

Reliability Gaps and Market Performance Metrics Part V -2021 Update

Scott Harvey
NYISO ICAP/MIWG
February 3, 2022

We have continued to include material from prior presentations and update it with the new information so that all the information is contained within one presentation. New information is in red; some minor updating of references to 2020 or 2021 and clarifying edits are not highlighted.



FTI®

Topics

- Potential Reliability Gaps with New York's Evolving Resource Mix ¹
- Review of BPCG Metrics ¹
- Review of Day-Ahead Market Commitments Analysis ²
- Discussion of Real-Time Commitments ²
- Next Steps

1. Review of topic previously covered in the March 19, April 20, September 20 and December 2, 2021 presentations.

2. Updating of presentation to cover 2021 data.

Potential Reliability Gaps with New York's Evolving Resource Mix

Reliability Gap Assessment

The Reliability and Market Considerations for a Grid in Transition (Grid in Transition) white paper ¹ includes a Reliability Gap Assessment. The full assessment is in Appendix B and a high-level discussion of the assessment starts on page 20.

- Today's presentation is the third focused on proposed market metrics relating to bid production cost guarantees (BPCG).
 - The new content in today's presentation is focused on the real-time market BPCG metrics.
 - Today's presentation also reviews the day-ahead market BPCG metrics discussed on March 19 and April 20.
 - The goal is again to get feedback on the proposed approach from stakeholders.
 - The proposed metrics are being considered for inclusion with existing metrics and would be compiled on an ongoing basis and reviewed periodically with stakeholders (respecting the constraints of confidentiality).

1. <https://www.nyiso.com/documents/20142/9869531/Reliability%20and%20Market%20Considerations%20for%20a%20Grid%20in%20Transition%20-%2020191220%20Final.pdf/7846db9c-9113-a85c-8abf-1a0ffe971967>

Reliability Gap Assessment

The ten areas of potential reliability gaps identified in that report were:

1. Maintain Ability to Balance Load and Generation
2. Maintain 10-Minute Operating Reserves
3. Maintain Total 30-Minute Operating Reserves
4. Maintain Ability to Meet Daily Energy Requirements
5. Maintain Reliable Transmission Operations
6. Maintain Black Start Capability
7. Maintain Voltage Support Capability
8. Maintain Frequency Response Capability
9. Maintain Resource Adequacy
10. Ability to Manage Supply Resource Outage Schedules

The metrics discussed today are most focused on reliability gap 1 but also relate to gaps 2, 3, 4, 5 and 9.

Reliability Gap Assessment

The Grid in Transition white paper touched upon a number of other reliability performance and market performance metrics that are not discussed in this presentation. Not all of these metrics may need to be developed and monitored in the same time frame. These other market performance metrics include:

- Level of self-scheduling in RTD by potentially dispatchable resources;
- Net load forecast latency;
- Frequency/level/duration of price spikes due to ramp constraints;
- Frequency resources are committed in real-time for voltage support;
- Average level of spinning reserve prices (already reported in the NYISO CEO/COO Report¹);
- Frequency that energy limited resources are depleted prior to price spikes;
- RTC net load forecast error (modified version of net load forecast metric in Monthly Report²);
- RTD net load forecast error (modified version of net load forecast metric in Monthly Report²);
- Efficiency of RTD dispatch of storage resources;
- CTS Performance

1. February's NYISO CEO/COO Report: <https://www.nyiso.com/documents/20142/19386712/03%20NYISO%20CEO%20COO%20Report.pdf/26cfa638-c9c6-65b8-f238-70c95dd6e32e>

2. February's Operations Performance Metrics Monthly Report: https://www.nyiso.com/documents/20142/19386712/03%20Operations_Report.pdf/c69e9ff1-7e48-af8e-2c4d-32ec3c8f147b

Reliability Gap Assessment

The NYISO already tracks several Reliability Performance and Market Performance Metrics in the Operations Performance Metrics Monthly Report¹ presented at the Management Committee.

The NYISO has also reviewed the operations reliability considerations in the Grid in Transition white paper. These were reviewed at the June 10 2020 ICAP/MIWG.²

Today's presentation reviews additional Market Performance Metrics the NYISO is considering. Stakeholder feedback on the proposed Market Performance Metrics is encouraged.

¹ February's NYISO CEO/COO Report: <https://www.nyiso.com/documents/20142/19386712/03%20NYISO%20CEO%20COO%20Report.pdf/26cfa638-c9c6-65b8-f238-70c95dd6e32e>

² <https://www.nyiso.com/documents/20142/12967767/20200610%20Reliability%20and%20Market%20Considerations%20for%20a%20Grid%20in%20Transition.pdf/910012cd-a809-a74e-5da7-f740a6b8128d>

Review of BPCG Metrics

BPCG Metrics

Why is the level of BPCG payments important?

- A high level of BPCG payments to flexible resources in NYISO markets can have a number of adverse impacts.
 - Some impacts are specifically related to retaining and efficiently operating flexible resources whose output (and resource characteristics) will be needed to balance higher levels of intermittent resource output.
 - Some impacts are related more generally to the NYISO's ability to meet New York net load at least cost.

BPCG Metrics

As the proportion of starts that are uneconomic at market prices increases and resources are more often made whole with uplift payments:

1. There would be a reduced incentive for the affected resource owner to make investments to maintain or improve resource capabilities such as ramp rate, start time and fuel cost efficiency. This is because lower costs and higher revenues would reduce BPCG payments on the unprofitable starts and only increase margins on the profitable starts.
2. Energy market margins would likely make a smaller contribution to covering resource going forward costs, potentially leading to the inefficient exit of flexible resources.
3. High levels of BPCG do not send a price signal for the entry of new resources, or even new types of resources, able to provide flexibility at lower cost.

BPCG Metrics

4. There would be an increased incentive for resources to submit inflated commitment cost offers, increasing profits through BPCG payments, even absent market power.
5. Even for the many real-time commitments that would be economic if settled at RTC prices, high levels of net load uncertainty in the time frame of the commitment decision combined with a BPCG design will inflate generator returns and consumer costs.
6. A final concern is straight forward economic efficiency. A pattern of a rising proportion of RTC commitments that are uneconomic at RTD settlement prices could be an indicator of biases or inappropriate simplifications in RTC commitment logic that are inflating consumer costs, and emissions, by committing too many thermal units under some, or perhaps many, conditions.

