



Watertown City Council
Monday, May 9, 2022
6:00 p.m.

CITY OF WATERTOWN, NEW YORK

WORK SESSION AGENDA

Monday, May 9, 2022

6:00 p.m.

This shall serve as notice that the next regularly scheduled work session of the City Council will be held on Monday, May 9, 2022, at 6:00 p.m. in the City Council Chambers, 245 Washington Street, Watertown, New York.
The City Council meeting is open to the public.

Discussion Item:

1. Hydro-Electric Revenue Options
 - * Skip Trimble, Managing Director
 - * AMBER Energy US, Inc

MAY 3, 2022

WATERTOWN HYDRO-ELECTRIC PROJECT

REVENUE OPTIONS



**WATERTOWN HYDRO-ELECTRIC PROJECT
REVENUE OPTIONS**

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PURPOSE OF THIS REPORT

The City of Watertown is engaged in looking at what options they have to continue a revenue stream, for the City, with termination of the agreements between National Grid and the city. The agreements terminations commence on the contractual termination between National Grid and the City for: 1.) Power Purchase Agreement and, 2.) Transmission and Distribution Services Agreement, both begun on January 1, 1991, and both terminating on December 31, 2030. In those contractual terminations, the payments from National Grid for “excess power” ends and the generation asset returns to the city’s control.

The evaluation of these options has been done with an in-depth framework of:

- * what products and markets are available to the hydro-electric plant;
- * what legal structures are available to the city to participate in the various markets;
- * what are the values and range of risks for different options for the plant;
- * what other potential electrical revenues are possible, and,
- * what are the potential pros and cons of these options.

In adherence to the agreements mentioned above, National Grid currently and through the life of the agreements, pays the city a pre-published Avoided Cost for Excess Power after the city’s use for specific commercial application. This avoided cost is, presently, extremely beneficial to The City of Watertown. The agreements identify that National Grid accepts “power and energy” from the city. The definition of “power and energy” was not articulated in the agreements but National Grid stated that they are defining “power

and energy” as: energy (“kWhs”), capacity (“kW”) and Renewable Energy Credits (RECs). National Grid stated that they did use RECs and capacity from the unit, and that it was allowed by the NYPSC as preceded in NYPSC Case 08-E-1048. This was confirmed by Mr. Trimble, the acting city energy consultant, via NYSEDA, NYPSC and NYISO. National Grid also stated that they did not use the normal protocols at collecting and utilizing these products (respectively capacity is defined by the NYISO capacity market participation and RECs are initialized and retired, i.e. “used”, in NYSEDA’s GATS [Generation Attribute Tracking System]). National Grid stated that they integrated capacity and RECs into their Central New York portfolio, a process to which this energy expert is not aware of and could not find an exception to the rules for how National Grid utilized these products. In order to observe how this arcane process was executed, we requested access to the NYGATS (New York Generation Attribute Tracking System) to identify the RECs and how they were being created and retired. We were politely denied access by National Grid due to its “proprietary” nature. We also requested access to the NYGADS (Generation Availability Data System) which defines the capacity of every generating unit in the NYISO. We also were politely denied access by National Grid.^{1 2 3}

This report is predicated on the best information available and the denied access to appropriate systems forced us to take a more conservative approach to the data that was

¹ E-Mail from Christopher Meyer, National Grid to John Trimble, Sept. 7, 2021: “Unfortunately National Grid will not be able to grant your request for read-only access to the Niagara Mohawk NYGATS account to view the data for the Watertown hydro asset. Our Niagara Mohawk NYGATS account contains confidential transaction data that is visible to anyone with a Niagara Mohawk NYGATS account , including our electric load, information regarding the amount of RECs and ZECs we are acquiring for NY Clean Energy Standard compliance, generation data/certificates for other facilities, and other Company information. The confidential information is viewable to anyone with account access regardless of the generator access and read-only permissions that are selected. It is for this reason that National Grid must respectfully decline your request. ”

² E-Mail from Christopher Meyer, National Grid to John Trimble, Sept. 7, 2021: “There is no official GADS reporting occurring for the Watertown hydro generator asset to the NYISO or NERC. The generator is classified as load modifier on the system and is not a participant in the NYISO markets therefore GADS reporting to NYISO is not required. It is also my understanding that GADS reporting to NERC is not a requirement since the generator has a nameplate rating of below 20MW.”

³ Section 4.5 of the NYISO Manual 4 Installed Capacity Manual:
“The NYISO shall compute the amount of Unforced Capacity that each Limited Control Run-of-River Hydro Resource is authorized to provide in the NYCA separately for Summer and Winter Capability Periods. The amount for each Capability Period shall be equal to the rolling average of the hourly net Energy provided by each Limited Control Run-of-River Hydro Resource during the twenty (20) highest NYCA-integrated real-time load hours in each of the five (5) previous Summer or Winter Capability Periods, as appropriate, stated in megawatts.” Skip Trimble calculated that the summer capacity (2016-2020) was 4.52 MWs and Winter was 5.37 MWs. Jim Mills, City Comptroller, has the calculations.

not able to be audited. We believe it does not impair the validity of this report and even requires us to handle the results in a more conservative approach.

As we are exploring all electric revenue options, this report shall also look at the potential of the city offering its citizens the option of buying electrical energy from the city⁴ at a guaranteed discount to the National Grid tariff. This potential would offer the citizen's a discounted electric energy cost compared to National Grid's tariff and also bring in much needed revenue for the city.

⁴ NYSERDA has established a Community Choice Aggregation (CCA) which allows local elected officials to choose where the energy comes from for their community. It's a program to purchase power in bulk for virtually all homes and small businesses within the participating jurisdiction.

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EXECUTIVE SUMMARY

The goal of this report was to find the best option to replace the existing PPA and the T&D Services Agreements with National Grid, upon the termination of these agreements on December 31, 2030. We identified six different options and evaluated a range of possible variables that would change in the future, but all of our calculations were based upon actual historic information. We had over 27 permutations of variables that produced a range of results. Those variables included actual river flow, actual hydro generation, energy prices⁵, capacity prices, and a range of costs in executing energy products transactions. Energy prices being the one variable that we had an extensive collection of data (hourly pricing for the three years) we evaluated the range of its potential costs by using a normal distribution methodology that represented a 60% confidence level. The rest of the variables were based upon actual results of tariff costs or capacity auctions were are normally changed on an annual basis.

The options included:

1. Sell Off the Hydro-Generation Unit
2. Sell Wholesale Market Generation Products ONLY
3. Sell Residential Market ONLY
4. Wholesale Market Generation Products and Residential Market Sales
5. Electric Cooperative
6. Electric Municipal Utility

The range of calculated values, the pros, the cons and the author's suggestions are included in the following table, **REVENUE OPTIONS TABLE - PROS AND CONS**. Briefly, the following facts are evaluated in this report:

1. All options have a potential revenue of between \$180,500 to \$3,920,000.
2. Hydro-generation products alone have a value range of between \$180,500 to \$1,193,000 per year with a potential additional RECs and Spinning Reserve revenue, that we are still exploring, of another \$660,000.

⁵ Energy and capacity prices were actual based upon three random years - 2021, 2018 and 2015 which we felt covered a full ranges of diverse political, energy industry, and energy market conditions.

3. Residential Sales alone have a value range of \$576,400-\$2,812,000.
4. It looks like New York laws invalidates the Federal Law to allow for cooperatives hence this option was not pursued.
5. The Municipal Utility, i.e. creating a utility for the city, does not have the correct economies to scale to make it, revenue-wise, viable plus the city is not yet ready, in the author's opinion, to develop the human capital and focus on a utility business.
6. A residential sales program under NYSERDA's Community Choice Aggregation program can and it is **RECOMMENDED BY THE AUTHOR IT SHOULD BE EVALUATED** before the termination of the National Grid agreements.
7. We have explored the possibility of the NY Department of Public Service helping out with O&M. This should continue going forward but the operative, as discussed with Jim Mills, City Comptroller, is that there has to be an economic "need".
8. The NY Department of Public Service has programs to grant capital to expand small hydro projects. This should continue to be explored with the NYDPS.
9. We are continuing to explore the value of how to implement the Spinning Reserve ancillary product. It is a very valuable service and suited for a run-of-river hydro unit. The NYISO initially said that a ROR hydro plant could not sell this product. Upon further inquiries they changed their mind and we are getting specific details on how to bill and model this product.
10. The NY PSC is currently modifying the definitions, processes and implementation of Renewable Energy Credits (RECs). In this flux, REC definitions are changing and hence we did not include REC modeling. This is a future upside that we need to keep monitoring the changes as they occur.

