

Appendix A

2021-2040 System & Resource Outlook (The Outlook)

**A Report from the New York
Independent System Operator**

September 22, 2022

Appendix A: Glossary

Ancillary Services: Services necessary to support the transmission of Energy from Generators to Loads, while maintaining reliable operation of the NYS Power System in accordance with Good Utility Practice and Reliability Rules. Ancillary Services include Scheduling, System Control and Dispatch Service; Reactive Supply and Voltage Support Service (or Voltage Support Service); Regulation Service; Energy Imbalance Service; Operating Reserve Service (including Spinning Reserve, 10-Minute Non-Synchronized Reserves and 30-Minute Reserves); and Black Start Capability. (As defined in the Services Tariff.)

Bid Production Cost: Total cost of the Generators required to meet Load and reliability Constraints based upon Bids corresponding to the usual measures of Generator production cost (e.g., running cost, Minimum Generation Bid, and Start Up Bid). (As defined in the NYISO Tariffs.)

New York State Bulk Power Transmission Facility (BPTF): Facilities identified as the New York State Bulk Power Transmission Facilities in the annual Area Transmission Review submitted to the Northeast Power Coordinating Council by the NYISO pursuant to Northeast Power Coordinating Council requirements. See NYISO OATT

Business Issues Committee (BIC): A NYISO governance committee that is charged with, among other things, the responsibility to establish procedures related to the efficient and non-discriminatory operation of the electricity markets centrally coordinated by the NYISO, including procedures related to Bidding, Settlements, and the calculation of market prices. The BIC reviews the System & Resource Outlook report and makes recommendations regarding review of the report by the Management Committee.

Capacity: The capability to generate or transmit electrical power (in MW), or the ability to reduce demand at the direction of the ISO, measured in MW. (As defined in the NYISO Tariffs.)

CARIS: The now expired Congestion Assessment and Resource Integration Study for economic planning developed by the ISO in consultation with the Market Participants and other interested parties pursuant to Section 31.3 of this Attachment Y. (As defined in the NYISO OATT.) The study is replaced by System & Resource Outlook and Economic Transmission Project Evaluation.

Clean Energy Standard (CES): State initiative for 70% of electricity consumed in New York State to be produced from renewable sources by 2030.

Climate Leadership and Community Protection Act (CLCPA): State statute enacted in 2019 to address and mitigate the effects of climate change. Among other requirements, the law mandates that; (i) 70% of energy consumed in New York State be sourced from renewable resources by 2030, (ii) greenhouse gas emissions must be reduced by 40% by 2030, (iii) the electric generation sector must be zero greenhouse gas emissions by 2040, and (iv) greenhouse gas emissions across all sectors of the economy must be reduced by 85% by 2050.

Comprehensive Reliability Plan (CRP): A biennial study undertaken by the NYISO that evaluates projects offered to meet New York's future electric power needs, as identified in the Reliability Needs Assessment (RNA). The CRP may trigger electric utilities to pursue regulated solutions to meet Reliability Needs if market-based solutions will not be available by that point.

Comprehensive System Planning Process (CSPP): The Comprehensive System Planning Process set forth in the NYISO OATT Attachment Y, and in the Interregional Planning Protocol, which covers the reliability planning, economic planning, Public Policy Requirements planning, cost allocation and cost recovery, and interregional planning process (As defined in the OATT.)

Congestion: A characteristic of the transmission system produced by a constraint on the optimum economic operation of the power system, such that the marginal price of Energy to serve the next increment of Load, exclusive of losses, at different locations on the Transmission System is unequal. (As defined in the NYISO Tariffs.)

Congestion Rent: The opportunity costs of transmission Constraints on the NYS Bulk Power Transmission System. Congestion Rents are collected by the NYISO from Loads through its facilitation of LBMP Market Transactions and the collection of Transmission Usage Charges from Bilateral Transactions. (As defined in the OATT.)

Contingency: An actual or potential unexpected failure or outage of a system component, such as a Generator, transmission line, circuit breaker, switch, or other electrical element. A Contingency also may include multiple components, which are related by situations leading to simultaneous component outages. (As defined in the NYISO Tariffs.)

