

# Capacity Accreditation: Representative Unit Modeling

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**ICAPWG/MIWG**

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# Agenda

- **Previous Discussions**
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- **CAFs vs Resource-Specific Derating Factors**
- **Representative Unit Modeling**
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- **Next Steps**

# Previous Discussions

# Previous Discussions

Date	Working Group	Discussion Points and Links to Materials
August 5, 2021	ICAPWG	Review of Existing Capacity Accreditation Rules: <a href="https://www.nyiso.com/documents/20142/23590734/20210805%20NYISO%20-%20Capacity%20Accreditation%20Current%20Rules%20Final.pdf">https://www.nyiso.com/documents/20142/23590734/20210805%20NYISO%20-%20Capacity%20Accreditation%20Current%20Rules%20Final.pdf</a>
August 9, 2021	ICAPWG	Capacity Accreditation Proposal: <a href="https://www.nyiso.com/documents/20142/23645207/20210809%20NYISO%20-%20Capacity%20Accreditation%20Straw%20Proposal.pdf">https://www.nyiso.com/documents/20142/23645207/20210809%20NYISO%20-%20Capacity%20Accreditation%20Straw%20Proposal.pdf</a>
August 30, 2021 & August 31, 2021	ICAPWG	Capacity Accreditation Proposal: <a href="https://www.nyiso.com/documents/20142/24172725/20210830%20NYISO%20-%20Capacity%20Accreditation_v10%20(002).pdf">https://www.nyiso.com/documents/20142/24172725/20210830%20NYISO%20-%20Capacity%20Accreditation_v10%20(002).pdf</a>
September 28, 2021	ICAPWG	Comprehensive Mitigation Review Proposal and Tariff: <a href="https://www.nyiso.com/documents/20142/24925244/20210928_NYISO-CMR_Final.pdf/769828a1-f224-0140-240b-0762ec18efec">https://www.nyiso.com/documents/20142/24925244/20210928_NYISO - CMR_Final.pdf/769828a1-f224-0140-240b-0762ec18efec</a>
October 18, 2021	ICAPWG	Comprehensive Mitigation Review Proposal and Tariff Updates: <a href="https://www.nyiso.com/documents/20142/25440628/20211018%20NYISO%20-%20CMR%20v9.pdf/4475e775-159c-75c7-9cf8-7050dad9a363">https://www.nyiso.com/documents/20142/25440628/20211018%20NYISO%20-%20CMR%20v9.pdf/4475e775-159c-75c7-9cf8-7050dad9a363</a>
October 29, 2021	ICAPWG	Comprehensive Mitigation Review Proposal and Tariff Updates: <a href="https://www.nyiso.com/documents/20142/25780701/20211029%20NYISO%20-%20CMR.pdf/ea8494b0-0860-b260-89b6-0c418d28a91d">https://www.nyiso.com/documents/20142/25780701/20211029%20NYISO%20-%20CMR.pdf/ea8494b0-0860-b260-89b6-0c418d28a91d</a>

# Previous Discussions (cont.)

Date	Working Group	Discussion Points and Links to Materials
November 2, 2021	ICAPWG	<p>NYISO CMR Consumer Impact Analysis:  <a href="https://www.nyiso.com/documents/20142/25835955/CIA%20-%20Comprehensive%20Mitigation%20Review.pdf/36d447d4-5b33-8ab1-2654-90a529ff1dfe">https://www.nyiso.com/documents/20142/25835955/CIA%20-%20Comprehensive%20Mitigation%20Review.pdf/36d447d4-5b33-8ab1-2654-90a529ff1dfe</a></p> <p>Potomac CMR Consumer Impact Analysis:  <a href="https://www.nyiso.com/documents/20142/25835955/MMU%20ICAP%20Accreditation%20Consumer%20Impact%20Analysis%201-02-2021.pdf/637ba21e-db75-a4c1-5b41-f770dd26e529">https://www.nyiso.com/documents/20142/25835955/MMU%20ICAP%20Accreditation%20Consumer%20Impact%20Analysis%201-02-2021.pdf/637ba21e-db75-a4c1-5b41-f770dd26e529</a></p>
November 9, 2021	BIC	<p>Comprehensive Mitigation Review Proposal and Tariff:  <a href="https://www.nyiso.com/documents/20142/25928340/5%2020211109%20NYISO%20-%20CMR%20v3.pdf/84d8b429-126c-68dd-0308-caa50886de92">https://www.nyiso.com/documents/20142/25928340/5%2020211109%20NYISO%20-%20CMR%20v3.pdf/84d8b429-126c-68dd-0308-caa50886de92</a></p> <p>Comprehensive Mitigation Review Approved Motion:  <a href="https://www.nyiso.com/documents/20142/25928340/110921%20bic%20final%20motions.pdf/785d5869-1e04-9f97-e330-e2e632ae7a9c">https://www.nyiso.com/documents/20142/25928340/110921%20bic%20final%20motions.pdf/785d5869-1e04-9f97-e330-e2e632ae7a9c</a></p>
November 17, 2021	MC	<p>Comprehensive Mitigation Review Proposal and Tariff:  <a href="https://www.nyiso.com/documents/20142/26119798/05%20CMR.pdf/11217ade-152a-74a2-d478-6b5ae5e21207">https://www.nyiso.com/documents/20142/26119798/05%20CMR.pdf/11217ade-152a-74a2-d478-6b5ae5e21207</a></p> <p>Comprehensive Mitigation Review Approved Motion:  <a href="https://www.nyiso.com/documents/20142/26119798/111821%20MC_Final_Motions.pdf/bbf15d66-4108-7173-1596-9b20677914e6">https://www.nyiso.com/documents/20142/26119798/111821%20MC_Final_Motions.pdf/bbf15d66-4108-7173-1596-9b20677914e6</a></p>

