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### COMMENTS OF THE AMERICAN PUBLIC POWER ASSOCIATION ON THE ENVIRONMENTAL PROTECTION AGENCY'S REVIEW OF STANDARDS OF PERFORMANCE FOR GREENHOUSE GAS EMISSIONS FROM NEW, MODIFED AND RECONSTRUCTED STATIONARY SOURCES: ELECTRIC UTILITY GENERATING UNITS; PROPOSED RULE

83 Fed. Reg. 65,424 (December 20, 2018) Docket ID No. EPA-HQ-OAR-2013-0495

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#### I. <u>INTRODUCTION</u>

The American Public Power Association (APPA or Association) appreciates the opportunity to submit the following comments in response to the U.S. Environmental Protection Agency's (EPA or Agency) proposed rule entitled "Review of Standards of Performance for Greenhouse Gas Emissions From New, Modified, and Reconstructed Stationary Sources: Electric Utility Generating Units," commonly referred to as New Source Performance Standards (NSPS) for Greenhouse Gas (GHG) Emissions for Electric Generating Units (EGUs).<sup>1</sup> APPA is the national service organization representing interests of more than 2,000 not-for-profit community and state-owned electric utilities that provide electricity to more than 49 million Americans and employ approximately 93,000 people. The Association advocates and advises on electricity policy, technology, trends, training, and operations. Association members strengthen their communities by providing superior service, engaging citizens, and instilling pride in community-owned power. APPA participates in EPA's rulemakings and other Clean Air Act (CAA or Act) proceedings that affect the interests of public power utilities. For these reasons, APPA has a clear interest in the proposed rulemaking, as well as other EPA rulemakings that address carbon dioxide (CO<sub>2</sub>) and other GHG emissions under the CAA.

#### II. <u>EXECUTIVE SUMMARY</u>

EPA issued its first proposed New Source Performance Standards (NSPS) for GHG emissions for new fossil fuel-fired EGUs in April of 2012.<sup>2</sup> That proposed rule would have set a single output-based emissions standard of 1,000 pounds of carbon dioxide per megawatt hour (lb CO<sub>2</sub>/MWh) for all new fossil fuel-fired EGUs. The proposed standard was based on the

<sup>&</sup>lt;sup>1</sup> 83 Fed. Reg. 65424 (Dec. 20, 2018) or "Proposed Rule".

<sup>&</sup>lt;sup>2</sup> 77 Fed. Reg. 22392 (April 13, 2012).

performance of natural gas combined cycle (NGCC) technology as the best system of emission reduction (BSER) in place of coal for new power plants. EPA withdrew its 2012 Proposal and issued a new proposal in 2014 and in October 2015 issued instead its final rule for NSPS for GHG emissions for EGUs.<sup>3</sup> In the October 2015 Rule, EPA determined that partial carbon capture and storage (CCS) technology was the BSER for new coal-fired power plants as well as for those undertaking large modifications. The new unit performance standard for coal-fired EGUs in the 2015 Rule was 1,400 lb CO<sub>2</sub>/MWh. Separately, standards were set for reconstructed and for "large" modifications (hourly  $CO_2$  emissions increases of more than 10 percent). EPA did not issue standards for EGUs undertaking small modifications (hourly CO<sub>2</sub> emissions increases of 10 percent or less) in the 2015 Rule. Now, in its December 2018 Proposed Rule, EPA seeks to revise the BSER for newly constructed EGUs to be the most efficient demonstrated steam cycle in combination with the best operating practices, in lieu of partial CCS.<sup>4</sup> Based on the proposed revisions to the BSER, EPA seeks to establish revised emission rates as the standard of performance for large and small EGUs.<sup>5</sup> For reconstructed units, EPA is proposing to retain the 2015 Rule BSER but is proposing to revise the reconstructed unit standard of performance to match the 2018 Proposed Rule standard for large and small units.<sup>6</sup> For "large" modifications, EPA is proposing to adjust the standard determined by the unit's best historical annual performance from 2002 to modification date, but not more stringent than 1,900 lb

<sup>&</sup>lt;sup>3</sup> 80 Fed. Reg. 64510 (October 23, 2015) or "2015 Rule".

<sup>&</sup>lt;sup>4</sup> 83 Fed. Reg. 65424 (Dec. 20, 2018).

<sup>&</sup>lt;sup>5</sup> 83 Fed. Reg. 65431, Table 3. (large sources with heat input > 2,000 MMBTu/h and small sources with heat input  $\leq$  2,000 MMBtu/h.)

<sup>&</sup>lt;sup>6</sup> 83 Fed Reg. 65449.

CO<sub>2</sub>/MWh. EPA is also seeking comments on whether to set a standard for "small" modifications.

Public power has made great strides in reducing CO<sub>2</sub> emissions from EGUs. The Energy Information Administration (EIA) notes that CO<sub>2</sub> emissions from the U.S. power sector have declined 28 percent from 2005 levels. The EIA has calculated that CO<sub>2</sub> emissions from the electric power sector totaled 1,744 million metric tons in 2017, the lowest level since 1987.<sup>7</sup> This decrease in CO<sub>2</sub> emissions is due, in part, to public power utilities' investments in low- and non-emitting generation technologies, such as solar, wind, nuclear, hydro, and natural gas. APPA agrees that the utility sector needs to continue to reduce CO<sub>2</sub> emissions to address the risks associated with climate change, and APPA members are actively pursuing reduction of GHG emissions in coordination with local, state, and regional programs targeting standards exceeding federal proposals. Thus, APPA's comments on this Proposed Rule constitute our recommendations for the continued development of workable, legally-enforceable NSPS for GHG emissions limiting CO<sub>2</sub> emissions from new, modified, and reconstructed EGUs.

In general, APPA supports the Proposed Rule, but offers recommendations below that should be made to ensure that the Final Rule is achievable and meets the goal of reducing CO<sub>2</sub> emissions. APPA's comments are summarized as follows:

• Under CAA Section 111, EPA must make a finding that the source category significantly contributes to endangerment before it can regulate a new pollutant from the source category. APPA is not challenging the 2009 Endangerment Finding. The Association is not recommending the Agency make a new endangerment finding. Instead we offer our

<sup>&</sup>lt;sup>7</sup> U.S. Energy Information Administration, *Energy Related Carbon Dioxide Emissions*, 2017, <u>https://www.eia.gov/environment/emissions/carbon/pdf/2017\_co2analysis.pdf</u>.

legal analysis in response to EPA's request from comment on what is required when the Agency decides to regulate a new pollutant, such as  $CO_2$  from a source category that has been previously listed by EPA. See section III A. of these comments for further discussion.

- APPA supports EPA's decision to rescind partial CCS as the BSER for EGUs. CCS is a
  promising technology; however, partial CCS is cost prohibitive and not adequately
  demonstrated for the EGUs source category as a whole.
- APPA agrees with the proposed BSER of highly efficient generation technology combined with best operating practices. This includes supercritical steam conditions for large EGUs and subcritical steam conditions for small EGUs.
- APPA also agrees with EPA's proposal that co-firing with natural gas is not BSER.
- APPA believes that the EPA should ensure the performance standards are achievable under all load conditions and EPA should consider creating a low duty subcategory for those units operating below 65 percent duty cycle or create separate standards for those EGUs operating at partial load and low load.
- While APPA supports the proposed BSER, concerns remain over the emission rates that have been proposed as the standards of performance for large and small units. APPA believes that the proposed limits need to be revised to ensure achievability.
- Finally, APPA agrees that the proposed NSPS should have no effect on whether a source is subject to NSR or Title V permits.

APPA believes that the comments below will assist EPA in developing workable requirements to reduce CO<sub>2</sub> emissions from new, modified, and reconstructed EGUs. The Association and its members look forward to working with the Agency as it finalizes these emission performance standards to provide regulatory certainty to the electric generating industry.

### III. LEGAL REQUIREMENTS FOR SECTION 111 NEW SOURCE PERFORMANCE STANDARDS.

Section 111 of the CAA directs EPA to list categories of stationary sources that it determines causes or contributes significantly to air pollution that "may reasonably be anticipated to endanger public health or welfare."<sup>8</sup> Once EPA lists a source category, it must establish standards of performance for new and modified sources.<sup>9</sup> As stated above, EPA promulgated NSPS for GHG emissions from new, modified, and reconstructed EGUs in 2015.<sup>10</sup> Those standards were challenged in the U.S. Court of Appeals for the District of Columbia Circuit (D.C. Circuit) when APPA, along with numerous other parties, filed petitions for review.<sup>11</sup> The litigation was stayed pending EPA's review of the NSPS.

On March 28, 2017, the President issued Executive Order No. 13783<sup>12</sup> directing EPA to review the 2015 NSPS, resulting in the current Proposed Rule.

Section 111(b) of the CAA requires that EPA promulgate standards of performance for new sources<sup>13</sup> that reflect "the degree of emission limitation *achievable* through the application of the best system of emission reduction [(BSER)] which (taking into account the cost of

<sup>&</sup>lt;sup>8</sup> 42 U.S.C. § 7411(b)(1)(A).