Day Ahead Market (DAM): A NYISO-administered wholesale electricity market in which Capacity, Energy, and/or Ancillary Services are scheduled and sold Day-Ahead consisting of the Day-Ahead scheduling process, price calculations, and Settlements. The DAM sets prices as of 11 a.m. the day before the day these products are bought and sold, based on generation and energy transaction bids offered in advance to the NYISO. More than 90% of energy transactions occur in the DAM. (As defined in the NYISO Tariffs)

DC tie-lines: A high voltage transmission line that uses direct current for the bulk transmission of electrical power between two control areas.

Demand Response: A mechanism used to encourage consumers to reduce their electricity use during a specified period, thereby reducing the peak demand for electricity.

Dispatchable Emission Free Resource (DEFRR): A proxy generator type assumed for generation expansion in the Policy Case to represent a yet unavailable future technology that would be dispatchable and produces emissions-free energy (e.g., hydrogen, RNG, nuclear, other long-term season storage, etc.).

Eastern Interconnection Planning Collaborative (EIPC): A group of planning authorities convened to establish processes for aggregating the modeling and regional

transmission plans of the entire Eastern Interconnection and for performing inter-regional analyses to identify potential opportunities for efficiencies between regions in serving the needs of electrical customers.

Economic Dispatch of Generation: The operation of generation facilities to produce energy at the lowest cost to reliably serve consumers.

Economic Transmission Project Evaluation (ETPE): The evaluation of a Regulated Transmission Project by the NYISO. Under this process a Developer can propose a RETP to address constraint(s) on the BPTFs identified in the Economic Planning Process for purposes of potential cost allocation and cost recovery. The process is further described in Sections 31.3.2, 31.5.1, 31.5.4, and 31.5.6 (As defined in the OATT.)

Electric System Planning Working Group (ESPWG): A NYISO governance working group for Market Participants designated to fulfill the planning functions assigned to it. The ESPWG is a working group that provides a forum for stakeholders and Market Participants to provide input into the NYISO's CSPP, the NYISO's response to FERC reliability-related Orders and other directives, other system planning activities, policies regarding cost allocation and recovery for reliability projects, and related matters.

Exports: A Bilateral Transaction or purchases from the LBMP Market where the Energy is delivered to a NYCA Interconnection with another Control Area. (As defined in the NYISO Tariffs.)

External Areas: Neighboring Control Areas including Hydro Quebec, ISO-New England, PJM Interconnection, and IESO.

Federal Energy Regulatory Commission (FERC): The federal energy regulatory agency within the U.S. Department of Energy that approves the NYISO's tariffs and regulates its operation of the bulk electricity grid, wholesale power markets, and planning and interconnection processes.

FERC Form 715: An annual transmission planning and evaluation report required by the FERC – filed by the NYISO on behalf of the transmitting utilities in New York State.

FERC Order No. 890: Adopted by FERC in February 2007, Order 890 is a change to FERC's 1996 open access regulations (established in Orders 888 and 889). Order 890 added provisions establishing competition in transmission planning, transparency and planning in wholesale electricity markets and transmission grid operations and strengthened the OATT with regard to non-discriminatory transmission service. Order 890 requires Transmission Providers – including the NYISO – to have a formal planning process that provides for a coordinated transmission planning process, including reliability and economic planning studies.

Gold Book: Annual NYISO publication, also known as the Load and Capacity Data Report. See Library/Reports at NYISO.com

Heat Rate: A measurement used to calculate how efficiently a generator uses thermal energy. It is expressed as the number of BTUs of thermal energy required to produce a kilowatt-hour of electric energy. Operators of generating facilities can make reasonably accurate estimates of the

amount of heat energy a given quantity of any type of fuel. When thermal energy input is compared to the actual electric energy produced by the generator, the resulting figure tells how efficiently the generator converts fuel into electrical energy.

High Voltage Direct Current (HVDC): A transmission line that uses direct current for the bulk transmission of electrical power, in contrast with the more common alternating current systems. For long-distance distribution, HVDC systems are less expensive and suffer lower electrical losses.

Hurdle Rate: The conditions in which economic interchange is transacted between neighboring markets/control areas. The rate represents a minimum savings level, in \$/MWh, that needs to be achieved before energy will flow across the interface.

