

2016 Project Candidates

Product and Project Management

5/20/2015

This document represents the 2016 project candidates identified through internal discussions with Business Owners and discussions with Market Participants in the stakeholder process. These candidates and their corresponding descriptions reflect information known about each of the project candidates as of the date of this document. If you have any additional questions, please contact the appropriate Product Manager to seek clarification.

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Business Intelligence Products

Enterprise Information Management: Data Integration Phase 2

The Enterprise Information Management initiative is a strategic initiative focused on bringing together process, design and technology to satisfy market and operations information needs at NYISO. The Decision Support System (DSS) system will be upgraded to new data integration technology which will reduce support issues and improve maintainability. This will also allow the NYISO to have improved visibility to the impact of data modeling changes within these systems to help improve the efficiency of all projects that modify data models.

Enterprise Information Management: Analytics Environments

NYISO's Information Management roadmap calls for consolidating the desktop and server environments of the analytics system into a single cohesive environment. By consolidating the environments, there will be improved reliability for our tariff and compliance obligations. This effort will also reduce the licensing and support costs.

Public Website Refresh

The NYISO public website was last refreshed in 2009. The process of updating the site and the presentation of data will include an updated look for the NYISO public website to improve usability and the locating of information.

Capacity Market Products

DMNC Test Validation Automation

This project seeks to consolidate the supply of DMNC test data from Installed Capacity Suppliers by enhancing the ICAP AMS to accept additional data and to automate current manual validations and decision points to the extent possible. Allowing suppliers to enter data into a single system and quicker turnaround on acceptance or rejection to DMNC test data submittal is a primary goal of this project. Secondary goal is to reduce risk of errors from administration of manual processes.

ICAP AMS Enhancements Phase 3

The ICAP AMS Enhancements Phase 3 project will focus on automation of several key processes which are currently performed manually. Those will include, but are not limited to: the automation of Credit Registration Agreement (CRAs) and Operation Control Certification (OCC) tracking; improvements/alerts on the Assign Transaction ID screen; automation of posting of Remaining Available Import Rights; adding ability for MPs to view purchased Spot excess and price details. The goal of the automation is to reduce risk of potential errors that may be introduced through manual processes.

The automation will further improve the efficiency of ICAP processes as well as the ICAP AMS software.

ICAP Auction Validation and Reporting Phase 3

The NYISO is proposing a Phase 3 of the ICAP Auction Validation and Reporting project to develop additional corporate reports to assist in developing the FERC annual report and support monthly auction review and validation. This is a continuation project from 2015 that included the expansion of the ICAP Universe to include an extension of the UCAP schema and portions of BIDBOX and DRIS to merge data across Universes, which are the needed data elements to support the FERC and Auction review and validation reports.

ICAP Reference System Phase 2

The NYISO collects extensive data from the NYISO Market Participants in order to implement the ICAP market mitigation measures. In the past the data collection process, calculations, communication and documentation for the purposes of ICAP market mitigation has been done manually and ad-hoc. The NYISO recognized the benefits of streamlining the process through the development of a web-based data portal and spearheaded the development of the ICAP Reference System for the Going Forward Costs (GFCs), Physical Withholding, and Buyer Side Mitigation (BSM) processes among others and implemented the ICAP Reference System as part of a 2014 project.

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In 2015, the NYISO developed additional requirements for the system to include tracking historical inputs, robust input formatting and including multiple types of Buyer Side Mitigation evaluations and GFC evaluations in support of the NYISO Reliability Must Run (RMR) process. Implementation of these requirements is being proposed for 2016.

Reactive Test Data Management System

In 2015, the NYISO developed requirements for a Reactive Test Data Management System (RTDMS) in order to eliminate the risk of errors from manual manipulation of Voltage Support Services (VSS) test data and incorrect compensation for VSS. This new system will allow VSS suppliers to enter their data into the RTD BMS where the rules associated with compensation will automatically be applied.

From the VSS supplier perspective, the interface will allow for a quicker provision of test results, and quicker determination of compensation level. Both of these improvements in processing time will allow additional time for retesting during the testing period, if needed. The system will also allow confirmation of compensation level by the VSS supplier as soon as the level has been determined. This eliminates the need for the NYISO to manually send 400 approval emails to VSS suppliers annually, and reduces risk of errors from administration of manual processes.

Automate ICAP Import Rights

Simplify and automate the procurement process for ICAP import rights including the gathering and processing of MP faxes, and tracking MP requests for import MWs. Eliminate many of the manual processes used to calculate import headroom, interface availability, and interface limits.

Demand Curve Reset

Work with the selected Demand Curve Reset (DCR) consultant to address challenges with the study of the parameters used as the basis to set the NYISO's ICAP Demand Curves for three, four and five years beginning with the Summer 2017 Capability Period. Efforts shall extend beyond those efforts for a "traditional" DCR, to include supporting development of:

- 1) Proposed parameters and thresholds that could be used to trigger interim updates to reduce the risks imposed by extending the time between resets for up to 5 years,
- 2) A forward looking methodology to project Energy and Ancillary Services (EAS) offsets that can reflect energy market rule changes that are largely not reflected in historic EAS data
- 3) Alternative demand curve shapes and zero crossing points methodologies that may achieve enhanced market performance.

These additional efforts may result in enhanced market performance, and the increased periodicity will create more time for the NYISO and Market Participants to address other market initiatives.

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Winter DMNC Temperature Adjustments

Modify the rules for temperature adjusting a resource’s ability to participate in the winter capacity auction to utilize cold weather (consistent with NYCA peak load) conditions, rather than the current rules that utilize local transmission districts independent peak load conditions.

ICAP Import Rights Design

The Import Rights project would develop a market construct for awarding import rights.

Fuel Assurance – Study

The NYISO will evaluate if the Fuel Assurance provisions implemented in the Energy Market are providing sufficient incentives to meet performance objectives. If not, the NYISO will study various market design changes that may be necessary in the Energy and/or Capacity Markets to provide additional incentives for generation to be available to reliably meet the real-time needs of the NYCA, especially during days where there is a high risk for a reduction in real-time resource availability due to factors such as interchange and fuel supply uncertainty.

Alternative Methods for Calculating the Locational Capacity Requirements

This project would consider alternative methods for calculating the Locational Capacity Requirements (LCRs) for the G-J, J and K Localities. The project would be a carry-over from 2015 in which NYISO initiated an ad hoc effort through the creation of an LCR Task Force at the request of the Market Participants. As of May 2015, the LCR Task Force is trying to define the scope and objectives that the Market Participants want the NYISO to pursue.

