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Preserving Upstate Nuclear Saves New York Consumers Billions, Compared With Additional Renewables Beyond CES Goals

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The New York Public Service Commission (PSC), after studying how to achieve statewide goals of reducing carbon emissions by 40% and generating 50% of the state's electricity with renewable sources by 2030, approved the Clean Energy Standard (CES). The CES accelerates the development of wind, solar and energy efficiency, and uses Zero Emission Credits (ZECs) to keep existing nuclear plants operating, which will hold down carbon emissions during the transition phase necessary for these other carbon-free options to ramp up to scale. While the CES has been endorsed by senior leaders of the Natural Resources Defense Council, Sierra Club, New York League of Conservation Voters, Alliance for Clean Energy New York, The Nature Conservancy in New York, senior officials at the U.S. Department of Energy and the Obama Administration, and by leading climate change experts like Dr. James Hansen, some smaller groups (Food & Water Watch, and NYPIRG) have recently criticized the inclusion of nuclear power in the CES. They have suggested that the state's objectives should be achieved with 100% renewable energy, an approach that was studied and rejected by the PSC as physically infeasible and unreasonably expensive. These groups have wrongly called the ZEC program a 'tax' and claimed that it will raise New Yorkers' electricity bills. In fact, it would save New York customers about a billion dollars a year, or $12 billion by 2030, compared with immediately replacing the upstate nuclear plants with 100% renewables, as these groups advocate. If the upstate nuclear plants were to shut down and were not replaced immediately with renewables, it would mean the loss of 15% of New York's electricity supply; this would cause electricity prices and customer costs to rise by much more than the cost of ZECs.

To replace the carbon-free generation of the upstate nuclear plants with incremental renewable generation would require going far beyond the already ambitious renewable goals of the CES, necessitating an additional 10,000 MW of new renewables on top of the 13,000 MW it already includes. The CES plan builds out its 13,000 MW of new renewables between now and 2030, recognizing that such a large-scale expansion will take years to implement. If the added 10,000 MW needed to "replace" the nuclear generation were phased in over the same period, total CO_2 emissions would increase sharply in the near term, since the incremental renewable generation would not be in place immediately. New York would rely more heavily on fossil generation, from in-state resources and potentially imports from neighboring electrical systems, in the interim.

The cost of these incremental renewables would be significantly higher than the ZEC cost – by about a billion dollars a year, as shown below, or as much as $12 billion by 2030. ZEC prices are capped at an average of about $22/MWh over the 12 year ZEC horizon. Renewable cost projections by the New York Department of Public Service (DPS) in its April 2016 CES Cost Study show New York renewable costs

are likely to be $100/MWh or higher at the quantities needed for the CES goals. An additional demand for 10,000 MW more renewables to replace lost nuclear generation would likely push the price higher still. Using the $39/MWh current power price that establishes the ZEC price cap, REC prices would be $61/MWh or more, which is nearly three times the ZEC cap. This $39/MWh price difference between RECs and ZECs would cost New York consumers an additional $1 billion per year in power costs, if the full 26 million MWh of annual generation from the upstate nuclear plants could be replaced. And cost protections built into the ZEC program mean that average ZEC cost may be below $22/MWh but will not be higher. REC prices are not capped similarly. If power prices rise above $39/MWh, REC and ZEC prices decline together; if prices fall, REC prices rise but ZEC prices stay at the cap. As the CES Order notes, "The marginal cost of additional increments of renewable resources is expected to always be significantly higher than ZEC prices."[1]

ZEC Pricing

The ZEC price, established by the CES Order, is determined by 1) starting with the U.S. government's estimate of the social cost of carbon (SCC); 2) subtracting the portion of this cost already captured in current wholesale power prices through the RGGI carbon cap program; and 3) converting the value from $/ton to $/MWh, using a measure of the New York system's carbon emissions per MWh. The ZEC price for Tranche 1, April 2017 through March 2019, is $17.48/MWh. For subsequent two-year tranches, the actual ZEC price will be set similarly, except that it will be reduced by any increase in the New York Zone A wholesale cost of power from its near-term price of $39/MWh. This one-sided dependence on market prices creates a ZEC price cap, with ZEC prices being below the cap to the extent future power prices rise above their current level; if power prices fall, the ZEC price stays at the cap. Table 1 illustrates the derivation of the ZEC price cap. It rises over time as the SCC rises, reaching $26.26/MWh (nominal) for Tranche 6, April 2027 – March 2029, and averaging about $22/MWh across the 12-year horizon.

