Solution Option A Considerations For Variable Resources

Introduction

- The slides are meant to supplement the CIRs for ELCC Options & Package Matrix and provide clarification how Solution Option A will apply to Variable Resources in particular.
- PJM has included the following additional information to provide stakeholders with more detailed implementation considerations and implications for Variable Resources under Solution Option A.
  - How PJM proposes to select the maximum expected net summer outputs for each Variable Resource type
  - How ELCC Class UCAPs might be impacted by incorporating CIRs into the ELCC calculations

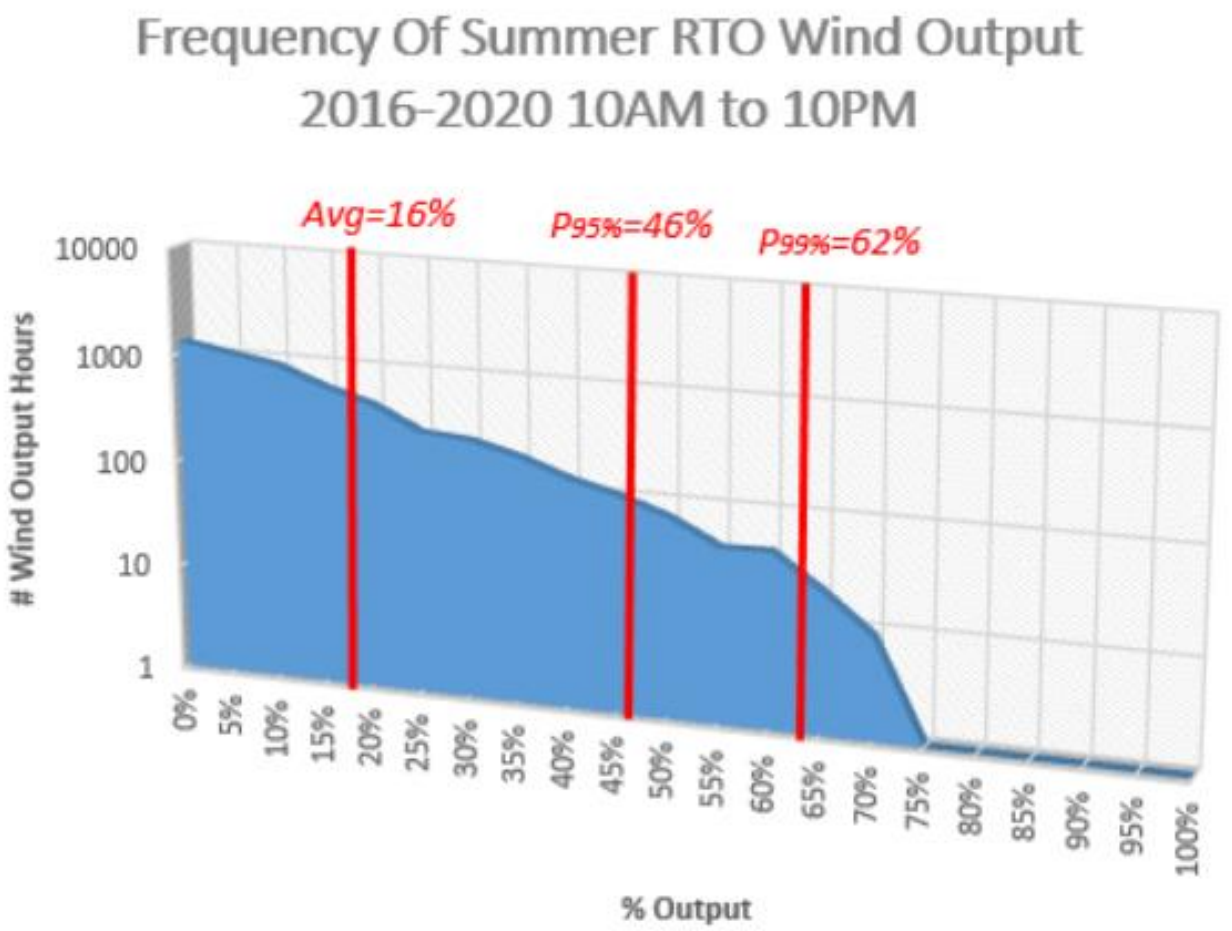
Design Component #1: CIR Request Policies

- In order to clarify how PJM intends to define a Variable Resource's maximum expected net summer output, PJM has compiled 5 years of RTO-wide outputs by Variable Resource type and the next few slides show this in graphical form for onshore wind, solar and hydro from 10AM to 10PM over June, July & August.

