New York ISO
Independent System Operator

Tailored Availability Metric

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Agenda

- Background and Recap
- Availability-based resources
- Wind and solar resources
- MST 5.12 Changes
- Next Steps
- Appendix

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Background and Recap

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A Grid in Transition – The Plan

- **Carbon Pricing**
- **Comprehensive Mitigation Review**
- **DER Participation Model**
- **Energy Storage Participation Model**

Aligning Competitive Markets and New York State Clean Energy Objectives

- **Enhancing Energy & Shortage Pricing**
  - Ancillary Services Shortage Pricing
  - Constraint Specific Transmission Shortage Pricing
  - Enhanced Fast Start Pricing
- **Review Energy & Ancillary Services Product Design**
  - More Granular Operating Reserves
  - Reserve Enhancements for Constrained Areas
  - Reserves for Resource Flexibility

Valuing Resource & Grid Flexibility

- **Enhancements to Resource Adequacy Models**
- **Revise Resource Capacity Ratings to Reflect Reliability Contribution**
  - Expanding Capacity Eligibility
  - Tailored Availability Metric
- **Capacity Demand Curve Adjustments**

Improving Capacity Market Valuation

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Recap

- **2020 Deliverable: Q2 Market Design Complete for a May 1, 2021 Implementation**
- **2019 Deliverable: Market Design Concept Proposal**
  - For availability-based resources, the NYISO proposed the weightings of peak months in the Market Design Concept Proposal
  - For wind and solar resources, the NYISO proposed a reoccurring study that will result in relative capacity value weightings across the Peak Load Window hours

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Availability-based Resources

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Proposal

- **At this time, the NYISO is proposing the following changes to the structure of the EFORd calculation**
  - The NYISO proposes changing the structure of the EFORd to take the average of the previous 2 like-Capability Periods EFORds
  - Under this construct:
    - A two year look-back would be consistent with the look-back time-frame used today
    - Outages directly effect their respective Capability Period (i.e. Winter outages are reflected in the Winter EFORd)
    - Respective peak months account for 50% of the calculation
  - See Appendix for example calculations of the delta AEFORd value

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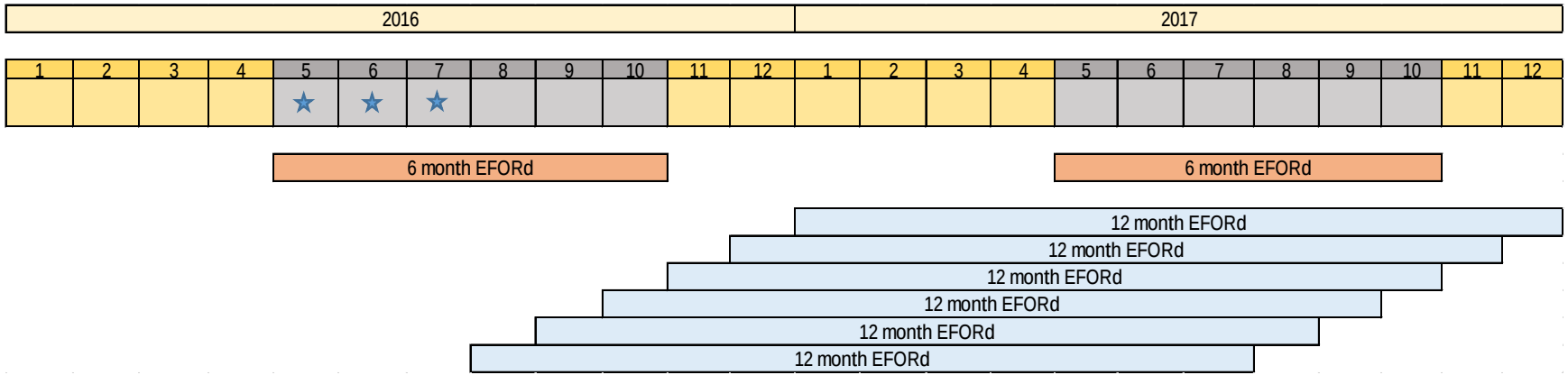
Proposal – Summer 2018 AEFORd Example



- The current calculation consists of 6 consecutive 12-month rolling average EFORds, and the proposed calculation takes the average of the previous 2-like Capability Period EFORds
  - The stars on May, June, and July of 2016 indicate the additional months for the Summer 2018 AEFORd example that would now be included in the proposed calculation