[1] CES Order, page 127.

Table 1: ZEC Price Cap Derivation

		US SCC "Central Value"[1]	Baseline Avg April 2017-March 2019 RGGI estimate in CARIS LBMP	Net CO_2 Externality	Short Ton to MWh Conversion Factor[2]	ZEC Price Cap
		$ Nominal / Short Ton	**$ Nominal / Short Ton**	**$ Nominal / Short Ton**	**Short Ton / MWh**	**$ / MWh**
Tranche 1	4/1/2017 - 3/31/2019	42.87	10.41	32.46	0.53846	17.48
Tranche 2	4/1/2019 - 3/31/2021	46.79	10.41	36.38	0.53846	19.59
Tranche 3	4/1/2021 - 3/31/2023	50.11	10.41	39.70	0.53846	21.38
Tranche 4	4/1/2023 - 3/31/2025	54.66	10.41	44.25	0.53240	23.56
Tranche 5	4/1/2025 - 3/31/2027	59.54	10.41	49.13	0.50876	25.00
Tranche 6	4/1/2027 - 3/31/2029	64.54	10.41	54.13	0.48511	26.26

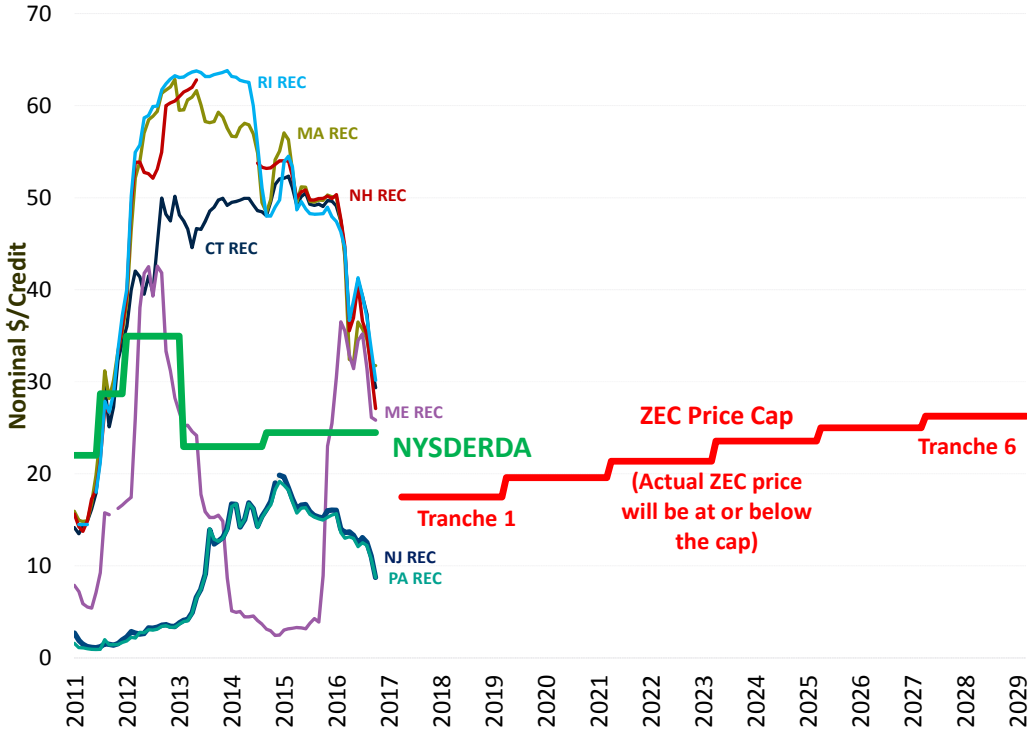
[1] Uses the central value estimate for the social cost of carbon from the U.S. Interagency Working Group on the Social Cost of Carbon, averaged over each Tranche period.

[2] Assumes the CES achieves its renewable generation goal of 50% renewables by 2030 (i.e., 70,496,000 MWh). Renewable generation is interpolated for years between 2021 and 2030 to derive the conversion factor.

REC Pricing

REC prices for most Northeast states have been generally above the ZEC price cap. Figure 2 below shows historical REC prices for Northeast states, and the average cost of renewable attributes for resources contracted by NYSERDA in New York. It also shows the ZEC price for Tranche 1 and the ZEC price cap going forward; the actual ZEC price may be below the cap for subsequent Tranches.

