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August 8, 2023

Michael S. Regan
Administrator
U.S. Environmental Protection Agency
1200 Pennsylvania Avenue, NW
Washington, DC 20460-0001

Re: **EPA Docket ID No. EPA-HQ-OAR-2023-0072;** Comments by Clean Energy Group, et al., on New Source Performance Standards for Greenhouse Gas Emissions from New, Modified, and Reconstructed Fossil Fuel-Fired Electric Generating Units; Emission Guidelines for Greenhouse Gas Emissions from Existing Fossil Fuel-Fired Electric Generating Units; and Repeal of the Affordable Clean Energy Rule

Administrator Regan:

Clean Energy Group (CEG), along with our undersigned partner organizations (The POINT CDC, Slingshot, Massachusetts Climate Action Network, Louisiana Against False Solutions, Berkshire Environmental Action Team, New York City Environmental Justice Alliance, New York Lawyers for the Public Interest, New Virginia Majority, and Just Solutions Collective), respectfully submits these comments in response to the Environmental Protection Agency's proposed rules for fossil fuel-fired power plants.

Our comments are divided into three sections. The first two sections of these comments are in response to the proposed Best Standard of Emissions Reduction for new and reconstructed fossil fuel-fired stationary combustion turbine electric generating units, as well as existing large, frequently used fossil fuel-fired stationary combustion turbines. Section I addresses Carbon Capture and Storage and Section II addresses Hydrogen Co-Firing. The comments in Section III address a proposed regulatory approach for emissions guidelines for existing fossil fuel-fired stationary combustion turbines used for peaking purposes, called "low load combustion turbines" or "peakers."

These comments reflect the position of CEG, a national nonprofit focused on accelerating an equitable and inclusive transition to a resilient, sustainable future, and our undersigned partners. These comments do not necessarily reflect the positions of CEG's other partner organizations or funders.

Thank you for your consideration.

Respectfully submitted,

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Comments of Clean Energy Group, et al., Regarding Proposed New Source Performance Standards for Greenhouse Gas Emissions from New, Modified, and Reconstructed Fossil Fuel-Fired Electric Generating Units

EPA Docket ID No. EPA-HQ-OAR-2023-0072

Clean Energy Group (CEG), along with our undersigned partner organizations, respectfully submit these comments in response to the Environmental Protection Agency's (the Agency) proposed rules for fossil fuel-fired power plants. These comments reflect the position of CEG, a national nonprofit focused on accelerating an equitable and inclusive transition to a resilient, sustainable future, and our undersigned partners. These comments do not necessarily reflect the positions of CEG's other partner organizations or funders.

Clean Energy Group's multi-year Phase Out Peakers project works to accelerate the retirement of polluting, fossil-fuel peaker power plants and to advance the deployment of clean, cost-effective alternatives, such as energy storage, renewable generation, transmission, energy efficiency, and demand response. It is the first national effort to systematically demonstrate with analysis and technical assessments how communities can harness clean non-combustion alternatives to meet peak electricity demand and capture local health and wealth benefits. This work is done in partnership and close collaboration with organizations representing the low-income communities and communities of color disproportionately impacted by power plant emissions. For the past two years, CEG has also worked extensively with environmental justice and community-based partners on topics intersecting with hydrogen production, transportation, and use, as well as carbon capture and storage (CCS). Through its national Hydrogen Information and Public Education initiative, CEG is working to counter misinformation regarding hydrogen by developing a repository of research and information on the viability of and issues related to the production and use of hydrogen, particularly in the context of power generation. Through this initiative, CEG supports the work of frontline organizations challenging hydrogen that may negatively impact their communities.

The first two sections of these comments are in response to the proposed Best Standard of Emissions Reduction (BSER) for new and reconstructed fossil fuel-fired stationary combustion turbine electric generating units (EGUs), as well as existing large, frequently used fossil fuel-fired stationary combustion turbines. The proposed BSER for turbines falling into these categories includes implementing CCS technology with 90 percent capture by 2035, or secondarily, co-firing a blend of 30 percent low greenhouse gas (GHG) hydrogen by 2032, ramping up to 96 percent hydrogen by 2038.[1]

The comments in Section Three address a proposed regulatory approach for emissions guidelines for existing fossil fuel-fired stationary combustion turbines used for peaking purposes, or "peakers," defined in the proposed rule as those EGUs with a capacity factor of less than 20

[1] 88 FR 33283 (May 23, 2023)

percent.[2] CEG focuses specifically on peaking power plants for several reasons. Peakers have historically been placed close to the load they serve; in urban areas, load equates to people, but the placement of peakers has not historically occurred in an equitable and just manner. Peakers are disproportionately located near low-wealth communities and communities of color.[3]

Comments are requested in several sections of the Federal Register notice that we also find relevant to the issue, and CEG will provide comments in the order that the rulemaking proposal is organized. We will also comment on some of the assumptions articulated throughout the proposed rule. We understand that Sections 111(b) and 111(d) of the Clean Air Act (CAA) require affected sources to reduce emissions to a level that the Agency has determined is *technically achievable*, and these sections are *not* designed to require sources to reach a level that has been deemed *safe*.[4] We note this, but we also call upon the Agency to abide by its own words articulated in Section XII: State Plans for Proposed Emission Guidelines for Existing Fossil Fuel-Fired EGUs:

> "*While the consideration of RULOF may warrant application of a less stringent standard of performance to a particular affected EGU, such standards have the potential to result in disparate health and environmental impacts to communities most affected by and vulnerable to impacts from those EGUs. Those communities could be put in the position of bearing the brunt of the greater health and environmental impacts resulting from an affected EGU implementing a less stringent standard of performance than would otherwise have been required pursuant to the emission guidelines**. A lack of consideration of such potential outcomes would be antithetical to the public health and welfare goals of CAA section 111(d**).*"[5] (emphasis added)

Section VII(A) outlines two BSER pathways with corresponding standards of performance that new and reconstructed stationary combustion turbines may take – one pathway is based on the use of CCS with 90 percent capture, and the other is based on co-firing a blend of 30 percent low-GHG hydrogen, eventually moving up to 96 percent hydrogen.[6] Section XI(A) outlines the same BSER pathways with corresponding standards of performance for existing fossil fuel-fired stationary combustion turbines.[7] Implementing CCS and co-firing low-GHG hydrogen should not be considered as a BSER for applicable plants. CCS has not been adequately demonstrated and has been proven to increase air pollution. Due to its indirect global warming potential, the negative environmental impacts associated with its production, and its limited efficacy at reducing carbon dioxide (CO_2) emissions, low-GHG hydrogen also does not meet the

[2] 88 FR 33244 (May 23, 2023)

[3] Clean Energy Group. "Mapping the Inequities of Fossil Peaker Power Plants." Clean Energy Group, April 21, 2022. Accessed July 21, 2021. https://www.cleanegroup.org/mapping-the-inequities-of-fossil-peaker-power-plants/.

[4] 88 FR 33374 (May 23, 2023)

[5] 88 FR 33386 (May 23, 2023)

[6] 88 FR 33277 (May 23, 2023)

[7] 88 FR 33361 (May 23, 2023)

requirements to be considered a potential BSER pathway. Below, CEG outlines our concerns regarding CCS and hydrogen.

SECTION I: Carbon Capture and Storage

A. Inadequate Demonstration

Section VII(F)3iii(A)1 states that the CO_2 capture component of CCS has been adequately demonstrated based on the demonstration of the technology at existing coal-fired steam generating units.[8] However, CCS has not been deployed successfully at any power plant in the US.[9] Section VII(F)3iii(A)2 references SaskPower's Boundary Dam Unit 3, which has demonstrated 90 percent capture.[10] However, data from the plant shows that these rates only occur at intermittent intervals, and do not represent an overall capture rate of 90 percent. The Boundary Dam plant is the only operating commercial CCS power plant in the world.[11]

B. Environmental Justice Impacts

Section VII(F)3iii(C) states that, because most new combustion turbines will be equipped with low-NOx burners and/or will be required to install select catalytic reduction (SCR), the Agency does not expect CCS to result in a substantial increase in non-GHG air pollutants.[12] However, because of the additional fuel needed to power the CCS equipment itself, electricity generation paired with CCS requires up to 44 percent more fuel than standalone power generation. CCS does not capture any toxic local air pollutants, such as fine particulates (PM2.5) or nitrogen oxides (NOx); the additional fuel burned to power the technology can therefore increase particulates and NOx emissions by anywhere from 5 percent-60 percent.[13] Even if power plants install additional NOx controls, these plants will have the NOx emissions of an existing newer natural gas plant. Combustion controls such as water injection or dry low NOx systems, as well as post-combustion controls such as selective catalytic reduction (SCR) do not operate during startup or shutdown of combustion turbines, resulting in uninhibited NOx emissions.[14]

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[8] 88 FR 33291 (May 23, 2023)

[9] Steyn, Matt, Jessica Oglesby, Turan Gulorean, Alex Zapantis, and Ruth Gebremedhin. "Global Status of CCS 2022." Global CCS Institute. Accessed July 18, 2023. https://status22.globalccsinstitute.com/wp-content/uploads/2022/12/Global-Status-of-CCS-2022_Download_1222.pdf.

[10] 88 FR 33291 (May 23, 2023)

[11] SaskPower. "BD3 Status Update: Q4 2022," January 23, 2023. https://www.saskpower.com/about-us/our-company/blog/2023/bd3-status-update-q4-2022.

[12] 88 FR 33302 (May 23, 2023)

[13] Hertwich, Edgar G., Thomas Gibon, Evert A. Bouman, Anders Arvesen, Sangwon Suh, Garvin A. Heath, Joseph D. Bergesen, Andrea Ramirez, Mabel I. Vega, and Lei Shi. "Integrated Life-Cycle Assessment of Electricity-Supply Scenarios Confirms Global Environmental Benefit of Low-Carbon Technologies." *Proceedings of the National Academy of Sciences* 112, no. 20 (May 19, 2015): 6277–82. https://doi.org/10.1073/pnas.1312753111.

