BEFORE THE NEW YORK STATE
PUBLIC SERVICE COMMISSION

Proceeding on Motion of the Commission to Implement a Large-Scale Renewable Program and a Clean Energy Standard	)	Case 15-E-0302

SIERRA CLUB AND EARTHJUSTICE'S COMMENTS IN RESPONSE TO DECEMBER 2023 TECHNICAL CONFERENCE

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TABLE OF CONTENTS

Earthjustice and Sierra Club ("Commenters") respectfully submit these limited comments to address certain statements and omissions during the technical conference convened on December 11 and 12, 2023 in this proceeding. Commenters' selection of these limited topics for response should not be read to imply Commenters' agreement with the remainder of the statements made by panelists during the course of the conference. These comments briefly address a few discrete issues that Commenters believe were misleadingly addressed or mischaracterized, but Commentors have more fulsomely set forth their views on the topics at issue in this proceeding in earlier submissions on this docket.

1. The Hydrogen Panel's Claim that There Are "No Technical Issues" with Hydrogen Transportation and Storage Is Misleading.

During the technical conference, speakers on the hydrogen panel suggested that, based on prior experience elsewhere in the country transporting hydrogen, there would be limited barriers to increasing reliance on hydrogen as a power generation fuel. This suggestion is misleading, however, because pipelines constructed specifically to transport hydrogen do not exist in New York, existing gas pipelines in New York cannot safely transport more than de minimis concentrations of hydrogen, and creating a new pipeline distribution system for hydrogen would incur enormous costs.

Leakage of hydrogen is a serious concern. Due to its small molecular size, hydrogen is prone to leakage rates on the order of 1.3-2.8 times greater than methane.[1] Hydrogen's elevated leakage rate is important because of hydrogen's substantial impacts as an indirect greenhouse gas.[2] Recent analysis of hydrogen warming research has found that, on a 100-year time scale, hydrogen's global warming potential (GWP) is approximately 11 times greater than that of carbon dioxide.[3] Critically, hydrogen's maximum warming impact occurs around 7 years after the initial emissions, and when measured using the 20-year GWP in New York's climate accounting, hydrogen has a GWP approximately 33 times greater than carbon dioxide.[4]

Technical conference panelist David Cohn from Sargent & Lundy downplayed concerns about hydrogen leakage, noting that hydrogen pipelines have been successfully designed and built. However, this observation ignores the lack of designated hydrogen pipelines in New York State, the high cost of building such pipelines, and the risks of trying to use existing pipelines built to transport natural gas to transport hydrogen or hydrogen-gas blends.

According to the U.S. Department of Energy (DOE), only approximately 1,600 miles of hydrogen pipelines are in current operation in the United States, and these are concentrated in the Gulf Coast region where existing large hydrogen producers and users such as petroleum

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[1] Fotis Rigas & Paul Amyotte, *Myths and Facts about Hydrogen Hazards*, 31 Chem. Eng'r Transactions 913, 914 (2013), https://www.aidic.it/cet/13/31/153.pdf.

[2] Richard Derwent et al., , *Global Environmental Impacts of the Hydrogen Economy*, 1 Int'l J. of Nuclear Hydrogen Prod. & Applications 57, 57–67 (2006),https://www.geos.ed.ac.uk/~dstevens/publications/derwent_ijnhpa06.pdf.

[3] Ilissa B. Ocko & Steven P. Hamburg, *Climate Consequences of Dydrogen Emissions*, 22 Atmospheric Chemistry & Physics 9349, 9358 (2022), https://acp.copernicus.org/articles/22/9349/2022/acp-22-9349-2022.pdf.

[4] *Id.*

refineries and chemical plants are located.[5] By comparison, there are 3 million miles of natural gas pipeline across the country, approximately 2,000 times the mileage of existing hydrogen pipeline.[6] Currently, there does not exist a transport network to move hydrogen at large scale. An entirely new system would need to be purpose-built to enable hydrogen transport at the scale envisioned by Sargent & Lundy.