Imports: A Bilateral Transaction or sale to the LBMP Market where Energy is delivered to a NYCA Interconnection from another Control Area. (As defined in the NYISO Tariffs.)

Independent System Operator (ISO): An organization, formed at the direction or recommendation of the Federal Energy Regulatory Commission (FERC), which coordinates, controls and monitors the operation of the electrical power system, usually within a single U.S. State, but sometimes encompassing multiple states.

Installed Capacity (ICAP): A generator or load facility that complies with the requirements in the Reliability Rules and is capable of supplying and/or reducing the demand for energy in the NYCA for the purpose of ensuring that sufficient energy and capacity are available to meet the Reliability Rules. (As defined in the OATT.)

Installed Reserve Margin (IRM): The amount of installed electric generation capacity above 100% of the forecasted peak electric consumption that is required to meet the NYSRC adequacy criteria. Most planners consider a 15-20% reserve margin essential for good reliability.

ISO Market Administration and Control Area Services Tariff (Services Tariff): Sets forth the provisions applicable to the services provided by the ISO related to its administration of competitive markets for the sale and purchase of Energy and Capacity and for the payments to Suppliers who provide Ancillary Services to the ISO in the ISO Administered Markets ("Market Services") and the ISO's provision of Control Area Services ("Control Area Services"), including services related to ensuring the reliable operation of the NYS Power System. (As defined in the Services Tariff.)

ISO Open Access Transmission Tariff (OATT): Every [FERC]-approved ISO or RTO must have on file with [FERC] an open access transmission tariff of general applicability for transmission services, including ancillary services, over such facilities. (As defined in the Code of Federal Regulations.)

Load: A term that refers to either a consumer of Energy or the amount of demand (MW) or Energy (MWh) consumed by certain consumers. (As defined in the NYISO Tariffs.)

Locational Capacity Requirement (LCR): Specifies the minimum amount of installed capacity that must be procured from resources situated specifically within a locality (Zones G-J, Zone J, and Zone K). It considers resources

within the locality as well as the transmission import capability to the locality in order to meet the resource adequacy reliability criteria of the NYSRC and the NPCC.

Load Serving Entity (LSE): Any entity, including a municipal electric system and an electric cooperative, authorized or required by law, regulatory authorization or requirement, agreement, or contractual obligation to supply Energy, Capacity and/or Ancillary Services to retail customers located within the NYCA, including an entity that takes service directly from the NYISO to supply its own Load in the NYCA. (As defined in the Services Tariff.)

Load Zones: The eleven regions in the NYCA connected to each other by identified transmission interfaces. Designated as Load Zones A-K.

Local Transmission Planning Process (LTPP): The first step in the CSPP, under which stakeholders in New York's electricity markets participate in local transmission planning.

Locational Based Marginal Pricing (LBMP): The price of Energy at each location in the NYS Transmission System.

Management Committee: NYISO governance committee that reviews the System & Resource Outlook report following review by the Business Issues Committee and makes recommendations regarding approval to the NYISO's Board of Directors.

Multi-Area Production Simulation (MAPS) Software: An analytic tool for market simulation and asset performance evaluations.

Multi-Area Reliability Simulation (MARS) Software: An analytic tool for market simulation to assess the reliability of a generation system comprised of any number of interconnected areas.

Market Based Solution: Investor-proposed projects that are driven by market needs to meet future reliability requirements of the bulk electricity grid as outlined in the RNA. Those solutions can include generation, transmission and Demand Response programs. .

Market Participant: An entity, excluding the NYISO, that produces, transmits sells, and/or purchases for resale capacity, energy, and ancillary services in the wholesale market. Market Participants include: customers under the NYISO tariffs, power exchanges, TOs, primary holders, load serving entities, generating companies and other suppliers, and entities buying or selling transmission congestion contracts.

New York Control Area (NYCA): The area under the electrical control of the NYISO. It includes the entire state of New York and is divided into 11 Load Zones.

