Unpacking New York's Indexed REC Renewable Procurement Framework

By Ananya Chaurey and George Katsigiannakis, ICF

Shareables

- The NYSDPS has adopted NYSERDA's proposal to offer an indexed REC structure in addition to the current fixed REC structure for contracting with new renewable projects. NYSERDA expects this structure will enable lower financing costs for developers due to the greater revenue certainty and predictability inherent in an Indexed REC contract.
- The new framework is a significant improvement, but some of its design choices still leave developers exposed to revenue risk. The most significant risk arises due to potential differences between a project's realized price and NYSERDA's reference price used to calculate the indexed REC cost. Factors that contribute to revenue risk include nodal LBMP basis relative to zone, a project's realized price, and generation profile. Developers, however, can minimize this risk by adjusting their all-in strike price bids.

Executive Summary

A flurry of renewable development activity in New York started in 2017 and is now set to accelerate as the state doubles down on achieving its ambitious greenhouse gas reduction goals. The Climate Leadership and Community Protection Act (CLCPA)—passed into law in 2019—calls for 70% renewable energy by 2030 and 100% emissions-free electricity generation by 2040.

Achieving 70% renewable energy by 2030 would require roughly 20 gigawatt (GW) in new wind and solar capacity over the next 10 years[1]. However, the state is yet to witness the pace of renewable energy development required to meet its climate goals.

The New York Independent System Operator (NYISO) and state agencies such as the New York State Energy Research and Development Authority (NYSERDA) and the New York State Department of Public Service (NYSDPS) have proposed measures to mitigate the hurdles surrounding renewable development. One such proposal is the potential adoption of a carbon price in the wholesale electricity market[2].

On January 16, 2020, the NYSDPS directed NYSERDA to offer new renewable projects the option of an Indexed Renewable Energy Credit (REC) contract in addition to the current Fixed REC framework. Starting from the 2020 Tier 1 Renewable Energy Standard (RES) solicitations, developers would be required to choose either an Indexed REC contract or a Fixed REC contract and bid a single "strike price" in dollars per megawatt-hour ($/MWh). NYSERDA expects the new procurement structure to reduce financing—and therefore, development—costs associated with large-scale renewable projects[3].

The Renewable Procurement Framework Today

New York first adopted a Renewable Portfolio Standard (RPS) in 2004, 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.

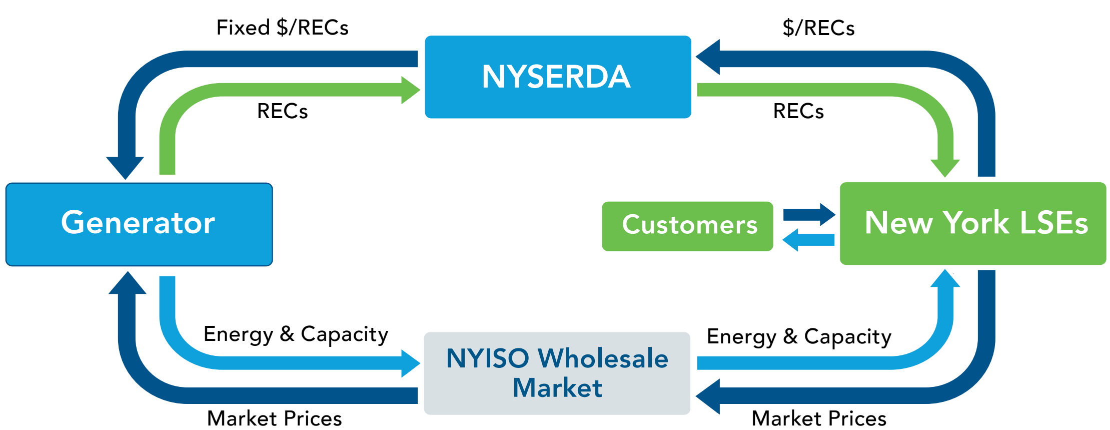
While the renewable targets have increased over the years, the state has stuck with the central procurement model established in the 2004 order. The 2016 Clean Energy Standard (CES) replaced the RPS and called for 50% renewable generation by 2030. Since then, NYSERDA has contracted three GW of wind and solar capacity procured through two solicitations, while the results of a third solicitation are pending.