<sup>&</sup>lt;sup>9</sup> 42 U.S.C. § 7411(B)(1)(B).

<sup>&</sup>lt;sup>10</sup> 80 Fed. Reg. 64510 (Oct. 23, 2015).

<sup>&</sup>lt;sup>11</sup> See North Dakota v. EPA, No. 15-1381 (and consolidated cases) (D.C. Cir.).

<sup>&</sup>lt;sup>12</sup> 82 Fed. Reg. 16093 (Mar. 31, 2017).

<sup>&</sup>lt;sup>13</sup> The term "new source" according to 42 U.S.C. § 7411(a)(2), is defined as any stationary source, the construction or modification of which is commenced after the publication of regulations prescribing a standard of performance under this section which will be applicable to such source.

achieving such reduction and any nonair quality health and environmental impact and energy requirements) the Administrator determines has been *adequately demonstrated*.<sup>"14</sup> To determine the BSER, EPA must first analyze systems of emission reduction for sources within the category, identify the category, and then identify the "best" emission reduction for that category -- while accounting for cost and "any non-air quality health and environmental impact and energy requirements."<sup>15</sup> To be "adequately demonstrated," a system of emission reduction must be "one which has been shown to be reasonably reliable, reasonably efficient, and which can reasonably be expected to serve the interests of pollution control without being exorbitantly costly in an economic or environmental way."<sup>16</sup> To be "achievable," the standard must be capable of being met "for the industry as a whole," "under the range of relevant conditions which may affect the emissions to be regulated," including "under most adverse conditions which can reasonably be expected to recur."<sup>17</sup> Thus, section 111 standards are technology-based in that they are limited to what individual sources can achieve by applying certain controls.

In this Proposed Rule, EPA is proposing to retain the statutory interpretations and record determinations from the 2015 Rule regarding the endangerment finding but is also seeking comment on the correctness of EPA's prior interpretations and determinations and whether there are alternate interpretations that may be permissible as applied to GHG emissions.<sup>18</sup> EPA is also

<sup>&</sup>lt;sup>14</sup> 42 U.S.C. § 7411(a)(1) (emphasis added).

<sup>&</sup>lt;sup>15</sup> 42 U.S.C. § 7411(a)(1).

<sup>&</sup>lt;sup>16</sup> Essex Chem. Corp. v. Ruckelshaus, 486 F.2d 427, 433 (D.C. Cir. 1973).

<sup>&</sup>lt;sup>17</sup> Nat'l Lime Ass'n v. EPA, 627 F.2d 416, 431 n. 46, 433 (D.C. Cir. 1980).

<sup>&</sup>lt;sup>18</sup> 83 Fed. Reg. at 65432, n.25.

seeking comment on whether the Agency has a rational basis for regulating  $CO_2$  emissions from new coal-fired EGUs and if it would have a rational basis for declining to do so.<sup>19</sup>

### A. Section 111(b) of the Act Requires a Endangerment and Significant Contribution Findings Before Regulating CO<sub>2</sub> Emissions from New, Modified, and Reconstructed EGUs

The Clean Air Act section 111(b)(1)(A), requires EPA to list a source category (and then establish NSPS for that source category) "if in [the Administrator's] judgement [the source category] cause, or contributes significantly to, air pollution which may reasonably be anticipated to endanger public health or welfare."<sup>20</sup> EPA originally made its endangerment finding for GHG emissions from new motor vehicles in 2009.<sup>21</sup> APPA does not support overturning or reversing that finding and does not dispute the 2009 Endangerment Finding. More importantly, the Association is not arguing EPA could not or should not make these findings. However, the 2009 Endangerment Finding is not applicable to new, modified, or reconstructed EGUs. By proposing to retain the statutory interpretations and record determinations from the 2015 Rule, yet at that same time seeking comment on the correctness of those interpretations and determinations, EPA muddles the issue. Those earlier statutory interpretations and determinations are either correct or they are not. APPA has argued in previous comments that they were not correct.<sup>22</sup>

The CAA requires a two-step process before EPA can promulgate performance standards for a source category. First, EPA must make an endangerment finding, which is a determination

<sup>&</sup>lt;sup>19</sup> 83 Fed. Reg. at 65432, n.25.

<sup>&</sup>lt;sup>20</sup> CAA §111(b)(1)(A).

<sup>&</sup>lt;sup>21</sup> See 74 Fed. Reg. 66,496 (Dec. 15, 2009).

<sup>&</sup>lt;sup>22</sup> See APPA's Comments on the Proposed New Sources Performance Standards for Electric Generating Units, (June 25, 2012), EPA-HQ-OAR-2011-0660-10039.

that the pollutant it intends to regulation from a source category "may reasonably be anticipated to endanger public health or welfare."<sup>23</sup> Second, EPA then must determine that the source category "causes, or contributes significantly to" that pollutant.<sup>24</sup> Both the endangerment finding and the significant contribution determination are required before EPA can create a new source category.

### **B.** EPA's Statutory Interpretations and Record Determinations Were Flawed in the 2015 Rule and Remain Flawed.

In the 2015 Rule, EPA argued that because it was not listing a new source category, EPA was not required to make a new endangerment finding with regard to the affected sources. It further argued that, regardless, the required endangerment finding concerned the source category, not the individual pollutants. EPA argued that because it had previously found that GHG emissions from motor vehicles cause or contribute to air pollution and that it had previously found that emissions from source categories, including those covered by Subparts Da and KKKK cause or contribute to air pollution, it did not need to make an additional finding that CO<sub>2</sub> emissions from those category sources listed in Subparts Da and KKKK cause, or significantly contribute to, pollution found to endanger the public health or welfare.<sup>25</sup>

In the 2015 Rule, EPA based its determination on its December 2009 Endangerment Finding for GHG emissions from motor vehicles.<sup>26</sup> In the 2009 Endangerment Finding, EPA

<sup>&</sup>lt;sup>23</sup> 42 U.S.C. § 7411(b)(1)(A).

<sup>&</sup>lt;sup>24</sup> *Id*.

<sup>&</sup>lt;sup>25</sup> See 79 Fed. Reg. at 1453-1454. The 2015 Rule created a new subpart TTTT, 40 C.F.R. § 60.5508, *et seq.* specifically, for the CAA section 111(b) standards of performance for GHG emissions ( $CO_2$ ) from fossil fuel-fired EGUs.

<sup>&</sup>lt;sup>26</sup> 80 Fed. Reg. 64510, 79 Fed. Reg. 1430 at 1455, *citing* 74 Fed. Reg. 66496 (Dec. 15, 2009), "Endangerment and Cause or Contribute Findings for Greenhouse Gases Under Section 202(a) of the Clean Air Act" ("Endangerment Finding").

determined that pursuant to section 202(a) of the CAA, "six greenhouse gases taken in combination endanger both the public health and the public welfare. . ."<sup>27</sup> In that Endangerment Finding, the EPA specifically defined air pollution as referred to in section 202(a) to be the mix of six long-lived and directly emitted greenhouse gases: carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), nitrous oxide (N<sub>2</sub>O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF<sub>6</sub>).<sup>28</sup> EPA did not make a separate finding then, or now, that CO<sub>2</sub> alone is a danger to the public health or welfare. EPA has argued that because CO<sub>2</sub> is the "dominant anthropogenic greenhouse gas," it is not required to "make an endangerment finding with respect to a particular pollutant."<sup>29</sup> This view does not satisfy the statutory standard. In addition, the 2009 Endangerment Finding was made pursuant to section 202 of the CAA. However, this is different than the requirement under section 111 of the CAA, which requires that the contribution to the endangerment of public health or welfare be significant.

EPA then argued, in the 2015 Rule, that "we do not need to make a pollutant-specific endangerment finding, but instead must demonstrate a rational basis for controlling the emissions of the pollutant."<sup>30</sup> EPA argued that the rational basis test it used qualified as an endangerment finding.<sup>31</sup>

<sup>31</sup> *Id*.

<sup>&</sup>lt;sup>27</sup> 74 Fed. Reg. at 66497 (Dec. 15, 2009).

<sup>&</sup>lt;sup>28</sup> 74 Fed. Reg. 66497 (Dec. 15, 2009).

<sup>&</sup>lt;sup>29</sup> 79 Fed. Reg. at 1455, (*quoting* 74 Fed. Reg. at 66519).

<sup>&</sup>lt;sup>30</sup> See 79 Fed. Reg. at 1453-1454.