Modify Demand Curve to Minimize Costs of Satisfying LCR (SOM)

Create a dynamic and efficient framework for incenting the lowest cost solutions when setting and meeting locational planning requirements in the capacity market. This will enable the NYISO capacity market to better provide locational signals in the future and result in more efficient market outcomes.

Internal Capacity Deliverability Rights for Transmission Upgrades into a Local Area (SOM)

Create a dynamic and efficient framework for reflecting locational planning requirements in the capacity market to better enable the market to provide locational signals in the future, by granting internal capacity deliverability rights for AC Transmission between zones when AC transmission is upgraded into a local area.

Locational Planning Requirements – Pre-define Capacity zones (SOM)

Develop the rules for reflecting locational planning requirements in the capacity market to better enable the market to provide locational signals in the future by predefining a set of interfaces or zones that address potential resource adequacy needs and highway deliverability constraints.

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Expand BSM to Address Uneconomic Transmission Investment (SOM)

Evaluate the market design options to enhance Buyer-Side Mitigation measures that address the effects of uneconomic transmission investment on capacity market prices.

Reform Offer Floor for Mitigated Projects (SOM)

Modify the BSM rules to mandate a default offer floor greater than the current 75% offer floor, to ensure uneconomic resources are not under mitigated.

Behind the Meter: Net Generation Integration

This is a continuation of the 2015 project to integrate loads with behind-the-meter generators that have excess generating capability into the NYISO's Energy and Capacity markets. This phase of the project will include the filing of tariff language, development of functional requirements and use cases for implementation of market rules.

Develop Rules for the Elimination of Capacity Zones or Achievement of Price Convergence

This effort would be to evaluate whether a mechanism for zone elimination is necessary. If it is deemed necessary, then further evaluate the market design concepts for developing the market rules to allow for the elimination of capacity zones or achieve price convergence when the deliverability constraint(s) that caused its creation is effectively removed such that the constraint can no longer be expected to bind.

Model Zone K as Export Constrained

Zone K's capacity is not fully fungible with capacity in the G-J Locality, and was excluded from the G-J locality boundary due to Zone K export constraints. The reliability of G-J may benefit from Zone K exports, up to the export limit, if it were modeled that way in the auction. This proposal will build upon initial design concepts developed with stakeholders in the 2014/2015 time frame, and further enhance them.

External CRIS Rights for non-UDR Transmission Expansion

Evaluate the market design options for allowing Market Participant-funded transmission upgrades enabling incremental transfer capacity at an external interface and associated generation supplies to be considered in the Class Year process and obtain incremental External CRIS Rights.

Mitigation Rules for Uneconomic Retention of Capacity (SOM)

Develop mitigation rules to prevent an entity from subsidizing the continued operation of an uneconomic resource in order to artificially suppress prices.

Mitigation Rules for Uneconomic Investment Outside the G-J Locality (SOM)

Assess if the exercise of market power outside the NYISO localities can occur, and if so, define the BSM rules necessary to mitigate it.

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Limited Application of Buyer Side Mitigation by Technology

The NYISO will evaluate whether narrowing the application of the existing Buyer Side Mitigation (BSM) to specifically identified technologies that can be shown to have the potential to effectively exercise market power strikes the appropriate balance required by FERC in applying the BSM rules to avoid over or under mitigation.

Renewables Exemption

Projects that use non-traditional sources of fuel, like solar and wind for example, are not defined in the Tariff. There are different economic and social factors that influence their profitability outlook. It is important to devise how a renewable project will be treated under the BSM

Self-Supply Mitigation Measures

New units built to self supply a load obligation might be viewed as not profitable from the BSM rules prospective, and may be mitigated as a result. The purpose of this project is to evaluate the BSM rules to determine if a self-supply exemption is appropriate.

Repowering Exemption

Repowering projects are not specifically defined within the tariff. The purpose of this project is to define what a repowering project is, and to develop BSM measures to prevent exercise of market power.

Competitive Entry Exemption for Additional CRIS

The purpose of this project is to define under what circumstances Additional CRIS requests may be considered to be eligible under the competitive entry exemption rules.

Modify the Pivotal Supplier Test (SOM)

Modify the pivotal supplier test in NYC (Zone J) Locality to be consistent with pivotal supplier rules in effect in the G-J Locality. The modification would prevent a large supplier from circumventing mitigation by selling capacity in the forward auctions.

Modify Treatment of Units Being Replaced, Mothballed and Retired in Forecasts of ICAP Prices and Net Revenues (SOM)

The Part A and Part B Test mitigation exemption tests include energy and capacity (ICAP) markets forecasted market revenues that are dependent on the generating units that are modeled as in service. Current revenue forecast inclusion rules for generating units may model units that have exited the market and are unlikely to return as in service, while other projects from completed class years are modeled as in-service when project progress suggests it is unlikely they will be. This project will propose to revise the forecast inclusion rules to achieve a more reasonable economic forecast.

Enhanced EAS Forecasting Engine

This project will apply Ranger, the same model that is used to dispatch in RT and DAM, to provide improved EAS forecasts for units currently not integrated into the network. Today the forecasting is based on an econometric model integrated with GE MAPS. Utilizing Ranger, to generate EAS forecasts will provide more accurate results by allowing for increased flexibility in modifying model parameters, market conditions, and market rule changes. The Ranger enhancements are also expected to reduce modeling time and increase efficiency in making EAS forecasts associated with both the Demand Curve Reset and mitigation exemption testing.

BSM Part A and Part B Test Enhancements

There is opportunity for improving the accuracy of the BSM part A and part B tests. These enhancements include procedural and process changes, data requirements, test optimization, along with financing and transparency enhancements.

Develop Physical Withholding Rules for UDRs

Supply side mitigation and physical withholding rules do not currently apply to UDRs, even if the UDR is part of pivotal portfolio. This project would modify the external generator certification procedures and enhance existing rules to prevent UDRs that are part of a pivotal portfolio from physical withholding.

Demand Response

Demand Response in the Real-Time Energy Market

The objective of this project is completion of the market design to integrate the demand response resources into NYISO's real-time markets developed through the stakeholder process. This project has a dependency on the outcome of EPSC v FERC that will be reviewed by the U.S. Supreme Court during its 2015 session.