11. Should the City elect to sell off hydro generation products, an ESCO needs to be found that is a NYISO member and understands how to sell the generation portfolio. Should the city elect to sell electricity at a discount to the National Grid tariff, an ESCO will need to be found that can buy energy from the grid, work within the NYSERDA CCA framework and one that has EDI certification and is HEPFA certified. Both of these may be found in one ESCO.
12. Before the termination of the National Grid agreements, the hydro plant needs to get "Qualified Facility" status. Under PURPA 1978, this would give the plant grid access rights and reduce the regulatory requirements that could be onerous. Steve Wood with Northeast Energy Service LLC, is currently developing a plan for this.
13. The city needs to develop working knowledge of both GATS (Generation Attribute Tracking System) and GADS (Generating Availability Data System) so as to understand RECs processing and capacity processing.
14. It is hereby recommended, by the author, to **NOT SELL OFF THE HYDRO PLANT**. I recently had lunch with the STATOIL (Norwegian State Owned Oil Company) officer that hired me years back. He relayed to me that Norway knew they had a finite amount of gas and oil in the North Sea. As such they planned for the future generations by, whenever they sold this finite resource, putting 95% of the revenue into The Norway Fund. This was for their future generations. The City of Watertown has a resource that is virtually infinite and whose value will continue to grow. I strongly believe keeping this resource is in the city's best interest. This report calculated that a one time sale of this unit had a sale value of \$2.3-\$15.5 Million.
15. It should be noted that a variable O&M cost of about \$500,000 per year was not incorporated into the calculus of the viability of the options. It was thought, by the author, that this was a sunk cost regardless of options taken and there is the possibility that there are funds from the NYPSC that can cover this. Others may handle this cost differently but the conclusions remain the same.

16. The author also hereby recommends, that for optimal revenue creation, **BOTH HYDRO GENERATION PRODUCTS BE SOLD TO THE WHOLESALE MARKET (NYISO) AND THE CITY PARTICIPATE IN RESIDENTIAL SALES (NYSERDA's CCA).**

REVENUE OPTIONS TABLE - PROS & CONS

OPTION	ANNUAL VALUE	BENEFITS	CONS of OPTION	Skip's SUGGESTION
I. Sell Hydro-Generation Asset	This report calculates a range \$2.3-\$15.5 Million though it has been reported that the city has been offered \$40 million	A one time payment Value of \$5.8-\$38.6 Million with an estimated payout of: \$2.3-\$15.5 Million	<ul style="list-style-type: none"> • Lose increased energy products value forward • Get a fraction of value in PW • Lose a "forever" green and valuable asset 	DO NOT sell this valuable and green resource. It is a legacy and forever cash flow.
II. Wholesale Market ONLY	A range of \$180,500-\$1,193,000 per year	<ul style="list-style-type: none"> • Must also include RECs • Constant cash flow • Potential NYDPS O&M help • Potential NYDPS plant expansion capital 	<ul style="list-style-type: none"> • Need an ESCO for NYISO markets • Small investment in metering and communications equipment for NYISO participation • Need understanding of LBMP, capacity, RECs and spin reserve markets • Need "QF" status to protect access and regulatory rights 	Always the safe bet to use an existing and valuable resource but there can be a much bigger revenue play by adding residential offering.
III. Residential Market ONLY	A range of \$576,500-\$2,812,000 per year	<ul style="list-style-type: none"> • Sell to residents at 10% discount to tariff • Sell less LBMP normally a positive for city • City and residents benefit! 	<ul style="list-style-type: none"> • Needs ESCO to handle opt-in and billing • Need to explain to residents (difficult) • Slight potential risk LBMP is greater than receipts 	Watertown should look at an early entree into this market. That is to say, participation before the termination of the National Grid agreements.

WATERTOWN HYDRO-ELECTRIC PROJECT

OPTION	ANNUAL VALUE	BENEFITS	CONs of OPTION	Skip's SUGGESTION
IV. Participate in both Wholesale and Residential Markets	A range of \$885,100-\$3,920,000 per year	<ul style="list-style-type: none"> • Also participate in green (RECs) market • Constant cash flow • Potential NYDPS O&M help • Residential benefits from energy purchase • City adds to coffers • Residential charge ALWAYS beats National Grid's tariff 	<ul style="list-style-type: none"> • Need an ESCO to participate • Small investment in metering and communications equipment for NYISO participation • Need understanding of LBMP, capacity, RECs and spinning reserve • Need "QF: status to protect access and regulatory rights • Need to explain and sell residential target (what % will participate?) • Slight LBMP risk (floating to fixed) 	The BEST option based upon city revenue optimization
V. Become an Electric Cooperative	N/A	N/A	N/A	It has been pointed out that this is not able to be executed since New York laws prohibit this now.
VI. Become an Electric Municipal Utility	A range of \$460,100-\$3,495,500	Same as IV above	<ul style="list-style-type: none"> • Legal Fees of \$100,000 to become a cooperative • Need to explain and have opt-in for every cooperative member • Annual coop membership meeting and elections and admin costs • Need to oversee wholesale and residential markets • Need a staff of at least 6 people at about \$400,000/year • "QF" designation required to protect access rights 	Too costly to go in this direction and the size of Watertown does not allow economies to scale.

WHAT PRODUCTS DO WE HAVE?

National Grid uses the electric generation (kWhs) as directed by the Purchase Power Agreement. The electric generation, less the city's contractual usage, is the Excess Power. The Excess Power is multiplied by the agreement's published Avoided Cost which results in the city's current revenue stream. We were not able to identify how National Grid used or monetized RECs and capacity, but we verified from the NYSERDA and the NYISO, respectively, that there were active commodity quantities on the books. NYSERDA is responsible for the RECs data (who in turn reports to the New York Public Service Commission) in the NYGATS system. NYISO is responsible for the capacity market and maintaining the NYGADS system in which capacity is documented. NYSERDA and NYISO both independently confirmed commodities were created (i.e. capacity and RECs) but would not disclose details without National Grid's approval. In summary, National Grid used the energy commodity per the agreement and somehow used RECs and capacity with no discernible documentation to indicate how.

We decided to look at the Watertown hydro-generation unit from a blank canvas, ignoring National Grid's Purchase Power Agreement portfolio management process. Looking at Watertown's generation portfolio, we identified the following major revenue streams: 1.) **Energy** (kWhs), 2.) **Capacity** (kW), 3.) **RECs** (Renewable Energy Credits in MWh) and an ancillary service - 4.) **Synchronized Spinning Reserve**. This is the portfolio of products that we focused on, but be aware that there are additional ancillary services that Watertown Hydro-electric can tap into. They are not here addressed as they are minor compared to these four consequential and detailed products. As one example, we could also enlist Black Start Capabilities for the NYISO for an additional, comparatively diminutive, revenue stream. These will be explored in detail closer to the termination of the contracts.