- PJM will develop similar metrics for the following Variable Resource types
  - Landfill gas
  - Offshore wind using backcast data
  - Onshore wind by region
  - Non-dispatchable hydro

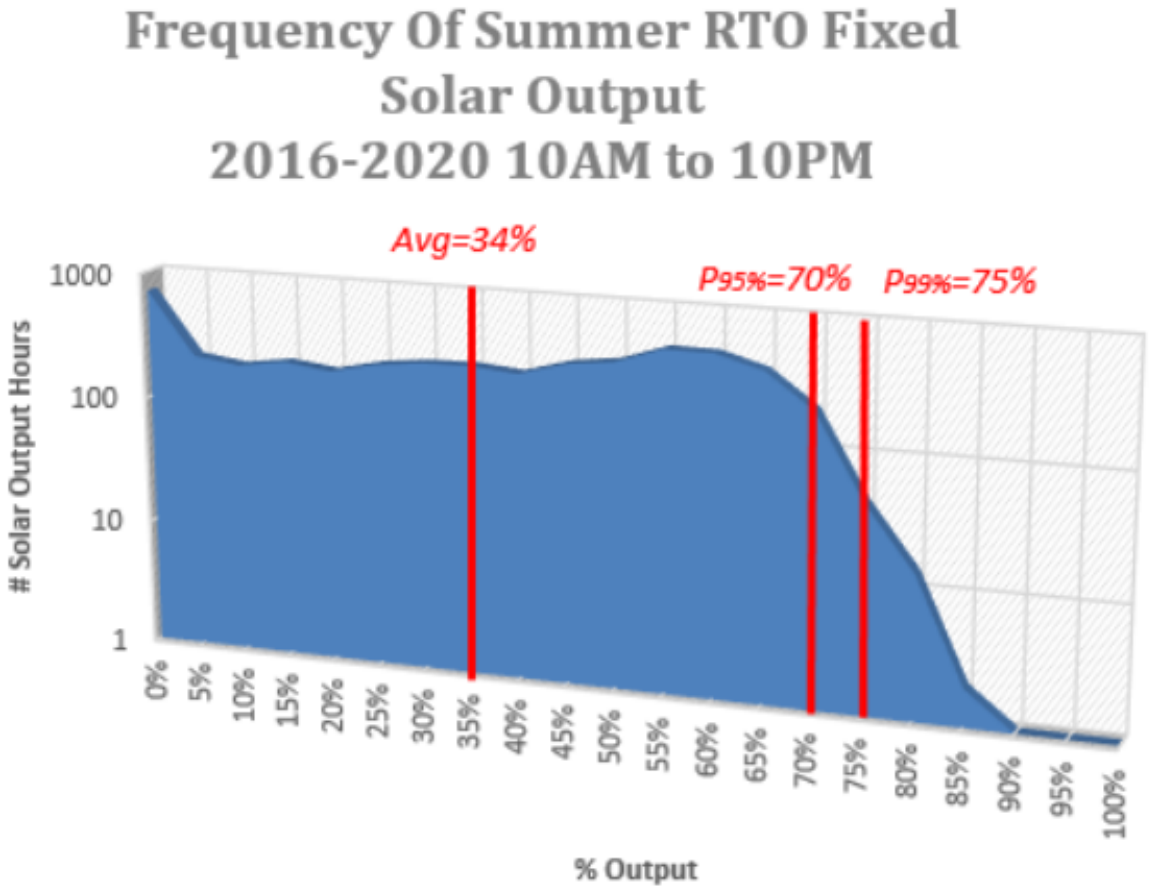
Design Component #1: CIR Request Policies For Onshore Wind

- While the average summer RTO onshore wind output is 16% of MFO, 5% of the time output levels are above 46% of MFO and 1% of the time above 62% of MFO.
- PJM has observed regional differences in these output levels and will likely recommend separate CIR upper limits by region.