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Proposal

- **At this time the NYISO is not proposing applying a direct weighting to the peak months of the calculation**
  - As previously presented on July 24th 2019, the EFORd calculation is based on the Service Hours in relation to the Forced Outage Hours and Reserve Shutdown Hours
  - For peaker plants, Service Hours typically occur during peak periods
    - If an outage that has a long duration (e.g., 1 month) occurs in a non-peak month, it will drive the non-peak EFORd up due to the fact that the peaking units typically record less Service Hours during non-peak periods
    - If a peaker unit records a high number of Service Hours and no outages during a peak month, it will drive the peak EFORd down
  - Therefore, the calculation captures the incentive to be available during the peak period
    - See example on the following slide

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EFORd Example

- When a high non-peak EFORd and a low peak EFORd is weighted and averaged together, the result shows an increase in the overall EFORd
- The following shows data and calculated EFORds for 2 months of a hypothetical unit
  - When a low peak-month EFORd is weighted 75% of the calculation, the total AEFORd increases by 4%

Non-Peak

SH	RSH	FOH	FO Count	EFDH	Attempted Starts	Actual Starts
20	600	100	1	0	2	1

Peak

SH	RSH	FOH	FO Count	EFDH	Attempted Starts	Actual Starts
500	195	25	1	0	15	14

Total

SH	RSH	FOH	FO Count	EFDH	Attempted Starts	Actual Starts
520	795	125	2	0	17	15

	EFORd	Weighting	New EFORd
Non-peak month	51%	25%	13%
Peak month	4%	75%	3%
Total	12%		16%

Delta	4%

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Proposal

- **For new resources the class average will be used**
  - For example:
    - If a resource has recorded data for 1 Capability Period, the AEFORd will take the average of the calculated EFORd of the unit's actual data for 1 Capability Period and the class average for the missing Capability Period
- **For a resource that is in an ICAP ineligible state (e.g., Mothball, IIFO) the NYISO will look-back until historic data is available**
  - For example:
    - For a Summer 2018 Capability Period AEFORd, if historic data was unavailable for months August – October 2016, the NYISO would replace the missing data from the next available historic year, *i.e.* August – October 2015

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Wind and Solar Resources

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Wind and Solar Resources

- **As a part of the Market Design Concept Proposal, the NYISO proposed a reoccurring study every 4 years, that would result in hourly capacity value weightings across the Peak Load Window**
  - Weightings would be applied to the respective hourly production data
  - The study would run concurrently with the study for Expanding Capacity Eligibility
  - Each study could reset the top 4 hours within the Peak Load Window and percentages based on the percentages for Expanding Capacity Eligibility
- **Initial analysis shows potential weighting percentages across the Peak Load Window based off of different IRM cases**
  - Tying the percentages to Loss of Load Events reflects the highest needs of the system

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Wind and Solar Resources

- The following cases show the differences in the hourly LOLE percentages of the top 4 hours:

	2019 IRM Final Base Case	
HB	8 Hour	6 Hour
12	7%	
13	13%	14%
14	17%	19%
15	19%	21%
16	19%	21%
17	14%	15%
18	9%	10%
19	3%	
Top 4 Hours	68%	76%

	2020 IRM Preliminary Base Case	
HB	8 Hour	6 Hour
12	7%	
13	13%	14%
14	17%	19%
15	19%	21%
16	19%	21%
17	13%	15%
18	9%	10%
19	4%	
Top 4 Hours	68%	76%

	High Renewables (12K) Case	
HB	8 Hour	6 Hour
12	5%	
13	11%	12%
14	16%	18%
15	18%	20%
16	19%	21%
17	16%	18%
18	9%	10%
19	5%	
Top 4 Hours	69%	78%

- The High Renewables Case runs the 2020 Base Case with an additional 12,000 MW of renewable resources
  - 4,000 MW of solar, 4,000 MW of onshore wind, and 4,000 MW of offshore wind
- The whitepaper that describes the high renewable study can be found here:
  - http://nysrc.org/PDF/MeetingMaterial/ECMeetingMaterial/EC%20Agenda%20249/4.3%20High%20Renewable%20Resource%20Modeling%20White%20Paper%20v1.1%201-7-2020-Attachment%204.3.pdf