BPCG Metrics

While this initial analysis is focused on gas fired generation, we envision that it would be extended to other types of flexible resources as their importance grows.

- Hence, once there are a material number of batteries in operation, a similar analysis could track the impact of forecast errors in the NYISO RTD dispatch on battery operating profits.
- Moreover, these metrics would have relevance to the economics of other types of flexible resources, such as dispatchable hydro resources or other types of storage resource, as high levels of BPCG relative to gas unit margins would be an indicator of a poor price signal for the retention of dispatchable hydro or storage resources.

BPCG Metrics

We propose that the two metrics for BPCG trends be:

[1] Proportion of economic starts receiving BPCG.

[starts receiving BPCG/Total economic starts]

[2] Relationship between BPCG and Margins

[Total BPCG payments / (Total BPCG Payments + Total Net Margins)]

We also propose to track the impact of Forecast Pass commitments of long start generation as measured by:

Total Megawatt Hours scheduled in final scheduling pass on long start units committed in forecast load pass.

BPCG Metrics

This table summarizes how the two metrics relate to the six concerns relating to BPCG.

	Metric 1	Metric 2
1. Investment Incentives	Good	OK
2. Going Forward Cost Contributions	n/a	Good
3. Price Signal Quality	n/a	Good
4. Incentive to Inflate Offers	Good	n/a
5. Excess Costs	Good	Good
6. Economic Efficiency	Good	Good

Metric 1 is better for issues 1 and 4, while Metric 2 is better for issues 2 and 3.

Review of Day-Ahead Market Commitments Analysis

Day-Ahead Market Metrics

We propose that the day-ahead market metrics will be based on intra-day commitments (units that cycle on and off within the time frame of the day-ahead market) ¹ and only include resources committed based on the day-ahead market economic evaluation.

- The metric would exclude resources that received LRR, DARU or forecast load physical commitments (not just a schedule for a quick start unit) or were self-committed in any hour.
- The purpose of this metric is to provide an indicator of whether the current market design, penalty prices, and operating practices provide reasonably efficient incentives for investment in and continued operation of flexible resources that are needed to balance variations in net load.

1. We have excluded a very small number of resources that notionally cycled on and off within the day but were long-start resources that submitted zero start up times. We believe these resources were using their offers to self-schedule their commitment and the revenue calculation may be misleading. There can be some anomalies with resources that cycle on or off shortly before or after the day-ahead market day. This involves a very small number of units and we do not think the metric needs to be further complicated to better cover these instances.

BPCG Metric #1

BPCG Metric 1: Proportion of economic starts receiving BPCG.

The data shows that over all four quarters of 2020, slightly more than 90% of resources committed based on the day-ahead market's economic evaluation, and cycling on and off with the day-ahead market timeframe, did not receive BPCG.

- The percentage was around 84% January through May and around 92% June through December.

2020

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Total	276	256	185	85	210	616	1477	934	431	240	463	468	5710
BPCG	39	44	28	21	31	46	133	78	30	21	36	21	532
No BPCG	237	212	157	64	179	570	1344	856	401	219	427	447	5113
% BPCG	14.1	17.2	15.1	24.7	14.8	7.5	9.0	8.4	7.0	8.8	7.8	4.5	9.4

BPCG Metric #1

BPCG Metric 1: Proportion of economic starts receiving BPCG.

The 2021 data show that over 2021 the proportion of economic starts was just under 95%.

This is a somewhat higher proportion than in 2020, perhaps because the level of uneconomic commitments was increased in spring 2020 by the impact of covid and also because of low prices in the day-ahead market even before the outbreak impacted load.

2021

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Total	345	429	308	178	303	797	1031	1362	623	391	472	567	6806
BPCG	22	25	16	16	26	32	69	46	32	18	22	21	345
No BPCG	323	404	292	162	277	765	962	1316	591	373	450	546	6461
% BPCG	6.4	5.8	5.2	9.0	8.6	4.0	6.7	3.4	5.1	4.6	4.7	3.7	5.1

BPCG Metric #1

There was discussion in March 2020 of the small number of economic starts in first quarter 2020.

- The number of economic starts was even lower in April and May of 2020, but then rose to much higher levels for the rest of 2020.
- Most of the variation in the number of units cycling on and off within the day arises from differences in the number of quick start units scheduled in the day-ahead market.
- We see a similar increase in units cycling on and off in summer 2021, relative to the winter and spring months.

BPCG Metric #1

There was also discussion in March 2020 of the number of starts that ran over into a second day.

In 1Q 2020, 194 units had commitments that extended into the next operating day and only 7 of these received BPCG.

BPCG Metric #2:

BPCG Metric #2: Total BPCG payments /(BPCG Payments + Net Margin)

- BPCG Metric #2 was generally low over 2020, averaging 1.8% for the year.
- BPCG Metric #2 was high in April and above 2% in four other months.
- BPCG Metric #2 shows much higher BPCG payment ratios for long-start units.

