 years (up to 10 years) of data when determining the resource's average hourly net power output on the top 5% of net load hours (CCHs).

4.4.6.34.3.7.3 QCC Allocations for New ResourcesVERs or ResourcesVERs with less than 3 Years of Operational Data

The PO will utilize the following method for newer resourcesVERs when determining the historical average hourly net power output:

1. No less than three years will be utilized.
2. 1. A Participant (or resource owner) can supply synthesized data if at least 3 years of actual data is not available, using:
   a. Manufacturer's engineering or performance data;

1) ActualNo less than three years will be utilized; and
2) A Participant (or resource owner) can supply synthesized data if at least 3 years of actual data is not available, using:
   b)a) Manufacturer's engineering or performance data and actual weather (preferably from on-site, but not from outside of 50-mile radius); and/or
   c)b) Historical performance of similar resources within a 50-mile radius.
3) If three years of data is not provided by the Participant, either through synthetic data or actual output, the resource will receive an ELCC value equal to the product of a calculated class average ELCC percentage times the nameplate capacity of the resource at issue, subject to an exception, described below, if the

~~resource has been repowered.~~. The PO will use the synthesized wind output shape for the appropriate VER ~~zone~~Zone to determine the class average ELCC percentage.

As actual data is accrued, it will replace synthesized data as it becomes available (e.g., one year of actuals ~~+~~plus two years of synthesized; two years actuals ~~+~~plus one year synthesized, then eventually three years of actuals). Once a new or repowered facility has a full year of operational data the synthesized data for years two (2) and three (3) will be evaluated for reasonableness. If the synthesized data significantly understated or overstated the forecasted generation of the resource, the year 2 and 3 synthesized data will be adjusted by the PO accordingly.

~~4.4.6.4~~4.3.7.4 Determination of ELCC for Future VER Resources

It is understood that as VERs are added to a system, the capacity value provided by all similar VERs as a function of the nameplate value of those resources will decrease. It therefore becomes important for Participants to have an understanding of how VER QCC values may change over time as the penetration of similar VERs increases.

After the QCC values of all existing and near-term planned VERs have been calculated and allocated, additional ELCC studies will be performed to account for future VERs of each type. These additional wind and solar resource amounts will be created by scaling up the number of wind turbines (nameplate capacity) or solar photovoltaic panels in each ~~zone~~VER Zone. The PO will provide an ELCC curve, useful for guidance purposes on a strictly non-binding basis, that can be used to estimate future capacity values for new resources dependent upon the penetration of resources in that ~~zone~~VER Zone.

~~4.5~~4.4 Energy Storage

The QCC for ESRs ~~such as pumped storage facilities or battery storage systems~~ will be determined using the same general ELCC methodology used for wind and solar resources (see ~~the~~Section ~~Qualified Capacity Contribution of Resources section)~~4.3) with any specific differences being highlighted in this section and will be limited to ESRs that have the capability to store energy equal to or greater than the energy output by the ESR over four continuous hours (or longer) of operation. The ELCC study for each Binding Season will have a scope document that details the analysis. ESRs with eight-hour or longer durations are considered Long Duration Energy Storage (Section 4.2).

ESRs will be modeled as energy limited devices that will charge and discharge in accordance with their equipment specifications. ESRs will be modeled to charge and discharge in a ~~'~~preserve ~~reliability'~~reliability mode, which means they will only be discharged to mitigate potential loss of load when there is a lack of other resources available to serve load. The dispatch of ESRs will be assumed for this modeling prupose

to be scheduled during high net load hours. Because of this schedule there may be hours where there is uncertain generator performance and the ESRs may not be ~~avialable~~available to meet reliablity needs. ~~This is further detailed below:~~

~~4.5.1~~4.4.1 *ESR with Four- to Eight-Hour Rating*

Based on the four-hour minimum continuous time duration requirement, four-hour ESR or ESRs with longer duration ratings will receive QCC values based on the four-hour curve for the ESR penetration level of all ESR on the system at the time of the ELCC assessment.

~~4.5.2~~4.4.2 *ESR with ~~Two-Hour~~ Rating Less than Four Hours*

Based on the four-hour minimum continuous time duration requirement, ~~two-hour ESRs would~~ESRs with ratings less than four hours will receive QCC values based on the four-hour curve for the ESR penetration level of all ESRs on the system at the time of the ELCC assessment ~~and~~. For example, two-hour rated ESRs would receive no more than 50% QCC value of a four-hour ESR with the same maximum output.

~~4.5.3~~4.4.3 *Allocation of ELCC for ESRs*

All ESRs in a WRAP defined Subregion will be studied together. All ESRs within a Subregion will receive the average ELCC value of ESRs with a four-hour rating in that Subregion, subject to the limitations outlined in ~~the section ESR with Two Hour Rating.~~Section 4.4.2. To ensure that over-accreditation of ESRs does not occur, ESRs will be included in the ELCC study of all VERs of the WRAP Region and a total combined capacity value for all VERs and ESRs in the WRAP Region will be calculated. After all ESR ~~Sub-regions~~Subregions and VER ~~zone~~Zone capacity totals have been determined, the sum of the VER ~~zone~~Zone and ESR Subregion totals will be compared to the WRAP Region VER total. If the sum of the ~~zones~~ VER Zones and ESR Subregion is greater than the regional total, all VER ~~zone~~Zone and ESR Subregion totals will be scaled down until the totals match the regional total.

4.4.4 Late Registered ESRs

If a Participant seeks to claim capacity from an ESR not registered at the time of the Advance Assessment data request, the Participant may use the late registered resource options (described generally in Section 3.2), choosing one of the following approaches:

1) Demonstrate that the resource was acquired following the Advance Assessment data request due date for the Binding Season in question, in which case the resource will be permitted to use the class average QCC for the ESRs within the Subregion; or
2) Claim a decremented QCC of 70% of the class average for ESRs in the Subregion.

~~4.6~~4.5 Hybrid Facilities

Hybrid Facilities are resources that have at least two different fuels or ~~technologicsat~~technologies at a common location where one of those resources is an ESR. The QCC for Hybrid resources will be determined by applying the appropriate methodology to each component of the facility and summing them and capping the total at the interconnection limit. While hybrid resources are modeled as they would operate in the LOLE study, determining QCC for combined hybrid resource is not performed due to the inability to perform ELCC analysis for similar type resources.

~~4.7~~4.6 Demand Response

~~Demand Response (~~DR~~)~~ can be utilized as a Qualifying Resource if it is greater than 1 MW in aggregate (see Section 3.3) and can be demonstrated to be controllable and dispatchable by the Participant or host utility. DR programs that register as Qualifying Resources will be assigned a seasonal QCC value (one value for each Binding Season) and will need to meet testing criteria and demonstrate load reduction (see Section 3.4.2.3) for a period of up to five continuous hours~~.~~. A DR program may be able to demonstrate load reduction for a period beyond five continuous hours, but reductions of such duration go beyond the typical duration of CCHs in a day, and so would not provide meaningful QCC.[11] Programs that are not able to provide five hours of load reduction will have their load reduction prorated over the course of 5 hours for the determinatoin of QCC value. Participants registering a DR Qualifying Resource must either i) demonstrate that the DR program was not operated historically and has therefore not impacted the historical load information ~~proivded~~provided by the Participant for determination of their P50 load value, or ii) provide historical information about the operations of the DR program such that the load reduction impacts of the DR program can be removed from the historical data prior to determination of the P50 load value.

The QCC value of the DR Qualified Resource is determined by multiplying the maximum load reduction (in ~~MWs~~MW) the resource is capable of sustaining by the number of hours the resource can demonstrate such sustained load reduction capability (up to five hours, maximum) divided by five.

A DR Qualifying Resource will be reflected in the FS Submittal as a capacity resource by submitting it as a 'Resource' in the FS Submittal. As with all resources, the QCC value of

[11] WPP, WRAP Detailed Design, March 2023, p113. Available at: 2023-03-10_WRAP_Draft_Design_Document_FINAL.pdf (westernpowerpool.org)

the DR Qualifying Resource will count toward a Participant meeting its ~~Forward Showing~~FS Capacity Requirement.