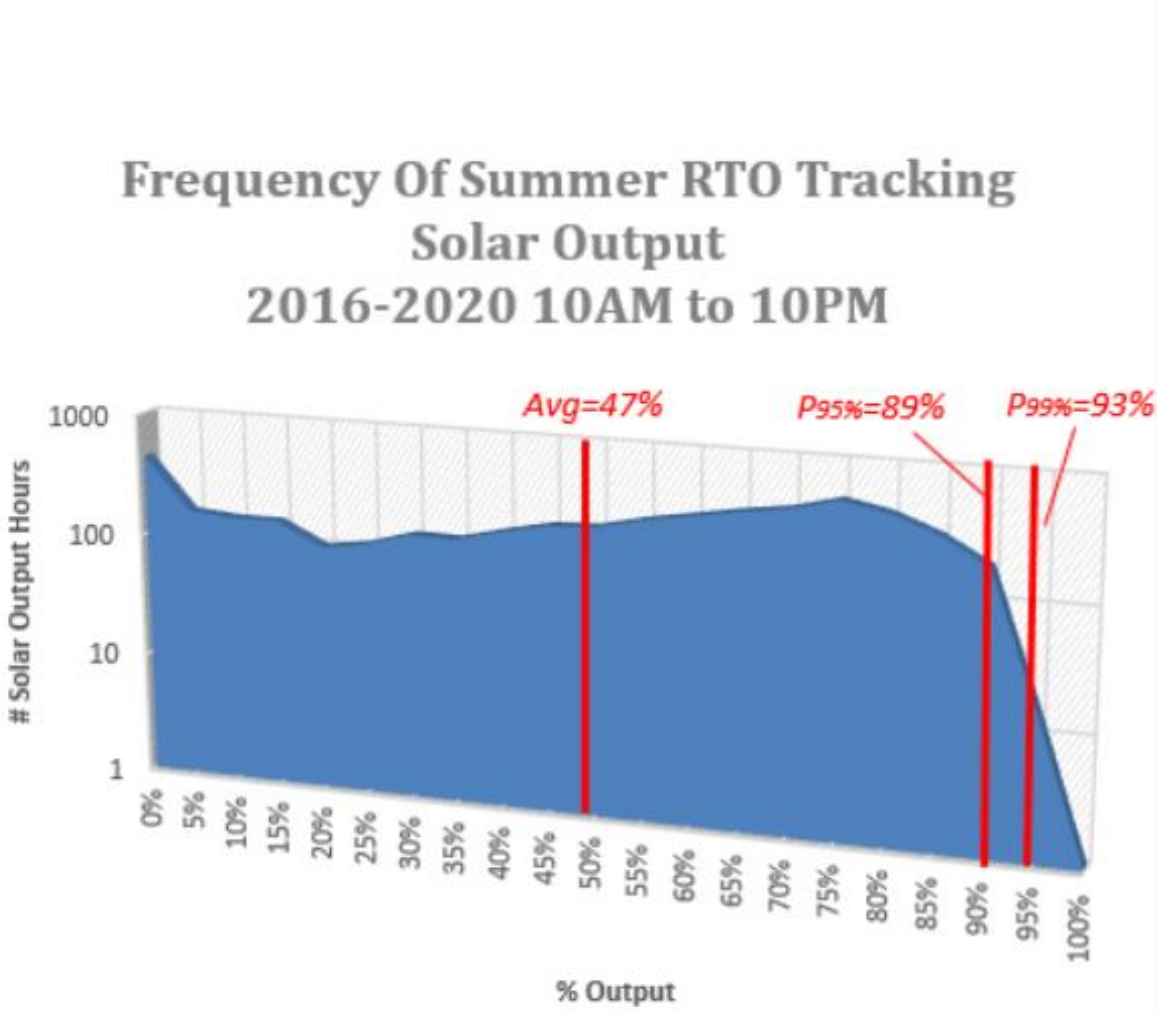
Design Component #1: CIR Request Policies For Fixed Solar