Increasing the mileage of pipelines in New York capable of transporting hydrogen also presents significant cost challenges. As DOE explains, "[t]he high initial capital costs of new pipeline construction constitute a major barrier to expanding hydrogen pipeline delivery infrastructure."[7] While DOE notes the possibility of making use of existing natural gas pipeline infrastructure to transport low concentration blends of hydrogen (less than 15% hydrogen), the Department acknowledges that "[c]onverting existing natural gas pipelines to deliver pure hydrogen may require more substantial modifications."[8]

Indeed, hydrogen embrittles steel and cast iron pipelines, necessitating a costly replacement of existing pipeline infrastructure to accommodate hydrogen: The small molecular size of hydrogen also enhances its diffusion through the lattice structure of pipeline materials and causes embrittlement.[9] A recent analysis by the California Public Utilities Commission (CPUC) from July 2022 confirmed that hydrogen causes embrittlement and blistering of cathodically sealed pipes[10] and that even synthetic (MDPE) pipes show deteriorating performance with increased hydrogen blending, finding limitations in material integrity for mixtures of 20 percent hydrogen.[11] The CPUC concluded, based on the analyses conducted, that a "systemwide blending injection scenario becomes concerning as hydrogen blending approaches 5% by volume."[12] Indeed, above a 25% hydrogen concentration, equipment must be upgraded to be resistant to hydrogen explosions and unplanned ignition.[13]

Furthermore, even if existing natural gas pipelines could be easily repurposed to transport higher percentages of hydrogen, the amount of energy flowing through the pipelines would be drastically reduced and necessitate either additional pipelines or expanding existing pipelines to deliver the same amount of energy as natural gas. This is due to the low volumetric energy

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[5] U.S. Dept. of Energy, Hydrogen Pipelines, https://www.energy.gov/eere/fuelcells/hydrogen-pipelines# (last visited June 14, 2024).
[6] U.S. Energy Information Admin., Natural Gas Explained: Natural Gas Pipelines, https://www.eia.gov/energyexplained/natural-gas/natural-gas-pipelines.php# (last updated Mar. 19, 2024).
[7] U.S. Dept. of Energy, Hydrogen Pipelines, https://www.energy.gov/eere/fuelcells/hydrogen-pipelines# (last visited June 14, 2024).
[8] *Id.*
[9] Zahreddine Hafsi et al., *Hydrogen Embrittlement of Steel Pipelines During Transients*, 13 Procedia Structural Integrity 210, 211 (2018), https://www.sciencedirect.com/science/article/pii/S2452321618302683#:~:text=The%20transient%20regime%20is%20created,diffusion%20through%20the%20pipeline%20wall.
[10] CPUC, Hydrogen Blending Impacts Study at 16–17 (July 18, 2022), https://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M493/K760/493760600.PDF.
[11] *Id.* at 3.
[12] *Id.* at 4.
[13] Jeff St. John, *Green Hydrogen in Natural Gas Pipelines: Decarbonization Solution or Pipe Dream?*, Green Tech Media (Nov. 30, 2020), https://www.greentechmedia.com/articles/read/green-hydrogen-in-natural-gas-pipelines-decarbonization-solution-or-pipe-dream.

density of hydrogen. For example, natural gas energy density in the U.S. averages 1,036 Btu per standard cubic foot compared to hydrogen's 323.6 Btu/standard cubic foot.[14,15] These values show that hydrogen pipelines would need to be expanded to transport approximately three times the volume of gas, or pressure in the natural gas pipeline would need to be tripled to move the same amount of energy as was moved previously using natural gas. This change would have downstream effects and substantial costs related to the number of compressor stations required, the amount of energy to compensate for pipeline losses, and the cost to retrofit downstream end users to offtake higher pressure gases. In sum, transporting hydrogen at scale would require substantial cost, redesign, and new infrastructure at a time when we can least afford it.

