July 10, 2015

VIA ELECTRONIC MAIL

Wendy Jacobs
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RE: Comments of the Sierra Club Regarding Proposed Revisions to R.C.S.A. § 22a-174-22e

Dear Ms. Jacobs:

Thank you for the opportunity to provide comments on the Department's proposed revisions to Connecticut's Reasonably Available Control Technology (RACT) regulations for nitrogen oxides (NOx), R.C.S.A. § 22a-174-22e. Last July, the Sierra Club submitted detailed comments regarding the need for further revisions to Connecticut's NOx RACT regulations to bring them in line with those of other states and to help address unsafe ozone levels in Connecticut. We appreciate the subsequent steps that the Department has taken to do so. Despite the progress to date by the RACT working group, however, the Sierra Club's July 11, 2014 comments remain directly pertinent, especially regarding the appropriate RACT emission rate for coal-fired electric generating units (EGUs). As set forth below and in the July 2014 comments, which are appended as Exhibit 1 to this submission, an SCR-level emission rate is RACT for coal-fired EGUs, particularly in the size range of Bridgeport Harbor Station Unit 3. Indeed, Bridgeport Harbor Station Unit 3 is one of shrinking handful of 400 MW plants in the East that still lacks SCR or a plan to install SCR or cease operating. Moreover, CAMx ozone source apportionment modeling attached as an exhibit to these comments indicates that the Bridgeport plant has significant impacts on ozone levels at Connecticut air monitors. The proposed Phase 2 level of 0.12 lb/MMBtu, which represents a mere 10% reduction from current uncontrolled emissions seven years in the future, is wholly deficient. In addition, the Sierra Club offers several recommended changes to Section (g)(2) of the working draft of R.C.S.A. § 22a-174-22e to ensure that the RACT alternatives for EGUs laid out in that section are adequately protective and do not undermine the ameliorative goals of these regulations.

I. Comment #1: The Proposed Phase 2 Emission Limit for Coal-Fired EGUs Must Be Significantly Strengthened

a. Selective Catalytic Reduction Is NOx RACT for Coal-Fired EGUs, Particularly Those in the Size Range of Bridgeport Harbor Station Unit 3

Consistent with the definition of RACT, EPA guidance, and sound policy considerations, the Department should require selective catalytic reduction (SCR) as RACT for coal-fired EGUs in Connecticut. RACT is defined as "the lowest emission limitation that a particular stationary source is capable of meeting by the application of control technology that is reasonably available considering technological and economic feasibility."[1] The RACT definition comprises two parts: (A) technological feasibility and (B) economic feasibility.

(A) Technological Feasibility:

"The technological feasibility of applying an emission reduction method to a particular source should consider the source's process and operating procedures, raw materials, physical plant layout, and any other environmental impacts such as water pollution, waste disposal, and energy requirements."[2] Installation of SCR would be technologically feasible on any large coal EGU and would not create collateral adverse impacts to water pollution, waste disposal, or impose significant additional energy requirements. Indeed, as discussed below, SCR is the most widespread control technology and is installed on all coal units larger than 125 MW in a number of states.

(B) Economic Feasibility

"Economic feasibility considers the cost of reducing emissions and the difference in costs between the particular source and other similar sources that have implemented emission reduction."[3]

> EPA presumes that it is reasonable for similar sources to bear similar costs of emission reductions. **Economic feasibility rests very little on the ability of a particular source to 'afford' to reduce emissions to the level of similar sources. Less efficient sources would be rewarded by having to bear lower emission reduction costs if affordability were given high consideration. Rather, economic feasibility for RACT purposes is largely determined by evidence that other sources in a source category have in fact applied the control technology in question.**[4]

SCR is the most widespread control technology for NOx and has been installed or is slated for installation on over 47% of active coal units in the country above 150 MW. When units that have announced an intention to retire are excluded, the percentage of units over 150 MW with SCR or with plans to install SCR rises to nearly 52%.