### C. EPA Does Not Have a Rational Basis for Regulating CO<sub>2</sub> from New, Modified, and Reconstructed EGUs.

EPA must make an endangerment finding pursuant to section 111 and cannot substitute a rational basis standard in its place. Even if a rational basis standard were appropriate, EPA has not shown that it exists for regulating CO<sub>2</sub> from new EGUs. In this Proposed Rule, just as in its previous iterations, EPA is proposing to regulate new fossil-fired EGUs. In the 2015 Rule, EPA established an entirely new category in Subpart TTTT of its regulations, which was created for CAA 111(b) standards of performance for GHG emissions from fossil-fuel fired EGUs.<sup>32</sup> Therefore, EPA must make a finding that CO<sub>2</sub> emissions from the new, not-existing, sources, cause or significantly contribute to air pollution and may reasonably be anticipated to endanger the public health or welfare.

Further, even if EPA could rely on a rational basis test, no such basis exists here. In the 2015 Rule, EPA projected that the Rule would "result in negligible CO<sub>2</sub> emissions changes, qualified benefits, and costs by 2022 as a result of the performance standards for newly constructed EGUs."<sup>33</sup> In this Proposed Rule, EPA states that it "believes that the projections it made in conjunction with its promulgation of the 2015 Rule remain generally correct, in that . . . few new, reconstructed, or modified sources will trigger the provisions the EPA is proposing."<sup>34</sup> Therefore, EPA projects that this new Proposed Rule "will not result in any significant carbon dioxide (CO<sub>2</sub>) emission changes or costs."<sup>35</sup>

<sup>&</sup>lt;sup>32</sup> 80 Fed. Reg. 64512.

<sup>&</sup>lt;sup>33</sup> 83 Fed. Reg. at 65427, *quoting* 2015 Rule at 80 Fed. Reg. 65414.

<sup>&</sup>lt;sup>34</sup> 83 Fed. Reg. at 65427.

<sup>&</sup>lt;sup>35</sup> 83 Fed. Reg. at 65427, *see also* "Economic Impact Analysis for the Review of Standards of Performance for Greenhouse Gas Emissions from New, Modified, and Reconstructed Stationary Sources: Electric Utility Generating Units".

### IV. <u>APPA SUPPORTS EPA'S DETERMINATION THAT PARTIAL CARBON</u> <u>CAPCTURE AND SEQUESTRATION IS NOT THE BSER FOR NEW EGUS.</u>

#### A. EPA's 2015 BSER Determination.

In the 2015 Final Rule, EPA determined that partial CCS was the BSER for newly constructed coal-fired steam generating units. EPA also determined that the final emission limitation of 1,400 lb CO<sub>2</sub>/MWh-g would be the standard of performance for new EGUs.<sup>36</sup>

EPA based its determination that partial CCS was the BSER for new EGUs on a flawed analysis when it found that partial CCS had reasonable costs, was technically feasible in a majority of the U.S., and would promote technology development.

### B. Partial CCS Was Not Adequately Demonstrated at the Time of the 2015 Rule and Remains So Today.

### 1. Partial CCS Remains Cost Prohibitive and Unreliable.

In this Proposed Rule, EPA is proposing that partial CCS is not the BSER as the cost of partial CCS is unreasonable and the technology is not widely geographically available.<sup>37</sup> APPA agrees with EPA's assessment. As APPA pointed out in its comments to the 2015 Rule, EPA had failed to correctly assess the costs of partial CCS. EPA based its cost assumptions only on pilot CCS projects located in oil and gas recovery areas and did not evaluate CCS projects in karst, tight rock, or other geologic formations.

In addition, EPA has now determined that when water availability and geologic sequestration sites are considered together, partial CCS is not widely geographically available.

<sup>&</sup>lt;sup>36</sup> 80 Fed. Reg. at 64545 (October 23, 2015).

<sup>&</sup>lt;sup>37</sup> 83 Fed. Reg. at 65426, 65445, response to Comment C-13.

As such, EPA is seeking comment regarding the technical feasibility of CCS, and specifically seeking any information about the long-term reliability of CCS technology.<sup>38</sup>

As APPA has stated in its previous comments to the 2015 Rule, which it incorporates here, partial CCS was not an "adequately demonstrated" system of emission reduction and was not achievable. The same is true today. CCS cannot be implemented without a suitable site for carbon storage or reuse that eliminates or limits CO<sub>2</sub> emissions to the ambient air on a consistent basis. The lack of suitable nationwide opportunities for sequestration bars CCS as a potential BSER for new coal-fired EGUs.

The Association would agree that CCS is a promising technology, but extremely costly and unproven thus making it inappropriate for nationwide utility application. There is limited experience with CCS at just two North American demonstration projects and a few pilot plants. The limited experience is not enough to support a BSER determination. The Petra Nova W.A. Parish Unit 8 demonstration is the only U.S. based commercial project operating a CCS system. Capital costs for this demonstration is approximately \$1billion dollars. The Department of Energy (DOE) is providing up to \$190 million in total cost share with \$167 million in financial assistance through the original Clean Coal Power Initiative (CCPI) Round 3, which includes funding from the Recovery Act, and additional \$23 million in February 2016 under the Section 313 of the FY2016 Consolidated Appropriations Act.<sup>39</sup> The CCPI is limited to technologies that have not been adequately demonstrated. The CCPI program funds projects that "advance efficiency, environmental performance, and cost competitiveness well beyond the level of technologies that are in commercial service or have been demonstrated on a scale" that the DOE

<sup>&</sup>lt;sup>38</sup> 83 Fed. Reg. at 65445, response to Comment C-13.

<sup>&</sup>lt;sup>39</sup> <u>https://www.energy.gov/fe/petra-nova-wa-parish-project.</u>

"determines is sufficient to demonstrate that commercial services is viable as of [the date of enactment]." <sup>40</sup>

### V. <u>APPA SUPPORTS EPA'S PROPOSED BSER</u>

#### A. Identification and Summary of the Revised BSER.

In this Proposed Rule, EPA determines that partial CCS does not qualify as the BSER and instead proposes highly efficient generation technology as the BSER.<sup>41</sup> In reviewing the 2015 Rule, EPA evaluated six control technology configurations as potential BSER for new and reconstructed EGUs.<sup>42</sup> The six technologies included: partial CCS, conversion to (or co-firing with) natural gas, use of combined heat and power (CHP), use of a hybrid power plant, use of integrated gasification combined cycle (IGCC) technology, and efficient generation.<sup>43</sup> In evaluating each of the technologies, EPA considered: (1) whether the system of emission reduction was technically feasible, (2) whether the costs of the system were reasonable, (3) the energy impacts at the source, regional, and nationwide level, and (4) the amount of emissions reductions that the system would generate.<sup>44</sup>

EPA found that five of these technologies did not meet the requirements necessary to consider it the BSER. For partial CCS (as discussed above), EPA found that the cost is not reasonable, and it is not widely geographically available.<sup>45</sup> For conversion or co-firing with

<sup>&</sup>lt;sup>40</sup> 42 U.S.C. §15962(a).

<sup>&</sup>lt;sup>41</sup> 83 Fed. Reg. at 65435.

<sup>&</sup>lt;sup>42</sup> 83 Fed. Reg. at 65444.

<sup>&</sup>lt;sup>43</sup> *Id*.

<sup>&</sup>lt;sup>44</sup> 83 Fed. Reg. at 65444-65445.

<sup>&</sup>lt;sup>45</sup> 83 Fed. Reg. at 65445.

natural gas (discussed in more detail below) EPA found that, among other things, some parts of the country have infrastructure limitations.<sup>46</sup> EPA found that CHP posed a problem as it can be difficult to locate a thermal host to accept the thermal output.<sup>47</sup> Hybrid power plants, the most relevant for this Proposed Rule being the integration of solar energy with a fossil fuel-fired EGU, also failed to meet the standard due to the limited geographic availability of areas with sufficient space and abundant sunshine.<sup>48</sup> Finally, when evaluating IGCC, EPA determined that because there are relatively few IGCC EGUs, it lacked sufficient information based on operating data to evaluate it is as possible BSER.<sup>49</sup>

After evaluating the six technologies, EPA is proposing that the BSER is the most efficient generation technology available.<sup>50</sup> EPA is proposing to create three subcategories of EGUs: large units (those with a heat input greater than 2,000 MMBtu/h), small units (those with a heat input less than or equal to 2,000 MMBtu/h) and those fired with coal refuse.<sup>51</sup> For large EGUs this will be the use of supercritical steam conditions (*i.e.* a SCPC or supercritical circulating fluidized bed (CFB) boiler), and for small EGUs the use of the best available subcritical steam conditions, both in combination with the best operating practices and dry cooling.<sup>52,53</sup>

<sup>&</sup>lt;sup>46</sup> *Id.* 

<sup>&</sup>lt;sup>47</sup> 83 Fed. Reg. at 65446.
<sup>48</sup> *Id.*

<sup>&</sup>lt;sup>49</sup> 83 Fed. Reg. at 65447.

<sup>&</sup>lt;sup>50</sup> 83 Fed. Reg. at 65447.

<sup>&</sup>lt;sup>51</sup> 83 Fed. Reg. at 65430. APPA only addresses the first two subcategories, large and small EGUs, in these comments.

<sup>&</sup>lt;sup>52</sup> Id.

