

Walk Through of Proposed Solutions for CIRs for ELCC Resources

Andrew Levitt

Market Design & Economics Dep't
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- Design Components 1 and 2—CIR Request and Retention:
 - ***Basic Concept: CIRs/Firm Deliverability Up To Maximum Expected Net Summer Output***
- Design Component 3—CIRs as Input to ELCC Model and Accredited UCAP Calculation
 - ***Basic Concept: Output Above CIRs Not Counted Towards Accreditation***
- Design Components 4 and 5 – Implementation and Transition
 - New ELCC modeling and AUCAP calculations take effect with 2024/25 Delivery Year
 - Higher CIR request/retention eligibility takes effect as soon as PJM and FERC review/approvals/endorsements complete

Design Components 1 and 2—
CIR Request and Retention:
***Basic Concept: CIRs/Firm Deliverability Up To
Maximum Summer Output***



Design Components 1 and 2: CIR Request and Retention:

Basic Concept: Maximum Summer Output

Variable Resources (e.g., wind, solar, etc.):

- **Max summer output.** CIR request: max expected summer output (metric is TBD, might be 99th or 95th percentile of class-wide historical output) for resource type. CIR retention: maximum metered value across last 3 summers.

Limited Duration Resources (e.g., batteries)

- **Maximum summer output across X consecutive hours.** CIR request: expected value. CIR retention: highest average output across 4 consecutive hours from last 3 summers.

Hybrids (e.g., solar+battery hybrids)

- **Sum of eligibility/retention metrics of components**, not to exceed MFO.

Unlimited Resources and dispatchable hydro

- **Max summer output.** CIR request: status quo evaluation. CIR retention: max metered summer output across last 3 summers.

“Summer output” is proposed to mean metered output at the POI across a clock hour between hour-ending 11AM and 10PM Eastern Prevailing Time (inclusive), June/July/Aug.



Selected Hypothetical Examples for Design Components 1 and 2: CIR Request and Retention

Example of 100 MW nameplate wind (a Variable Resource):

- **Max summer output.** Unit can request up to the [e.g., 95th] percentile of expected summer output for resource type → e.g., 60 MW.
- If unit hits 60 MW for one hour across 3 summers, it retains CIRs.

Example of 100 MW/300 MWh battery (a Limited Duration Resource):

- **Maximum output across X consecutive hours.** 100 MW, 300MWh battery in the 4-hour class can run at 75 MW for 4 hours. It can request 75 MW of CIRs.
- If after 3 summers its best average output across a 4-hour window in the summer shows no more than 72 MW, then it loses 3 MW of CIRs.

Example of a 100 MW solar-battery hybrid with 20 MW/80 MWh battery:

- **Sum of eligibility/retention metrics of components** (not to exceed MFO). Solar has expected 95th percentile summer output of e.g., 100 MW, battery can run at 20 MW for 4 hours. MFO is 100 MW. Unit is eligible for $\text{MIN}(120, 100) = 100\text{MW}$ of CIRs.
- If after 3 years max summer output of solar is 92 MW, and max summer 4-hour average output of battery is 17 MW, then unit retains $\text{MIN}(109, 100) = 100\text{ MW}$ of CIRs.

Design Component 3— CIRs as Input to ELCC Model and Accredited UCAP Calculation

***Basic Concept: Output Above CIRs Not
Counted Towards Accreditation***

- Variable Resources--hourly output shape truncated to be no higher than CIRs:
 - For the aggregate hourly shape used in the ELCC model for calculating class ratings, each constituent unit's shape is truncated at CIRs.
 - For the Performance Adjustment used for calculating Accredited UCAP, each hourly value will be truncated to be no higher than the CIR value.
- Example: a 100 MW wind farm makes 80MW at 4PM, 10MW at 5PM, and 20 MW at 6PM each summer day.
 - Such a wind farm with 80 MW of CIRs would contribute the entirety of their output to the ELCC model for calculating the class rating for wind. It would also use all of those values as-measured for calculating their Performance Adjustment.
 - Such a wind farm with only **60** MW of CIRs would contribute only 60 MW at 4PM to the class rating calculation (even though actual output was 80 MW), and only 60 MW at 4PM for calculating the Performance Adjustment.

CIRs of Limited Duration Resources in ELCC

- Limited Duration Resources-“Effective Nameplate Capacity” (ENC) to be no higher than CIRs. ENC is nameplate capacity derated as needed by the “X hour rule”.
 - ENC is analogous to the ICAP value for Unlimited Resources.
 - Limited Duration Resources in the ELCC model produce up to ENC but no higher.
 - For Limited Duration Resources, $AUCAP = ENC * ClassRating * (1 - EFORd)$.
- Example: a 100 MW, 400MW battery in the 4-hour class
 - Assume a 10% EFORd, an 80% ClassRating for the 4-hour class, and a 95% ClassRating for the 6-hour class.
 - ENC is the lesser of (MW it can run at for X hours, CIRs).
 - Assume the unit is in the 4-hour class. It can run at 100 MW for 4 hours.
 - With 100MW of CIRs, $ENC = \text{MIN}(100, 100)$ and $AUCAP = 100 * 80\% * 90\% = 72 \text{ MW}$.
 - With 72 MW of CIRs, $ENC = \text{MIN}(72, 100)$ and $AUCAP = 72 * 80\% * 90\% = 51.84 \text{ MW}$
 - If the battery w/ 72 MW of CIRs were in the 6-hour class, it could run at 66.67 MW for 6 hours, so ENC would be $\text{MIN}(72, 66.67)$. $AUCAP = 66.67 * 95\% * 90\% = 57 \text{ MW}$.

- ELCC model: simulated hourly output from hybrids capped at CIRs.
- UCAP & AUCAP: CIRs are first allocated to the ENC of the Limited Duration Component, and the remainder is allocated to the Variable Resource component. Storage portion of CIRs establish an upper limit on the Effective Nameplate Capacity value of the storage component; variable resource portion of CIRs establish an upper limit on the hourly output of the variable resource component used in the ELCC model and on the output of the variable resource component of the hybrid used in the AUCAP calculation.

- ELCC model: CIRs cap unit-specific MaxMW parameter.
- UCAP & AUCAP: follows ELCC modeling.

- Additional CIRs can be requested through the PJM Queue Process immediately upon necessary approvals/endorsements (including FERC if applicable) of the the solution developed in this stakeholder process.
- CIRs will be established as an upper limit for the 24/25 Delivery Year.

SME/Presenter:
Andrew Levitt,
Andrew.Levitt@pjm.com

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Member Hotline

(610) 666 – 8980

(866) 400 – 8980

custsvc@pjm.com