- While the average summer RTO fixed solar output is 34% of MFO, 5% of the time output levels are above 70% of MFO and 1% of the time above 75% of MFO.
- PJM is investigating whether there are significant regional differences in these output levels but does not expect there to be and will not likely recommend separate CIR upper limits by region.



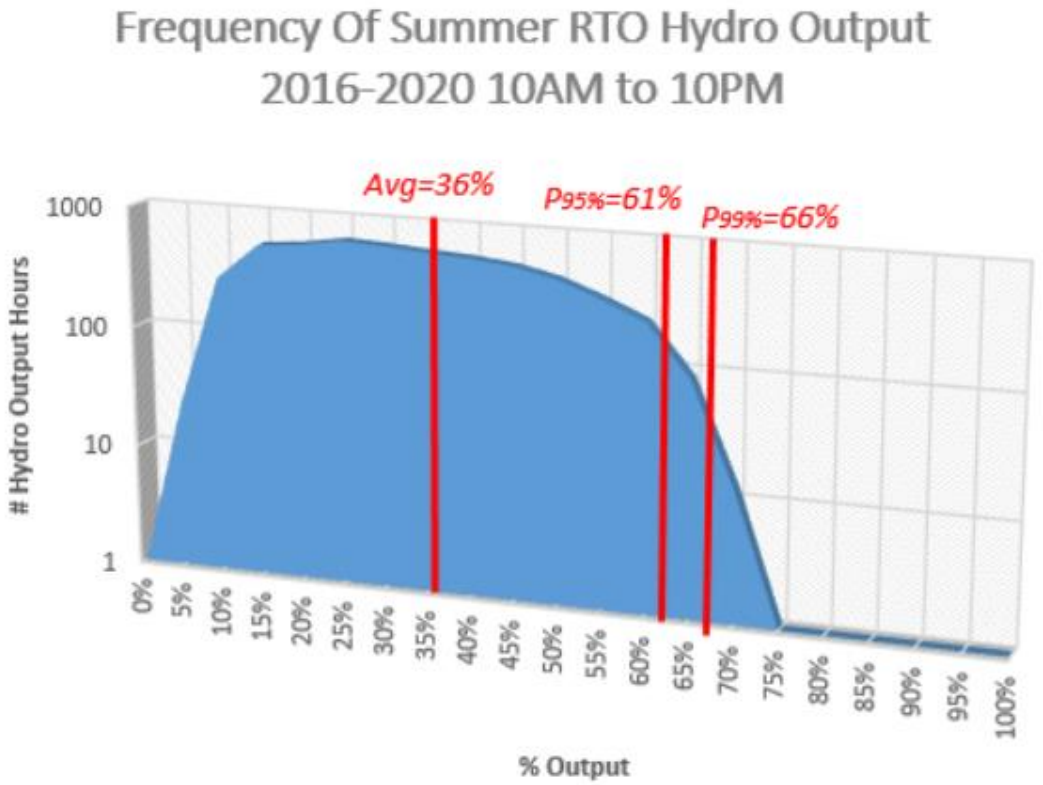
Design Component #1: CIR Request Policies For Tracking Solar

- While the average summer RTO tracking solar output is 47% of MFO, 5% of the time output levels are above 89% of MFO and 1% of the time above 93% of MFO.
- PJM is investigating whether there are significant regional differences in these output levels but does not expect there to be and will not likely recommend separate CIR upper limits by region.