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Wind and Solar Resources

- **Additional analysis assessed the hourly LOLE percentages for 4000 MW of onshore wind, offshore wind, and solar from the 2020 Base Case**
  - Analysis incremented 4000 MW of each of the specific resource type to the 2020 IRM Base Case, rebalanced to the 0.1 LOLE standard

	4000 MW Onshore Wind	
HB	8 Hour	6 Hour
12	8%	
13	13%	14%
14	17%	19%
15	18%	21%
16	18%	21%
17	14%	15%
18	9%	10%
19	4%	
Top 4 Hours	67%	76%

	4000 MW Offshore Wind	
HB	8 Hour	6 Hour
12	9%	
13	16%	18%
14	20%	23%
15	19%	22%
16	18%	20%
17	11%	13%
18	5%	6%
19	2%	
Top 4 Hours	68%	77%

	4000 MW Solar	
HB	8 Hour	6 Hour
12	5%	
13	9%	10%
14	15%	17%
15	18%	20%
16	20%	23%
17	16%	18%
18	11%	12%
19	7%	
Top 4 Hours	68%	78%

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Wind and Solar Resources

- **The relative capacity value weightings established will align with the Peak Load Windows proposed in the Expanding Capacity Eligibility project**
  - 6 hour Peak Load Window:
    - Summer: HB 13 – HB 18
    - Winter: HB 16 – HB 21
  - 8 hour Peak Load Window:
    - Summer: HB 12 – HB 19
    - Winter: HB 14 – HB 21
  - The duration of the Peak Load Window is dependent on resources with duration limitations

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Proposal

- **At this time, the NYISO is proposing the following weightings across the 8-hour and 6-hour PLW**
- **For a 6-hour PLW, the top 4 hours will receive a 75% weighting**
  - Weightings of the shoulder 2 hours will be equally weighted at 12.5% each
- **For an 8-hour PLW, the top 4 hours will receive a 70% weighting**
  - Weightings of the shoulder hours will be 3-tiered
    - In other words, the next top 2 hours will be weighted 20%, and the last 2 hours will be weighted 10%
      - See chart on Slide 18

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Proposal

- **Summer and Winter Capability Period months will receive the same set of weightings, within its respective Peak Load Window hours**
  - For the Winter PLW, the top 4 hours will remain consistent with methodology used today, and the top load hours from Expanding Capacity Eligibility (HB 16 – HB 19)
- **Under this construct, wind and solar resources will still have the opportunity to receive 100% performance factors if they perform in all hours of the Peak Load Window**

	Summer Peak Load Window		Winter Peak Load Window	
HB	6 Hour	8 Hour	6 Hour	8 Hour
12		5.0%		
13	12.5%	10.0%		
14	18.75%	17.5%		5.00%
15	18.75%	17.5%		5.00%
16	18.75%	17.5%	18.75%	17.50%
17	18.75%	17.5%	18.75%	17.50%
18	12.5%	10.0%	18.75%	17.50%
19		5.0%	18.75%	17.50%
20			12.5%	10.0%
21			12.5%	10.0%
Top 4 Hours	75%	70%	75%	70%

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Change in Performance Factors

- **Analysis shows the delta in performance factors for wind and solar resources in both Summer and Winter**
  - A negative percentage reflects a decrease in the performance factor

Summer Solar Delta		
Year	6-hour PLW 75%	8-hour PLW 70%
2012	-2.4%	-3.2%
2013	-2.3%	-3.2%
2014	-2.8%	-3.8%
2015	-2.4%	-3.3%
2016	-2.6%	-3.6%
Average	-2.5%	-3.4%

Summer Wind Delta		
Year	6-hour PLW 75%	8-hour PLW 70%
2013	-0.3%	-0.3%
2014	-0.2%	-0.2%
2015	-0.4%	-0.4%
2016	-0.4%	-0.4%
2017	-0.6%	-0.6%
Average	-0.4%	-0.4%

Winter Solar Delta		
Year	6-hour PLW 75%	8-hour PLW 70%
2012	-0.3%	2.5%
2013	-0.2%	2.1%
2014	-0.3%	2.1%
2015	-0.3%	2.2%
2016	-0.2%	2.3%
Average	-0.2%	2.2%

