PJM Manual 21B:

PJM Rules and Procedures for Determination of Generating Capability

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Introduction

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Section 1: Overview of Effective Load Carrying Capability Analysis

The Effective Load Carrying Capability (ELCC) analysis is an hourly loss-of-load-probability model used to calculate the Accredited UCAP for each ELCC Resource which sets a cap on the amount of UCAP that such resource can offer or otherwise provide in the Capacity Market.

In order to calculate the Accredited UCAP, resources are grouped into ELCC Classes which the model then uses to calculate a marginal ELCC value for each class. This value represents the incremental improvement to reliability that would be achieved by adding additional MW of that class.

Further details regarding this model can be found in **PJM Manual 20A**.

Section 2: ELCC Classes

ELCC Classes are as listed and defined in the RAA. These classes fall into one of five categories: Variable Resources, Limited Duration Resources, Combination Resources, Unlimited Resources, and Demand Resources

2.1 Variable Resources Classes

The following are the ELCC Classes for Variable Resources

- Tracking Solar Class
- Fixed-Tilt Solar Class
- Onshore Wind Class
- Offshore Wind Class
- Intermittent Landfill Gas Class
- Intermittent Hydropower Class
- Other Variable Resource Class

"Tracking Solar Class" shall mean an ELCC Class consisting of Variable Resources that produce electrical energy with solar panels that are primarily mounted on trackers that align the panels with incoming sunlight over the course of the day.

"Fixed-Tilt Solar Class" shall mean an ELCC Class consisting of Variable Resources that produce electrical energy with solar panels that are primarily mounted in a fixed orientation.

Solar resources with a single energy market metering point that consist of both tracking solar and fixed solar components are included in the class that constitutes the majority of the nameplate capacity as measured by aggregate DC nameplate rating of the respective sets of solar panels. If the DC nameplate ratings of the fixed and tracking components are identical, then the resource will be in the tracking solar class.

"Onshore Wind Class" shall mean an ELCC Class consisting of Variable Resources that produce electrical energy using wind turbines and that are not in the Offshore Wind Class.

"Offshore Wind Class" shall mean an ELCC Class consisting of Variable Resources that produce electrical energy with offshore wind turbines located in the ocean.

"Intermittent Landfill Gas Class" shall mean an ELCC Class consisting of Variable Resources fueled by landfill gas that, because of fuel availability patterns, cannot run consistently at installed capacity levels for 24 or more hours.

"Intermittent Hydropower Class" shall mean an ELCC Class consisting of Variable Resources that are run-of-river hydropower generators that must generally pass incoming water and therefore cannot appreciably store water to later increase the output of the facility. Resources in the Intermittent Hydropower Class are not Hydropower with Non-Pumped Storage resources.

"Other Variable Resource Class" shall mean an ELCC Class consisting of Variable Resources that are not in any other Variable Resource class, including Variable Resources that are composed of multiple components, each of which would be a Variable Resource. A resource composed of both fixed-tilt solar panels and tracking solar panels is not in this class. A resource that is a member of a Other Variable Resource Class has a single Point Of Interconnection, unless the resource is controlled in an integrated fashion, is at a single site, and is approved by PJM to be considered a single resource in accordance with **PJM Manual 14-D**: Generator Operational Requirements.

2.2 Limited Duration Resources Classes

The following are the types of ELCC Classes for Limited Duration Resources:

- The type of Capacity Storage Resource Classes, with different classes for the 4, 6, 8, and 10-hour durations
- The type of Other Limited Duration Resource Classes, with different classes for the 4, 6, 8, and 10-hour durations

"Capacity Storage Resource Class" shall mean the ELCC Classes specified in Schedules 9.1 and 9.2, section B of this Agreement, each of which is composed of Capacity Storage Resources with the same specified characteristic duration of 4, 6, 8, and 10 hours. The characteristic duration of an Energy Storage Resource Class is the ratio of the modeled MWh energy storage capability of members of the class to the modeled MW power capability of members of the class.

An Energy Storage Resource of "X" hours duration is capable of running continuously at its Effective Nameplate Capacity power level for X hours starting with a full state of charge, provided that such calculation excludes any MWh that must be reserved for Black Start service or for other firm commitments, and that such resource is capable of fully recharging in a similar amount of time. For example, a 100 MW, 300 MWh Energy Storage Resource can run at 75 MW for 4 hours continuously, and therefore has an Effective Nameplate Capacity value of 75 MW.

A generic limited duration resource of "X" hours duration is capable of running continuously at its Effective Nameplate Capacity power level for X hours on the PJM system.

"Other Limited Duration Class" shall mean the ELCC Classes specified in RAA Schedules 9.1 and 9.2 section B of this Agreement, each of which has a specified characteristic duration and consists of Limited Duration Resources that are not Capacity Storage Resources. The

characteristic duration of an Other Limited Duration Class is the maximum period of time represented in the ELCC model that the resources of the class can run at a stated capability.

2.3 Combination Resources Classes

The following are the ELCC Classes for Combination Resources:

- The types of Hybrid Resource Classes
- Hydropower With Non-Pumped Storage Class
- Complex Hybrid Class
- The types of Other Limited Duration Combination Classes

Hybrid Resource Classes

"Hybrid Resource Class" shall mean the ELCC Classes specified in RAA Schedules 9.1 and 9.2 Section B. Each Hybrid Resource Class has a specified combination of two components, whereby, absent being part of a Combination Resource, one component would be in a Capacity Storage Resource Class, and the other component would be in a Variable Resource Class or would be an Unlimited Resource. A resource that is a member of a Hybrid Resource Class has a single Point Of Interconnection, unless the resource is controlled in an integrated fashion, is at a single site, and is approved by PJM to be considered a single resource in accordance with **PJM Manual 14-D**: Generator Operational Requirements.

There are Hybrid Resource Classes for all "open-loop" combinations of each Capacity Storage Resource class and each Variable Resource class, as well as all "closed-loop" combinations of each Capacity Storage Resource class and each Variable Resource class. An "open-loop" resource is physically and contractually capable of charging from the grid, while a "closed-loop" resource is not. An example of a Hybrid Resource Class is "Tracking Solar plus 4-hour Storage—Open Loop".

Hydropower with Non-Pumped Storage

"Hydropower With Non-Pumped Storage" shall mean a hydropower facility that can capture and store incoming stream flow, without use of pumps, in pondage or a reservoir, and the Generation Owner has the ability, within the constraints available in the applicable operating license, to exert material control over the quantity of stored water and output of the facility throughout an Operating Day.

A hydropower resource can exert material control over the quantity of stored water and over the output of the facility when it can consistently produce power equal to or in excess of 110% of the daily average power baseline for at least 4 hours. This criterion is demonstrated by evaluating the ratio of the average actual output during the 4 highest load hours of all summer afternoons of the five year period starting with when the unit entered the applicable ELCC Class against the

average actual output of all other hours on the same days. Such assessment and determination is once per five years.

An existing Hydropower with Non-Pumped Storage resource that fails to demonstrate material control over the output of the facility through the foregoing evaluation will be reclassified as an Intermittent Hydropower Resource, provided that PJM may, at its discretion, retain the prior classification of the resource if, due to exceptional circumstances, such evaluation fails to capture the resource's capability to consistently produce power equal to or in excess of 110% of the daily average power baseline for at least 4 hours.

Reasons that such evaluation might fail to capture such capability could include exceptional recreational and public safety factors, unit outages, locational market energy prices, ancillary market participation, and other exceptional operational factors or market factors that may limit a unit with material control capability from meeting the foregoing demonstration evaluation.

Complex Hybrid Class

"Complex Hybrid Class" shall mean an ELCC Class composed of Combination Resources that combine three or more components, whereby one component is a class of Limited Duration Resource, and the other components are different Variable Resource classes, and such Combination Resources cannot be included in any other Combination Resource class. A resource that is a member of a Complex Hybrid Class has a single Point Of Interconnection, unless the resource is controlled in an integrated fashion, is at a single site, and is approved by PJM to be considered a single resource in accordance with **PJM Manual 14-D**: Generator Operational Requirements.

Other Limited Duration Combination Classes

Other Limited Duration Combination Class" shall mean the ELCC Classes specified in RAA Schedules 9.1 and 9.2 section B. Each Other Limited Duration Class has a specified combination of two components, whereby, absent being part of a Combination Resource, one component would be in an Other Limited Duration Class, and the other component would be in a Variable Resource Class or would be an Unlimited Resource. A resource that is a member of an Other Limited Duration Combination Class has a single Point Of Interconnection, unless the resource is controlled in an integrated fashion, is at a single site, and is approved by PJM to be considered a single resource in accordance with **PJM Manual 14-D**: Generator Operational Requirements.

There are "Other Limited Duration Combination Classes" for all combinations of each Variable Resource Class and each Other Limited Duration Resource Class, and for combinations of an Unlimited Resource with each Other Limited Duration Resource Class.

2.4 Unlimited Resources Classes

The following are the ELCC Classes for Unlimited Resources:

- Nuclear Class
- Coal Class
- Gas Combined Cycle Class
- Gas Combustion Turbine Class
- Gas Combined Cycle Dual Fuel Class
- Gas Combustion Turbine Dual Fuel Class
- Diesel Utility Class
- Steam Class
- Other Unlimited Resource Class

"Nuclear Class" shall mean an ELCC Class consisting of Unlimited Resources primarily fueled by nuclear fuel.

"Coal Class" shall mean an ELCC Class consisting of Unlimited Resources primarily fueled by coal.

"Gas Combined Cycle Class" shall mean an ELCC Class consisting of Unlimited Resources of the combined cycle technology type that is primarily fueled by natural gas, but does not meet the requirements to be included in the Gas Combined Cycle Dual Fuel Class.

"Gas Combustion Turbine Class" shall mean an ELCC Class consisting of Unlimited Resources of the combustion turbine technology type that is primarily fueled by natural gas, but does not meet the requirements to be included in the Gas Combustion Turbine Dual Fuel Class.

"Gas Combined Cycle Dual Fuel Class" shall mean an ELCC Class consisting of Unlimited Resources of the combined cycle technology type that is primarily fueled by natural gas, and that attests that it has the capability to start and operate independently on an alternate, onsite fuel source up to its maximum capacity level during the winter season of the applicable Delivery Year in which it is providing capacity, and capable of operating on the alternate fuel for two 16-hour periods over two consecutive days at its maximum capacity level.

"Gas Combustion Turbine Dual Fuel Class" shall mean an ELCC Class consisting of Unlimited Resources of the combustion turbine technology type that is primarily fueled by natural gas, and attests that it has the capability to start and operate independently on an alternate, onsite fuel source up to its maximum capacity level during the winter season of the applicable Delivery Year in which it is providing capacity, and capable of operating on the alternate fuel for two 16-hour periods over two consecutive days at its maximum capacity level.

In order for a natural gas-fired combined cycle ("CC") or combustion turbine ("CT") capacity resource to be classified in the "Gas Combined Cycle Dual Fuel Class" or "Gas Combustion Turbine Dual Fuel Class" an attestation must be submitted to the Office of the Interconnection that attests the resource has the capability to start and operate independently on an alternate, onsite fuel source up to its maximum capacity level during the winter season of the applicable Delivery Year in which it is providing capacity, and capable of operating on the alternate fuel for two 16-hour periods over two consecutive days at its maximum capacity level.

