Integrating Public Policy: Real-time Simulation Methodology

Michael Swider
Gary Zhang, Ph.D.

Market Issues Working Group
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Agenda

- Review of the Integrating Public Policy Project and Phase 2 Process
- Real-Time Market Simulation Assumptions
- Real-Time Market Simulation Methodology
- Next steps

Background

Date	Working Group	Discussion points and links to materials
9-12-16	Budget & Priorities Working Group (BPWG)	Presentation of stakeholder feedback, proposed scope of the project
10-19-16	Market Issues Working Group (MIWG)	Presentation providing more detail on the scope and timeline of the project
11-22-16	Market Issues Working Group (MIWG)	Presentation updating project status -- consultant selection and goals of Phases 1 and 2
12-14-16	Market Issues Working Group (MIWG)	Consultant's Project Introduction and solicitation of input (Phase 1)
1-31-17	Market Issues Working Group (MIWG)	Integrating Public Policy Update (Phases 1 and 2)
2-16-17	Market Issues Working Group (MIWG)	Phase 2: Study Description and Assumptions Review
3-28-17	Market Issues Working Group (MIWG)	Phase 2: Study Description and Assumption Update
4-24-17	Market Issues Working Group (MIWG)	Phase 2: Preliminary DAM Results
6-21-17	Market Issues Working Group (MIWG)	Phase 2: Real-time Study Description and Assumptions

Integrating Public Policy

Integrating Public Policy Project

The Brattle Group Work

PHASE 1: Incorporating the Cost of Carbon Study Study whether incorporating a state policy defined cost of carbon in the wholesale market would improve the overall efficiency of the NYISO energy and capacity markets

NYISO Work

PHASE 2: Market Impact Assessment Study the impacts of decarbonization goals on the current NYISO energy and capacity markets from the high penetration of low carbon or carbon-free resources

PHASE 3: Market Rule Assessment Study whether other market products or changes to the existing market structure will be necessary to meet the anticipated reliability needs

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Phase 2: Market Impact Assessment