<sup>&</sup>lt;sup>53</sup> 83 Fed. Reg. 65447, which adds dry cooling for small units.

### B. APPA Supports EPA's Proposed Revised BSER Determination of the Most Efficient Demonstrated Steam Cycle in Combination with the Best Operating Practices and Dry Cooling for Small EGUs in Lieu of Partial CCS.

#### 1. EPA's Proposal.

EPA is proposing to rescind its 2015 decision that partial CCS is the BSER and, instead, issue a revised BSER determination of the most efficient generation technology available, in combination with the best operating practices and dry cooling for small EGUs.<sup>54</sup> An adequately demonstrated system of emission reduction is "one which has been shown to be reasonably reliable, reasonably efficient, and which can reasonably be expected to serve the interests of pollution control without becoming exorbitantly costly in an economic or environmental way."<sup>55</sup> EPA has determined that the use of higher steam temperatures and pressures increases the efficiency of converting the thermal energy in the steam to electrical energy.<sup>56</sup> EPA has also determined that the best operating practices, to be used in conjunction with the most efficient generation technology available, include installing and maintaining equipment such as economizers and feedwater heaters, in such a way as to maximize overall efficiency.<sup>57</sup> Best practices also include operating steam generating units so as to maximize overall efficiency such as minimizing excess air, optimizing soot blowing, etc.<sup>58</sup>

When selecting the BSER for this Proposed Rule, EPA looked at the costs, non-air quality health and environmental impacts, reductions in CO<sub>2</sub> emissions, technical feasibility, and

<sup>&</sup>lt;sup>54</sup> Id.

<sup>&</sup>lt;sup>55</sup> Essex Chem. Corp. v. Ruckelshaus, 486 F.2d 427, 443 (D.C. Cir. 1973); See also Nat. Res. Def. Council v. Thomas, 805 F.2d 410, 428 n. 30 (D.C. Cir. 1986).

<sup>&</sup>lt;sup>56</sup> 83 Fed. Reg. 65447.

<sup>&</sup>lt;sup>57</sup> Id.

<sup>&</sup>lt;sup>58</sup> 83 Fed. Reg. 65447.

promotion of the development and implementation of technology. When EPA conducted a cost evaluation, it found that advanced generation technologies enhance operational efficiency, are technically feasible, and present little incremental capital costs compared to other types of technologies.<sup>59</sup> This, in turn, should lead to these more efficient designs being dispatched more often and selling more electricity.<sup>60</sup>

Examination of the non-air quality health and environmental impacts of the proposed BSER, something EPA failed to do in the 2015 Rule when it determined that partial CCS was the BSER, found that highly efficient generation reduces environmental and energy impacts compared to less efficient generation.<sup>61</sup> Because more efficient units require less fuel, overall emissions decrease compared with less efficient units operating at the same input-based emissions rate.<sup>62</sup> EPA also determined that supercritical steam conditions reduce pollutants between three to five percent compared to subcritical steam conditions.<sup>63</sup>

EPA estimates that the proposed BSER will result in a reduction in CO<sub>2</sub> emissions. While the 2015 Rule found that highly efficient generation did not represent the BSER because it would not result in meaningful emission reductions, it was based on the assumption that no new coal-fired EGUs would be built without the 2015 Rule because they could not compete economically with NGCC combustion turbines. EPA found that the emissions rates proposed in this Rule (discussed below) will require that new EGUs be highly efficient and operate to

- <sup>60</sup> *Id.*
- <sup>61</sup> *Id*.
- <sup>62</sup> *Id*.
- <sup>63</sup> *Id*.

<sup>&</sup>lt;sup>59</sup> 83 Fed. Reg. 65447.

minimize CO<sub>2</sub> emissions, with an overall reduction of approximately two percent for large EGUs and nine percent for small EGUs.<sup>64</sup> Similarly, EPA found that the proposed BSER is technologically feasible and will promote the development and implementation of improved control technology.<sup>65</sup>

### 2. APPA Supports Using the Most Efficient Generation Technology.

EPA is proposing the most efficient generation technology as the BSER. For large units, EPA is proposing that the most efficient generation technology is a supercritical pulverized coal (SCPC) or supercritical circulating fluidized bed (CFB) boiler.<sup>66</sup> EPA found that in the U.S., approximately 90 percent of the large EGUs that have commenced operation since 2010 use either supercritical steam conditions or IGCC technology. EPA argues that the BSER for large EGUs is well demonstrated and has been at multiple facilities since the 1970s, with the typical unit using supercritical<sup>67</sup> steam conditions around 500 MW.<sup>68</sup> Using supercritical steam conditions also allows the use of a second reheat cycle, further increasing efficiency. Supercritical boiler design has a long operating history in the electric utility industry, and owners of these sources therefore have extensive experience with the design, cost, and operating characteristics of this technology for a wide range of coal types, load duties, emission control configurations, and ambient conditions. The costs of the proposed system are well-characterized and reasonable.

<sup>&</sup>lt;sup>64</sup> 83 Fed. Reg. at 65448.

<sup>&</sup>lt;sup>65</sup> Id.

<sup>&</sup>lt;sup>66</sup> 83 Fed. Reg. at 65447.

<sup>&</sup>lt;sup>67</sup> EPA notes that in this Proposed Rule the use of the term supercritical steam conditions encompasses both ultrasupercritical and advanced ultra-supercritical steam conditions. *See* 83 Fed. Reg. at 65,430.

<sup>&</sup>lt;sup>68</sup> 83 Fed. Reg. at 65448.

For small units, EPA is proposing that the most efficient generation technology is the use of best available subcritical steam conditions, in combination with the best operating practices and dry cooling.<sup>69</sup> The majority of units using subcritical steam conditions tend to be less than 300 MW.

APPA supports EPA's BSER determination. First, adopting this BSER standard as opposed to the use of partial CCS is more cost effective and will ensure that coal-fired EGUs remain competitive in the market. EGUs using supercritical steam conditions can be competitive with natural gas combined cycle (NGCC) plants with only modest changes.<sup>70</sup> These modest changes include: changes in overnight capital cost, finance charges, fixed and variable operating and maintenance charges, and fuel prices.<sup>71</sup> However, if new EGUs are required to install partial CCS, this competitiveness disappears, ensuring that new coal-fired EGUs will not be built. Further, identifying supercritical technology as the BSER for large coal-fired EGUs will enable broader implementation of the technology. The proposed NSPS could encourage designers of new coal-fired EGUs to develop and bring down the costs of even more advanced equipment that can accommodate higher steam temperature and pressure, to provide a greater compliance margin.

Ensuring that cost-effective, environmentally-responsible coal-fired EGUs remain a viable option to offset any increase in natural gas prices and maintain a diverse generation portfolio is the responsible action to take to maintain reliability and affordability.

<sup>&</sup>lt;sup>69</sup> 83 Fed. Reg. at 65447.

<sup>&</sup>lt;sup>70</sup> J. Edward Cichanowicz, "A Critique of the September 2013 Regulatory Impact Analysis: Coal-Fired Power Without CCS Is Competitive With Natural Gas Combined Cycle Power Without CCS" (April 29, 2014).

<sup>&</sup>lt;sup>71</sup> Id.

### C. APPA Supports EPA's Determination that Co-Firing Gas is not BSER.

While the EPA is not proposing to revise its view from the 2015 Rule that natural gas cofiring (and IGCC) are alternate control technologies, it does find that they are not the BSER.<sup>72</sup> The EPA found in this Proposed Rule that while co-firing with natural gas in an EGU is a technically feasible option to reduce CO<sub>2</sub> emission rates, it is inefficient compared to the use of an NGCC for generating electricity.<sup>73</sup> EPA found that while co-firing with natural gas could be accomplished without any capital investment, the reduction could be between \$40 to \$70 per ton of CO<sub>2</sub> avoided. However, the cost does not account for any potential adverse impacts on the operation of the boiler. Further, while natural gas prices have decreased significantly over the past decade, there is no guarantee that the prices will remain low. In addition to unknowns regarding the prices of natural gas, there are areas of the country that do not have adequate natural gas pipeline infrastructure. Some areas lack access to natural gas transportation infrastructure or suffer from capacity constraints with existing pipelines. Therefore, EPA notes that for new coal plants that might locate in these areas, it will be impossible or extremely costly to co-fire with natural gas. Accordingly, EPA is not proposing natural gas co-firing as part of the BSER and is requesting comment on the cost to add natural gas capability to areas of the country that lack sufficient infrastructure to support new natural gas-fired EGUs.<sup>74</sup>

APPA supports EPA's decision to not include co-firing with natural gas in the BSER. Not only does natural gas co-firing provide only modest CO<sub>2</sub> emission reductions, limited natural gas infrastructure makes achievability tenuous. In order to deploy natural gas, the agency must

<sup>&</sup>lt;sup>72</sup> 83 Fed. Reg. at 65431.

<sup>&</sup>lt;sup>73</sup> 83 Fed. Reg. at 65445.