- Attestations that the resource does or does not meet the requirements must be submitted to the Office of the Interconnection by August 1 prior to the calendar year for the RPM Auction in which the ELCC Resource intends to submit a Sell Offer or, except for Base Residual Auctions that are not scheduled for May, which will be communicated in a timely manner through a mass email notification.
    - Attestations shall be submitted to PJM in accordance with Section 8.2
- Resources that do not currently have the capability, but intend to have the capability by the start of the applicable Delivery Year will need to provide (i) the steps that will be taken and corresponding schedule to meet the dual fuel criteria, and (ii) evidence of corporate commitment (which may include an officer certification indicating intent to make such investment)
- Attestation submitted for a resource will be applicable for the delivery years specified within the attestation. Any changes to an attestation will require supporting documentation.
    - PJM may request additional information from Generation Capacity Resource Providers at the time of the attestation and/or going into the Delivery Year to confirm their eligibility for the duel fuel class.
- Generation Capacity Resource Providers must notify PJM of any material change in their resource that would impact whether or not they meet the dual fuel criteria.
- If a Generation Capacity Resource Provider does not submit an attestation and no prior attestation exists, the resource will be placed in the non-dual fuel class.

"Diesel Utility Class" shall mean an ELCC Class consisting of Unlimited Resources of the diesel technology type that is not primarily fueled by landfill gas.

"Steam Class" shall mean an ELCC Class consisting of Unlimited Resources of the steam technology type and the primary fuel is not coal or nuclear.

"Other Unlimited Resource Class" shall mean an ELCC Class consisting of Unlimited Resources that do not qualify for any other ELCC Class specified in RAA Schedule 9.2, section D.

2.5 Demand Resources Classes

The following are the ELCC Classes for Demand Resources:

- Demand Resource Class

2.6 Administration of ELCC Classes

For each ELCC Resource, except an ELCC Resource that is a Capacity Storage Resource or includes a Capacity Storage Resource component:

- PJM shall determine the ELCC Class of which such resource is a member by matching the physical characteristics of such resource with the definition of the ELCC Class.

For each ELCC Resource that is a Capacity Storage Resource or includes a Capacity Storage Resource component:

- PJM shall determine, by matching the physical characteristics of such resource with the definition of the ELCC Class, the type of ELCC Class of which such resource is a member; provided however, the Generation Capacity Resource Provider shall choose the specific ELCC Class within the type ELCC Class identified by PJM that corresponds to the chosen characteristic duration.
    - Initial elections shall be submitted to PJM in accordance with Section 8.2
- If the Generation Capacity Resource Provider fails to choose the specific class, PJM will choose a specific ELCC Class to assign to the resource
- The election of the specific ELCC class corresponding to the chosen characteristic duration shall be for a term of five consecutive Delivery Years
- After such five Delivery Year period, a Generation Capacity Resource Provider may request a change in the ELCC Class, based on choosing a different characteristic duration, by submitting to the Office of the Interconnection a written request to switch ELCC Classes and provide documentation supporting such change.
    - A Generation Capacity Resource Provider must submit such request and supporting documentation by August 1 prior to the calendar year for the RPM Auction in which the ELCC Resource intends to submit a Sell Offer or otherwise commit to provide capacity
    - The Office of the Interconnection shall provide no later than following November 15 written notification to the Generation Capacity Resource Provider of its determination
    - If the request is granted, the ELCC Resource shall be considered in the new ELCC Class starting with the next Delivery Year for which no RPM Auction has been conducted and for subsequent Delivery Years
    - If the request is denied, the Office of the Interconnection shall include in the notice a written explanation for the denial

- Requests and supporting documentation for a change in the ELCC class are initiated by emailing ELCC@pjm.com

Mixed-technology resources are composed of components with different generation technologies, at least one of which would be an ELCC Resource, behind a single Point of Interconnection.

The following business rules apply to each mixed-technology resource:

- A mixed-technology resource comprised of components that have significant interaction must participate as a single Combination Resource (or, if the components would all be Variable Resources, then as a single Variable Resource)
- A mixed-technology resource comprised of components that do not have significant interaction are eligible to participate as either a single Combination Resource or as separate resources
- The Generation Capacity Resource Provider of a mixed-technology resource eligible to participate as either a single ELCC Resource or as multiple stand-alone resources shall elect, for a term of five consecutive Delivery Years, whether PJM is to model it as a single ELCC Resource or as multiple stand-alone resources.
- After such five Delivery Year period, a Generation Capacity Resource Provider may request a change in such modelling approach by submitting to the Office of the Interconnection a written request to change the modelling approach and provide documentation supporting such change.
    - A Generation Capacity Resource Provider must submit such request and supporting documentation by August 1 prior to the calendar year for the RPM Auction in which the ELCC Resource intends to submit a Sell Offer or otherwise commit to provide capacity
    - The Office of the Interconnection shall provide no later than following November 15 written notification to the Generation Capacity Resource Provider of its determination
    - If the request is granted, the ELCC Resource(s) shall be modelled as requested starting with the next Delivery Year for which no RPM Auction has been conducted and for subsequent Delivery Years o If the request is denied, the Office of the Interconnection shall include in the notice a written explanation for the denial
- Requests and supporting documentation for a change in the ELCC modelling are initiated by emailing ELCC@pjm.com

Section 3: ELCC Results Posting Schedule

PJM will post final ELCC Class Rating values for the upcoming Delivery Year at least once per year in an annual report that also includes appropriate details regarding methodology and inputs. PJM will post this report and communicate ELCC Resource Performance Adjustment values or resource-specific values to applicable Generation Capacity Resource Providers no later than five months prior to the start of the upcoming Delivery Year. These values will be used to calculate the final Accredited UCAP values for the upcoming Delivery Year.

PJM shall also post preliminary ELCC Class Rating values for nine subsequent Delivery Years. For any Delivery Year where a final ELCC Class Rating has not been posted and a preliminary ELCC Class Rating has been posted, the Accredited UCAP of an ELCC Resource for such Delivery Year shall be based on (i) the most recent ELCC Class Rating value for that Delivery Year and the most recently calculated ELCC Resource Performance Adjustment value, or (ii) the most recent resource-specific value for that Delivery Year. Except to the extent specified above or otherwise specified, the ELCC Class Rating values and resource-specific values for future years are non-binding and are only for indicative purposes.

Section 4: Calculations of ELCC Class Rating, ELCC Resource Performance Adjustment, Accredited UCAP, and Accredited UCAP Factor

4.1 Calculation of ELCC Class Rating

For a given Delivery Year, ELCC Class Ratings will not be calculated for any ELCC Class to the extent that no member of the class is expected to provide, or offer to provide capacity, in the applicable Delivery Year. PJM will determine the ELCC Class Ratings for an ELCC Class when any one of the following criteria are met:

1. An Existing Generation Capacity Resource is in such class; or
2. A Planned Generation Capacity Resource has submitted timely and valid data through the ELCC data submission process and is in such class; or
3. The resource deployment forecast contains a resource in such class

ELCC Class Ratings for a Delivery Year are calculated by adding to the forecasted resource portfolio incremental quantities of resources belonging to the subject ELCC Class, depending on the resource type:

1. The ELCC Class Rating of Variable Resources, Limited Duration Resources, Unlimited Resources (except Other Unlimited Resources), and Demand Resources shall be the ratio of the expected unserved energy improvement resulting from adding an incremental quantity of the subject ELCC Class to the expected unserved energy improvement resulting from adding an incremental quantity of an Unlimited Resource with no outages, where expected unserved energy improvement is calculated relative to the Portfolio EUE for the Delivery Year.
2. No ELCC Class Rating is determined for Combination Resources and ELCC Resources in the Hydropower with Non-Pumped Storage Class, in the Complex Hybrid Class, in the Other Unlimited Resource Class, and in any ELCC Class whose members are so distinct from one another that a single ELCC Class Rating would fail to capture their physical characteristics.

Further details on this methodology can be found in PJM Manual 20A: PJM Resource Adequacy Analysis.

4.2 Calculation of ELCC Resource Performance Adjustment

For a Variable Resource, a Limited Duration Resource, and an Unlimited Resource the ELCC Resource Performance Adjustment is based on a metric consisting of the weighted average

expected hourly output (weighted by the Effective Nameplate Capacity or ICAP, as applicable) of the resource in the ELCC model during hours of loss of load risk where

1. the weights correspond to the modeled probability of losing load in such hour and
2. the expected hourly output is based on the resource's modeled output during the same hour on days since June 1st, 2012 identified as having similar weather from an RTO-perspective

For a given resource or component, the Performance Adjustment shall equal the ratio of such metric to the average (weighted by the Effective Nameplate Capacity or ICAP, as applicable) of such metrics for all units in the applicable ELCC Class.

In determining the ELCC Resource Performance Adjustment, the actual output of a Variable Resource shall be adjusted to reflect historical curtailments, and output in any hour shall be capped at:

1. the greater of the Variable Resource's Capacity Interconnection Rights, or the transitional system capability as limited by the transitional resource MW ceiling as defined in **Manual 14B** awarded for the applicable Delivery Year, for hours in the months of June through October and the following May of the Delivery Year, and
2. the Variable Resource's assessed deliverability, as defined in **Manual 14B**, for hours in the months of November through April of the Delivery Year, where assessed deliverability shall equal the winter deliverability MW in all hours except for hours beginning 9 am to 5 pm EPT in which the assessed deliverability shall equal the light load deliverability MW.

In determining the ELCC Resource Performance Adjustment, the output of an Unlimited Resource in any hour shall be capped at the greater of the resource's Capacity Interconnection Rights, or the transitional system capability as limited by the transitional resource MW ceiling as defined in **Manual 14B**: PJM Region Transmission Planning Process, awarded for the applicable Delivery Year.

An ELCC Resource Performance Adjustment will not be calculated for any resource that receives a resource-specific value calculated for the Delivery Year.

4.3 Calculation of Accredited UCAP

Accredited UCAP will be calculated using the following equations where the ELCC Class Rating is the most recent ELCC Class Rating for the applicable Delivery Year. Such values shall establish an upper limit on the amount of Unforced Capacity that an ELCC Resource can physically provide or offer to provide in the applicable Delivery Year. This value shall not exceed the resource's Capacity Interconnection Rights .

A Generation Capacity Resource Provider can offer or provide capacity from an ELCC Resource that is not subject to a capacity market must offer obligation (as specified in Tariff, Attachment DD, Section 6.6) at a level less than the Accredited UCAP for such resource.

For Variable and Limited Duration Resources, Accredited UCAP values shall be equal to the lesser of the resource's Capacity Interconnection Rights or the following:

Effective Nameplate Capacity × applicable ELCC Class Rating × ELCC Resource Performance Adjustment

For Unlimited Resources that have an ELCC Class Rating determined pursuant to section 4.1, Accredited UCAP values shall be equal to the lesser of the resource's Capacity interconnection Rights or the following:

Installed Capacity × applicable ELCC Class Rating × ELCC Resource Performance Adjustment

For Demand Resources, Accredited UCAP values shall be equal to the following:

Nominated Value of the Demand Resource × applicable ELCC Class Rating

Further details regarding Demand Resources accreditation can be found in **PJM Manual 18**.

For any resource in an ELCC Class for which no Class Rating, the Accredited UCAP shall be based on a resource-specific effective load carrying capability analysis based on the resource's unique parameters.

4.4 Calculation of Accredited UCAP Factor

For Generation Capacity Resources, PJM shall determine an Accredited UCAP Factor, which is the ratio of the resource's Accredited UCAP to the resource's installed capacity and cannot exceed 1.

Section 5: Capacity Interconnection Rights

Capacity Interconnection Rights (CIRs) are granted as a function of a control area integration, or the execution of an Interconnection Service Agreement (ISA), Wholesale Market Participant Agreement (WMPA) or Generation Interconnection Agreement (GIA) as delineated in the specifications section of the respective ISA, WMPA or GIA after completion of all required work.

PJMs planning department determines whether the transmission and/or distribution system can receive power commensurate with the CIR level of a generating unit and whether upgrades to the system are needed in order to receive the power therein. CIRs are evaluated under summer peak conditions.

CIRs are typically granted on an individual generating unit basis, but, in some cases, can be issued in aggregate at the Point of Interconnection (POI).