In addition to looking at the revenue portfolio of the hydro generation, we also will investigate the viability of using NYSERDA's **Community Choice Aggregation** as not only an additional revenue stream for the city, but a simultaneous reduced electric energy cost option to the citizens of Watertown should they elect to opt-in to such a program.

i. GENERATION PRODUCTS

1.) ENERGY (MWhs)

Energy: *Energy is the amount of electricity a generator produces over a specific period of time. It is measured in megawatt-hours (MWh). For example, a generating unit with a 1 megawatt capacity operating at full capacity for one hour will produce 1 megawatt-hour of electricity.*⁶

After many decades of electricity markets dominated by regulated monopolies, there was a movement to restructure the electricity industry in the 1990s. Driven by the desire to address high electricity prices, some U.S. states opted to deregulate the electric utility industry. The New York Independent System Operator (NYISO) was created in 1999 to facilitate the restructuring of the industry in the state of New York. The NYISO's mission is to provide fair and open access to the electrical grid, maintain and enhance regional reliability, provide factual information to policymakers, stakeholders and investors in the power system, and plan the power system for the future.

In a deregulated electricity market, load serving entities (or distributors) provide bids to purchase energy and power suppliers (or generators) provide offers to sell energy. The NYISO manages these market transactions and schedules energy sales and purchases in multiple locations across the state.

Locational Based Marginal Pricing (LBMP) is a pricing methodology for the cost of energy at each location in the New York State transmission system. LBMP is calculated every hour at every proximate delivery point. It includes three components:

1. **least costed available generation** that can be delivered to the delivery point,
2. Added to that are: **resultant transmission losses** of the least costed generation, and,
3. **transmission congestion** caused by the flow of power from the selected generation to the delivery point.

LBMP is stored on the NYISO site as aggregated hourly energy costs, \$/MWh, and it is from this source that the LBMP values were extracted for respective time periods evaluated .

⁶ Definition from the NYISO Glossary

2.) CAPACITY (MWs)

Capacity: *Capacity is the maximum electric output that a generator can produce. It is measured in megawatts (MW).⁷*

The NYISO-administered capacity market serves a vital role in New York State by promoting reliability on the grid. In order for the electric grid to work, the amount of electricity put onto the grid must always equal the amount of electricity being consumed. At times when energy demand is at its highest, capacity must be available to keep the grid in balance.

By selling capacity, electricity suppliers commit themselves to being available to meet the energy needs of New Yorkers. The capacity market supports reliability every day, but especially on high-demand days such as in the summer when increased air conditioning use pushes load to higher levels.

“Installed Capacity” refers to the maximum amount of electricity that a generator has demonstrated it can generate under the expected peak design conditions. The capacity market facilitates the purchase and sale of generating capacity to cover the maximum needs of the system PLUS extra to meet unforeseen contingencies.

Through this market, resources are essentially paid to be available when needed.

Capacity is bought and sold through auctions (as well as individual contracts between generators and suppliers). We will, unlike National Grid, monetize the capacity which has been calculated for the Watertown Hydro unit.

⁷ Definition from the NYISO Glossary

3.) RECs (Renewable Energy Credits in MWhs)

RECS: *A REC is created for each megawatt-hour (MWh) of electricity generated from a qualifying clean energy resource. The resource then sells that REC to NYSERDA for a fixed price per REC, as agreed upon in its contract. The New York Load Serving Entities (LSEs) purchase RECs from NYSERDA to demonstrate compliance with the state's targets.⁸*

New York first adopted a Renewable Portfolio Standard (RPS) in 2004, with the State calling for 25% renewable generation—including large-scale hydro—by 2013. The program set up a central procurement structure, with NYSERDA tasked with contracting renewable projects.

On October 2, 2019, NYSERDA published its proposal for an Index REC contract structure with the aim of reducing financing and procurement costs for renewable resources. An Index REC structure is akin to a Fixed REC structure, but with variable REC prices indexed to reference energy and capacity prices that reflect market conditions. This has caused significant changes, yet to be determined, in the valuation of RECs in the RECs market.

The Index REC price and energy and capacity reference prices share an inverse relationship. When market conditions improve (higher energy and capacity prices), the Index REC price declines—and vice versa. The idea is that the REC price should be responsive to market conditions so that projects are not over-compensated or under-compensated. So, an Index REC structure should provide more revenue certainty and predictability to developers, allowing them to acquire financing at lower costs.

While the renewable targets have increased over the years, the state has stuck with the central procurement model established in the 2004 order. The 2016 Clean Energy Standard (CES) replaced the RPS and called for 50% renewable generation by 2030. We have not been able to accurately determine what valuation model can be or should be used to identify a RECs revenue stream.⁹

⁸ Whitepaper: Clean Energy Standard Procurements Case: 15-E-0302, Dept. of Public Service/NYSERDA

⁹ ICF Whitepaper (icf.com ©Copyright 2020 ICF): Unpacking New York's Indexed Renewable Procurement Framework

4.) SYNCHRONIZED SPINNING RESERVE

Operating Reserve: is defined by NERC (North America Electric Reliability Council) as “that capability above firm demand required to provide for regulation, load forecasting error, equipment forced and scheduled outages, and local area protection.” NERC further states that operating reserve “consists of spinning and non-spinning reserve”. It is the capability of a generator to increase and or reduce output within a 10 or 30 minute period.

Power market ancillary services refer to a series of services needed for maintaining the secure and stable operation of the power system or recovering system security, ensuring power supply, and meeting voltage, frequency quality, and other requirements. Spinning reserve is very much like an automobile’s speed control. When going up a hill (akin to the grid having a load drag) the accelerator automatically speeds up. Spinning reserve does the same. When going down a hill (akin to the grid over exciting) the accelerator pulls back and so does spinning reserve. Spinning reserve is measured in MWhs on a minute by minute evaluation.

Spinning reserves take specific metering and NYISO communications setup that we are currently specifying for the Watertown plant. It would then produce the most valuable of all products produced from the plant at about \$750/MWh when the electricity product goes for about \$25/MWh. The NYISO is currently researching the applicability and modeling parameters of this service for Watertown’s portfolio. The NYISO service representative team originally said it could not be used by a run-of-river hydro unit. When Mr. Trimble researched their citations and found quite the opposite case, they took up a research project where Mr. Trimble asked for specific citations and the expert NYISO representative signify on the conclusion of whether it was possible or impossible for Watertown. This product and its modeling is pending.

ii. AGGREGATION SUPPLY PRODUCTS

Community Choice Aggregation: *The following opportunities were established on an April 21, 2016, Order Authorizing Framework for Community Choice Aggregation (CCA) Opt-out Program, Case 14-M- 022410*

Selling Energy to Watertown’s Residents Opportunity

¹⁰ Whitepaper: Community Choice Aggregation Guidelines Document, August, 2019, NY Department of Public Service

1. The three types of municipalities under New York State law eligible to form a CCA are: villages, towns, and cities.
2. A municipality or group of municipalities may work with a non-profit, retain a consultant, or otherwise designate a third party to act as a CCA Administrator and complete some or all the tasks
3. CCA programs will be permitted to aggregate electric supply, gas supply, or both. Customers in CCA programs where both gas and electric supply are offered shall have the option to opt- out of either aggregation.
4. CCA programs may include Assistance Program Participants or APPs so long as those customers are enrolled in products that comply with requirements for ESCO service of APPs at the time of enrollment but are not required to include APPs.
5. NYSERDA shall be available as a technical consultant to assist municipalities and CCA Administrators, including through individual consultations and through a CCA toolkit describing best practices and including model documents such as customer outreach materials and contracts.

In this analysis, we evaluated a targeted cost to the CCA Watertown customer as a 10% reduction in energy costs to the rate payer compared to National Grid tariff rate. Watertown and its agent would be purchasing power from the NYISO at an hourly index (LBMP) which results in a revenue stream for Watertown and, at the same time, that the Watertown electric customer garners a savings compared to the National Grid tariff cost.

In summary and in our analysis, we shall be evaluating four main products from the hydro-electric plant. That is different than the National Grid portfolio and our portfolio includes: Energy (kWhs), Capacity (kW), Renewable Energy Credits (RECs), and the ancillary service - Spinning Reserves. We too will evaluate the potential revenue stream for the City of Watertown and a simultaneous discounted energy purchase opportunity to the residents of Watertown under NYDERDA's Community Choice Aggregation.