DRIS and DR Reporting Enhancements for DR Program Administration

The NYISO Demand Response Operations (DRO) group performs several routine functions related to the administration of the Demand Response programs. Automating key manual processes will decrease the risks of errors being introduced from these processes and functions. In addition, expansion of the reporting capabilities for Demand Response data developed in 2015 would provide DRO with a robust means to access additional key data. The data to be added to the Reporting Universe for DR includes the following: kW values for the ACL, Verified ACL for Provisional and Incremental resources; shortfall and change of status.

Demand Response Contingency Implementation: Order 745 or DR Backstop Design

This project plans for an implementation of either the NYISO's outstanding Order 745 compliance filing or the DR Backstop, based on the outcome of EPSC v FERC that will be reviewed by the U.S. Supreme Court during its 2015 session.

Energy Market Products

Fuel Assurance - Constrained Fuel Supply Bidding (SOM)

Allowing generators to submit in bids subject to an inter-temporal constraint in the day-ahead market is a recommendation made by the MMU in the 2013 State of the Market report. The premise behind this is that generators face significant fuel supply constraints that can be difficult or impossible to reflect efficiently in day-ahead offers. For example, hourly OFOs may require a generator to schedule a specific quantity of gas in each hour of a 24-hour period even though this does not match its day-ahead schedule. Not only does this subject the generator to significant financial risks when it is scheduled in the day-ahead market, but it also raises costs for consumers, since the generator is likely to respond by reflecting these costs in other offer parameters or by reducing its availability. Hence, allowing generators to submit offers that are scheduled subject to an inter-temporal constraint would reduce the OFO-based risks of being available.

In addition, when gas prices are very high, oil-fired and dual-fueled generators can be limited by air permit restrictions and/or by low oil inventories. It would be beneficial for the generator to be able to conserve its limited oil-fired generation for periods when it is most valuable. Currently, generators reflect these quantity limitations by raising offer prices, but this is an imprecise method that requires generators to guess what offer price levels are needed to achieve the targeted level of fuel consumption over the day. This leads to both foregone opportunities and unnecessary depletion of limited oil inventories. Hence, allowing generators to submit offers in the day-ahead market that reflect quantity limitations over the day would allow such generators to be scheduled more efficiently when they are subject to fuel or other production limitations. This capability would also be beneficial at other times of year for hydro-electric and other generators that also have significant energy limitations.

Energy Storage Optimization

With the advancement of Mixed Integer Programming technology, the NYISO will look for ways to optimize the energy availability of storage devices. This project would look at ways to optimize, on a least cost basis, the management of energy by selecting the most efficient dispatch mode (generator mode vs. charging/pump mode).

Targeted Virtual Trading

Day Ahead and Real Time price convergence is an essential measure of market efficiency. Prices in the DA reflect the anticipated price in RT, plus a risk premium. The existence of many buyers and sellers of energy at the zonal level allow the collective intelligence of traders, LSEs, and generators to settle on a DA LBMP that, on average, approximates the RT LBMP.

Prices typically converge well at the zonal level within the NYISO markets; however, Potomac Economics has reported on divergence between DA and RT prices at the bus level in each SOM

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from 2006 to 2013. This divergence is tied to having few buyers and sellers of Energy at the bus level; generators receive a bus level price and loads pay a zonal price based on a weighted average of the bus level price, but traders are unable to take positions at these buses that will influence the DA commitment. Increasing the number of buyers and sellers at targeted virtual trading buses will increase price convergence at the sub-zonal level, ensuring zonal LBMPs accurately reflect the value of energy.

Targeted Virtual Trading (TVT) will enhance the NYISO’s virtual trading offering to Market Participants, providing for better price convergence, increased liquidity, and more accurate unit commitment among other benefits.

Linked Virtual Buy-Sell Transactions

Allowing Linked Buy/Sell Transactions between internal NYCA zones will make it easier for Market Participants to hedge exposure to congestion, and ensure price signals in each zone accurately reflect grid conditions. Linked Buy/Sell Transactions would allow an MP to specify a source/sink pair upon which to place a spread bid; if the transaction was accepted, then the reverse transaction would occur in RT. This product would effectively allow MPs to buy/sell the net congestion component of the LBMP between two NYCA zones to take a position regarding differences between the DA and RT.

Though Market Participants may hedge DA congestion through TCCs, there is currently no method for MPs to directly hedge against exposure to congestion costs in Real-Time. Allowing hedging of congestion will reduce the overall market risk premium.

Linked Buy/Sell Transactions will enhance the NYISO’s virtual trading offering to Market Participants, providing for reduced exposure to congestion, better price convergence, increased liquidity, and a more accurate unit commitment among other benefits.

Long Island PAR Optimization & Financial Rights (SOM)

The Long Island Phase Angle Regulators at Lake Success and Valley Stream, collectively the “LI PARs”, are not currently optimized by the NYISO’s market software and instead operated to facilitate a long-standing contract to deliver power to Con Edison. This causes power to flow in an inefficient direction for the majority of the time in the DA (2013 and 2014 SOM). The market software/ processes should be modified to optimize the LI PARs and minimize total production cost by ensuring power flows in the economic direction. Since more efficient operation of the LI PARs would benefit one party financially at the expense of the other, it is also reasonable to create a financial settlement mechanism to compensate the party that would be giving up some of the benefits from the current operation.

Hybrid GT Pricing Improvements (SOM)

The current RTD pricing logic does not allow economic Gas Turbines (GTs) to set price in some intervals; this leads to an LBMP that is lower than the bid cost of the GT, inaccurate price signals, and possibly uplift. Potomac Economics recommended the NYISO allow all GTs

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economically committed by RTC and certain out of merit commitments for reliability to be eligible to set price in the final pricing pass.

Potomac Economics has recommended the NYISO pursue Hybrid GT pricing improvements in a number of recent State of Market (SOM) reports. The Market Monitoring Unit (MMU) has determined that gas turbines were economic in 55 to 68 percent of intervals during their initial commitment period (excluding self schedules and local TO commitment), however, those economic gas turbines did not set LBMPs in 7 to 12 percent of intervals during that same period (2013 SOM). This outcome has been attributed to the current Hybrid GT pricing methodology.