Winter Wind Delta		
Year	6-hour PLW 75%	8-hour PLW 70%
2013	0.6%	0.5%
2014	1.0%	0.6%
2015	0.7%	0.3%
2016	0.6%	0.5%
2017	0.5%	0.4%
Average	0.7%	0.5%

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MST 5.12 Changes

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MST 5.12

- **Updates have been made to 5.12.6.2 to reflect the following:**
  - The hourly weightings proposed for wind and solar resources within the 8-hour and 6-hour Peak Load Window
    - A table has been added to show the hourly weightings
  - The previous 2 like-Capability Period look-back for availability-based resources
- **Section 5.12.14.3 has been updated to reflect the 4-year reoccurring study for wind and solar resources**
- **Detailed changes will be made to Section 4.5 and Attachment J of the ICAP Manual pending FERC approval**

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Next Steps

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Next Steps

- **At this time, the NYISO is targeting a BIC in the near future for May 1, 2021 implementation**
  - The NYISO is seeking stakeholder feedback on today's presentation by March 3rd

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Feedback/Questions?

The NYISO will consider input received during today's Working Group meeting and further input sent in writing to deckels@nyiso.com and econway@nyiso.com

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Appendix

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Recap

- March 7th, 2019: The NYISO discussed expanding the project scope to include all availability-based and performance-based resources
  - https://www.nyiso.com/documents/20142/5375692/Tailored%20Availability%20Metric.pdf/92ef1b5d-0ec3-cee5-df69-e2130934ec0e
- May 9th, 2019: The NYISO presented initial analysis for availability-based resources that use the EFORd
  - https://www.nyiso.com/documents/20142/6474763/Tailored%20Availability%20Metric%20050919.pdf/2c86f002-0fe5-b3cb-05d8-f118e4dd392f
- July 24th, 2019: The NYISO presented the Market Design Concept Proposal for availability-based resources that use the EFORd as their derating factor
  - https://www.nyiso.com/documents/20142/7674442/Tailored%20Availability%20Metric.pdf/e28df5c2-6994-ba5c-7ca2-05abeba9daeb
- August 23rd, 2019: The NYISO began discussion of analysis options for performance-based resources
  - https://www.nyiso.com/documents/20142/8040247/tailored%20availability%20metric%20082319.pdf/ada7cacf-97aa-699a-7ead-e1e39b1a51f8
- October 18th , 2019: The NYISO continued discussion of analysis for performance-based resources
  - https://www.nyiso.com/documents/20142/8783504/Tailored%20Availability%20Metric.pdf/7a9c6c65-f218-b685-a2d5-16f491276d29
- November 21st, 2019: The NYISO presented the Market Design Concept Proposal for performance-based resources
  - https://www.nyiso.com/documents/20142/9312827/Tailored%20Availability%20Metric.pdf/c4271e59-b0e0-7c0a-c2f9-15cc91bbb2ef

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Availability-based Resources

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Background

- **Unforced Capacity (UCAP) is the amount of capacity a Resource is qualified to supply**
  - UCAP = Minimum ICAP x (1 – Derating Factor)
- **Translation factor *1 – Derating Factor* is used to measure availability of a Resource**
  - Takes into account forced outages and forced deratings

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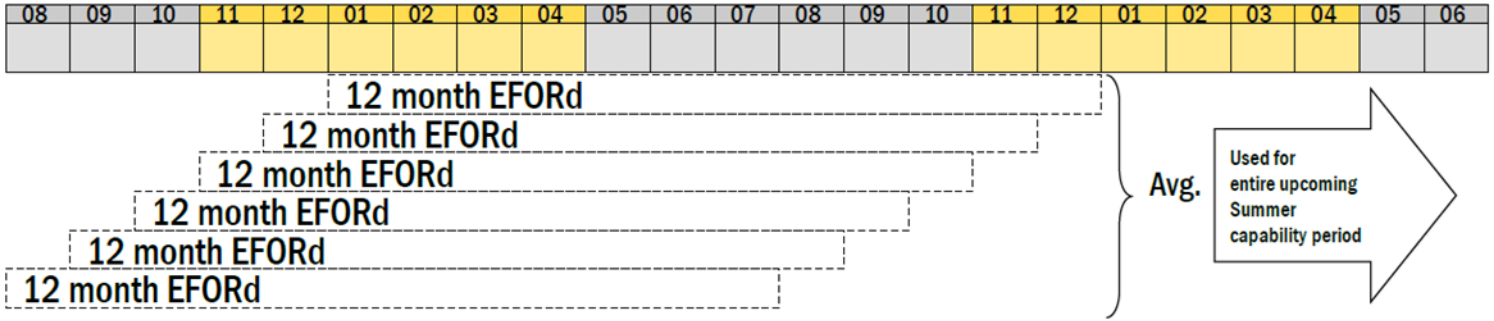
Background