The first renewable solicitation, held in 2017, awarded REC contracts to 1.4 GW of land-based wind and solar at a weighted average price of $21.7 per REC. The second solicitation, held in 2018, awarded contracts to 1.4 GW of renewable projects at a lower price of $18.5 per REC.

Separately, NYSERDA procured 1.7 GW of offshore wind through an offshore wind solicitation at an estimated offshore wind REC (OREC) price of $25.14 per OREC.[4] The various state agencies have so far intimated that they will continue to use a central procurement structure for the CLCPA. Under this structure, NYSERDA awards Fixed REC contracts to renewable projects (Figure 1).

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.

FIGURE 1: FIXED REC STRUCTURE[5]



[1] Assuming an average capacity factor of 30% for wind and solar combined https://www.icf.com/insights/energy/nyiso-carbon-price

[2] Case 15-E-0302 NYSERDA Comments on Index Petition. http://documents.dps.ny.gov/public/MatterManagement/CaseMaster.aspx?MatterCaseNo=15-E-0302&submit=Search

[3] Order Modifying Tier 1 Renewable Procurements, Case 15-E-0302. State of New York Public Service Commission, January 16, 2020.

[4] Order Modifying Tier 1 Renewable Procurements, Case 15-E-0302. State of New York Public Service Commission, January 16, 2020.

RECs are intended to monetize the environmental attributes of renewable energy resources since the current wholesale markets do not. Projects that enter into REC contracts with NYSERDA receive revenue from REC sales and also participate in the competitive energy, capacity, and ancillary services markets. Thus, a REC contract is designed to only supplement revenue from the competitive markets—not to offer projects a fully hedged contract.

For all its simplicity, a Fixed REC framework leaves projects exposed to substantial revenue risk because energy and capacity revenues are not contracted and are uncertain as a result. For instance, because a fixed REC price is locked in for the entirety of a long-term contract, a low wholesale price environment due to low gas prices or increasing renewable penetration in the future may render a fixed REC price unable to meet a project's revenue requirement. To account for this risk, project developers incur higher financing costs and, thus, higher development costs relative to a fully hedged contract structure, such as a power purchase agreement (PPA).

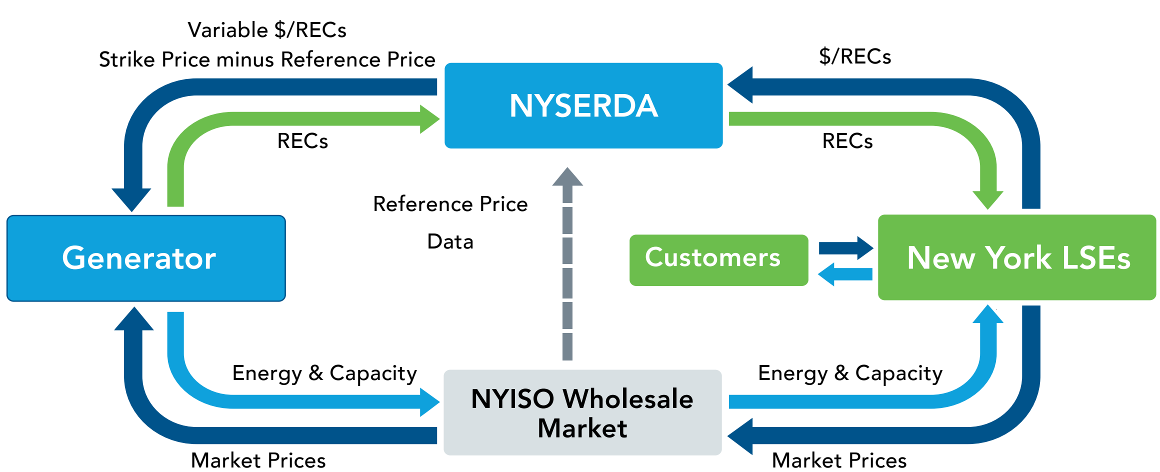
Indexed REC: Pathway to rapid renewable growth?

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.

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.

NYSERDA's proposal requires projects to bid an Index REC strike price that reflects the all-in revenue requirement per megawatt-hour. The Index REC price would then be calculated by subtracting a referential energy and capacity price (Reference Energy Price" and "Reference Capacity Price) from the all-in strike price for each project (Figure 2).