If DR does not meet the criteria of a Qualifying Resource, its contribution to the load reduction ~~will~~may be captured in the historical data used to calculate the P50 load in the ~~Forward Showing.~~FS.

4.6.1 New, Expanded, or Late Registered DR Resources

DR programs intended to be used as Qualifying Resources in the first year of operation or expansion of an existing program ~~will program~~or DR programs not registered at the time of the Advance Assessment will be reported at 50% of the expected capability, unless validated by testing the program to 100% of the claimed capability prior to the Binding Season. ~~See the Testing of DR Programs section~~See the section related to DR testing requirements (within Section 3.4.2) for more information.

~~*4.7.1 Testing of DR Programs*~~

~~A Capability Test for a DR program, registered as a Qualifying Resource, will be conducted at least every five years. The Capability Test will be used to confirm the claimed capability of the DR program, as well as the claimed duration of the load reduction (up to five hours). If a DR program fails to achieve the claimed load reduction capability and duration during the Capability Test, the program's QCC will be determined using the tested values instead.~~

~~Testing for new DR programs in their first year of operation will be allowed if the Participant intends to claim QCC of more than 50% of the expected capability. This test will be similar to a Capability Test, but will be conducted outside of the Participant's peak season. Testing outside of the peak season will only be considered a Capability Test during the first year of operation or during the expansion of an existing DR program. An Operational Test shall then be performed during the upcoming FS Binding Season and reported to the PO.~~

~~An Operational Test will be conducted yearly during the Participant's peak season and at a minimum of 50% of the DR program's claimed load reduction capability. The duration of an Operational Test shall be for a minimum of 1 hour.~~

~~4.8~~4.7 Hydro Resources

~~*4.8.1*~~*4.7.1 Storage Hydro (Also see Appendix A – Qualified Capacity Contribution for Storage Hydro Resources~~*Appendix A*~~)*

QCCs for Storage Hydro resources are calculated by the Participant owners and the results are provided to the PO for review, through the provision of the 'results tab' of the workbook. The PO may ask the Participant for information from the Storage Hydro

QCC methodology, subject to limitations described in the Tariff, as part of the verification and validation process. The Storage Hydro QCC methodology is based on the ability of Storage Hydro to maximize output during the CCHs each day of the historical record, subject to operational limitations and non-power constraints of each ~~project~~plant. Limitations include available water in storage and all constraints that restrict the use of the Net Generating Capability. These constraints include, but are not limited to, discharge limits, tailrace and forebay elevation limits, and rate of change limits.

The methodology considers each resource's actual generation output, residual generating capability, water in storage, reservoir levels (if applicable), upstream discharge from ~~cascaded plants~~Cascaded Dual Plants and ~~project~~plant constraints over the most recent 10-year historical period. The QCC of the Storage Hydro resource is determined using a calculation of how much historical actual generation could have been increased during CCHs by increasing generation by utilizing water in storage each day of the historical record, while respecting all operating constraints. The QCC is the monthly average of this hypothetical increased generation during the CCHs, for the same month of the historical record. The resulting QCC is determined as the average contribution to the CCHs for each Winter Season and Summer Season over the previous 10 years. The ~~WPP~~ Storage Hydro QCC Workbook captures the aforementioned Storage Hydro QCC methodology and is available for use by WRAP Participants. If historical data is not available for 10 years, a comparable facility may be utilized or some other reasonable approach that provides similar confidence in the computed QCC may be proposed by the Participant and adopted at the discretion of the WPP. The Participant will provide all required detailed data for the ~~project~~plant.

The detailed Storage Hydro QCC methodology can be found in Appendix A – Qualified Capacity Contribution for Storage Hydro Resources~~Appendix A~~ of this BPM.

~~4.8.2.0~~4.7.1.1 Late Registered Storage Hydro Resources

If a Participant seeks to claim capacity from a Storage Hydro resource not registered at the time of the ~~Advanced~~Advance Assessment ~~Data Request~~data request, the Participant may use the ~~'~~late registered ~~resource'~~resource options, choosing one of the following approaches:

1) Demonstrate that the resource was acquired following the ~~Advanced~~Advance Assessment ~~Data Request~~data request due date for the ~~season~~Binding Season in question and ~~claim~~utilize the ~~average QCC of~~established Storage Hydro ~~resources in the program~~QCC methodology described above, or

2) Claim a ~~'~~decremented ~~QCC'~~QCC of 70% of the average Storage Hydro QCCs in the program. ~~Note that awards of discounted QCC values are indicative of the program having very little information about the late registered Qualified Resource; as such late registered resources receiving discounted QCC values may constitute no more than 10% of the total Forward Showing Capacity Requirement for an individual Participant.~~

~~4.8.3~~4.7.2 *Run of River Hydro*

Run of River Hydro resources will have their QCC determined on the historical performance of the resources during the CCH over the most recent 10-year period. The data provided by the Participant in the ~~Advanced~~Advance Assessment ~~Data Submittal~~data submittal (see *BPM 101 ~~Advanced~~Advance Assessment*) will be used for the determination of QCC~~. If no historical output data is provided for the resource, it cannot receive a QCC value. Other Resources~~.

If less than ten years of historical data is available for use in determining the QCC of a Run of River Hydro plant, the PO will utilize the following method when determining the historical average hourly net power output:

1. No less than three years will be utilized.
2. A Participant (or resource owner) can supply synthesized data if at least 3 years of actual data is not available, using:
    a. Manufacturer's engineering or performance data;
    b. Actual water conditions (preferably from on-site, but not from a different river); or
    c. Historical performance of similar resources on the same river system.
3. If three years of data is not provided by the Participant, either through synthetic data or actual output, the resource cannot receive a QCC value.

As actual data is accrued, it will replace synthesized data as it becomes available (e.g., one year of actuals plus two years of synthesized; two years actuals plus one year synthesized, then eventually three years of actuals). Once a new or repowered facility has a full year of operational data, the synthesized data for years two (2) and three (3) will be evaluated for reasonableness. If the synthesized data significantly understated or overstated the forecasted generation of the resource, the year 2 and 3 synthesized data will be adjusted by the PO accordingly.

4.7.2.1 Late Registered Run of River Hydro Resources

If a Participant seeks to claim capacity from a Run of River Hydro resource not registered at the time of the Advance Assessment data request, the Participant may use the late registered resource options, choosing one of the following approaches:

1) Demonstrate that the resource was acquired following the Advance Assessment data request due date for the Binding Season in question and execute the methodology described above for Run of River Hydro Resources (for validation by the PO), or
2) Claim a decremented QCC of 70% of the average Run of River Hydro QCCs in the program.

4.8 Other Resources

~~4.8.4~~4.8.1 *Customer Resources*

Resources that are generally located on the customer side of the meter can be included in the ~~Forward Showing~~ FS Program. To be eligible as a Qualifying Resource, the customer resource must 1) be controllable and dispatchable by the Participant or host transmission operator~~;~~ and 2) not have already been used to modify the Participant's load forecast (i.e., serving a portion or all of the load not included in load forecast). The resource shall meet testing criteria applicable for resource type~~.~~ and will be awarded a QCC value based on the appropriate methodolgy for the resource type. Customer resources (behind the meter resources) can be aggregated to the 1 MW requirement to be considered a capacity resource, granted that they are in the same BAA, controllable and dispatchable, and visible to the Ops Program.