Modification of the Hybrid GT logic in Ranger to allow generators to set price in more instances will provide for more accurate price signals and performance incentives, as well as better align pricing outcomes with reliability needs and operator actions

RTC-RTD Forward Horizon Coordination Improvements (SOM)

Modeling inconsistencies between RTC and RTD look-ahead evaluations as they evaluate external transactions and the start-up/shut-down of gas turbines, result in unforeseen ramp constraints and undermine the accuracy of prices forecasted by RTC. These inconsistencies may also contribute to transient shortage conditions and unnecessary price volatility. Review and adjustment of the look-ahead RTC and RTD evaluations should be investigated to alleviate unnecessary ramp constraints, reduce unnecessary price volatility, and could also lead to better SCUC-RTC-RTD price convergence.

Enhanced PAR Modeling (SOM)

Variation in loop flows and in flows across certain PAR-controlled lines were among the leading causes of transient price spikes in 2014 (2014 SOM). Discrepancies between modeled and actual loop flows, and modeled and actual flows across PAR-controlled lines lead to transient shortages where generation must be ramped up to account for scheduling discrepancies and flexible generators cannot ramp quickly enough to compensate for changes. This subsequently leads to spikes in shadow costs or LBMPs. Mechanisms incorporated into the market solution may help to alleviate these discrepancies between modeled and actual loop flows and flows on PAR-controlled lines. Adjusting the last telemetered flows on fixed scheduled PARs and using these adjusted values as inputs to RTC and RTD to account for variations in generation, load, interchange, and other PARs that are located in the NYISO footprint can more accurately model actual PAR flows realized. In addition, developing a mechanism to forecast deviations between telemetered and actual loop flows and telemetered and actual fixed PAR flows and incorporating these adjustments within RTC and RTD can more accurately reflect real-time system conditions, resulting in more efficient scheduling and prices and reducing unnecessary price spikes. This initiative also involves evaluating improvements to the modeling of day-ahead loop flows and flows on PAR controlled lines.

Review of RACT Compliance Plans (SOM)

NOx bubble constraints were established by the NYISO in the LRR pass of SCUC for three generator portfolios in New York City based on the compliance plans they filed with the

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Department of Environmental Conservation (“DEC”). Currently these portfolios use the “System Averaging” compliance option which requires the operation of a steam turbine unit in order to reduce the overall NOx emission rate from a portfolio containing higher-emitting gas turbine units. Owners of generation in NOx bubbles likely have additional RACT compliance options, which may result in lower emissions at lower cost. Since commitments of steam turbines are necessary for the associated gas turbines to operate (or even provide non-spinning reserves), they are categorized as for local reliability and the resulting out-of-market costs are uplifted to the market. If generators select lower cost options to comply with RACT standards, uplift may be reduced, or these units may be committed economically instead of out of market.

Additionally, the MMU assessed that it is likely that NOx bubble commitments had the effect of increasing rather than decreasing overall NOx emissions across electric generating units in New York City. This is because the commitment of steam turbine units typically crowds-out generation from new fuel efficient generation with selective catalytic reduction capability, and it is rare that these commitments would reduce production from older gas turbines as they were intended. According to the 2014 SOM, steam units emit approximately 13 times more NOx per MWh than the newer generators with emission-reduction equipment. To reduce uplift and ensure more economic unit commitments, the NYISO proposes to create a review process for RACT compliance plans where the NYISO will work with generation owners to ensure their RACT compliance plans use the most economic compliance option available.

Wholesale Market Alignment with the NY PSC REV Proceeding

This project will develop the concepts for aligning the NYISO’s markets to support REV initiatives through participation in REV development activities, advancement of wholesale market design concepts, and support for applicable pilot projects.

Fuel Limited Reserves (SOM)

Hourly Operational Flow Orders (“OFOs”) are often declared on the days when gas supply is very tight. During hourly OFOs, many generators that are reliant on natural gas may be unable to start-up or ramp-up if deployed in response to a sudden large contingency. Even if generators are authorized to take additional gas on such days, pipeline operators may have difficulty maintaining sufficient pressure to allow a large amount of generation to suddenly respond to a reserve pick-up. According to the 2014 State of the Market Report, analysis suggested that real-time reserve clearing prices (and LBMPs) may have been understated during periods with hourly OFOs – reserve clearing prices did not always reflect the limited availability of operating reserves or the costs of the supplemental commitments made to maintain reserves. Out-of-market commitments often result in uplift charges and depressed real-time clearing prices for energy and ancillary services which could undermine incentives to perform reliably during tight winter operating conditions. Consequently, the energy market may not provide adequate incentives for generators to make reserve capacity available by maintaining oil inventories and equipment necessary to operate on oil. To address these concerns, the NYISO is proposing to implement procedures to help identify unloaded capacity that is not capable of responding reliably in the event of a reserve pick-up. This may require generators to provide necessary information in real-time and/or for pipeline operators to

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indicate when the pipeline has limited capability to support a large pick-up in gas-fired generation over a ten -minute period.

5 Minute Transaction Scheduling

In 2011, the NYISO activated 15 minute transaction scheduling with Hydro Quebec followed by PJM. This project would look to continue to improve real-time interchange scheduling processes by allowing economic scheduling of interchange across controllable interties via the 5 minute Real-Time Dispatch ('RTD').

15 Minute Transaction Scheduling - HQ Cedars (SOM)

As part of the Broader Regional Market Initiatives the NYISO activated 15-minute transaction scheduling with Hydro Quebec at the Chateauguay interface followed by PJM at all NY-PJM interfaces. This project would look to continue to improve real-time interchange scheduling flexibility by implementing 15-minute transaction scheduling at the HQ Dennison-Cedars intertie.

15 Minute Transaction Scheduling - IESO (SOM)

As part of the Broader Regional Market Initiatives the NYISO activated 15-minute transaction scheduling with Hydro Quebec at the Chateauguay interface followed by PJM at all NY-PJM interfaces. This project would look to continue to improve real-time interchange scheduling processes by implementing 15 minute transaction scheduling at the IESO Bruce intertie.

Enterprise Products

NERC CIP v5 Planning & Conversion - Phase II

This initiative is focused on developing and enhancing the NYISO's North American Electric Reliability Corporation (NERC) Critical Infrastructure Protection (CIP) program to ensure readiness for the transition to the NERC CIP version 5 Standards, in accordance with FERC Order 791. The scope of this project includes final preparations for a February 2016 compliance audit, resolution of any critical recommendations from the audit team as needed prior to the April 2016 enforcement date and other program enhancements to improve the efficiency and/or reliability of processes. This will involve upgrades to the NYISO's applicable Bulk Electric System (BES) Cyber Systems (as needed), in conjunction with changes to the NYISO's cyber security policies, procedures and related controls.