<sup>&</sup>lt;sup>74</sup> 83 Fed. Reg. at 65445, response to Comment C-14.

consider the costs related to pipeline infrastructure, plant site equipment to distribute the fuel, and changes to the boiler. Various technical issues arise when cofiring with natural gas. One example is the significant impacts on heat transfer within the boiler as the heat transfer characteristics of natural gas and coal are very different.<sup>75</sup> Further, cofiring natural gas would "redefine the source" and the option to co-fire is not adequately demonstrated for the source category as a whole and would be uneconomical for many units.

EPA and the courts have frequently determined that a source owner's choice of fuel for a unit is a fundamental part of the source's design. Setting a performance standard based on switching to an alternate or lower emitting fuel generally exceeds EPA's or the permit issuer's authority under the Act. In EPA's *PSD and Title V Permitting Guidance for Greenhouse Gases* it states that in most cases, "the option of using natural gas as a primary fuel would fundamentally redefine a coal-fired electric generating unit."<sup>76</sup> Co-firing a secondary fuel that is otherwise available at the source would likely constitute "redefining the source" if it would "disrupt the applicant's basic purpose."<sup>77</sup> The Environmental Appeals Boards has articulated this policy position in three cases involving coal-fired power plants.<sup>78</sup>

Sources are free to voluntary use co-firing to comply with the NSPS, however, the standards of performance cannot be based on the use of co-firing. EPA's determination that co-firing natural gas is not the BSER for new coal-fired EGUs is correct.

<sup>&</sup>lt;sup>75</sup> "Combining Solar Power with Coal-Fired Power Plants, or Cofiring Natural Gas," Stephen Mills, *Clean Energy*, Volume 2, Issue 1, July 6, 2018.

<sup>&</sup>lt;sup>76</sup> PSD and Title V Permitting Guidance for Greenhouse Gases at 27.

<sup>&</sup>lt;sup>77</sup> Id. at 27-28.

<sup>&</sup>lt;sup>78</sup> In re *Desert Rock Energy Company*, PSD Appeal No. 08-03 et al. (EAB Sept. 24, 2009); In re <u>Northern Michigan</u> <u>University</u>, PSD Appeal No. 08-02 (EAB Feb. 18, 2009); In re *Prairie State Generating Company*, 13 E.A.D. 1 (EAB 2006).

### D. The Standards of Performance for Units Undergoing Large Modifications Should be Revisited.

#### 1. The 2015 Rule and Current Proposal.

In the 2015 Rule, EPA issued final standards for EGUs that underwent "large modifications," those that resulted in an increase of hourly CO<sub>2</sub> emissions of more than 10 percent, which were based on the affected unit's own best historical performances as the BSER.<sup>79</sup> The EPA did not, in the 2015 Rule, issue standards for those EGUs that underwent "small modification," i.e., those that resulted in an hourly increase of CO<sub>2</sub> emissions of less than or equal to 10 percent.<sup>80</sup> The EPA's rationale for not issuing standards for small modifications was a lack of sufficient information. In this Proposed Rule, EPA is again seeking comment on its options for determining standards for small modifications.<sup>81</sup> EPA is also proposing in this Rule to revise the 2015 Rule's maximally stringent emissions rate for large modifications to be the same as the standards for newly constructed and reconstructed units.<sup>82</sup>

### 2. The BSER for "Large" Modified Coal-Fired EGUs Needs to be Revised.

In this Proposed Rule, EPA is not reopening or revising the BSER or final standard for EGUs that conduct large modifications. However, EPA is proposing to revise the maximum stringency of the standard to bring it in line with the proposed standards for large and small new and reconstructed EGUs.

<sup>&</sup>lt;sup>79</sup> 83 Fed. Reg. at 65428.

<sup>&</sup>lt;sup>80</sup> *Id.* 

<sup>&</sup>lt;sup>81</sup> 83 Fed. Reg. at 65428, response to Comment C-2 and 83 Fed. Reg. at 65,453, response to Comment C-23.

<sup>&</sup>lt;sup>82</sup> 83 Fed. Reg. at 65426, 65431. The proposed standards would be 1,900 lb  $CO_2/MWh$ -gross for large EGUs and 2,000 lb  $CO_2/MWh$ -gross for small EGUs.

As APPA noted in its comments to the 2015 Rule, there were problems with the methodology and lack of analysis that EPA used to set the BSER. In the 2015 Rule, EPA stipulated that any EGU undergoing a large modification was required to meet a unit-specific CO<sub>2</sub> emission limit based on that unit's best demonstrated historical performance. In this Proposed Rule, APPA has similar concerns because EPA is setting a target for reductions and not a "system of reduction". The identification of the "system of emission reduction" on which the standard is based is a prerequisite to establishing the NSPS for "large" modifications. A unit's "best demonstrated performance" and "historical performance" are not systems that a modified EGU can implement to meet a performance standard. EPA must identify the adequately demonstrated system of emission reduction *before* setting a specific emission performance target.<sup>83</sup> While EPA is not proposing to revise or reopen the BSER for "large" modifications, the Agency should accept public comment on the underlying basis for the validity of the current NSPS for coal-fired EGUs that undergo "large" modifications.

If EPA's maintains its BSER determination for large modifications, EPA could take a similar approach to that which it took in the proposed Affordable Clean Energy Rule (ACE Rule) to setting the performance standards. In the ACE Rule, EPA focused on the implementation of heat rate improvements to reduce CO<sub>2</sub>. As APPA noted in its comments to the ACE Rule, and incorporates here, heat rate improvements are generally adequately demonstrated methods of reducing an EGU's CO<sub>2</sub> emission rate. Various methods of maintaining or improving a unit's heat rate are already widely used in the industry. The heat rate represents the amount of heat, and thus the amount of fuel combusted, that is required to generate a unit of electricity. Therefore, by reducing the amount of heat needed to produce a unit of electricity, EGUs can

<sup>&</sup>lt;sup>83</sup> Sierra Club, 657 F. 2d at 330.

reduce the amount of fuel combusted and CO<sub>2</sub> emitted. To control the costs of electricity produced, EGU owners are strongly motivated to operate their facilities as efficiently as possible.

APPA supports a similar approach to that proposed in the ACE Rule. That is, EPA should set standards of performance for individual facilities by conducting unit-specific evaluations of heat rate improvement potential, technical feasibility, and applicability for each of the technologies. Thus, rather than adopting uniform standards of performance for a source category or subcategory, i.e. those EGUs undergoing large modifications, EPA should adopt standards that will reflect the characteristics of each individual unit.

### E. APPA Recommends EPA Set a Performance Standard that is Achievable Under All Load Conditions

EPA explains in this Proposed Rule, that due to the low variable operating costs of highly efficient EGUs, any affected EGU would likely operate at high capacity factors.<sup>84</sup> However, EPA notes that during periods of low electric demand, EGUs may "reduce load to approximately 45 percent as an alternative to shutting down completely."<sup>85</sup> The Agency explains that while efficiency is reduced during this time, it remains high enough to maintain power generation, continue operation of the pollution control equipment, and allow the unit to ramp up relatively quickly as demand increases.<sup>86</sup> EPA is seeking comment on whether it should establish separate emissions standards for EGUs operating at reduced load.<sup>87</sup>

<sup>&</sup>lt;sup>84</sup> 83 Fed. Reg. at 65456.

<sup>&</sup>lt;sup>85</sup> Id.

<sup>&</sup>lt;sup>86</sup> Id.

<sup>&</sup>lt;sup>87</sup> *Id.*, response to Comment C-31.

EPA's data showed that maximum efficiency is achieved when an EGU operates between 80 to 90 percent load, and that efficiency is relatively stable to as low as 65 percent load.<sup>88</sup> Once EGUs operate below 65 percent load, they lose efficiency and complying with emissions standards becomes difficult. As such, EPA is considering, and seeking comment on, the establishment of a subcategory for EGUs that operate below 65 percent duty cycle on a rolling average basis during any 12-operating month period, where duty cycle is defined as the average operating load during periods of operation.<sup>89</sup> EPA is also seeking comment on whether the low duty cycle subcategory should be based on percent of potential electric sales instead of a heat input-based capacity.<sup>90</sup>

We appreciate EPA embarking on this level of inquiry, as overall electricity market trends project near term average utilization of coal-fired EGUs to decrease.<sup>91</sup> Utilization – in terms of capacity factor – is predicted to remain at 50-60 percent in the near future. NSPS requirements must account for low load operation and allow new coal-fired EGUs to meet the changing generation needs over time. EGUs often operate at different load levels and capacity factors, which affect their  $CO_2$  emissions. Many factors are responsible for this trend; among the most significant are a compromise in the pressure and temperature of steam delivered to the turbine, and a reduction in boiler thermal efficiency (due to the need to operate the boiler at higher excess air levels to maintain flame stability and optimal heat transfer. In many cases, third party system operators determine when and at what level a generating unit will run. The NSPS

<sup>&</sup>lt;sup>88</sup> 83 Fed. Reg. at 65456.