[14] Sargent & Lundy. "Combustion Turbine NOx Control Technology Memo." Eastern Research Group, Inc., January 2022. https://www.epa.gov/system/files/documents/2022-03/combustion-turbine-nox-technology-memo.pdf#:~:text=Combustion percent20controls percent20reduce percent20the percent20amount percent20of percent20NOx percent20generated,exhaust percent20gas percent20and percent20includes percent20selective percent20catalytic percent20reduction percent20 percent28SCR percent29.

Environmental justice communities are already seeing disproportionate health impacts from NOx emissions at these levels.[15]

While there are major concerns regarding CCS implementation as a BSER pathway, there is an additional concern that designating the co-firing of a 30 percent blend of hydrogen by volume as a secondary BSER will encourage its adoption. Most existing power plants can combust a blend of 30 percent hydrogen, and it is unlikely that many operators would pursue the added expense of installing CCS technology if this option is available. CEG's concerns regarding hydrogen as a BSER pathway are outlined in the following section.

SECTION II: Hydrogen

A. Global Warming Potential

While hydrogen does not produce CO_2 when burned, when leaked into the atmosphere, it causes atmospheric chemical reactions that are associated with four main climate impacts: 1) it extends the lifetime of methane in the atmosphere; 2) it increases the production of ozone; 3) it increases the production of stratospheric water; and 4) it alters the production of certain aerosols. Due to these atmospheric effects, hydrogen is estimated to have a global warming potential nearly 12 times that of CO_2 over 100 years after release. In the first 20 years of its atmospheric lifetime, it contributes to 35 times the climate warming of CO_2. Hydrogen's global warming potential is so powerful that reducing its manmade presence in the atmosphere could tangibly slow down global warming in the next 20 years.[16] Conversely, increasing its presence would rapidly accelerate warming.

Due to its small molecular size, hydrogen gas is prone to leakage. While limited data on hydrogen leakage rates currently exists, a high-risk scenario based on future hydrogen demand could see up to 5.6 percent economy-wide leakage by 2050, compared to 2.7 percent in 2020.[17] If all the hydrogen in use economy-wide over the next two decades is zero-GHG hydrogen, leaks must be kept under 9 percent economy-wide to mitigate hydrogen's impact. If that hydrogen is produced using natural gas via steam methane reformation, leaks must be kept below 1 percent.[18]

Promoting hydrogen specifically for blending with natural gas could also contribute to a high leakage scenario. Hydrogen can crack steel pipelines in a process called embrittlement, so it

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[15] Buonocore, Jonathan J, Srinivas Reka, Dongmei Yang, Charles Chang, Ananya Roy, Tammy Thompson, David Lyon, Renee McVay, Drew Michanowicz, and Saravanan Arunachalam. "Air Pollution and Health Impacts of Oil & Gas Production in the United States." *Environmental Research: Health* 1, no. 2 (May 8, 2023): 021006. https://doi.org/10.1088/2752-5309/acc886.

[16] Sand, Maria, Ragnhild Bieltvedt Skeie, Marit Sandstad, Srinath Krishnan, Gunnar Myhre, Hannah Bryant, Richard Derwent, et al. "A Multi-Model Assessment of the Global Warming Potential of Hydrogen." *Communications Earth & Environment* 4, no. 1 (June 7, 2023): 203. https://doi.org/10.1038/s43247-023-00857-8.

[17] Bertagni, Matteo B., Stephen W. Pacala, Fabien Paulot, and Amilcare Porporato. "Risk of the Hydrogen Economy for Atmospheric Methane." *Nature Communications* 13, no. 1 (December 13, 2022): 7706. https://doi.org/10.1038/s41467-022-35419-7.

[18] Ocko, I. B., and S. P. Hamburg. "Climate Consequences of Hydrogen Emissions." *Atmospheric Chemistry and Physics* 22, no. 14 (2022): 9349–68. https://doi.org/10.5194/acp-22-9349-2022.

cannot be blended or transported in existing natural gas pipelines. Even at low levels of blending, hydrogen injected into natural gas pipelines can increase metal fatigue by more than 10 times and reduce resistance to fracture by more than 50 percent.[19] Technology sensitive enough to capture hydrogen leaks prior to a rupture event does not currently exist, but hydrogen leaks are estimated to be at least double that of natural gas.[20]

Given the low margin for error on hydrogen leaks, the limited technology currently available to safely contain hydrogen or detect leaks, and its immense global warming potential, it is irresponsible to consider co-firing of hydrogen as a BSER. Promoting its widespread use could lead to an increase in GHG emissions overall, even if power plant CO_2 emissions are somewhat reduced.

B. Local Air Pollution Impacts

When combusted, hydrogen produces on average six times as much NOx as methane.[21] NOx pollution is a public health hazard that does significant damage to the respiratory system over time. Many frontline communities located near existing heavily polluting power plants or existing oil and gas production sites have developed serious health disparities due to overexposure to NOx. A recent study estimated that air pollution from oil and natural gas production causes roughly $77 billion in health impacts nationwide every year.[22] These impacts are not limited to areas where production or combustion takes place. The study found that the health impacts associated with NOx exposure, including premature deaths, asthma attacks, and increased rates of childhood asthma, also spread regionally to impact areas that had little to no gas activity.[23] These adverse health impacts are seen even when NOx emissions are within permitted limits.