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[1] R.C.S.A. § 22a-174-1(96); *accord* U.S. EPA, State Implementation Plans; Nitrogen Oxides Supplement to the General Preamble for the Implementation of Title I of the Clean Air Act Amendments of 1990, 57 Fed. Reg. 55,620, 55,624 (Nov. 25, 1992).
[2] U.S. EPA, State Implementation Plans; General Preamble for the Implementation of Title I of the Clean Air Act Amendments of 1990; Supplemental, 57 Fed. Reg. 18,070, 18,074 (Apr. 28, 1992).
[3] 57 Fed. Reg. at 18,074.
[4] *Id.*

The prevalence of SCR is even greater when one considers only the states in the East. Of the eighteen easternmost states with coal plants, Connecticut ranks **dead last** in the proportion of coal units controlled by SCR.[5]

(1) Delaware – 100%
(2) New Hampshire – 100%
(3) New Jersey – 100%
(4) South Carolina – 100%
(5) Tennessee – 100%
(6) West Virginia – 88%
(7) Ohio – 76%
(8) Georgia – 73%
(9) Pennsylvania – 72%[6]
(10) Florida – 70%
(11) Alabama – 65%
(12) North Carolina – 63%
(13) Virginia – 60%
(14) Kentucky – 56%
(15) Maryland – 43%[7]
(16) New York – 40%[8]
(17) Connecticut – 0%

The disparity is even starker when larger units in the size range of the 400 MW Bridgeport Harbor Station Unit 3 are considered. Apart from the Bridgeport coal unit, only 14 coal units (< 5.5%) out of over 250 coal units in the seventeen Eastern states listed above are 400 MW or larger and lack SCR controls or plans to install SCR controls by the end of 2016.[9]

Moreover, EPA has explained that RACT is not intended to enshrine existing installed control technologies, but rather is technology-forcing.[10] "In determining RACT for an individual source or group of sources, the control agency, using the available guidance, should select the best available controls, deviating from those controls only where local conditions are such that

[5] Percentage of each state's coal units 125 MW or larger currently equipped with SCR, with announced plans to install SCR by 2016, or with announced plans to retire the unit by 2017. Note that four Eastern states—Maine, Rhode Island, Vermont, and Massachusetts—either have no coal plants or have committed to retire their remaining coal plants by 2017 and are therefore not included.
[6] When planned retirements are excluded, the percentage is actually higher (78%), as there are coal units in Pennsylvania equipped with SCR that have announced plans to retire by 2016.
[7] In January 2015, Maryland finalized new NOx RACT requirements for coal-fired EGUs that required installation of SCR, repowering to cleaner fuel or shutdown of all of the non-SCR units in the state by June 1, 2020.
[8] New York DEC has recently required the 153 MW non-SCR unit at Cayuga to install SCR, repower to natural gas, or shut down by July 1, 2018. The addition of SCR at Cayuga Unit 2 would increase the New York figure from 40% to 60%.
[9] The 14 comprise one unit each in AL, FL, and NC, two units each in OH and WV, three units each in VA, and four units in PA.
[10] *See* Memorandum from Roger Strelow, Assistant Administrator for Air and Waste Management, U.S. EPA, to Regional Administrators, Regions I - X (Dec. 9, 1976), at 2 ("RACT encompasses stringent, or even 'technology forcing,' requirement that goes beyond simple 'off-the-shelf' technology.") [hereinafter "Strelow Memo"].

they cannot be applied there and imposing even tougher controls where conditions allow."[11] "**In every case RACT should represent the toughest controls considering technological and economic feasibility that can be applied to a specific situation. Anything less than this is by definition less than RACT and not acceptable for areas where it is not possible to demonstrate attainment**"[12] "In those situations where the State's control strategy cannot demonstrate attainment it will be necessary for the State to document that their control strategy represents the application of reasonably available control measures to all available source categories. The Region should not approve a control strategy that does not contain sufficient documentation to show that the required control measures are the toughest that are reasonably available for the sources in the area covered by the control strategy." [13]

EPA has also explained that the cost-effectiveness threshold for RACT controls is a function of the severity of the nonattainment, and that areas with more severe nonattainment will need to increase the threshold for cost-effectiveness accordingly.[14] EPA has stated that:

> **Areas with more serious air quality problems typically will need to obtain greater levels of emissions reductions from local sources than areas with less serious problems, and it would be expected that their residents could realize greater public health benefits from attaining the standard as expeditiously as practicable. For these reasons, EPA believes that it will be reasonable and appropriate for areas with more serious air quality problems and higher design values to impose emission reduction requirements with generally higher costs per ton of reduced emissions than the cost of emissions reductions in areas with lower design values. In addition, where essential reductions are more difficult to achieve (e.g., because many sources are already controlled), the cost per ton of control may necessarily be higher.**[15]

Where, as in Connecticut, the nonattainment problem is severe, a robust approach to cost-effectiveness is required.