5.1 Attaining CIRS

CIRs can only be attained or increased by entering the New Services Queue and Executing an ISA, WMPA or GIA. If the studies identify any system upgrades are required to obtain the rights, then those upgrades must be completed before the rights are available for use by the generating unit in the market.

Variable Resources can request CIRs up to the expected 95th percentile hourly summer net output between the hour ending 11 AM and 10 PM EPT.

Limited Duration Resources can request CIRs up to the maximum expected net summer capability not to exceed the sustained power output capability over X hours, where X is the duration of the ELCC Class for such resource.

Hydropower With Non-Pumped Storage resources can request CIRs up to the maximum expected net capability of the generating unit at the time of the expected summer peak.

Combination Resource (other than Hydropower With Non-Pumped Storage) can request CIRs up to the sum of eligible CIR request for the components and cannot exceed the Maximum Facility Output.

Mixed Technology Facilities with multiple Co-Located Resources must have their CIR level allocated to each Co-Located Resource. This allocation will be determined by the Interconnection Customer and each Co-Located Resource cannot be allocated more CIRs than it is expected to be capable of retaining.

Unlimited Resources can request CIRs up to the maximum expected net capability of the generating unit at the time of the expected summer peak.

5.2 Retaining CIRS

Retention or loss of CIRs is calculated by PJM annually in the fourth quarter of the calendar year for each resource that holds CIRs. CIRs are lost when a resource fails to meet or exceed its current CIR level based on the CIR retention metric described below once in the most recent consecutive three year period where the three year clock commences at the beginning of the next summer test period after the CIRs are declared in-service, regardless if the owner exercised the rights in the market or they are interim rights. If CIRs are declared in-service during the summer test period the three year clock will have started on the declared in service date.

Variable Resources CIRs are retained when the 95th percentile hourly summer net output between the hour ending 11 AM and 10 PM EPT (inclusive) of the resource meets or exceeds the current CIR level once in the most recent consecutive three year period. For purposes of this retention policy, the summer months are June, July and August.

Limited Duration Resources CIRs are retained when the resource meets or exceeds its current CIR level in the PJM Summer Capability Verification Test, as described in section 10 of this manual, once in the most recent consecutive three-year period. CIR retention will be analyzed based on only those summer verification tests performed within the summer test period. Results of out of period tests cannot be used in CIR retention calculations.

Hydropower With Non-Pumped Storage resources CIRs are retained when the resource meets or exceeds its current CIR level in the PJM Summer Capability Verification Test, as described in section 10 of this manual, once in the most recent consecutive three-year period. CIR retention will be analyzed based on only those summer verification tests performed within the summer test period. Results of out of period tests cannot be used in CIR retention calculations.

Combination Resources (other than Hydropower With Non-Pumped Storage) CIRs are retained when the sum of the CIR retention metrics for the components meet or exceed the current CIR level of such Combination Resource.

Mixed Technology Facilities with multiple Co-Located Resources CIRs are retained separately on each Co-Located Resource.

Unlimited Resources CIRs are retained when the resource meets or exceeds its current CIR level in the PJM Summer Capability Verification Test, as described in section 10 of this manual, once in the most recent consecutive three-year period. CIR retention will be analyzed based on only those summer verification tests performed within the summer test period. Results of out of period tests cannot be used in CIR retention calculations.

CIRs are lost when the MW level calculated in the applicable retention metric fails to meet or exceed the current CIR level. The CIRs lost will equal the difference between the current CIR level and the MW level calculated in the applicable retention metric. If the CIRs were granted at an aggregate level and not on an individual unit level, once CIRs are lost, the CIRs will be set at

the individual unit level based on the highest summer test in the past three years and will be retained individually for each unit going forward.

Any CIRs lost will be effective immediately after the summer months (June/July/August) and the ELCC Resource will have the reduced CIR level applied to the determination of the Accredited UCAP effective with the following Delivery Year.

CIRs for Unlimited Resources, if lost, are lost immediately after the summer testing period (September 1st). For generators that have lost CIRs and whose ICAP after the CIR loss is greater than the CIR level of the generator, the ICAP of the generator must be reduced to the new CIR level or lower on February 1st of the next calendar year. This delay in reducing the ICAP at a later date than the CIR loss, provides the generator with sufficient time to provide for replacement capacity, if needed, and time for PJM staff to officially communicate that a reduction in ICAP is necessary due to the loss of CIRs.

Section 6: Determination of Installed Capacity (ICAP)

Installed Capacity (ICAP) of a generation resource is defined as the net capability of a generating unit as determined in accordance with this manual and is within the capacity interconnection right limits of the bus to which it is connected . The ICAP for any generating unit is the sum of the capacity modifications (CAPMODs) in the Capacity Exchange system for that date.

ICAP is also the capability of the generating unit at the expected time of the PJM Summer Peak. This is also referred to as the "rated capability" or "rated ICAP." Rated capability or rated ICAP is determined by adjusting the generators capability for generator site conditions coincident with the dates and times of the last 15 years PJM summer peaks (also known as summer conditions). Summer Conditions are specifically defined in section 11.3 of this manual. Generator capability corrected to summer conditions is a proxy for a generators capability at future PJM summer peaks. All generators that are affected by generator site conditions that participate in the PJM Markets must correct their generators capability to summer conditions. Some generating units may not be affected by any of the conditions below; hence, they do not have to correct their capability to those conditions. Generator site conditions include, but are not limited to, dry bulb temperature, relative humidity, wet bulb temperature, dew point temperature, barometric pressure and cooling body (intake) water temperature. It is assumed that all generators have already adjusted their capability for their respective elevation. Simply put, if generator capability has not been adjusted for barometric pressure under summer/ winter conditions it is expected that it has been adjusted for standard barometric pressure at its elevation. Calculating a generators capability at sea level standard barometric pressure is improper if the generator is not located at zero elevation. Additionally, streamflow and forebay (reservoir) elevation (head) are generator site conditions specific to hydroelectric units and state of charge is a generator site condition applicable to battery storage units.

Calculation of ICAP must take into consideration station service power use and other load, such as, but not limited to, host process load (including steam, mechanical and electrical loads), scrubber load, cooling load, supplemental cooling load and any other load that supports the generating unit.

Station service and auxiliary loads should be commensurate with those experienced coincident with the most recent 15 years PJM summer peaks (i.e. under summer conditions). Additionally, if other load is used only under extreme conditions, and those conditions existed during any of the most recent 15 years PJM summer peaks, that load must be accounted for in the ICAP calculation. For example, if supplemental cooling load has been used during 10 of the 15 most recent PJM summer peaks, then two thirds of that load (the average supplemental cooling load used during the 10 years) should be removed from the generators ICAP to account for the expected supplemental cooling load. Additionally, if there is common load that is split among the generators at a plant, such as, but not limited to, scrubber load, that load must also be accounted for in the determination of ICAP.

In addition to consideration of station service, auxiliary and other load that is used to support the operation of the generating unit, the ICAP of a generation resource must also take into consideration host/process load that is located behind the generation resource's Point of Interconnection. Such load must be removed from the generator's ICAP and must be measured and reported separately for the generation resource net of station service load and other load that supports the operation of the generation resource.

If a generators rated ICAP is determined by using a particular set of generator site conditions (rated conditions), the summer/winter capability verification tests, CAPMOD tests and acceptance tests must be corrected for the same set of generator site conditions under summer/ winter conditions.

6.1 Determining Rated Capability

For each of the Variable Resource ELCC Classes, ICAP shall equal the Effective Nameplate Capacity of the resource, not to exceed the greater of the CIRs of the resource, or the transitional system capability as limited by the transitional resource MW ceiling, awarded for the applicable time period.

6.1.1 Variable Resources ICAP

For each of the Variable Resource ELCC Classes, ICAP shall equal the Effective Nameplate Capacity of the resource, not to exceed the greater of the CIRs of the resource, or the transitional system capability as limited by the transitional resource MW ceiling, awarded for the applicable time period.

6.1.2 Limted Duration Resources ICAP

Limited Duration Resources ICAP shall equal the sustained level of output that the unit can provide and maintain over a continuous period, whereby the duration of that continuous period matches the characteristic duration of the corresponding ELCC Class, with consideration given to ambient conditions expected to exist at the time of PJM system peak load, as described in Section 6.

The ICAP value cannot exceed the lower of i) the resource's Maximum Facility Output (or, for a Co-Located Resource, the applicable share of the Mixed Technology Facility's Maximum Facility Output) or ii) the greater of the Capacity Interconnection Rights or the transitional system capability as limited by the transitional resource MW ceiling as defined in the PJM Manuals, awarded for the applicable time period.

A Generation Capacity Resource Provider of an Energy Storage Resource shall notify PJM of a permanent reduction in the MWh energy storage capability of an Energy Storage Resource. Permanent reductions in the MWh energy storage capability of an Energy Storage Resource due to ordinary battery cell degradation shall be reported once every 5 years. A permanent

reduction in the MWh energy storage capability of an Energy Storage Resource is recognized with a decrease in Effective Nameplate Capacity.

6.1.3 Combination Resources ICAP

The ICAP of a Combination Resource other than Hydropower with Non-Pumped Storage shall equal the lesser of the Maximum Facility Output or the sum of the resource's components considered on a stand-alone basis where a Variable Resource or Limited Duration Resource component will be the Effective Nameplate Capacity and an Unlimited Resource component will be the ICAP. That value is then capped at the greater of the Capacity Interconnection Rights or the transitional system capability as limited by the transitional resource MW ceiling as defined in Manual 14-B: PJM Region Transmission Planning Process, awarded for the applicable time period.

The ICAP of a Hydropower with Non-Pumped Storage shall equal the Effective Nameplate Capacity of the resource, not to exceed the greater of the CIRs of the resource, or the transitional system capability as limited by the transitional resource MW ceiling, awarded for the applicable time period. Additionally, their ICAP should be determined by adjusting for forebay inflows and head (reservoir level/elevation) under summer conditions.

6.1.4 Unlimited Resources ICAP

1. Steam Units
    a. Steam units with only once through or multipass cooling must have their ICAP determined by adjusting for cooling body (intake) water temperature under summer conditions.
    b. Steam units with only wet cooling towers must have their ICAP determined by adjusting for wet bulb temperature under summer conditions. Basically this is an adjustment for temperature and relative humidity; however, barometric pressure can affect the wet bulb temperature and adjustments for barometric pressure are permitted and encouraged.
    c. Steam units with only dry cooling towers must have their ICAP determined by adjusting for dry bulb temperature under summer conditions
    d. Steam units with both wet and dry cooling towers must have their ICAP determined by adjusting appropriately for the generator site conditions listed in (B) and (C) above under summer conditions.
    e. Steam units with a combination of once through/multipass cooling and wet cooling towers must have their ICAP determined by adjusting appropriately for the generator site conditions in (A) and (B) above under summer conditions.

2. Nuclear Units

   a. Nuclear units with only once through/multipass cooling must have their ICAP determined by adjusting for cooling body (intake) water temperature under summer conditions.

   b. Nuclear units with only wet cooling towers must have their ICAP determined by adjusting for wet bulb temperature under summer conditions. Basically this is an adjustment for temperature and relative humidity; however, barometric pressure can affect the wet bulb temperature and adjustments for barometric pressure are permitted and encouraged.

   c. Nuclear units with a combination of once through/multipass cooling and wet cooling towers must have their ICAP determined by adjusting appropriately for the generator site conditions in (A) and (B) above under summer conditions.