# Previous Discussions (cont.)

Date	Working Group	Discussion Points and Links to Materials
January 20, 2022	ICAPWG	2022 Market Projects: <a href="https://www.nyiso.com/documents/20142/27799605/2022%20Projects%20Presentation.pdf/4553eb95-177d-7cbc-f2fe-7754b7c66644">https://www.nyiso.com/documents/20142/27799605/2022%20Projects%20Presentation.pdf/4553eb95-177d-7cbc-f2fe-7754b7c66644</a>
February 3, 2022	ICAPWG	Improving Capacity Accreditation Plan: <a href="https://www.nyiso.com/documents/20142/28227906/Improving%20Capacity%20Accreditation%20Plan.pdf/92560e95-5703-4c57-45cb-7706c36f4656">https://www.nyiso.com/documents/20142/28227906/Improving%20Capacity%20Accreditation%20Plan.pdf/92560e95-5703-4c57-45cb-7706c36f4656</a>
February 24, 2022	ICAPWG	Improving Capacity Accreditation Project Kick Off: <a href="https://www.nyiso.com/documents/20142/28687884/Capa%20city%20Accreditation%20Kick%20ff%2002-24-22%20v7.pdf/5ab742c4-650b-5094-6a22-d41a2f29da6f">https://www.nyiso.com/documents/20142/28687884/Capa%20city%20Accreditation%20Kick%20ff%2002-24-22%20v7.pdf/5ab742c4-650b-5094-6a22-d41a2f29da6f</a>  MARS Review (GE Consulting): <a href="https://www.nyiso.com/documents/20142/28687884/GE-Support%20for%20NYISO%20Capacity%20Accreditation%20Project_0224-v4.pdf/d302df1c-5607-16a8-ba01-fba700d5bbd1">https://www.nyiso.com/documents/20142/28687884/GE-Support%20for%20NYISO%20Capacity%20Accreditation%20Project_0224-v4.pdf/d302df1c-5607-16a8-ba01-fba700d5bbd1</a>
March 3, 2022	ICAPWG	CMR Draft Deficiency Response: <a href="https://www.nyiso.com/documents/20142/28897222/CMR%20Deficiency%20Draft%20Responses%2003-03%20ICAPWG.pdf/0a3c8303-515e-7725-dee5-a9dda1398672">https://www.nyiso.com/documents/20142/28897222/CMR%20Deficiency%20Draft%20Responses%2003-03%20ICAPWG.pdf/0a3c8303-515e-7725-dee5-a9dda1398672</a>

# Previous Discussions (cont.)

Date	Working Group	Discussion Points and Links to Materials
March 16, 2022	ICAPWG	Capacity Accreditation Resource Class Criteria, Resource-Specific Derating Factors, and Areas of Needed Change: <a href="https://www.nyiso.com/documents/20142/29177064/Capacity%20Accreditation%2003-16-22%20v7.pdf/b26e6a99-5f4e-29cc-c60c-47608c78c983">https://www.nyiso.com/documents/20142/29177064/Capacity%20Accreditation%2003-16-22%20v7.pdf/b26e6a99-5f4e-29cc-c60c-47608c78c983</a>