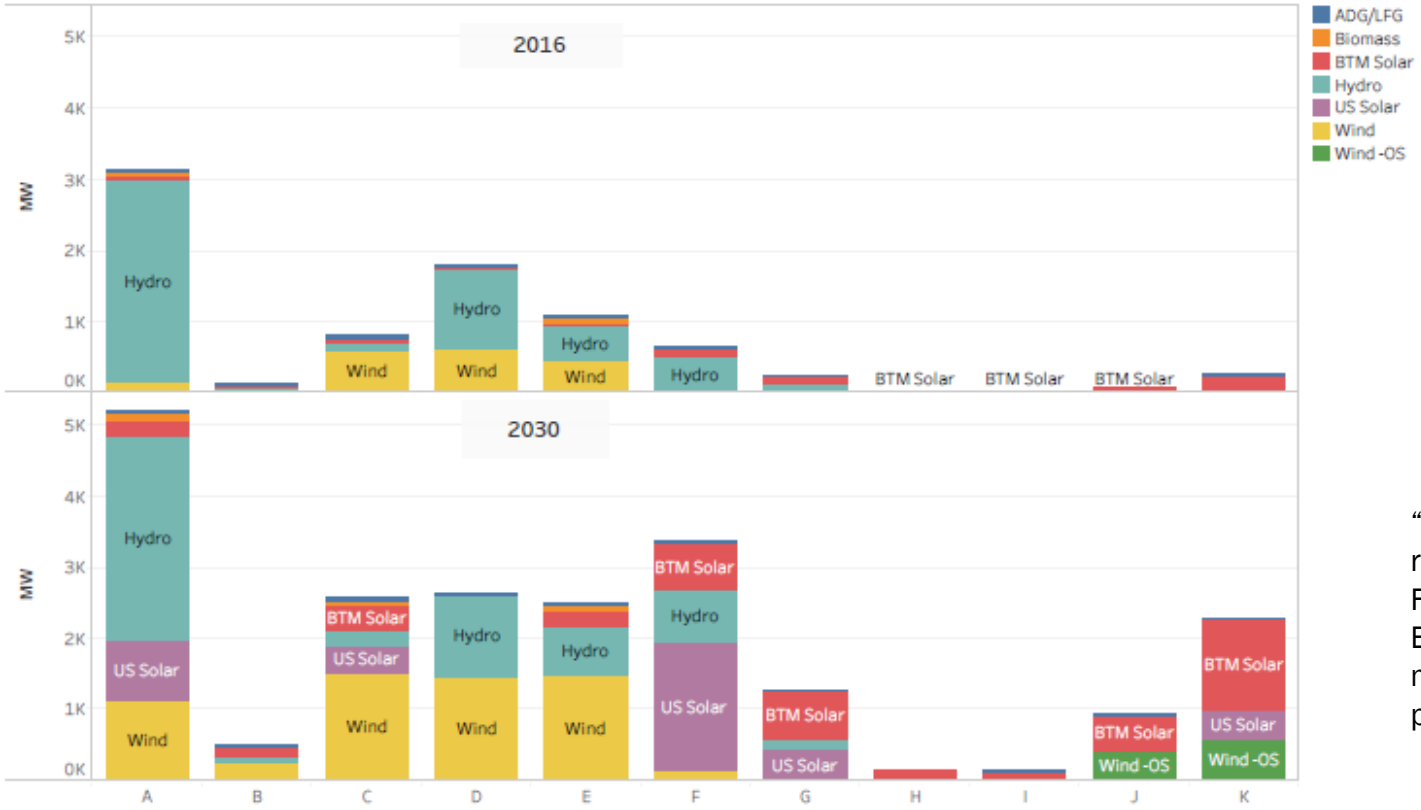
- **NYISO's goal is to provide stakeholders with information regarding potential market conditions after the incorporation of renewable resources to meet 50% of the NYCA load**
  - This information will provide insight into what will be needed for the Phase 3: Market Rule Assessment
- **The NYISO will study the impact on today's market of adding sufficient renewable resources to meet the CES goal of 50% renewable by 2030**
  - This study is looking at a scenario where there existed sufficient additional renewable resources to reach the State's CES goal in addition to the existing capacity resources, to estimate market outcomes given today's system and market rules
  - The study utilizes existing energy market tools, historical system topology and energy market results
- **This study is a market assessment and not a planning study. The question of underlying transmission and distribution upgrades to support CES is important but is not part of the scope**

Real-time modeling framework

Assumptions Review

- **The types and locations of the resources: same as in the DAM study**
  - Incremental Resources based on NY State Zonal GW-hour and MW Projections for 2030:
    - The primary source of projections for the quantity and location of qualified CES renewable generation is the NYSDPS Final Supplemental Environmental Impact Statement ("Final EIS") in CASE 15-E-0302 using the "Blend Base Case"
    - A full summary of assumptions is available in past presentations to the Market Issues Working Group
- **The days studied will also be the same as the DAM study**
  - Days: January 19; March 22; July 25; November 10, 2016

Distribution of Renewable Capacity



"2030" case represents NYDPS Final Supplemental EIS installed megawatt (MW) projections.

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Day-Ahead vs. Real-Time Market Assumptions

- **Some changes to the 24 hour profiles:**
  - On-shore wind profiles based on forecasts in DAM and metered performance in RT
    - Off-shore wind profiles are the same in the DAM and RT and based on NREL data because NYISO does not have an applicable forecast
  - July 25 solar profiles based on clear sky profile in DAM and on sampled output in RT
    - Solar profiles for all other days are based on sampled historical output in both DAM and RT
  - All profiles converted to 5 minute increments (DAM is hourly)
- **External Transactions are fixed at the production schedule (not economically evaluated) except for import and export transactions between HQ and NYISO**
  - Addresses the competing concerns of not using external control areas to balance NYISO load and generation while also not modeling imports from HQ when NYISO prices are negative
- **The simulated bids of opportunity cost bidders are treated similar to how NYISO adjusted them in the DAM – a ratio of simulation prices to historical prices**