Combusting a 30 percent blend of hydrogen and natural gas has not been tested on a large scale in US power plants. Existing NOx emissions control technologies, such as using a catalytic reaction, diluting the fuel mix with water or steam, or using newer low-NOx technology such as a dry low NOx (DLN) combustion system, are not equipped to handle higher blends of hydrogen and natural gas. During a pilot hydrogen blending demonstration at NYPA's Brentwood facility, NOx emissions increased as much as 24 percent as the fraction of hydrogen increased. To keep

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[19] San Marchi, Christopher. "Fatigue and Fracture of Pipeline Steels in High-Pressure Hydrogen Gas." In Proceedings of the ASME 2022. Las Vegas, NV: Sandia National Laboratories, 2022.

[20] Ocko and Hamburg.

[21] Cellek, Mehmet Salih, and Ali Pınarbaşı. "Investigations on Performance and Emission Characteristics of an Industrial Low Swirl Burner While Burning Natural Gas, Methane, Hydrogen-Enriched Natural Gas and Hydrogen as Fuels." *International Journal of Hydrogen Energy* 43, no. 2 (January 11, 2018): 1194–1207. https://doi.org/10.1016/j.ijhydene.2017.05.107.

[22] Buonocore, Jonathan J, Srinivas Reka, Dongmei Yang, Charles Chang, Ananya Roy, Tammy Thompson, David Lyon, Renee McVay, Drew Michanowicz, and Saravanan Arunachalam. "Air Pollution and Health Impacts of Oil & Gas Production in the United States." *Environmental Research: Health* 1, no. 2 (May 8, 2023): 021006. https://doi.org/10.1088/2752-5309/acc886.

[23] Ibid.

NOx emissions within permitted limits, the plant had to significantly increase water consumption.[24]

At best, in newer turbines developed to successfully combust 100 percent hydrogen while deploying NOx emissions control technologies, NOx emissions remain like that of a newer natural gas plant.[25] Environmental justice communities are already seeing adverse health impacts from NOx emissions at these levels. As written, these rules for new and existing power plants will create new sources of NOx emissions for decades to come, exacerbating these impacts even further.

C. Production Concerns

The proposed rules define "low-GHG hydrogen" as hydrogen produced with .45 kg CO_2e/1 kg hydrogen from well to gate. It is likely that most of the hydrogen falling under this definition will be produced via electrolysis. Electrolysis is a water-intensive process, requiring 9 kg of water for every 1 kg of hydrogen produced.[26] Because electrolysis breaks down water into constituent elements, this water needs to be purified. Most industrial water purification processes require, at minimum, a ratio of 2:1 wastewater to pure water, effectively doubling the amount of water required. This water cannot be recycled back into the ecosystem entirely, which is of particular concern in drought-stricken parts of the country where hydrogen production is already occurring, such as the Southwest and California.[27]

In addition to its heavy water use, electrolytic hydrogen can have deceptively high GHG emissions. While the definition of low-GHG hydrogen in the rules will likely exclude hydrogen produced from more GHG-intensive methods such as SMR, it does not adequately guard against the inclusion of hydrogen produced via grid-connected electrolysis. A study by Princeton University's Zero-carbon Energy systems Research and Optimization Laboratory (ZERO Lab) found that electrolysis production powered by even the cleanest grid could have a carbon emissions intensity of roughly double that of hydrogen produced via SMR.[28] In order to guard against this, the EPA must not include hydrogen produced from grid-connected electrolyzers in its definition of low-GHG hydrogen. It is especially pertinent that the EPA set this standard for power plants co-firing hydrogen given the rollout of several federal incentives and programs,

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[24] "Hydrogen Cofiring Demonstration at New York Power Authority's Brentwood Site: GE LM6000 Gas Turbine."

[25] Kawasaki Heavy Industries, Ltd. "World's First Successful Technology Verification of 100 percent Hydrogen-Fueled Gas Turbine Operation with Dry Low NOx Combustion Technology Improving Power Generation Performances to Realize a Hydrogen Society," July 21, 2020. https://global.kawasaki.com/news_200721-1e.pdf.

[26] Beswick, Rebecca R., Alexandra M. Oliveira, and Yushan Yan. "Does the Green Hydrogen Economy Have a Water Problem?" *ACS Energy Letters* 6, no. 9 (September 10, 2021): 3167–69. https://doi.org/10.1021/acsenergylett.1c01375.

[27] Terlouw, Tom, Christian Bauer, Russell McKenna, and Marco Mazzotti. "Large-Scale Hydrogen Production via Water Electrolysis: A Techno-Economic and Environmental Assessment." *Energy Environ. Sci.* 15, no. 9 (2022): 3583–3602. https://doi.org/10.1039/D2EE01023B.

[28] Ricks, Wilson, Qingyu Xu, and Jesse D Jenkins. "Minimizing Emissions from Grid-Based Hydrogen Production in the United States." *Environmental Research Letters* 18, no. 1 (January 6, 2023): 014025. https://doi.org/10.1088/1748-9326/acacb5.

such as the 45V Hydrogen Production Tax Credit for low-GHG hydrogen, which may use less stringent standards when defining low-GHG hydrogen.