In addition to the transport challenge, storing hydrogen presents both cost and feasibility hurdles. While it is true that storage technologies are mature, there are physical and energy limitations due to hydrogen's low volumetric density that raise costs and make large-scale storage potentially infeasible. To illustrate this challenge, assume that hydrogen is used for a 60 MW peaking plant with a 9,600 Btu/kWh lower heating value heat rate like the Siemens SGT-400 gas turbines that recently ran a 100% hydrogen fuel test.[16] This facility would have a requirement of 8 hours of fuel storage to ensure that it can operate when needed and mitigate fuel supply risks. The total amount of hydrogen required to run this plant at full output for 8 hours would be 10,100 kg. If this facility were to use current gaseous hydrogen storage tube trailers onsite it would require approximately 14 trailers at 500 bar (731 kg/trailer), if it used liquid hydrogen, it would require 2.4 liquid hydrogen tanks (16,000 gallon tank equivalent to 4,300 kg of liquid hydrogen).[17,18] Capital costs of these storage systems alone, not considering balance of plant or energy costs, could increase the plant capital cost by 6-16%.[19] The additional energy required to compress or liquefy hydrogen for storage would also need to be factored in, along with the capital costs of the compression or liquefaction facilities, whether located onsite or offsite. If planners are assuming that large-scale clean hydrogen will just appear without significant infrastructure investments for transport and storage, and the energy required to pressurize, liquefy (if required), and transport hydrogen then the full costs will consistently be understated.

Any strategy built around hydrogen would need to consider and quantify the potential cost of building new hydrogen pipelines and recognize the limited potential to retrofit existing pipeline networks to high levels of hydrogen to transport it at sufficient scale. Additional considerations would need to be made for whether the sites can host significant hydrogen storage

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[14] U.S. Energy Information Admin., Units and Calculators Explained: Energy Conversion Calculator, https://www.eia.gov/energyexplained/units-and-calculators/energy-conversion-calculators.php (last updated June 16, 2023).

[15] U.S. Energy Information Admin., British Thermal Unit Conversion Factors at 226 n. c (May 2024), https://www.eia.gov/totalenergy/data/monthly/pdf/sec12.pdf.

[16] Hydrogen Insight, *Correction: Siemens Energy Burns 100% Hydrogen in Industrial Gas Turbine in Energy-Storage Pilot*, https://www.hydrogeninsight.com/power/correction-siemens-energy-burns-100-hydrogen-in-industrial-gas-turbine-in-energy-storage-pilot/2-1-1535850 (last updated Nov. 6, 2023).

[17] Bayo Tech, Bulk Hydrogen Transport Trailers, https://bayotech.us/bulk-hydrogen-transport-trailers/ (last visited June 14, 2024).

[18] Air Products, Liquid Hydrogen at 2 (2014), https://www.airproducts.com/-/media/files/en/900/900-13-082-us-liquid-hydrogen-safetygram-9.pdf.

[19] Based on a 60 MW SGT-400 plan with four 15 MW units at $1,000/kW, a 500 bar gaseous hydrogen tube trailer at $680,000/trailer, or a 4,300 kg liquid hydrogen tank at $1,400,000/tank.

to balance delivery and consumption of hydrogen or to provide sufficient hours of backup fuel depending on the needs. In addition to these factors there is the potential for continual adverse climate impacts due to hydrogen leakage during production, transport, and use.

2. The Claim that Pipelines Are the Most Efficient Way of Moving Energy Does Not Account for the Roundtrip Efficiency of Green Hydrogen Versus Direct Transportation of Electricity Produced by Renewable Sources.

During the technical conference, panelist Bryan Pivovar, of the National Renewable Energy Laboratory, suggested that moving hydrogen through pipelines over long distances is a significantly more efficient form of energy transportation than moving electricity through wires. But in addition to the technical challenges, expense, and leakage potential of long-distance hydrogen pipelines discussed above, any consideration of pipeline efficiency needs to account for the very low roundtrip efficiency of the entire electricity-to-hydrogen-to-electricity process.

Using electricity to produce hydrogen that is in turn converted back into electricity results in roundtrip efficiency that is significantly lower than that of transporting electricity via transmission lines. The roundtrip efficiency of using renewable electricity to produce hydrogen that is later burned to generate electricity has been estimated at about 20% based on data supplied by General Electric.[20] Even optimistic roundtrip efficiency estimates, like those contained in the United States Department of Energy's Energy Storage Handbook, still find that the *majority* of energy produced will be lost when using hydrogen as an energy carrier, whether this is for electric power generation or as a transportation fuel.[21] This stands in contrast to producing renewable energy and transporting it via transmission. The EIA estimates transmission and distribution losses at approximately 5%, meaning that 95% of electricity generated reaches end users.[22] Even when accounting for storing electricity using batteries, they are typically 82% efficient and the result is that 82% of electricity produced is delivered to end users compared to approximately 20% for hydrogen. Therefore, there is a significant danger of wasting the state's limited supply of renewable energy on producing hydrogen and transporting it over long distances.