OPTIONS EVALUATED? *legal structure and evaluation process*

To execute the potential generator portfolio and also to purchase electric energy for resale to the citizens, interfaces with the NYISO (energy sales and purchases, capacity sales and spinning reserve sales) and NYSERDA (RECs) and Community Choice Aggregation (CCA) need to be established. We have various venues to do this. The following Revenue Options are evaluated in this report:

1. Sell Off the Hydro-Generation Unit
2. Sell Wholesale Market Generation Products ONLY
3. Sell Residential Market ONLY
4. Wholesale Market Generation Products and Residential Market Sales
5. Electric Cooperative
6. Electric Municipal Utility

i. EVALUATION PROCESS - ENERGY AND CAPACITY

The valuation process shall include several methodologies over three randomly picked years. The random pick is a non-scientific yet plausible outcome for the various factors that shall contribute to the portfolio's valuation. Those years are 2015, 2018 and 2021. These selected years shall be the basis for: actual river flow (throughput and the resultant **electric generation actually metered**), **actual hourly electric values** from the NYISO (i.e. "LBMP", Localized Base Marginal Price at Watertown), **actual auction price of capacity** as published by the NYISO for those years. **RECs** are in a state of flux at this time with rules, guidelines and application being re-defined by the Department of Public Service and the NYPSC with input from the NYSERDA so these have been left out and as a consequence unstated upside for the portfolio valuation.¹¹ The **Spinning Reserve ancillary service** is currently being defined and modeled for Watertown by the NYISO expert team and also has been left out and consequently an unstated upside.

Energy will use the hourly LBMP, averaged by month. The source of the data by years (2015, 2018 and 2020) and in more detail, then by month, can be found on the NYISO web site.¹²

Energy, since there are 8,760 hourly prices in a year which is greater than a minimum sample of 31 data points, will be evaluated by the normal distribution methodology and calculating a range in a confidence level.¹³ This requires the calculation of the averaged monthly LBMP (" μ "), a standard deviation by month (" σ "), and, the calculus of number of standard deviations that 60% encompasses (" Z " estimator factor). We decided that a range of evaluation would be a 60% confidence level based upon the actual data. In simple terms, this will give you a 60% confidence high level price, a 60% low level price and an average or expected

¹¹ NYSERDA ANNOUNCEMENT, August 5, 2021: **Gov. Cuomo Announces Second Competitive Tier 2 Solicitations to Retain NY's Existing Renewable Resources** - "Through its second Competitive Tier 2 solicitation, the New York State Energy Research and Development Authority is seeking proposals to procure Tier 2 eligible RECs from existing privately-owned hydropower and land-based wind generators in New York State that entered commercial operation prior to January 1, 2015. NYSERDA's procurement approach will increase the amount of locally-produced renewable energy under contract with New York State, while still allowing [Community Choice Aggregations](#) to continue to voluntarily negotiate the best price and terms on energy supply, products, and services for their customers. NYSERDA will evaluate and select the competitive proposals based on the lowest price received. Proposals are due on September 9, 2021, by 3:00 p.m. Interested proposers can [apply here](#). NYSERDA expects to announce the awards in October 2021."

¹² https://www.nyiso.com/custom-reports?report=ham_lbmp_zonal (look up the MHK VAL zone)

¹³ Text "Statistical Methods" Pfaffenberger and Patterson, 1981, Chapter 9.4

price. Energy as calculated shall be used as a generation energy valuation and a Community Choice Aggregation energy cost. See **Appendix I - Range of Energy Prices by Month and Year (\$/kWh)** (below) which is the resultant calculus of this process.

APPENDIX I - Range of Energy Prices by Month and by Year (\$/kWh)

	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN
2021												
Avg.	\$0.03082	\$0.04370	\$0.03687	\$0.04328	\$0.04337	\$0.03463	\$0.02323	\$0.03402	\$0.01430	\$0.01145	\$0.01861	\$0.03144
High	\$0.04396	\$0.06898	\$0.05161	\$0.05607	\$0.05815	\$0.04713	\$0.04087	\$0.05608	\$0.02684	\$0.02271	\$0.03667	\$0.05488
Low	\$0.01767	\$0.01843	\$0.02213	\$0.03049	\$0.02859	\$0.02212	\$0.00559	\$0.01196	\$0.00175	\$0.00020	\$0.00055	\$0.00799
2018												
Avg.	\$0.03043	\$0.03263	\$0.03478	\$0.02682	\$0.03336	\$0.03052	\$0.06303	\$0.02142	\$0.02132	\$0.02719	\$0.01989	\$0.02055
High	\$0.04514	\$0.04444	\$0.08918	\$0.04243	\$0.05097	\$0.04171	\$0.11240	\$0.02967	\$0.02922	\$0.03973	\$0.03483	\$0.04535
Low	\$0.01572	\$0.02083	(\$0.01963)	\$0.01121	\$0.01576	\$0.01933	\$0.01367	\$0.01317	\$0.01342	\$0.01465	\$0.00494	(\$0.00424)
2015												
Avg.	\$0.02290	\$0.02603	\$0.02849	\$0.02138	\$0.01404	\$0.01418	\$0.03442	\$0.06870	\$0.03730	\$0.02148	\$0.02649	\$0.01927
High	\$0.03977	\$0.04773	\$0.04851	\$0.02974	\$0.02772	\$0.02770	\$0.05236	\$0.11321	\$0.06015	\$0.03099	\$0.06233	\$0.03409
Low	\$0.00603	\$0.00433	\$0.00846	\$0.01303	\$0.00035	\$0.00066	\$0.01648	\$0.02419	\$0.01445	\$0.01197	(\$0.00936)	\$0.00444

Capacity is based upon an annual auction, summer and winter. As such there will not be more than 31 points of information so we will use the annual summer and winter capacity extracted from the NYISO site, by Mohawk Valley Zone (NYCA).¹⁴

CAPACITY VALUES USED (\$/kW-month)

YEAR	SUMMER (\$/kW-month) May 1 - October 31	WINTER (\$/kW-month) November 1 - April 30
2021	\$4.09	\$0.10
2018	\$1.75	\$0.36
2015	\$3.50	\$2.90

¹⁴ http://icap.nyiso.com/ucap/public/auc_view_strip_selection.do, NYCA (in which the Mohawk Valley, Zone E is included).

ii. STRUCTURE AND SPECIFIC CALCULATION

SELL OFF THE HYDRO-GENERATION UNIT

The sale of the Watertown hydro-generation plant and the associated land, FERC license, sub-station and all revenue streams, was used to develop a present worth of 30 years of revenue at an interest rate of 3%, compounded quarterly. The revenue streams were the highest, average and lowest revenue stream calculated and then assumed that a transaction would be predicated on 40% of that value. Why such a discount? Everything associated with the revenue streams have a high risk associated with them. Products (capacity, energy, RECs and spinning reserve) could, as they all have changed in the recent past, be again changed and therefore change the valuation. The FERC licence while good through 2035 may not be renewed or could be pulled at anytime. River flow could be modified by a myriad of natural and man made causes. In polling the generation market, the 40% valuation could be as low as 15%, but 40% seems to be a reasonable number for now in the current environment of sustainability and high fossil prices.

SELL WHOLESALE MARKET GENERATION PRODUCTS ONLY

The sale of all of the products produced by the hydro-generation could be sold, through a third party, to the NYISO (i.e. energy, capacity and spinning reserve). This evaluation looks at a range of possible costs - 1, 2 and 3 mills/kWh (1 mill = \$0.001/kWh) for energy and 2% valuation of all other products total value.¹⁵ These costs would cover a third party that is a NYISO member, has credit capability with the NYISO to cover the transactions and is vigilant in monitoring all wholesale markets.