D. Limited CO_2 Emissions Reduction

Co-firing a blend of 30 percent of hydrogen by volume will not lead to a significant reduction in CO_2 emissions. Hydrogen has a lower energy density and lower heating value than natural gas, meaning that a 30 percent blend of hydrogen by volume will necessarily contain less energy unless the flow rate of hydrogen is increased.[29] As a result, CO_2 reductions from hydrogen blending by volume will not lead to linear reductions in CO_2. The recent hydrogen blending pilot at the New York Power Authority's Brentwood site found co-firing a blend of 34 percent hydrogen by volume led to only a 14 percent reduction in CO_2 emissions.[30] This minor reduction in CO_2 emissions is not enough to mitigate hydrogen's high leakage rates and massive global warming potential, as noted above.

For all of the reasons outlined above, CCS and hydrogen co-firing should not be considered BSER pathways for new and reconstructed stationary combustion turbines or for existing fossil fuel-fired stationary combustion turbines. There is an additional concern that putting forth these two untested and expensive technologies as BSER pathways for baseload and intermediate power plants, without extending new guidance for low load "peaker" plants, will encourage some plant operators to lower their capacity factor to avoid expensive retrofitting or plant upgrades. CEG's concerns regarding the omission of peaker plants from these proposed rules are outlined in the following section.

SECTION III: Peaker Plants

Peakers are some of the dirtiest power plants on the grid with high marginal emissions of CO_2 as well as localized NOx pollution.[31] This is due to frequent ramping, short duration operation, and low-level standby spinning that make it difficult, if not impossible, to control emissions.[32] NOx is a locally harmful pollutant and a contributor to secondary PM2.5, also a localized harmful pollutant. Combustion turbines can also burn petroleum, and often do so in areas where supplies of natural gas are constrained. Petroleum combustion is even more harmful than methane combustion. In Section IV(G), it is noted that the pounds of CO_2 emitted per MMBtu for

[29] Goldmeer, Dr Jeffrey. "Fuel Flexible Gas Turbines as Enablers for a Low or Reduced Carbon Energy Ecosystem," February 2019, 19. https://www.ge.com/content/dam/gepower/global/en_US/documents/fuel-flexibility/GEA33861 percent20Power percent20to percent20Gas percent20- percent20Hydrogen percent20for percent20Power percent20Generation.pdf

[30] "Hydrogen Cofiring Demonstration at New York Power Authority's Brentwood Site: GE LM6000 Gas Turbine." Technical Brief. 2022 LCRI-PG LCRI Program. EPRI, September 15, 2022. https://www.epri.com/research/products/000000003002025166

[31] Behles, Deborah Nicole, Controlling Ancillary Emissions Under the Clean Air Act: Consideration of Energy Storage as Best Available Control Technology, 42 Ecology L.Q. 573 (2015), pp. 585-587 https://digitalcommons.law.ggu.edu/cgi/viewcontent.cgi?article=1763&context=pubs accessed July 21, 2023

[32] ibid

petroleum products is 161 lb CO_2/MMBtu compared to that of natural gas at 117 lb CO_2/MMBtu.[33]

In Section IV(B)2, it is *acknowledged* that the simple cycle combustion turbines often used as peakers are less efficient than combined cycle combustion turbines, a fact that also contributes to higher marginal emissions. Also noted in this section is that combustion turbines "contribute to reliable operations of the grid during periods of peak demand or provide flexibility to support increased generation from variable energy sources."[34] The accompanying footnote states that "As more renewable energy is added to the electric grid and generation forecasts improve, the intermittency of renewable energy is reduced."[35] This statement creates doubt that significant investment in fossil peakers is economically prudent, and that the focus should instead be on non-emitting grid resources such as battery storage that can also provide more flexible services to the grid as needs change.

The Agency notes in Section IV(F)4 that the Inflation Reduction Act is likely to accelerate the adoption of non-emitting capacity on the grid such as renewables, and this is expected to "impact the operation of certain combustion turbines. For example, as the electric output from additional non-emitting generating sources fluctuates daily and seasonally, flexible low and intermediate load combustion turbines will be needed to support these variable sources and provide reliability to the grid. This requires the ability to start and stop quickly and change load more frequently."[36]

The Agency then acknowledges the ability of *energy storage* to support the expansion of renewable electricity "by meeting demand during peak periods and providing flexibility around the variability of renewable generation and electricity demand," in Section IV(G).[37] That paragraph continues "In the longer term, as renewables and battery storage grow, they are anticipated to *outcompete* the need for natural gas-fired generation and the overall utilization of natural gas-fired capacity is expected to decline" (emphasis added). This reasoning exposes a fundamental flaw in the proposed rule: if renewables and energy storage – technologies that are readily available, more than adequately demonstrated, and reasonable in cost – are expected to "outcompete the need for gas-fired generation," why is the Agency incentivizing via regulation two technologies – hydrogen co-firing and CCS – that 1) have not reached a level of technical maturity even approaching that of renewables and energy storage and 2) are *not* non-emitting technologies? Why isn't the focus instead on developing rules that help accelerate the pace of renewable and energy storage displacement of fossil generation?