Finally, it is important to bear in mind that when electricity moves over wires, there is no need for further pollution-emitting combustion before the electricity may be used by consumers.

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[20] *See* Jeffrey Goldmeer, Gen. Elec., Power to Gas: Hydrogen for Power Generation at 5 tbl.3 (2019), https://www.gevernova.com/content/dam/gepower-new/global/en_US/downloads/gas-new-site/resources/GEA33861%20Power%20to%20Gas%20-%20Hydrogen%20for%20Power%20Generation.pdf.According to the data, the GE 9HA.02, a relatively high efficiency combustion turbine with a capacity of 557 MW, would require 19,500 gigawatt-hour (GWh) of renewable electricity to generate the amount of green H2 needed to operate the turbine for 8,000 hours per year of use at its rated capacity. The roundtrip efficiency of using renewable energy to produce green H2 that is combusted in the GE 9HA.02 gas turbine to produce electric power is: [[(557 MW x 8,000 hours) x (1 GWh/1,000 MWh)] ÷ 19,500 GWh] x 100 = 23 percent.

[21] Alexander J. Headley & Susan Schoenung, *Hydrogen Energy Storage*, U.S. Department of Energy Storage Handbook at 3 (2020), https://www.sandia.gov/app/uploads/sites/163/2022/03/ESHB_Ch11_Hydrogen_Headley.pdf (estimating 40% roundtrip efficiency).

[22] U.S. Energy Information Admin., *How Much Electricity Is Lost in Electricity Transmission and Distribution in the United States?*, https://www.eia.gov/tools/faqs/faq.php?id=105&t=3 (last updated Nov. 7, 2023).

By contrast, unless the hydrogen's ultimate destination is use in a fuel cell, the hydrogen traveling through a pipeline is ultimately likely to be combusted in a turbine, resulting in inevitable emissions of harmful Nitrogen Oxides (NOx), as discussed below.

3. The Panel Did Not Dispel the Serious Doubts Facing the Potential Use of Hydrogen Combustion as a "Zero Emissions" Fuel Source Due To the Inevitability of Harmful NOx Emissions.

Although the speakers on the panel at the technical conference described their hope for future improvements in available equipment, panelist Jeffrey Goldmeer of General Electric acknowledged that "you'll never get to zero" NOx with combustion turbines. Instead, the goals expressed by the panel largely consisted of replicating the NOx characteristics of methane combustion, rather than reducing or eliminating NOx emissions from their present level. Therefore, in addition to confirming that hydrogen combustion cannot emit zero NOx, the panel's discussion of NOx raised two additional issues.

First, although the panel was sanguine on the possibility of hydrogen combustion achieving a NOx profile similar to that of methane combustion, the pilot project discussed by the panel did not indicate that this was realistic. A 2022 study conducted by General Electric on its combustion turbines found that a 50/50 mixture of hydrogen and fossil gas (by volume) increased concentrations of NOx in gas exhaust by 35%.[23] And of serious concern, the New York Power Authority (NYPA) blending pilot project, which tested hydrogen blends under 50% by volume, found that "NOx levels increased by up to 24% as the hydrogen fuel fraction increased," and that the only way to keep emissions within the air permit limit even at this low concentration was to increase water injection rates.[24] The study confirmed that burning 100% hydrogen cannot be zero emissions because of increased NOx levels inconsistent with state air permits, or realistic water usage conditions. In fact, the NYPA pilot project found that "blending and burning a hydrogen mix of 5% to 44% with fracked gas at the… Brentwood Power State, resulted in… NOx levels increase[ing] by up to 24% as the fraction of hydrogen increased." [25]

Additionally, the report "detail[ed] several of the challenges that would prevent ongoing plant operation using the blend, including volume of hydrogen required, little industry experience with blending, and restrictive code requirements."[26]

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[23] See Jeffrey Goldmeer et al., Gen. Elec., Hydrogen as a Fuel for Gas Turbines at 5 (2022), https://www.gevernova.com/content/dam/gepower-new/global/en_US/downloads/gas-new-site/future-of-energy/hydrogen-fuel-for-gas-turbines-gea34979.pdf.