Design Component #1: CIR Request Policies For Hydro

- While the average summer RTO hydro output is 36% of MFO, 5% of the time output levels are above 61% of MFO and 1% of the time above 66% of MFO.
  - These numbers reflect both dispatchable and non-dispatchable hydro and will need to be updated to include only non-dispatchable hydro since Solution Option A will not apply new request policies for dispatchable hydro, which are not considered Variable Resources.
- PJM is investigating whether there are significant regional differences in these output levels but does not expect there to be and will not likely recommend separate CIR upper limits by region.



Design Component #1: CIR Request Policies

- Using of an RTO-wide 95th or even the 99th output percentile is not as conservative as it may appear when considering weather diversity across the PJM footprint and the local generation patterns that are considered in the generator deliverability test.
  - Because weather patterns across the PJM footprint will be less correlated than weather patterns within localized regions, localized pockets of Variable Resources of a given resource type will have a much higher likelihood of reaching the highest RTO-wide output levels achieved for the resource type, e.g. the 95th output percentile for the RTO-wide generation may be the 80th output percentile for a small pocket of bottled generation.
  - In the generator deliverability test the vast majority of PJM generators will be at or below their UCAP and only a small pocket of, e.g. 20-30, generators in similar electrical proximity to one another will be ramped above their UCAP to their CIR level.
- Prior to the August 31 PC meeting, PJM will perform ELCC studies applying CIRs to cap Variable Resource outputs at the status quo CIR levels, the 95th and, if necessary, the 99th output percentiles to confirm which CIR level results in a minimal, i.e., not more than a 5% reduction, change in ELCC Class UCAP's for Variable Resources.

Design Component #1: CIR Request Policies

- PJM proposes that the default amount of CIRs that will be applied to new Interconnection Requests for Variable Resources should be the historical RTO-wide or regional 95th (or 99th) output percentile for the resource type.
- New Interconnection Customers who would like less CIRs than the 95th (or 99th) output percentile can request a reduction in their CIRs per existing procedures specified in PJM Tariff Section 36.

