Comments to the Power Generation Advisory Panel
on the Draft Recommended Enabling Initiatives and Reliability in Light of the Texas Blackouts
25 March 2021

I am submitting these comments based on my evaluation of the Generation Advisory Panel draft recommended enabling initiatives and as follow up to verbal comments I made. Reliability and affordability should be primary concerns for this panel and I am unsure that all the members of the panel agree even in the face of the catastrophic impacts of the Texas blackout. The draft recommended initiatives do not adequately address reliability.

I am a retired electric utility meteorologist with nearly 40 years-experience analyzing the effects of meteorology on electric operations. I have written extensively on implementation of the CLCPA closely because I worry that its impacts on affordability, reliability and the environment affect my future as a New Yorker. The opinions expressed in this comment do not reflect the position of any of my previous employers or any other company I have been associated with, these comments are mine alone.

Executive Summary

This comment addresses the Power Generation Advisory Panel draft recommendations for enabling initiatives. In light of the catastrophic impacts of the Texas blackouts I believe that the panel's recommendations should explicitly address issues raised in the Analysis Group Climate Change Impact and Resilience Study ("Resilience Study") prepared for the New York Independent System Operator (NYISO).

I worry that some commenting stakeholders and even some members of the panel under value reliability and would accept blackouts in the future. My comments describe blackouts that have affected New York City and the responses that were implemented to prevent future blackouts. I go on to describe the impacts of the Texas blackout in February 2021, reasons it occurred, and what needs to be done to prevent a re-occurrence. As New York transitions its electric system to one dependent upon renewables all of the issues raised by that blackout need to be addressed.

In the next section I briefly describe the New York reliability planning process. I note that reliability risks are increasing in New York because of diversity, redundancy, flexibility, dependability, and resiliency changes in the electrical sector. I go on to explain that the Resilience Study and similar work by E3 for the Climate Leadership and Community Protection Act implementation process both highlight the problem that in order to meet the CLCPA emissions reduction goals a resource category that provides firm, dispatchable and zero-emissions generation is needed. Because the only proven technologies that can provide those resources are nuclear and hydro which are unlikely to provide additional significant future energy in the future, both the Analysis Group and E3 include a placeholder resource category in their projections for future electric generation. Meeting the resource needs for the identified energy deficit gap is necessary and is a major technological challenge.

I explain that the Power Generation enabling initiatives should specifically address concerns derived from the Resilience Study conclusions: “The variability of meteorological conditions that govern the output from wind and solar resources presents a fundamental challenge to relying on those resources to meet electricity demand” and “Energy storage resources that are currently and expected to be available can fill part, but not all of the gap needed to maintain system reliability”. Of course, the third concern is what can be done about the energy storage gap itself.

I recommend that the enabling initiatives emphasize planning requirements. It is necessary to understand how many renewable resources are available during the likely worst case, the multi-day winter wind lull, and an initiative addressing this should be included. There are initiatives included to address energy storage resources but they should be re-framed to recognize that this technology is not mature and that there are significant implementation challenges to overcome even to meet the 2030 goal. It cannot be over-emphasized that the only firm, dispatchable and zero-emissions technologies available today are nuclear and hydro. The relevant initiative does not adequately address the Analysis Group points that: “There is a void that will need to be filled with technologies and/or fuels that - at the scales that would be required - are currently neither proven nor economical” and “There is no doubt a major amount of technological change that will happen over the next twenty years, rendering it very difficult to forecast a future resource set with reasonable confidence”. A separate initiative should be included that spells out a planning process to meet this challenge and notes that until this technology is available and deployable the 2040 zero-emission target cannot be met without reliability consequences

I do not believe that the 2021 Texas energy debacle was caused by the lack of wind and solar resources but it does foreshadow the difficulty replacing them when the wind isn’t blowing at night. The lesson to be learned is that Texas energy policy prioritized and subsidized unreliable energy sources (wind and solar) at the expense of reliable ones (natural gas, coal and nuclear) for decades but did not incorporate market mechanisms to ensure that the system could operate under conditions that had occurred in the past. It is incumbent upon the Power Generation advisory panel to ensure that New York’s transition to a zero-emissions electric energy grid does not result in a similar fiasco.