2020

	Count of Units	January	February	March	April	May	June	July	August	September	October	November	December	Total
All Units	BPCG for Units Cycling	\$ 15,462	\$ 17,325	\$ 15,180	\$ 39,929	\$ 19,072	\$ 71,242	\$ 87,024	\$ 62,238	\$ 17,004	\$ 18,968	\$ 55,385	\$ 13,261	\$ 432,090
	Net Revenue for Units Cycling	\$ 2,214,120	\$ 1,484,561	\$ 855,888	\$ 151,569	\$ 370,574	\$ 2,277,244	\$ 6,619,486	\$ 4,168,197	\$ 1,377,763	\$ 776,712	\$ 1,838,169	\$ 2,109,446	\$ 24,243,727
	(BPCG)/(BPCG + Net Revenue)	0.7%	1.2%	1.7%	20.9%	4.9%	3.0%	1.3%	1.5%	1.2%	2.4%	2.9%	0.6%	1.8%
Fast-Start Units (Start-up time <=30 minutes)	BPCG for Units Cycling	\$ 4,334	\$ 1,667	\$ 290	\$ 9	\$ 204	\$ 2,790	\$ 7,588	\$ 6,788	\$ 4,932	\$ 4,667	\$ 813	\$ 372	\$ 34,454
	Net Revenue for Units Cycling	\$ 184,703	\$ 122,150	\$ 8,790	\$ 3,594	\$ 37,777	\$ 416,689	\$ 3,608,206	\$ 2,208,021	\$ 447,982	\$ 121,329	\$ 267,766	\$ 455,144	\$ 7,882,150
	(BPCG)/(BPCG + Net Revenue)	2.3%	1.3%	3.2%	0.2%	0.5%	0.7%	0.2%	0.3%	1.1%	3.7%	0.3%	0.1%	0.4%
Units with Start-up Time >30 minutes and <=1 hour	BPCG for Units Cycling	\$ 18	\$ 619	\$ 2,356	\$ 2,550	\$ 537	\$ -	\$ -	\$ -	\$ 5	\$ -	\$ 1,645	\$ -	\$ 7,730
	Net Revenue for Units Cycling	\$ 68,412	\$ 32,337	\$ 23,750	\$ 28,860	\$ 37,616	\$ 120,263	\$ 365,580	\$ 182,219	\$ 101,303	\$ 73,158	\$ 191,388	\$ 256,478	\$ 1,481,362
	(BPCG)/(BPCG + Net Revenue)	0.0%	1.9%	9.0%	8.1%	1.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.9%	0.0%	0.5%
Units with Start-up Time >1 hour and <=3 hours	BPCG for Units Cycling	\$ 5,555	\$ 10,676	\$ 6,340	\$ 14,168	\$ 10,182	\$ 3,540	\$ 240	\$ 45	\$ -	\$ 6,083	\$ 18,057	\$ 4,480	\$ 79,368
	Net Revenue for Units Cycling	\$ 239,880	\$ 213,011	\$ 221,028	\$ 78,289	\$ 221,510	\$ 546,303	\$ 724,428	\$ 828,781	\$ 442,369	\$ 435,093	\$ 567,641	\$ 772,895	\$ 5,291,228
	(BPCG)/(BPCG + Net Revenue)	2.3%	4.8%	2.8%	15.3%	4.4%	0.6%	0.0%	0.0%	0.0%	1.4%	3.1%	0.6%	1.5%
Units with Start-up Time >3 hours and <=6 hours	BPCG for Units Cycling	\$ 5,555	\$ 4,363	\$ 6,194	\$ 23,202	\$ 8,149	\$ 23,338	\$ 23,358	\$ 9,839	\$ 947	\$ 6,014	\$ 28,374	\$ 4,919	\$ 144,250
	Net Revenue for Units Cycling	\$ 1,712,831	\$ 1,117,063	\$ 583,824	\$ 40,827	\$ 58,695	\$ 1,052,262	\$ 1,762,582	\$ 780,546	\$ 340,440	\$ 112,029	\$ 506,190	\$ 492,548	\$ 8,559,837
	(BPCG)/(BPCG + Net Revenue)	0.3%	0.4%	1.0%	36.2%	12.2%	2.2%	1.3%	1.2%	0.3%	5.1%	5.3%	1.0%	1.7%
Units with Start-up Time >6 hours	BPCG for Units Cycling	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 41,574	\$ 55,839	\$ 45,566	\$ 11,120	\$ 2,205	\$ 6,496	\$ 3,490	\$ 166,289
	Net Revenue for Units Cycling	\$ 8,294	\$ -	\$ 18,497	\$ -	\$ 14,975	\$ 141,726	\$ 158,691	\$ 168,630	\$ 45,668	\$ 35,103	\$ 305,184	\$ 132,381	\$ 1,029,149
	(BPCG)/(BPCG + Net Revenue)	0.0%	0.0%	0.0%	0.0%	0.0%	22.7%	26.0%	21.3%	19.6%	5.9%	2.1%	2.6%	16.2%

BPCG Metric #2:

BPCG Metric #2: Total BPCG payments /(BPCG Payments + Net Margin)

- BPCG Metric #2 was generally low over 2021, averaging 1.0% for the year.
- BPCG Metric #2 was .5% April 2021, compared to 20.9% in April 2020.
- BPCG Metric #2 shows a BPCG payment ratio of 1.9% for long-start units in 2021, compared to 16.2% in 2020.