New York State Department of Public Service (NYDPS): The New York State agency that supports the New York State Public Service Commission. See DPS.NY.gov

New York State Energy Research and Development Authority (NYSERDA): The New York State public authority charged with conducting a multifaceted energy and environmental research and development program to meet New York State's diverse economic needs, including administering the state System Benefits Charge, Renewable

Portfolio Standard, energy efficiency programs, the Clean Energy Fund, and the NY-Sun Initiative. See NYSERDA.NY.gov

New York Independent System Operator (NYISO): Formed in 1997 and commencing operations in 1999, the NYISO is a not-for-profit organization that manages New York's bulk electricity grid – a more than 11,000-mile network of high voltage lines that carry electricity throughout the state. The NYISO also oversees the state's wholesale electricity markets. The organization is governed by an independent Board of Directors and a governance structure made up of committees with Market Participants and stakeholders as members.

New York State Public Service Commission (NYSPPSC): The decision-making body of the New York State Department of Public Service, which regulates the state's electric, gas, steam, telecommunications, and water utilities, oversees the cable industry, has the responsibility for setting rates and overseeing that safe and adequate service is provided by New York's utilities, and exercises jurisdiction over the siting of major gas and electric transmission facilities.

New York State Reliability Council (NYSRC): A not-for-profit entity the mission of which is to promote and preserve the reliability of electric service on the New York State Power System by developing, maintaining, and, from time-to-time, updating the Reliability Rules which shall be complied with by the New York Independent System Operator (NYISO) and all entities engaging in electric transmission, ancillary services, energy and power transactions on the New York State Power System.

New York State Bulk Power Transmission Facilities (BPTFs): The facilities identified as the New York State Bulk Power Transmission Facilities in the annual Area Transmission Review submitted to the NPCC by the ISO pursuant to NPCC requirements. (As defined in the OATT.) The BPTFs include (i) all NYCA transmission facilities 230 kV and above, (ii) all NYCA facilities identified by the NYISO to be part of the Bulk Power System, as defined by the NPCC and the NYSRC, and (iii) select 115 kV and 138 kV facilities that are considered to be bulk power transmission in accordance with the 2004 FERC Order.

Nomogram: Nomograms are system representations used to model electrical relationships between system elements. These can include; voltage or stability related to load level or generator status; two interfaces related to each other; generating units the output of which are related to each other; and operating procedures.

North American Electric Reliability Corporation (NERC): A nonprofit corporation based in Atlanta Georgia to promote the reliability and adequacy of bulk power transmission in the electric utility systems of North America. NERC establishes mandatory reliability standards that it enforces and that are enforced by the Northeast Power Coordinating Council.

Northeast Coordinated System Planning Protocol (NCSPP): ISO New England, PJM and the NYISO work together under the NCSPP, to analyze cross-border issues and produce a regional electric reliability plan for the northeastern United States.

Northeast Power Coordinating Council (NPCC): A not-for-profit corporation in the state of New York responsible for promoting and enhancing the reliability of the international, interconnected bulk power system in Northeastern North America. The NPCC encompasses Ontario, Quebec, New York and New England, and serves as the Regional Entity overseeing and enforcing the reliability standards of the North American Electric Reliability Corporation.

Operating Reserves: Capacity that is available to supply Energy or reduce demand and that meets the requirements of the NYISO. (As defined in the Services Tariff.)

Overnight Costs: Direct permitting, engineering and construction costs with no allowances for financing costs.

Phase Angle Regulator (PAR): Device that controls the flow of electric power in order to increase the efficiency of the transmission system.

PLEXOS Software: An analytic tool used for purposes of capacity expansion optimization in this study.

Proxy Generator Bus: A proxy bus located outside the NYCA that is selected by the NYISO to represent a typical bus in an adjacent Control Area and for which LBMP prices are calculated. The NYISO may establish more than one Proxy Generator Bus at a particular Interface with a neighboring Control Area to enable the NYISO to distinguish the bidding, treatment and pricing of products and services at the Interface. (As defined in the NYISO Tariffs.)

Public Policy Transmission Planning Process (PPTPP): The process by which the ISO solicits needs for transmission driven by Public Policy Requirements, evaluates all solutions on a comparable basis, and selects the more efficient or cost-effective transmission solution, if any, for eligibility for cost allocation under the ISO Tariffs. (As defined in the OATT.)

Queue Position: The order, in the NYISO's Interconnection Queue, of a valid Interconnection Request, Study Request, or Transmission Interconnection Application relative to all other pending Requests. See NYISO OATT

Regional Greenhouse Gas Initiative (RGGI): A cooperative effort by ten Northeast and Mid-Atlantic states to limit carbon dioxide emissions using a market-based cap-and-trade approach.

