Reliability Gaps and Market Performance Metrics

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Topics

- Potential Reliability Gaps with New York's Evolving Resource Mix
- Discussion of BPCG Metrics
- Discussion of Day-ahead Market BPCG Metrics
- Discussion of RTC/RTD BPCG Metrics [forth coming]
- Next Steps

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 first of two focused on proposed market metrics relating to bid production cost guarantees (BPCG).
  - Today's presentation is focused on the day-ahead market metrics.
  - The goal is 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 Report[1]);
- 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 Report[2]);
- RTD net load forecast error (modified version of net load forecast metric in Monthly Report[2]);
- Efficiency of RTD dispatch of storage resources;
- CTS Performance (based on metrics in Monthly Report[2]).

1. February's NYISO CEO/COO Report: https://www.nyiso.com/documents/20142/1938671 2/03%20NYISO%20CEO%20COO%20Report.pdf/26cfa638-c9c6-65b8-f238-70c95dd6e32e
2. February's Operations Performance Metrics Monthly Report: https://www.nyiso.com/documents/20142/1938671 2/03%20Operations_Report.pdf/cc69eff1-7e48-af8e-2c4d-32ec3c8f147b

Reliability Gap Assessment

The NYISO already tracks several Reliability Performance and Market Performance Metrics in the Operations Performance Metrics Monthly Report[1] presented at the Management Committee.

The NYISO is also considering additions to the Operations Performance Metrics based on 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

Reliability Gaps

As the level of intermittent resource output increases and intermittent resources displace other resources in the NYISO market, there will be changes in the resource mix available to balance variations in net load.

- It will be important that the NYISO energy and ancillary service markets support the retention and efficient operation of resources having the flexibility needed to balance both predictable and unpredictable variations in net load on the NYISO transmission system.
- Flexible resources have characteristics such as short start up times, small minimum load outputs, high ramp rates and a large dispatchable range.
  - However, flexibility is a function of many resource characteristics and of the relationship between resource costs and market prices.
  - The many factors contributing to flexibility or inflexibility are why it is essential that NYISO energy and ancillary service markets provide revenues to support the operation or resources that provide balancing when it is valuable, at a cost effective price.

Reliability Gaps

Conversely, the efficient evolution of the NYISO market will be hindered if NYISO energy and ancillary service markets provide the same compensation to flexible and inflexible resources, delaying the retirement of inflexible resources and their replacement with resources better suited to balancing net load on a transmission system with high levels of intermittent resource output.

- It will be particularly important that the NYISO energy and ancillary service markets provide efficient short-term price signals as the role of distributed generation, price responsive load, and storage resources increases.

Discussion of BPCG Metrics

BPCG Metrics

There will likely be some challenges in achieving these market evolution goals but a starting point is to understand on an ongoing basis how the evolution of the NYISO's resource mix is impacting the economic performance of different types of resources under the current market design.

- One measure of the efficiency and effectiveness of NYISO market signals for flexible resources that we recommend that the NYISO monitor is the level of uplift payments, BPCG, paid to flexible and to less flexible resources.
- BPCG are payments that are paid to resources committed and dispatched by the NYISO that do not recover their as bid costs in their energy and ancillary service market revenues. In this context we are not focusing on resources that are dispatched out of merit, but on resources that are committed based on an economic evaluation in the day-ahead market or RTC but do not recover their commitment costs (start-up and minimum load costs) in market prices.

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.
    - If commitments typically result in the receipt of BPCG payments, not in earning a profit margin, there is less to lose from not being committed as a result of inflated commitment cost offer prices, and more to gain from submitting inflated offers.

BPCG Metrics

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.
    - This net load forecast uncertainty will cause some commitments to be more profitable than projected in RTC, and cause other commitments to be less profitable than projected.
    - If unpredictable variations in net revenues are large relative to expected returns in RTC, and the settlement system is structured such that resources receive BPCG payments when their commitment turns out to be uneconomic, but retain the profits when their commitment is more profitable than projected in RTC, this settlement design can inflate consumer costs and result in less flexible resources receiving higher payments (energy margins plus BPCG) than more flexible units.