<sup>&</sup>lt;sup>89</sup> 83 Fed. Reg. at 65456, response to Comment C-32.

<sup>&</sup>lt;sup>90</sup> 83 Fed. Reg. at 65457, response to Comment C-38.

<sup>&</sup>lt;sup>91</sup> Energy Information Agency Annual Energy Outlook, graphics #111-112. Available at <u>https://www.eia.gov/outlooks/aeo/pdf/aeo2019.pdf</u>.

should not prevent a source from operating at any particular load level or capacity factor to meet electricity demand. There are several options for how the Agency can account for low load operation when setting achievable performance standards. We discuss these options below.

The Association believes EPA could account for low load operations by adopting a single standard of performance for each of its currently proposed subcategories that is achievable at low load. EPA could base its standards on actual emissions data from representative units, including units with significant low load operations.

Another alternative might include adopting a different standard of performance for CO<sub>2</sub> emissions during hours of operation at full load and part load. EPA could develop a standard based on partial load similar to the agency's approach to NO<sub>X</sub> emission limits for stationary combustion turbines in Subpart KKKK.<sup>92</sup> In Subpart KKKK, if the combustion turbine operates at less than 75 percent of its peak load at any point during an hour, then it is subject to a different "part load" standard applicable during that hour. Compliance is then determined by how many hours the unit operated at "full" or "part load".

Finally, EPA could create a subcategory for low duty cycle operation to ensure the NSPS performance standards are achievable. However, one concern with respect to subcategorization is the fact that some EGUs may operate during periods of full load operation and periods of much lower load operation and these units might not meet the subcategory definition over a 12-operating month period, but the effect on their CO<sub>2</sub> emissions during those periods of low load operation may be so significant that they have difficulty complying with the standard for higher duty cycle units.

<sup>&</sup>lt;sup>92</sup> 40 C.F.R Part 60, Subpart KKKK Tbl.1.

The Association's consultant analyzed CO<sub>2</sub> emission rates trends from 2008-2018 for recent EGUs operating under low load conditions. The analysis looked at eight large supercritical, ten subcritical, and two subcritical small EGUs. Of the large supercritical units, five of the units exceeded the proposed standard of 1,900 lb CO<sub>2</sub>/ MWh-gross at high and low load operation. Only two of the units surveyed attained the proposed standards at both high and low loads and one unit met the proposed standard at high load but exceeded the standards at low load. The two small subcritical units exceeded the proposed 2,000 lb CO<sub>2</sub>/ MWh-gross emission rate and at fifty percent load the CO<sub>2</sub> emission rates were erratic. See Appendix A for detailed graphics of the analysis.

### VI. <u>EPA MUST ENSURE ITS PROPOSED EMISSION RATES ARE ACHIEVABLE</u>

### A. Summary of Proposal

Pursuant to the CAA, once EPA determines the BSER, the Administrator then must establish NSPS emission standards for new units that reflect the application of that BSER.<sup>93</sup> In this Proposed Rule, EPA sets forth a standard for new and reconstructed EGUs of 1,900 lb CO<sub>2</sub>/MWh-gross for large EGUs (those with a nameplate heat input greater than 2,000 MMtu/h) and 2,000 lb CO<sub>2</sub>/MWh-gross for small EGUs (those with a nameplate heat input of less than or equal to 2,000 MMBtu/h).<sup>94</sup> The compliance with these standards will be determined on a 12operating month rolling average basis.<sup>95</sup>

EPA reviewed annual generation and CO<sub>2</sub> emissions data from 2008 through 2017 for all coal-fired EGUs that submitted continuous emissions monitoring system (CEMS) data to EPA's

<sup>&</sup>lt;sup>93</sup> 42 U.S.C. § 7411(b).

<sup>&</sup>lt;sup>94</sup> 83 Fed. Reg. at 65449-65450.

<sup>&</sup>lt;sup>95</sup> Id.

emission collection and monitoring plan system (ECMPS).<sup>96</sup> EPA used data reported by EGU owners/operations to EPAs Clean Air Markets Division (CAMD) database.<sup>97</sup> Using this data, EPA found that the average 2017 reported emissions rates of all large coal-fired EGUs which began operation since 2010 was 1,938 lb CO<sub>2</sub>/MWh-gross, which is two percent higher than the proposed standard of 1,900 lb CO<sub>2</sub>/MWh.<sup>98</sup> EPA also noted that, in the data it has from the one small coal-fired EGU that commenced operations in 2010 and uses subcritical steam conditions, the EGU had an annual emissions rate of 2,200 lb CO<sub>2</sub>/MWh-gross, which is nine percent higher than the proposed standard.<sup>99</sup>

### B. EPA's Proposed Limit of 1,900 lbs CO<sub>2</sub>/MWh is Not Achievable.

While EPA is proposing an emission standard of 1,900 lb CO<sub>2</sub>/MWh-gross for large EGUs and 2,000 lb CO<sub>2</sub>/MWh-gross for small EGUs, it is also seeking comment on using a range for emission standards. Specifically, EPA is seeking comment on using a range of 1,700 – 1,900 lb CO<sub>2</sub>/MWh-gross for new and reconstructed large EGUs<sup>100</sup> and a range of 1,800 – 2,000 lb CO<sub>2</sub>/MWh-gross for new and reconstructed small EGUs.<sup>101</sup> While APPA believes that setting the emissions standards as a range may be more beneficial then simply selecting one specific number, the numbers EPA puts forth in its Proposed Rule are not achievable.

### 1. Any Emission Limit Under 1,900 lb CO<sub>2</sub>/MWh-gross for New Units or 2,000 lb CO<sub>2</sub>/MWh-gross for Reconstructed EGUs Is Unachievable.

<sup>&</sup>lt;sup>96</sup> 83 Fed. Reg. at 65450.

<sup>&</sup>lt;sup>97</sup> Id.

<sup>&</sup>lt;sup>98</sup> 83 Fed. Reg. at 65448 *citing* EPA's Clean Air Markets Division (CAMD).

<sup>&</sup>lt;sup>99</sup> Id.

<sup>&</sup>lt;sup>100</sup> 83 Fed. Reg. at 65451 in response to Comment C-16.

<sup>&</sup>lt;sup>101</sup> 83 Fed. Reg. at 65451 in response to Comment C-17.

EPA explains that to calculate its proposed emission standards, it calculated the 12-month  $CO_2$  emission rates by dividing the sum of the  $CO_2$  emissions by the sum of the gross electrical output over the same period.<sup>102</sup> EPA found that the best performing large EGU is the Weston 4 supercritical coal-fired EGU in Wisconsin with an emissions rate of 1,780 lb  $CO_2$ /MWh-gross.<sup>103</sup>

EPA also found that using data submitted to the ECMPS, there are 25 large EGUs that have maintained annual emission rates of 1,900 lb CO<sub>2</sub>/MWh-gross over the last ten years.<sup>104</sup> EPA also explains that the best performing small EGU is the Wygen III subcritical coal-fired EGU in Wyoming which has an emission rate of 2,170 lb CO<sub>2</sub>/MWh-gross.<sup>105</sup> In addition to the Wygen III plant, EPA found that five other small coal-fired EGUs, all of which began operations between 1957 to 1960, have maintained an annual emission rate of 2,000 lb CO<sub>2</sub>/MWh-gross over a ten year period. Thus, EPA concluded that an emission standard above 1,900 lb CO<sub>2</sub>/MWh-gross for large EGUs would not promote the use of the best available steam conditions, and a standard for small EGUs above 2,000 lb CO<sub>2</sub>/MWh-gross would not promote the use of best available efficiency technologies.<sup>106</sup>

While the proposed emission limits in this Proposed Rule are more realistic than the limits in EPA's 2015 Rule, achievability is a concern.<sup>107</sup> The standard of 1,900 lb CO<sub>2</sub>/MWh-gross for large supercritical EGUs and 2,000 lb CO<sub>2</sub>/MWh-gross for small subcritical EGUs are

<sup>&</sup>lt;sup>102</sup> 83 Fed. Reg. at 65451.

<sup>&</sup>lt;sup>103</sup> *Id*.

<sup>&</sup>lt;sup>104</sup> *Id*.

<sup>&</sup>lt;sup>105</sup> *Id*.

<sup>&</sup>lt;sup>106</sup> 83 Fed. Reg. at 65451-65452.