3. Combustion Turbine Units

   a. Combustion turbine units with no compressor inlet cooling or conditioning must have their ICAP determined by adjusting for dry bulb temperature under summer conditions. However, adjustments for relative humidity are permitted and encouraged.

   b. Combustion turbine units with compressor inlet cooling or conditioning must have their ICAP determined by adjusting for wet bulb temperature under summer conditions. Basically this is an adjustment for temperature and relative humidity; however, barometric pressure can affect the wet bulb temperature and adjustments for barometric pressure are permitted and encouraged. Compressor inlet cooling or conditioning includes, but is not limited to, evaporative cooling, use of chillers, fogging and wet compression. In cases where these units have performance info such as charts/graphs/equations/tables that use only dry bulb temperature and relative humidity to determine performance, it is proper to use the aforementioned performance information to determine their ICAP, if and only if, the performance information includes the effects of the inlet cooling or conditioning on generator output.

4. Combined Cycle Units
    a. Combined cycle units with no combustion turbine compressor inlet cooling or conditioning must have their combustion turbine ICAP determined by adjusting for dry bulb temperature under summer conditions.
    b. Combined cycle units with compressor inlet cooling or conditioning must have their combustion turbine ICAP determined by adjusting for wet bulb temperature under summer conditions. Basically this is an adjustment for temperature and relative humidity; however, barometric pressure can affect the wet bulb temperature and adjustments for barometric pressure are permitted and encouraged. Compressor inlet cooling or conditioning includes, but is not limited to, evaporative cooling, use of chillers, fogging and wet compression. In cases where these units have performance info such as charts/graphs/equations/tables that use only dry bulb temperature and relative humidity to determine performance, it is proper to use the aforementioned performance information to determine their ICAP, if and only if, the performance information includes the effects of the inlet cooling or conditioning on generator output.
    c. Combined cycle units with only once through/multipass cooling on the steam components must have their steam unit ICAP determined by adjusting for cooling body (intake) water temperature under summer conditions.
    d. Combined cycle units with only wet cooling towers on the steam components must have their steam unit ICAP determined by adjusting for wet bulb temperature under summer conditions. Basically this is an adjustment for temperature and relative humidity; however, barometric pressure can affect the wet bulb temperature and adjustments for barometric pressure are permitted and encouraged.
    e. Combined cycle units with only dry cooling towers on the steam components must have their steam unit ICAP determined by adjusting for dry bulb temperature under summer conditions.
    f. Combined cycle units with both wet and dry cooling towers on the steam components must have their steam unit ICAP determined by adjusting for the generator site conditions listed in (D) and (E) above under summer conditions.
5. Diesel and Reciprocating Engine Units
    a. Diesel and reciprocating engine units do not need to have their ICAP adjusted for summer conditions since they are rarely affected sufficiently to warrant adjustments for generator site conditions.
6. Fuel Cell Units
    a. Fuel cell units do not need to have their ICAP adjusted for summer conditions since they are rarely affected sufficiently to warrant adjustments for generator site conditions.

Section 7: Determination of Effective Nameplate

7.1 Effective Nameplate Capacity for Variable Resource and Combination Resources

The Effective Nameplate Capacity for Variable Resources and Combination Resource shall equal:

- For such a resource with a PJM Interconnection Service Agreement, Generation Interconnection Agreement, or Wholesale Market Participation Agreement executed on or after January 1, 2000, the Effective Nameplate Capacity is the Maximum Facility Output specified in the Interconnection Service Agreement, Generation Interconnection Agreement, or Wholesale Market Participation Agreement, except:
    - If there are multiple Generation Capacity Resources corresponding to a single PJM Interconnection Service Agreement, Generation Interconnection Agreement, or Wholesale Market Participation Agreement, then the Effective Nameplate Capacity of each resource is allocated as a share of the Maximum Facility Output proportionate to the maximum hourly output of each resource over the last 3 years (or, if immature, then the estimated such maximum), unless the PJM can clearly discern from the corresponding PJM Interconnection Service Agreement, Generation Interconnection Agreement, or Wholesale Market Participation Agreement which fraction of the Maximum Facility Output corresponds to which resource, or unless the Generation Capacity Resource Provider submits a valid value that represents the current maximum power capability of each such resource.
- For such a resource that does not have a PJM Interconnection Service Agreement, Generation Interconnection Agreement, or Wholesale Market Participation Agreement executed after January 1, 2000, the Effective Nameplate Capacity is the maximum hourly output over the last 3 years, unless the Generation Capacity Resource Provider submits a valid value that represents the maximum power capability of the resource.

Generation Capacity Resource Provider shall notify PJM of a permanent reduction in the maximum power capability of a Variable Resource or a Combination Resource. Additionally, a Generation Capacity Resource Provider shall notify PJM of a significant permanent reduction in the effectiveness of a Variable Resource at converting the underlying energy source to electric energy (excluding ordinary solar panel degradation). Such reduction is recognized by reducing the resource's ELCC Resource Performance Adjustment.

7.2 Effective Nameplate Capacity for Limited Duration Resource

The Effective Nameplate Capacity for Limited Duration Resource shall equal the sustained level of output that the unit can provide and maintain over a continuous period, whereby the duration

of that continuous period matches the characteristic duration of the corresponding ELCC Class, with consideration given to ambient conditions expected to exist at the time of PJM system peak load to the extent that such conditions impact such resource's capability.

This Effective Nameplate Capacity cannot exceed the lower of i) the resource's Maximum Facility Output (or, for a Co-Located Resource, the applicable share of the Mixed Technology Facility's Maximum Facility Output) or ii) the greater of the Capacity Interconnection Rights or the transitional system capability as limited by the transitional resource MW ceiling as defined in Manual 14-B: PJM Region Transmission Planning Process, awarded for the applicable time period.

For Limited Duration Resources, Effective Nameplate Capacity and ICAP are equivalent.

A Generation Capacity Resource Provider of an Energy Storage Resource shall notify PJM of a permanent reduction in the MWh energy storage capability of an Energy Storage Resource. Permanent reductions in the MWh energy storage capability of an Energy Storage Resource due to ordinary battery cell degradation shall be reported once every 5 years. A permanent reduction in the MWh energy storage capability of an Energy Storage Resource is recognized with a decrease in Effective Nameplate Capacity.

Section 8: Data Submission Requirements

In order to facilitate the effective load carrying capability analysis, Generation Capacity Resource Providers must submit the following information for each ELCC Resource by no later than August 1 prior to the calendar year for the RPM Auction in which the ELCC Resource intends to submit a Sell Offer or otherwise commit to provide capacity, except for the required data needed for the 2025/2026 BRA where such required information must be provided by December 18, 2023.

Generation Capacity Resource Providers of solar, onshore wind, and intermittent landfill gas do not have any ELCC data submission requirement. However, providers of onshore wind and solar resources must submit the data specified in section 8.1.1 if they are requesting a unit-specific backcast.

A Planned Generation Capacity Resource that does not submit any valid data may be issued an Accredited UCAP value calculated on the basis of its apparent class and physical characteristics.

The required information may include relevant physical parameters, relevant historical data such as weather data and actual or estimated historical energy output, and documentation supporting such parameters and historical data. The relevant physical parameters are those that are incorporated into the effective load carrying capability analysis. The parameters required for Hydropower With Non-Pumped Storage shall include Ordinary Water Storage and any applicable Exigent Water Storage. Submitted parameters must indicate the expected duration for which any submitted physical parameters are valid.

PJM shall evaluate, validate, and approve the foregoing information in accordance with the process set forth in accordance with Section 2.6. In evaluating the validity of submitted information, PJM may assess the consistency of such information with observed conditions. If PJM observes that the information provided by the Generation Capacity Resource Provider of the ELCC Resource is inconsistent with observed conditions, PJM will coordinate with the Generation Capacity Resource Provider of the ELCC Resource to understand the information and observed conditions before making a determination regarding the validity of the applicable parameters. PJM may engage the services of a consultant with technical expertise to evaluate the foregoing information.

After PJM has completed its evaluation of the foregoing information, PJM shall notify the Generation Capacity Resource Provider in writing whether the submitted information is considered invalid by no later than September 1 following the submission of the information. PJM's determination on the validity of the foregoing information shall continue for the applicable Delivery Year and, if requested, for such longer period as PJM may determine is supported by the data.

In the event that PJM is unable to validate any of the required information, physical parameters, supporting documentation, or other related information submitted by the Generation Capacity Resource Provider of an ELCC Resource, then PJM shall calculate Accredited UCAP values for that ELCC Resource based only on the validated information. Such ELCC Resource shall not be permitted to offer or otherwise provide capacity above such Accredited UCAP values until the PJM determines new Accredited UCAP values for such resource.

Generation Capacity Resource Providers of ELCC Resources that are hydropower plants with water storage must provide documentation to support the physical parameters provided for expected load carrying capability analysis modeling, as specified in the section 8.1.5. This documentation must: (a) support the plant's physical capabilities; (b) demonstrate that the parameters do not violate any federal, state, river basin, or other applicable authority operating limitations of the plant; and (c) demonstrate full authorization from FERC, any river basin commissions, and any other applicable authorities to meet those capabilities.

In addition to the information specified in this section to support the ELCC analysis, Generation Capacity Resource Providers must meet the governing provisions of all requirements specified in PJM Manuals and Tariff

Generation Capacity Resource Providers of all resources, except wind and solar, must also submit operating and outage data into PJM eGADS system. GADs data is submitted monthly to PJM and is due by the 20th of the following month. Any errors or inconsistencies found in the PJM GADS Outage Data must be corrected. All revisions to outages, for reasons of data integrity, must be accomplished by revising the PJM GADS database via the PJM eGADS Tool.

8.1 Data Required

Generation Capacity Resource Providers planning to offer or otherwise commit to provide capacity in the Capacity Market, must submit data (as described in detail in the subsections below) by the deadlines outlined in section 8 in order to facilitate the effective load carrying capability analysis.

8.1.1 Onshore Wind and Solar

Providers of onshore wind and solar resources must provide the following data only if requesting a unit-specific backcast, otherwise they may provide it if desired. For onshore wind plants:

- Latitude and longitude in decimal degrees
- Turbine make, model, rating, and number of such turbines
- Turbine power curves
- Hub height

For solar plants:

- Latitude and longitude in decimal degrees

- Inverter and panel make, model, DC and AC power ratings, and other specifications
- Number of inverters and total AC power rating of inverters
- Number of panels and total DC power rating of panels
- Physical configuration of the panels: fixed tilt, single axis tracking, or dual axis tracking
- For tracking: brand of tracker
- For fixed-tilt: azimuth angle and tilt angle

For onshore wind and solar resource providers that wish to provide their own hourly backcast instead of a PJM-provided backcast, such backcasts must meet the following requirements and are subject to PJM validation:

- Planned Generation Capacity Resources and Existing Generation Capacity Resources that entered service after June 1, 2012: hourly backcast from June 1, 2012, through the most recent May 21, together with the underlying data and method used to develop such backcast.
- Existing Generation Capacity Resources that entered service on or before June 1, 2012: data submission is only required if there was a material change in physical plant configuration.

After an onshore wind or solar resource enters service, PJM may update its backcast annually by using new production data to calibrate previously developed backcasts.

8.1.2 Variable Resources other than Onshore Wind and Solar

In order to derive the most accurate ELCC analysis, providers of landfill gas units and intermittent hydro units should, if possible, provide the data specified below. In the case of intermittent landfill gas and intermittent hydro, PJM may utilize existing data and publicly available data to perform ELCC analysis and calculate Accredited UCAP values when no valid data or incomplete valid data has been submitted.

- Latitude and longitude in decimal degrees.
- Planned Generation Capacity Resources and Existing Generation Capacity Resources that entered service after June 1, 2012: hourly backcast for all years from June 1, 2012 through the most recent May 31, together with the underlying data and method used to develop such backcast (for example, hourly streamflow data from the United States Geological Survey ("USGS") in the case of hydropower, together with the method to convert streamflow to MWh using the generator characteristics).
- Existing Generation Capacity Resources that entered service on or before June 1, 2012: data submission is only required if there was a material change in physical plant configuration.