Regulated Backstop Solution: Proposals required of Responsible TOs to meet Reliability Needs identified in the RNA as outlined in the OATT. Those solutions can include generation, transmission or Demand Response. Non-Transmission Owner developers may also submit regulated solutions. The NYISO may call for a Gap Solution if neither market-based nor regulated backstop solutions meet Reliability Needs in a timely manner. To the extent possible, the Gap Solution should be temporary and strive to be compatible with market-based solutions. The NYISO is responsible for evaluating all solutions to determine if they will meet identified Reliability Needs in a timely manner.

Regulated Economic Transmission Project (RETP): A transmission project or a portfolio of transmission projects proposed by Developer(s) to address constraint(s) on the BPTFs identified in the Economic Planning Process, which

transmission project(s) are evaluated in the Economic Transmission Project Evaluation and are eligible for cost allocation and cost recovery under the ISO OATT if approved by a vote of the project's Load Serving Entity beneficiaries pursuant to Section 31.5.4 of this Attachment Y.

Regulation Service: The Ancillary Service defined by the FERC as "frequency regulation" and that is instructed as Regulation Capacity in the Day-Ahead Market and as Regulation Capacity and Regulation Movement in the Real-Time Market.

Reliability Need: A condition identified by the NYISO in the RNA as a violation or potential violation of Reliability Criteria. (As defined in the OATT.)

Reliability Needs Assessment (RNA): A biennial report that evaluates resource adequacy and transmission system security over years three through ten of a ten-year planning horizon, and that identifies future needs of the New York electric grid. It is the first step in the NYISO's Reliability Planning Process.

Reliability Planning Process (RPP): The process set forth in this [OATT] Attachment Y by which the ISO determines in the RNA whether any Reliability Need(s) on the BPTFs will arise in the Study Period and addresses any identified Reliability Need(s) in the CRP, as the process is further described in Section 31.1.2.2. (As defined in the OATT.)

Requested Economic Planning Study (REPS): The process by which a Market Participant or any other interested party may, at any time, request that the NYISO perform a study separate from and in addition to the System & Resource Outlook at the requesting party's sole expense and solely for informational purposes. The process is further described in Section 31.3.3. (As defined in the OATT.)

Security Constrained Unit Commitment (SCUC): A process developed by the NYISO, which uses a computer algorithm to dispatch sufficient resources, at the lowest possible Bid Production Cost, to maintain safe and reliable operation of the NYS Power System.

Shadow Price: The incremental economic impact of a constraint on system production cost. Calculated in linear program optimization for economic dispatch.

Short-Term Assessment of Reliability (STAR): The NYISO's quarterly assessment, in coordination with the Responsible Transmission Owner(s), of whether a Short-Term Reliability Process Need will result from a generator becoming retired, entering into a Mothball Outage, or being unavailable due to an Installed Capacity Ineligible Forced Outage, or from other changes to the availability of Resources or to the New York State Transmission System. See NYISO OATT Attachment FF

Short-Term Reliability Process: The process by which the NYISO evaluates and addresses the reliability impacts resulting from both: (1) Generator Deactivation Reliability Need(s), and/or (2) other Reliability Needs on or affecting the Bulk Power Transmission Facilities that are identified in a Short-Term Assessment of Reliability. The Short-Term Reliability Process evaluates reliability needs in years one through five of the ten-year Study Period, with a focus on needs in years one

through three. See NYISO OATT Attachment FF

Special Case Resource (SCR): Demand Side Resources whose Load is capable of being interrupted upon demand at the direction of the ISO, and/or Demand Side Resources that have a Local Generator, which is not visible to the ISO's Market Information System and is rated 100 kW or higher, that can be operated to reduce Load from the NYS Transmission System or the distribution system at the direction of the ISO. (As defined in the Services Tariff.)

Stakeholders: A person or group that has an investment or interest in the functionality of New York's transmission grid and markets.

System & Resource Outlook (formerly "CARIS"): Biennial report produced by the NYISO, through which it summarizes the current assessments, evaluations, and plans in the biennial Comprehensive System Planning Process, produces a twenty-year projection of congestion on the New York State Transmission System, identifies, ranks, and groups congested elements, and assesses the potential benefits of addressing the identified congestion.