Figure 2: Historic Class 1 REC Prices, and New York ZEC Price Cap



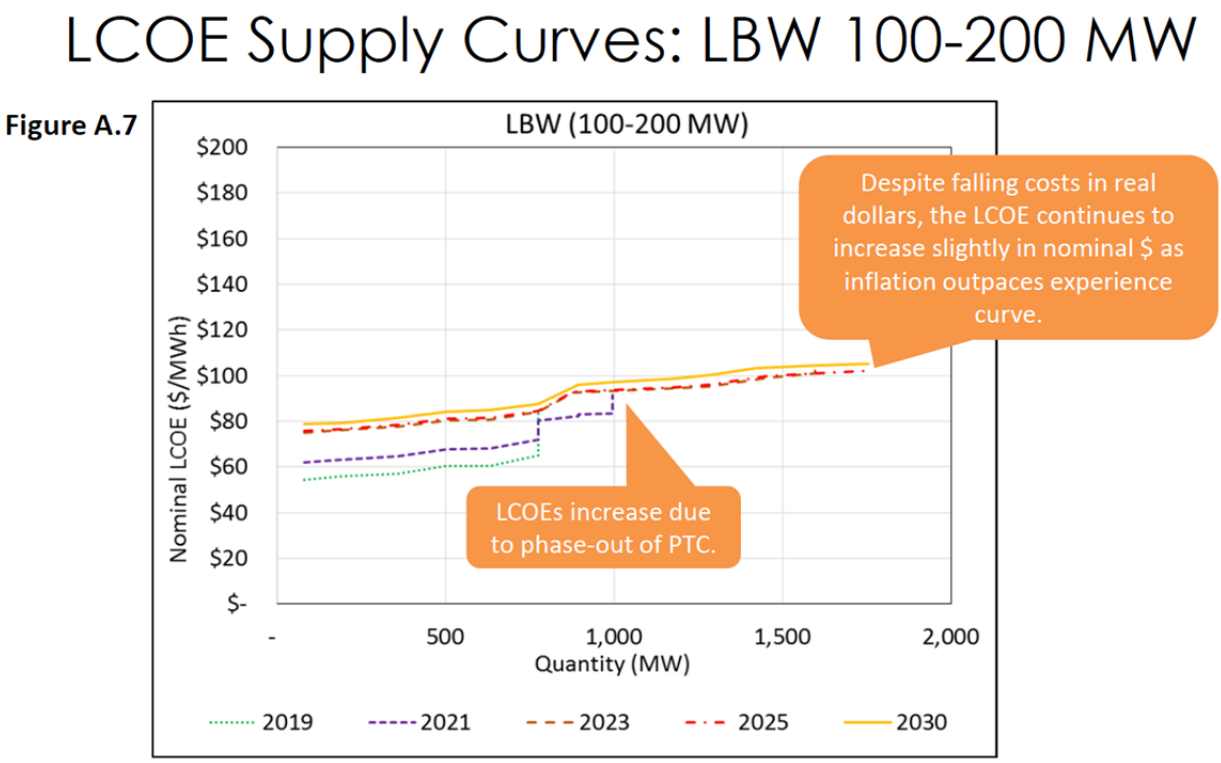
Sources: REC prices reflect average available state price data from SNL's Renewable Energy Credit data set. NYSERDA cost data is as reported on the NYSERDA Main Tier Solicitations webpage. The ZEC Price Cap is from the CES Order.

It can be challenging to predict future REC prices, but in conceptual terms, the REC price will be the amount by which total renewable costs (net of tax credits) exceed the market price of power. That is, given that wholesale power prices are below renewable costs, RECs provide the "missing money" that allows a renewable generator to cover their full net costs, including return of and on capital, and operating and maintenance costs, net of tax credits. Competition among renewable developers will prevent the REC price from being materially higher than this. Although the market price of power will affect the REC price, it will also affect ZEC price in the same way, so total renewable costs will be the fundamental driver of the relative values of REC and ZEC prices.

The April 2016 Cost Study by the DPS developed supply curves for a number of relevant renewable technologies. These supply curves estimate how much renewable generation of each type is available in New York at a given price. As more renewable resources are developed, each additional increment will be more costly, since the most cost-effective sites tend to be developed first. As an example, Figure 3 below, reproduced from the DPS Cost Study, is the supply curve for large land-based wind (LBW) projects of 100-200 MW, showing the upward sloping character common to supply curves. As more

LBW is developed, the price rises. According to the Cost Study, LBW in medium to large installations (30-100MW, or 100-200MW) is generally the most economic large-scale renewable technology in New York. Offshore wind, utility-scale PV, small hydro and other technologies tend to be more costly and sometimes are available in only relatively small quantities. The supply curve for large LBW below shows that about 1,500 MW is available at a price of $100/MWh or less. In aggregate across all the technologies considered in the Cost Study, only about 6,300 MW of renewables are available at or below $100/MWh. Since meeting the CES Tier 1 target requires the addition of more than twice this amount of new renewable generation, about 13,000 MW, even just meeting these goals will mean renewable prices of at least $100/MWh.