~~4.8.5 Public Utility Regulatory Policies Act (PURPA) Qualifying Facility Resources~~

4.8.2 Non-Dispatchable, Must Take Resources

For resources that are either i)~~ are~~ not dispatchable; or ii) require the purchaser of energy from the resource to take energy as available from such resource, including but not limited to a qualifying facility as defined under ~~PURPA~~the Public Utility Regulatory Policies Act, the QCC will be determined based on the monthly average performance of such resource during CCH. The Participant will provide ten (10) years of historical hourly dispatch data. This data may be provided ~~in~~within the ~~Advanced~~Advance Assessment ~~Data Submittal~~data submittal (see *BPM 101 ~~Advanced~~Advance Assessement*) or a workbook will be found at an appropriate location on the WPP website that contains the latest set of CCH. The workbook will allow the Participant to calculate the QCC values taking the average of the facility output during the CCH.

4.8.2.1 Late Registered Non-Dispatchable, Must Take Resources

If a Participant seeks to claim capacity from a non-dispatachable, must take resource not registered at the time of the Advance Assessment data request, the Participant will be required to execute the methodology described above for such resource (for validation by the PO).

Appendix A – Qualified Capacity Contribution for Storage Hydro Resources

~~4.9~~5.1 Time Period Approach for Summer and Winter Season Requirements

Storage ~~hydro~~Hydro resources will use a "time period" approach to determine the QCC. A time period approach consists of a historical look-back of the generation output during CCH to determine how much capacity should be expected to be available during high load periods in the future. While this approach is limited to a daily window for determining available capacity, it does establish a common and transparent method for determining the QCC for Storage Hydro Resources.

The following methodology would be used to determine the QCC value using the time period approach described above, and Table A-1 summarizes the resource information required to apply the methodology.:

- For each day found to contain one or more CCHs, the ~~hydro~~Storage Hydro resource will be evaluated to determine the maximum available capacity for each CCH, based on the conditions of the storage associated with the hydro resource on that day.
- For each ~~hydro~~Storage Hydro resource, for each CCH, determine:
    - Maximum generation output during the CCH.
    - Useable water in storage at the end of the CCH.
    - QCC for each hour, which would be the historical generation output plus additional generation for capacity, up to the maximum generation capability (adjusted for reservoir elevation head as applicable), taking into account plant or unit-specific limitations (e.g., units on a common penstock, transformer limitations, etc.) and the resource's Equivalent Demand Forced Outage Rate (EFORd~~.~~).
    - For calendar days with multiple CCHs, the QCC will be limited to the actual historical generation, plus the useable energy in storage over that day.

Non-power operational constraints that limit the use of energy in storage.

Table A-1~~.~~. Resource information required to apply the methodology.

Information Needed	Notes
Reservoir Elevation Range	Min and Max – this may be seasonally adjusted
Reservoir Storage Curve	Indicating volume of water in storage based on the reservoir elevation
Capacity as a Function of Elevation	Plant maximum capacity at a given forebay elevation
CCH Adjusted $EFOF_{CCH}$ or Historical Outage ~~Evalution~~Evaluation Equivalent	Historical forced outage factor
Power as a Function of Discharge	For the "discharge method"
H/K as a Function of Elevation	For the "elevation method"
Hourly Historical Data	– Actual generation – Starting reservoir elevation – Ending reservoir elevation – –

From the information in Table A-1, the hourly values in Table A-2 can be estimated for each CCH:

Table A-2. Hourly values that can be estimated.

Estimated Values	Notes
Actual water in storage	Using the elevation and storage (kcfsh or cmsh) tables
Additional capacity available beyond the actual generation	Subject to forebay elevation restrictions
Cumulative additional generation	The running total of the additional generation claimed in each CCH for the day, used to deplete the elevation of the reservoir to validate the feasibility of using additional capacity in each CCH on each calendar day
Hourly QCC	The sum of the actual generation plus the additional capacity available

The Storage Hydro capacity contribution towards the ~~Forward Showing~~FS Capacity Requirement is calculated by the resource owner as the simple average of the hourly QCC values in each CCH over the ten years studied. These QCC values are averaged over each month in each ~~season~~Binding Season to determine final monthly QCC values.

~~4.9~~5.2 Treatment of Planned Outages

In addition to accounting for forced outages, the UCAP values used in the FS workbooks may (at the Participant's option), be reduced for planned outages. Planned outages that are not included in the UCAP values will need to be planned in a manner similar to thermal resources, meaning those planned outages will be taken from the Participant's surplus capacity in excess to the Participant's ~~Forward Showing~~FS Capacity Requirement.

Table A-3 and Table A-4 below illustrate the QCC calculation over a four-hour consecutive period using the UCAP methodology and the UCAP + planned outages methodology.

Table A-3. Calculating QCC using UCAP = 125 MW.

Consecutive CCHs	Historical Generation	Historical Storage	UCAP (125 MW)	Draft to Maximize Capacity	Storage After Draft	QCC
	MW	MWh	MW	MWh	MWh	MW
1	50	250	125	75	175	125
2	50		125	75	100	125
3	50		125	75	25	125
4	50		125	25	0	75
Storage empty after 25 MW draft				4-hour average		113

Table A-4. Calculating QCC using UCAP + Planned Outages = 100 MW.

Consecutive CCHs	Historical Generation	Historical Storage	UCAP + Planned Outages (100 MW)	Draft to Maximize Capacity	Storage After Draft	QCC
	MW	MWh	MW	MWh	MWh	MW
1	50	250	100	50	200	100
2	50		100	50	150	100
3	50		100	50	100	100
4	50		100	50	50	100
A 25 MW planned outage decreased QCC by 13 MW				4-hour average		100

The four consecutive CCHs in Table A-3 illustrate how the QCC is limited due to insufficient storage. In Table A-4, the UCAP is reduced by a 25 MW planned outage. This reduced capacity requires less draft from storage in CCHs 1-3 to maximize the QCC in those hours. This reduction in draft provides sufficient storage in CCH 4 to maximize the QCC.

For FS purposes, planned outages may be included or excluded in the QCC calculation at the choice of the Participant pursuant to the requirements in ~~section~~Section 16.2.8 of the Tariff.

~~4.9~~5.3 Treatment of Non-Power Constraints

Each Participant is asked to review the methodology and incorporate the specific non-power constraints that are applicable to the individual ~~projects~~plants, thus reducing the QCC value of each plant to a level that is believed to reflect the plants operational capability for the upcoming ~~Forward Showing season..~~Binding Season. This is done through creating additional constraint logic in the spreadsheet that adds current and future non-power constraints to all 10 years' worth of evaluation.

It is expected that Participants will include such non-power constraints that accurately reflect their forecasted QCC capability, to facilitate reliance on Storage Hydro Resource QCC values in the Operations Program and for other purposes.

~~4.9~~5.4 Treatment of Cascaded and Coordinated Hydro Systems

A Cascaded Dual Plant methodology was also developed specifically for cascaded and coordinated hydro systems. For cascaded hydro resources on the same river systems that are operated in a coordinated manner, when determining the QCC, the useable water in storage at the downstream resource could be enhanced by the operations at the upstream resource, thereby maximizing the contribution of the combined cascaded systems. The Cascaded Dual Plant methodology does not attempt to optimize use of the upstream storage to maximize the combined QCC, but it does allow the downstream ~~project~~plant to utilize the discharge from the upstream ~~project~~plant.

~~4.9~~5.5 Form To Complete Storage Hydro Resource QCC

The Hydro QCC Workbook ~~can~~will be completed by the Participant. The workbook will be located at an appropriate location on the WPP website.

WESTERN POWERPOOL

Western Resource Adequacy Program

206 Settlement Pricing

200 – Operations

Revision History

Manual Number	Version	Description	Revised By	Date
206	1.0	Settlement Pricing	Ryan L. Roy	7/18/2023
206	1.1	Settlement Pricing	Ryan L. Roy	8/8/2023

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206 Settlement Pricing

1. Introduction

When a Participant is facing a calculated resource deficiency in an Operating Day, the Operations Program of the Western Resource Adequacy Program (WRAP) requires Participants with surplus resources to sell the deficient Participant energy in bilateral transactions at prices and quantities determined by the Program Administrator and Program Operator as prescribed by the WRAP Tariff. The WRAP Tariff directed transactions are known as Holdback Requirements and Energy Deployments. The Settlement Pricing Business Practice Manual (BPM) provides implementing details and practices regarding the WRAP-required pricing for Energy Deployments and Holdback Requirements, the identification of Applicable Price Indices used in such pricing, and the calculation and posting of settlement quantities and settlement prices.