This is particularly true given that the most serious health impacts from ozone are associated with high energy demand days when Connecticut's coal-fired EGU—Bridgeport Harbor Station Unit 3—is most likely to be operating. Indeed, there is a strong correlation between high ozone episodes and days when Bridgeport Harbor Station is operating. Figure 3 overlays high ozone episodes with operations of the Bridgeport coal unit during the ozone season of 2013, a recent ozone season during which the unit operated at a low capacity factor.

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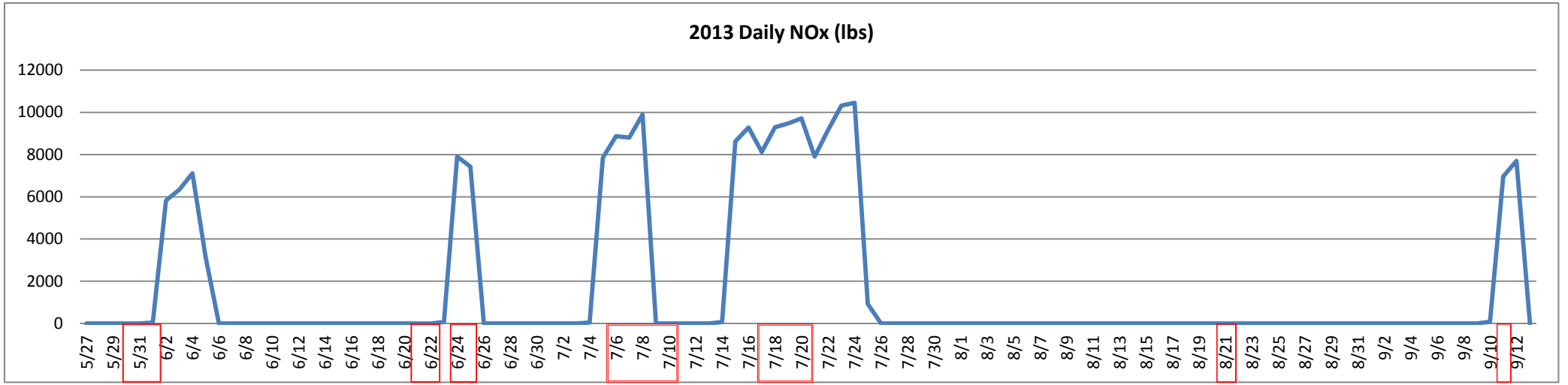
[11] Strelow Memo at 2.
[12] *Id.* at 3.
[13] *Id.* at 4.
[14] *See* http://www.epa.gov/air/lead/kittech.html.
[15] *Id.*; *accord* Strelow Memo at 5 ("We should ensure that all sources contributing to the nonattainment situation are required to implement restrictive available control measures even if it requires significant sacrifices.").

Figure 3: Bridgeport Harbor Station 2013 Daily Ozone Season NOx Emissions with Ozone Exceedance Days Marked



As Figure 3 depicts, Bridgeport's emissions are loading Connecticut's atmosphere with NOx at exactly the wrong times: when ozone levels are at their highest. And because of the coincidence of its operations with peak ozone formation conditions, Bridgeport has a significant impact on Connecticut's ozone issues even in years when, as an annual matter, it is not operating at a high capacity.

DEEP's own analysis illustrates that Bridgeport Harbor Station is responsible for a significant fraction of Connecticut's EGU emissions on peak days. According to DEEP, during the June 20-21, 2012 ozone episode EGU emissions averaged 18 tons per day.[16] Of this 18 tons, 31% (nearly 1/3rd) came from coal units (i.e., Bridgeport Harbor Station Unit 3, as no other coal units were operating in Connecticut at that time according to the Air Markets Program Database).[17] It is imperative Bridgeport Harbor Station be capable of curtailing its NOx emissions including on peak days to levels consistent with the installation and operation of SCR.

In addition, ozone source apportionment modeling demonstrates that the Bridgeport coal unit's NOx emissions translate into appreciable ozone impacts at Connecticut ozone monitors on many days during the ozone season. Sonoma Technology, Inc. (Sonoma) conducted air dispersion modeling using the Comprehensive Air Quality Model with extensions (CAMx) and EPA's 2011 modeling platform. Sonoma acquired 2011 emissions data from EPA, 2011 outputs from the Weather Research and Forecasting (WRF) meteorological model, and 2011 GEOS-Chem results to prepare initial conditions and boundary condition inputs. Emissions processing was conducted using the Sparse Matrix Kernel Emissions Modeling System (SMOKE). A number of individual sources were tagged in the modeling run including Bridgeport Harbor Station Unit 3. As the attached table (Exhibit 2) shows, the Bridgeport coal unit had 8-hour impacts greater than 0.3 ppb at Connecticut ozone monitors 29 times during the 2011 ozone season, with a maximum impact of 0.66 ppb at the Sherwood Island Connector monitor.