Blackouts

There is a long history of blackouts in New York City (NYC) that is relevant to reliability. After a blackout in July 2019 AMNY published a brief history of blackouts in New York City. In 1959 and 1961 surges in electrical use caused blackouts and “The outage spurred changes to better protect the city’s power grid from future blackouts”. The 1965 blackout was the first regional blackout and was caused by a transmission problem in Ontario causing a wave of disruptions in the transmission system. Over 30 million people and 80,000 square miles in Ontario, New York, Connecticut, Massachusetts, New Hampshire, New Jersey, Pennsylvania, Rhode Island, and Vermont were left without power for up to 13 hours. As part of the response to that event New York set up a power pool to manage electricity generation and transmission. There was another blackout in 1977 that was limited to NYC. This one was caused by storms cutting off transmission into the City and in-City generation being unable to replace the load. When generating units or transmission lines trip off, the system is unbalanced and protective devices turn off overloaded lines and transformers to prevent damage. Those shutoffs

cascade down to the distribution system cutting off power to consumers and this led to the blackout. As a result, reliability constraints were implemented to ensure that when storms threaten transmission into the City that sufficient in-City generation is available to prevent a re-occurrence. Other similar issues were identified and additional constraints implemented. In 2003 there was another regional blackout caused by a computer software problem. Grid operators identified the cause and then developed procedures to prevent it from happening again. In 2012 tropical storm Sandy caused blackouts exacerbated by flood protection weaknesses. Since then, there have been massive investments to strengthen the infrastructure to prevent a reoccurrence. Note that after every blackout the electric system owners and operators have developed strategies to prevent a reoccurrence of the problems that caused the blackouts.

In February 2021 the Texas electric system suffered major blackouts. In brief, the ultimate cause of the blackouts and resulting problems in Texas was due to poor planning. The weather in Texas during the storm was extreme but not unprecedented. Similar cold snaps occurred in 2011, 1991, 1990, 1989, 1983, 1963, and 1961 and there were electrical outages in 2011. Because there is no apparent trend in low daily maximum temperatures, climate change was not a factor. This was a weather event.

While there have been reports that dozens of deaths are tied to the storm in Texas, experts say the death toll is likely far larger. And it could be weeks or months before the true magnitude is known. In addition, the blackouts cost the state economy upward of **$130 billion in damages and losses**, and some people who did have power saw their bills **spike by thousands of dollars**. Grid operators say that the situation could actually have been a lot worse, with the system **minutes away from a months long blackout**.

Chuck DeVore explains that poor planning led to two problems that caused the blackouts but policy failures over many years were the root cause. He states that "had every Texas generator powered by natural gas, coal, nuclear and hydro operated at full output during the height of the storm's demand, Texas still would have experienced planned blackouts". The policy failure that led to this situation is that "Federal and state tax policy have encouraged the overbuilding of wind, and to a lesser extent, solar power, resulting in cheap, subsidized power flooding the Texas grid" and that in turn has discouraged building new natural gas power plants and keeping existing coal and gas plants on-line. Clearly the extremely cold weather did reduce wind turbine output and it also affected fossil and nuclear output. The more worrisome problem for me is that as ERCOT struggled to keep the lights on, "the grid became unstable, tripping additional power plants offline to protect their massive generators from destructive interaction with a fluctuating line frequency". This appears to have been largely caused by large fluctuations in wind output. "As ERCOT issued the order to start load shedding – rotating blackouts – some of the darkened circuits included vital oil and gas infrastructure. This uncoordinated move starved natural gas power plants of their fuel – leading to a further loss of power and the widespread and incorrect rumor that wellhead and pipeline freeze off contributed to the disaster." I am very confident that the NY electric system is resilient to current conditions but I worry about major changes.

Clearly the Texas electricity market failed to provide adequate resiliency for these conditions. I agree with Becky Klein, former commissioner and chairman of the Public Utility Commission of Texas who writes that the questions that need to be considered now are:

- Are we prepared to pay more for electricity and water to ensure higher levels of reliability?
- And if so, how much more?
- How can we be better prepared for "outlier" events, regardless of their probability?

As New York transitions its electric system to one dependent upon renewables all of these questions need to be addressed. Fortunately, the NYISO Climate Change Impact and Resilience Study ("Resilience Study") lays the foundation to start to address those questions in New York. Unfortunately, the Generation Advisory Panel draft recommended enabling initiatives presented at the last several meetings do not explicitly address the aspects of that study that pertain to reliability.