<sup>&</sup>lt;sup>107</sup> APPA filed comments in response to EPA's 2015 Rule and incorporates those relevant portions here.

not realistic. The record before EPA shows that the proposed standards are not achievable through application of the proposed BSER. EPA acknowledges that for large EGUs burning any type of coal other than bituminous, the use of supercritical boiler design is not enough to achieve the proposed 1,900 lb CO<sub>2</sub>/MWh-gross standard.<sup>108</sup> Units combusting subbituminous coal or dried lignite can only comply with the standard though the use of ultra-supercritical steam conditions.<sup>109</sup> Ultra-supercritical boiler design is not part of the BSER nor has the technology been adequately demonstrated as there is only one ultra-supercritical plant in commercial operations. Furthermore, examination of the actual performance data from coal-fired EGUs implementing the BSER show that the proposed standards are not achievable, as 8 out of the 16 most recently constructed large coal-fired EGUs designed with supercritical steam conditions have exceeded 1,900 lb CO<sub>2</sub>/MWh-gross since 2012 -2018 and all the most recently constructed small coal-fired EGUs have exceeded 2,000 lb CO<sub>2</sub>/MWh-gross.<sup>110</sup>

It is particularly important for EPA to consider a broad range of representative data in establishing standards of performance for  $CO_2$  emissions from coal-fired EGUs. Courts have held that to show a given emission level is "achievable," EPA must "(1) identify variable conditions that might contribute to the amount of expected emissions, and (2) establish that the test data relied on by the agency are representative of potential industry-wide performance, given the range of variables that affect the achievability of the standard."<sup>111</sup>

<sup>&</sup>lt;sup>108</sup> 83 Fed. Reg. at 65,451.

<sup>&</sup>lt;sup>109</sup> 83 Fed. Reg. 65451.

<sup>&</sup>lt;sup>110</sup> J. Edward Cichanowicz, "*Review of EPA's Methodology to Select an Achievable Carbon Dioxide New Sources Performance Standards for Coal Fired Generating Units*", March 8, 2019, at 25 Tbl. 5-1.

<sup>&</sup>lt;sup>111</sup> Sierra Club, 657 F.2d at 377.

The graph below show, that emissions limits must be based on real world performance. Figure 1 represents annual CO<sub>2</sub> emission data, in lb /MWh gross for sixteen units over a period of 2005-2017. The data represents sixteen recently constructed supercritical and an ultrasupercritical EGU burning subbituminous, bituminous and lignite coal, generally equipped with state-of-the-art emission controls. On average these recently constructed units are not able to meet the proposed emission rate of 1,900 lb CO<sub>2</sub>/MWh-gross. Eight units exceeded the proposed emission limit; Prairie State Units 1 and 2, Comanche Unit 3, Elm Road Units 1 and 2, Sandy Creek, and Oak Grove Units 1 and 2.



Figure 1: CO<sub>2</sub> Emission Rates for 16 Recently Constructed Supercritical Units.

The Association believes that any rule finalizing the NSPS for new coal-fired EGUs, should adjust the standards of performance to be achievable for new units based on available emissions data.

#### C. APPA Supports Subcategorization by Fuel Type

There are substantial differences in the CO<sub>2</sub> emissions associated with different coal types. EPA solicits comment in the Proposal on whether it should further subcategorize by fuel type.<sup>112</sup> The Association supports this notion. While higher rank coals tend to contain less CO<sub>2</sub> per unit of heat input than lower rank coals, a unit burning "bituminous coal would emit 5 percent less CO<sub>2</sub> than a lignite fired EGU."<sup>113</sup> EGUs burning bituminous coal tend to be more efficient than EGUs burning lower moisture content coals (*e.g.* undried lignite).<sup>114</sup> Given there is no adequately demonstrated add-on controls to reduce CO<sub>2</sub> emissions, an EGU owner cannot make up these differences in efficiency through designing a greater level of emission control into the unit. Therefore, the standards of performance should account for the differences in fuel type.

If EPA does not subcategorize its standards of performance based on coal type, then it must at least ensure that the standards are achievable for all coal types through application of the BSER. The Proposed Rule acknowledges that a large EGU combusting subbituminous or lignite coal would need to implement ultra- or advanced ultra-supercritical steam conditions in order to achieve a CO<sub>2</sub> emission rate of 1,900 lb CO<sub>2</sub>/MWh-gross.<sup>115</sup> If EPA maintains a single standard

<sup>&</sup>lt;sup>112</sup> 83 Fed. Reg. 65456, See response to Comment C-30.

<sup>&</sup>lt;sup>113</sup> Achievability TSD at 2-3.

<sup>&</sup>lt;sup>114</sup> *Id*.

<sup>&</sup>lt;sup>115</sup> 83 Fed. Reg. at 65451.

for all large and all small coal-fired EGUs, then the standard must reflect what a unit combusting undried lignite can achieve with supercritical steam conditions.

### VII. <u>APPA CONTINUES TO BELIEVE THAT THE NSPS FOR CO<sub>2</sub> SHOULD HAVE</u> <u>NO EFFECT ON NSR AND TITLE V PERMITS.</u>

EPA states that this Proposed Rule is not intended to change any regulations or processes for determining whether a source is subject to permitting under the Prevention of Significant Deterioration (PSD) program or Title V for GHG emissions.<sup>116</sup> In the 2015 Final Rule<sup>117</sup>, EPA discussed how its regulation of GHGs under section 111 of the CAA would impact other EPA rules and permits. In the 2015 Rule EPA maintained the threshold for determining whether a PSD source must satisfy the Best Available Control Technology (BACT) requirements for GHGs. In addition, EPA determined that the 2015 Rule did not affect whether sources are subject to the requirements of the Title V operating permit program.

Because this Proposed Rule does not change any regulations or processes for determining whether a source is subject to permitting under the PSD program, permitting authorities will simply continue to apply the appropriate applicability criteria contained in Subpart TTTT of 40 CFR Part 60. Since BACT cannot be less stringent than an applicable standard of performance, any new emission levels finalized as part of this rule will be the minimum level of GHG control that will represent BACT for an affected EGU. Similarly, this Proposed Rule does not propose to change any regulations or processes under Title V for GHG emissions. Therefore, this rule does not affect whether sources are subject to Title V permitting requirements. EPA is also

<sup>&</sup>lt;sup>116</sup> 83 Fed. Reg. at 65455.

<sup>&</sup>lt;sup>117</sup> 80 Fed. Reg. at 64628.

leaving unchanged its earlier determination that GHG emissions are exempt from the definition of a regulated pollutant in 40 CFR 70.2 and 71.2 for Title V fee calculations.

APPA supported these findings in the 2015 Rule and reiterates its support now with respect to this Proposed Rule.

### VIII. CONCLUSION

APPA appreciates the opportunity to provide these comments for EPA's consideration in the final NSPS Rule. The suggested revisions will ensure that the Final Rule will be achievable and preserve the ability to build new, modify, or reconstruct a coal-fired EGU. Should you have any questions regarding these comments, please contact Ms. Carolyn Slaughter, Director of Environmental Policy at <u>cslaughter@publicpower.org</u> or (202) 467-2900.

### APPENDIX A

## CO<sub>2</sub> EMISSION RATE TRENDS WITH LOAD: RECENT STATE-OF-ART GENERATING UNITS

**Overview Prepared for** 

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Consultants to APPA

March 15, 2019

# OVERVIEW

- Units Identified for Analysis
  - Eight Supercritical Large Units (proposed 1,900 lbs/MWh)
  - Ten Subcritical Large Units (proposed 1,900 lbs/MWh)
  - Two Subcritical Small (proposed 2,000 lbs/MWh)
- CO<sub>2</sub> Emissions Data Acquired from EPA AMD: 2008-2018
  - Seek relationship with load
  - Report data over three load and duty cycle "bins"
  - Average rate and counts

## HOURLY CO<sub>2</sub> EMISSION RATE AVERAGE: TWO LOAD RANGES



## 365-DAY CO<sub>2</sub> EMISSION RATE STATISTICS PER CAPACITY FACTOR RANGES

		Number of	FORE Day A	worages	Average 30	Average 365-Day Average (lbs/MWh)			
LInit ID	Linit Name	0-45%	5% 45-66% 66-100+% 0-45% 45-66%						
1082#4	COUNCIL BLUFFS 4	0 4370	778	2.876	0 4370	1.834	1.809		
130#3	CROSS 3		597	3.057		2.024	1.992		
130#4	CROSS 4	78	516	3,060	2,061	2,128	2,078		
55856#01	PRAIRIE STATE 1	1	669	1,523	2,151	1,958	2,044		
55856#02	PRAIRIE STATE 2		677	1,334		1,973	1,966		
56068#1	ELM ROAD 1	1314	804	897	1,998	1,963	1,933		
56068#2	ELM ROAD 2	758	1,419	565	1,948	1,950	1,951		
56319#001	WYGEN II			3 <i>,</i> 654			2,313		
56456#1	PLUM POINT 1		648	2,094		1,991	1,992		
56596#001	WYGEN III			2,833			2,139		
56609#01	DRY FORK 1			2,377			2,034		
56611#S01	SANDY CREEK ENERGY STN	398	543	978	2,148	2,111	2,036		
60#2	WHELAN ENERGY CTR 2	483	1,627	448	2,024	2,001	2,059		
6065#2	IATAN 2		615	2,035		1,810	1,839		
6071#2	TRIMBLE COUNTY 2	89	1,610	951	1,853	1,823	1,832		
6096#2	NEBRASKA CITY 2		331	2,957		1,920	1,901		
6195#2	SOUTHWEST 2	28	2,292	238	1,974	1,931	1,922		
7097#2	SPRUCE 2	678	1,516	639	2,064	2,035	2,017		
8223#4	SPRINGERVILLE 4		1,223	1,792		1,951	1,886		
963#4	DALLMAN 4	25	2,991	91	1,957	1,959	1,921		