Thermal transfer limit: The maximum amount of heat a transmission line can withstand. The maximum reliable capacity of each line, due to system stability considerations, may be less than the physical or thermal limit of the line.

Transfer Capability: The amount of electricity that can flow on a transmission line at any given instant, in MW, respecting facility rating and reliability rules.

Transmission Congestion Contract (TCC): The right to collect, or obligation to pay, Congestion Rents in the Day Ahead Market for Energy associated with a single MW of transmission between a specified Point Of Injection and Point Of Withdrawal. TCCs are financial instruments that enable Energy buyers and sellers to hedge fluctuations in the price of transmission. (As defined in the OATT.)

Transmission Constraint: Limitations on the ability of a transmission facility to transfer electricity during normal or emergency system conditions.

Transmission District: The geographic area in which a Transmission Owner, including LIPA, is obligated to serve Load, as well as the customers directly interconnected with the transmission facilities of the Power Authority of the State of New York. (As defined in the NYISO Tariffs.)

Transmission Interface: A defined set of transmission facilities that separate Load Zones and that separate the NYCA from adjacent Control Areas.

Transmission Owner (TO): The public utility or authority (or its designated agent) that owns facilities used for the transmission of Energy in interstate commerce and provides Transmission Service under the Tariff. (As defined in the NYISO Tariffs.)

Transmission Planning Advisory Subcommittee (TPAS): A group of Market Participants that advises the NYISO Operating Committee and provides support to the NYISO Staff with regard to transmission planning matters including transmission system reliability, expansion, and interconnection.

Unforced Capacity (UCAP): The measure by which Installed Capacity Suppliers will be rated, in accordance with formulae set forth in the ISO Procedures, to quantify the extent of their contribution to satisfy the NYCA Installed Capacity Requirement, and which will be used to measure the portion of that NYCA Installed Capacity Requirement for which each LSE is responsible.

List of Key Acronyms

100 x 40	New York 100% Carbon Free Electric Sector by 2040 Goal
70 x 30	New York 70% End Use Renewable Energy by 2030 Goal
BTM-PV	Behind-The-Meter Photovoltaic Generation
CARIS	Congestion Assessment and Resource Integration Study
CC	Combined Cycle Generation
CLCPA	Climate Leadership and Community Protection Act
CO₂	Carbon Dioxide
CT	Combustion Turbine
DEFR	Dispatchable Emission Free Resource
DMNC	Dependable Maximum Net Capacity
EIA	U.S. Energy Information Administration
EPA	U.S. Environmental Protection Agency
ESPWG	Electric System Planning Working Group
ESR	Energy Storage Resource
ETPE	Economic Transmission Project Evaluation
FERC	Federal Energy Regulatory Commission
Gold Book	NYISO's Load and Capacity Data Report "Gold Book"
HRM	Hourly Resource Modifier
HQ	Hydro Quebec
ICAP	Installed Capacity
LBMP	Locational-Based Marginal Pricing
LBW	Land Based Wind
MAPS	Multi Area Production Simulation Software
MARS	Multi-Area Reliability Simulation software
MW	Megawatt
MWh	Megawatt Hour
NO_x	Nitrogen Oxide
NREL	National Renewable Energy Laboratory

NYCA	New York Control Area
NYISO	New York Independent System Operator
NYSDPS	New York State Department of Public Service
NYSERDA	New York State Energy Research & Development Authority
OATT	Open Access Transmission Tariff
OSW	Offshore Wind
PV	Photovoltaic or Solar Powered Generation
PSH	Pumped Storage Hydro Generation
RE	Renewable Energy
REC	Renewable Energy Certificates
REPS	Requested Economic Planning Study
RETP	Regulated Economic Transmission Project
RGGI	Regional Greenhouse Gas Initiative
RPP	Reliability Planning Process
TARA	Transmission Adequacy & Reliability Assessment
TCCs	Transmission Congestion Contracts
TPAS	Transmission Planning Advisory Subcommittee
TWh	Terawatt Hour
UCAP	Unforced Capacity
UPNY-SENY	Upstate New York – Southeast New York
UPV	Utility Scale Photovoltaic Solar Generation