New York Reliability Planning

According to the 2020 NYISO Reliability Needs Assessment: "The New York system is deemed to have sufficient resources if the probability of an unplanned disconnection of firm load (loss of load expectation, or "LOLE") is equal to or less than the standard of once in every 10 years or 0.1 events per year." Note that the Texas data indicate that conditions similar to those that caused the blackouts exceed this standard. As a result, the New York energy planning process should address a problem similar to this.

A primary concern of the Power Generation Advisory panel should be how to maintain the current levels of reliability during the transition to a zero-emissions electric grid. I believe that diversity, redundancy, flexibility, dependability, and resiliency are key components of a reliable and affordable system. The Draft New York State Energy Plan and Draft Environmental Impact Statement dated December 2001 sets the bar: "Greater diversity in the types of fuel used for energy production could benefit all market participants, ensuring adequate fuel supplies and dampening price volatility."

Unfortunately, the New York trends for all components of reliability are towards increasing risk. Fuel diversity in New York has already been reduced. In 2001, New York electricity was generated 16% by coal, 27% by natural gas, 11% by oil, 16% by hydro, 28% by nuclear, 0% by wind and solar and 2% by other sources. In 2019, New York electricity was generated 38% by natural gas, 23% by hydro, 33% by nuclear, 3% by wind and solar and 2% by other sources. One key aspect of redundancy is the ability to store fuel on-site so the facility can run for weeks which is a feature of coal, oil, hydro and nuclear which are used much less than in 2001. It is also important to be able to transport and deliver fuel in different ways which is another feature of coal and oil that has disappeared. Although activists claim that wind and solar are flexible - I disagree. Wind and solar power are utterly dependent upon the vagaries of weather so cannot be called flexible. They certainly are not dependable without additional energy storage and grid support services that markedly increase the cost. The claim that wind and solar are more resilient to massive outages is absurd given that every night with calm winds causes an outage of

both of these generating resources. Furthermore, solar panels and wind turbines are more fragile to extreme weather and thus less resilient.

Ultimate Problem

Both E3 in their presentation to the Power Generation Advisory Panel on September 16 and the Analysis Group in their September 10, 2020 presentation to NYISO described what I maintain is the ultimate problem. They explained that in order to meet the CLCPA emissions reduction goals that a resource category that provides firm, dispatchable and zero-emissions generation is needed. The Analysis Group labels these resources as dispatchable and emissions-free resources ("DE Resources") but gives no specific examples. On the other hand, E3 gives examples such as "such as bioenergy, synthesized fuels such as hydrogen, hydropower, carbon capture and sequestration, and nuclear generation". The International Energy Agency (IEA) recently published "Special Report on Clean Energy Innovation" that classified the technology readiness level of the technologies that could possibly be both dispatchable without GHG emissions. The bottom line is that none of the E3 examples of firm, dispatchable and zero-emissions technologies are close to being ready for adoption except nuclear and hydro which I believe are unlikely to provide any meaningful additional support for New York.

The Resilience Study does a good job outlining the difficulties of the challenge of this problem. They explained the criteria used to "establish a system that; (a) has demand consistent with the Climate Change Phase I Study, (2) has a set of resources that comply with the requirements of the CLCPA, and (3) that meets electricity demand in every hour all year." They went on to explain the uncertainties for these initial "starting point" resources:

- The New York power system is currently heavily dependent on natural gas fired generating units to provide energy, to be available during high load hours, to provide critical reserves on the system, and to be able to ramp up and downs on timescales of seconds, minutes, hours, and days to manage net load variability. At least as currently configured and fueled, these resources cannot operate in 2040;
- Even retaining existing low-carbon (nuclear, hydro) resources, there is an enormous amount of energy and capacity needed to meet projected demand in 2040;
- Currently-available and reasonably economic resources available to make up the zonal and system-wide energy deficits include solar and wind resources, yet their availability is uncertain and somewhat unpredictable. In fact, data reviewed for this report reveal that there would be long (multi-day) "lulls" in production from these resources. This means that almost no quantity of nameplate capacity from these resources is sufficient to meet demand in all hours of the year;
- Energy storage resources that are currently and expected to be available can fill part, but not all of the gap needed to maintain system reliability;
- There is a void that will need to be filled with technologies and/or fuels that - at the scales that would be required - are currently neither proven nor economic; and
- There is no doubt a major amount of technological change that will happen over the next twenty years, rendering it very difficult to forecast a future resource set with reasonable confidence.