- **The current methodology for calculating a Capability Period AEFORd is the average of six consecutive (rolling) 12-month EFORd calculations**
  - Under this construct:
    - It is assumed outages are random
    - Winter outages directly effect a Summer AEFORd
    - Respective peak months (June, July, and August) account for 25% of the calculation



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EFORd Calculation

- **The EFORd equation looks at 7 different inputs to calculate the value**
- **Event Hours:**
  - Service Hours (SH) – sum of all Unit Service Hours
  - Reserve Shutdown Hours (RSH) – sum of all Unit Reserve Shutdown Hours
  - Forced Outage Hours (FOH) – sum of all hours experienced during Forced Outages or Startup Failure
  - Equivalent Forced Derated Hours (EFDH) – the sum of all forced derating hours multiplied by the size of the reduction (MW), divided by the Net Maximum Capacity (NMC)
- **Event Counts:**
  - Number of Forced Outage Events
  - Number of Attempted Start Events
  - Number of Actual Start Events

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EFORd Calculation

$$EFORd = \frac{f_f \times FOH + f_p \times (EFDH)}{SH + f_f \times FOH}$$

$$f_f = \frac{\frac{1}{r} + \frac{1}{T}}{\frac{1}{r} + \frac{1}{T} + \frac{1}{D}} \qquad f_p = \frac{SH}{AH}$$

- $r = average\ forced\ outage\ deration = \frac{FOH}{number\ of\ forced\ outages}$
- $T = average\ time\ between\ calls\ for\ a\ unit\ to\ run = \frac{RSH}{number\ of\ attempted\ starts}$
- $D = average\ run\ time = \frac{SH}{number\ of\ successful\ starts}$

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GT Unit 1

- Summer 2018

Proposed Calculation	
Year	EFORd
2016	24.92
2017	11.38
2018	18.15

Current Calculation	
Calc. No	EFORd
1	21.20
2	16.47
3	13.24
4	10.55
5	11.36
6	13.05
2018	14.31

Delta
-3.84

- Winter 2018-19

Proposed Calculation	
Year	EFORd
2016-17	10.09
2017-18	17.40
2018-19	13.74

Current Calculation	
Calc. No	EFORd
1	15.05
2	14.78
3	14.36
4	14.31
5	13.74
6	10.23
2018	13.74

Delta
0.00

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GT Unit 2

- Summer 2018

Proposed Calculation	
Year	EFORd
2016	0.12
2017	2.63
2018	1.38

Current Calculation	
Calc. No	EFORd
1	1.75
2	1.70
3	1.75
4	1.78
5	1.79
6	2.07
2018	1.81

Delta
0.43

- Winter 2018-19

Proposed Calculation	
Year	EFORd
2016-17	0.64
2017-18	0.11
2018-19	0.37

Current Calculation	
Calc. No	EFORd
1	2.16
2	1.92
3	1.94
4	1.87
5	1.84
6	0.05
2018	1.63

Delta
1.26

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GT Unit 3

- Summer 2018

Proposed Calculation	
Year	EFORd
2016	37.36
2017	0.37
2018	18.87

Current Calculation	
Calc. No	EFORd
1	21.71
2	13.02
3	6.10
4	0.43
5	9.76
6	19.36
2018	11.73

Delta
-7.13

- Winter 2018-19

Proposed Calculation	
Year	EFORd
2016-17	1.75
2017-18	91.13
2018-19	46.44

Current Calculation	
Calc. No	EFORd
1	28.27
2	35.92
3	42.43
4	45.42
5	49.41
6	54.65
2018	42.68

Delta
-3.76

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ST Unit 4

- Summer 2018

Proposed Calculation	
Year	EFORd
2016	1.88
2017	5.67
2018	3.77

Current Calculation	
Calc. No	EFORd
1	4.85
2	4.92
3	5.04
4	3.59
5	3.22
6	3.05
2018	4.11