2021

	Count of Units	January	February	March	April	May	June	July	August	September	October	November	December	Total
All Units	Sum of BPCG for Units Cycling	\$ 23,250	\$ 53,048	\$ 24,989	\$ 3,728	\$ 50,385	\$ 28,485	\$ 125,464	\$ 27,466	\$ 54,747	\$ 26,235	\$ 17,635	\$ 37,991	\$ 473,423
	Sum of Net Revenue for Units Cycling	\$ 2,071,630	\$ 3,650,358	\$ 1,069,748	\$ 796,426	\$ 989,678	\$ 6,876,613	\$ 6,376,319	\$ 17,756,470	\$ 3,234,616	\$ 1,818,599	\$ 1,831,452	\$ 2,828,589	\$ 49,300,499
	Ratio (BPCG/(BPCG + Net Revenue))	1.1%	1.4%	2.3%	0.5%	4.8%	0.4%	1.9%	0.2%	1.7%	1.4%	1.0%	1.3%	1.0%
Fast-Start Units (Start-up time <=30 minutes)	Sum of BPCG for Units Cycling	\$ 3,312	\$ 235	\$ 9,188	\$ 1,317	\$ 118	\$ 12,639	\$ 37,215	\$ 15,010	\$ 12,547	\$ 3,111	\$ 1,560	\$ 5,217	\$ 101,470
	Sum of Net Revenue for Units Cycling	\$ 602,034	\$ 1,295,765	\$ 231,178	\$ 56,522	\$ 191,902	\$ 2,995,708	\$ 3,140,377	\$ 13,587,388	\$ 1,778,470	\$ 476,373	\$ 554,404	\$ 1,236,208	\$ 26,146,330
	Ratio (BPCG/(BPCG + Net Revenue))	0.5%	0.0%	3.8%	2.3%	0.1%	0.4%	1.2%	0.1%	0.7%	0.6%	0.3%	0.4%	0.4%
Units with Start-up Time >30 minutes and <=1 hour	Sum of BPCG for Units Cycling	\$ 2,243	\$ -	\$ 3,390	\$ 236	\$ 274	\$ 1,332	\$ 1,713	\$ 134	\$ 285	\$ 1,611	\$ 2,428	\$ 27,870	\$ 41,517
	Sum of Net Revenue for Units Cycling	\$ 204,881	\$ 796,261	\$ 108,828	\$ 66,680	\$ 15,080	\$ 64,990	\$ 167,891	\$ 61,471	\$ 31,135	\$ 80,779	\$ 170,579	\$ 265,598	\$ 2,034,173
	Ratio (BPCG/(BPCG + Net Revenue))	1.1%	0.0%	3.0%	0.4%	1.8%	2.0%	1.0%	0.2%	0.9%	2.0%	1.4%	9.5%	2.0%
Units with Start-up Time >1 hour and <=3 hours	Sum of BPCG for Units Cycling	\$ 5,279	\$ 22,887	\$ 8,313	\$ 1,470	\$ 32,526	\$ 2,349	\$ 69,246	\$ 1,172	\$ 299	\$ 7,853	\$ 26	\$ 76	\$ 151,497
	Sum of Net Revenue for Units Cycling	\$ 569,909	\$ 454,984	\$ 567,151	\$ 636,829	\$ 449,654	\$ 2,129,456	\$ 1,561,863	\$ 2,639,983	\$ 840,914	\$ 477,779	\$ 515,997	\$ 847,209	\$ 11,691,727
	Ratio (BPCG/(BPCG + Net Revenue))	0.9%	4.8%	1.4%	0.2%	6.7%	0.1%	4.2%	0.0%	0.0%	1.6%	0.0%	0.0%	1.3%
Units with Start-up Time >3 hours and <=6 hours	Sum of BPCG for Units Cycling	\$ 3,766	\$ 23,672	\$ 4,097	\$ 705	\$ 17,466	\$ 12,165	\$ 3,684	\$ 11,151	\$ 34,422	\$ 9,303	\$ 13,621	\$ 4,827	\$ 138,881
	Sum of Net Revenue for Units Cycling	\$ 675,708	\$ 1,007,153	\$ 161,555	\$ 36,395	\$ 298,584	\$ 817,157	\$ 971,842	\$ 1,119,755	\$ 564,468	\$ 724,578	\$ 590,473	\$ 446,457	\$ 7,414,124
	Ratio (BPCG/(BPCG + Net Revenue))	0.6%	2.3%	2.5%	1.9%	5.5%	1.5%	0.4%	1.0%	5.7%	1.3%	2.3%	1.1%	1.8%
Units with Start-up Time >6 hours	Sum of BPCG for Units Cycling	\$ 8,649	\$ 6,253	\$ -	\$ -	\$ -	\$ -	\$ 13,605	\$ -	\$ 7,194	\$ 4,356	\$ -	\$ -	\$ 40,057
	Sum of Net Revenue for Units Cycling	\$ 19,099	\$ 96,196	\$ 1,036	\$ -	\$ 34,459	\$ 869,302	\$ 534,345	\$ 347,872	\$ 19,628	\$ 59,090	\$ -	\$ 33,117	\$ 2,014,144
	Ratio (BPCG/(BPCG + Net Revenue))	31.2%	6.1%	0.0%	0.0%	0.0%	0.0%	2.5%	0.0%	26.8%	6.9%	0.0%	0.0%	1.9%

BPCG Metric #1

There were questions in 2020 regarding the number of profitable DARU and LRR commitments. **This data is reported below for 2020 and 2021.**

- All of the DARU commitments were unprofitable. This is because unit starts are only classified as DARU if they are unprofitable. ¹
- There were a very limited number of LRR units committed, less than half of which received BPCG.

	2020 Units Receiving BPCG	2020 Total Units	2021 Units Receiving BPCG	2021 Total Units
DARU	35	35	31	31
LRR	10	26	3	6
Forecast Load	30	70	17	48

1. This analysis classifies a resource as committed in DARU if it has a DARU commitment in any hour of its day-ahead market schedule. There are some resources that are unprofitable over their DARU schedule but earn profits in additional hours.

Forecast Load Metric

Forecast Load Metric will be based on the total megawatt hours of output scheduled in final scheduling pass on long start units committed in that hour in the forecast load pass.

The table on the prior page shows that most units receiving forecast load commitments did not receive BPCG because they were profitable over the day as a whole.

Figures in the table below are total megawatt hours for the month.

MWH	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2020	2448	163	604	2740	6950	4079	5583	15017	928	290	543	1080

Forecast Load Metric

Since this statistic is a metric for use in tracking trends over time, the units used are not critical.

- However, the NYISO discussed with stakeholders in 2020 how to calibrate the metric so that the reported values would provide more intuition regarding the impact of forecast load commitments on a typical day.
- A request was made for the NYISO to examine the difference between forecast load commitments on weekdays vs weekends.
- This analysis showed that 85.17% of the forecast load megawatt hours were scheduled on weekdays, while weekdays composed only 71.43 % of the days included in the analysis.

Forecast Load Metric

Analysis of weekday and weekend commitments also found that the pattern of forecast load commitments was substantially different between weekdays and weekends at the hourly level.

- We found high levels of forecast load commitments during hours 15-18 during the weekdays, while those hours had far below average levels of forecast load commitments on weekends.

2020

Hour	Hr DAM Sched Gen - Weekday	Hr DAM Sched Gen - Weekend
0	481.1	267.5
1	293.1	455.5
2	293.1	455.5
3	293.1	455.5
4	293.1	475.5
5	806	475.5
6	751	455.5
7	1140.2	455.5
8	1519.8	162.5
9	1059.3	455.5
10	643.8	162.5
11	1621.6	162.5
12	1997.7	162.5
13	2491.9	162.5
14	2308.3	162.5
15	2628.6	122.9
16	2750.4	188
17	2712.4	0
18	2865.6	59.2
19	1963.4	0
20	1576.8	0
21	1205.9	242.5
22	1351.9	291.6
23	1382.1	162.5

Forecast Load Metric

During the April, September, and December 2020 meetings there was extended discussion of the proposed method for presenting the forecast load metric.

In December 2020, it was decided that the metric would be the total megawatt hours of forecast load commitments over the month, divided by the number of hours in the month.

The average level of forecast load commitments in 2021 will be included in a subsequent presentation.