On October 8, 2020 Kevin DePugh, Senior Manager for NYISO Reliability Planning, made a presentation to the Executive Committee of the New York State Reliability Council that gave an overview of the Reliability Study and emphasizes the results in the context of reliability planning. He listed the following characteristics of the DE resource:

- Large quantity of DE Resource generation is needed in a small number of hours;
- DE Resource has low capacity factor (~12%) during the winter;
- DE Resource has only a 3.7% capacity factor in the summer;
- DE Resource is not needed at all during spring and fall;
- Substantial quantity of DE Resource capacity is needed, the energy need is minimal;
- DE Resource must be able to come on line quickly, and be flexible enough to meet rapid, steep ramping need;
- On an average day, storage can meet evening peaks, but the DE Resource must generate if storage is depleted and renewable generation is low; and
- In the Winter CLCPA scenario, the DE Resource output across the state must increase from 362 MW (1.1% of DE Resource nameplate capacity) to27,434 MW (85.4% of name plate capacity) in six hours of the most stressed day.

To sum up this section, these are the resources that are necessary to prevent a New York blackout similar to the Texas blackout of 2021. If the Climate Action Council scoping plan does not develop a plan to ensure that these resources will be available as needed, then blackouts will occur.

Draft Recommended Enabling Initiatives

At the February 12 and 22 and March 10, 2021 Power Generation Advisory Panel meetings ten "enabling" initiatives or strategy recommendations for the Climate Action Council were discussed. Table 1 lists 15 different initiatives for possible recommendations. At the time of this writing ten of the initiatives have been discussed. I assume that the remaining initiatives will be discussed at upcoming meetings.

I am disappointed with the initiative topics addressed by the panel. In general, given that no jurisdiction anywhere has actually implemented a zero-emissions electricity generating system I believe that the emphasis of this advisory panel should be on initiatives that enable or implement zero-emissions generation and the necessary supporting infrastructure including transmission necessary to deliver the power generated when and where needed. Affordability and reliability should also be considered. Given the obvious ramifications of getting this wrong shown by the Texas energy debacle I would hope that there would be a focus on reliability. I am disappointed because not only is there a lack of focus on reliability but resources were squandered on four topics that are out of the scope of power generation and are being considered by other advisory panels.

Table 1: CLCPA Power Generation Advisory Panel Enabling Strategy Initiatives Summary

Discussed	Described	Initiative #	Description
2/12/2021		1	Technology Solutions
2/12/2021		2	Market Solutions
2/12/2021		3	Existing Storage Technology
2/12/2021		4	Long Duration Storage Technology
2/22/2021		5	Workforce Development
2/22/2021		6	Access and Affordability for All
2/22/2021		7	Growth of Large Scale Renewable Energy Generation
3/10/2021		8	Reliability for the future grid
3/10/2021		9	Distributed Generation / Distributed Energy Resources
3/10/2021		10	Methane leakage
3/10/2021		1	Reaching Zero Emissions by 2040 (Build into Technology Solutions)
	2/12/2021		Fossil fuel-fired electricity generation
	2/12/2021		Advanced fuels use
	2/12/2021		Clean energy siting and community benefits
	2/12/2021		Electrification of Buildings and Transportation
	2/12/2021		Energy delivery and hosting capacity

In my analysis I looked at all the initiative to see how many components specifically addressed reliability issues. Table 2 lists eight initiatives that have components that explicitly address reliability and categorizes which components address it. There are 36 components and 29 address reliability in some fashion. I am specifically worried about three concerns derived from these Resilience Study conclusions: "The variability of meteorological conditions that govern the output from wind and solar resources presents a fundamental challenge to relying on those resources to meet electricity demand" and "Energy storage resources that are currently and expected to be available can fill part, but not all of the gap needed to maintain system reliability". Of course, the third concern is what can be done about the energy storage gap itself.

The first enabling initiative addresses reliability more than any other. As such it is instructive to consider the notes from the February 12 meeting where this was discussed as well as the draft summaries. There are two categories of technology solutions in this enabling initiative: those required to meet the 2030 goal and those to meet the 2040 goal.