NAESB Public Key Infrastructure

FERC issued Order No. 676-H adopting North American Electric Standard Board (NAESB) Public Key Infrastructures (PKI) Standards for the use of digital certificates to secure specific energy industry transactions. As a result, the NYISO must replace its existing digital certificate infrastructure with a NAESB PKI compliant solution.

Market Test Environment

NYISO Market Participants need a means of testing their business processes and systems against the NYISO market to validate outcomes and ensure proper inter-system operations. This project will create a permanent external-facing market test environment (i.e. "sandbox") where market participants can conduct testing against a non-production environment, including MIS, JESS, DRIS, Credit, ICAP, TCC and other functions.

Storage Infrastructure Redesign Phase II

Many of the NYISO's existing storage technologies have reached, or will soon reach, the end of their lifecycle. This results in significant increases in support and maintenance costs and higher rates of component failures. This project is a multi-year initiative to replace an aging storage infrastructure with new systems designed to leverage technology advances for improved performance and reliability with a reduced storage footprint and total cost of ownership. These performance improvements are necessary to avoid tariff violations and achieve required service levels.

Identity and Access Management (IAM) - Phase V

This is a multi-year project to improve identity and access management (IAM) controls for cyber systems and physical facilities. The IAM Phase V project builds upon the completed deliverables from earlier IAM project phases. This phase seeks to further extend automated provisioning capabilities and implement infrastructure upgrades for data loss prevention, enhanced security and improved system availability.

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Application Platform Upgrade Phase III

This is a multi-year effort to replace aging server infrastructure and migrate to a new application platform standard. This phase includes hardware/operating system migrations and middleware upgrades. The last of the hardware/operating system migrations will be completed with this phase. There is expected to be another phase to this project to complete the middleware upgrades.

Enterprise Monitoring Phase III

Phase III of the Enterprise Technology Monitoring (ETM) project will seek to eliminate gaps within the NYISO's systems management program by implementing log analysis, custom application monitoring and event enrichment policies. The objective is to improve IT situational awareness and enable faster incident resolution.

Stakeholder Services Suite Phase II

This initiative will build on the initial phase of this project and enable the NYISO Stakeholder and Member Relations (SMR) team to better manage customer interactions from initial contact, to registration, training, and ongoing communication. The Phase II project will integrate the existing solution with various other NYISO systems to improve responsiveness and realize efficiencies.

Integration Platform Availability Improvements

This project will build on the NYISO Integration Platform capabilities developed under the previous Ranger Messaging Integration initiatives. This effort will enhance the platform to handle the performance and availability requirements of reliability applications, which are more stringent than the market applications it currently supports. It will also significantly improve the availability of the integration of existing market applications and ensure the platform is on a vendor supported version capable of handling future market and reliability application integration needs.

Learning Management System

The NYISO uses separate systems and manual processes to develop, schedule, manage, and monitor a variety of training offerings. This project includes an assessment of training needs across the organization and implementation of a Learning Management System (LMS) to increase the efficiency of NYISO training, compliance monitoring and delivery.

Service Management Enhancements

The IT Service Management system is used by the NYISO to request and manage IT services. This project will provide additional functionality to improve internal processes by providing better integration between the incident, problem and change management modules.

Database Upgrades and Performance Improvements

This is a multi-year effort to upgrade the NYISO's database systems and implement changes to improve the overall performance of critical databases. This technology lifecycle project is

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necessary to ensure the ongoing availability of security patches and vendor support for critical systems.

Telephony System Upgrade

This is a multi-year project intended to reduce the total cost of ownership of telephony systems, improve network resiliency and redundancy, utilize best-in-class technology and maintain or enhance current levels of service and support. This phase will implement vendor technology solutions selected for voice / data equipment and services, network connectivity and unified communications.

Enterprise Job Scheduling Upgrade

This is a multi-year effort to upgrade the NYISO's enterprise job scheduling system. This system is used to schedule and coordinate automated business processes. This technology lifecycle project is necessary to ensure the ongoing availability of security patches and vendor support for this critical system.

Network Proxy Upgrade

NYISO is currently utilizing aging network proxy appliance and proxy firewall systems to facilitate user access to the internet and outbound network traffic. This project seeks to consolidate this network infrastructure on a next generation platform to reduce costs, increase performance and enable new security features.

Laptop/Desktop Refresh and Migration

A significant number of NYISO laptops and desktops will be coming out of warranty at the end of 2015 and need to be replaced in order to assure continued vendor support for the hardware. At the same time, the NYISO's standard productivity suite is approaching its end of support cycle and needs to be replaced. This project includes a feasibility assessment of virtual desktop infrastructure (VDI) technology, replacement of aging laptop/desktops and migration to the next version of productivity suite software. This technology lifecycle project is necessary to ensure the ongoing availability of security patches and vendor support for NYISO corporate productivity systems.

Content Management System Upgrade and Consolidation

The NYISO is currently supporting two content management systems. This project seeks to standardize on a single upgraded content management platform to reduce costs and ensure the ongoing availability of security patches and vendor support for the NYISO's content management infrastructure.

Email Security Enhancements

This project will implement security enhancements to the NYISO's email system to reduce the risk of improper disclosure of confidential or sensitive information.

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Conference Room Technology Refresh

This project involves completing the refresh of audio/video technologies in the corporate conference center and throughout the conference rooms in the main building. This includes wireless projection, room automation, room scheduling, high resolution displays, and smart board technologies where appropriate.

Enterprise Project Management (EPM) Upgrade

The EPM system is used for timesheet entry, resource management and project management functions. It is the primary data collection and reporting tool for Enterprise Cost Management data. This technology lifecycle project is necessary to ensure the ongoing availability of security patches and vendor support for this system.

Finance Products

Regulated Transmission Cost Recovery – Phase 2

In 2015 modifications were made to the Billing and Settlements System and Consolidated Invoice to provide for cost recovery of regulated transmission projects deriving from the NYISO’s Comprehensive System Planning Process. Phase 1 of Regulated Transmission Cost Recovery included functionality to handle billing for reliability, economic, and/or public policy needs. Modifications were also included to accommodate cost recovery for the Transmission Owner Transmission Solutions (TOTS). The system was designed with flexibility to handle multiple cost recovery methodologies. Phase 2 would accommodate any additional updates or changes pending Transco tariff filings and FERC acceptance.