FIGURE 2: INDEX REC STRUCTURE[6]



The table below lists the design selections proposed by NYSERDA for its Index REC framework. The reference energy price is calculated using hourly day-ahead market (DAM) location-based marginal price (LBMP) simple averaged over a month.

The averaged LBMPs are calculated for all NYISO zones, resulting in a single monthly reference energy price for each zone. Further, negative LBMPs are only considered up to a limit in the calculation of the reference price. The monthly reference capacity price is calculated using the spot auction results for each locality. Both the reference prices would be technology agnostic.

NYSERDA also proposes to permit negative REC payments, that is, payments made from a project to NYSERDA when all-in revenue in $ per MWh exceeds the agreed-upon strike price. NYSERDA's analysis found that due to reduced financing costs, the Indexed REC framework would lower REC prices by up to $8 per MWh when compared to the current Fixed REC structure. NYSERDA's proposal was approved in its entirety by the NYSDPS in an order issued on January 16, 2020[7].

TABLE 1: INDEX REC DESIGN CHOICES[8]

Design Choice	Index REC Design Selection
Settlement Period	Monthly settlement period with a single Reference Price
Treatment of Negative REC Payments	Allow negative REC payments (from project to NYSERDA)
Reference Energy Price	
Market Choice	Hourly day-ahead LBMP
Geographic Precision	Zonal Reference Energy Price
LBMP Weighting	Simple averaging of hourly prices
Treatment of Negative LBMPs	Determine limits to the impact of negative LBMPs on REC pricing
Reference Capacity Price	
Market Choice	ICAP Spot Market Auction
Geographic Prevision	Single-locality Reference Capacity Price
UCAP Production Factor	Allow fixed and custom UCAP factors

Unpacking the Indexed REC framework

NYSERDA's Index REC design selections (Table 1) aim to mitigate risk for large-scale renewable projects but do not represent a perfect hedge against market volatility. While the new framework offers more revenue certainty and lowers development costs, generators are still exposed to some revenue risks. Understanding the project risks that remain in NYSERDA's design proposal helps developers make an informed choice in the NYISO market.

[5]Source: NYSERDA Comments on the AWEA/ACE-NY Petition Regarding Integration of an Index REC Procurement Structure into Tier 1 REC Procurements Under the Clean Energy Standard. NYSERDA, October 2, 2019.

[6]Source: NYSERDA Comments on the AWEA/ACE-NY Petition Regarding Integration of an Index REC Procurement Structure into Tier 1 REC Procurements Under the Clean Energy Standard. NYSERDA, October 2, 2019.

[7]Order Modifying Tier 1 Renewable Procurements, Case 15-E-0302. State of New York Public Service Commission, January 16, 2020.

[8]Source: NYSERDA Comments on the AWEA/ACE-NY Petition Regarding Integration of an Index REC Procurement Structure into Tier 1 REC Procurements Under the Clean Energy Standard. NYSERDA, October 2, 2019.

Basis risk

NYSERDA recommends that REC prices be calculated once every month (monthly settlement period) using a single reference energy price. Further, it proposes to use hourly DAM LBMPs simply averaged over the entire month to arrive at the reference energy price for each zone.

Due to these design choices, some deviation is inevitable between the reference energy price used to calculate the REC price and the project's realized price. NYSERDA refers to this variance as "basis risk."[9]

Renewable realized price vs. monthly reference price basis risk

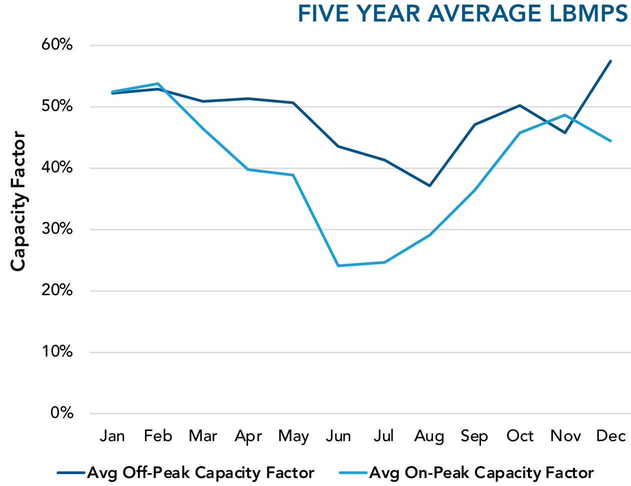
NYSERDA proposes to calculate the monthly reference energy price using a simple average of hourly day-ahead LBMPs over the entire month. The generation profiles of wind and solar resources, however, are not uniformly distributed over a month.