MWH	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2020	3.3	0.2	0.8	3.8	9.3	5.7	7.5	20.2	1.3	0.4	0.8	1.5

Discussion of Real-Time Commitments

Real-Time Commitments

A primary focus of the real-time analysis is to assess the extent to which resources committed economically in RTC, with no day-ahead market schedule to impact offer prices, operate uneconomically in real-time and receive BPCG payments.

A secondary focus of the analysis is on the real-time bidding behavior of resources with day-ahead market schedules that are committed in RTC.

Real-Time Commitments

For the purpose of the initial discussion with market participants we have compiled the real-time metrics for the first week of every month in 2020 and 2021.

- This approach of only analyzing the first week of each month enabled the NYISO and market participants to review the metric over the year while avoiding devoting undue resources to compiling the initial metrics.

Uneconomic Real-Time Commitments

Uneconomic Commitments

It is proposed to use the same two metrics to measure the level of BPCG impacts on real-time commitments that will be compiled for the day-ahead market. The two metrics are:

- Proportion of real-time economic starts receiving BPCG
[starts receiving BPCG/Total economic starts]
- Relationship between BPCG and Margins
[Total BPCG payments/(Total BPCG Payments + Total Net Margins)]

Uneconomic Commitments

As in the day-ahead market analysis, the real-time metric will be limited to resources committed economically in RTC and to resources cycling on and off within the operating day.

- We exclude resources committed by SRE's or out of merit operator commitments from the metrics.
 - There was discussion in 2020 of compiling similar metrics for resources committed out of merit.
 - Potomac Economics reports a variety of tabulations relating to out-of-market schedules and commitments. These metrics are focused on economic commitments.
 - Because BPCG is calculated over the day, combining economic and OOM starts, we have excluded both the economic and OOM start in instances in which a unit had both and economic and OOM starts in the same day.

Uneconomic Commitments

We also exclude resources that are self-committed by the market participant.

- Margins that are calculated without accounting for start up costs or other commitment costs would be overstated and understate the impact of BPCG on the price signal.
- It will be difficult in practice, however, to exclude resources that are in effect self-committed by submitting understated commitment costs offers.

Uneconomic Commitments

We limit the resources included in calculating the metric to resources that cycle on and off within the operating day.

- This assessment of cycling is based on the 24 hour calendar day. This definition can exclude a few units that came on late in the prior day or off very early in the next day.
 - There was a discussion in the 202 meetings of a metric that included resources committed in RTC that continue operating past the end of the day.
 - We have a concern, however, that such units may remain on line into the second day because of changes in their offer prices that are intended to keep them on line over night and margins calculated based on those offer prices may overstate actual margins.

Uneconomic Commitments

For the December 2020 meeting we re-examined the data for the period January 2020 through January 2021.

- We determined that there are only four instances of units that would be eligible to be included in the analysis that either were already on at the beginning of the day or continued operating into the next day.
- In considering this finding we should keep in mind that the real-time commitment analysis is limited to units committed in RTC, which only includes units with 30 minute or shorter start up and notification times.
- We believe that the small number of such cases is consistent with our decision to exclude them from the analysis.

Uneconomic Commitments

- We also exclude resources with day-ahead market schedules that overlap any part of their real-time commitment because of the potential for understated real-time commitment cost offers by resources with day-ahead market schedules that would overstate actual margins and understate the impact of BPCG on the price signal.
 - We have, however, analyzed the day-ahead and real-time commitment cost offers as discussed in the second part of this section.
- We have excluded units with total output less than 10MW to avoid unduly impacting metric 1 with failed starts and other anomalies. These starts are also excluded from metric 2 but the impact is immaterial.

Uneconomic Commitments

- Starts with zero values for both BPCG and margins are also excluded.
 - The NYISO has further examined these cases and determined that units have zero values reported for both BPCG and net margins because they are not eligible for BPCG for one reason or another and the net margin is not calculated in the settlement data used to compile the metric.
 - Since these units could have either profits or losses but we do not know which, this analysis confirms our decision to exclude them from the metric.
 - The number of started excluded is very small, 22 units over the 13 months January 2020 through January 2021.

BPCG Metric #1

BPCG Metric #1: Uneconomic Real-time Commitments/Total # real-time Economic Commitments

The metric for 2020 portrays a relatively high level of uneconomic real-time commitments over the months studied, averaging almost 55%.

The ratio exceeds 70% in 4 months, and 50% in 8 months, and is less than 30% in only 1 month. However, this is the month with the most commitments.

2020

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Total	67	55	65	23	72	64	142	213	70	96	80	64	1,098
BPCG	31	38	35	21	35	24	106	63	39	77	62	36	602
No BPCG	36	17	30	2	37	40	36	150	31	19	18	28	496
% BPCG	46.3	69.1	53.9	91.3	48.6	37.5	74.7	29.6	55.7	80.2	77.5	56.3	54.8

BPCG Metric #1

BPCG Metric #1: Uneconomic Real-time Commitments/Total # real-time Economic Commitments

The metric for 2021 again portrays a relatively high level of uneconomic real-time commitments over the months studied, averaging slightly over 48%, which is somewhat lower than in 2020.

