WESTERN POWERPOOL



Western Resource Adequacy Program

105 Qualifying Resources

100 – Forward Showing

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Table of Contents

Revision History 2
105 Qualifying Resources 4
1. Introduction 4
1.1 Intended Audience 4
1.2 What You Will Find in This Manual 4
1.3 Purpose 4
1.4 Definitions 4
2. Background 5
3. Resource Registration 6
3.1 Resource Eligibility 6
3.2 Late Registration of Resources 6
3.3 Qualifying Resource Aggregation (Resources <1 MW) 11
3.4 Generator Testing 11
4. Qualifying Capacity Contribution of Resources 18
4.1 Background 18
4.2 Thermal or Long Duration Storage Resources 18
4.3 Variable Energy Resources 23
4.4 Energy Storage 30
4.5 Hybrid Facilities 31
4.6 Demand Response 31
4.7 Hydro Resources 32
4.8 Other Resources 34
Appendix A – Qualified Capacity Contribution for Storage Hydro Resources 36
A.1 Time Period Approach for Summer and Winter Season Requirements 36
A.2 Treatment of Planned Outages 38
A.3 Treatment of Non-Power Constraints 40
A.4 Treatment of Cascaded and Coordinated Hydro Systems 40
A.5 Form To Complete Storage Hydro Resource QCC 40
Appendix B – Qualified Capacity Contribution for Demand Response Capacity Resources 41

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 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 Program Operator will undertake to calculate QCC values for all registered Qualifying Resources.

1.1 Intended Audience

BPM 105 is intended for Western Power Pool (WPP) Western Resource Adequacy Program (WRAP) Participants and other interested individuals or entities. BPM 105 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

BPM 105 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 BPM 105 have their meaning set forth in the Tariff.

Advance Assessment Data Request: As defined in *BPM 101 Advance Assessment*.

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

[1] ASHRAE Fundamentals Handbook

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.

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

Cascaded Dual Plant: Two Storage Hydro Qualifying Resources that are on the same river systems and operated in a coordinated manner.

Cure Period: As defined in *BPM 108 Forward Showing Submittal Process*.

Data Request Instruction Manual: As defined in *BPM 101 Advance Assessment*.

Fuel Type: A resource's primary fuel source, such as coal, natural gas, wind, or hydroelectric.

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.

Hydro QCC Workbook: The workbook that determines the QCC of a Storage Hydro resource(s).

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 eight 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.

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 Program Operator. The Program Operator will develop and maintain a registration and certification process for all Qualifying Resources identified

for the FS Program as outlined in BPM 105. BPM 105 does not cover timelines associated with Participants and the Program Operator completing the registration and QCC assessment process. Timelines for registration can be found in *BPM 101 Advance Assessment*.

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 BPM 105.

Resource registrations, including the appropriate modeling data required by the Program Operator, 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, and the guidance and instructions in the Data Request Instruction Manual for providing resource registration information. The then-effective versions of the Advance Assessment Data Request and the Data Request Instruction Manual are available 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 Program Operator 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 Program Operator, by means of the Advance Assessment Data Request. 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 Program Operator, by means of the Advance Assessment Data Request.

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 Process* provided the Participant provides the necessary information in Table 1 and Table 2 (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. During the Transition Period, late registered resources may constitute as much as 20% of an individual Participant's total FS Capacity Requirement, 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 for 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.

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

Description / Instructions	
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 (ROR), and Energy Storage Resources (ESR) located in the U.S. and iii) the nameplate capacity for Wind, Solar, ROR 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, ROR, and ESR located in the U.S. and iii) the nameplate capacity for Wind, Solar, ROR 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 possible, the operating Year used in EIA-860

Description / Instructions	
	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 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 (or county equivalent) where the resource is located.
Inverter Loading Ratio (Only for Solar and Wind)	For solar and wind resources only, 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 MW (Only for Hybrid Facilities)	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 on the WPP website.
Wind, ROR, Solar Resources – hourly output profiles for the last 10 Years or as much as is available. For further details on the format of the submittal, refer to the Data Request Instruction Manual 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.
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.
Retirement Date Month-Year	Provide the Month and Year for resources that have been either formally announced or marked for retirement.