The following supporting documentation must be submitted for run-of-river hydropower without storage and landfill gas resources that are Planned Generation Capacity Resources or that entered service after June 1, 2012 Run-of-river hydro without storage:

- FERC license and any other agreements by which they are required to operate

Landfill gas:

- Expected landfill life
- Size (acreage)

For offshore wind plants providers must provide the data specified below:

- Turbine make, model, rating, and number of such turbines
- Turbine power curves
- Hub height
- Rotor diameter

8.1.3 Energy Storage Resources Including Pumped Storage Hydropower

Examples of Energy Storage Resources include standalone batteries and pumped storage hydropower. Providers of Energy Storage Resources must provide the following data and information:

1. Maximum combined power output capability of the plant while running all generators simultaneously under conditions corresponding to PJM peak loads (MW)
2. Maximum number of hours plant can run at maximum output. For pumped storage hydropower, this metric accounts for the water storage capability of upper and lower ponds, assumes conditions corresponding to PJM peak loads, and assumes the plant starts with an upper pond at its maximum elevation. (Hours)
3. Storage inventory capacity in MWh (A times B)
4. Black Start commitments in MW
5. Any other firm commitments in MW and either MWh or duration (hours)
6. Duration class (e.g., 4 hours, 6 hours, 8 hours, etc.)
7. Charging/discharging roundtrip efficiency

In addition, Pumped Storage Hydropower plants must submit monthly average values for the ratio of the number of cubic feet of water required to pump a single MWh, as well as for the ratio of the number of cubic feet of water required to produce a single MWh. These parameters should not be submitted in cubic-feet-per-second per MW; note that these parameters are equivalent to (cubic-feet-per-second per MW) times (3600 seconds per hour).

Additional Supporting Documentation for Pumped Storage Hydropower

This documentation is intended to support the information requested for pumped storage hydropower plants as detailed above.

- FERC-related documents
- Documents from river basin authorities
- Any relevant river-sharing agreements
- Prime mover ratings, power curve and elevation
- Upper and lower ponds volumes (minimum and maximum)
- Pond elevations (minimum and maximum)
- Daily average hourly inflows and outflows (if any) of upper and lower ponds
- Requirements related to elevation changes or discharge rates

Additional Supporting Documentation for Batteries

- Battery specifications
- Inverter specifications

8.1.4 Combination Resources (other than Hydropower with Non-Pumped Storage)

Combination Resources (other than Hydropower with Non-Pumped Storage) must provide the following data and information:

- All data required for the equivalent standalone components (e.g., solar data listed in Section 8.1.1 above)
- Maximum Output Facility (MFO) in MW
- Power rating capability associated with each component (in MW)
- Storage inventory capacity for energy storage resource component in MWh • Contractually and physically capable of charging from the grid (yes/no)
- Components are DC-coupled (that is, they share inverters) (yes/no)
- Duration class of Limited Duration Resource component (including storage) (e.g., 4 hours, 6 hours, 8 hours, etc.)
- Black Start commitments in MW
- Any other firm commitments in MW and MWh
- Charging/discharging roundtrip efficiency of storage component (%)

8.1.5 Hydropower with Non-Pumped Storage

A Hydropower with Non-pumped Storage plant is one that has water pondage, a water reservoir, or other water storage that is passively filled from incoming streamflow, and which can actively control the hour-by-hour output of the plant. Providers of such resources must submit the following data and information:

- Hourly Maximum Power capability for each month since June 2012 through the most recent May 31 (in MW).
  - This parameter for a Hydropower with Non-Pumped Storage resource is the maximum net power the resource can maintain in a given month over the hours of highest risk of shortage on the PJM system in that month.
  - The Maximum Power parameter can never exceed the Maximum Facility Output.
  - For summer months, the Maximum Power parameter cannot exceed the sum of the Installed Capacity values of all units that comprise the resource when running simultaneously.
  - The Maximum Power parameter can never exceed the greater of the resource's CIR value, or the transitional system capability as limited by the transitional resource MW ceiling as defined in Manual 14-B: PJM Region Transmission Planning Process, awarded for the applicable time period.
- Minimum Allowable Water Flow.
  - This parameter for Hydropower with Non-Pumped Storage resources is the minimum sustained water flow allowable under applicable licenses, contracts, and/or other agreements.
  - This parameter represents incoming streamflow that cannot be retained in storage during off-peak hours due to contractual or other legal obligations to maintain minimum water flows downstream of the facility.
  - For any given day, the minimum sustained water flow is the average of the lowest contractually-allowable water flow levels in CFS that may be derived for a) 14 consecutive off-peak hours in the summer (i.e., June 21 through September 21, inclusive); or b) 6 consecutive off-peak hours in the rest of the year.
  - Different values of this parameter may be submitted for different modeled days. o Submitted values must cover each modeled day from June 1, 2012 through the most recent May 31. These values are not historical actual water flow values, but instead based on the contracts that will be in place in the target Delivery Year. These values reflect governing agreements (such as FERC licenses), river sharing agreements, and any other governing contracts that will be in place in the target Delivery Year. If such contract levels are dependent on water flow levels or other conditions, these values should reflect the impact of those historical conditions.
  - The ELCC model uses this parameter to indicate incoming streamflow that cannot be retained in storage during off-peak hours due to contractual or other legal obligations to maintain minimum water flows downstream of the facility.

- Monthly average values for the ratio of the number of cubic feet of water required to produce a single MWh for each month from June 2012 through the most recent May.
    - This parameter should not be submitted in cubic-feet-per-second per MW; note that this parameter is equivalent to (cubic-feet-per-second per MW) times (3600 seconds per hour).
- 24-hour rolling average streamflow data in cubic-feet per hour, for each hour from June 1, 2012, through the most recent May 31, and 24-hour rolling average data on incoming available water energy in MWh per hour, for each hour from June 1, 2012 through the most recent May 31, together with a description and justification for the method for converting streamflow to available MWh. If a valid source of such data is not available, PJM will work with the corresponding owner/operator to identify an alternate data source
- Ordinary Water Storage capability, which can vary monthly, in various forms: cubic feet, converted to MWh, and in terms of daily minimum and maximum forebay elevations, together with a description and justification for the method for converting water storage in cubic feet or forebay elevation to MWh. Only water storage capability specific to the specified hydro plant should be included— storage from upstream plants must not be included, since the ELCC model captures those cascading relationships already.
- Exigent Water Storage capability—water storage that is only available on exceptionally high load days or on a PJM-declared emergency, which can vary monthly, in various forms: cubic feet, converted to MWh, and in terms of daily minimum and maximum forebay elevations, together with a description and justification for the method for converting water storage in cubic feet or forebay elevation to MWh. Do not include Ordinary Water Storage capability in the reported number for Exigent Water Storage—the ELCC model will add the two parameters in determining total storage capability. Only water storage capability specific to the specified hydro plant should be included— storage from upstream plants must not be included, since the ELCC model captures those cascading relationships already. When both the maximum exigent pond elevation is above its normal limit, and also the minimum exigent pond elevation is below its normal limit, both the additional pond bottom volume and the additional pond top volume should be included in the Exigent Water Storage. The sum of Exigent Water Storage and Ordinary Water Storage matches the volume of water between the exigent minimum pond elevation and exigent maximum pond elevation (as expressed in MWh).
- Any cascading relationships to Hydropower with Non-Pumped Storage plants on the same river system in MW. In the ELCC model, water discharges from upstream hydro plants with cascading relationships will be available to downstream hydro plants for generation or storage.
- Any Black Start commitments, in MW.
- Any other firm commitments, in MW and MWh, together with a description of the nature of such firm commitments.

Supporting Documentation for Hydropower with Non-pumped Storage

Owners of Hydropower with Non-pumped Storage plants must provide documentation to support the parameters provided for dispatch modeling. This documentation must support a) their plants' physical capabilities; b) show that the parameters do not violate any operational limits of the plant; and c) show full authorization from FERC, river basin commissions, and any other applicable authorities to meet those capabilities.

- FERC license
- Documents from river basin authorities
- Any relevant river-sharing agreements
- Geographical information
- Storage information to support storage MWh values (ordinary and exigent)

8.2 ELCC Data Submission Process

ELCC Data Submission Process:

1. Visit the ELCC web page: https://www.pjm.com/planning/resource-adequacy-planning/effective-load-carrying-capability
2. From the ELCC web page, download the data submission template corresponding to the applicable ELCC Class. For all ELCC Classes except Hydro With Non-Pumped Storage, a separate template for each RPM Resource ID must be submitted (except for hydropower resources for which multiple RPM Resource ID's apply to a single hydropower plant).
3. Review all the sheets in the data submission template. Input all the required data following the data submission standards provided in the template.
4. Access the ELCC portal linked on the ELCC web page. If access has not already been granted, access will need to be requested following the instructions available on the ELCC web page.
5. Use the ELCC portal to submit the filled in data submission template together with the accompany form.

Resubmission of Data:

Generation Capacity Resource Providers who must resubmit data annually should do so in a complete new data submission template including the full time series and complete set of parameters, as applicable. Supporting documentation does not need to be resubmitted unless it has changed. Members who already submitted ELCC-related data through the above process do not need to submit new data annually except in the following circumstances:

1. If the previously submitted data did not include the complete time series from June 1, 2012 through the most recent May 31, or was deemed by PJM to not be valid;
2. If the data has changed since the prior submission;

3. If the PJM data template for the applicable class has been updated since the most recent submission.

Duel Fuel Attestation Submission Process:

1. Click on the PJM Connect link: https://connect.pjm.com/elccdata/SitePages/Home.aspx
2. Log into SharePoint (via the web browser). If you have issues logging into SharePoint visit the following link: https://pjm.com/-/media/planning/res-adeq/elcc/login-troubleshootinginstructions.ashx
3. Once you have successfully logged in, you will be directed to the ELCC Data Submission homepage. Navigate to the "Dual Fuel Attestation" tab on the left side of the page.
4. On the "Dual Fuel Attestation" tab, you will be able to view any prior submissions of the dual fuel attestation. Click on the "New" button to submit a new attestation form.
    a. Further instructions can be found at: https://www.pjm.com/-/media/planning/res-adeq/elcc/dual-fuel-attestation.ashx
    b. Supporting documentation may be attached by clicking the "Attach File" button located at the top of the page.
5. Once all fields have been completed and any supporting documentation has been attached, click on Submit.

Section 9: Backcasts

For resources that entered service after June 1, 2012, a backcast is required so that a complete time series of estimated output stretching from June 1, 2012 until the most recent May 31 can be identified. This time series is used in developing the ELCC Resource hourly output shapes and in calculating the ELCC Resource Performance Adjustments.

For onshore wind and solar resources, and for Combination Resources with an onshore wind or solar component, PJM will develop the backcasts based on historical weather data consistent with the particular site conditions and generator configurations for each such resource, unless a Generation Capacity Resource Provider requests to use their own PJM-validated backcast. Where data is available prior to development of a given backcast, PJM will use the actual plant characteristics to develop a unit-specific backcast; otherwise, PJM will use a generic backcast that corresponds to the overall technology type and location of the resource. In order to improve the accuracy of backcasts, PJM may update onshore wind and solar backcasts on a regular basis, including using additional available data to enhance backcasts developed in prior years.

For intermittent landfill gas resources that entered service after June 1, 2012 or otherwise require a backcast, PJM will use the average historical output of the landfill gas fleet to derive an estimate of historical production of a given landfill gas resource, unless the provider of such resource submits an alternative backcast that is validated by PJM.

For offshore wind resources, PJM will work with the Generation Capacity Resource Provider to develop a backcast.

For other Variable Resources and Combination Resources (except solar hybrids and onshore wind hybrids) that entered service after June 1, 2012, or otherwise require a backcast, the resource provider should provide that backcast based on generator parameters, site conditions, and historical weather.