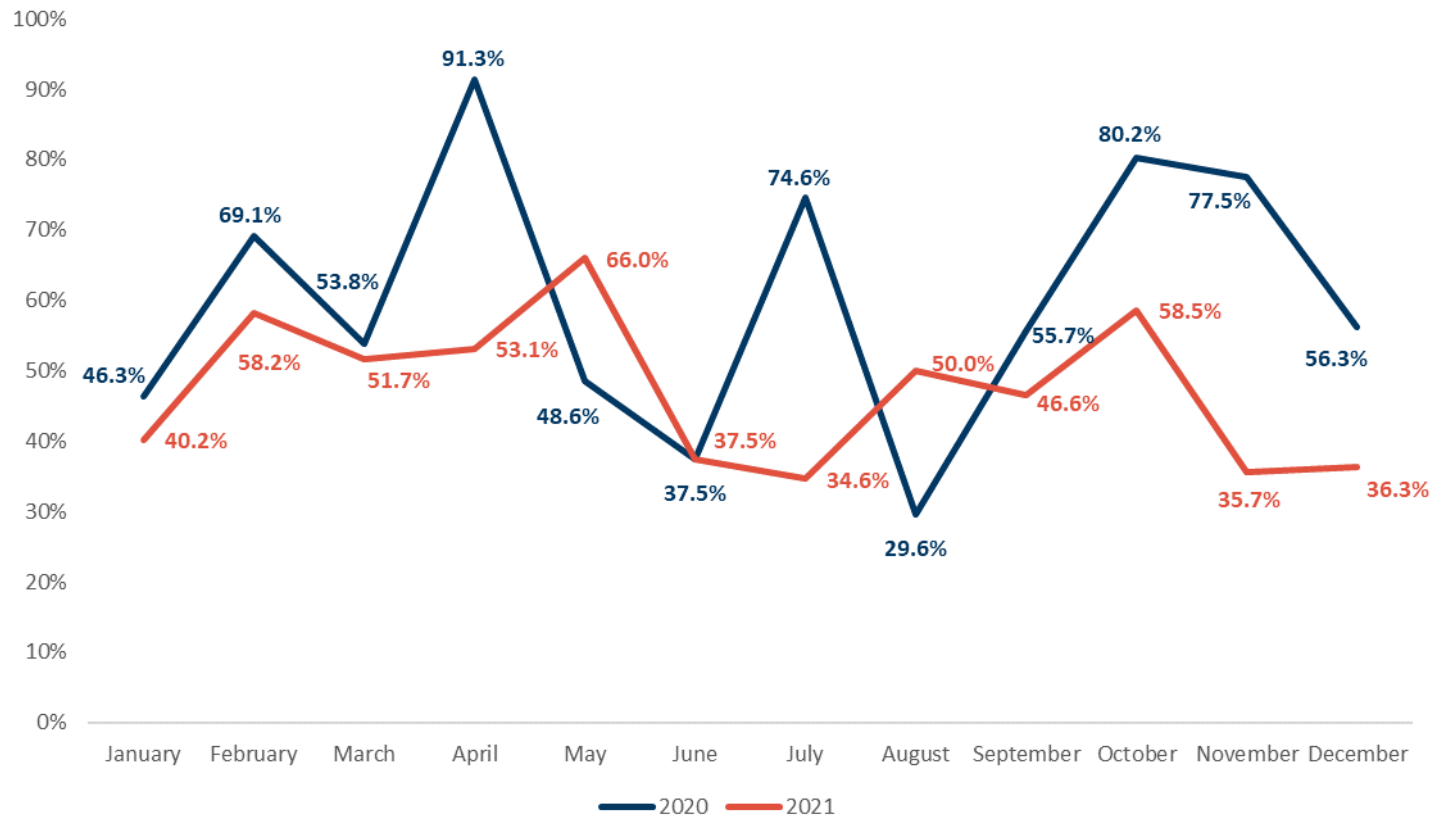
2021

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Total	67	153	116	49	47	177	159	116	58	106	129	124	1234
BPCG	31	89	60	26	31	97	55	58	27	62	46	45	596
No BPCG	36	64	56	23	16	80	104	58	31	44	83	79	638
% BPCG	46.3	58.2	51.7	53.1	66.0	54.8	34.6	50.0	46.6	58.5	35.7	36.3	48.3

BPCG Metric #1

BPCG Metric #1: Uneconomic Real-time Commitments/Total # real-time Economic Commitments

This figure shows the pattern over the two years, with a more consistent proportion in 2021.



BPCG Metric #2

BPCG Metric 2: Total BPCG relative to Total Margins (profitable starts).¹

The Metric indicates that in 2020 BPCG accounted for 37% of the net margins of fast start units over the year. The ratio is much higher in some months but those are months with low total margins and BPCG.

2020

	Jan	Feb	Mar	April	May	June	July
Total	10.6%	56.0%	35.3%	95.1%	19.7%	11.9%	43.0%
Fast Start	55.9%	84.4%	57.5%	97.2%	35.8%	17.3%	61.9%
BPCG	\$11,291	\$11,005	\$17,277	\$15,574	\$19,117	\$22,762	\$36,214
Net Margin	\$8,924	\$2,042	\$12,785	\$447	\$34,342	\$108,945	\$22,323
30 Minute	3.4%	36.0%	7.8%	81.7%	7.9%	.4%	20.4%
BPCG	\$4,255	\$6,640	\$1,890	\$2,108	\$5,668	\$223	\$9,980
Net Margin	\$122,479	\$11,801	\$22,318	\$472	\$66,478	\$61,258	\$39,035

1. The total margin calculation only includes the margins on starts that did not receive BPCG, the total margin is not reduced by the losses that are made whole with BPCG payments.

BPCG Metric #2

BPCG Metric 2: Total BPCG relative to Total Margins(profitable starts).¹

The 2020 Metric indicates that BPCG accounted for only 9% of the margins of 30 minute units over the period. As with fast start units the ratio was much higher in some months but they were months with low overall margins and BPCG.

2020

	Aug	Sep	Oct	Nov	Dec	2020 Total
Total	11.6%	35.0%	13.4%	73.0%	30.5%	23.1%
Fast Start	16.4%	57.8%	31.5%	81.3%	55.6%	37.0%
BPCG	\$45,189	\$27,692	\$48,180	\$48,896	\$45,626	\$348,822
Net Margin	\$231,169	\$20,192	\$104,968	\$11,287	\$36,480	\$593,904
30 Minute	2.0%	14.2%	2.6%	63.4%	7.4%	9.0%
BPCG	\$2,668	\$7,441	\$6,621	\$29,483	\$6,585	\$83,559
Net Margin	\$132,329	\$45,001	\$248,079	\$17,770	\$82,389	\$849,410

1. The total margin calculation only includes the margins on starts that did not receive BPCG, the total margin is not reduced by the losses that are made whole with BPCG payments.

BPCG Metric #2

BPCG Metric 2: Total BPCG relative to Total Margins(profitable starts).¹

Metric 2 indicates that in 2021 BPCG accounted for 26% of the net margins of fast start units over the period. The ratio is much higher in some months, but those tend to be months with low total margins and BPCG.

2021

	Jan	Feb	Mar	April	May	June	July
Total	21.6%	31.6%	36.4%	58.2%	27.2%	22.2%	7.8%
Fast Start	28.9%	61.1%	43.0%	73.5%	43.4%	28.0%	7.2%
BPCG	\$41,605	\$70,697	\$62,680	\$64,450	\$11,968	\$74,901	\$39,491
Net Margin	\$102,222	\$45,064	\$83,023	\$23,188	\$15,603	\$192,635	\$508,742
30 Minute	9.1%	13.7%	8.7%	13.8%	14.7%	10.7%	9.3%
BPCG	\$7,713	\$25,923	\$3,018	\$4,164	\$5,314	\$14,313	\$20,141
Net Margin	\$76,738	\$163,761	\$31,685	\$25,997	\$30,729	\$119,855	\$196,292

1. The total margin calculation only includes the margins on starts that did not receive BPCG, the total margin is not reduced by the losses that are made whole with BPCG payments.