1.1. Intended Audience

This BPM is intended for WRAP Participants and other interested individuals or entities. This BPM is particularly useful for those individuals that are responsible for their Participant organization's implementation of Holdback Requirement and Energy Deployment transactions, and ensuring that the pricing for those transactions complies with WRAP requirements.

1.2. What You Will Find in This Manual

This BPM consists of sections detailing the WRAP-required pricing for Energy Deployments and Holdback Requirements, the Applicable Price Indices used in such pricing, and the calculation of settlement prices. Related provisions are addressed in other BPMs. This BPM will be paired with *BPM 207 Settlement Process* which covers details such as how to access posted prices, the process for remedying disputed prices, and the process for handling changes in input data etc. In addition, *BPM 204 Holdback Requirement* and *BPM 205 Energy Deployment* provide implementing details on the Tariff rules for determining the seller (surplus Participant), the buyer (deficient Participant), and the transaction quantity for Holdback Requirements and for Energy Deployments. *BPM 102 Reliability Metric Setting* defines the two Subregions of the WRAP Region.

1.3. Purpose

The purpose of this BPM is to provide implementation details of the settlement pricing for Holdback Requirement and Energy Deployment transactions in the WRAP.

1.4. Definitions

All capitalized terms that are not otherwise defined in this BPM have the meaning set forth in the Tariff. Terms that are not defined in the Tariff are defined here:

Declined Energy: The amount of Holdback Requirement not affirmatively requested by a deficient Participant.

Final Settlement Revenue: The revenue paid by the deficient Participant to the surplus Participant for any hour of a given day where the deficient Participant was responsible for Holdback Requirement or claimed an Energy Deployment.

Heavy Load Hour (HLH): The hours from hour ending 7 through hour ending 22, Monday through Saturday, excluding national holidays.

Light Load Hour (LLH): The hours from hour ending 1 thru hour ending 6 and from hour ending 23 thru hour ending 24, Monday through Saturday, and all hours of the day on Sundays and national holidays.

Possible Block Sale Revenue: The revenue that would have been realized had the surplus Participant sold a standard block with a MW value equal to the MW value in the hour with the highest sum of such Participant's Holdback Requirements obligated to all deficient Participants.

Unheld Energy: A quantity of energy that was not part of a Holdback Requirement, but that was part of a block that could have been sold in a day ahead market had the Participant not been subject to a Holdback Requirement.

2. Background

When one surplus Participant provides a Holdback Requirement for the benefit of a deficient Participant, or provides Energy Deployment to a deficient Participant, the sale is a bilateral transaction between the two parties, but the pricing is dictated by the WRAP Tariff and calculated by the Program Administrator. Under the WRAP Tariff it is possible for a surplus Participant to provide a Holdback Requirement for a deficient Participant that does not result in an Energy Deployment to that deficient Participant, because the deficient Participant will not receive an Energy Deployment unless it expressly confirms on the Operating Day that it still requires the Energy Deployment. The WRAP Tariff thus provides for calculation of separate prices to compensate for Holdback Requirement and Energy Deployment, along with separate calculations of i) the amounts to be paid and received as compensation for Holdback Requirement; and ii) the amounts to be paid and received as compensation for Energy Deployment. The WRAP Tariff-prescribed pricing also includes a Make Whole Adjustment component to

compensate for a specific type of opportunity cost. This BPM also provides certain implementing details that the Program Administrator or Program Operator will use to calculate the settlement prices and quantities.

BPM 207 describes in detail the various settlement processes including but not limited to the mechanics of posting settlement information, invoicing, the process for addressing changes to or errors in published prices, missing data, timing requirements of the bilateral settlement process and changing the Applicable Index Price.

3. Applicable Index Prices

Two Subregions have been established within the WRAP Region: 1) the Northwest Subregion, and 2) the East and Southwest Subregion, as defined and delineated in *BPM 102 Reliability Metric Setting*. Each Subregion will have a Day-Ahead Applicable Index Price and a Real-Time Applicable Index Price. The Applicable Index Prices are intended to be a fair representation of the price of energy in a given Subregion and were chosen based on a reasonable assumption that they could be utilized to facilitate an efficient and timely settlement process. If necessary the Applicable Index Prices can be changed as describe in *BPM 207 Settlement Process.*

Northwest Subregion

The Day-Ahead Applicable Index Price is the ICE Day-Ahead (DA) Mid-Columbia (Mid-C) Index.

The Real-Time Applicable Index Price is the Powerdex real-time Mid-Columbia Index.

East and Southwest Subregion

The Day-Ahead Applicable Index Price is the ICE DA Palo Verde (PV) Index.

The Real-Time Applicable Index Price is the average of the four fifteen-minute market (FMM) results for the Palo Verde intertie in the California Independent System Operator (CAISO) market (FMM Scheduling Point / Tie Combination locational marginal price; Node: PALOVRDE_ASR-APND; Tie: PVWEST).

4. Settlement Pricing Overview and Components

The pricing for Holdback Requirements and Energy Deployments both start with calculation of the Total Settlement Price. The separate prices for Holdback Requirements and for Energy Deployments are then derived (at least in part) from the Total Settlement Price. The price for Holdback Requirements is known as the Holdback Settlement Price. The price for Energy Deployments is known as the Energy Declined Settlement Price. The following subsections show the calculation of the Total Settlement

Price (Section 4.1), the Holdback Settlement Price (Section 4.2), and the Energy Declined Settlement Price (Section 4.3).

Section 4.4 shows how the pricing for Holdback Requirements is applied to the transaction quantities for Holdback Requirements, and how the pricing for Energy Deployments is applied to the transaction quantities for Energy Deployments.

Section 4.5 of this BPM shows how to calculate a Make Whole Adjustment, which is applied if the settlement revenue and the estimated value of the Holdback Requirement not deployed (the sum of the Unheld Energy and Energy Declined) is less than the estimated revenues the surplus Participant would have received had it not been subject to a Holdback Requirement. In other words, the Make Whole Adjustment ensures a surplus Participant is compensated in an amount that is no less than the revenue that it could have made had it sold in a day ahead market the full block that was bifurcated to meet the Holdback Requirement. The Make Whole Adjustment includes both pricing elements and quantity elements, since it is triggered by revenue levels, and results in a minimum revenue amount. As the Make Whole Adjustment compensates a surplus Participant for taking on a Holdback Requirement, it is applied to any surplus Participant that takes on a Holdback Requirement, whether or not it also provides an Energy Deployment.

Section 4.6 of this BPM shows how to allocate the Make Whole Adjustment when there is a single surplus Participant with a Holdback Requirement that is being allocated to multiple deficient Participants. The surplus Participant with the Holdback Requirement should receive a Make Whole Adjustment equal to their maximum total Holdback Requirement. In such cases, the obligation for providing the Make Whole Adjustment will be shared among multiple Particpants.

If and when a Participant voluntarily takes on a Holdback Requirement or Energy Deployment (meaning that the WRAP Tariff does not require the Participant to take on the Holdback Requirement or Energy Deployment), the pricing will be the same as described in this BPM for Holdback Requirements and Energy Deployments that are required by the WRAP Tariff.

A daily settlement reflecting Holdback Requirements and Energy Deployments between two Participants will be calculated any time a deficient Participant has requested holdback resulting in a Holdback Requirement for another Participant.