Design Component #2: CIR Test, Verification & Retention Policies

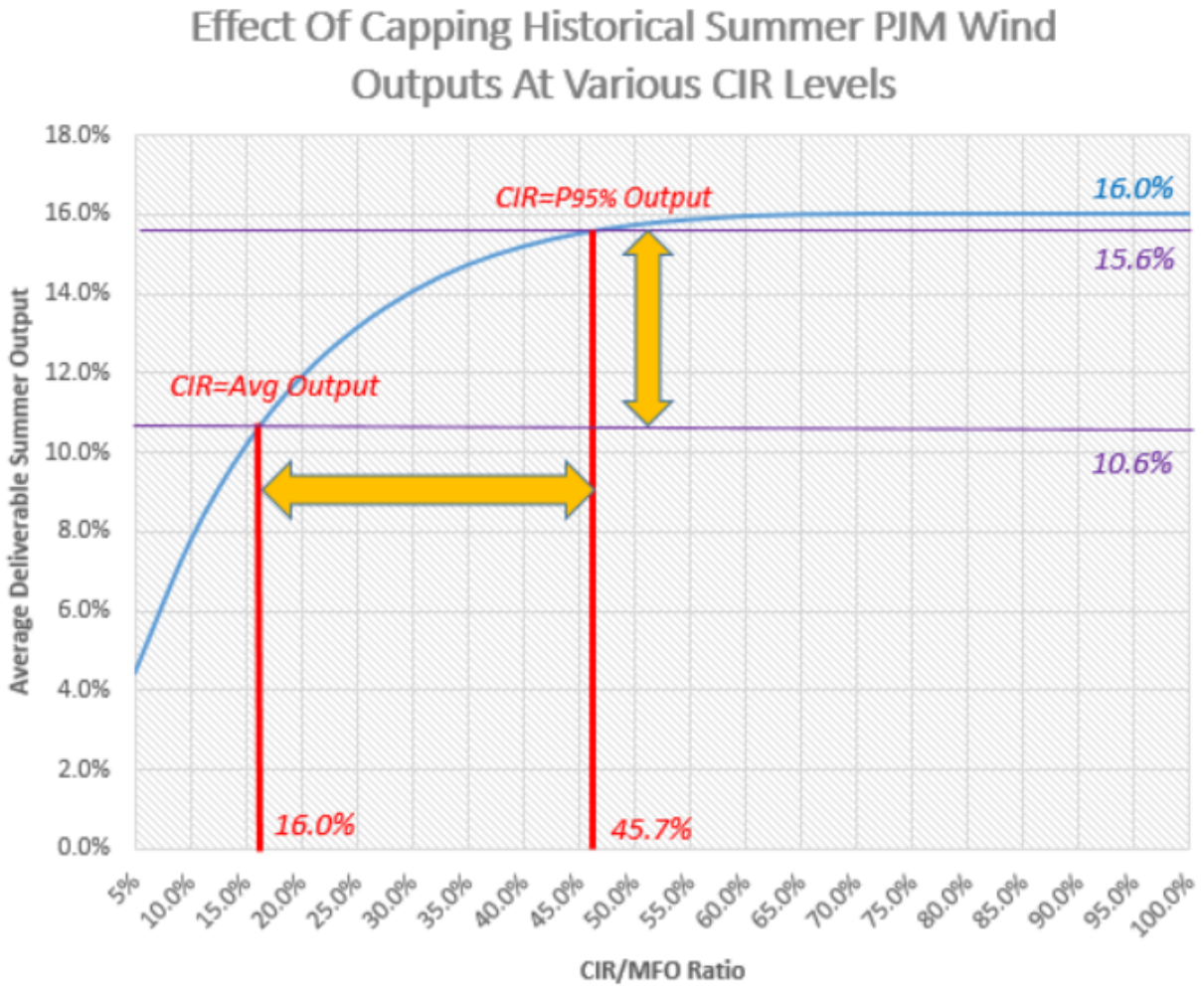
- CIR testing/retention policies will be consistent across all Variable Resource types.
- CIR testing/retention policies should be different from ICAP/UCAP testing/retention policies, which can continue to use the status quo CIR testing/retention policies, but should probably be explored as part of a future issue charge.
  - For ICAP/UCAP testing/retention purposes PJM will replace the term CIR with Tested Capacity Value
- CIR testing/retention policies should consider the same broad set of summer hours considered it setting the CIR request policy, i.e., 10AM to 10PM.

Design Component #3: CIRs in ELCC Methodology and Accredited UCAP Calculation

- Incorporate CIRs upfront into the ELCC Portfolio UCAP and ELCC Class UCAP calculations.
- Consider CIRs when allocating ELCC Class UCAP to individual ELCC Resources.
- CIRs continue to provide an upper limit to UCAP/AUCAP.
- The following two slides are for illustration purposes only.
  - They show the effect of capping aggregate RTO wind and solar output levels on the average aggregate RTO wind and solar output.
  - They do not show the effect of capping individual RTO wind and solar unit output levels, which may lead to different results because of diversity of weather patterns across the PJM footprint.