Description / Instructions	
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 (or county equivalent) 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 1 MW 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, 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 Program Operator.

- 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 Program Operator during the Advance Assessment Data Request submission.

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 BPM 105. Capability Tests will be required for resources as detailed below.

3.4.2 Capability Testing

Capability Tests will be required for Thermal Resources, Long Duration Storage resources, and Demand Response resources (as defined in BPM 105) 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 one hour. Once a qualifying Capability Test is submitted to the Program Operator by the FS Submittal Deadline, the five-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 five Years. The most recent testing data will be used to determine a generator's QCC if a Capabilty Test is performed between the Advance Assessment and the FS Submittal.

For Storage Hydro, ROR Hydro, Wind, Solar, and ESR, 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 BPM 105. 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 Program Operator 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 below 20 degrees of 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 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 maximum load reduction capability of the DR program. 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:

- the maximum number of hours per day for Demand Response Capacity Resources with a daily hourly dispatch limit; or
- one hour, for Demand Response Capacity Resources with a weekly or monthly hourly dispatch dispatch limit.

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 Capability 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 Program Operator (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 submittal. A Capability Test must be performed in the next Summer Season for the next FS submittal. If the unit fails to complete the make-up Capability Test, the unit cannot be claimed on the FS Submittal.

3.4.3 Operational Testing

All Qualifying Resources must perform annual Operational Tests completed in the 12-Month period prior to the FS Submittal due date, or within the Cure Period, that may be conducted within or outside of a Binding Season (at Participant's discretion).

3.4.3.1 Thermal Resources and Long Duration Storage

An Operational Test serves as an annual demonstration of the functional capability of a Qualifying Resource to generate at a high-level of its Net Generating Capability in the upcoming Binding Season. Test data shall be compiled and submitted via the FS Submittal process, as outlined in *BPM 108 Forward Showing Submittal Process*. 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 one 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 (to which the UCAP calculations are applied – see Section 4.2) 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. Test data shall be compiled and submitted via the FS Submittal process, as outlined in *BPM 108 Forward Showing Submittal Process*. 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 one 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/de-rates are not occurring. If one or more units were on outage or de-rated 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/de-rated at the time of the Operational Test were offline/de-rated for more than 90 consecutive days of the 12 Months preceding the FS Submittal due date.
2) Demonstrate that the unit was out/de-rated 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., two-hour, four-hour, etc. An ESR must be able to achieve its full QCC as determined in the QCC process for ESRs.

3.4.3.4 ROR 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 peak load reduction capability (to avoid unnecessary disruption to the Participant's customers). The duration of an Operational Test shall be for a minimum of one hour. In case of failure to meet 50% of the QCC, the resource can only claim what it can achieve on the Operational Test as a peak load reducition input for purposes of determining its QCC for the upcoming FS Submittal as described in Appendix B.

3.4.4 New or Upgraded Resource Capability and 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 (this may occur during the Cure Period for the second Binding Season), in order to establish the new Net Generating Capability for all succeeding Binding Seasons. If the resource type requires a Capability Test be performed in a Summer Season, the registering Participant will conduct a Capability test in the first Summer Season in which the new or upgraded resource is operational.

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 Program Operator and assigned an appropriate testing value based on comparability to testing requirements established in BPM 105; 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 Program Operator in the FS Submittal (see *BPM 108 Forward Showing Submittal Process* 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 Request 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, Equivalent Forced Outage Factors (EFOF) biofuel, and nuclear, or Long Duration Storage, the FS Program will use an 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 the $EFOF_{CCH}$ to the Net Generating Capability (or Installed Capacity) as determined in Section 3. The Capacity Critical Hours (CCH)[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 4.2.2 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.