For Unlimited Resources that entered service after June 1, 2012 PJM will develop the putative output based on actual performance of similar units for any hour the unit was not in service.

Where possible, backcasts should reflect relevant changes (including prospective changes) in plant characteristics, including deterioration, enhancements to control systems, derates, uprates, and other physical changes.

In all cases above, the backcasted hourly output of a resource shall be capped at (i) the greater of the resource's CIR value, or the transitional system capability as limited by the transitional resource MW ceiling, as defined in Manual 14B, awarded for the applicable Delivery Year, for hours in the months of June through October and the following May of the Delivery Year, and (ii) at the resource's assessed deliverability MW value for hours in the months of November through April of the Delivery Year.

Section 10: Testing Requirements

There are three types of testing required of Generation Capacity Resources, except for Variable Resources, in PJM: Acceptance testing, CAPMOD testing and Capability Verification testing.

1. Acceptance testing is required of all newly constructed Generation Capacity Resources in PJM.
2. CAPMOD testing is required for any increases to a Generation Capacity Resource's ICAP value in the PJM Capacity Market.
3. Capability Verification testing is required of all Generation Capacity Resources.

10.1 Acceptance Testing

1. Acceptance tests for newly constructed generating units must be completed prior to any new generating unit's CAPMOD effective date in the PJM Capacity Market. These acceptance tests can be performed simultaneously with vendor/architect/engineering firm acceptance tests; however, the initial CAPMOD effective date must follow successful vendor/architect/engineering firm acceptance tests and successful emissions testing. In other words, the unit must have a valid emissions permit and have been released to the generator owner by the vendor/architect/engineering firm for participation in the PJM Markets. These tests must be corrected to summer conditions (pursuant to Section 11 of this document) and must meet or exceed the newly constructed generating units ICAP which cannot exceed the CIR level delineated in the generating units GIA or WMPA.
2. The newly constructed generators ICAP (Rated ICAP) value must be determined in accordance with Section 6 of this manual.
3. In cases when a newly constructed generating unit's participation in the PJM Capacity Markets increases by a series of CAPMODs, subsequent acceptance test(s) must be conducted prior to any subsequent CAPMOD effective date(s). Failure to meet or exceed the ICAP in any acceptance test will be remedied by entering a CAPMOD that causes the PJM RPM Markets ICAP value to be equal to or lower than the Net Corrected Test Capacity in the Acceptance test; however, the ICAP value must not exceed the CIR level delineated in the generating units GIA or WMPA.
4. A final acceptance test, conducted within the summer test period, will also be accepted as the Summer Capability Verification test for that year as long as it is corrected for summer conditions (pursuant to Section 11 of this document) and meets the requirements of Section 10.3.1 of this manual.

10.2 CAPMOD Testing

1. In cases when a generating unit's ICAP increases in the PJM Capacity Market by a CAPMOD, a CAPMOD test must be conducted within 30 days of the CAPMOD effective date.
2. A CAPMOD test is required to accompany any existing generating unit being included in the PJM capacity markets for the first time, returning to the PJM capacity markets after an absence, or returning the PJM capacity markets from a "mothballed" state. The included test must meet or exceed the requested ICAP and the ICAP of the generating unit cannot be greater than the generating unit's capacity interconnection rights.
3. The new ICAP (the sum of the CAPMODs to date) must be determined in accordance with Section 6 of this manual.
4. This excludes new generating units that have submitted acceptance tests in, or prior to, the summer test period. Units in this category must follow the acceptance test guidelines in Section 10.3.1 above.
5. Limited Duration Resources that switch ELCC Classes, based on choosing a different characteristic duration do not need to submit a CAPMOD test as long as the total MWh does not change.
6. A Summer/Winter Capability Verification test performed within the last 12 months can be used to prove a CAPMOD increasing the Summer/Winter ICAP of a generating unit. This test must meet or exceed the requested ICAP and the ICAP of the generating unit cannot be greater than the generating unit's capacity interconnection rights.
7. A failed test that does not meet or exceed the ICAP after a CAPMOD must be remedied by a CAPMOD down for the shortfall, effective as soon as practical. Also, a derating event for the shortfall must be entered into the PJM eGADS system that starts and ends on the respective CAPMOD effective dates.
8. In items (1) and (2) above, if the CAPMOD effective date is within the summer test period (June 1-August 31) the summer capability verification test (pursuant to section 2 of this document) can be used in lieu of a separate CAPMOD test. This test needs to be corrected for summer conditions (pursuant to section 2 of this document) and if the Corrected Net Test Capacity does not meet or exceed the ICAP, a CAPMOD in the amount of the difference must be entered into the RPM system effective as soon as practical.

10.3 Capability Verification Testing

1. Verification tests for all PJM capacity resources (other than Variable Resources) are to be submitted for both summer and winter test periods.
    a. Test data shall be submitted to the Resource Adequacy Planning department (RAP) of PJM via the PJM eGADS system.[1] This requirement applies to both discrete tests and to tests that use actual operating data
2. The summer test period starts at June 1 @0000 hours local plant time and ends at September 1 @0000 hours local plant time.
3. The winter test period starts at December 1 @0000 hours local plant time and ends at March 1 @0000 hours local plant time.
4. Generation owners are responsible to comply with these requirements at their own expense
5. Exceptions to and deviations from these requirements shall be by RAP approval only. Such exceptions shall be requested in writing by the generating entity prior t the end of the respective test period for known occurrences such as, but not limited to, environmental restrictions and fuel limitations.

[1] PJM eGADS User Guide Appendix B: PJM Net Capability Verification Test User is available at: http://www.pjm.com/-/media/etools/ egads/egads-user-guide.ashx?la=en Frequently asked questions (FAQs) about testing is available at: https://www.pjm.com/-/media/planning/res-adeq/pjm-capacity-verificationtesting-frequently-asked-questions.ashx

6. PJM, at its discretion, can require multiple generating units to perform simultaneous Capability Verification tests during the Summer Test Period. This is to ensure that all shared auxiliary, common and process load is accounted for during Capability Verification tests. This also ensures proper testing for units with common cooling intakes and that share cooling water and auxiliary equipment.
    a. PJM will limit the number of plants subject to simultaneous testing to a maximum not to exceed ten per summer test period and notify (no later than April 15th annually) each plant owner/agent prior to the summer test period which generating units and plant(s) have been chosen for simultaneous testing. PJM will also specify a period of time in which the simultaneous tests must be performed. This period of time will be no less than a contiguous fourteen day period for each set of generating units.
    b. Keep in mind, that CIR retention calculations for units that are subject to simultaneous multiple unit Capability Verification testing for three or more consecutive summer test periods, are based on sum of the multiple generating units Net Corrected Test Capacities (the actual corrected summer test value) and the sum of multiple generating units CIRs (see Section 5 of this manual).
    c. Coordination between PJM Dispatch and the Generator Owner will be necessary for testing units whether they are scheduled day ahead or real time and it is important for both the Generator Owner and the PJM Dispatcher to maintain open communications. It is also incumbent upon the Generation Owner to ensure its preparation for the generator/plant testing has been executed properly. PJM will facilitate test coordination with other dependent resources, e.g. run of river hydro units. There may be times that testing cannot be accommodated by PJM Dispatch because of constraints or other system issues. If PJM Dispatch cannot accommodate the testing, extension of the delineated testing period in the PJM required simultaneous testing request can be granted only for those capacity verification tests specifically delineated. If an extension is needed because PJM Dispatch could not accommodate simultaneous testing, please email gadssupport@pjm.com and request an extension of the delineated time period.

10.3.1 Summer Capability Verification Testing Requirements

1. Steam and Nuclear Units

   a. For units with once through/multipass cooling only, tests should be conducted when the observed generator site cooling body (intake) water temperature is within 5°F of rated cooling body (intake) water temperature. Rated cooling body (intake) water temperature is equal to the average generator site cooling body (intake) water temperature coincident with the last 15 years PJM summer peaks. Tests need to be corrected for performance due to the difference between observed and rated cooling body (intake) water temperatures. The correction should be delineated separately on the test form in PJM eGADS; both the observed cooling body (intake) water temperature and the rated cooling body (intake) water temperature should be submitted.

   b. For units with only wet cooling towers, tests should be conducted when the observed generator site wet bulb temperature is within 10°F of rated wet bulb temperature. Rated wet bulb temperature is equal to the average generator site wet bulb temperature coincident with the last 15 years PJM summer peaks. Tests need to be corrected for performance due to the difference between observed and rated wet bulb temperatures. The correction should be delineated separately on the test form in PJM eGADS; the dry bulb temperature, relative humidity and the wet bulb temperature should be submitted for both observed and rated conditions.

   c. For units with only dry cooling, tests should be conducted when the observed generator site dry bulb temperature is within 20°F of rated dry bulb temperature. Rated dry bulb temperature is equal to the average generator site dry bulb temperature coincident with the last 15 years PJM summer peaks. Tests need to be corrected for performance due to the difference between observed and rated dry bulb temperatures. The correction should be delineated separately on the test form in PJM eGADS; the dry bulb temperature should be submitted for both observed and rated conditions.

   d. For units with a combination of once through/multipass cooling and wet cooling towers, tests should be conducted when the observed generator site cooling body (intake) water temperature is within 5°F of rated cooling body (intake) water temperature. Rated cooling body (intake) water temperature is equal to the average generator site cooling body (intake) water temperature coincident with the last 15 years PJM summer peaks and rated wet bulb temperature is equal to the average generator site wet bulb temperature coincident with the last 15 years PJM summer peaks. Tests need to be corrected for performance due to the difference between observed and rated cooling body (intake) water temperatures and observed and rated wet bulb temperatures. This correction should be delineated separately on the test form in PJM eGADS; the dry bulb temperature, relative humidity, wet bulb temperature and cooling body (intake) water temperature should be submitted for both observed and rated conditions.

2. Combustion Turbine Units

   a. For units with compressor inlet cooling (chillers, fogging, evaporative cooling, wet compression, etc.), tests should be conducted when the observed generator site wet bulb temperature is within 10°F of rated wet bulb temperature. Rated wet bulb temperature is equal to the average generator site wet bulb temperature coincident with the last 15 years PJM summer peaks. Tests need to be corrected for performance due to the difference between observed and rated wet bulb temperatures. The correction should be delineated separately on the test form in PJM eGADS; the dry bulb temperature, relative humidity and the wet bulb temperature should be submitted for both observed and rated conditions.

   b. For units without compressor inlet cooling, tests should be conducted when the observed generator site dry bulb temperature is within 20°F of rated dry bulb temperature. Rated dry bulb temperature is equal to the average generator site dry bulb temperature coincident with the last 15 years PJM summer peaks. Tests need to be corrected for performance due to the difference between observed and rated dry bulb temperatures. If corrections for relative humidity are desired, corrections for both can be calculated as long as rated conditions include both dry bulb temperature and relative humidity and they are calculated in accordance with Section 6 of this manual. The corrections should be delineated separately on the test form in PJM eGADS; the dry bulb temperature and relative humidity should be submitted for both observed and rated conditions.