[24] EPRI, Executive Summary: Hydrogen Cofiring Demonstration at New York Power Authority's Brentwood Site: GE LM6000 Gas Turbine (Sept. 15, 2022), https://www.epri.com/research/products/000000003002025166.

[25] PEAK Coalition, Statement on NYPA Hydrogen Combustion Pilot Study (Sept. 26, 2022), https://f1096961-3dc3-44e4-b248-f2d10eb29a01.usrfiles.com/ugd/f10969_6161e5d3872b4d488b6d1ae4f9caf657.pdf.

[26] T&D World, *NYPA Sees Results from Green Hydrogen Project* (Sept. 23,2022), https://www.tdworld.com/distributed-energy-resources/article/21251346/nypa-sees-results-from-green-hydrogen-project; *see also* New York Power Authority Press Release, EPRI and GE Announce Results from NYPA Green

Second, even if hydrogen turbines were to someday achieve performance characteristics similar to methane combustion, the NOx emitted by methane combustion is already burdening disadvantaged communities in New York with devastating health impacts.[27]T Reducing NOx emissions and resulting ozone is critical for public health, environmental equity, and compliance with the Clean Air Act, and the impact of poor air quality falls disproportionately on low-income New Yorkers and New Yorkers of color. NOx emissions leading to ozone formation are a major health concern for New Yorkers. For example, the State's Department of Health has identified the reduction of air pollution including ozone as a key indicator to drive improvements in asthma rates and public health outcomes throughout the State. The New York State Prevention Agenda 2019–24 notes the "extensive evidence" linking ozone with respiratory and cardiovascular illness and death.[28] The Agenda also establishes a goal to "reduce exposure to outdoor air pollutants," with an emphasis on vulnerable groups.[29]

Keeping NOx emissions consistent with the existing burden borne by disadvantaged communities would contradict the purpose of the CLCPA in reducing these disproportionate impacts. But since power generation resources in New York today—and therefore the infrastructure to interconnect new resources—are disproportionately located in low-income and environmental justice communities,[30] it is likely that deployment of green hydrogen combustion for power generation would be at or near existing generation sites. Use of this technology at such sites would increase and prolong the pollution burden borne by the same communities that the Legislature has instructed should be prioritized for benefits, in contravention of CLCPA § 7(3).

Finally, it is important to recognize that the use case of hydrogen combustion that appears to be under consideration in this proceeding is for periods of peak demand, with plants frequently starting up to meet that peak demand and then shutting back down. These uses present particular NOx concerns, because existing NOx controls are often offline during startup and shutdown, causing emissions to spike. As the PEAK Coalition concluded after the Brentwood pilot project, New York State must "turn away risky power generation experiments and redirect public and ratepayer funds toward rapid deployment of proven, clean renewable energy and battery storage solutions."[31]

4. Significant Modeling Gaps in NYISO's Presentation at the Technical Conference Cast Doubts on the Operator's Conclusion that New York Will Have a DEFR Need of 30 GW+.

Hydrogen Demonstration Project (Sept. 23, 2022), https://www.nypa.gov/news/press-releases/2022/20220923-greenhydrogen; EPRI, Executive Summary: Hydrogen Blending Demonstration at UMERC's A.J. Mihm Generating Station: Wärtsilä 18V50SG Reciprocating Internal Combustion Engine (Mar. 9, 2023), https://www.epri.com/research/products/000000003002026305.

[27] *See* PEAK Coalition, Hydrogen Statement at 3–4, https://f1096961-3dc3-44e4-b248-f2d10eb29a01.usrfiles.com/ugd/f10969_94e733b1328d4168b74475313cddf9de.pdf.