BPCG Metric #2

BPCG Metric 2: Total BPCG relative to Total Margins(profitable starts).¹

Metric 2 indicates that in 2021 BPCG accounted for 13.4% of the margins of 30 minute units over the year. As with fast start units, the ratio was much higher in some months but they tended to be months with low overall margins and BPCG.

2021

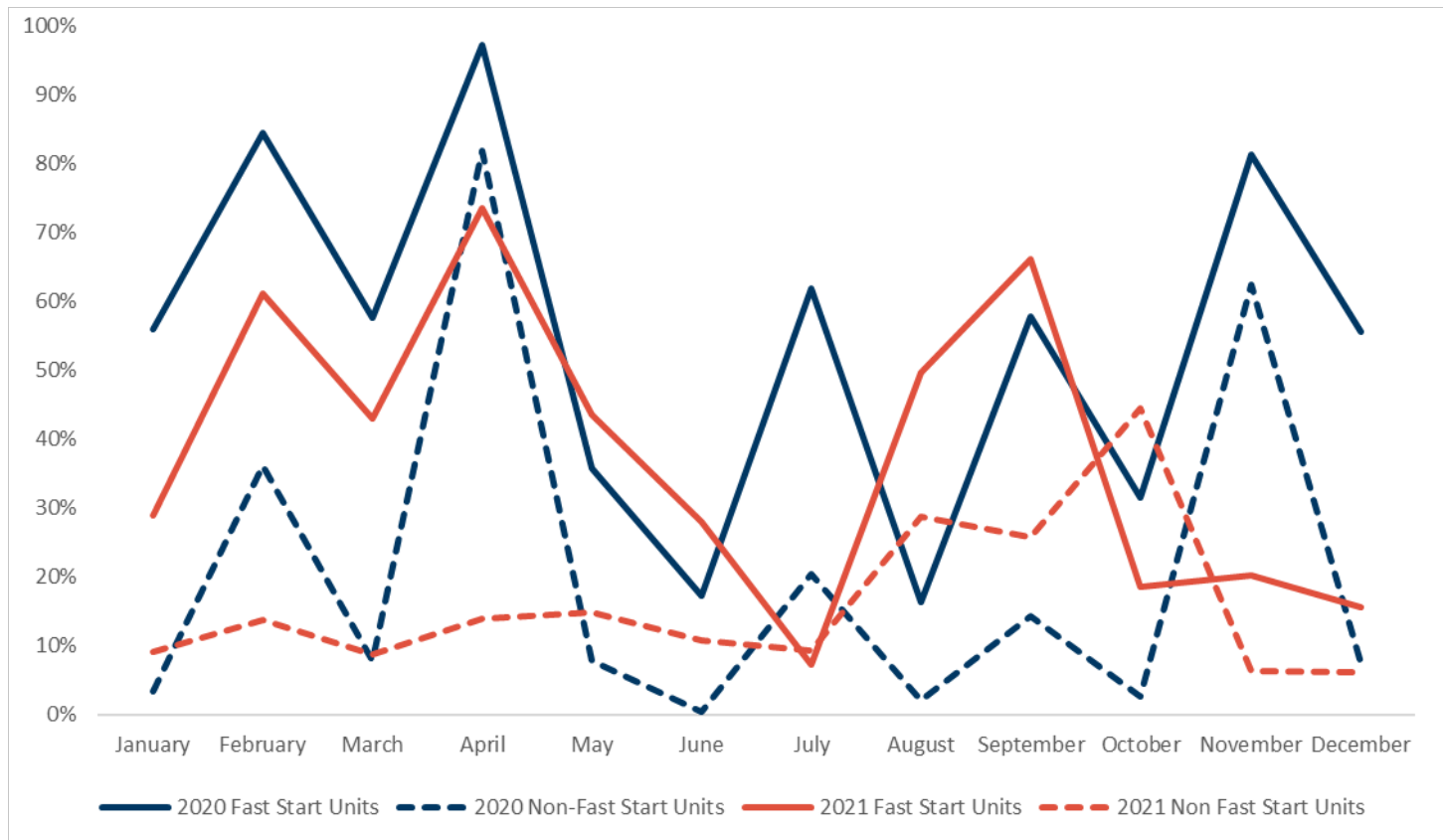
	Aug	Sep	Oct	Nov	Dec	2021 Total
Total	45.1%	35.4%	27.2%	15.9%	12.6%	21.7%
Fast Start	49.7%	66.0%	18.6%	20.2%	15.6%	26.1%
BPCG	\$59,739	\$14,198	\$24,468	\$48,480	\$44,847	\$557,524
Net Margin	\$60,550	\$7,303	\$107,198	\$191,856	\$242,686	\$1,580,070
30 Minute	28.7%	25.8%	44.5%	6.3%	6.1%	13.4%
BPCG	\$9,655	\$17,696	\$29,032	\$6,767	\$7,956	\$151,692
Net Margin	\$23,934	\$50,901	\$36,262	\$100,065	\$122,995	\$979,214

1. The total margin calculation only includes the margins on starts that did not receive BPCG, the total margin is not reduced by the losses that are made whole with BPCG payments.

BPCG Metric #2

BPCG Metric #2: Total BPCG relative to Total Margins(profitable starts).

This figure shows the pattern for Metric 2 over the two years.



Uneconomic Commitments

We noted in the September 2020 meeting that we had begun considering the potential impact of including units started in conjunction with reserve pickups in the analysis.

- The NYISO compiled data identifying all units started during a reserve pickup over the period January through June 2020.
- In analyzing these data we found there are a very small number of units that were started during reserve pickups.
- None of the unit starts included in the BPCG analysis for the Months January through May 2020, involved units started during a reserve pick up interval

Uneconomic Commitments

The June 2020 data did not show a pattern of higher BPCG levels or rates being associated with units started during reserve pick up intervals.