For example, in Zone A, wind output tends to be stronger during the lower-priced off-peak evening and night hours. Thus, realized prices (generation weighted average of LBMPs) for wind projects in Zone A are lower than the monthly zonal reference energy price. If not considered accurately, this basis risk could render the zone's Index REC price insufficient to meet revenue requirements for some projects.

Figure 3 below compares the off-peak and on-peak capacity factors of a representative wind project[10] with the average all-hours, on-peak, and off-peak LBMPs from the previous five years in Zone A. While there is some variability in on-peak and off-peak wind generation, overall, generation is stronger in the off-peak hours—as is evidenced by the off-peak capacity factor.

Further, in Zone A, there is a historical spread of $15/MWh between the on-peak and off-peak LBMPs. Since the representative wind project's generation is more biased towards the lower-priced off-peak hours, its monthly realized prices are lower than Zone A's reference energy prices by 2% on average—and up to 10% in certain months (Figure 4). As the Index REC is calculated as a strike price minus average zonal LMP, a plant that earns a realized LMP below the zonal average LMP could earn total revenue below its strike price.

FIGURE 3: ZONE A REPRESENTATIVE WIND PROJECT CAPACITY FACTOR VS. FIVE YEAR AVERAGE LBMPS



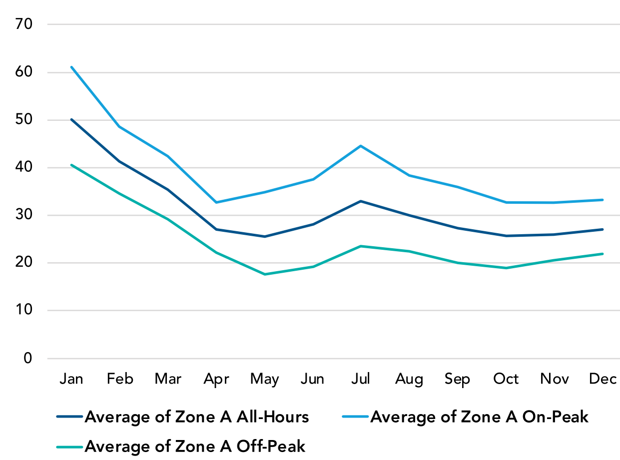
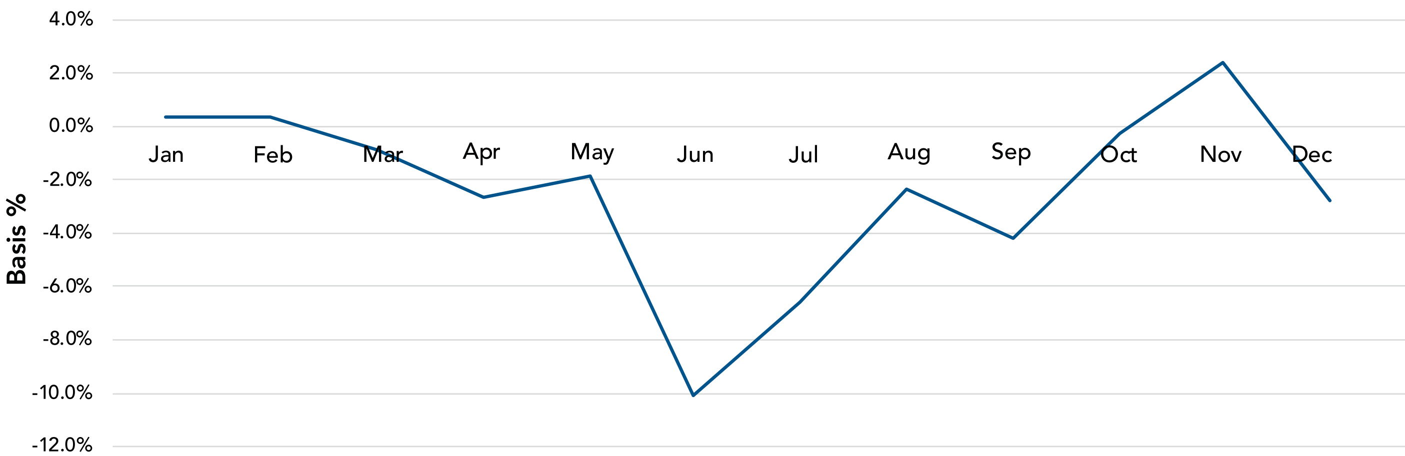