The valuation is predicated only on a fixed, one year period. ***This report is not predicting forward markets, merely looking at a range of historic snapshots.***

SELL RESIDENTIAL MARKET ONLY

As a stand alone opportunity which could start immediately, we have used the energy costs of the three years evaluated plus the same possible cost adders for energy to have someone handle the energy purchases, billing to the residential customers and controlling the opt-in and opt-out portion. This must be negotiated. This energy cost was compared to a 2021 National Grid's residential tariff and we assumed that a 10% discount to that rate would be valuable to potential participants. The difference between

¹⁵ AMBER Energy US Inc. currently uses Constellation which charges 1 mill/kWh for energy and 2% for non-energy products. This cost can vary depending on negotiations.

the cost of power procured (at LBMP) and the charge to the residential customers at the National Grid discounted tariff was the cash flow to the city. As a frame of reference and to put things in context, Maryland's discounts that are now selling are at a 1.5% discount to the utility's energy rates.

NYSERDA would give structural and consultation support and there are also potential for grants from NYSERDA to participate in the CCA. The efficacy and political acceptance of the residential offers to the citizens of Watertown was not a topic explored in this report.

WHOLESALE MARKET GENERATION PRODUCTS AND RESIDENTIAL MARKET SALES

The sale of all of the products produced by the hydro-generation could be sold, through a third party, to the NYISO (i.e. energy, capacity and spinning reserve). This evaluation looks at a range of possible costs - 1, 2 and 3 mills/kWh (1 mill = \$0.001/kWh) for energy and 2% valuation of all other products total value.¹⁶ These costs would cover a third party that is a NYISO member, has credit capability with the NYISO to cover the transactions and is vigilant in monitoring all wholesale markets.

The valuation is predicated only on a fixed, one year period. ***This report is not predicting forward markets, merely looking at a range of historic snapshots.***

The same third party, if chosen correctly, would also use the energy costs of the three years evaluated plus the same possible cost adders for energy to have someone handle the energy purchases, billing to the residential customers and controlling the opt-in and opt-out portion. This energy cost was compared to a 2021 National Grid's residential tariff and we assumed that a 10% discount to that rate would be valuable to potential participants. The difference between the cost of power procured (at LBMP) and the charge to the residential customers at the National Grid discounted tariff was the cash flow to the city. As a frame of reference and to put things in context, Maryland's discounts that are now selling are at a 1.5% discount to the utility's energy rates.

The combination of these two revenue streams would provide the greatest possible revenue for the city and still provide a reduction in energy costs for the citizens.

ELECTRIC COOPERATIVE

The opportunity for the city to become a cooperative could provide the city the benefits of: directly buying and selling generation-related products from the NYISO; initializing and retiring RECs through NYSERDA's GATS system; have certain tax reduction benefits;

¹⁶ AMBER Energy US Inc. currently uses Constellation which charges 1 mill/kWh for energy and 1.5% for non-energy products. This cost can vary depending on negotiations.

and have federal loans for capital and maintenance of the electric plant (distribution and generation) at a below-market interest rate. However, currently **New York law prohibits the future development of cooperatives.**

ELECTRIC MUNICIPAL UTILITY

The opportunity for the city to become a municipal utility could provide the city the benefits of: directly buying and selling generation-related products from the NYISO; initializing and retiring RECs through NYSEERDA's GATS system; have certain tax reduction benefits; and, on national average, has a 6.9% lower cost than Independently Owned Utilities not to mention local control, local transparency and local business benefits.¹⁷ However, to do these things:

- Watertown would need to become a NYISO member (a \$25,000 annual cost plus also have credit reserves to cover the value of energy, capacity and ancillary value to be transacted);
- Dedicate energy personnel (increase the Watertown staffing by an estimated 8 people);
- Legal fees to create a utility could be in the \$80,000 range; and,
- Create and manage the Customer Choice Aggregation (CCA) system and process.

The valuation is predicated only on a fixed, one year period. ***This report is not predicting forward markets, merely looking at a range of historic snapshots.***

The CCA, would also have to handle the energy purchases, billing to the residential customers and controlling the opt-in and opt-out portion. This energy cost based upon LBMP was compared to a 2021 National Grid's residential tariff where we assumed that a 10% discount to that rate would be valuable to potential participants. The difference between the cost of power procured (at LBMP) and the charge to the residential customers at the National Grid discounted tariff was the cash flow to the city. As a frame of reference and to put things in context, Maryland's discounts that are now selling at a 1.5% discount to the utility's energy rates compared to our 10% discount for this analysis.

¹⁷ www.publicpower.org "Benefits of Public Power"

RESULTS

The results are a snapshot of an historic period and not developed by a predictive model.¹⁸ We looked at the years 2015, 2018 and 2021 to show a range of real market, energy production, river flow and weather results. The span of time was assumed to be adequate reflection of a range of actual conditions and we did see a good range on all inputs. Our goal was to give relative valuations of the options and not produce a definitive, singular dollar value. This is due to the fact that we are still eight years out from termination of the National Grid agreements, politics are changing market designs at this moment, political machinations may dramatically change market structures and market products as has happened in the last decade or so.

SELL OFF THE HYDRO-GENERATION UNIT

The first option reviewed was to sell off the hydro-electric plant, its FERC license and all rights to grid interfaces, sub station plant and associated land and right-of-way rights. This would be a one time cash infusion for the city. To get a market number, the generation portfolio (capacity and energy only) was present-worthed over a thirty year period. We did not include RECs and Spinning Reserve as RECs are undergoing market changes at the present and Spinning Reserve will be an upside that we are currently working with the NYISO to correctly model. The present worth is evaluated for the annual generation portfolio amounts including: the highest, highest average or expected, and lowest values from the three years that were evaluated. The present worth process used an interest rate of 3.00%, annuities paid annually. The present worth equation:

$$P = \text{PMT} \times \frac{1 - \left(\frac{1}{(1+r)^n}\right)}{r}$$

The present worth value has a **transactional value**, i.e. a monetary value that is a fraction of the present worth. A run-of-river plant is very risky in the eyes of the market place. While Watertown has a FERC license through 2035, it could be pulled at any time for multiple reasons. The re-issue of that FERC license is not guaranteed. Weather, river flow, market product changes, political changes, electric system changes and so on affect the valuation of the plant and hence make this a risky purchase venture. In talking with the market's larger players, a general consensus is that a transactional value would be in the 40% of the present worth portfolio value range. Outliers were expecting a value as low as 10% though.

¹⁸ Predictive models would not enhance the accuracy of addressing the relative value of the options. All of the parameters are in a high state of flux (market, market structure, political and product definitions to name but a few). Predictive models could include: algorithmic predictors, Monte Carlo Simulation, Bayesian Optimization, etc.).

EXPECTED MARKET TRANSACTIONAL VALUES

Generation Portfolio (annual \$)	Annual (\$)	Present Value (30 years at <i>i</i> =3.0%,quarterly compounded) (\$)	Expected Market Transaction Value (\$, 40% of PV)
Highest Result (2018)	\$1,193,113	\$38,625,000	\$15,450,000
Expected Result (2018)	\$776,580	\$25,140,000	\$10,056,000
Lowest Result (2021)	\$189,463	\$5,840,000	\$2,336,000

The range of value for a sale of the hydro-electric plant for a one time payment, based upon the generation portfolio, a 30 year present worth valuation and discounted to 40% of the present worth value is **between \$2.3 Million to \$15.5 million** with an **expected value of \$10.1 Million**.

SELL WHOLESALE MARKET GENERATION PRODUCTS ONLY

The valuation of the wholesale products from the hydro-generation unit will include only the energy and capacity products to be sold to the NYISO and the process shall include several methodologies over three randomly picked years. The random pick of years is a non-scientific yet plausible outcome for the various factors that shall contribute to the portfolio’s valuation. Those years are 2015, 2018 and 2021. These selected years shall be the basis for: actual river flow (throughput and the resultant **electric generation actually metered**), **actual hourly electric values** from the NYISO (i.e. “LBMP”, Localized Base Marginal Price at Watertown), and, **actual auction price of capacity** as published by the NYISO for those years. **RECs** are in a state of flux at this time with rules, guidelines and application being re-defined by the Department of Public Service and the NYPSC with input from the NYSEDA so these have been left out and as a consequence is an unstated upside for the portfolio valuation.¹⁹ The **Spinning Reserve ancillary service** is currently being defined and modeled for Watertown by the NYISO expert team and also has been left out and consequently another unstated upside.