# Background



# Background

- **The NYISO has begun stakeholder discussions to 1) develop the implementation details and technical specifications for establishing Capacity Accreditation Factors (CAFs) and Capacity Accreditation Resource Classes (CARCs) and 2) propose necessary ICAP Manual revisions**
  - The NYISO has contracted with GE Energy Consulting to support the NYISO and its stakeholders in the development of the implementation details and technical specifications
- **The 2022 Improving Capacity Accreditation project deliverable is a Q3 Market Design Complete**

# CAFs vs Resource-Specific Derating Factors

# Capacity Accreditation Factors

- **CAFs will reflect the marginal reliability contribution of the representative unit of each CARC for each location that is evaluated**
- **The impact of the following characteristics would be captured by CAFs:**
  - Energy Duration Limitations
  - Correlated unavailability due to weather and/or fuel supply limitations
  - Start-up notification time limitations

# Resource-Specific Derating Factors

- **Resource-specific derating factors will capture any difference in availability that is specific to an individual resource and not captured in the CAF of the resource's CARC**
  - Examples:
    - Forced outages, forced derates, failed starts, etc.
    - Resource output that is different from the modeled production profile of the CARC
- **Generally, a Resource's UCAP will be determined by combining the Resource's ICAP, CAF, and resource-specific derating factor as illustrated below**
  - $UCAP = \text{Adjusted ICAP} \times (1 - \text{resource-specific derating factor})$ 
    - Where:
      - $\text{Adjusted ICAP} = \text{ICAP} * \text{CAF}$
      - $\text{ICAP} = \min(\text{DMNC}, \text{CRIS})$
    - So,  $UCAP = \min(\text{DMNC}, \text{CRIS}) * \text{CAF} * (1 - \text{resource-specific derating factor})$
  - For more information on current resource-specific derating factors, see the [03/16/22 ICAPWG presentation](#)

# Representative Unit Modeling

# Representative Unit Modeling

- As part of the Improving Capacity Accreditation project, the NYISO must determine the modeling characteristics for the representative units of each CARC for each location
- Before determining the exact modeled size and location of the representative units, it is necessary to determine how to model the performance and availability of the representative units
- This presentation includes the NYISO's proposed methodology for modeling the performance and availability of the representative units

# Availability- based Resources

# Availability-based Resources

- Availability-based resources include Conventional Generation, Energy Limited Resources (ELRs), Capacity Limited Resources (CLRs), Behind-the-Meter Net Generation Resources (BTM:NG), Energy Storage Resources (ESRs), and Distributed Energy Resources (DERs)
- In the current IRM model, most availability-based resources are modeled with transition rate matrices that represent the specific unit's EFORD over the most recent five-year period\*
  - If a unit has less than five years of operating data, NERC class-average data is used for the remaining years
- From a unit's transition rate matrix, MARS calculates the average time that the unit resides in each capacity state, and the probability of the unit transitioning from each state to each other state
- The average time in each capacity state and the unit's transition probabilities determine the duration, frequency, and magnitude of random forced outages and forced derates experienced by the unit in each MARS iteration

\* Does not apply to DERs or resources with an EDL



# Availability-based Resources

## Transition Rate Matrix Example

Time in State Data			Transition Data			
State	MW	Hours	From State	To State 1	To State 2	To State 3
1	200	5000	1	0	10	5
2	100	2000	2	6	0	12
3	0	1000	3	9	8	0
State Transition Rates						
From State	To State 1		To State 2		To State 3	
1	0.000		0.002		0.001	
2	0.003		0.000		0.006	
3	0.009		0.008		0.000	

Table A.2 from Appendix A of the 2022 IRM Report:

[https://www.nysrc.org/PDF/Reports/ICS%20Annual%20Reports/Final%20Final%202022%20IRM%20Study%20technical%20Report%20Appendices%2012\\_10\\_21%20Clean%2013\\_21.pdf](https://www.nysrc.org/PDF/Reports/ICS%20Annual%20Reports/Final%20Final%202022%20IRM%20Study%20technical%20Report%20Appendices%2012_10_21%20Clean%2013_21.pdf)

# Availability-based Resources

- In calculating the CAF of availability-based resources, modeling the representative unit with random forced outages or forced derates would double count unavailability when used in conjunction with existing resource-specific derating factor calculations
- To calculate CAFs, the NYISO proposes to model the representative unit of availability-based resources with no random forced outages or forced derates in MARS
- When modeled with no random forced outages or forced derates, availability-based resources can continue to utilize their existing resource-specific derating factor calculations without any adjustment or double accounting of unavailability