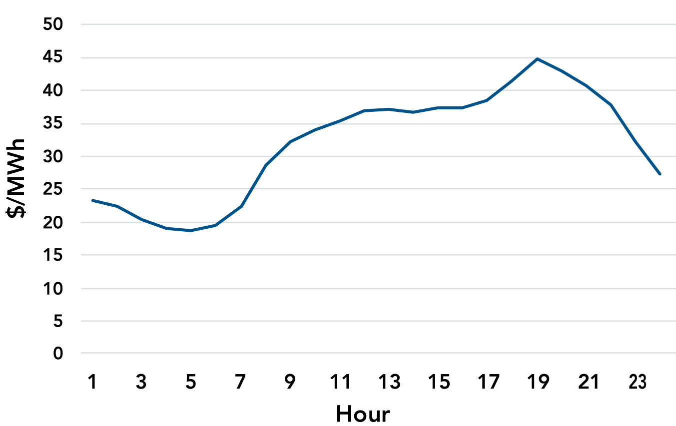
FIGURE 4: BASIS BETWEEN MONTHLY REALIZED PRICE FOR A REPRESENTATIVE WIND PROJECT VS. MONTHLY REFERENCE PRICE IN ZONE A

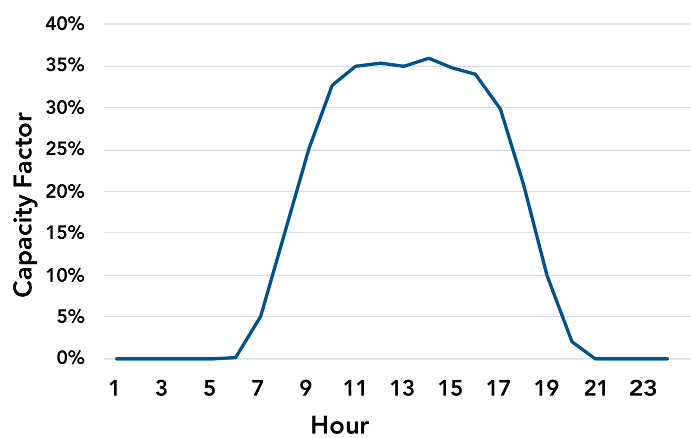


Contrary to wind projects, solar projects could see a positive basis between realized price and reference energy price due to their "daytime-biased" generation profiles. But, as penetration of solar resources increases—there is currently about 9 GW of solar in the NYISO interconnection queue—negative basis risk could become substantial in the coming years.

Figure 5 compares the solar output profile[11] with average hourly LBMPs from the previous five years in Zone A. The highest LBMPs have historically been between the hours of 5:00 PM and 9:00 PM, while solar generation peaks between the hours of 9:00 AM and 4:00 PM. The spread between "afternoon" LBMPs and "evening" LBMPs is currently around $5-8/MWh but could become much more acute as solar penetration increases. It is possible, then, that as New York pursues its solar and wind energy targets, the positive realized price basis enjoyed by solar projects may significantly decline—or even reverse.

FIGURE 5: ZONE A SOLAR HOURLY CAPACITY FACTOR VS. FIVE-YEAR AVERAGE HOURLY LBMPS





[9]Usually, ICF refers to basis only as it relates to the spread between zonal and nodal prices. However, NYSERDA's proposal defines basis as the spread between a project's realized price and the reference energy price applicable to the project. In this paper, ICF uses the term "basis" as defined in the NYSERDA proposal.