Day Ahead Margin Assurance Payment (DAMAP) Enhancements

Changes are needed to ensure all committed DAM Reserve Bids are submitted into the Real-Time market appropriately for evaluation. If a generator subsequently makes themselves unavailable for reserves or regulation after receiving a DAM reserve or regulation award, they should not be eligible for a DAMAP payment. This project will change several bid submittal and validation rules, as well as DAMAP rules to ensure both the Reserve and Regulation markets are evaluated appropriately in the real-time for DAMAP. These changes will require tariff revisions.

North Subzone Redistricting

In 2008 NYPA and National Grid requested new sub-zonal boundaries in the North Zone in order to reduce Unaccounted For Energy (UFE). NYISO worked with NYPA and National Grid to provide a solution, which was effective 12/1/2008. The current solution is a manual process administered by NYPA and National Grid. In 2015, the NYISO had a project to identify a solution that would allow for changing the boundaries of subzones within zones. This project will implement the market design that was developed in 2015.

Rate Schedule 1 Technology Automation

Rate Schedule 1 Technology Enhancements will automate manual processing and manual adjustments of non-physicals, the TCC, and Virtual Markets. This project would provide automation of Rate Schedule 1 to improve efficiency and reduce risk associated with manual processing.

Settlements Sub Accounts

Market Participants have requested an option for detailed reporting of sub-account level settlements data for those MPs that are a Financially Responsible Party (FRP).

The NYISO would provide MPs that are a FRP with transparency of settlement data of their dependent-entities in that FRP relationship. This enhancement will provide MPs with flexibility

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in reconciling their settlements, increased accuracy in billing and allocating costs to their customers.

CMS Financial Risk Assessment Tools

The NYISO has a Financial Risk Assessment process used to evaluate each Market Participant’s potential risk exposure. This project will provide Corporate Credit with automated tools and processes to replace the manual processes associated with the risk assessment. Automation of Corporate Credit’s Financial Risk Assessment process will facilitate the performance of credit risk assessments on all Market Participants in an efficient and effective manner. These automated processes will assist in the identification and mitigation of credit risk.

CMS Ratings Automation

Redesign of the Credit Management System (CMS) functionality for the handling of automated feeds received from the Credit reporting agencies is needed to ensure consistent updates and integrated into daily re-calculations. This project is intended to complete the redesign of the automated functionality of ratings in the CMS, update the CMS Corporate Family functionality, and automate the tracking of financial statements within CMS to ensure Market Participants are receiving the appropriate amount of unsecured credit and that the NYISO does not encounter unnecessary or unexpected exposure.

CMS Unbalanced Trading Hubs

This project would implement the credit requirements needed to address the risk associated with unbalanced energy MWhs and remove the bidding check that enforces balanced Trading Hub bids.

The credit calculations would be performed any time a trading hub bid is confirmed, updated or deleted and the bids will be accepted or rejected based on the availability of collateral to support the credit requirement for the bids.

Foreign Guarantees

The NYISO’s tariff does not currently permit Market Participants to use foreign parent guarantees to meet their creditworthiness requirements, with the exception of Canada. Market Participants have requested a change to NYISO policy to develop rules and procedures in which the NYISO would accept a foreign entity’s parent guarantee for their U.S. subsidiary.

Budget versus Actual Automation

This project would allow for automation of certain components of the internal NYISO Budget vs. Actual monitoring and reporting processes. These are currently manual processes which require substantial effort to prepare the information and provide it to the appropriate stakeholders. This project would create efficiencies, mitigate risk of error due to manual processes and provide for more timely information.

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RFP Evaluation Tool

The Procurement Department and Business Owners need a tool specifically for creation, administration and evaluation of 'Request For Proposals' (RFPs). The tool would provide standardization for the entire RFP process (creation, editing, approval, distribution, selection and storage) and help to shorten the RFP lifecycle, enabling additional opportunity for competitive bid sourcing and cost savings.

Operations & Reliability Products

Calculations of BAL Standards

On 4/16/15, FERC issued an order approving Reliability Standard BAL-001-2 (Real Power Balancing Control Performance) submitted by the North American Electric Reliability Corporation (NERC), the Commission-certified Electric Reliability Organization (ERO). Reliability Standard BAL-001-2 applies to balancing authorities and Regulation Reserve Sharing Groups, and is intended to ensure that Interconnection frequency is maintained within predefined frequency limits.

Reliability Standard BAL-001-2 is designed to ensure that applicable entities maintain system frequency within narrow bounds around a scheduled value, and improve reliability by adding a frequency component to the measurement of a Balancing Authority's Area Control Error. In addition, the Commission directed NERC to submit an informational filing pertaining to the potential impact of the Reliability Standard, and also directed NERC to revise one definition.

This project will support real time monitoring and alarming capability of the new requirements to be presented to the control room operators. It will also provide after the fact reporting of NYISO compliance with the standard requirements.

Breaker Level Market Modeling

Updates to the BMS breaker modeling logic will allow for closer alignment with the EMS model. Specifically, the BMS uses a bus model for its power flow calculations while the EMS has a breaker level model. Increasingly substations are being developed with ring buses which have internal configurations capable of splitting the substation. The intent of this project is to allow the BMS to match the defined bus model in the EMS system for these configurations.

Transmission Outage Application Platform Upgrade

This project will upgrade the current end-of-life software and hardware for the Sun-Net TOA. Currently the NYISO is the only remaining customer on the dated platform reducing our ability to implement new functionality and increasing concern of supportability.

EMS BMS System Upgrade

This is the second phase of a multi-year project to upgrade both the Energy Management System (EMS) and the Business Management System (BMS) which can also be referred to as the Market Management System (MMS). The EMS encompasses the core reliability functions used by the system operators such as load flow and contingency analysis. The BMS/MMS encompasses the day ahead and real time energy market functionality. The second phase will be identifying the must have requirements for Operations/Reliability and Markets. In addition, development of contracts and a Statement of Work with the selected vendor will be completed. Initial project implementation plans, initial development and hardware requirements will also take place during 2016.