I do not believe the components described to meet the 2030 goal adequately address reliability. Based on my impression from the summary and notes, the panel believes that meeting the 70% reduction of GHG emissions by 2030 will not require technological breakthroughs, only accelerated deployment and investments. I think that presumes that we are not that far away from the target, but we don't know how far we have to go because current levels of emissions using New York's methodology have not been released. The key question is whether the New York inventory adjustments for methane are so large to make this a more difficult goal to achieve than is commonly believed today. I believe that it might be

Table 2: Generation Advisory Panel Enabling Initiative Components that Explicitly Address Reliability Issues

Component	Reliability
Components required for delivery in Initiative #1: Technology Solutions	
Achievement of 70 by 30:	
Focus on energy delivery, the economics of long duration and seasonal storage, siting, and identifying technology gaps	Yes
Aggressive deployment of current renewable energy and storage technologies	Yes
Achievement of 100 by 40:	
Detailed, holistic, modeling within a zero-emissions world to identify needed technologies	Yes
Support NYSERDA in its innovation efforts, including the development of a consortium of stakeholders to develop these solutions	Yes
Supporting utility-scale demonstration projects of new technologies, including storage and transmission and distribution	Yes
Additional Topics Presented at the March 10, 2021 meeting	
During planning, emissions free resources (e.g., storage, energy efficiency, distributed renewable energy) should be prioritized where feasible when considering end uses, technology limitations, and costs. However, should a substitute for natural gas still be needed, advanced green hydrogen and possibly RNG could fill this gap in order to maintain reliability, if scalability, feasibility, and environmental impact issues can be addressed.	Yes
Analysis and Research Needed	
Determine the lifecycle carbon accounting framework of RNG and advanced green hydrogen. Priority utilization should be provided for feedstocks with the lowest carbon emissions, with further preference given to zero or negative emissions sources.	
The potential air quality and health impacts of these fuels.	
The safety of advanced green hydrogen, storage, and pipeline operation.	
Technological innovation, development, and scaled deployment is needed in order to prove the effectiveness and economics of the technologies.	Yes

Table 2, continued: Generation Advisory Panel Enabling Initiative Components that Explicitly Address Reliability Issues

Component	Reliability
Components required for delivery in Initiative #2: Market Solutions	
Expand wholesale market eligibility participation rules for new policy resources	Yes
Continue assessing opportunities to improve accuracy and granularity of wholesale market energy price signals, including shortage pricing, congestion relief, and peak/off peak pricing	Yes
Adapt current ancillary service market designs and look to add products that are needed to incent flexibility as needed to efficiently integrate renewables	Yes
Expand Demand Side Opportunities and Opportunities for Flexible Resources	Yes
Improve access for Distributed Resources and continue improvements to cost causation $ retail rate price signals	Yes
Continued analysis and consideration of Incorporating Environmental Values in Market Pricing and/or in Policy and Investment Benefit Cost Analysis	Yes
Examine all Resource Adequacy options and continue to improve resource adequacy contribution compensation	Yes
Enhance/augment the availability of public information to assist developers in making informed project development decisions	
Components required for delivery in Initiative #3: Exisiting Storage Technology	
Provide increased funding for energy storage deployment	Yes
Expand Clean Energy Standard to better integrate storage	Yes
Update State Energy Storage Roadmap and revise storage deployment goals	Yes
Incorporate energy storage into energy delivery and transmission planning	Yes
Further refined modeling of the future grid is needed to evaluate the potential system reliability needs anticipated for the future grid. The modeling should identify the need for storage resources with longer durations that may develop with technology innovation, to show the true breakdown of potential storage vs. fully dispatchable generation needs.	Yes
Incentives for companies that provide systems sufficiently tested for the higher safety standards required in urban environments such as NYC.	
Continued work with NYISO on market enhancements that facilitate the resource transition, support investment, minimize costs to consumers, minimize the impact of BSM, and meet reliability.	Yes

Table 2, continued: Generation Advisory Panel Enabling Initiative Components that Explicitly Address Reliability Issues