[28] N.Y. Dep't of Health, Prevention Agenda 2019–2024: New York State's Health Improvement Plan at 72–73 (June 30, 2023), https://www.health.ny.gov/prevention/prevention_agenda/2019-2024/docs/ship/nys_pa.pdf.

[29] *Id.* at 14.

[30] *See* PEAK Coalition, Dirty Energy, Big Money at 5 (May 2020), https://www.nylpi.org/wp-content/uploads/2020/05/PEAK-report-Dirty-Energy-Clean-Money-May-2020.pdf.

[31] PEAK Coalition, Statement on NYPA Hydrogen Combustion Pilot Study at 2 (Sept. 26, 2022), https://f1096961-3dc3-44e4-b248-f2d10eb29a01.usrfiles.com/ugd/f10969_6161e5d3872b4d488b6d1ae4f9caf657.pdf.

Commenters are concerned that NYISO's presentation at the December technical conference overstates the need for dispatchable, emissions-free resources ("DEFRs") and downplays the value of taking steps in the near term to minimize this gap. Rushing to deploy expensive and untested DEFRs risks committing New York to flawed technologies, as it is unclear at the present time which technologies will emerge as commercially scalable and cost effective, much less which ones of the often talked about DEFRs would actually be emissions free. Rather than picking DEFR technologies to subsidize that may end up being sub-optimal, the DPS should focus on accelerating the build out of storage, solar, and wind, along with other existing methods to minimize the DEFR gap. Some of these existing methods include but are not limited to improving inter-regional coordination, expanding import capability with inter-regional transmission, expanding intra-regional transmission, increasing energy efficiency and mandatory demand response, and incorporating flexibility of large loads if possible. Recent State initiatives, such as the New York Power Authority's "Propel NY" project,[32] as well as newly enacted legislation, such as the Renewable Action Through Project Interconnection and Deployment ("RAPID") Act,[33] are empowering New York to take decisive steps towards shrinking the gap in the next few years.

Deployment of new long duration storage to fill any gap may also become a viable avenue for filling whatever gap remains. In fact, just this April the US Department of Energy disbursed $15 million to advance projects seeking to "enable a long-duration capable (10+ hours) energy storage technology with a pathway to $0.05/ kWh Levelized Cost of Storage (LCOS) by 2030."[34] As one commentator notes, in recent years, "batteries have quickly gone from providing niche grid services like frequency regulation to storing large amounts of power and supplying energy at times of peak demand."[35] Batteries are getting larger and cheaper over time: Just five years ago, the average battery storage project in America had a peak capacity of 4 MW. "The average battery project that has come online this year has had 61 MW of peak capacity... Between now and 2026, the average battery project is expected to have 89 MW of peak capacity."[36] Especially since a sizeable gap may not emerge until the later 2030s, employing the methods listed above can drastically shrink the potential DEFR gap while buying time for viable DEFR technologies to emerge.

At this stage, accurately characterizing the size and timing of the DEFR gap is important. If the PSC overestimates the size of the gap, the agency is more likely to feel the need to begin imprudently investing state resources in experimental DEFR technologies before these have had a few more years to develop and prove their viability. Zachary Smith, NYISO's Vice President of System and Resource Planning, presented a particularly alarmist slideshow at the "Characterizing the potential 'gap'" Panel presentation during the technical conference. This

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[32] NYISO, Power Trends Report at 27 (2024), https://www.nyiso.com/documents/20142/2223020/2024-Power-Trends.pdf/31ec9a11-21f2-0b47-677d-f4a498a32978?t=1717677687961 (hereinafter "Power Trends Report").
[33] New York State Senate, Assembly Bill A8808A (2024), https://www.nysenate.gov/legislation/bills/2023/A8808/amendment/A.
[34] U.S. Dept. of Energy, DOE Awards $15M to Launch Innovations for Long Duration Energy Storage Earthshot (Apr. 8, 2024), https://www.energy.gov/oe/articles/doe-awards-15m-launch-innovations-long-duration-energy-storage-earthshot.
[35] Michael Thomas, *The Rise of the Clean Energy Megaproject*, Distilled (June 11, 2024), https://www.distilled.earth/p/the-rise-of-the-clean-energy-megaproject.
[36] *Id*.