# Availability-based Resources

- While no random forced outages or forced derates would be modeled in MARS, the NYISO will recognize operating limitations such as energy duration limitations, fuel supply limitations, and start-up notification time limitations as inputs to the MARS model
- Additionally, the NYISO will conduct tests and sensitivities to confirm that the existing resource-specific derating factor calculations accurately capture the impact of forced outages and forced derates on the marginal reliability contribution of availability-based resources

# Performance- based Resources

# Performance-based Resources

- Performance-based resources include Intermittent Power Resources (IPRs), Limited Control Run-of-River Hydro (LCRoRs), and Special Case Resources (SCRs)
- In the IRM model, existing IPRs and LCRoRs are modeled using the specific unit's hourly production profiles from the most recent five-year period
  - Each iteration, MARS randomly selects the production profile from one of the five years of historical production
  - Applicable to wind, solar, run-of-river hydro, and landfill gas
- If 3 or more units of the same resource type exist in a zone, new IPR and LCRoR units are assigned a zonal weighted-average hourly production profile
- If less than 3 units of the same resource type exist in a zone, new IPR and LCRoR units are assigned a representative hourly production profile based on the production of other existing or simulated units

# Performance-based Resources

- **The NYISO proposes to model IPRs and LCRoRs with historical average hourly production profiles calculated as the weighted-average hourly production of existing units of the same resource type in the evaluated location and scaled to the representative unit's size**
  - For new resource types, the default production profile utilized in the IRM would be used
- **Resource-specific derating factor calculations for IPRs and LCRoRs will be adjusted to compare a unit's specific output to the production profile used in calculating the CAF of the unit's CARC**

# Performance-based Resources

- SCRs are modeled as an Emergency Operating Procedure (EOP) in the IRM model
- If there is not enough capacity to supply load in a given hour, MARS activates EOPs
- SCR activation is limited to a maximum of 5 calls per month in the current IRM model
- In the IRM, the total MWs of SCRs available is equal to the sum of the zonal SCR ICAP enrollment from the preceding July multiplied by the zone's Effective Performance Factor
  - $\text{SCR Model Value MW} = \text{SCR ICAP MW} * \text{Effective Performance Factor}$

# Performance-based Resources

- **Effective Performance Factor = Zonal Performance Factor \* ACL to CBL Factor \* Fatigue Factor**
  - Where:
    - Zonal Performance Factor is calculated using SCR performance by zone during all mandatory event hours from the most recent five-year period (in which a mandatory event was called) and all test hours from the most recent five-year period
    - ACL to CBL Factor adjusts performance based on the reported Average Coincident Load (ACL) baseline values to the Customer Baseline Load (CBL) values reported following an event or test
    - Fatigue Factor is applied to address concerns that fatigue may occur if SCRs are deployed frequently
      - Current value of Fatigue Factor is 1.00



# For 2022 IRM - Final SCR Model Values

Program	Super Zone	Superzone Performance Factor	ICS Adjustment Factors		Effective Performance Factor	SCR ICAP MW based on July 2021 Enrollment Data	Final Model Values MW
			ACL to CBL Factor	Fatigue Factor			
SCR	A-F	87.4%	93.6%	100%	81.8%	636.0	520.3
SCR	G-I	76.8%	84.5%	100%	64.9%	84.9	55.1
SCR	J	70.1%	74.6%	100%	52.3%	406.5	212.4
SCR	K	73.5%	82.2%	100%	60.4%	36.8	22.2
<b>Total</b>						<b>1164.2</b>	<b>810.0</b>
							<b>69.6%</b>

Presented at the August 4, 2021, NYSRC Installed Capacity Subcommittee:

<https://nysrc.org/PDF/MeetingMaterial/ICSMaterial/ICS%20Agenda%20249/AI%207.2%20-%20Final%20SCR%20Model%20Values%20&%20SCR%20Performance%20Analysis.pdf>

# Performance-based Resources

- For every 1000 MWs of SCRs in the 2022 IRM model, the average Effective Performance Factor results in 696 MWs of load reduction available in MARS
- The NYISO proposes to continue the use of the Effective Performance Factors in calculating the CAF of SCRs
- The resource-specific derating factor of SCRs will be adjusted to avoid double counting of historic unavailability

# External Resources

# External Resources

- **The NYISO plans to return to the April 19th ICAPWG to discuss the modeling of external resources**

# Next Steps

# Next Steps

- **The NYISO plans to return to the April 19th ICAPWG to discuss adjusted resource-specific derating factor calculations for performance-based resources and the modeling of external resources**

# Questions?

# Our Mission & Vision



## Mission

Ensure power system reliability and competitive markets for New York in a clean energy future



## Vision

Working together with stakeholders to build the cleanest, most reliable electric system in the nation