3. Combined Cycle Units

   a. For combustion turbine components with compressor inlet cooling (chillers, fogging, evaporative cooling, wet compression, etc.), tests should be conducted when the observed generator site wet bulb temperature is within 10°F of rated wet bulb temperature. Rated wet bulb temperature is equal to the average generator site wet bulb temperature coincident with the last 15 years PJM summer peaks. Tests need to be corrected for performance due to the difference between observed and rated wet bulb temperatures. The correction should be delineated separately on the test form in PJM eGADS; the dry bulb temperature, relative humidity and the wet bulb temperature should be submitted for both observed and rated conditions.

   b. For combustion turbine components without compressor inlet cooling or conditioning, tests should be conducted when the observed generator site dry bulb temperature is within 20°F of rated dry bulb temperature. Rated dry bulb temperature is equal to the average generator site dry bulb temperature coincident with the last 15 years PJM summer peaks. Tests need to be corrected for performance due to the difference between observed and rated dry bulb temperatures. It is encouraged and permitted to also correct for both observed and rated relative humidity although it is not mandatory and if corrections for relative humidity are desired, they need to be calculated in accordance with Section 6 of this manual. The correction(s) should be delineated separately on the test form in PJM eGADS; the dry bulb temperature and relative humidity should be submitted for both observed and rated conditions.

   c. For steam components with once through/multipass cooling only, tests should be conducted when the observed generator site cooling body (intake) water temperature is within 5°F of rated cooling body (intake) water temperature. Rated cooling body (intake) water temperature is equal to the average generator site cooling body (intake) water temperature coincident with the last 15 years PJM summer peaks. Tests need to be corrected for performance due to the difference between observed and rated cooling body (intake) water temperatures. The correction should be delineated separately on the test form in PJM eGADS; both the observed cooling body (intake) water temperature and the rated cooling body (intake) water temperature should be submitted.

d. For steam components with a combination of once through/multipass cooling and wet cooling towers, tests should be conducted when the observed generator site cooling body (intake) water temperature is within 5°F of rated cooling body (intake) water temperature. Rated cooling body (intake) water temperature is equal to the average generator site cooling body (intake) water temperature coincident with the last 15 years PJM summer peaks and rated wet bulb temperature is equal to the average generator site wet bulb temperature coincident with the last 15 years PJM summer peaks. Tests need to be corrected for performance due to the difference between observed and rated cooling body (intake) water temperatures and observed and rated wet bulb temperatures. This correction should be delineated separately on the test form in PJM eGADS; the dry bulb temperature, relative humidity, wet bulb temperature and cooling body (intake) water temperature should be submitted for both observed and rated conditions.

e. For steam components with wet cooling towers, tests should be conducted when the observed generator site wet bulb temperature is within 10°F of rated wet bulb temperature. Rated wet bulb temperature is equal to the average generator site wet bulb temperature coincident with the last 15 years PJM summer peaks. Tests need to be corrected for performance due to the difference between observed and rated wet bulb temperatures. The correction should be delineated separately on the test form in PJM eGADS; the dry bulb temperature, relative humidity and the wet bulb temperature should be submitted for both observed and rated conditions.

f. For steam components with dry cooling, tests should be conducted when the observed generator site dry bulb temperature is within 20°F of rated dry bulb temperature. Rated dry bulb temperature is equal to the average generator site dry bulb temperature coincident with the last 15 years PJM summer peaks. Tests need to be corrected for performance due to the difference between observed and rated dry bulb temperatures. The correction should be delineated separately on the test form in PJM eGADS; the dry bulb temperature should be submitted for both observed and rated conditions.

4. Limited Duration Resources

a. The duration of the test must equal the corresponding ELCC Class for that applicable Delivery Year.

b. The tested hours must be between the hour ending 11AM and 10 PM Eastern Prevailing Time during the summer period (June/July/August).

c. The tested MW should be corrected to ambient conditions expected to exist at the time of PJM system peak load, to the extent that such conditions impact such resource's capability

d. All units at the same plant must perform the test simultaneously

e. Actual operation data can be used.

5. In cases where multiple conditions must be met on any generating unit, the following observed generator site condition test correction hierarchy must be followed:
    a. If there is once through/multipass cooling, the test must be performed within 5°F of rated cooling body (intake) water temperature.
    b. If there is no once through cooling and there is wet cooling, the test must be performed within 10°F of rated wet bulb temperature.
    c. If there is dry cooling and no compressor inlet cooling, the test must be performed within 20°F of rated dry bulb temperature.
6. All Units in section 10.3.1.1, 10.3.1.2 and 10.3.1.3 above
    a. If it is impractical to test the unit types above, within the observed temperature and humidity limits delineated above, testing can occur without adherence to the aforementioned temperature and humidity limits as long as the testing start time is 10 am or later (local plant time) and the testing end time is 10 pm or earlier (local plant time) on any day from July 7th through August 31st.
    b. If testing has been completed per Section 1.3.4.5.a above and at a later date, within the summer test period, the generator can meet the temperature requirements listed in sections 1.3.4.1, 1.3.4.2 or 1.3.4.3 above, a re-test is not required.
    c. For the purposes of this document "wet cooling" shall mean any wet cooling used in cooling circulating water or combustion turbine inlet cooling of any type.
7. Units other than those cited in sections 1.3.4.1, 1.3.4.2, 1.3.4.3, or 1.3.4.4 above
    a. All units other than those cited in sections 1.3.4.1, 1.3.4.2 and 1.3.4.3 above can test in any set of hours as long as the test start time is on or after June 1 @0000 hours and the test end time is on or before September 1 @0000 hours.

10.3.2 Winter Capability Verification Testing Requirements

1. Steam and Nuclear Units
   a. For units with once through/multipass cooling only, tests should be conducted when the observed generator site cooling body (intake) water temperature is within 5°F of rated cooling body (intake) water temperature. Rated cooling body (intake) water temperature is equal to the average generator site cooling body (intake) water temperature coincident with the last 15 years PJM winter peaks. Tests need to be corrected for performance due to the difference between observed and rated cooling body (intake) water temperatures. The correction should be delineated separately on the test form in PJM eGADS; both the observed cooling body (intake) water temperature and the rated cooling body (intake) water temperature should be submitted.
   b. For units with only wet cooling towers, tests should be conducted when the observed generator site wet bulb temperature is within 10°F of rated wet bulb temperature. Rated wet bulb temperature is equal to the average generator site wet bulb temperature coincident with the last 15 years PJM winter peaks. Tests need to be corrected for performance due to the difference between observed and rated wet bulb temperatures. The correction should be delineated separately on the test form in PJM eGADS; the dry bulb temperature, relative humidity and the wet bulb temperature should be submitted for both observed and rated conditions.
   c. For units with only dry cooling, tests should be conducted when the observed generator site dry bulb temperature is within 20°F of rated dry bulb temperature. Rated dry bulb temperature is equal to the average generator site dry bulb temperature coincident with the last 15 years PJM winter peaks. Tests need to be corrected for performance due to the difference between observed and rated dry bulb temperatures. The correction should be delineated separately on the test form in PJM eGADS; the dry bulb temperature should be submitted for both observed and rated conditions.
   d. For units with a combination of once through/multipass cooling and wet cooling towers, tests should be conducted when the observed generator site cooling body (intake) water temperature is within 5°F of rated cooling body (intake) water temperature. Rated cooling body (intake) water temperature is equal to the average generator site cooling body (intake) water temperature coincident with the last 15 years PJM winter peaks and rated wet bulb temperature is equal to the average generator site wet bulb temperature coincident with the last 15 years PJM winter peaks. Tests need to be corrected for performance due to the difference between observed and rated cooling body (intake) water temperatures and observed and rated wet bulb temperatures. This correction should be delineated separately on the test form in PJM eGADS; the dry bulb temperature, relative humidity, wet bulb temperature and cooling body (intake) water temperature should be submitted for both observed and rated conditions.

2. Combustion Turbine Units
    a. For units with compressor inlet cooling (chillers, fogging, evaporative cooling, wet compression, etc.), tests should be conducted when the observed generator site wet bulb temperature is within 10°F of rated wet bulb temperature. Rated wet bulb temperature is equal to the average generator site wet bulb temperature coincident with the last 15 years PJM winter peaks. Tests need to be corrected for performance due to the difference between observed and rated wet bulb temperatures. The correction should be delineated separately on the test form in PJM eGADS; the dry bulb temperature, relative humidity and the wet bulb temperature should be submitted for both observed and rated conditions.
    b. For units without compressor inlet cooling, tests should be conducted when the observed generator site dry bulb temperature is within 20°F of rated dry bulb temperature. Rated dry bulb temperature is equal to the average generator site dry bulb temperature coincident with the last 15 years PJM winter peaks. Tests need to be corrected for performance due to the difference between observed and rated dry bulb temperatures. If corrections for relative humidity are desired, corrections for both can be calculated as long as rated conditions include both dry bulb temperature and relative humidity and they are calculated in accordance with Section 6 of this manual. The corrections should be delineated separately on the test form in PJM eGADS; the dry bulb temperature and relative humidity should be submitted for both observed and rated conditions.

3. Combined Cycle Units
    a. For combustion turbine components with compressor inlet cooling (chillers, fogging, evaporative cooling, wet compression, etc.), tests should be conducted when the observed generator site wet bulb temperature is within 10°F of rated wet bulb temperature. Rated wet bulb temperature is equal to the average generator site wet bulb temperature coincident with the last 15 years PJM winter peaks. Tests need to be corrected for performance due to the difference between observed and rated wet bulb temperatures. The correction should be delineated separately on the test form in PJM eGADS; the dry bulb temperature, relative humidity and the wet bulb temperature should be submitted for both observed and rated conditions.
    b. For combustion turbine components without compressor inlet cooling or conditioning, tests should be conducted when the observed generator site dry bulb temperature is within 20°F of rated dry bulb temperature. Rated dry bulb temperature is equal to the average generator site dry bulb temperature coincident with the last 15 years PJM winter peaks. Tests need to be corrected for performance due to the difference between observed and rated dry bulb temperatures. It is encouraged and permitted to also correct for both observed and rated relative humidity although it is not mandatory and if corrections for relative humidity are desired, they need to be calculated in accordance with Section 6 of this manual. The correction(s) should be delineated separately on the test form in PJM eGADS; the dry bulb temperature and relative humidity should be submitted for both observed and rated conditions.
    c. For steam components with once through/multipass cooling only, tests should be conducted when the observed generator site cooling body (intake) water temperature is within 5°F of rated cooling body (intake) water temperature. Rated cooling body (intake) water temperature is equal to the average generator site cooling body (intake) water temperature coincident with the last 15 years PJM winter peaks. Tests need to be corrected for performance due to the difference between observed and rated cooling body (intake) water temperatures. The correction should be delineated separately on the test form in PJM eGADS; both the observed cooling body (intake) water temperature and the rated cooling body (intake) water temperature should be submitted.

d. For steam components with a combination of once through/multipass cooling and wet cooling towers, tests should be conducted when the observed generator site cooling body (intake) water temperature is within 5°F of rated cooling body (intake) water temperature. Rated cooling body (intake) water temperature is equal to the average generator site cooling body (intake) water temperature coincident with the last 15 years PJM winter peaks and rated wet bulb temperature is equal to the average generator site wet bulb temperature coincident with the last 15 years PJM winter peaks. Tests need to be corrected for performance due to the difference between observed and rated cooling body (intake) water temperatures and observed and rated wet bulb temperatures. This correction should be delineated separately on the test form in PJM eGADS; the dry bulb temperature, relative humidity, wet bulb temperature and cooling body (intake) water temperature should be submitted for both observed and rated conditions.

e. For steam components with wet cooling towers, tests should be conducted when the observed generator site wet bulb temperature is within 10°F of rated wet bulb temperature. Rated wet bulb temperature is equal to the average generator site wet bulb temperature coincident with the last 15 years PJM winter peaks. Tests need to be corrected for performance due to the difference between observed and rated wet bulb temperatures. The correction should be delineated separately on the test form in PJM eGADS; the dry bulb temperature, relative humidity and the wet bulb temperature should be submitted for both observed and rated conditions.

f. For steam components with dry cooling, tests should be conducted when the observed generator site dry bulb temperature is within 20°F of rated dry bulb temperature. Rated dry bulb temperature is equal to the average generator site dry bulb temperature coincident with the last 15 years PJM winter peaks. Tests need to be corrected for performance due to the difference between observed and rated dry bulb temperatures. The correction should be delineated separately on the test form in PJM eGADS; the dry bulb temperature should be submitted for both observed and rated conditions.