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Coordinated Transaction Scheduling with ISO-NE (SOM)

As part of the Broader Regional Markets initiatives, ISO New England (ISO-NE), and the New York Independent System Operator (NYISO) commenced the joint Inter-Regional Interchange Scheduling (IRIS) project. The main goal of this project is to improve price convergence between proxy buses of the two ISOs. For the IRIS project, two approaches were proposed according to the IRIS white paper¹ Tie Optimization (TO) and Coordinated Transaction Schedule (CTS). The two ISOs agreed to pursue the latter. To implement the CTS approach, two design options were also proposed: the supply curve method proposed by NYISO; and the marginal equivalent algorithm suggested by ISO-NE. The two ISOs agreed to pursue the supply curve method based on the assumption that it is much easier to implement. In 2012 FERC accepted the tariff changes to implement CTS.

This project shall implement in Q4 2015 and activate the software in Q4 2015 or Q1 2016 if needed.

MetrixIDR (Load Forecaster Upgrade)

The NYISO has been notified by their Load Forecasting software vendor that product support will be discontinued in early 2016. In order to mitigate risk and enhance the NYISO's load forecasting capabilities, this project will upgrade to the MetrixIDR product. The MetrixIDR product will enhance the NYISO's ability to create 90/10 forecasts and solar forecasts.

Scheduling & Pricing - Comprehensive Scarcity Pricing (SOM)

Revisions to the scarcity pricing mechanism were identified during the Q2 2014 Comprehensive Shortage Pricing Review. Improvements were identified in the implementation of scarcity pricing and application of scarcity prices at external locations; specifically, through the modeling of a scarcity reserve product in the optimization during reliability Demand Response (DR) calls.

This effort will look to move Scarcity Pricing into the real-time scheduling and pricing optimization engine to better align scheduling decisions with pricing outcomes.

This project will continue the 2015 Comprehensive Scarcity project. Deployment to production is targeted for June, 2016.

Comprehensive Scarcity Pricing - Ranger DRIS Integration

Revisions to the scarcity pricing mechanism were identified during the Q2 2014 Comprehensive Shortage Pricing Review. Improvements were identified in the implementation of scarcity pricing and application of scarcity prices at external locations; specifically, through the modeling of a scarcity reserve product in the optimization during reliability Demand Response (DR) calls.

¹ IRIS white paper (ISO New England), January 5, 2011, [Online] www.iso-ne.com/pubs/whtpprs/iris_white_paper.pdf

To ensure the activation of SCR/EDRP events align with the scarcity pricing mechanism, this project will automate the exchange of information between Ranger and DRIS so that the activation events do not need to be entered in two different systems manually.

This project will deliver, test and implement code that will automate the exchange of information between Ranger and DRIS so that SCR/EDRP events are entered in one system and the information automatically flows to the second system.

Transmission Service Charges Rate Update

The purpose of this project is to improve the calculation process used to allocate export transaction shares so that the Transmission Owner's (TO) can invoice their Transmission Service Charges (TSC) for export and wheel-through transactions.

Interconnection Reliability Operating Limits IROL Visualization

Direct telemetry charts represent flows against static IROL based upon an all facilities in service scenario. The purpose of this project is to feed dynamic limits back to the telemetry charts so that operators get visual indicators of flow against the true limits in the event Ranger is down. This project will enhance the operational awareness of the system operators, especially during events of Ranger's unavailability.

Smart Grid Visualization

This project will integrate into the larger situational awareness system the enhanced data and analytics available through the Phasor Measurement (PMU) tools. This upgrade will allow the control room to receive increased benefit from the PMU devices.

NERC Certification Task Management

As operators are trained, NERC requires accurate record keeping for each of the specific requirements. The intent of this project is to procure, customize and deploy software to track NYISO specific activities for each NERC requirement. This will allow easy and transparent access to our compliance documentation. This solution will also enhance compliance with NERC training requirements.

Price Validation Test Automation

This project will develop an enhanced testing environment which will include the functionality of the Price Validation System for User Acceptance Testing (UAT). The benefits will include the ability to test new market features for evaluation of maker outcomes, augmenting the current testing practices.

PCC Visualization Options

The implementation of a new, state of the art, electronic control room and video wall at the NYISO's main campus has created a significant disconnect in our ability to technically support and operationally utilize primary business tools at our alternate control center in Guilderland.

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The increasing disconnect between situational awareness tools used every day by the system operators and the lack thereof at the Carman road facility presents inefficiencies and risks to operations by forcing them to work with tools unfamiliar to them and lacking information now considered standard. This project will evaluate and propose a recommendation for leveraging the significant investment in software tools developed as part of the EMS Visualization project at the Carman Road facility.

CTS – NE System Audit

Coordinated Transaction Scheduling (CTS) with ISONE has expanded the market features available in the Real-Time Commitment (RTC) software. These new features will require certification of the RTC software to show that NYISO administered the market in agreement with the stated rules. Following activation of CTS-NE functionality, it is expected that NYISO and ISO New England will certify their scheduling tools used to facilitate the CTS process.

Synchrophasor Product Upgrade

This project is the continuation of the 2010-2013 Smart Grid Investment Grant project that implemented 50 Phasor Measurement Units (PMUs) and infrastructure components needed to exchange synchrophasor data collected by the NY based PMUs. The original project implemented software solutions that process and array the data from Grid Operations to use in a variety of NYISO applications. This project is to update the software components once a year.

NERC IDC System Tool Modification

NYISO supplies generation, load, and flow data to an Interconnection wide application, the Interchange Distribution Calculation (IDC). The IDC is employed for calculation transaction curtailments between Reliability Coordinators and is the basis for the Generation to Load impact calculations being implemented by NAESB. This project will implement new tools and processes to streamline the required updates.

DAM Posting Improvements

This project will enhance and streamline the DAM process in order to allow the NYISO to consistently post earlier than the current posting schedule.

FERC Funded Rerun Phase 4

The NYISO’s ability to simulate the Day-Ahead Market was instrumental to the success of FERC’s Office of Enforcement (“OE”) actions against Constellation. As such, the FERC OE is requesting that all ISOs develop the capabilities demonstrated by the NYISO, and in our specific case, to expand upon on our current fundamental analysis capabilities. One million dollars in funding was provided to the NYISO as part of the Constellation Settlement.

This project proposes to utilize the remaining funds on scope items that have been reviewed and approved by FERC.