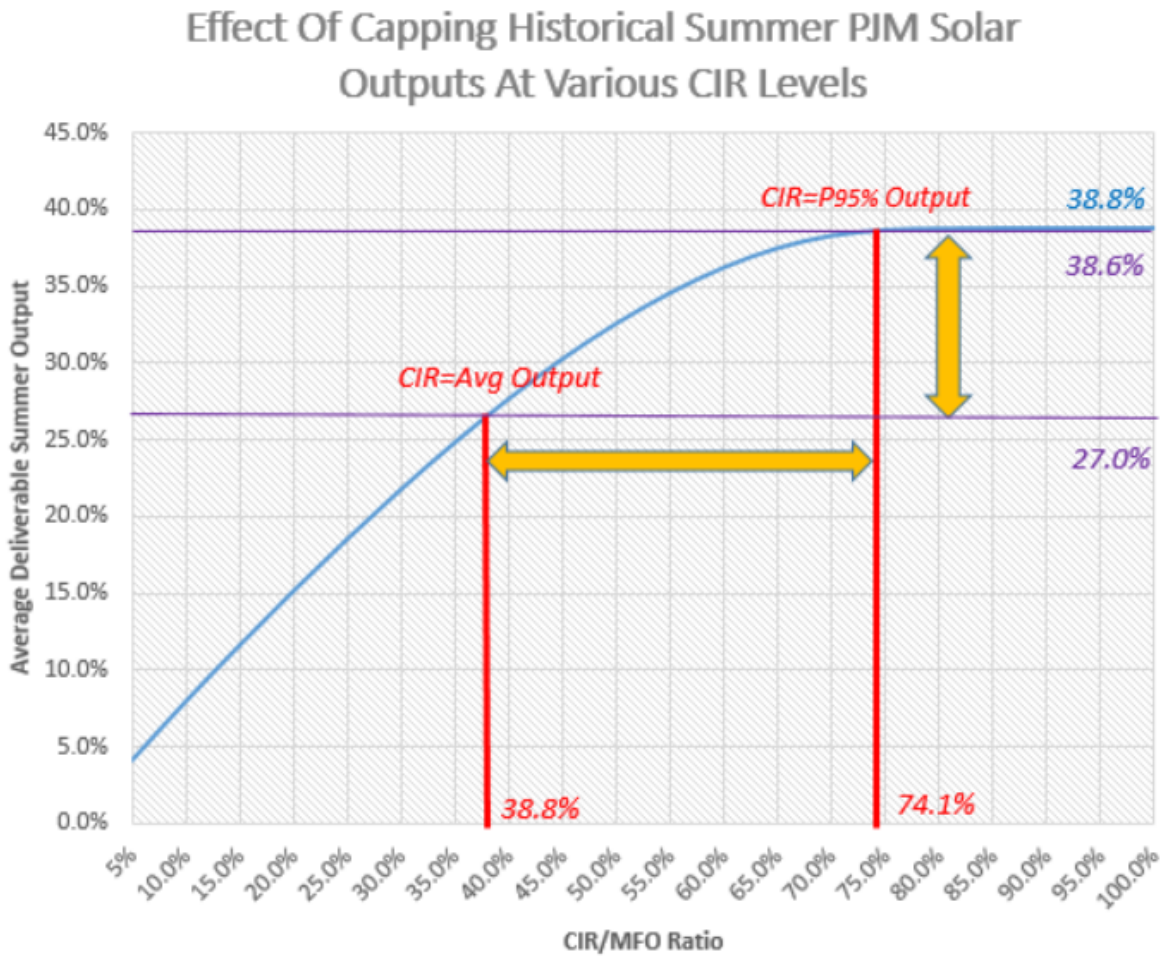
Design Component #3: CIRs in ELCC Methodology and Accredited UCAP Calculation

- Historical summer RTO-wide onshore wind output is 16.0% on average.
- Constructing the grid to only support onshore wind CIRs at 16.0% of their MFO could result in a average deliverable summer output of 10.6%, which is a 33% reduction in the average available summer output.
- Increasing the CIR/MFO ratio to 45.7%, which is the 95th output percentile, could result in an average deliverable output that is much closer to the average available summer output.



Design Component #3: CIRs in ELCC Methodology and Accredited UCAP Calculation

- Historical summer RTO-wide solar (fixed and tracking combined) output is 38.8% on average.
- Constructing the grid to only support onshore wind CIRs at 38.8% of their MFO could result in a average deliverable summer output of 27.0%, which is a 30% reduction in the average available summer output.
- Increasing the CIR/MFO ratio to 74.1%, which is the 95th output percentile, could result in an average deliverable output that is much closer to the average available summer output.



Design Component #4: Implementation/Effective Date

- CIR Requests
  - Require existing Variable Resources and non-commercial Variable Resource in the PJM queue to re-enter the queue if they would like additional CIRs.
  - For Variable Resources that enter the queue after the Solution Option A effective date, apply the new CIR request policies.
- CIR Retention
  - Use summer historical data to ensure that the awarded CIRs are not being underutilized.
- CIR in ELCC
  - Apply CIRs in the ELCC and AUCAP calculations.