¹⁹ NYSEDA ANNOUNCEMENT, August 5, 2021: **Gov. Cuomo Announces Second Competitive Tier 2 Solicitations to Retain NY’s Existing Renewable Resources** - “Through its second Competitive Tier 2 solicitation, the New York State Energy Research and Development Authority is seeking proposals to procure Tier 2 eligible RECs from existing privately-owned hydropower and land-based wind generators in New York State that entered commercial operation prior to January 1, 2015. NYSEDA’s procurement approach will increase the amount of locally-produced renewable energy under contract with New York State, while still allowing [Community Choice Aggregations](#) to continue to voluntarily negotiate the best price and terms on energy supply, products, and services for their customers. NYSEDA will evaluate and select the competitive proposals based on the lowest price received. Proposals are due on September 9, 2021, by 3:00 p.m. Interested proposers can [apply here](#). NYSEDA expects to announce the awards in October 2021.”

Energy will use the hourly LBMP, averaged by month purchased from the NYISO. The source of the data by years (2015, 2018 and 2021), will be the average hourly LBMP by month, which is extracted from the NYISO web site.²⁰

Energy, since there are 8,760 hourly prices in a year, will be evaluated by the normal distribution methodology and calculating a range in a confidence level.²¹ This requires the calculation of the averaged monthly LBMP (“ μ ”), a standard deviation by month (“ σ ”), and, the calculus of number of standard deviations that 60% encompasses (“Z” estimator factor). We decided that a range of evaluation would be a 60% confidence level based upon the actual data. In simple terms, this will give you a 60% confidence high level price, a 60% low level price and an average or expected price. Energy as calculated shall be used as a generation energy valuation and a Community Choice Aggregation energy cost.²² It should be noted that a cost to sell has been included in the energy cost over a range of costs from 1 mills/kWh (\$0.001/kWh) to \$0.003/kWh. These costs shall be a part of the city’s negotiations.

Capacity is based upon an annual auction, summer and winter. As such there will not be more than 31 points of information so we will use the annual summer and winter capacity extracted from the NYISO site, by Mohawk Valley Zone (NYCA).²³ It should be noted that a cost to sell includes a 2% cost of total value. The energy and capacity costs are on the high side of what AMBER Energy US Inc. currently has negotiated in other ISOs.

CAPACITY VALUES USED (\$/kW-year)

YEAR	SUMMER (\$/kW-year)	WINTER (\$/kW-year)
2021	\$49.08	\$1.20
2018	\$21.00	\$4.38
2015	\$42.00	\$34.80

²⁰ https://www.nyiso.com/custom-reports?report=ham_lbmp_zonal (look up the MHK VAL zone)

²¹ Text “Statistical Methods” Pfaffenberger and Patterson, 1981, Chapter 9.4

²² Energy Values are listed in APPENDIX I - attached

²³ http://icap.nyiso.com/ucap/public/auc_view_strip_selection.do, NYCA (in which the Mohawk Valley, Zone E is included).

APPENDIX II - NET REVENUE GENERATION & SUPPLY displays the total net capacity and energy revenue results for generation over the three years that we are using. We selected the highest, lowest and expected (average) cases of scores of permutations of various factors that incorporated energy price variances, a range of cost of sales of products, and a range of river flows.

APPENDIX II - Net Revenue Generation & Supply

YEAR		GENERATION (\$)	SUPPLY (\$)	GEN & SUPPLY (\$)
2021	High	\$618,366	\$2,505,154	\$3,123,520
	High Average	\$413,374	\$1,675,405	\$2,088,779
	Low	\$180,463	\$760,882	\$941,345
2018	High	\$1,193,113	\$2,703,704	\$3,896,816
	High Average	\$776,580	\$1,682,451	\$2,459,031
	Low	\$308,625	\$576,425	\$885,050
2015	High	\$1,107,955	\$2,811,940	\$3,919,895
	High Average	\$715,617	\$1,811,902	\$2,527,519
	Low	\$277,549	\$727,111	\$1,004,660

By selling only the products from the generator, specifically only energy and capacity, there is a range of value between **\$180,500 to \$1,193,000 per year** with an **expected (average) value of \$776,500**. We did not include Spinning Reserve and RECs which are in the midst of further review but that may add an additional **\$660,000 per annum**.²⁴

²⁴ RECs as a Tier 2 item could add about \$1/MWh or between \$23,100 to \$14,000 per annum. Spinning Reserve may be used 10% of 8,760 yearly hours at \$750/MWh which is about \$660,000 per annum.

SELL RESIDENTIAL MARKET ONLY

The valuation of the “residential” market actually has two components: 1.) opted-in residential supply and 2.) municipal, high volume usage. All of the supply shall be obtained under NYSEERDA’s Community Choice Aggregation at LBMP which is an hourly supply purchase which provides low costs compared to a fixed, forward price. The reason that an hourly index has a lower price than a fixed forward price is that an hourly index has no risks embedded in its price. A fixed price needs to incorporate weather, volume, fuel costs, interest rates, energy supply, energy demand and many other unknown risks going forward, hence the cost disparity.

Upon buying at an hourly index (LBMP), the city will charge at a discount to National Grid’s applicable tariff. We used a 10% discount of the energy rate from the current residential tariff for the residential customers and 10% discount of the large volume business tariff for the municipal high volume accounts. This gives all consumers a beneficial discount and, at the same time, brings in revenue for the city. This is a win-win proposition. The 10% discount can be modified higher or lower as the city wishes but will have an impact of the revenue created for the city.

The energy calculation will be the same as was used in calculating the generator’s energy value. It should be noted that a cost to purchase has been included in the energy cost over a range of costs from 1 mills/kWh (\$0.001/kWh) to \$0.003/kWh. These costs shall be a part of the city’s negotiations.

Energy will use the hourly LBMP, averaged by month. The source of the data by years (2015, 2018 and 2021), will be the average hourly LBMP by month, which is extracted from the NYISO web site.²⁵

Energy, since there are 8,760 hourly prices in a year, will be evaluated by the normal distribution methodology and calculating a range in a confidence level.²⁶ This requires the calculation of the averaged monthly LBMP (“ μ ”), a standard deviation by month (“ σ ”), and, the calculus of number of standard deviations that 60% encompasses (“Z” estimator factor). We decided that a range of evaluation would be a 60% confidence level based upon the actual data. In simple terms, this will give you a 60% confidence high level price, a 60% low level price and an

²⁵ https://www.nyiso.com/custom-reports?report=ham_lbmp_zonal (look up the MHK VAL zone)

²⁶ Text “Statistical Methods” Pfaffenberger and Patterson, 1981, Chapter 9.4

average or expected price. Energy as calculated shall be used as a Community Choice Aggregation energy cost.²⁷

APPENDIX II - NET REVENUE GENERATION & SUPPLY displays the total net energy revenue results for supply over the three years that we are using. We selected the highest, lowest and expected (average) cases that incorporated energy price variances, a range of costs of purchase of energy, and current, fixed tariff costs.

By buying energy at LBMP and then reselling it to residential and municipal high volume customers at a discount to tariff energy costs, there is a range of value to the city's revenue of between **\$576,400 to \$2,812,000 per year** with an **expected (average) value of \$1,812,000.**

WHOLESALE MARKET GENERATION PRODUCTS AND RESIDENTIAL MARKET SALES

Another option is to sell products from the generator to the NYISO and simultaneously buy required energy from the NYISO under the auspices of the Community Choice Aggregation and sell it to "residential" customers at a discount to the National Grid tariff. This provides two revenue streams for the city, hydro generation products and sales of "residential" supply. The calculus used is the same as under SELL WHOLESALE MARKET GENERATION PRODUCTS ONLY and SELL RESIDENTIAL MARKET ONLY.

The combined results are the addition of "GENERATION (\$)" and "SUPPLY (\$)" results as displayed in APPENDIX II - NET REVENUE GENERATION & SUPPLY.