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2016 Reference Level Software Enhancements

The Reference Level System (RLS) Enhancements project for 2016 is intended to further improve generator cost modeling in RLS, automate MMA Fuel submission monitoring and analysis, and streamline the manual mitigation of certain generator bid parameters (E.g. Min Gen).

Market Operations Report Automation

Market Mitigation and Analysis uses a series of SAS reports to produce the Monthly Market Operations Report that is presented to the Board of Directors, several committee meetings, and the public (via web posting). The NYISO is obligated to produce this report to maintain market transparency. This project will focus on simplifying data collection, automating SAS programs, and eliminating unnecessary manual processes.

Modeling 100+kV Transmission Constraints

Modeling 100+kV transmission constraints in upstate NY in the DAM and RT markets could reduce unnecessary price volatility, particularly in the West Zone. In addition, a more detailed model of Niagara to reflect the effects of its interconnection points on the 115kV and 230kV systems in the West would reduce price volatility on the 230 kV transmissions constraints in the West Zone since it would allow the real-time market to re-dispatch Niagara generation more efficiently to relieve congestion. This would reduce out of market commitments made to address these transmission constraints.

Market incentives for investment in resources on the 115kV system in up-state New York are also inadequate partly because these facilities are not reflected in the NYISO's energy and ancillary services markets. This has contributed to the need for cost-of-service contracts to keep older capacity in service. For these reasons, the NYISO is proposing to assess the value and impacts of modeling 100+kV transmission constraints in the day-ahead and real-time markets.

Planning Products

Order 1000

As part of the FERC Order 1000 directive, the System and Resource Planning department will continue its efforts in 2016 to update/create policies, procedures and tariff language to remain compliant with the FERC Order.

Once completed, regional transmission planning will have the procedures in place to consider and evaluate possible transmission alternatives and produce a regional transmission plan along with an evaluation / selection process for transmission studies.

Solar Forecasting Initiatives

This project would allow the NYISO to create solar forecasts for use in the energy market and real-time operations.

As of December 2014, there was about 310 MW-DC of installed capacity of behind-the-meter solar PV in Zones A to K. This represents about 1% of NYISO peak load, and is expected to increase to about 1,000 MW-DC of installed capacity by the end of 2016, or about 3% of NYISO peak load. Recent work conducted by the NYISO and by the California ISO indicates that it is feasible to incorporate the impact of behind-the-meter solar PV in load forecast models when the penetration of Solar PV installed capacity is at or above 3% of zonal or system load at any given hour.

At present, there is 32 MW-AC solar PV interconnected to the bulk power system at a single location in Zone K. Since June 1, 2014, solar PV projects totaling 129 MW-AC have been added to the NYISO interconnection queue. Four of these projects totaling 79 MW are located in Zone K, the other two in Zones C and F. All these projects have in-service dates no later than 1/1/2017, which would bring the total installed capacity of interconnected solar PV to about 150 MW-AC.

The NYISO has already developed the capabilities to incorporate forecasts of behind-the-meter solar in its 2015 Long Term Forecast, and currently monitors the installation of these facilities at the county level via the NYSERDA PowerClerk website, but does not yet have the capability of including behind-the-meter solar PV forecasts in its real-time forecasting models of load, nor of forecasting the real-time output of interconnected solar PV facilities. In addition, unlike wind power, there is no situational awareness of solar PV in the control room.

Generator Reporting Enhancements

The NYISO's fleet of generators totals over 700 individual units, ranging in size from over 1,000 MW for nuclear and large hydro to as small as 100 or 200 kW for small run-of-river hydro units. Generator characteristics are used in a number of planning studies, in MIS, and in operations.

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Tracking the status of the generation fleet continues to become more complicated with adoption of outage state, behind the meter and other DER market rules.

This project would establish a uniform source of generator data across the NYISO organization and allow the NYISO to continue to provide authoritative information regarding the New York electric system. It would also eliminate a number of manual tasks that are performed each year to compile data for the Gold Book, Power Trends, the FERC 714 filing, and other reporting requirements. It would also serve as a reference for the planned changes in the generating fleet that are included in any given NYISO planning study or report (Gold Book, RNA, RNA Revisit, CRP, CARIS-1, CARIS-2, IRM, Class Year, ATBA, SRIS, FERC 714, FERC 715, LTRA, etc).

Congestion Reporting Enhancements

This project seeks to enhance the processes for congestion reporting. These efforts will both improve efficiency and glean greater insight into congestion patterns.

TCC Products

TCC AMS Round Type and Upgrade

The purpose of this project is to update the TCC Automated Market System (AMS) to include a new auction round type, addressing defects and enhancements, and updating the underlying technology of the system. The new round type would be used by TCC Market Operations (TMO) for purposes of performing a feasibility analysis or any detailed analysis of auction situations that is required as a result of internal or external inquiries. The new round type would not impact production data visible to market participants. In addition, this project will holistically evaluate the system to fix any defects and enhancements found over the years and update the technology the system runs on in order to optimize the system and provide a stable base for future projects.

TCC Balance-of-Period (TCC AMS, TCC AVS & CMS)

This project continues the Revenue Allocation Automation efforts to provide for TCC Auction “End-State” functionality (described in NYISO Tariff) through a series of incremental software enhancements to the TCC Automated Market System (AMS) and supporting systems.

Market Participants have indicated that a Balance-of-Period (BoP) auction format is a high priority for those participating in the TCC Market. This project would update the TCC AMS and TCC Automated Validation System (AVS) to include functionality to support the multi-period BoP auction format. The Credit Management System (CMS) would also need to be updated to support the BoP auction format.

The TCC BoP auction format will replace the current single period Monthly TCC Reconfiguration Auctions. Once implemented, MPs would be able to reconfigure their TCCs for the remaining months within the Capability Period and be required to hold collateral for those months remaining in capability period (NYISO currently holds the entire 6 months credit until the last monthly Reconfiguration Auction runs for the Capability Period).

On-Peak/Off-Peak TCCs

The on-peak/off-peak TCC product is a desired featured requested by Markets Participants who participate in the TCC auctions. The on-peak/off-peak TCCs allow MPs to bid only during on-peak hours, off-peak hours or a combination of both in the TCC auctions. Today TCCs that are awarded are settled across all hours of a day during the time period in which the TCC is active. With the on-peak/ off-peak option, MPs would be able to adjust their portfolios to hedge against congestion costs during on-peak or off-peak periods of a day.

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