Figure 3: Levelized Cost of Electricity from Land Based Wind (New York DPS Cost Study)



Source: "Clean Energy Standard White Paper – Cost Study," New York State Department of Public Service, April 8, 2016, Figure A.7 from page 141.

If the upstate nuclear plants were to retire prematurely, replacing their carbon-free generation output would require another 10,000 MW of renewables, on top of the 13,000 MW needed for the Tier 1 goals, for a total of 23,000 MW of new renewables.[2] Even assuming it would be feasible to develop this much

[2] Because most types of renewables have a much lower capacity factor than nuclear, more capacity is needed to achieve comparable energy output. Replacing the energy output of 3,300 MW of upstate nuclear would require 10,000 MW of renewables, using the mix considered in the DPS Cost Study.

additional renewable capacity this quickly, the already rapid and unprecedented expansion needed for the Tier 1 goals would have quickly exhausted the least costly renewable resources and pushed the price to $100/MWh or more. This additional renewable demand would push much farther out on the renewable supply curves to costs even farther above $100/MWh, and potentially much higher.

Comparing Future ZEC Prices with Potential REC Prices

ZEC prices, as defined in the CES Order, will be at or below the ZEC price cap, which averages about $22/MWh. The historical average cost of New York renewable attributes acquired by NYSERDA has been above this value, as have REC prices in neighboring states. Further, several factors will serve to keep New York REC prices relatively high in the future, and possibly push them upward. The large renewable additions targeted by Tier 1 of the CES will quickly exhaust the least costly renewable resources in New York, pushing well to the right on the available renewable supply curves. The renewable cost estimates presented in the CES Cost Study suggest that the cost for incremental renewables will be more than $100/MWh, even at just the Tier 1 renewable targets. If the upstate New York nuclear plants were to retire prematurely, replacing their carbon-free generation in addition would dramatically increase the amount of renewables needed, from 13,000 MW to 23,000 MW. This would push considerably farther up the renewable supply curves, putting still more upward pressure on the future cost of New York renewables. With market capacity and energy prices at the baseline $39/MWh level, $100/MWh or higher renewable costs imply future New York REC prices of $61/MWh or more, nearly three times the $22/MWh ZEC price cap.[3] If power prices rise above $39/MWh, REC prices and ZEC prices both fall, leaving the difference unchanged. If power prices fall, REC prices would rise but ZEC prices remain at their cap.

Given all this, and in light of the ambitious CES renewable goals already in place, incremental near-term renewables beyond the CES goals are almost certain to be much more costly than supporting the existing upstate New York nuclear plants with the ZEC program. Procuring sufficient additional renewables to accomplish the carbon abatement of the upstate nuclear plants is probably not physically feasible, but if it were, it could cost New York consumers about $1 billion more each year than the ZEC program, according to the DPS renewable cost estimates. The PSC Order correctly found that ZECs will cost less than the additional renewable resources that would be needed to replace the upstate nuclear plants' output.

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[3] The estimate of $100/MWh renewable cost leaves out the effect of tax credits, such as the PTC and ITC; tax credits can and do reduce the effective cost of renewables. However, 2015 legislation is phasing out these renewable tax credits. The PTC for wind will be phased out entirely for facilities that begin construction after 2019, and the ITC for solar at the end of 2021, both well before most of the additional renewables would be developed to replace retiring nuclear. Tax credits have influenced historical REC prices; their loss will add upward pressure to REC prices, relative to historical values.

This is not to say that nuclear power is in competition with renewables and efficiency in the larger policy context. On the contrary, the Cuomo Administration and the New York PSC recognize that both approaches are necessary to achieve the long-term goal of reducing carbon emissions. The CES appropriately relies on large scale investment in renewables and energy efficiency in the longer term, while using the ZEC program as a bridge to maintain the zero-emissions nuclear plants during the transition period. This keeps carbon emissions down as new carbon-free resources ramp up to scale, and also provides the best value to New York consumers.