[10]Wind generation profile sourced from EPA Platform v6 for TRG 5 wind resource in NYISO Zone A

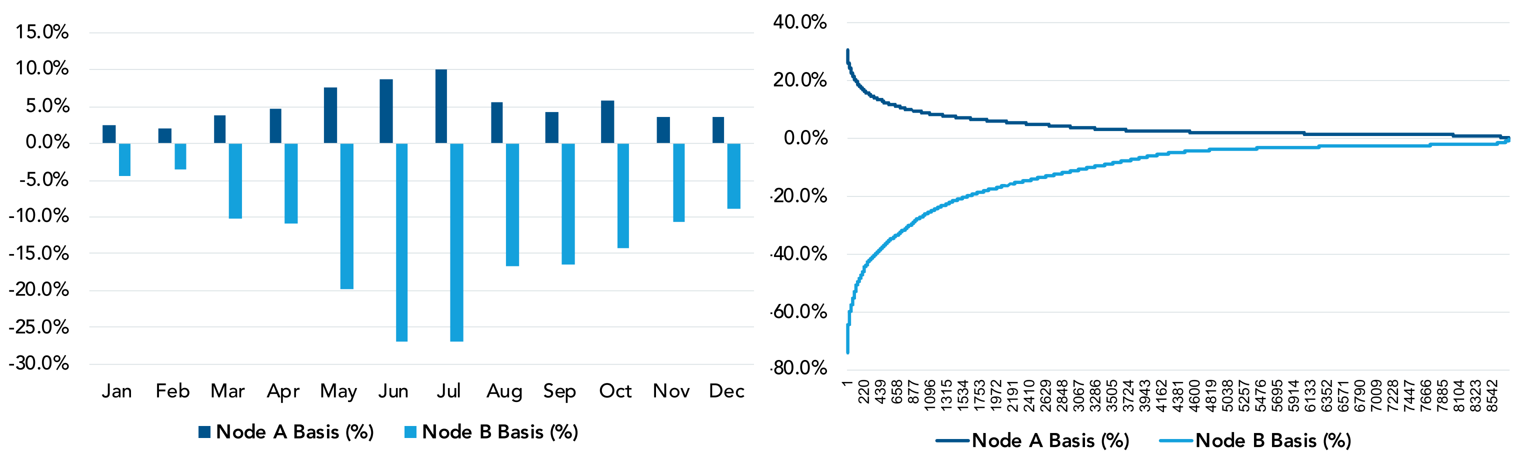
Nodal LBMP vs. Zonal LBMP basis risk

Another source of basis risk is "nodal basis risk," which occurs due to a disparity between a project's nodal LBMP and the zonal LBMP used to calculate the reference energy price.

The chart below compares the nodal bases of two nodes in Zone A, both of which are being considered as possible interconnection points by renewable developers. Figure 6 shows the 5-year average magnitude and distribution of nodal basis for these nodes, referred to here as Node A and Node B, relative to Zone A LBMP.

From 2014 to 2018, Node A averaged a positive nodal basis of 4%, while Node B averaged a negative nodal basis of -10%. Basis at Node A was greater than 5% for 27% of the hours, while basis at Node B was lower than -5% (more negative) for 50% of the hours. Further, the spread between the two nodal bases is markedly wider in the summer months, coincident with higher peak demand in New York State.

FIGURE 6: 5-YEAR AVERAGE MAGNITUDE AND DISTRIBUTION OF NODE A AND NODE B NODAL BASES VS. ZONE A



The presence of intra-zonal LBMP spread that widens during peak summer months in Zone A implies the presence of congestion in the local transmission and distribution system. Indeed, Node A is located upstream of historical congestion in Zone A, while Node B is located downstream of congestion.

Such intra-zonal transmission congestion is present throughout NYISO. Increasing renewable penetration, transmission development, and extreme weather events could change the intensity and location of intra-zonal transmission congestion and nodal LBMP basis spread over time. Developers in New York need to be especially mindful of these basis dynamics and balance them with renewable resource potential when choosing sites for their projects.