In Section V(C)3, the Agency explains their approach to determining the BSER and degree of emission limitation achievable. The Agency identifies systems of emissions reduction that have been adequately demonstrated and identifies the "best" of these "after evaluating the amount of reductions, costs, and non-air health and environmental impacts, and energy requirements."[38]

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[33] 88 FR 33259 (May 23, 2023)
[34] 88FR 33253 (May 23, 2023)
[35] 88 FR 33253 (May 23, 2023)
[36] 88 FR 33258 (May 23, 2023)
[37] 88 FR 33265 (May 23, 2023)
[38] 88 FR 33272 (May 23, 2023)

As the Agency notes in Section V(C)3(a) in its discussion of the impact of *West Virginia v. EPA* on this proposed rule, the Supreme Court does not define "system of emissions reduction." The majority opinion states, "We have no occasion to decide whether the statutory phrase "system of emission reduction" refers exclusively to measures that improve the pollution performance of individual sources, such that all other actions are ineligible to qualify as the BSER."[39]

Clean Energy Group therefore recommends, here and later in our comments, that battery storage be *added*, essentially in the same manner as an add-on control, as a BSER for peaking EGUs for two reasons. First, CEG is aware that the interconnection process in many RTOs/ISOs is currently complex and time-consuming. In some instances, it is procedurally difficult, if not impossible, to disconnect a fossil EGU from the grid and interconnect a battery storage installation without losing the rights to interconnect at that location (essentially forcing the operator to the back of the line). Second, this hybrid concept complies with *West Virginia v. EPA*. As an add-on control, battery storage would serve the short to medium duration peaking functions with priority over the combustion turbine, but this would not require the retirement of the combustion turbine. Hybrid peaker systems are already in place and providing a 60 percent reduction in GHG emissions over standalone combustion turbines.[40] Gridwell Consulting describes how these reductions are achieved in their paper "Hybrid Storage Technology—Initial assessment of the greenhouse gas reduction and economic savings from Hybrid EGT® adoption in California." "A hybrid storage technology plant is more effective than a traditional combustion turbine or combined-cycle plant at providing the most common market ancillary services—regulation-up, regulation-down, spinning reserve, and non-spinning reserve. A plant using hybrid storage technology is always online and synchronized with the grid and only needs to burn fuel if the needed output is beyond the capability of the plant's battery storage system."[41]

Of additional interest in *West Virginia v. EPA* is the following: "[O]ur traditional interpretation… has allowed regulated entities to produce as much of a particular good as they desire provided that they do so through an appropriately clean (or low-emitting) process."[42] So what is the "good" in the case of peaking power plants? If the "good" is electrons to the grid, reliability, and grid services, then the addition of energy storage to peaking power plants does not interfere in that provision**.** The Agency has already considered this conceptually when it issued the informal white paper titled "Available and Emerging Technologies for Reducing Greenhouse Gas Emissions from Combustion Turbine Electric Generating Units" in April of 2022.[43] The reduction measures in the paper include the co-location of technologies that do not emit onsite GHG emissions with EGU's, and this includes energy storage. The Agency also notes in Section VII(B) of this rulemaking that "Energy storage technologies can store energy

[39] No. 20-1530, West Virginia v. EPA, United States Supreme Court, June 30, 2022, pp. 30-31

[40] https://energized.edison.com/stories/sce-unveils-worlds-first-low-emission-hybrid-battery-storage-gas-turbine-peaker-system accessed July 25, 2023

[41] https://www.gridwell.com/_files/ugd/fe68bf_ff74a8c24c6d4907b8bea661be9f99df.pdf p. 45 accessed July 25, 2023

[42] No. 15-1530, West Virginia v. EPA, United States Supreme Court, June 30, 2022, p. 21

[43] https://www.epa.gov/stationary-sources-air-pollution/white-paper-available-and-emerging-technologies-reducing accessed July 21, 2023

during periods when generation from renewable resources is high relative to demand and provide electricity to the grid during other periods. This could reduce the need for fossil fuel-fired firm dispatchable power plants to start and stop as frequently."[44] The Agency seems to have made its case for itself that battery storage be added as a BSER for low load peaking units.

In Section VII(B), it is stated that among the important characteristics of peaking power plants is their ability to start and stop quickly and their ability to "operate at partial loads while maintaining acceptable emission rates and efficiencies."[45] CEG questions the characterization of the emissions of peaking EGUs as "acceptable." The quick ramping referenced as an attribute is also a key reason that these units have much higher localized emissions rates than do baseload plants. The communities that have surrounded these power plants for decades, such as Sunset Park in New York City, do not consider these emissions as "acceptable." The following sentence in that section is "The ability to start and quickly attain full load is *important to maximizing revenue* during periods of peak electric prices…." (emphasis added) We do not believe that the importance of a generator's ability to maximize revenue is mentioned anywhere else in this proposed rule, and it is a strong indicator that the welfare of the communities surrounding peaking power plants was not a consideration in the drafting of this proposed rule.

In Section VII(F)1(b), the Agency is soliciting comments on the cost premium of high-efficiency simple cycle turbines, noting "If the use of highly efficient simple cycle turbines results in GHG reductions at reasonable cost, their use could qualify as the BSER for low load combustion turbines."[46] This is suggesting that a change in turbine technology as a BSER is a possibility. If this is the case – if a *technology* change is possible as a BSER – then energy storage should also be considered as a BSER. This returns us to the *West Virginia v. EPA* question about what the "good" being provided is. Low load peaking EGUs and battery storage can provide the same services to the grid, or the same *good*, while providing the operator with revenue.

