

# PJM Manual 21a:

Determination of Accredited UCAP Using Effective Load  
Carrying Capability Analysis

Post December 15, 2020 initial outline and partial first draft

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## Section 1: Overview, Function of ELCC and Accredited UCAP, Definitions, and Classes

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### 5.1 Overview and Function of ELCC and Accredited UCAP

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### 5.2 Definitions and Classes

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The ELCC Classes consist of any of the below classes for which units are expected to participate in an applicable year:

1. Tracking solar
2. Fixed-tilt solar
3. Onshore wind
4. Offshore wind
5. Landfill gas units that cannot run consistently at ICAP levels for 24 or more hours
6. Intermittent run-of-river hydropower
7. Hydropower With Non-Pumped Storage
8. Energy Storage Resources of 4-hour, 6-hour, 8-hour, and 10-hour duration, or longer duration as required to secure a 100% ELCC Rating. Such classes include pumped storage hydropower.
9. Generic limited duration resources of 4-hour, 6-hour, 8-hour, and 10-hour duration, or longer duration as required to secure a 100% ELCC Rating
10. Hybrids that are combinations of one of the above generation types plus an Energy Storage Resource of 4-hour, 6-hour, 8-hour, or 10-hour duration
11. Hybrids that are combinations of one of the above generation types plus generic limited duration resource of 4-hour, 6-hour, 8-hour, or 10-hour duration

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 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. A generic limited duration resource of “X” hours duration is capable of running at its Effective Nameplate Capacity power level for X hours.

A resource must be in a given duration class for at least five delivery years.

The RAA provides that the term “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”. A hydropower resource can exert material control over the quantity of stored water and over the output of the facility when it can consistently store at least 10% of its ICAP for at least 4 hours. This criterion is demonstrated by evaluating the difference of the actual output during the 4 highest load hours of all summer afternoons of a year against the average actual output of all other hours on the same days, and comparing with the ICAP value. Such assessment and determination is once per five years.

## Section 2: Overall Timeline for the ELCC Accreditation Process

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### Schedule for ELCC Results and Applicability

ELCC Round	Applicable to BRA for Delivery Year	Posting Date	Note
Round 1	2023/24 BRA	June, 2021	Includes floors for 2021 cohort
Round 2	2024/25 BRA	December, 2021	Includes floors for 2022 cohort
Round 3	2025/26 BRA	July, 2022	Updated results, but no floors and no report
Round 4	2026/27 BRA	No later than December 31, 2022	Includes floors for 2023 cohort
2023 and Subsequent Years	Results and report generally posted in November, include floors during the transition period, and apply to all activities in the following calendar year, as well as to the Delivery Year that starts the following calendar year.		

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## Section 5: Data Submission and Validation

### 5.1 Introduction

The ELCC methodology developed by PJM requires modeling hourly output from ELCC Resources (i.e., Generation Capacity Resources that are not capable of running continuously at their summer rated power level for 24 or more hours). To perform the hourly modeling, PJM needs specific information about such resources (such information may go beyond the information the resources supplied during the interconnection process).

Those Variable Resources (e.g., wind, solar, hydro without storage or pondage, landfill gas without alternate fuel), Limited Duration Resources (e.g., Energy Storage Resources including pumped hydro), and Combination Resources (e.g., hybrids of generation plus energy storage, hydro with non-pumped storage) that wish to offer in any auctions, or otherwise provide Capacity, for Delivery Year 2023/24 or subsequent Delivery Years shall provide the required information and supporting documentation as detailed below by the deadlines also outlined below in order to ensure that PJM can perform the necessary ELCC analysis.

#### Data Submission Deadlines

Delivery Year	Deadline
2023/24 BRA	Feb. 15, 2021 For resources with an Accredited UCAP derived from a resource-specific effective load carrying capability analysis based on the resource's unique parameters, this deadline is March 1, 2021.
2024/25 BRA	Aug. 15, 2021
2025/26 BRA	Feb. 15, 2022

For subsequent delivery years, the data submission deadline is August 1 of each calendar year prior to the calendar year in which the applicable RPM auction is held, or in which the applicable Delivery Year begins, or in which the applicable FRR plan is submitted.