Consistent with the demonstrated capabilities of SCR controls, the Department should establish a NOx RACT emission limit for coal-fired EGUs of 0.07 lb/MMBtu. SCR catalysts have been applied over the last 20 years as retrofits to existing power plants across the country and have a proven track record of meeting low emission rates. In particular, a limit of 0.07 lb/MMBtu based on an eight-hour averaging time that applies at all times, including during startup and shut down is readily achievable.[18] EPA has long acknowledged that 90% removal efficiency for SCR on coal-burning units is achievable,[19] and vendors such as Haldor Topsoe and

[16] Draft RACT Analysis at 27, Fig. 6.
[17] *Id.* The Air Markets Program Database confirm that Bridgeport Harbor Station's coal unit emissions approximately 6 tons NOx/day when operating at a high capacity factor, as it frequently does on high energy demand days. *See* http://ampd.epa.gov/ampd/.
[18] While these emission rates should be based on 0.07 lb/MMBtu, the limit should be set as a lb/hour limit, calculated by multiplying 0.07 MMBtu/hr times the maximum allowable heat input or maximum heat input in prior permit applications for the EGU. Setting the limit in lb/hour ensures consistent protection of the ambient air quality regardless of whether the claimed maximum heat input capacity for the unit is accurate or changes in the future. In addition, a limit in lb/hour addresses the issue of startup and shutdown. Even if the NO_x emission rate in lb/MMBtu is higher during startup and shutdown when the SCR cannot be engaged, the source should be able to remain under the limit because the heat input is lower during startup and shutdown.
[19] *See* EPA, Ambient Air Quality Impact Report for Desert Rock Energy Facility PSD Permit, at 8, Tbl. 3.

Cormetech now advertise SCR equipment capable of reducing NOx by more than 95%.[20] Using EPA's more conservative control estimate of 90% and taking even the highest emission rate that EPA has set with no post-combustion control—that is, 0.5 lb/MMBtu—an emission limit of 0.05 lb/MMBtu is clearly achievable. A 0.07 lb/MMBtu limit incorporates a significant 40% "safety factor" and is readily achievable.

A review of the RACT/BACT/LAER clearinghouse demonstrates that numerous PSD permits for coal-burning boilers were issued in the early 2000's with emission limits of 0.07 lb/MMBtu. Later that decade, permits for proposed new coal plants were issued with NO_x limits of 0.05 lb/MMBtu. For example, the Michigan Department of Environmental Quality's permit to install for the Consumers Energy Karn-Weadock plant included a NO_x emissions limit of 0.05 lb/MMBtu. EPA acknowledged, in setting limits for the proposed Desert Rock facility, that even 0.05 lb/MMBtu involves a significant "safety factor." In 2001, Babcock & Wilcox Company, in its paper, "How Low Can We Go," states that 0.016 lb/MMBtu was achievable for units burning bituminous coal and 0.008 lb/MMBtu for those burning Powder River Basin coal.[21] Bridgeport Harbor Station burns a very low-sulfur subbituminous coal from Indonesia and should be readily capable of meeting extremely low rates with the installation and operation of appropriate post-combustion controls.

In addition, actual emission data confirm that 0.07 lb/MMBtu is easily achievable at plants burning a range of fuel types. For example, during 2013, 88 coal-fired units achieved emission limits of 0.07 lb/MMBtu or less according to data from EPA's Air Markets Program Database. And very well controlled units such as the Morgantown coal plant in Maryland, which burns bituminous coal, routinely achieve NOx emission rates below 0.04 lb/MMBtu.[22] Consistent with these emission limitations and historic plant operations, the Department should set the Phase 2 NOx RACT limit for coal-fired EGUs at 0.07 lb/MMBtu.

b. Even If SCR Were Not Deemed to Categorically Be RACT for Coal-Fired EGUs, the Phase 2 Emission Limits Applicable to Bridgeport Harbor Station Unit 3 Must Be Significantly Strengthened