4.1. Total Settlement Price

The Total Settlement Price is based on a Subregion index price, shaped hourly to reflect changes in energy/capacity value from hour to hour, includes a 10% adder, and will not exceed $2,000/MWh or be lower than $0/MWh. The Total Settlement Price is determined in accordance with the following formula:

Total Settlement Price = Maximum of (Minimum of (Hourly Shaping Factor × Day-Ahead Applicable Index Price × 110%, 2000 $/MWh), 0)

where:

Day-Ahead Applicable Index Price is the Day-Ahead peak/off-peak ICE Index price specified above for the Subregion applicable to the location of the delivering entity, applicable to the day and hour of the energy delivery (assuming that the surplus and deficient Participants are in the same Subregion; if not, see Section 4.8). If donated transmission was used to facilitate holdback, the Day-Ahead Applicable Index Price is the higher of the two subregional Day-Ahead index prices for that portion of the transaction.

And where:

Hourly Shaping Factor is derived using the System Marginal Energy Component of the Locational Marginal Price, as deinfed in the CAISO tariff, which price component is the same at all locations in the CAISO energy market as described generally below and more fully in the CAISO Business Practice Manual for Market Instruments, Section P.2 Maximum Import Bid Price Calculation, located here: https://bpmcm.caiso.com/Pages/BPMDetails.aspx?BPM=Market%20Instruments. Specifically, the Hourly Shaping Factor uses the most recent High-Priced Day for the current season, defined as a day in which at least one hour has a system marginal energy cost ("SMEC") greater than $200/MWh, and is calculated as follows:

Hourly Shaping Factor = 1 + {[CAISO Hourly Day-Ahead SMEC – CAISO Average Day-Ahead SMEC (on- or off-peak hours)] / [CAISO Average Day-Ahead SMEC (on- or off-peak hours)]}

The Hourly Shaping Factor is published by the CAISO and can be found on their Open Access Same-Time Information System (OASIS) located here: http://oasis.caiso.com/mrioasis/logon.do using the following navigation: Prices -> Energy Prices -> Hourly Energy Price Shaping Factor.

4.2. Holdback Settlement Price

The Holdback Settlement Price is the Energy Declined Settlement Price subtracted from the Total Settlement Price.

Holdback Settlement Price =
Total Settlement Price - Energy Declined Settlement Price

4.3. Energy Declined Settlement Price

The Energy Declined Settlement Price is the minimum of (i) 0.80 multiplied by the Total Settlement Price, or (ii) the Real-Time Applicable Index Price for the hour. This price is used both as the price paid by the deficient Participant for energy delivered and as the credit the deficient Participant receives towards the Make Whole Adjustment for any of the surplus Participant's Holdback Requirement that was not delivered. It is termed Energy Declined Settlement Price because the calculation of settlement prices is from the perspective of the surplus or selling Participant.

Energy Declined Settlement Price =
*Minimum of (0.8*Total Settlement Price, Real-Time Applicable Index Price)*

4.4. Application of Pricing and Quantities for Holdback Requirements and Energy Deployment Transactions

A surplus Participant assigned a Holdback Requirement on a Preschedule Day for any hour of an Operating Day shall be paid the Holdback Settlement Price multiplied by the MW quantity of the Holdback Requirement. A surplus Participant that provides energy to a deficient Participant pursuant to an Energy Deployment shall be paid the Energy Declined Settlement Price multiplied by the MWh of energy provided to the deficient Participant. A surplus Participant assigned a Holdback Requirement also shall be paid, when applicable, a Make Whole Adjustment (see Section 4.5).

A Participant that had a negative Sharing Calculation for any hour of an Operating Day (a deficient Participant) and confirmed to the Program Administrator its need for the Holdback Requirement, which was incorporated in the calculation of Holdback Requirements of any surplus Participants for such hour, determined as of the Preschedule Day, shall pay the Holdback Settlement Price multiplied by the MW quantity of such negative Sharing Calculation. Such a deficient Participant shall also pay the Energy Declined Settlement Price multiplied by the MW quantity deployed. In addition, any Participant that had a negative Sharing Calculation and confirmed to the Program Administrator its need for the Holdback Requirement, that was incorporated in the calculation of a Holdback Requirement shall contribute to the payment of the Make Whole Adjustment based on its negative Sharing Calculation.

Final Settlement Revenue =
*(Holdback Settlement Price * MW of holdback)*
*+(Energy Declined Settlement Price * MW energy deployed)*

4.5. Make Whole Adjustment

The Make Whole Adjustment is a single value calculated on a daily basis applied in the event that the settlement revenue and the estimated value of the Unheld Energy and Energy Declined for a given day is less than the estimated revenues the surplus Participant would have received had the surplus Participant not been subject to a Holdback Requirement and had sold a Day-Ahead block of energy with a MW value equal to the maximum amount of Holdback Requirement for the hours in the block. If the Holdback Requirement occurs on a HLH the Possible Block Sale Revenue will be calculated using the peak Day-Ahead Applicable Index Price. If the Holdback Requirement occurs on a LLH the Possible Block Sale Revenue will be calculated using the off-peak Day-Ahead Applicable Index Price. The Make Whole Adjustment is determined as follows:

Make Whole Adjustment (when applicable) =

Possible Block Sale Revenue
- Final Settlement Revenue
- Real-Time Value of Declined Energy
- Real-Time Value of Unheld Energy

Where:

Real-Time Value of Declined Energy = Energy Declined × Energy Declined Settlement Price

Provided that Declined Energy is only applicable to those hours where there was a positive Holdback Requirement.

And where:

Real-Time Value of Unheld Energy = (Maximum Holdback MW in Block of Energy – Holdback MW Requested) × Real-Time Applicable Index Price

Provided that the calculation of Unheld Energy is only applicable to those hours where there was not a Holdback Requirement and will be calculated for all remaining hours in the heavy load period if the Holdback Requirement is in the Heavy Load Hours or for all remaining hours in the light load period if the Holdback Requirement is in the Light Load Hours.

For which purpose:

Real-Time Applicable Index Price is the real-time index price above for the Subregion applicable to the location of the surplus Participant, applicable to the day and hour of the energy delivery (assuming the surplus and deficient Participants are in the same Subregion; if not, see Section 4.8);

And Block of Energy means a transactable amount of MWs having a set number of hours corresponding to either the Light Load Hours or Heavy Load Hours where the MW amount is the same in all hours and equal to the maximum amount of the Holdback Requirement.

The Make Whole Adjustment can mathematically result in a negative value which might be interpeted to mean that the surplus Participant would be making a payment to the deficient Participant. The Make Whole Adjustment is intended to ensure the surplus Participant is made whole for lost opportunity cost so in the event the result of the calculation is less than or equal to zero there will be no Make Whole Adjustment. The Make Whole Adjustment will be calculated for each day on a regular cadence.

4.6. Allocation of Holdback Settlement to Multiple Participants

Any Participant having a Holdback Requirement that is allocated to multiple deficient Participants shall have their Possible Block Sale Revenue calculated based on the MW amount in the hour with their largest Holdback Requirement.

To determine how much of the holdback MW used to derive the Possible Block Sale Revenue is attributable to each deficient Participant receiving an allocation of the Holdback Requirement the following methodology will be utilized.

1. Each deficient Participant's maximum allocation of the Holdback Requirement will be organized into tranches where the portion of the total Make Whole Adjustment attributable to each tranche is separately calculated and allocated to the Participants claiming the Holdback Requirement MW in each tranche.

2. A deficient Participant's portion of the Make Whole Adjustment attributable to the MW in each tranche will be allocated based on the following:

    a. On hours where there is a Holdback Requirement those Participants receiving the allocation will be responsible for the settlement associated with that holdback MW amount.

    b. On hours where there is no Holdback Requirement the settlement associated with the MW amount used to calculated the Possible Block Sale

Revenue will be split equally to those Participants with Holdback Requirement MW in the tranche.

3. The total Make Whole Adjustment is derived by calculating the Make Whole Adjustment attributable to the Holdback Requirement MW in the first tranche, allocating the resulting adjustment value to Participants in the first tranche, increasing the Holdback Requirement MW for those Participants in the second tranche, recalculating the Make Whole Adjustment, and allocating the delta in the Make Whole Adjustment from the previous calculation to each Particpant in the second tranche equally. This continues until there are no more tranches to process.