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

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.

4.2.1 New Long Duration Storage Resources that Do Not Fit into an Existing Class

For Long Duration Storage Resources new to the FS Program that do not have sufficient data over the historical period used for determining a QCC and do not fit into an existing class of resources in order to receive a class average QCC, synthesized data will be used to calculate the EFOF until actual historical data is generated through operations. Once actual historical data is available, that data will be weighted more heavily than the synthesized data in the EFOF calculation.

Table 4. Data used in EFOF for new Long Duration Storage Resources that do not fit into an existing class

Binding Season	Data used for EFOF Calculation
1st Binding Season	5 years of synthesized data
2nd Binding Season	5 years of synthesized data
3rd and 4th Binding Seasons	3 years of synthesized data 1 year of actual data: (year 1)x2
5th and 6th Binding Seasons	1 year of synthesized data 2 years of actual data: (years 1 and 2)x2
7th and 8th Binding Seasons	3 years of actual data: (year 1)x1 and (years 2 and 3)x2
9th and 10th Binding Seasons	4 years of actual data: (year 1, 2, and 3)x1 and (year 4)x2
11th and 12th Binding Seasons	5 years of actual data
13th and 14th Binding Seasons	6 years of actual data

Once the resource has a full Year of operational data, the synthesized data for Binding Seasons 3-6 will be evaluated for reasonableness. If the synthesized data significantly understated or overstated the forecasted output of the resource, the synthesized data will be adjusted by the Program Operator accordingly.

[4] https://www.nerc.com/pa/RAPA/gads/Pages/Data%20Reporting%20Instructions.aspx

4.2.2 $EFOF_{CCH}$ Equation

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

Where:

FOH_{CCH} is Forced Outage Hours occurring on CCH,

$EFDH_{CCH}$ is Equivalent Forced Derating Hours occurring on CCH, 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 5.

Table 5. 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 de-rates 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 Program Operator.
- The Program Operator 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 June 1, 2020 at 4:25 PPT, 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 June 1, 2020 on hour beginning 4:00 PPT 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.

4.2.3 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/globalassets/programs/rapa/gads/conventional/appendix_k_outside_management_control_2024_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.

4.2.4 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 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 calculate their QCC for the FS Submittal. The workbook will allow the Participant to calculate the QCC values taking the average of the facility output during the CCH. If less than 10 Years of historical data is available for use in determining the QCC, the Program Operator will utilize the methodology described in Section 4.8.2.

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 on the WPP website. The Participant will provide five Years of outage information as provided in the workbook. The Program Operator will determine the QCC of the resource in question using a methodology similar to the $EFOF_{CCH}$ methodology applied to all Thermal Resources.

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*

Process) 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 Effective Load Carrying Capability (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 and may submit up to 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 Program Operator 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 Years of historical conditions. Otherwise, the Program Operator 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.

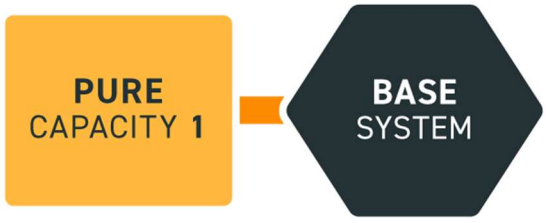


Figure 1. Diagram of system without renewable resources.

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 Section 4.3.5.

The Program Operator 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 inSection 4.3.6, 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 Program Operator 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[8] 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.