Component	Reliability
Components required for delivery in Initiative #4: Long Duration Storage Technology	
Focus State programs and funding on research and demonstration projects for the development of large scale and longer duration storage	Yes
Develop and expand a Storage Center of Excellence so that new technologies can be matured and deployed on the grid for large scale testing	Yes
Attract and engaged relevant parties in collaborative efforts to address the challenges unique to long duration storage	Yes
Components required for delivery in Initiative #7: Grow Renewables	
There remains a large amount of renewables that must be procured and developed to reach the goals. The Public Service Commission issued an Order in October 2020 that implemented key provisions to align the Clean Energy Standard with the CLCPA. NYSERDA's implementation of these procurement targets is essential to meeting the CLCPA goals for both 2030 and 2040.	
Though much progress towards the 70 by 30 goal has been made, most renewable energy projects have been deployed upstate. Both OSW and Tier 4 seek to increase renewables penetration into the downstate region.	
New and upgraded transmission and distribution systems will be necessary to deliver energy from the generation location (both upstate and offshore), to the load demand downstate. The Power Grid study was recently completed and should provide directional support on necessary transmission upgrades.	Yes

Table 2, continued: Generation Advisory Panel Enabling Initiative Components that Explicitly Address Reliability Issues

Component	Reliability
Components required for delivery in Initiative #8: Reliability for the Future Grid	
Established biennial checkpoints should be conducted to assess the state of bulk power system reliability in consultation with the federally designated electric bulk system operator. These checkpoints will ascertain if any program adjustments are needed to ensure continued safe and adequate electric service and will be informed by the review of NY power system performance in conformance with established operations requirements and by relevant studies including the NYISO's Reliability Needs Assessment.	Yes
Power system studies and planning should integrate analysis to consider climate change impacts as needed for reliability and resiliency.	Yes
Actions needed to ensure reliability while working to achieve CLCPA will additionally be reflected in the State Energy Plan.	Yes
Continued efforts to improve reliability and resiliency to extreme weather events, which will be exacerbated by climate change, should occur. This work should include continued infrastructure investment such as: storm hardening, elevating equipment and substations, and moving lines underground. Additionally, design criteria must change through time and reflect the impacts of climate change as needed.	Yes
The market products, requirements and technology standards needed to maintain reliability should be updated through time while also ensuring that undue costs are not imposed which would impair meeting CLCPA goals, including creating barriers to renewables.	Yes

necessary to have long-duration storage in the energy mix needed to meet the 2030 goal. That means natural gas is going to be needed until long-duration energy storage can be implemented at scale and in time. It appears that is a controversial issue within the panel. I am also concerned that the reality of current energy storage technology does not comport with what will be needed. No jurisdiction has implemented energy storage at the levels likely needed so there may be unforeseen issues. Finally, I believe we do not know enough about renewable energy resources worst case availability to determine whether present technology can make the necessary reductions.

The Technology Solutions initiative has two components for the 70 by 30 goal: "focus on energy delivery, the economics of long duration and seasonal storage, siting, and identifying technology gaps" and "aggressive deployment of current renewable energy and storage technologies". It appears to me that these are simply calls to build as much as possible as fast possible and worry about whether that will work, much less effectively work later. I think this might lead to problems. For example, at the 19 January 2021 Climate Action Council meeting the meeting presentation announced that New York's 2020 renewable energy standard solicitation includes 22 new large-scale renewable energy projects including the 110 MW Rutland Center Solar One project due east of Lake Ontario in the north central part of the state. This may not be an appropriate location if the multi-day winter period of calm is the critical worst-case period because this site is in the Lake Ontario snow belt. As a result, it is likely that during the worst-case renewable resource availability period solar panels located there will be covered by snow and provide no support at all for the New York electric system when it is needed most. To effectively address the worst case, solar in similar locations should not be encouraged.

There are four components for the achievement of the 100 by 40 goal. The first component is "detailed, holistic, modeling within a zero-emissions world to identify needed technologies". Clearly, in order to meet the 2040 goals technological innovations will be required and this kind of modeling is necessary to define the problem. Unfortunately, I don't think most of the panel understands just how large a challenge this is. Moreover, there is not universal understanding that replacing fossil fuel infrastructure should only be done when those innovations have produced technology that is mature enough to be available for deployment. That takes time. This goes back to the politically correct but technical unreality that replacing fossil fuels is only a matter of political will. That simply is not the case. It is not clear that all the members of the panel understand this point.

Finally, the notes include complaints about an over-emphasis on the last 5-10%. The comment that the "conversation about the last 5-10% is a distraction" demonstrates a lack of knowledge about the problem. The electric system is designed to provide reliable service under all conditions and it turns out that in order to do that the prime consideration becomes how do you handle peak load periods – the last 5-10%. The Texas energy system did not consider the last 1% and look what happened. I believe that not emphasizing the last 5-10% will lead to blackouts sooner and more often.