By buying energy at LBMP and then reselling it to residential and municipal high volume customers at a discount to tariff energy costs, PLUS selling the products of the hydro generator to the NYISO, there is a range of combined value to the city's revenue of between **\$885,100 and \$3,920,000 per year** with an **expected (average) value of \$2,528,000.** We did not include Spinning Reserve and RECs in the GENERATION valuation which are in the midst of further review but that may add an additional **\$660,000 per annum.**²⁸

²⁷ Energy Values are listed in APPENDIX I - attached

²⁸ RECs as a Tier 2 item could add about \$1/MWh or between \$23,100 to \$14,000 per annum. Spinning Reserve may be used 10% of 8,760 yearly hours at \$750/MWh which is about \$660,000 per annum.

ELECTRIC COOPERATIVE

The opportunity for the city to become a cooperative cannot be completed due to New York state laws. This was not evaluated.

ELECTRIC MUNICIPAL UTILITY

The opportunity for the city to become a municipal utility could provide the city the benefits of: directly buying and selling generation-related products from the NYISO; initializing and retiring RECs through NYSERDA's GATS system; have certain tax reduction benefits; and, on national average, has a 6.9% lower cost than Independently Owned Utilities not to mention local control, local transparency and local business benefits.²⁹ However, to do these things:

- Watertown would need to become a NYISO member (a \$25,000 annual cost plus also have credit reserves to cover the value of energy, capacity and ancillary value to be transacted);
- Dedicate energy personnel (increase the Watertown staffing by an estimated 8 people). Assuming a personnel cost of \$400,000 per annum;
- Legal fees to create a cooperative could be in the \$100,000 range; and,
- create and manage the Customer Choice Aggregation (CCA) system and process.

In context of a municipal utility which would buy energy at LBMP and then resell it to residential and municipal high volume customers at a discount to tariff energy costs, PLUS sell the products of the hydro generator to the NYISO, there is a range of combined value to the city's revenue of between **\$460,100 to \$3,495,500** per year with an **expected (average) value of \$2,103,000**. This includes the cost of new personnel and NYISO membership and the cost of the annual membership meeting. We did not include Spinning Reserve and RECs in the GENERATION valuation which are in the midst of further review but that may add **an additional \$660,000 per annum**. There also is an **initial legal fee of about \$100,000** in order to create the municipal utility.

²⁹ www.publicpower.org "Benefits of Public Power"

Post note from the author:

A special thank you to Jim Mills, City Comptroller, whose enthusiasm, review, insight and calculations were invaluable in the making and directing of this report. A sincere thank you!

Skip

GLOSSARY

Energy Argot

Affiliated Reference
to
Watertown Hydro-Electric Project
REVENUE OPTIONS
April 18, 2022

ANCILLARY SERVICES - Services that support the reliable operation of the power system, which can include voltage support, frequency regulation, operating reserves, and black-start capabilities.

CAPACITY - Capacity is the maximum electric output that a generator can produce. It is measured in megawatts (MW).

A MW is a measure of electricity that is the equivalent of 1 million watts. It is generally estimated that a megawatt provides enough electricity to supply the power needs of 800 to 1,000 homes. The MW is used in the wholesale market and capacity is a fungible commodity whose price is determined by an annual auction. The retail market uses the metric of kW (kilowatt) due to lower economies to scale. One MW is equal to 1,000 kW.

CCA (Community Choice Aggregation) - The purpose of Community Choice Aggregation is to allow participating local governments to procure energy supply service and distributed energy resources (DER) for eligible energy customers in the community. These customers will have the opportunity to opt out of the procurement, while maintaining transmission and distribution service from the existing Distribution Utility. CCA allows local governments to work together through a shared purchasing model to put out for bid the total amount of electricity and/or natural gas being purchased by eligible customers within the jurisdictional boundaries of participating municipalities. Eligible customers will have the opportunity to have more control to lower their overall energy costs, to spur clean energy innovation and investment, to improve customer choice and value, and to protect the environment, thereby fulfilling an important public purpose.

NYSERDA has developed a toolkit to assist local governments and CCA Administrators to develop CCA programs in New York State.

EDI - On July 23, 2001, the Commission issued Opinion 01-03 (case 98-M-0667), approving the policies and data standards for the implementation of the **electronic data interchange (EDI)** to provide for uniformity in the business communications between ESCOs and utilities in New York, continuing the collaborative industry effort to develop and implement EDI procedures and transactions to support customer retail access.

ELECTRIC COOPERATIVE - The idea of providing federal assistance to accomplish rural electrification gained ground rapidly when President Roosevelt took office in 1933. On May 11, 1935, Roosevelt signed Executive Order No. 7037 establishing the Rural Electrification Administration (REA). It was not until a year later that the Rural Electrification Act was passed and the lending program that became the REA got underway. Within months, it became evident to REA officials that established investor-owned utilities were not interested in using federal loan funds to serve sparsely populated rural areas. But loan applications from farmer-based cooperatives poured in, and REA soon realized electric cooperatives would be the entities to make rural electrification a reality.

In 1937, the REA drafted the Electric Cooperative Corporation Act, a model law that states could adopt to enable the formation and operation of not-for-profit, consumer-owned electric cooperatives.

ENERGY - Energy is the amount of electricity a generator produces over a specific period of time. It is measured in megawatt-hours (MWh). For example, a generating unit with a 1 megawatt capacity operating at full capacity for one hour will produce 1 megawatt-hour of electricity.

A megawatt-hour is equal to one megawatt of energy produced or consumed continuously for one hour. The MWh is the normal trading metric at the wholesale level. At the retail level the energy metric used is kWh which is a 1 kW potential (capacity) operating at full capacity for one hour. 1 MWh is equal to 1,000 kWhs.

ESCO (ENERGY SERVICE COMPANY) - An energy service company is a company that provides comprehensive energy solutions to its customers, including auditing, redesigning and implementing changes to the ways the customer consumes energy, the main goal being improved efficiency. It is not a succinct legal term but rather a broad brush that paints a wide spectrum of energy services. In the **REVENUE OPTIONS REPORT** “ESCO” was used in context of a NYISO market participant, consumption data and billing services, retail delivery services and general energy consultant and portfolio manager. It is this comprehensiveness of services that differentiates an ESCO from a common energy company, whose main business is solely providing energy to its customers. Typically compensation to the ESCO is performance based so that the benefits of improved energy efficiency are shared between the client and the ESCO. ESCOs often use performance contracting, meaning that if the project does not provide returns on the investment, the ESCO is responsible to pay the difference, thus assuring their clients of the energy and cost savings.

GADS (GENERATING AVAILABILITY DATA SYSTEM) - data is required by NYISO to determine the amount of capacity available for the Installed Capacity Market and to evaluate the reliability within the NY Control Area. The data is used to calculate the De-rating Factors for the NYISO Capacity Market. GADS data is used as an input into NYISO and the New York State Reliability Council's (NYSRC) Reliability Studies, specifically the Annual Installed Reserve Margin (IRM) Study for the New York Control Area and the NYCA Locational Capacity

Requirements calculation. There are three types of data: Design Data identifies the unit as a unique entity; Performance Data provides a summary of unit operation for a month; and Event Data consists of specific data for each event.

GATS (GENERATING ATTRIBUTES TRACKING SYSTEM) - NYGATS is an online certificate-tracking system that records information about electricity generated, imported, and consumed within New York State.

Using unique serial numbers, it can issue, track, and manage energy attribute certificates and renewable energy certificates (RECs). It prevents double counting of RECs, provides public reports, and records a full audit trail of all transactions to support the integrity of the RECs issued and held in the system.

Registered NYGATS users can trade, retire, or verify and substantiate ownership of RECs to support compliance or voluntary claims. Certificates can be bundled and traded with megawatt-hours of energy, but this is not a requirement in NYGATS.