### 5.2 Required Information

**Note: for planned solar resources and onshore wind resources (as well as those that do not have complete historical output data since June 1, 2012), for Delivery Year 2023/24, PJM plans to develop an hourly backcast (i.e., estimate of historical hourly output given site conditions and historical weather). Owner/operators of such units do not need to submit any additional information other than that provided in the Interconnection Queue process, unless they wish to request a unit-specific backcast, in which case additional information is required (as outlined below).**

In general, providers of all resources other than onshore wind and solar must provide basic physical details of the resource, including geographic coordinates, Effective Nameplate, technology type, generator make and model, and other relevant physical characteristic of the plant. Providers of Variable Resources other than onshore wind and solar that have not been in

service since June 1, 2012 must provide an hourly backcast back to June 1, 2012. In addition, they must provide the underlying data and method used to develop such backcast (for example, hourly streamflow data from the USGS in the case of hydropower, together with the method to convert streamflow to MWh using the generator characteristics).

The information and data required for specific technology types is as follows:

#### 5.2.1 Onshore Wind and Solar

Starting March 1, 2022, providers of onshore wind and solar resources must provide the following data. Prior to March 1, 2022, 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 (optional prior to March 1, 2022):

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

For solar plants (optional prior to March 1, 2022):

- Latitude and longitude in decimal degrees
- Inverter and panel make, model, AC power ratings, and other specifications
- Number of inverters and total AC power rating of inverters
- Number of panels and total DC power rating panels

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 Resources and Existing Resources that entered service after June 1, 2012: hourly backcast going back to June 1, 2012, together with the underlying data and method used to develop such backcast.
- Existing resources that entered service on or before June 1, 2012: data submission is only required if there was a change in physical plant configuration as specified in Section YYYYYY below.

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.

#### 5.2.2 Variable Resources Other Than Onshore Wind and Solar

Providers of Variable Resources other than onshore wind and solar, for example offshore wind, run-of-river hydro without storage/pondage, and landfill gas, must provide the data specified below.

- Latitude and longitude in decimal degrees.
- Planned Resources and Existing Resources that entered service after June 1, 2012: hourly backcast going back to June 1, 2012, together with the underlying data and method used to develop such backcast.

- Existing resources that entered service on or before June 1, 2012: data submission is only required if there was a change in physical plant configuration as specified in Section YYYYYY below.

For offshore wind plants:

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

*Supporting Documentation for Run-of-river Hydropower without Storage and Landfill Gas Resources that are Planned 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)

### 5.2.3 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:

- Storage inventory capacity in MWh
- Black Start commitments in MW
- Any other firm commitments in MW and MWh
- 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.

*Supporting Documentation for Pumped Storage Hydropower*

This documentation is intended to support the information requested for pumped storage hydropower plants 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

*Supporting Documentation for Batteries*

- Battery specifications
- Inverter specifications

#### 5.2.4 Combination Resources (Other than Hydropower with Non-Pumped Storage)

Combination Resources (other than Hydropower with Non-Pumped Storage) include hybrids of generation plus storage located at the same site with a single shared Point of Interconnection. Such resources must provide the following data and information:

- Maximum Output Facility (MFO) in MW
- Power rating capability associated with each component (in MW)
- Black Start commitments in MW
- Any other firm commitments in MW and MWh
- Storage inventory capacity for energy storage resource component in MWh
- Charging/discharging roundtrip efficiency

Providers of a Combination Resource that includes a component that is itself a type of ELCC Resource must additionally meet the requirements of the applicable section above for standalone equivalents of such resource. For example, providers of Combination Resources with a wind or solar component must meet the requirements in Section 5.2.1. Providers of Combination Resources with a component that is another types of variable resource must meet the requirements in Section 5.2.2.

#### 5.2.5 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).
- Daily average minimum water flow (in cubic feet per second) for each day from June 2012 through the most recent May 31 (in cubic feet per second). Minimum sustained water flow is that which can be maintained for 20 hours per day.
- Monthly average values for the ratio of the number of cubic feet of water required to produce a single MWh.
- 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 daily 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.
- 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.

- Any cascading relationships to ordinary or exigent storage in plants on the same river system in MW.
- 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)