Later in the same Section VII(F)1(b), the Agency submits the following:

> "Manufacturers may focus initial research and development for hydrogen co-firing on combustion turbines that operate at higher capacity factors and that can achieve higher levels of overall GHG reductions. The EPA is soliciting comment on whether this development could limit the availability of low load combustion turbines that are capable of burning higher percentages of hydrogen. The EPA is also soliciting comment on technologies to reduce potential costs and technical challenges for the transport and storage of hydrogen for owners/operators of low load combustion turbines. *In particular, the EPA is soliciting comment on approaches that could be used for owners/operators of low load combustion turbines located in high demand centers (e.g., dense urban areas).* To the extent these factors are not significant, the EPA is soliciting comment, with the intention of determining whether it would be appropriate to consider such a requirement in a future rulemaking, on whether the EPA should add a second component of the BSER

[44] 88 FR 33278 (May 23, 2023)
[45] 88 FR 33278 (May 23, 2023)
[46] 88 FR 33285 (May 23, 2023)

for low load combustion turbines, based on hydrogen co-firing that would begin in 2032."[47] (emphasis added)

We adamantly recommend that low-GHG hydrogen *should not* be added to the list of fuels that qualify as the BSER in this category. As discussed earlier in our comments in Section II(B), hydrogen combustion, among other concerns, has higher localized NOx emissions than methane. We have also fully established that controlling the emissions in peaking EGUs is difficult if not impossible due to the quick ramping and short operating time of these units. *Adding hydrogen as a BSER for low-load combustion turbines would significantly increase the pollution load on the communities surrounding these plants, especially in dense urban areas.*

In Section VII(N)3**,** the Agency is soliciting comment on including the rated output of energy storage when determining the design efficiency of the affected facility. The Agency is not proposing that the output from the energy storage be considered in determining the NSPS emissions rate. The Agency states "While additional energy storage will allow for additional variable renewable generation, the energy storage devices could be charged using grid supplied electricity that is generated from other types of generation. Therefore, this is *not necessarily stored low-GHG electricity*."[48] (emphasis added) This partially explains the Agency's unwillingness to consider energy storage as a BSER option for EGUs, but the argument is contradicted by the intent of this proposed rule, which is to lower the GHG intensity of the electric grid. Further, there is no reason that the Agency cannot include a requirement that storage must be charged with zero-emission sources in the same way that they are proposing this requirement for low-GHG hydrogen. Absent this requirement, EGU operators will charge co-located battery storage when energy is least expensive, which is increasingly when low-cost, zero-GHG renewables are producing the most. Operators of peaking EGUs will dispatch power from energy storage devices when energy demand (and prices) are highest, displacing dirtier co-located fossil EGUs in much the same way the Agency contends that hydrogen should displace methane as a fuel.

Section XI(C)2(b)i of the proposed rule states that "One concern with hydrogen co-firing is that, because it burns at a higher temperature, it has the potential to generate more thermal NOx."[49] The language then proceeds to discuss various controls such as dry low NOx combustion for turbines running at baseload levels. This is not an effective option for peaking units that ramp quickly and run for short periods. We reiterate our concerns with combusting hydrogen in turbines from Section II(B) of this comment letter. *We state unequivocally that hydrogen in any form is not an appropriate BSER for peaking turbines (or any turbines).*

In Section XI(D), the Agency is seeking comments as follows: "First, the EPA is soliciting comment on general assumptions about potential future utilization of combustion turbines. Second, the EPA is soliciting comment on assumptions about the appropriate group of existing combustion turbine units to be addressed in this rulemaking. Third, the EPA is requesting comment on the appropriate BSER for these turbines. Fourth, the EPA is requesting comment on

[47] 88 FR 33286 (May 23, 2023)
[48] 88 FR 33333 (May 23, 2023)
[49] 88 FR 33364 (May 23, 2023)

the timing of BSER requirements for existing combustion turbines."[50] We will frame our comments within the context of low load "peaking" combustion turbines.

First, we see increasing opportunities for fossil combustion turbines that operate at baseload levels to be replaced by wind, solar, geothermal, and longer duration non-combustion energy storage. For peaking EGUs, we see increasing opportunities for them to be completely replaced with non-combustion alternatives such as virtual power plants, demand response, and energy storage devices. Lithium batteries are currently being installed to supplement or replace fossil peakers that fill the two-to-eight-hour use case, as evidenced by the New York Power Authority's announcement that they will replace their New York City peaker fleet completely with battery storage by 2035.[51] For multi-day reliability needs, Form Energy has developed a 100-hour iron air battery to meet longer reliability needs. Unlike hydrogen and CCS, which still require significant technological development (evidenced by language in the proposed rule), Form Energy's multi-day energy storage technology is well on the pathway to maturity, evidenced by recent contracts with Georgia Power, Great River Energy, and Xcel Energy and evidenced by the construction of their manufacturing plant in West Virginia.[52] The localized pollution and health impacts caused by NOx and secondary PM2.5 that is emitted by fossil peakers is increasingly known and opposed by the communities that surround them. The availability of non-emitting technology and increasing local and state opposition are coinciding rapidly to make fossil peakers obsolete.