NYGATS also serves as the platform for applying for Renewable Energy Standard (RES) certification under the New York's Clean Energy Standard. NYGATS retains records of resources that have received a statement of qualification and designates the RECs created by a facility as several complicated tiers of purpose that are currently in flux.

HEPFA - Home Energy Fair Practices Act (HEPFA) – Amendments of Chapter 686, the Laws of 2002 (Cases 98-M-1343 & 99-M-0631/05-M-0117). HEPFA provides residential energy customers with comprehensive protections in areas such as application for service, customer billing, and payment and complaint procedures.

In 2002, the Home Energy Fair Practices Act (HEFPA) (Public Service Law Article 2) was amended to apply the same consumer rights and protections to residential electric and natural gas customers of ESCOs and other energy entities as those afforded to utility consumers. These provisions ensure fair treatment of all residential energy customers, and serve to strengthen consumer protections and consumer confidence in the State's competitive energy market.

All applicants filing for approval to be an ESCO or sub-meterer in New York, and who intend to provide energy supply to residential consumers, must file a package of HEFPA documents for a compliance review, as part of the eligibility process.

LBMP - Locational Based Marginal Pricing (LBMP) is a pricing methodology for the cost of energy at each location in the New York State transmission system. LBMP is the cost to serve the next megawatt (MW) of load at a specific location that includes losses to get the energy to that point, congestion created by delivering energy and the next incremental cost of generation. Locational marginal pricing is a way for wholesale electric energy prices to reflect the value of electric energy at different locations, accounting for the patterns of load, generation, and the physical limits of the transmission system.

MUNICIPAL UTILITY - Municipal utilities are owned and operated by local communities and often operate within the local municipal public works department. Municipal utilities can own and operate their own generation and distribution system, such as those in Austin, Texas; Jacksonville, Florida; and Colorado Springs, Colorado. However, more than half of the municipal utilities only own and operate the local distribution system and purchase their power wholesale, either from federal agencies or from IOUs or other entities. This class of utility is often not regulated by state or federal agencies, and municipalities may

operate the utility as a tool to promote local economic expansion or lower local tax burdens. Municipal utilities can range in size from one customer to over a million customers (e.g., the city of Los Angeles).

NYDPS (NEW YORK DEPARTMENT OF PUBLIC SERVICES) - The Department of Public Service has a broad mandate to ensure access to safe, reliable utility service at just and reasonable rates. The Department is the staff arm of the Public Service Commission. The Commission regulates the state's electric, gas, steam, telecommunications, and water utilities. The Commission also oversees the cable industry. The Commission is charged by law with responsibility for setting rates and ensuring that adequate service is provided by New York's utilities. In addition, the Commission exercises jurisdiction over the siting of major gas and electric transmission facilities and has responsibility for ensuring the safety of natural gas and liquid petroleum pipelines.

NYSERDA (NEW YORK STATE ENERGY RESEARCH AND DEVELOPMENT AUTHORITY) - NYSERDA offers objective information and analysis, innovative programs, technical expertise, and funding to help New Yorkers increase energy efficiency, save money, use renewable energy, and reduce reliance on fossil fuels. During the energy crisis of the 1970s, oil embargoes made the United States acutely aware that the world's petroleum supplies were finite. NYSERDA's earliest efforts focused solely on research and development of renewable energy technologies with the goal of reducing New York State's petroleum consumption. NYSERDA's funding structure changed in 1996 when the New York State Public Service Commission approved the ratepayer-supported System Benefits Charge Program and designated NYSERDA as the program's administrator. As renewable energy

was becoming popular in other parts of the country, New York State wanted to make it attractive to the State's residents and businesses. Between 2004 and 2008, the Public Service Commission approved two new programs related to funding renewable energy and energy efficiency as NYSERDA pursued a market-driven approach to doing business including creating effective partnerships among private industry, government, and academia that benefit all New Yorkers. By 2010, NYSERDA programs focused on reducing energy use, increasing energy efficiency, creating jobs, creating public-private partnerships to stimulate entrepreneurial spirit, and preparing tomorrow's workforce to excel in the clean energy economy. They now oversee the Renewable Energy Credits (RECs) program and the Aggregated Community Choice programs.

NYISO (NEW YORK INDEPENDENT SYSTEM OPERATOR)

- One of the seven regional transmission organizations (RTOs) and independent system operators (ISOs) operating in the US, the NYISO manages the electric grid in the state of New York. Although the NYISO operates only in New York State, it is subject to the jurisdiction of the Federal Energy Regulatory Commission because the state's transmission grid is interconnected with other grids in the Northeast.

The FERC proposed the creation of ISOs in 1996 in response to the Energy Policy Act of 1992. FERC's Order 888 in 1996 provided for the creation of ISOs to consolidate and manage the operation of transmission facilities to provide nondiscriminatory open transmission service for all generators and transmission customers. FERC Order 2000 supported the role of RTOs to oversee electric transmission and operate wholesale markets across a broad territory (multi-states).

NYPSC (NEW YORK PUBLIC SERVICE COMMISSION)

- The Public Service Commission was established in 1907. The New York Public Service Commission is the public utilities commission of the New York state government that regulates and oversees the electric, gas, water, and telecommunication industries in New York as part of the Department of Public Service. Their authority is for the distribution of electricity as FERC has the jurisdiction of transmission and generation.

QUALIFIED FACILITY - The Public Utility Regulatory Policies Act of 1978 (PURPA) was implemented to encourage, among other things,

1. The conservation of electric energy.
2. Increased efficiency in the use of facilities and resources by electric utilities.
3. Equitable retail rates for electric consumers.
4. Expeditious development of hydroelectric potential at existing small dams.
5. Conservation of natural gas while ensuring that rates to natural gas consumers are equitable.

One of the ways PURPA set out to accomplish its goals was through the establishment of a new class of generating facilities that would receive special rate and regulatory treatment. Generating facilities in this group are known as qualifying facilities (QFs), and fall into two categories: qualifying small power production facilities and qualifying cogeneration facilities.

QFs may enjoy certain benefits under Federal, State, and local laws. The benefits that are conferred upon QFs by Federal law generally fall into three categories:

1. The right to sell energy or capacity to a utility.

2. The right to purchase certain services from utilities.
3. Relief from certain regulatory burdens.

RECS (RENEWABLE ENERGY CERTIFICATES) -

New York, like many states across the country, has a standard by which certain qualifying renewable generation assets are awarded one Renewable Energy Certificate (REC) for each MWh of electricity delivered to the grid. RECs provide two main functions to the market:

1. RECs provide the ability for renewable generators to receive additional revenue to support their development, while also allowing the wholesale power market to value the MWh of energy they produce in a market-derived manner without having a distinct energy market price mechanism for renewable generators.
2. RECs also allow the renewable attributes of that MWh generated to be purchased by another entity and adequately tracked and accounted for by an independent third party. In New York, that entity is the New York State Energy Research and Development Authority (NYSERDA).

This market solution for RECs New York is a common practice; however, the different types of RECs, referred to as “Tiers”, are unique to New York. In this market, there are three tiers of RECs: Tier 1, Tier 2 (Maintenance Resources and Competitive Program), and Tier 4. These tiers of RECs should not be confused with Zero Emission Credits (ZECs), which are similar in name and structure but are distinct as they are only applicable to nuclear generation facilities.

SYNCHRONIZED SPINNING RESERVE - Operating reserves are a location-dependent ancillary service, so the NYISO must procure a set amount of reserves within NYCA and within specific regions.

- The NYISO must consider transmission constraints when determining where reserves are located and scheduled. There are three tiers of spinning reserve, each less valuable than the first:

10-Minute Spinning Reserve: Currently synchronized to the NYS power system; Can change output or reduce demand level in 10 minutes

10-Minute Non-Synchronized Reserve: Can be started, synchronized, and change output level or reduce demand within 10 minutes

30-Minute Spinning Reserve(Spinning and Non-Synchronized) Spinning - currently synchronized and can change output level or reduce demand within 30 minutes; and, **Non-Synchronized** - can be started, synchronized, and change output level or reduce demand within 30 minutes