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Real-Time Market Simulation Methodology

- **Saved cases retrieved from data historian**
  - Each case uses “as-was” topology
  - All RTM bids unchanged except for a small sub-set of resources that offer based on lost opportunity costs
- **Simulated day-ahead commitment used to overwrite the real-time unit bid mode**
  - Fast Start units re-evaluated using their HAM bids in real-time simulations
  - The remaining units set to either “must run” or “unavailable” based on their simulated day-ahead commitment
- **All resources are assumed to follow commitment and dispatch perfectly**
  - Commitments in RTC are passed to subsequent RTD and RTC intervals
  - Dispatches in RTD are passed to subsequent RTD intervals

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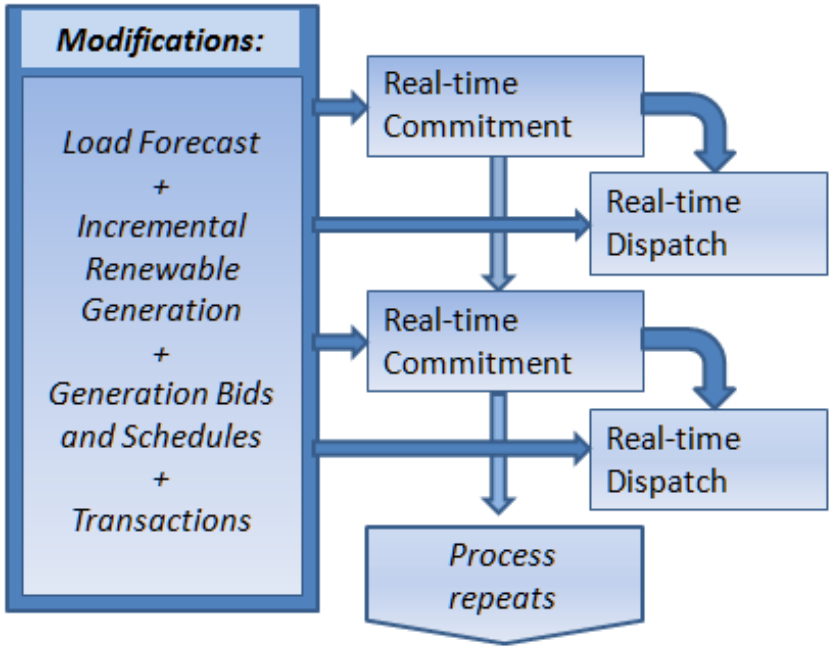
Real-Time Market Simulation Process

- Hourly commitments from DAM simulations passed to the real-time simulation
- Modifications are read into the solver for each RTC and RTD evaluation
  - Behind-the-meter solar modifies zonal load forecast
  - Incremental Renewable Generation
  - Commitment Schedules for existing Generation
  - Lost-opportunity cost bids modified for some resources
  - Fixed Transaction Schedules



Next steps

- Preliminary Real-Time Market simulation results to be presented at an upcoming MIWG - targeting mid-July
- The Day-Ahead Market should be aligned to the Real-Time Market so NYISO will look at the simulated real-time prices and may adjust virtual bids and offers and/or day-ahead opportunity cost offers
- Day-Ahead and Real-Time Market simulations will then be re-run to produce final results for all four days
- We appreciate feedback from stakeholders both in the meeting and emailed to: IPP_feedback@nyiso.com

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Questions?

The Mission of the New York Independent System Operator, in collaboration with its stakeholders, is to serve the public interest and provide benefits 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 policy makers, stakeholders and investors in the power system

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