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

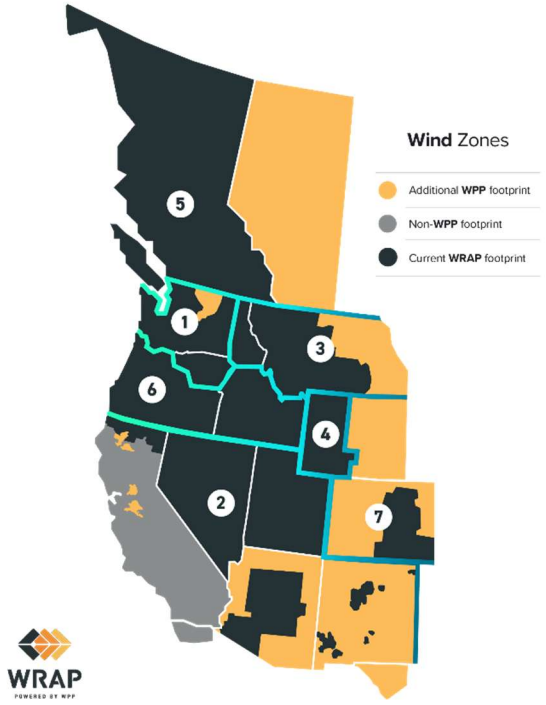


Figure 3. Wind VER Zones

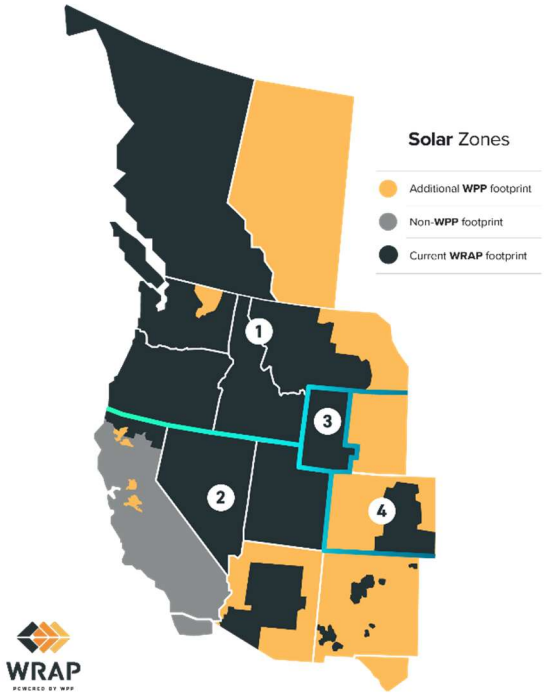


Figure 4. Solar VER Zones

4.3.7 Allocation of VER ELCC

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[9] 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	108.75MW			
Monthly Multiplier	Divides each Month's production on CCH by the seasonal average	110%	87%	83%	120%
Seasonal ELCC	Value resulting from ELCC study	100MW			
Monthly QCC	Multiplies the monthly multiplier by the seasonal ELCC value	110MW	87MW	83MW	120MW

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 Three Years or More of Operational Data

To allocate the ELCC MW to each resource, the Program Operator will utilize the historical hourly data for each resource provided by the Participant. For resources that have at least three Years of actual historical data, or at least three Years of engineered data for newer resources, the Program Operator will utilize the most recent three Years

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

(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 Three Years of Operational Data

The Program Operator 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 three 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 Program Operator 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 and three will be evaluated for reasonableness. If the synthesized data significantly understated or overstated the forecasted generation of the resource, the Year two and three synthesized data will be adjusted by the Program Operator accordingly.

4.3.7.4 Determination of ELCC for Future VERs

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 Program Operator 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 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.

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 ESRs 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 have monthly QCC value calculated by the Participant per the methodology in Appendix B – Qualifying Capacity Contribution of Demand Response Capacity Resources and will need to meet testing criteria and demonstrate load reduction as described in Section 3.4.2.3 DR prorgram QCC results will be provided to the Program Operator for review. The Program Operator may ask the Participant for information from the DR QCC methodology, subject to limitations described in the Tariff, as part of the verification and validation process. 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 Data 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.

A DR Qualifying Resource will be reflected in the FS Submittal as a Demand Response Capacity Resource by submitting it as a 'Resource' in the FS Submittal. As with all resources, the monthly QCC values of DR Qualifying Resource will count toward a Participant meeting its monthly FS Capacity Requirements.