4. Limited Duration Resources

a. The duration of the test must equal the corresponding ELCC Class for that applicable Delivery Year.

b. The tested hours must be between the hour ending 6 AM and 9 PM Eastern Prevailing Time during the winter period (December/January/February).

c. The tested MW should be corrected to ambient conditions expected to exist at the time of PJM system peak load, to the extent that such conditions impact such resource's capability

d. All units at the same plant must perform the test simultaneously

e. Actual operation data can be used.

5. In cases where multiple conditions must be met on any generating unit, the following observed generator site condition test correction hierarchy must be followed:
    a. If there is once through/multipass cooling, the test must be performed within 5°F of rated cooling body (intake) water temperature.
    b. If there is no once through cooling and there is wet cooling, the test must be performed within 10°F of rated wet bulb temperature.
    c. If there is dry cooling and no compressor inlet cooling, the test must be performed within 20°F of rated dry bulb temperature.
6. All Units in section 10.3.2.1, 10.3.2.2 and 10.3.2.3 above
    a. If it is impractical to test the unit types above, within the observed temperature and humidity limits delineated above, testing can occur without adherence to the aforementioned temperature and humidity limits as long as the testing start time is 6 am or later (local plant time) and the testing end time is 9pm or earlier (local plant time) on any day in January or Ferbruary.
    b. If testing has been completed per section 10.3.2.5.A above and at a later date, within the summer test period, the generator can meet the temperature requirements listed in sections 10.3.2.1, 10.3.2.2 or 10.3.2.3 above, a re-test is not required.
    c. For the purposes of this document "wet cooling" shall mean any wet cooling used in cooling circulating water or combustion turbine inlet cooling of any type.
7. Units other than those cited in sections 10.3.2.1, 10.3.2.2 and 10.3.2.3 above
    a. All units other than those cited in sections 10.3.2.1, 10.3.2.2 and 10.3.2.3 above can test in any set of hours as long as the test start time is on or after December 1 @0000 hours and the test end time is on or before February 1 @0000 hours.

10.3.3 Impact of Test Results

1. **Successful Test Result** –A successful test result is one in which the Corrected Net Test Capacity is equal to or greater than the claimed installed capacity (ICAP) for the applicable test period and conducted within the respective test period.
2. **Failed Test** – A failed test is one in which the Corrected Net Test Capacity is less than the claimed installed capacity (ICAP) for the applicable test period. This will result in an assessment of a Generation Resource Rating Test Failure Charge, per **PJM Manual 18**: PJM Capacity Market.
3. **Failure to Submit Test** - Failure to submit a verification test (conducted within the respective test period), unless exempted by GADS support personnel, will result in a full testing shortfall for the applicable test period. Also, this will result in an assessment of a Generation Resource Rating Test Failure Charge, per **PJM Manual 18**: PJM Capacity Market.

Section 11: Net Capability

11.1 General

1. Net Capability shall mean the number of megawatts of electric power which can be delivered by an electric generating unit without restriction by the owner under the conditions and criteria specified herein and shall be determined as the gross output of the unit less power used for unit auxiliaries and other station use required for electrical generation and any power required to serve host process load. In the case where auxiliary load, station use and/or process load is apportioned across multiple units at a plant, the apportioned auxiliary load, station use and/or process load during the test must be commensurate with the apportioned auxiliary load, station use and/or process load during summer conditions (summer conditions are delineated in Section 11.3 of this manual). As mentioned in Section 6, Net Capability is equivalent to rated ICAP and the claimed installed capacity in PJM eGADS.
2. Without restriction means that Net Capability values so determined are available for utilization at the request of PJM for supply of operating capacity and energy before any operating procedures are placed in effect anticipatory to a voltage reduction on the PJM system except as such utilization may at times be limited in duration by water or fuel availability. If the Net Capability, at times, is limited by water or fuel availability, the Net Capability should be based on the expected streamflow or expected fuel availability at the time of the summer PJM peak.
3. After a unit is in operation, its Net Capability shall be based on current operating performance or test results. Specifically, once a generator has historical operating data, it is expected that the data be used to render more appropriate rated ICAP values by updating them no less than once every five years (refer to 11.3 of this manual). It is preferred that the rated ICAP values be updated more often, when changes to rated ICAP are realized. Both Summer and Winter Net Capability values shall be confirmed annually. If adequate data is available from normal operation to confirm Net Capability during the summer or winter test period, no test is required to be performed, as long as actual operating data from the respective test period is used. Units for which the foregoing data is not available shall be tested to confirm Summer and Winter Net Capability. When a known change occurs in the Net Capability of a unit, or is indicated by operating data or test results, it shall become effective as soon as possible except as noted in items 4 and 6 below.

4. The Net Capability of a unit shall not be reduced to reflect unplanned deratings or temporary capacity restrictions provided it is the intention of the owner to restore the reduced capability. The time of this restoration may depend on availability of parts and scheduling of an outage required for repairs. If the owner does not intend to restore the reduced capability by the end of the next Delivery Year, a reduced Net Capability value (CAPMOD down) may become effective at the request of the owner. The owner shall make the required changes via the Capacity Modifications (CAPMOD) transaction in the Capacity Exchange tool.
5. Each generation owner shall be responsible for the determination and reporting of Summer and Winter Net Capability. The first notification is through completion of an Application and Studies Agreement, a form of which is provided in Tariff Part IX, Subpart A and sending this application to the PJM Interconnection Analysis Department. The second notification, if approval is received, is via the CAPMOD transaction in the Capacity Exchange tool. The Resource Adequacy Planning Department of the PJM RTO shall be responsible for the establishment of test procedures required to confirm such values including any amount which could be treated as limited energy capability.
6. The Net Capability reported for a generating unit shall in no case exceed an amount determined by the owner in accordance with items 1, 2 above but for PJM accounting purposes may initially be less than that amount. The extent of any such reduction in reported capability may be determined by the company in such manner as will permit the most effective use of its own resources.

11.2 Generator Site Conditions and Weather Data

1. Both observed and rated generator site conditions shall be based on plant weather station records or local weather bureau records.
2. Rated generator site conditions (summer/winter) shall be based on weather data coincident with the dates and times of the last 15 years' summer/winter PJM peaks, updated no less than once every five years.
3. Observed generator site conditions shall be those experienced at the generator site during the capability verification tests.
4. Both rated and observed generator site conditions shall be obtained from the same weather data source.
5. All generators at the same plant shall use the same weather data source.

6. If rated generator site conditions are obtained from the respective plants weather station, it is permissible to use local weather bureau records in lieu of plant weather data records, if plant weather data history is incomplete. This typically occurs when a new generator comes online and has little or no historical plant weather data. It is expected that the plant weather records will replace the local weather bureau records as the plant weather station accumulates weather data history.
7. Local weather bureau records should be obtained for a locale that is a good surrogate for the ambient conditions at the plant. In other words, the local weather bureau station should experience similar ambient conditions as the generator site. The weather station selected does not necessarily need to be the weather station that is closest in proximity to the plant.
8. Irrespective of the weather data used or its source, barometric pressure values (both observed and rated) must be corrected to plant elevation. This includes any barometric pressure values that are used to:
    a. determine the rated ICAP
    b. determine any test corrections
    c. determine the rated conditions coincident with the most recent 15 years' PJM summer peaks.
9. Local weather bureau records can be attained from, organizations such as NOAA, the National Weather Service, universities, colleges and weather service organizations. It is expected that the weather data used comes from weather collection devices/systems that are proven and calibrated by certified personnel on a regular basis.

11.3 Summer Net Corrected Test Capability

The Summer Net Corrected Test Capability of each generating unit shall be based on the actual generator site conditions observed at the time of the summer test.

Summer conditions shall reflect the 50% probability of occurrence (approximated by the mean) of generator site conditions coincident with the dates and times of the last 15 years' summer PJM peaks. Generator site conditions and weather data are discussed in section 11.2 of this manual. Generator site conditions shall be based on plant records or local weather records coincident with the dates and times of the last 15 years' summer PJM peaks, updated no less than once every five years. When local weather records are not available, the values shall be estimated from the best data available. Generator site conditions include, but are not limited to, dry bulb temperature, relative humidity, wet bulb temperature, dew point temperature, cooling body (intake) water temperature and barometric pressure. If tests are corrected using any of the above parameters observed during the test, rated site conditions must also include those same parameters. In other words, if only wet bulb temperature and barometric pressure are used to render a correction, the rated ICAP must be determined using only wet bulb temperature and

barometric pressure coincident with the dates and times of the last 15 years' PJM summer peaks. These conditions under which rated ICAP is determined are known as rated conditions.

The Summer Net Corrected Test Capability is the Summer Net Test Capability plus the correction (if any) for observed generator site conditions (those conditions present at the generator site at the time of the test).

The following business rules apply to the determination of the Summer Net Corrected Test Capability:

1. The determination of the Summer Net Corrected Test Capability of fossil and nuclear steam units shall be based on, where applicable, the actual observed condenser intake water temperature, the actual observed temperature of once-through and/or open cooling systems as well as the actual observed performance of cooling towers during the summer test
2. The determination of the Summer Net Corrected Test Capability of combustion turbine units shall be based on, where applicable, actual observed generator site conditions during the summer test.
3. The determination of Summer Net Corrected Test Capability of combined-cycle units shall be based on, where applicable, the actual observed intake water temperature of once-through or open cooling systems and/or the actual observed performance of cooling towers and combustion turbines during the summer test.
4. The determination of the Summer Net Corrected Test Capability of reciprocating engine units or fuel cell units shall be based on operational data or test results taken once each PJM delivery year during the summer test.

11.4 Winter Net Corrected Test Capability

The Winter Net Corrected Test Capability of each generating unit shall be based on the actual generator site conditions observed at the time of the winter test.

Winter conditions shall reflect the 50% probability of occurrence (approximated by the mean) of generator site conditions at the time of the last fifteen years' winter PJM peaks. Generator site conditions and weather data are discussed in section 11.3 of this manual. Generator site conditions shall be based on plant records or local weather bureau records coincident with the dates and times of the last 15 years' winter PJM peaks, updated no less than once every five years. When local weather records are not available, the values shall be estimated from the best data available. Generator site conditions include, but are not limited to, dry bulb temperature, relative humidity, wet bulb temperature, dew point temperature, cooling body (intake) water temperature and barometric pressure. If tests are corrected using any of the above parameters observed during the test, rated site conditions must also include those same parameters. In other words, if wet bulb temperature and barometric pressure are used to render

a correction, the rated conditions must also be based on wet bulb temperature and barometric pressure coincident with the last 15 years' PJM winter peaks.

The Winter Net Corrected Test Capability is the Winter Net Test Capability plus the correction (if any) for observed generator site conditions (those conditions present at the generator site at the time of the test).

The following business rules apply to the determination of the Winter Net Corrected Test Capability:

1. The determination of the Winter Net Corrected test Capability of fossil and nuclear steam units shall be based on, where applicable, the actual observed condenser intake water temperature during the winter test, the actual observed temperature of once-through or open cooling systems during the winter test as well as the actual observed performance of cooling towers during the winter test.
2. The determination of the Winter Net Corrected Test Capability of combustion turbine units shall be based on, where applicable, the actual observed generator site conditions during the winter test.
3. The determination of Winter Net Corrected Test Capability of combined-cycle units shall be based on, where applicable, the actual observed intake water temperature of once-through or open cooling systems during the winter test and/or the actual observed performance of cooling towers and combustion turbines during the winter test. The determination of the Winter Net Corrected Test Capability for reciprocating engine units or fuel cell units shall be based on operational data or test results taken once each PJM delivery year during the winter test.

Revision History