slideshow suggested that New York will require 30 GW of DEFRs. However, the analysis shown in slide 3 of Mr. Smith's presentation has multiple flaws. The first flaw relates to the "Wind Lull" analysis. The "Wind Lull" analysis only uses three wind profiles (including just two upstate wind profiles) to determine whether a "Wind Lull" occurs. An analysis of "Wind Lulls" limited to two upstate profiles likely misses the diversity of wind in the NYISO footprint which includes wind in Zones B, C, and E in addition to other wind sites in Zones A and D aside from Niagara and Plattsburgh. Further, despite a maximum winter "Wind Lull" of five days in the historical record evaluated, the analysis determined that the winter "Wind Lull" period should be 7 days because "it is possible that there have been more severe wind lulls than in the time span we analyzed, and that there could be more severe wind lulls going forward, particularly if such outcomes are made more likely by climate change."[37] While this may be true, this assumption was not substantiated by any climate models or other analysis and should not be used as the basis for determining the length of winter "Wind Lull" periods to be evaluated. The limited number of wind profiles evaluated and unsubstantiated lengthening of the "Winter" wind lull period arbitrarily increase "wind lull" period lengths leading to a conservative assumption on wind availability and an overestimate of the DEFR gap.

The second flaw of this analysis is more fundamental. The analysis presented in the Climate Change Phase 2 Study reflects a chronological dispatch but not of correlated wind, solar, and load. The analysis from the climate change impact study reflects wind lulls based on NREL wind data, but the wind lulls are "timed to overlap with the 12- and 7-day periods of highest load for each month, (including the peak load day)."[38] However, the average temperatures during these wind periods were in fact quite far from the modeled heat wave and cold snap scenarios, with average temperatures ranging from 64-75ºF in the summer wind lull periods and 25-33ºF in the winter wind lull periods. To properly evaluate DEFR needs in these scenarios, correlated wind, solar, and load profiles should be used rather than combining conservative assumptions on multiple drivers of resource adequacy issues to develop an implausible "worst-case" scenario. As described above, during these wind lulls, the temperature was far from extreme and the load would likely have been at moderate levels. By contrast, the model introduced heat wave and cold snap analyses using values that bear little relationship to New York's historical usage data: the model used a heat wave analysis during which hourly load was increased by up to 18.7%, and a cold snap analysis during which hourly load was increased by up to 25.6% with a minimum increase of 2.3%. The increase in the load for these analyses was not based on historical data or a robust process, but rather the increase in hourly load was performed to meet NYSERDA's criteria of a cold snap and heat wave. Further, solar profiles and wind profiles were adjusted arbitrarily for these cases. For example, the 20% capacity factor decrease for wind during heat waves is based on analysis of a European heat wave. While such analysis can be insightful, heat wave weather patterns on a different continent are a poor basis for determining wind output in New York. The result of the arbitrary assumptions on load, wind, and solar profiles in the heat wave, cold snap, and wind lull cases are extremely conservative scenarios that likely significantly overstate the capacity and energy need for DEFRs. If correlated wind, solar, and load shapes (without arbitrary adjustments) were used, it is likely that the DEFR Capacity need would be significantly reduced.

[37] Power Trends Report at 45.

[38] Paul J. Hibbard et al., Climate Change Impact and Resilience Study – Phase 2 at 45(Sept. 2020), https://www.nyiso.com/documents/20142/10773574/NYISO-Climate-Impact-Study-Phase-2-Report.pdf.

While there is going to be a gap that must be met with DEFR resources, the size of the gap must be adequately assessed. The Climate Phase 2 Study report's flaws cast considerable doubt on the size of the DEFR gap as presented in the report.

5. Conclusion

Commenters thank the Commission for considering these observations on discrete portions of the December Technical Conference. Commenters once again stress that identifying new "zero emissions" technologies is premature at this stage in the CLCPA's implementation. A more urgent deadline to create an electrical demand system that is primarily powered by renewables looms in 2030. In the near term, the Commission should focus its resources on deploying those renewable energy systems favored by the State's legislature at this time and work to improve the methodology for characterizing the gap to be filled by DEFRs. Doing so will both minimize and better position New York to address any gaps that remain in the later years of system transition.

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