The Real-Time Value of Declined Energy will be credited to the Participant that declined the energy delivery.

The Real-Time Value of Unheld Energy will be credited to each Participant receiving holdback based on the amount of MW they are obligated for in the calculation of Possible Block Sale Revenue.

The sum of the Make Whole Adjustment obligation allocated to each Participant shall always equal the Make Whole Adjustment that would have been calculated between a single surplus Participant and a single deficient Participant.

An example is provided in the Settlement Pricing Examples document which is posted on the WPP website.

4.7. Transmission Service

The WRAP Tariff does not separately address pricing for transmission service used in WRAP transactions in which the surplus Participant and deficient Participant are in the same Subregion. Participants are individually responsible for the cost of the transmission to deliver to a point (when such Participant is surplus) or take receipt at a point (when such Participant is deficient). These costs will not be included in the WRAP Tariff defined settlement.

4.8. Settlement Pricing for Subregions

Settlement prices recognize pricing differences among Subregions. Where the surplus Participant and deficient Participant are located in the same Subregion, the Applicable Index Price shall be the price index specified above for that Subregion. Where the surplus Participant and defcient Participant are located in different Subregions, the following components of the settlement price calculation will be calculated using the Applicable Price Index for the Subregion that has the higher index price: (i) Possible

Block Sale Revenue; (ii) Total Settlement Price; (iii) Energy Declined Settlement Price; and (iv) Real-Time Value of Unheld Energy. When there are only two Participants there is no explicit settlement for tranmission as the surplus Participant receives the higher of the two Subregions' Applicable Index Price. If a third Participant is involved by providing transmission service rights between Subregions, the Participant that provided holdback or Energy Deployment shall receive the settlement price of the Subregion from which the Holdback Requirement or Energy Deployment was sourced, and the Participant that provided Subregion to Subregion transmission service rights pursuant to the WRAP Tariff shall receive the difference in the Total Settlement Price between the Subregion where the holdback was sourced and the Subregion where the energy was delivered, or zero, whichever is greater.

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WESTERN POWERPOOL

Western Resource Adequacy Program

206 Settlement Pricing

200 – Operations

Revision History

Manual Number	Version	Description	Revised By	Date

Table of Contents

206 Settlement Pricing

1. Introduction

~~The Operations Program of the Western Resource Adequacy Program (WRAP) allows~~When a Participant is facing a calculated resource deficiency in an Operating Day ~~to require~~, the Operations Program of the Western Resource Adequacy Program (WRAP) requires Participants with surplus resources to sell the ~~deficit~~ deficient Participant energy in bilateral transactions at prices and quantities determined by the Program Administrator and Program Operator as prescribed by the WRAP Tariff. The WRAP Tariff directed transactions are known as Holdback Requirements and Energy Deployments. The Settlement Pricing Business Practice Manual (BPM) provides implementing details and practices regarding the WRAP-required pricing for Energy Deployments and Holdback Requirements, the identification of Applicable Price Indices used in such pricing, and the calculation and posting of settlement quantities and settlement prices.

1.1. Intended Audience

This BPM is intended for WRAP Participants and other interested individuals or entities. This BPM is particularly useful for those individuals that are responsible for their Participant organization's implementation of Holdback Requirement and Energy Deployment transactions, and ensuring that the pricing for those transactions complies with WRAP requirements.

1.2. What You Will Find in This Manual

This BPM consists of sections detailing the WRAP-required pricing for Energy Deployments and Holdback Requirements, the Applicable Price Indices used in such pricing, and the calculation of settlement prices. Related provisions are addressed in other BPMs. This BPM will be paired with *BPM 207 Settlement Process* which covers details such as how to access posted prices, the process for remedying disputed prices, and the process for handling changes in input data etc. In ~~particular~~addition, *BPM 204 Holdback Requirement* and *BPM 205 Energy Deployment* provide implementing details on the Tariff rules for determining the seller~~,~~ (surplus Participant), the buyer~~,~~ (deficient Participant), and the transaction quantity for Holdback Requirements and for Energy Deployments. *BPM 102 Reliability Metric Setting* defines the two Subregions of the WRAP Region.

1.3. Purpose

~~To~~The purpose of this BPM is to provide ~~implementing~~implementation details of the settlement pricing for Holdback Requirement and Energy Deployment transactions in the WRAP.

1.4. Definitions

All capitalized terms that are not otherwise defined in this BPM have the meaning set forth in the Tariff. Terms that are not defined in the Tariff are defined here:

Declined Energy: The amount of Holdback Requirement not affirmatively requested by a deficient Participant.

Final Settlement Revenue: The revenue paid by the deficient Participant to the surplus Participant for any hour of a given day where the deficient Participant was responsible for Holdback Requirement or claimed an Energy Deployment.

Heavy Load Hour (HLH): The hours from hour ending 7 through hour ending 22, Monday through Saturday, excluding national holidays.

Light Load Hour (LLH): The hours from hour ending 1 thru hour ending 6 and from hour ending 23 thru hour ending 24, Monday through Saturday, and all hours of the day on Sundays and national holidays.

Possible Block Sale Revenue: The revenue that would have been realized had the surplus Participant sold a standard block with a MW value equal to the MW value in the hour with the highest sum of such Participant's Holdback Requirements obligated to all deficient Participants.

Unheld Energy: A quantity of energy that was not part of a Holdback Requirement, but that was part of a block that could have been sold in a day ahead market had the Participant not been subject to a Holdback Requirement.

2. Background

When one surplus Participant provides a Holdback Requirement for the benefit of ~~another~~a deficient Participant, or provides Energy Deployment to ~~another~~a deficient Participant, the sale is a bilateral transaction between the two parties, but the pricing is ~~as~~ dictated by the WRAP Tariff and calculated by the Program Administrator. Under the WRAP Tariff~~,~~ it is possible for a surplus Participant to provide a Holdback Requirement for a deficient Participant that does not result in an Energy Deployment to that deficient Participant, because the deficient Participant will not receive an Energy Deployment unless it expressly confirms on the Operating Day that it still requires the Energy Deployment. The WRAP Tariff thus provides for calculation of separate prices to compensate for Holdback Requirement and Energy Deployment, along with separate calculations of i) the amounts to be paid and received as compensation for Holdback Requirement; and ii) the amounts to be paid and received as compensation for Energy Deployment. The WRAP Tariff-prescribed pricing also includes a Make Whole

Adjustment component to compensate for a specific type of opportunity cost. This BPM also provides certain implementing details that the Program Administrator or Program Operator will use to calculate the settlement prices and quantities.

BPM 207 describes in detail the various settlement processes including but not limited to the mechanics of posting settlement information, invoicing, the process for addressing changes to or errors in published prices, missing data, timing requirements of the bilateral settlement process and changing the Applicable Index Price.

3. Applicable Index Prices

Two Subregions have been established within the WRAP Region: 1) the Northwest Subregion, and 2) the East and Southwest Subregion, as defined and delineated in *BPM 102 Reliability Metric Setting*. Each Subregion will have a Day-Ahead Applicable Index Price and a Real-Time Applicable Index Price. The Applicable Index Prices are intended to be a fair representation of the price of energy in a given Subregion and were chosen based on a reasonable assumption that they could be utilized to facilitate an efficient and timely settlement process. If necessary the Applicable Index Prices can be changed as describe in *BPM 207 Settlement Process.*

Northwest Subregion

The Day-Ahead Applicable Index Price is the ICE Day-Ahead (DA) Mid-Columbia (Mid-C) Index.

The Real-Time Applicable Index Price is the Powerdex real-time Mid-Columbia Index.

East and Southwest Subregion

The Day-Ahead Applicable Index Price is the ICE DA Palo Verde (PV) Index.

The Real-Time Applicable Index Price is the average of the four fifteen-minute ~~(FMM)~~ market (FMM) results for the Palo Verde intertie in the California Independent System Operator (CAISO) market (FMM Scheduling Point / Tie Combination locational marginal price; Node: PALOVRDE_ASR-APND; Tie: PVWEST).