Second, for the pollution reasons we have outlined in our comments above, we advocate for the inclusion of the low-load peaking EGUs' in *this* iteration of the proposed rule. In Section XI(E), the Agency asks for comments that would guide a second rulemaking for low-load peaking combustion turbines,[53] but we believe that these units should be included in this rulemaking given the harm that they cause.

Third, as stated earlier in these comments, we believe that battery storage *can* and *should* be added as a BSER for these low-load peaking EGUs. We believe that the co-location of battery storage with peaking EGUs does comply with *West Virginia v. EPA*.

And fourth, because the addition of battery storage does not require a research and development "on ramp," we believe that battery storage as a BSER for peaking combustion turbines can and should be implemented upon the finalization of this rulemaking process. If we wait the many years it will take for a separate process to begin and finish, countless lives will be needlessly damaged and lost.

In Section XI(E) of the proposed rule, the Agency solicits comments for peaking turbines, specifically about "whether a clean hydrogen BSER would be appropriate, what the timing of

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[50] 88 FR 33369-33370 (May 23, 2023)

[51] https://www.nypa.gov/-/media/nypa/documents/document-library/NYPA-SCPP-Adaptation-Study.pdf accessed July 24, 2023

[52] https://www.canarymedia.com/articles/long-duration-energy-storage/form-energy-closes-its-biggest-deal-yet-for-long-duration-energy-storage accessed July 24, 2023

[53] 88 FR 33370 (May 23, 2023)

such a requirement should be and whether there should be any phasing."[54] We reiterate our comments responding to Section XI(C)2(b)i of the proposed rule that states that "One concern with hydrogen co-firing is that, because it burns at a higher temperature, it has the potential to generate more thermal NOx."[55] The language then proceeds to discuss various controls such as dry low NOx combustion for turbines running at baseload levels. Again, this is *not* an effective option for peaking units that ramp quickly and run for short periods. We reiterate our concerns with combusting hydrogen in turbines from Section II(B) of this comment letter. Hydrogen combustion in any form is not an appropriate BSER for peaking turbines.

Section XI(E) also includes a solicitation for comments as to whether improvements in energy storage will reduce reliance on peaking turbines and any technology developments that could impact the determination of a BSER.[56] We reiterate our comments from Section XI(D): For peaking EGUs, we see increasing opportunities for them to be completely replaced with non-combustion alternatives such as virtual power plants, demand response, and energy storage devices. The availability of reliable and cost-effective non-emitting technology, such as energy storage, is rapidly making fossil peakers obsolete. We believe that battery storage *can* and *should* be added as a BSER for these low load peaking EGUs. We believe that the co-location of battery storage with peaking EGUs does comply with *West Virginia v. EPA*. Combustion of hydrogen in any form is not an appropriate BSER for peaking turbines (or any turbines) because of the technological and operational inability to eliminate NOx emissions and the formation of secondary PM2.5. These emissions are proven to harm the communities that surround these plants, and hydrogen emits more NOx than methane does when combusted.

In Section XII(D)2e, the Agency requests comment on a separate rulemaking initiated in December of 2022 that proposes changes that will allow states to apply more stringent standards as part of their state improvement plans. They interpret Clean Air Act Section 111(d)(1) language (that states may consider "other factors" in the implementation of their plans) as allowing both less stringent and more stringent standards of performance. The Agency states "(O)ther factors that states may wish to account for in applying a more stringent standard than provided in these emission guidelines include, but are not limited to, effects on local communities…."[57] They note that it is appropriate to defer to a state's discretion to impose a more stringent standard of performance because it does not have the potential to undermine the presumptive stringency of the current proposed emissions guidelines. *We agree with the Agency on this point*. States such as the seven states the Agency references in Section IV(H) that have zero or net-zero carbon emissions requirements (Arizona, California, Colorado, Minnesota, New York, Oregon, and Washington)[58] should be allowed to enact legislation and rules that effectively will require more stringent plans for compliance. Several have done so already, and

[54] 88 FR 33371 (May 23, 2023)
[55] 88 FR 33364 (May 23, 2023)
[56] 88 FR 33371 (May 23, 2023)
[57] 88 FR 33387 (May 23, 2023)
[58] 88 FR 33263 (May 23, 2023)

they have enacted these laws and rules in order to protect their citizens from the negative effects of fossil fuel combustion, and their own citizens have supported these actions.

Clean Energy Group respectfully submits these comments, which were informed by many years of partnership and collaboration with community-based organizations and frontline communities seeking cleaner air and healthier lives. In closing, we remind the Agency of their guidance to states charged with drafting the plans for implementing the Agency's regulations: that failing to consider the potential outcomes when communities are put in the position of bearing the brunt of the greater health and environmental impacts resulting from the implementation of less stringent standards of performance "***would be antithetical to the public health and welfare goals of CAA section 111(d)***.*"*[59]

Clean Energy Group and its partners would welcome a conversation to discuss these issues further if that would be of interest.

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[59] 88 FR 33386 (May 23, 2023)

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