Even if DEEP were to ultimately decline to categorically require SCR as RACT for coal plants, the currently proposed Phase 2 limit of 0.12 lb/MMBtu for coal plants is plainly deficient. Bridgeport Harbor Station Unit 3, the only coal-fired EGU in Connecticut, presently achieves a NOx emission rate of approximately 0.135 lb/MMBtu without any add-on emission controls. A 0.12 lb/MMBtu Phase 2 emission rate amounts to only a 10% reduction from the current uncontrolled emission rate, far less than the 40% RACT alternative proposed in Section (g)(2)(A). Moreover, this rate would not even apply until 2022 or 2023—seven years in the

[20] *See* http://www.ccj-online.com/bg/companies/haldor-topsoe-as/ (Feb. 14, 2014) (Haldor Topsoe advertising Topsoe SCR series of catalysts with demonstrated capability of reducing greater than 95% NOx at a low ammonia slip while operating from 300 to 1,100 degrees F); http://www.ccj-online.com/bg/companies/cormetech/ (Feb. 14, 2014) (Cormetech advertisement discussing NΞxtGΞN Hi-ACTive SCR catalyst achieving upwards of 95% NOx reduction).
[21] *See* Ambient Air Quality Impact Report for Desert Rock Energy Facility PSD Permit, at 5, Tbl. 2.
[22] *See* Air Markets Program Database, http://ampd.epa.gov/ampd/.

future. A 0.12 lb/MMBtu limit is less stringent than Wisconsin's 0.10 lb/MMBtu NOx RACT standard for comparable coal boilers, and less stringent than the 0.09 lb/MMBtu NOx RACT standard for units lacking SCR controls that the Maryland Department of the Environment finalized in January, but has not yet implemented. A 10% haircut does little to address Bridgeport's direct contribution to NOx loading on high energy demand days—approximately 31% of the State's EGU emissions according to the Department's analysis discussed above—and such a modest emission reduction from one of the only remaining 400 MW coal units the East that lacks SCR establishes an unhelpful precedent for Connecticut, which is heavily dependent upon upwind states imposing NOx emission reductions much greater than 10% on their coal units in order for Connecticut to attain and maintain the current and forthcoming ozone NAAQS.

Ultimately, SCR is both an economically and technologically feasible NOx control for coal-fired EGUs. It is the prevalent control technology among coal EGUs, especially in the size category of the Bridgeport coal unit (400 MW), and has been widely installed on smaller unit as well. Indeed, New York recently required the Cayuga plant's 153 MW non-SCR unit to install SCR, repower to natural gas, or shut down by July 1, 2018 in order to comply with New York's NOx RACT regulation. The Department should require SCR-level emissions—0.07 lb/MMBtu--as RACT for coal plants in Connecticut. Moreover, even if the Department ultimately declines to categorically require SCR as RACT, the proposed 0.12 lb/MMBtu does not comport with the definition of RACT and must be tightened considerably.

II. Comment #2: The NOx RACT Alternatives in Section (g)(2) Should Be Clarified and Strengthened to Ensure Comparable Protection to the Emission Limits in Section (d)(2)(A) and (C)

a. The Department Should Clarify the Meaning of the Term "Emission Rate" in Section (g)(2)(A)

The Sierra Club urges the Department to clarify the meaning of the term "emission rate" as used in section (g)(2)(A) to refer specifically to a unit's rate of emissions as measured in lb/MMBtu or lb/MWh. Absent such clarification, the term "emission rate" could potentially be interpreted to refer to a unit's emissions in tons/year. Under such an interpretation, a unit that has reduced its annual capacity factor but still operates at high load levels on high energy demand (HED) days during the ozone season could thwart the ameliorative intent of the regulation by continuing to emit at historic (high) levels on these HED days so long as the unit operated less often during other times of year. Because emission reductions on HED days are critical to reducing ozone levels, it is important, especially during Phase 2, that the unit reduce its "emission rate" as measured in lb/MMBtu or lb/MWh—which will ensure reductions in NOx emissions when these emissions are most needed—rather than its annual NOx tonnage.

b. The Department Should Modify or Eliminate Section (g)(2)(C)