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[11]Solar generation profile sourced from EPA Platform v6 for solar resource in NYISO Zone A

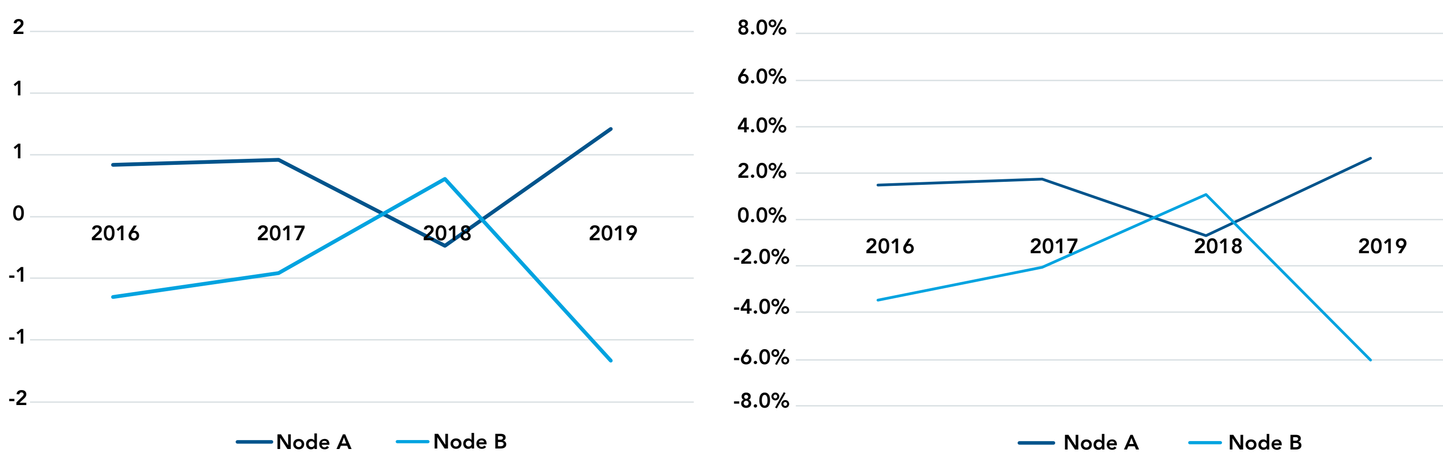
Day-ahead vs. real-time LBMP basis risk

Intermittent renewable resources in NYISO can participate in both the day-ahead (DA) and real-time (RT) energy markets. When participating in the RT market, the NYISO makes every effort to accommodate as much wind and solar output as available and dispatch other flexible units accordingly. Intermittent renewables prefer to participate in the RT market and, as such, receive RT energy market revenue.

On the contrary, NYSERDA's Index REC proposal calculates the reference energy price using DA market prices. Due to the inherent spread between DA and RT energy prices, this design choice results in a third kind of basis risk relating to RT versus DA energy prices.

Figure 7 compares the annual average RT versus DA price basis for the same two Zone A nodes considered earlier. Apart from 2018—when the "bomb cyclone" extreme weather event caused price distortions—Node B has seen a negative RT price basis relative to DA prices, while Node A has seen a positive basis. As noted earlier, Node B has a negative nodal basis relative to Zone A, while Node A has a positive nodal basis. So, while the Index REC reference price is calculated using Zone A average DA prices, the realized price for a project at Node B node sees a compounded negative basis due to nodal basis as well as RT versus DA basis.

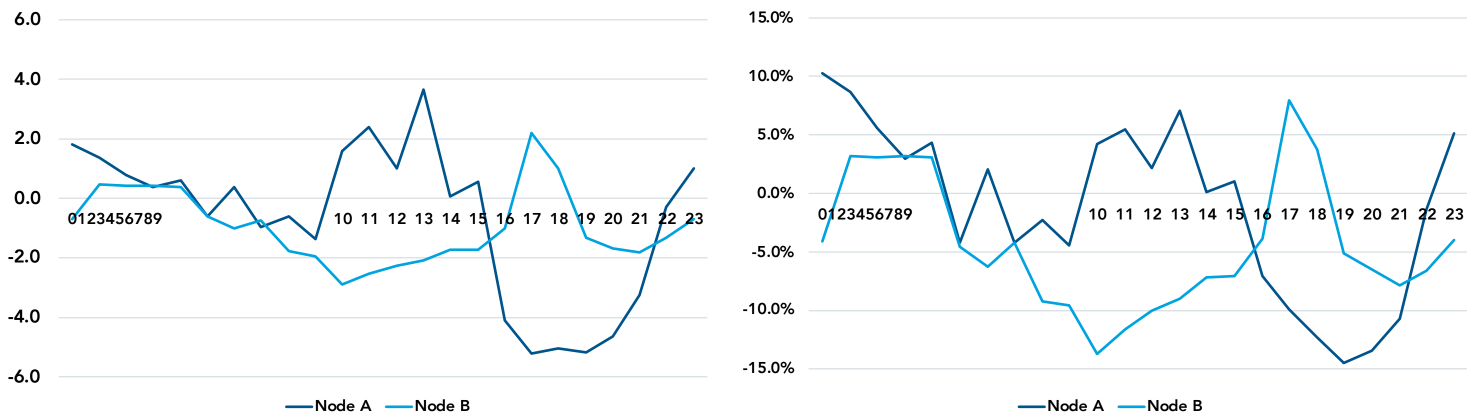
FIGURE 7: NODE A AND NODE B RT VERSUS DA PRICE BASIS