BPCG Metrics

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.
- These issues with RTC performance might not be inherent but could develop over time with changes in the NYISO resource mix and the variability of net load, and in combination with NYISO operating practices.
- It is possible, but much less likely that similar modeling issues could arise in the day-ahead market.

BPCG Metrics

A goal of these metrics is to provide an indictor of whether the current NYISO market design, penalty prices and operating practices provide reasonably good incentives for the efficient and continued operation of flexible resources that are needed to balance variations in net load.

- A finding that a rising number of the resources committed in the day-ahead market, and particularly those committed in RTC, receive bid production cost guarantees could indicate that the current energy and ancillary service market design is providing flexible resources with weak incentives to improve their operating performance and also may not be providing margins that would support the continued operation of flexible resources that are needed to balance variations in net load.
- Such a finding could also indicate that the operating characteristics of many resources are poorly suited to evolving market needs or that there are flaws in the RTC unit commitment evaluation.

BPCG Metrics

By tracking over time metrics reflecting the proportion of unit starts in both the day-ahead market and in RTC that receive BPCG payments, and tracking the magnitude of the BPCG payments relative to market revenues, the NYISO will be able to identify trends towards higher levels of starts that are committed based on an economic evaluation but uneconomic at settlement prices and receive BPCG, and/or muting of price signals due to high levels of BPCG.

These metrics would also identify reduced levels of unprofitable starts that may follow market design or implementation improvements.

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.
- Similar issues should not arise in the day-ahead market because there are no forecast errors within the day-ahead market. However, if there are anomalous day-ahead market outcomes that result in BPCG payments to batteries or other storage resources, those outcomes should be identified and tracked.

BPCG Metrics

- While batteries will not generally have start up or minimum load costs, their economics over their charge/discharge cycle will depend on how they are dispatched in RTD. The impact of discharge cycles on battery life is somewhat analogous to start-up costs and could be accounted for in NYISO analyses and settlements.
- Other types of storage resources may have other operating features or costs that could result in BPCG payments and could similarly be tracked and studied.

BPCG Metrics

The goal of these metrics is to evaluate if 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.

- It is proposed that the NYISO will track two measures of thermal unit BPCG and margins in both the day-ahead and real-time markets.
- The metrics selected will be tracked over time to establish a baseline that would be used to identify undesirable trends.
- Adverse movements in the metrics could trigger a review of the causes and an assessment if some market rules no longer support evolving reliability needs.

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 to Margins

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

We also propose to track the impact of Forecast Pass commitments of long start generation as measured by Total Minimum Load Megawatt Hour Commitments.

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.

BPCG Metrics

The metrics are only an indicator of undesirable, or desirable, trends in the level of BPCG payments.

- Metrics indicating trends of rising levels of BPCG payments in the day-ahead or real-time markets would need to be investigated to identify the cause.
- These investigations would only need to be carried out when a trend in a BPCG metric indicated a cause for concern.

Discussion of Day-Ahead Market BPCG Metrics

BPCG Metric #1

We propose that BPCG metric #1 be the overall ratio of profitable to unprofitable market based commitments in the day-ahead market.

- We propose that the metric be based on intra-day commitments (units that cycle on and off within the time frame of the day-ahead market) 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.

BPCG Metric #1

The table that follows shows the number of market based commitments in the day-ahead market of units that cycled on and off within the day-ahead market operating day.

- Units in the “Positive BPCG” column received positive daily BPCG payments (had negative market revenue), and were not self-committed in any hour.
- Units that did not receive BPCG are reported in the “Other Units” column.

BPCG Metric #1

The data shows that in 1Q 2020 slightly more than 80% of resources committed based on the day-ahead markets economic evaluation and cycling on and off with the day-ahead market timeframe did not receive BPCG.