The Sierra Club is concerned that section (g)(2)(C), as drafted, could create perverse incentives to install inexpensive and less effective NOx emission controls to comply with Phase 1, and then use the installation of these controls as a basis for avoiding further emission

reductions under Phase 2. Specifically, we are concerned that, following installation of controls under Section (g)(2)(C) to comply with Phase 1, a facility owner might seek a case-by-case RACT determination under Section (h) for Phase 2 and then argue that the incremental cost-effectiveness of further control is prohibitive. Given the relatively close timing of Phases 1 and 2, it does not make sense for DEEP to incentivize installation of less effective emission controls to comply with Phase 1 to the extent the resultant emissions will not also be compliant with the emission limitations in Phase 2. Moreover, as drafted, the Department does not even require a level of emission reductions that must be achieved by the installation or optimization of the additional controls. If the Department retains this alternative compliance mechanism, it should specify that the newly installed control technology achieve a reduction in the facility's emission rate of at least 40%, as measured in lb/MMBtu or lb/MWh, from a baseline that reflects operation of all existing installed emission controls. This 40% requirement would make this section comparably protective to Section (g)(2)(A).

c. The Department Should Eliminate or At Minimum Modify Section (g)(2)(D) to Ensure It Is Comparably Protective to Phase 1 and 2 Requirements Under (d)(2)(A) and (C)

The Sierra Club has serious concerns about the protectiveness of the alternative compliance pathway in Section (g)(2)(D). A mass cap will only protect against high levels of NOx emissions—and attendant high ozone levels—if the averaging time is sufficiently short. Given that the emission limits in Phase 2 are 24-hour averages, a mass cap will only be comparably protective if it has an averaging time no longer than 24 hours. With any longer averaging time, plants will comply by simply shifting their emissions to HED days when emission reductions are most critical, thereby defeating the protectiveness of regulation. Further, a limit on hours of operation is simply unworkable as an alternative to compliance with the 24-hour emission limits in Phase 2. While such an approach might work as an alternative to Phase 1's ozone and non-ozone season limits, a limit on hours of operation (unless it limited the number of hours a unit could operate each day), would do nothing to prevent NOx loading on HED days.

d. The Department Should Ensure That Section (g)(2)(E) Does Not Interfere with Winter Reliability or Raise Capacity Prices in New England

Given the role that dual fuel units currently play in ensuring winter reliability in New England mitigating price spikes caused by shortages of natural gas into the region, the Sierra Club has concerns about the alternative compliance mechanism provided in Section (g)(2)(E) as drafted. By encouraging plant owners to eliminate dual fuel capability, this compliance mechanism discourages retention of dual-fuel capability at current dual fuel (gas/oil) units. The Department should ensure that if it retains this mechanism, it does not have the perverse effect of either interfering with winter reliability or raising capacity prices by requiring even more capacity to remain online in New England.

e. The Department Should Tie the Fuel Conversion Alternative in Section (g)(2)(F) to a Specified Reduction in Emission Rate

The Sierra Club urges the Department to ensure actual emission benefits from the alternative compliance mechanism set forth in Section (g)(2)(F) by including a requirement that the fuel conversion identified in the section achieve a specified percentage reduction in emission rate. Absent changes to a boiler, fuel switching by itself often fails to achieve significant emission reductions. In order to ensure that the fuel switching alternative offered in Section (g)(2)(F) actually achieves meaningful NOx reductions, it should be accompanied by a requirement that the refueled unit achieve a specific reduction in NOx emission rate in lb/MMBtu or lb/MWh.

f. In Section (g)(2)(I), the Department Should Clarify That Credit Is Given Only for Prospective Retirements Decisions

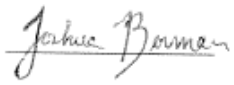
The Sierra Club urges the Department to clarify that retirements used to comply with Section (g)(2)(I) must occur after the effective date of the new NOx RACT regulations. Connecticut's air quality will not improve if historic unit retirements are allowed to reduce or eliminate future emission reduction requirements. Consequently, Section (g)(2)(I) should be clarified to remove any ambiguity regarding the date of a qualifying unit retirement and should ensure this date occurs after the effective date of the new regulations.

g. The Substantive Requirements of Section (g)(2)(J) Should Be Clarified, or Preferably, This Compliance Alternative Should Be Eliminated

As drafted, it is unclear what level of emission reductions are required to comply with the alternative compliance mechanism in Section (g)(2)(J). Some of the alternatives in (g)(2) apply during Phase 1 only, and some apply during either phase. For some of the alternatives, it would be unclear how they would apply to a specific unit. The previous nine alternatives provide more than sufficient compliance routes for facilities that do not meet with the actual NOx RACT emission limits set forth in Section (d)(2)(A) and (C). The Sierra Club sees little benefit, and significant potential for ambiguity and misuse, in the inclusion of Section (g)(2)(J), and urges the Department to eliminate this option.

Thank you for your consideration, and please let me know if there is any additional information I can provide regarding any of the above comments.

Respectfully submitted,



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