4. Settlement Pricing Overview and Components

The pricing for Holdback Requirements and Energy Deployments both start with calculation of ~~a~~the Total Settlement Price. The separate prices for Holdback Requirements and for Energy Deployments are then derived (at least in part) from the Total Settlement Price. The price for Holdback Requirements is known as the Holdback Settlement Price. The price for Energy Deployments is known as the Energy Declined Settlement Price. The following subsections show the calculation of the Total Settlement

Price (Section 4.1), the Holdback Settlement Price (Section 4.2), and the Energy Declined Settlement Price (Section 4.3).

Section 4.4 ~~show~~shows how the pricing for Holdback Requirements is applied to the transaction quantities for Holdback Requirements, and how the pricing for Energy Deployments is applied to the transaction quantities for Energy Deployments.

Section 4.5 of this BPM shows how to calculate a Make Whole Adjustment~~-~~, which is applied if the settlement revenue and the estimated value of the Holdback Requirement not deployed (the sum of the Unheld Energy and Energy Declined) is less than the estimated revenues the ~~seller~~surplus Participant would have received had it not been subject to a Holdback Requirement. In other words, the Make Whole Adjustment ensures a surplus Participant is compensated in an amount that is no less than the revenue that it could have made had it sold in a day ahead market the full block that was bifurcated to meet the Holdback Requirement. The Make Whole Adjustment includes both pricing elements and quantity elements, since it is triggered by revenue levels, and results in a minimum revenue amount. As the Make Whole Adjustment compensates a ~~seller~~surplus Participant for taking on a Holdback Requirement, it is applied to any ~~seller~~surplus Participant that takes on a Holdback Requirement, whether or not it also provides an Energy Deployment.

Section 4.6 of this BPM shows how to allocate the Make Whole Adjustment when there is a single surplus Participant with a Holdback Requirement that is being allocated to multiple ~~deficit~~deficient Participants. The surplus Participant with the Holdback Requirement should receive a Make Whole Adjustment equal to their maximum total Holdback Requirement. ~~The~~In such cases, the obligation for providing the Make Whole Adjustment ~~can~~will be shared among multiple Particpants.

If and when a Participant voluntarily takes on a Holdback Requirement or Energy Deployment (meaning that the WRAP Tariff does not require the Participant to take on the Holdback Requirement or Energy Deployment), the pricing will be the same as described in this BPM for Holdback Requirements and Energy Deployments that are required by the WRAP Tariff.

A daily settlement reflecting Holdback Requirements and Energy Deployments between two Participants will be calculated any time ~~that~~ a deficient Participant has requested holdback resulting in a Holdback Requirement for another Participant.

4.1. Total Settlement Price

The Total Settlement Price is based on a Subregion index price, ~~is~~ shaped hourly to reflect changes in energy/capacity value from hour to hour, includes a 10% adder, and will not exceed $2,000/MWh or be lower than $0/MWh. The Total Settlement Price is determined in accordance with the following formula:

Total Settlement Price = Maximum of (Minimum of (Hourly Shaping Factor × Day-Ahead Applicable Index Price × 110%, 2000 $/MWh), 0)

where:

~~Hourly Shaping Factor is derived using Day-Ahead prices in the CAISO energy market. Specifically, the Hourly Shaping Factor uses the most recent High-Priced Day for the relevant season, defined as a day in which at least one hour has a system marginal energy cost ("SMEC") greater than $200/MWh, and is calculated as follows:~~

~~***1 + {[CAISO Hourly Day-Ahead SMEC – CAISO Average Day-Ahead SMEC (on- or off-peak hours)] / [CAISO Average Day-Ahead SMEC (on- or off-peak hours)]}***~~

~~And where:~~

Day-Ahead Applicable Index Price is the Day-Ahead peak/off-peak ICE Index price specified above for the Subregion applicable to the location of the delivering entity, applicable to the day and hour of the energy delivery~~.~~ (assuming that the surplus and deficient Participants are in the same Subregion; if not, see Section 4.8). If donated transmission was used to facilitate holdback, the Day-Ahead Applicable Index Price is the higher of the two subregional Day-Ahead index prices for that portion of the transaction.

And where:

Hourly Shaping Factor is derived using the System Marginal Energy Component of the Locational Marginal Price, as deinfed in the CAISO tariff, which price component is the same at all locations in the CAISO energy market as described generally below and more fully in the CAISO Business Practice Manual for Market Instruments, Section P.2 Maximum Import Bid Price Calculation, located here: https://bpmcm.caiso.com/Pages/BPMDetails.aspx?BPM=Market%20Instruments. Specifically, the Hourly Shaping Factor uses the most recent High-Priced Day for the current season, defined as a day in which at least one hour has a system marginal energy cost ("SMEC") greater than $200/MWh, and is calculated as follows:

Hourly Shaping Factor = 1 + {[CAISO Hourly Day-Ahead SMEC – CAISO Average Day-Ahead SMEC (on- or off-peak hours)] / [CAISO Average Day-Ahead SMEC (on- or off-peak hours)]}

The Hourly Shaping Factor is published by the CAISO and can be found on their Open Access Same-Time Information System (OASIS) located here: http://oasis.caiso.com/mrioasis/logon.do using the following navigation: Prices -> Energy Prices -> Hourly Energy Price Shaping Factor.

4.2. Holdback Settlement Price

The Holdback Settlement Price is the ~~Total Settlement Price minus the~~ Energy Declined Settlement Price subtracted from the Total Settlement Price.

Holdback Settlement Price =
Total Settlement Price - Energy Declined Settlement Price

4.3. Energy Declined Settlement Price

The Energy Declined Settlement Price is the ~~lesser~~minimum of (i) 0.80 ~~times~~multiplied by the Total Settlement Price, or (ii) the Real-Time Applicable Index Price for the hour. This price is used both as the price paid by the deficient Participant for energy delivered and as the credit the deficient Participant receives towards the Make Whole Adjustment for any of the surplus Participant's Holdback Requirement that was not delivered. It is termed Energy Declined Settlement Price because the calculation of settlement prices is from the perspective of the surplus or selling Participant.

Energy Declined Settlement Price =
Minimum of (0.8*Total Settlement Price, Real-Time Applicable Index Price)

4.4. Application of Pricing and Quantities for Holdback Requirements and Energy Deployment Transactions

A surplus Participant assigned a Holdback Requirement on a Preschedule Day for any hour of an Operating Day shall be paid the Holdback Settlement Price ~~times~~multiplied by the MW quantity of the Holdback Requirement. A surplus Participant that provides energy to ~~another~~a deficient Participant pursuant to an Energy Deployment shall be paid the Energy Declined Settlement Price ~~times~~multiplied by the MWh of energy provided to ~~such other~~the deficient Participant~~, and its total payments shall be reduced by the Energy Declined Settlement Price times the MWh of energy that would have been provided under a Holdback Requirement but were declined by the other Participant.~~ A surplus Participant assigned a Holdback Requirement also shall be paid, when applicable, a Make Whole Adjustment~~.~~ (see Section 4.5).