Delta
0.34

- Winter 2018-19

Proposed Calculation	
Year	EFORd
2016-17	0.00
2017-18	0.61
2018-19	0.31

Current Calculation	
Calc. No	EFORd
1	3.03
2	2.92
3	2.99
4	3.06
5	2.96
6	0.29
2018	2.54

Delta
2.24

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Analysis

- **Initial analysis calculated the change in the translation factor between the current mechanism used today and the proposed methodology**
  - Translation factor = 1 – Derating Factor (see Appendix)
  - The delta value shows: (the proposed translation factor – the current translation factor)
- **Calculations show there is not a significant change in the AEFORd between the two methodologies**
  - Analysis included 3 peaker gas turbine units, and 1 steam turbine unit
  - GT Unit 3 recorded fairly high EFORds (more outages) in Summer 2016, which is not heavily reflected in the current EFORd used today
- **A similar methodology is used in the IRM set by the Reliability Council, which calculates an EFORd using data from the previous 5 years**

Summer 2018	
Unit Name	Translation Factor Delta
GT Unit 1	-3.84
GT Unit 2	0.43
GT Unit 3	-7.13
ST Unit 4	0.34

Winter 2018-19	
Unit Name	Translation Factor Delta
GT Unit 1	0.00
GT Unit 2	1.26
GT Unit 3	-3.76
ST Unit 4	2.24

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Wind and Solar Resources

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Wind and Solar Resources

- **The current performance factor for performance-based Installed Capacity Suppliers is based on actual performance over peak periods**
  - For wind and solar resources, performance factors are calculated based on the current 4-hour window in the respective peak months
    - Summer:
      - HB 14 – HB 17
      - June, July, and August
    - Winter:
      - HB 16 – HB 19
      - December, January, and February
  - Performance factors are calculated by dividing the output performance by the nameplate capacity of the resource

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Proposal for Wind and Solar Resources

- **Based off analysis done thus far, the NYISO is proposing a reoccurring study for wind and solar resources**
  - The study will run concurrently with the Capacity Value Study and will be conducted every 4 years
  - The Capacity Value Study and this study will use a similar base case
    - The base case built on will be from the IRM Study
    - For this base case, additional wind and solar resources could potentially be added to establish relative capacity value weightings for wind and solar resources
- **The proposal would be effective in 2021**
  - An initial study would be conducted in the Market Design Complete stage (Q2 of 2020)

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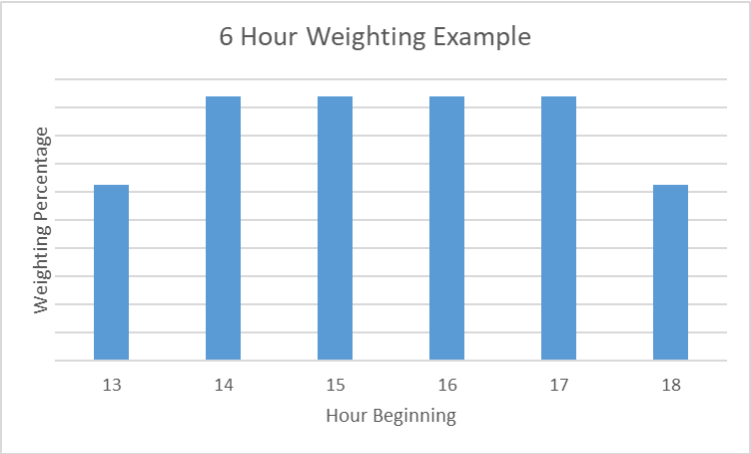
Proposal for Wind and Solar Resources

- **The relative capacity value weightings will be shaped across the Peak Load Window hours**
  - A subset of Peak Load Window hours will be weighted higher than the remaining shoulder hours
    - Preliminary weightings will be established as a part of the Market Design Complete
- **Summer and Winter Capability Period months will receive the same set of weightings, within its respective Peak Load Window hours**



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Our mission, in collaboration with our stakeholders, is to serve the public interest and provide benefit to consumers by:

- Maintaining and enhancing regional reliability
- Operating open, fair and competitive wholesale electricity markets
- Planning the power system for the future
- Providing factual information to policymakers, stakeholders and investors in the power system

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