A solar project at Node B would be even worse off. Figure 8 displays the 2016-2019 average hourly RT versus DA basis for Node A and Node B. While the four-year annual average basis at Node B is -3%, the average basis during the summer months of May through August is -5%. More crucially, the average basis in these months during the peak solar generation hours of 8:00 AM to 4:00 PM is -9%.

Combined with the negative nodal basis at Node B, a solar project there may suffer a discount in excess of 10% relative to the reference energy price for Zone A. And, it would need to know these basis dynamics when bidding its all-in Strike Price.

FIGURE 8: FOUR-YEAR AVERAGE HOURLY RT VERSUS DA BASIS AT NODE A AND NODE B, MAY THROUGH AUGUST



Summary

The NYSDPS adopted NYSERDA's proposal to offer Index REC contracts in addition to Fixed REC contracts starting from the 2020 RES solicitation. While the new framework lowers financing costs for new projects, market risks persist. Developers have to consider factors such as nodal versus zonal LBMP basis, realized price versus reference price basis, and real-time LBMP versus day-ahead LBMP basis. Developers must also be cognizant that as renewable penetration increases, market dynamics will change. The presence of intra-zonal LBMP spread in some zones in NYISO highlights congestion in the transmission and distribution systems in New York. As technology costs decline and renewable penetration increases, transmission congestion may get aggravated. This could affect intra-zonal market dynamics in ways that the Indexed REC framework might not capture fully.

Negative REC Payment Risk

NYSERDA proposes to allow negative REC prices during periods where the Reference Price exceeds the REC Strike Price. In other words, if NYSERDA's reference energy and capacity prices are sufficient for a project in a particular zone to meet its revenue requirement, it must reimburse the excess to the state via a negative REC price.

NYSERDA does not propose any time or monetary limit to negative REC payments, which continue for the entirety of the contract duration, and does not permit any upside revenue potential to projects beyond their contract determined revenue requirement. If a carbon price is adopted in the near term, it is possible that renewable projects in some zones would become economically viable without REC payments. And, consequently, they would be required to reimburse NYSERDA their excess revenue early in their contract terms.

For long-term contracts, as commodity prices rise and technology costs decline, negative REC prices could experience an unmitigated rise under the current design. Thus, some projects, such as those with contract terms in excess of 10 years, may end up sacrificing substantial revenue upside potential.

Additionally, negative REC prices could exacerbate the basis risks highlighted in the previous section. The negative basis risks of Node B could be compounded with the risk of negative REC prices. Developers considering projects at nodes with significant negative bases, such as Node B, must be especially aware of potential negative REC payments to the state in addition to the node's negative basis dynamics.

About the Authors

George Katsigiannakis joined ICF in 1997 and is an expert in U.S. electricity markets, with deep understanding of all factors affecting U.S. wholesale electric markets including market design, environmental regulations, fuel markets, transmission, renewable, energy efficiency, and demand side management (DSM). He has been involved in a large number of projects including several forward price curve assessments, development support, and financial performance of generation assets. He works in the areas of energy modeling, wholesale market assessments, asset valuations, restructuring, and litigation support, as well as contract evaluation and risk assessments.

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Ananya started his professional career as an electrical engineer in the automotive industry after obtaining a B.S. from the University of Michigan at Ann Arbor. He then completed a master's degree in energy and environment from Duke University's Nicholas School of the Environment, and joined ICF thereafter. As a graduate student, he worked with California Energy Storage Alliance, an advocacy group, in assisting the potential greenhouse gas emission savings from replacing peaker plants in CAISO with battery storage.

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