- The number of units with market based commitments that received BPCG is high enough that there should be room for improvement.
- It is also high enough that an increase in the proportion of units receiving BPCG for day-ahead market commitments should be a concern.

	Total Number of Commitments (Units cycling on and off)		
Type of Commitment	Positive BPCG	Other Units	All
Economic	113	**584**	697

BPCG Metric #2:

Metric #2 would be defined as: Total BPCG payments /(BPCG Payments + Net Margin)

- As for metric 1, this metric would include:
  - Units turning on and off within the time frame of the day-ahead market.
  - Units committed based on an economic evaluation in the day-ahead market (no LRR, DARU or forecast load commitments)
  - Units not self-committed in any hour
- This ratio would provide perspective on the importance of BPCG revenues to resource cost recovery. A high level of this ratio would indicate that BPCG is materially impacting the quality of the price signals provided for new flexible resources.
- This metric would be a good supplement to metric 1 as it would provide more perspective on the impact of BPCG on the price signal.

BPCG Metric #2

The table below shows the ratio over all resources for 1Q 2020 and broken down by resource start time grouping.

- While the NYISO would only report the aggregate metric for all units committed within the day-ahead market time frame, the NYISO could track the metric within start-time groupings to enable it to quickly see if change in the overall metric are driven by units in particular start time ranges.

BPCG Metric #2

This table reports the monthly average ratio of Total BPCG payments /(BPCG Payments + Net Margin) for each group of start up times.
We can see that BPCG is low relative to market revenues overall so the level of BPCG payments should not be significantly muting the price signal at present.

	Monthly Average Original - calculated by taking the average of the daily ratios		
	January	February	March
All	0.5%	0.8%	1.0%
Fast Start (<= 30 minutes)	2.3%	1.2%	3.2%
>30 minutes to <= 1 hour	0.0%	1.2%	0.9%
>1 to <= 3 hours	0.9%	2.0%	1.4%
>3 to <=6 hours	0.3%	0.4%	1.0%
6+ hours	0.0%	0.0%	0.0%

Forecast load pass and DAM BPCG

Forecast Pass Commitments:

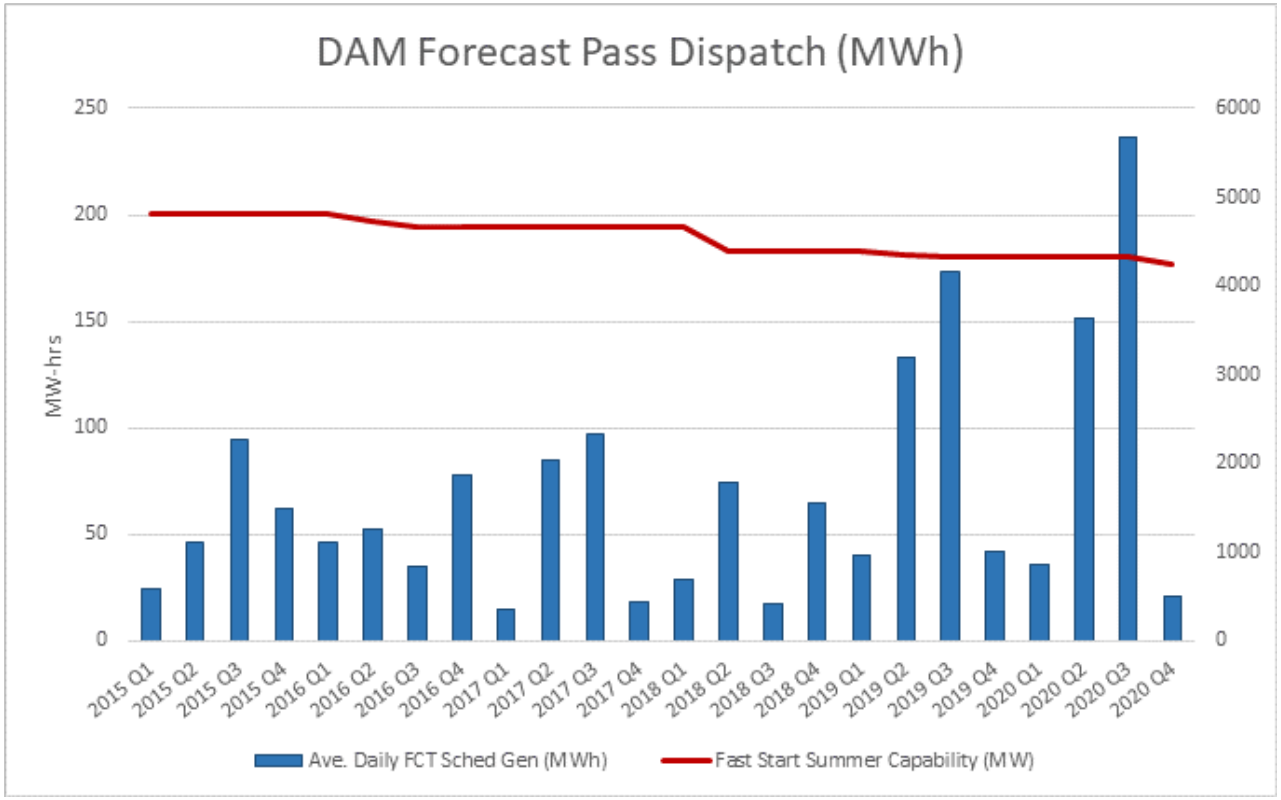
- The NYISO's reliability pass in SCUC ("Forecast Load Pass") commits and dispatches resources to meet forecast load net of forecast variable generation output.
- If generation scheduled in the Bid Load Pass is insufficient to meet forecast demand, the Forecast Pass will dispatch, not but commit, GTs and CTs (Fast-start resources) that can be committed in RTC if they are needed.
- The Forecast pass will commit and dispatch long-start resources if insufficient fast-start resources are available. Historically the NYISO has rarely needed to commit long start units in the forecast load pass. The NYISO's performance in this respect is much better than other ISOs.

Forecast load pass and DAM BPCG

- Over 1Q 2020 only 7 long start units received forecast load commitments in any hour and 3 of these commitments were extensions of market commitments.
- As NYISO Fast-start resources retire, the forecast pass may commit and dispatch more long-start resources, which can suppress day-ahead market prices, reduce the day-ahead market margins earned by flexible units in the day-ahead market, and contribute to emissions if their operation is not needed in real-time.
- The figures on the following page track MW-hours of Forecast Pass commitments (of all units, fast start and long start) over time

Forecast load pass and DAM BPCG

- Graph shows average daily megawatts dispatched.
- Forecast pass dispatch remains low and tends to occur on high load days.
- Very few long start units are committed.
- However fast start capacity is declining and additional Fast-start resources are expected to retire by 2023.



Forecast load pass and DAM BPCG

Rather than designing a metric that tracks the number of long start units committed in the forecast load pass, we propose that the forecast load pass metric measure the importance of these commitments based on the total megawatt hours of minimum load capacity of long start units committed in the forecast load pass.

- Basing the metric on a megawatt measure rather than starts accounts for whether the commitments are of small or large units.
- Using a per megawatt hour metric accounts for whether units are committed for many hours or if a start scheduled in the market pass is simply extended by an hour or two.

Forecast Load Metric = Total megawatt hour of long start unit minimum load scheduled in forecast load pass

Next steps

- Next presentation is anticipated to be at the March 29 ICAP/MIWG
  - Review of questions and present DAM BPCG and forecast load metrics covering all of 2020
  - Discussion of RTC/RTD BPCG Metrics
  - Next Steps