Also included in the 100 by 40 goal are two other components: "Support NYSERDA in its innovation efforts, including the development of a consortium of stakeholders to develop these solutions" and "supporting utility-scale demonstration projects of new technologies, including storage and transmission

and distribution". Both are necessary steps in order to develop the technology needed for a reliable system.

The final component of this initiative is "during planning, emissions free resources (e.g., storage, energy efficiency, distributed renewable energy) should be prioritized where feasible when considering end uses, technology limitations, and costs. However, should a substitute for natural gas still be needed, advanced green hydrogen and possibly RNG could fill this gap in order to maintain reliability, if scalability, feasibility, and environmental impact issues can be addressed". This concerns me because it appears to limit future technologies. Given the magnitude of the challenge and necessity for dispatchable emissions free resources, I think it is premature for anything to be taken out of consideration in the initial strategies.

Subsequent to the first meeting, two other topics were added to "build into Technology Solutions recommendation". The first was described: "As the State moves towards a zero emissions grid in 2040, flexible and dispatchable resources will be critical. Further analysis, technical development, and research is needed in order to determine the feasibility, climate impact, and health impacts of advanced fuels and nuclear." The second description stated that: "Under current NYS policy and regulation, upstate nuclear facilities are within the resource mix (with existing financial support) until at least 2030. The contribution of nuclear power to the 2040 resource mix and any additional policy actions needed should be evaluated prior to the cessation of the Zero Emissions Credit (ZEC) Program in 2029." My impression is that they both were added in response to comments received in the public input sessions included in these meetings. Obviously, if the climate crisis is an existential threat to society and to address that there is a need for a as yet unidentified new technology to provide zero-emissions dispatchable power, then shutting down 2,000 MW of generation that meets those criteria is the worst thing you can do. Keeping nuclear assetts available as long as possible is in the best interests of reliability.

The first added topic has a component that states that "During planning, emissions free resources (e.g., storage, energy efficiency, distributed renewable energy) should be prioritized where feasible when considering end uses, technology limitations, and costs. However, should a substitute for natural gas still be needed, advanced green hydrogen and possibly RNG could fill this gap in order to maintain reliability, if scalability, feasibility, and environmental impact issues can be addressed." This is another indication that the use of renewable natural gas and advanced green hydrogen as sources of dispatchable zero-emissions energy is a big controversy for this panel. It appears that the ideological and irrational fear of natural gas is spilling over to other similar fuels. Unfortunately, we may need natural gas and these technologies to keep the lights on. Four other components in this topic addressed the analysis and research needed to actually implement these technologies and all are necessary for reliability.

The second initiative is "Market Solutions". New York's electricity market is de-regulated so implementation is not simply a matter of telling the state utilities to do it. Instead, market rules have to be designed to entice companies to provide the necessary services. With all due respect to market economists, I think that anticipating all the consequences, potential opportunities for market manipulation, and market signals needed is more likely to be a trial-and-error process than a success

story in the first try. The Texas electricity market is not trying to incentivize 100% zero-emissions electricity and did not successfully implement market rules that kept the lights on. This is a very important initiative necessary for reliability.

The third and fourth initiatives address energy storage. Given that the membership of the panel includes people from the energy storage industry it is not surprising that the initiative is a blueprint for the expansion of that industry. While unquestionably necessary, this is another instance where it appears to me that these are simply calls to build as much as possible, as fast possible and worry about whether everything will out work later. I believe the first step should be to determine if this approach is feasible and affordable. In addition, the existing storage technology initiative presumes that current technology can be deployed at the scale needed in the time needed. Given the infancy of the technology I think that is unlikely.

Enabling initiative 7, "Grow Renewables" follows the pattern of initiatives that call for implementation before analysis. One component notes that most renewable energy has been installed upstate but that it needs to be available downstate as well. It seems to me that a feasibility analysis to see if that is possible would be appropriate. The last component states that new and upgraded transmission will be needed but the need for transmission support services is not mentioned.