If a DR program does not meet the criteria of a Qualifying Resource, its contribution to 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 Program Operator for review, through the provision of the 'results tab' of the workbook. The Program Operator 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 utilizing water in storage each Day to increase generation, 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.

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 (ROR) Hydro

ROR 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 10 Years of historical data is available for use in determining the QCC of a ROR Hydro plant, the Program Operator 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 three 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 and three will be evaluated for reasonableness. If the synthesized data significantly understated or overstated the forecasted generation of the resource, the Year two and three synthesized data will be adjusted by the Program Operator accordingly.

4.7.2.1 Late Registered ROR Hydro Resources

If a Participant seeks to claim capacity from a ROR 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 ROR Hydro Resources (for validation by the Program Operator), or
2) Claim a decremented QCC of 70% of the average ROR 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 (PURPA), the QCC will be determined based on the monthly average performance of

such resource during CCH. The Participant will provide 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 found on the WPP website. The workbook will allow the Participant to calculate the QCC values taking the average of the facility output during the CCH.

If less than 10 Years of historical data is available for use in determining the QCC of a non-dispatchable, must take resource, the Program Operator will utilize the methodology described in BPM 105 for the specific resource type. If the resource type is not covered in Sections 4.2 through 4.7 the Program Operator 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 three Years of actual data is not available, using:
    a. Manufacturer's engineering or performance data;
    b. Known or historical information about fuel availability;
    c. Known or historical information about unit performance; or
    d. Historical performance characteristics of similar resources.
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.

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 Program Operator).

Appendix A – Qualified Capacity Contribution for Storage Hydro Resources

A.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.
    - Usable 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 usable 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 time period methodology for QCC.

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 for each CCH.

Estimated Values	Notes
Actual water in storage	Using the elevation and storage (kcfs or cms) 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 10 Years studied. These QCC values are averaged over each Month in each Binding Season to determine final monthly QCC values.

A.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.

A.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.

A.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.

A.5 Form To Complete Storage Hydro Resource QCC

The Hydro QCC Workbook will be completed by the Participant. The workbook is located on the WPP website.

Appendix B – Qualified Capacity Contribution for Demand Response Capacity Resources

Demand Response Capacity Resource QCC will be determined based on the monthly average availability of such a resource during the appropriate ten-Year set of CCH subject to the DR program's constraints. The Participant will input the peak load reduction (as determined by a Capability Test) and the DR program's constraints into a workbook located on the WPP website.

The DR QCC workbook includes the following constraints:

- Peak load reduction (MW)
- Blackout functionality that prevents the DR program from contributing to QCC during any identified:
    - Hours of the day;
    - Days of the week;
    - Weeks of the Season; and, or
    - Months of the Season.
- Hourly dispatch limits (non-interactive, i.e. choose one):
    - Daily – maximum number of hours per day
    - Weekly – maximum number of hours per week
    - Monthly - maximum number of hours per month
- Hourly fatigue – if a DR program is called upon in consecutive CCH its peak load reduction can be reduced hour-on-hour, reflecting a customer's potential decreasing willingness to keep adjusting its load down hour after hour (for example, industrial loads).
- Daily fatigue – if a DR program is called upon in consecutive days its peak load reduction can be reduced day-on-day, reflecting customers' potential decreasing willingness to keep adjusting their loads down day after day (for example, aggregated residential DR programs).

The DR QCC workbook will allow the Participant to calculate monthly QCC values taking the average of the DR programs demand reduction availability during CCH subject to, at a minimum, the imposed program-specific constraints listed above. The monthly QCCs of a Participant's Demand Response Capacity Resources can then be used to meet its monthly FS Capacity Requirements along with the QCC of its other resources and contracts.

If a DR program has constraint permutations not captured by the workbook, its contribution to load reduction may be captured in the historical data used to calculate the P50 Peak Load Forecast in the FS.