A Participant that had a negative Sharing ~~Requirement~~Calculation for any hour of an Operating Day (a deficient Participant) and confirmed to the Program Administrator its need for the Holdback Requirement, which was incorporated in the calculation of Holdback Requirements of any surplus Participants for such hour, determined as of the Preschedule Day, shall pay the Holdback Settlement Price ~~times~~multiplied by the MW quantity of such negative Sharing ~~Requirement.~~Calculation. Such a deficient Participant shall also pay the Energy Declined Settlement Price multiplied by the MW quantity deployed. In addition, any Participant that had a negative Sharing ~~Requirement~~Calculation and confirmed to the Program Administrator its need for the Holdback Requirement, that was incorporated in the calculation of a Holdback Requirement shall contribute to the payment of the Make Whole Adjustment based on its negative Sharing Calculation. ~~A Participant that declines energy that would have been provided under a Holdback Requirement shall be credited the Energy Declined Settlement Price times the MWh of energy declined by such Participant.~~

Final Settlement Revenue =
(Holdback Settlement Price * MW of holdback)
+(Energy Declined Settlement Price * MW energy deployed)

4.5. Make Whole Adjustment

The Make Whole Adjustment ~~is~~is a single value calculated on a daily basis applied in the event that the settlement revenue and the estimated value of the ~~non-dispatched energy~~ Unheld Energy and Energy Declined for a given day is less than the estimated revenues the ~~selling~~surplus Participant would have received had ~~such~~the surplus Participant not been subject to a Holdback Requirement and had sold a Day-Ahead block of energy with a MW value equal to the maximum amount of Holdback Requirement for the hours in the block. If the Holdback Requirement occurs on a HLH the Possible Block Sale Revenue will be calculated using the peak Day-Ahead Applicable Index Price. If the Holdback Requirement occurs on a LLH the Possible Block Sale Revenue will be calculated using the off-peak Day-Ahead Applicable Index Price. The Make Whole Adjustment is determined as follows:

Make Whole Adjustment (when applicable) =

Possible Block Sale Revenue
- Final Settlement Revenue
- Real-Time Value of Declined Energy
- Real-Time Value of Unheld Energy

Where:

Real-Time Value of Declined Energy = Energy Declined × Energy Declined Settlement Price

Provided that Declined Energy is only applicable to those hours where there was a positive Holdback Requirement.

And where:

Real-Time Value of Unheld Energy = (Maximum Holdback MW in Block of Energy – Holdback MW Requested) × Real-Time Applicable Index Price

Provided that the calculation of Unheld Energy is only applicable to those hours where there was not a Holdback Requirement and will be calculated for all remaining hours in the heavy load period if the Holdback Requirement is in the Heavy Load Hours or for all remaining hours in the light load period if the Holdback Requirement is in the Light Load Hours.

For which purpose:

Real-Time Applicable Index Price is the real-time index price above for the Subregion applicable to the location of the ~~delivering entity~~surplus Participant, applicable to the day and hour of the energy delivery~~.~~ (assuming the surplus and deficient Participants are in the same Subregion; if not, see Section 4.8);

And Block of Energy means a transactable amount of MWs having a set number of hours corresponding to either the Light Load Hours or Heavy Load Hours where the MW amount is the same in all hours and equal to the maximum amount of the Holdback Requirement.

The Make Whole Adjustment can mathematically result in a negative value which might be interpeted to mean that the surplus Participant would be making a payment to the deficient Participant. The Make Whole Adjustment is intended to ensure the surplus Participant is made whole for lost opportunity cost so in the event the result of the calculation is less than or equal to zero there will be no Make Whole Adjustment. The Make Whole Adjustment will be calculated for each day on a regular cadence.

4.6. Allocation of Holdback Settlement to Multiple Participants

Any Participant having a Holdback Requirement that is allocated to multiple deficient Participants shall have their Possible Block Sale Revenue calculated based on the MW amount in the hour with their largest Holdback Requirement.

~~For example:~~

~~If Participant A has a 15 MW Holdback Requirement on hour ending 16 allocated 5 MWs to Participant B and 10 MWs to Participant C and an 11 MW Holdback Requirement on hour ending 20 allocated to Participant D their maximum Holdback Requirement is 15 MWs for the purpose of calculating Possible Block Sale Revenue.~~

To determine how much of the holdback MW used to derive the Possible Block Sale Revenue is attributable to each deficient Participant receiving an allocation of the Holdback Requirement the following methodology will be utilized.

1. Each ~~deficit participants~~deficient Participant's maximum allocation of the Holdback Requirement will be organized into tranches where the portion of the total Make Whole Adjustment attributable to each tranche is separately calculated and allocated to the ~~participants~~Participants claiming the Holdback Requirement ~~MWs~~MW in each tranche. ~~If, for example, there are three deficit participants where:~~

    a. ~~Participant 1 has a maximum allocation of the Holdback Requirement equal to 50 MWs~~

    b. ~~Participant 2 has a maximum allocation of the Holdback Requirement equal to 75 MWs~~

    c. ~~Particpant 3 has a maximum allocation of the Holdback Requirement equal to 100 MWs~~

    ~~The first tranche will be 50 MWs and will include all three deficit participants. The second tranche will be 25 MWs and include Participants 2 and 3 and the third tranche will include only Participant 3.~~

2. A ~~deficit participant's~~deficient Participant's portion of the Make Whole Adjustment attributable to the ~~MWs~~MW in each tranche will be allocated based on the following:

    a. ~~-~~On hours where there is a Holdback Requirement those Participants receiving the allocation will be responsible for the settlement associated with that holdback MW amount.

    b. On hours where there is no Holdback Requirement the settlement associated with the MW amount used to calculated the Possible Block Sale Revenue will be split equally to those ~~participants~~Participants with Holdback Requirement ~~MWs~~MW in the tranche.

~~i. Using the example above the allocation of the Possible Block Sale Revenue requirement for the first tranche will be split equally among Participants 1, 2 and 3.~~

3. The total Make Whole Adjustment is derived by calculating the Make Whole Adjustment attributable to the Holdback Requirement ~~MWs~~MW in the first tranche, allocating the resulting adjustment value to ~~participants~~Participants in the first tranche, increasing the Holdback Requirement ~~MWs~~MW for those ~~participants~~Participants in the second tranche, recalculating the Make Whole Adjustment, and allocating the delta in the Make Whole Adjustment from the previous calculation to each ~~particpant~~Particpant in the second tranche equally. This continues until there are no more tranches to process.

The Real-Time Value of Declined Energy will be credited to the Participant that declined the energy delivery.

The Real-Time Value of Unheld Energy will be credited to each Participant receiving holdback based on the amount of ~~MWs~~MW they are obligated for in the calculation of Possible Block Sale Revenue.

The sum of the Make Whole Adjustment obligation allocated to each ~~participan~~Participant shall always equal the Make Whole Adjustment that would have been calculated between a single surplus ~~participant~~Participant and a single ~~deficit participant.~~ deficient Participant.

An example is provided in the Settlement Pricing Examples document which is posted on the WPP website.

4.7. Transmission Service

The WRAP Tariff does not separately address pricing for transmission service used in WRAP transactions in which the ~~selling~~surplus Participant and ~~purchasing~~deficient Participant are in the same Subregion. Participants are individually responsible for the cost of the transmission to deliver to a point (when such Participant is surplus) or take receipt at a point (when such Participant is deficient). These costs will not be included in the WRAP Tariff defined settlement.

4.8. Settlement Pricing for Subregions

Settlement prices recognize pricing differences among Subregions. Where the ~~seller~~surplus Participant and ~~buyer~~deficient Participant are located in the same Subregion, the Applicable Index Price ~~Index~~ shall be the price index specified above for that Subregion. Where the ~~seller~~surplus Participant and ~~buyer~~defcient Participant are

located in different Subregions, the following components of the settlement price calculation will be calculated using the Applicable Price Index for the Subregion that ~~provides~~has the higher index price: (i) Possible Block Sale Revenue; (ii) Total Settlement Price; (iii) Energy Declined Settlement Price; and (iv) Real-Time Value of Unheld Energy. When there are only two Participants there is no explicit settlement for tranmission as the surplus Participant receives the higher of the two Subregions' Applicable Index Price. If a third Participant is involved by providing transmission service rights between Subregions, the Participant that provided holdback or Energy Deployment shall receive the settlement price of the Subregion from which the ~~holdback~~Holdback Requirement or Energy Deployment was sourced, and the Participant that provided Subregion to Subregion transmission service rights pursuant to the WRAP Tariff shall receive the difference ~~between each Subregion's~~in the Total Settlement Price between the Subregion where the holdback was sourced and the Subregion where the energy was delivered, or zero, whichever is greater.