Given that my main concern is reliability, Initiative 8: Reliability for the Future Grid promised to be the answer to that concern. Unfortunately, the initiative is more for a reliability tracking system during implementation than a comprehensive plan to maintain reliability from the get go. My over-riding concern is the lack of a comprehensive assessment of renewable resource availability for New York. Instead, it is just presumed that there is enough energy available from wind and solar resources coupled with energy storage to make it work. The Resilience Study also makes that point but their availability analysis did not consider the joint distribution of wind and solar resources and was over a relatively short period. Given that the New York reliability standard for a loss of load is a once in ten-year occurrence and that the last time Texas had a similar cold weather event was ten years ago, a minimum of ten years needs to be evaluated to ensure reliability. The enabling initiatives should include a renewable resources evaluation.

Conclusion

To be clear, the 2021 Texas energy debacle was not caused by the lack of wind and solar resources but it does foreshadow the difficulty replacing them when the wind isn't blowing at night. The lesson to be learned is that Texas energy policy prioritized and subsidized unreliable energy sources (wind and solar) at the expense of reliable ones (natural gas, coal and nuclear) for decades but did not incorporate market mechanisms to ensure that the system could operate under conditions that had occurred in the past. It is incumbent upon the Power Generation advisory panel to ensure that New York's transition to a zero-emissions electric energy grid does not result in a similar fiasco. Unfortunately, the enabling initiatives do not explicitly address the factors needed to ensure this will not be the case.

I believe that the enabling initiatives should specifically address three concerns derived from these Resilience Study conclusions: “The variability of meteorological conditions that govern the output from wind and solar resources presents a fundamental challenge to relying on those resources to meet electricity demand” and “Energy storage resources that are currently and expected to be available can fill part, but not all of the gap needed to maintain system reliability”. Of course, the third concern is what needs to be done about the energy storage gap. In order to understand meteorological variability it is necessary to understand how many renewable resources are available during the likely worst case, the multi-day winter wind lull and an initiative addressing this should be included. There are initiatives included to address energy storage resources but they should be re-framed to recognize that this technology is not mature and that there are significant implementation challenges to overcome even to meet the 2030 goal. It cannot be over-emphasized that the only firm, dispatchable and zero-emissions technologies available today are nuclear and hydro and it is unlikely that we can expect significant increased energy from them. The relevant initiative does not adequately address the Analysis Group points that: “There is a void that will need to be filled with technologies and/or fuels that - at the scales that would be required - are currently neither proven nor economical” and “There is no doubt a major amount of technological change that will happen over the next twenty years, rendering it very difficult to forecast a future resource set with reasonable confidence”. A separate initiative should be included that spells out a planning process to meet this challenge and notes that until this technology is available and deployable the 2040 zero-emission target cannot be met without reliability consequences.

I am very concerned that there appear to be members of this panel that either do not understand or do not want to understand the necessary planning needed to ensure reliability and that maintaining reliability is a prime responsibility for any recommendations to the Climate Action Council. There should be an initiative that specifically addresses that prime directive in addition to the initiative that tracks reliability.

Power Generation Verbal Comments 3 February 2021

My name is Roger Caiazza. I am a retired air pollution meteorologist making personal comments representing my fixed income senior citizen demographic. I do not believe that the majority of New York citizens have any idea what the Climate Act means to their future but I do and the potential impacts on affordability and reliability of the electric system scare me.

The German green energies experience should be an affordability concern. Germany's electricity prices have increased 27% over the past decade and green energy surcharges make up over half the cost. Their targets are less aggressive than ours so I suspect our costs will increase more. When the Climate Action Council claims that the plans are cost-effective even with the increased costs because of the NY value of carbon, it should be recognized that today's real costs are only cheaper compared to contrived value-driven estimates of speculative impacts occurring out to 2300 almost exclusively outside the state.

I am uncomfortable listening to the panel when reliability concerns are raised. There seems to be little recognition that there will always be peak electric energy periods – when it is very hot or very cold society needs more energy. The point is that you need to design the electric system to address those periods, not hope that that a magical solution will eliminate peak loads. Failure to do so will mean reliability risks at the worst possible time.

As a meteorologist I worry that an assessment of renewable energy resources using observed meteorological data has not been prepared. It is critical to determine how much renewable energy is available in the multi-day winter doldrums because energy use will increase in the future due to heating and transportation electrification.

The bottom line is that because energy use is inelastic an increase in energy costs is a regressive expense. While it is entirely appropriate that there should be an emphasis on environmental and social justice your proposed strategies have to consider cost-effectiveness to reduce the regressive impact on those who can least afford those increased costs, regardless of location, who are living in energy poverty or have a disproportionate energy burden.