2020

	Positive BPCG	Other Units	% BPCG
Economic Commitments	22	35	38.60%
Reserve Pick Ups	2	5	28.57%
Total	24	40	37.50%

	BPCG Paid	Net Margin	% (BPCG/BPCG + Margin)
Economic Commitments	\$20,990.11	\$130,176.00	13.89%
Reserve Pick Ups	\$1,995.06	\$40,026.87	4.75%
Total	\$22,985.17	\$170,202.87	11.90%

Uneconomic Commitments

We compiled similar data for February through December 2021. The 2021 data shows a slightly higher frequency of BPCG and level of BPCG being associated with units started during reserve pick up intervals. The number of RPU units was so small they had little impact on the overall metric.

2021	Positive BPCG	Other Units	% BPCG
Economic Commitments	545	621	46.74%
Reserve Pick Ups	51	17	75.00%
Total	596	638	48.30%

	BPCG Paid	Net Margin	% (BPCG/BPCG + Margin)
Economic Commitments	\$589,957.77	\$2,255,647.11	20.73%
Reserve Pick Ups	\$69,941.05	\$124,676.49	35.94%
Total	\$659,898.82	\$2,380,323.60	21.71%

Uneconomic Commitments

The January to June 2020 data for the overall BPCG analysis includes 265 fast start unit (10 minutes or less) starts.

- Seven of these starts occurred during large unit reserve pickups.
- No additional units were started until 15 minutes after the end of these reserve pickups, which should be unrelated.
- There are a total of 19 units included in the analysis that were on line during a reserve pick up interval (this includes the seven that started during a reserve pickup interval).

Uneconomic Commitments

Our conclusion from this additional analysis is that reserve pickups had an immaterial impact on the BPCG analysis and the high rates of BPCG payments for real-time starts are not attributable to reserve pickups.

We therefore propose to compile the overall metric as originally proposed without distinguishing between units started during reserve pickups and at other times.

Offer Prices of Units with Day-Ahead Market Schedules

Units with DAM Schedules

We propose to analyze the RTC commitment cost offers of resources with day-ahead market schedules to assess the magnitude of reductions in real-time commitment cost offers.

The concern is that the potential to incur large losses if a resource with a day-ahead market schedule is not committed economically in RTC may incentivize resources with day-ahead market schedules to understate their commitment cost offers in real-time, resulting in more resources being on line in real-time than is efficient.

Units with DAM Schedules

Uneconomic reductions in commitment offers between day-ahead and real-time could have a larger impact on market efficiency in the future as a consequence of rising levels of intermittent resource output.

- There could be rising levels of intermittent output that is available in the operating day but is not cleared in the day-ahead market.
- This outcome could arise from limits on the accuracy of day-ahead forecasts of intermittent resource output or from incentives created by the structure of the subsidies or of procurement contracts.

Units with DAM Schedules

The NYISO needs flexible resources with day-ahead market schedules to be available to be committed to meet load if intermittent resource output is consistent with the output cleared in the day-ahead market.

- However, both market efficiency and avoiding unnecessary emissions requires that these resources not come on line when real-time intermittent resource output is higher than the amount cleared in the day-ahead market and these resources' output is not needed to meet load.

Units with DAM Schedules

Low real-time prices when intermittent resource output is high should in principle make it profitable for resources with day-ahead market schedules to remain off-line when their output is not needed, and their operation is not economic at real-time prices.

- Low real-time prices would enable these resources to buy back their day-ahead market schedules at a profit. However:
- Inaccurate RTC evaluations could contribute to unnecessary commitments by RTC.
- Inaccurate RTC evaluations could also contribute to suppliers with day-ahead market schedules being unwilling to risk large losses from inaccurate RTC price forecasts and therefore reducing their real-time commitment cost offers to ensure they are committed in RTC.

Units with DAM Schedules

We propose to focus on the difference between commitment cost offers in the day-ahead market and RTC for resources with day-ahead market schedules.

- The analysis excludes units with OOM commitments or that are self-committed in the day-ahead market. The analysis is also limited to resources that cycle within the operating day and are committed in RTC (start time of 30 minutes or less).
- We expect some reduction in commitment cost offers between day-ahead and real-time because some day-ahead market commitment costs will be sunk in real-time.

Units with DAM Schedules

- We have used a 10% threshold for commitment cost reductions for this initial analysis. Commitment costs are the sum of start up costs and minimum load costs of the hours of the day-ahead market schedule.

The initial analysis portrays the entire distribution of reductions in commitment cost offers and the thresholds used for a metric can be informed by this data and by discussions with market participants.

Units with DAM Schedules

The data on day-ahead market commitment cost offers show that less than 10% of resources reduced their offers by more than 10% in 2021, with the highs being slightly over 20% in November 2020 and June 2021.

- We used a 10% reduction to classify the data. During 2020, almost 95% of the units that reduced their offers by more than 10%, reduced their real-time offers to less than 10% of the day-ahead market offer. The picture was more mixed in 2021 with 44% of the units that reduced their offer by more than 10% reducing it by less than 20% between day-ahead and real-time.

RTC Commitment Offers	2020	2021
>90% DAM	2510	3711
<90% DAM	213	353
Total	2723	4064

Units with DAM Schedules

Offer price changes in winter months may reflect changes in gas prices between day-ahead and real-time.

- We do not propose to try to control for differences between day-ahead and real-time gas prices in the metric.
- We instead propose to keep this factor in mind in comparing winter data to outcomes in other months. In any case, the data show that over the winter months in 2020 and 2021, offer price reductions slightly exceeded 15% in two of these months.
- We have broken the results down between units able to start in 15minutes or less and slower starting resources, to examine whether there is a difference in offering behavior related to start time.

Units with DAM Schedules

The data show that large offer price reductions were concentrated among fast start units in both 2020 and 2021.

Start Times	2020	2021
<15 Minute	723	1489
>90% DAM	550	1194
<90% DAM	173	295
>15 Minute	2000	2575
>90% DAM	1960	2517
<90% DAM	40	58

Units with DAM Schedules

The NYISO will be compiling this metric on an ongoing basis so that changes in the current pattern can be identified.

Next Steps

- The NYISO proposes to move forward with developing the metrics consistent with the discussion in 2020.
- The NYISO plans to incorporate new BPCG metrics into existing reporting in 2022.