## 365-DAY CO<sub>2</sub> EMISSION RATE STATISTICS PER DUTY CYCLE RANGES

		Number of	f 365-Day A	verages	Average 365-Day Average CO2 (lbs/MWh)				
Unit ID	Unit Name	0-45%	45-66%	66-100+%	0-45%	45-66%	66-100+%		
1082#4	COUNCIL BLUFFS 4	0	0	3,654			1,814		
130#3	CROSS 3	0	0	3,654			1,998		
130#4	CROSS 4	0	0	3 <i>,</i> 654			2,085		
55856#01	PRAIRIE STATE 1	0	23	2,170		1,793	2,020		
55856#02	PRAIRIE STATE 2	0	0	2,011			1,968		
56068#1	ELM ROAD 1	0	934	2,081		2,011	1,950		
56068#2	ELM ROAD 2	0	871	1,871		1,946	1,952		
56319#001	WYGEN II	0	0	3 <i>,</i> 654			2,313		
56456#1	PLUM POINT 1	0	0	2,742			1,992		
56596#001	WYGEN III	0	0	2,833			2,139		
56609#01	DRY FORK 1	0	769	1,608		1,973	2,064		
56611#S01	SANDY CREEK ENERGY STN	0	945	974		2,115	2,047		
60#2	WHELAN ENERGY CTR 2	0	0	2,558			2,016		
6065#2	IATAN 2	0	0	2,650			1,832		
6071#2	TRIMBLE COUNTY 2	0	0	2,650			1,827		
6096#2	NEBRASKA CITY 2	0	0	3,288			1,903		
6195#2	SOUTHWEST 2	0	591	1,967		1,942	1,927		
7097#2	SPRUCE 2	0	1,264	1,569		2,029	2,045		
8223#4	SPRINGERVILLE 4	0	938	2,077		1,939	1,900		
963#4	DALLMAN 4	0	567	2,540		1,977	1,953		

# LARGE SUPERCRITICAL UNITS

- Supercritical, PRB/Refined Coal, 922.5 MW
- CO<sub>2</sub> +100 lbs/MWh from full to 50% load



		Average C	O2 Hourly I	Emission			
			Rate		Number of Hours		
Unit ID	Unit Name	0-45%	45-66%	<del>66</del> -1 <b>00+%</b>	0-45%	45-66%	66-1 <b>00+%</b>
1082#4	COUNCIL BLUFFS 4	2,485	1,856	1,806	4,358	13,337	68,689

- Supercritical, Bit Coal, 883 MW
- CO<sub>2</sub> Rate Erratic and Exceeds Proposed Limit at Full Load, Slight Increase to 50% load



		Average C	Average CO2 Hourly Emission			Number of Hours Within Load			
		Ra	te (Ibs/MW	/h)	Range				
Unit ID	Unit Name	0-45%	45-66%	66-100+%	0-45%	45-66%	<del>6</del> 6-1 <b>00</b> +%		
55856#01	PRAIRIE STATE 1	6,894	2,094	2,028	732	2,142	42,673		

- Supercritical, Bit Coal, 883 MW
- CO<sub>2</sub> Rate Exceeds Proposed Limit at Full Load, Slight Increase to 50% load



		Average C	O2 Hourly E	mission	Number of Hours Within Load			
		Ra	te (Ibs/MW	h)	Range			
55856#02	PRAIRIE STATE 2	6,700	1,959	1,977	757	2,784	38,853	
56068#1	ELM ROAD 1	5,967	2,015	1,931	1,453	11,058	35,915	

- Supercritical, Bit/Refined Coal, 701.3 MW
- CO<sub>2</sub> Rate Exceeds Proposed Limit at Full Load, 150 Ibs/MWh Increase to 50% load



		Average CO2 Hourly Emission Rate (lbs/MWh)			Number of Hours Within Load		
					Range		
Unit ID	Unit Name	0-45%	45-66%	66-100+%	0-45%	45-66%	66-100+%
56068#1	ELM ROAD 1	5,967	2,015	1,931	1,453	11,058	35,915

- Supercritical, Bit/Refined Coal, 701.3 MW
- CO<sub>2</sub> Rate Meets Proposed Limit at Full Load, 200 Ibs/MWh Increase to 50% load



		Average CO2 Hourly			Number	of Hours Wi	ithin
Unit ID	Unit Name	0-45%	0-45% 45-66% 6-100+%			45-66%	6-100+%
56068#2	ELM ROAD 2	21,026	2,014	1,937	2,365	13,092	37,390

 Supercritical, PRB Coal, 1008 MW

 CO<sub>2</sub> Rate Exceeds Proposed Limit at Full Load, Erratic Increases to 50% load



		Average C	O2 Hourly I	Emission	Number of	Number of Hours Within Load			
		Ra		Range					
Unit ID	Unit Name	0-45%	45-66%	66-100+%	0-45%	45-66%	66-1 <b>00+%</b>		
56611#S01	SANDY CREEK ENERGY STN	3,129	2,225	2,031	5,858	4,562	31,319		

- Supercritical, PRB Coal, 914 MW
- CO<sub>2</sub> Rate Meets Proposed Limit at Full Load, Increases at 50% load but Still at Rate



		Average C	Average CO2 Hourly Emission			Number of Hours Within Load			
		Rate (lbs/MWh)				Range			
Unit ID	Unit Name	0-45%	45-66%	<del>66</del> -1 <b>00</b> +%	0-45%	45-66%	<del>66</del> -1 <b>00</b> +%		
6065#2	IATAN 2	3,960	1,855	1,825	566	2,846	54,204		

- Supercritical, Bit Coal, 732 MW
- CO<sub>2</sub> Rate Meets Proposed Limit at Full Load, Increases at 50% load to Exceed Limit



		Rate (lbs/MWh)			Range		
Unit ID	Unit Name	0-45%	45-66%	<del>66-100+</del> %	0-45%	45-66%	<del>6</del> 6-1 <b>00+%</b>
6071#2	TRIMBLE COUNTY 2	7,346	1,912	1,814	759	2,423	47,122

# LARGE SUBCRITICAL UNITS

- Subcritical, Bit/Refined Coal, 591 MW
- CO<sub>2</sub> Rate Exceeds Proposed Limit at Full Load, Increases 150 Ibs/MWh at 50% Load



		Average CO2 Hourly Emission Rate (lbs/MWh)			Number o	Number of Hours Within Load			
					Range				
Unit ID	Unit Name	0-45%	45-66%	<b>66-100+%</b>	0-45%	45-66%	66-100+%		
130#3	CROSS 3	3,250	2,058	1,982	642	10,354	70,689		

- Subcritical, Bit/Refined Coal, 652 MW
- CO<sub>2</sub> Rate Exceeds Proposed Limit at Full Load, Increases 150 Ibs/MWh at 50% Load



		Average CO2 Hourly Emission Rate (lbs/MWh)			Number of Hours Within Load Range			
Unit ID	Unit Name	0-45%	45-66%	<del>66-100+%</del>	0-45%	45-66%	66-1 <b>00+%</b>	
130#4	CROSS 4	2,638	2,183	2,068	1,774	14,312	65,767	

- Subcritical, PRB Coal, 720 MW
- CO<sub>2</sub> Rate Exceeds
   Proposed
   Limit at Full
   Load,
   Increases 200
   Ibs/MWh at
   50% Load



		Average CO2 Hourly Emission			Number of Hours Within Load			
		Rate (lbs/MWh)			Range			
Unit ID	Unit Name	0-45%	45-66%	<b>66-100+%</b>	0-45%	45-66%	<b>66-100+%</b>	
56456#1	PLUM POINT 1	5,025	2,138	1,990	1,823	1,800	57,011	

- Subcritical, PRB Coal, 483.7 MW
- CO<sub>2</sub> Rate Exceeds Proposed Limit at Full Load, Increasing and Erratic at

50% Load



		Average C	Average CO2 Hourly Emission			Number of Hours Within Load			
		Ra	Rate (lbs/MWh)			Range			
Unit ID	Unit Name	0-45%	45-66%	66-100+%	0-45%	45-66%	66-1 <b>00+</b> %		
56609#01	DRY FORK 1	3,035	2,082	2,034	357	454	58,624		

- Subcritical, PRB/Refined Coal, 248 MW
- CO<sub>2</sub> Rate Exceeds Proposed Limit at Full Load, No to Change to 50% Load, Erratic at Lower Loads



		Average C	Average CO2 Hourly Emission			Number of Hours Within Load			
		Ra	Rate (lbs/MWh)			Range			
Unit ID	Unit Name	0-45%	45-66%	66-100+%	0-45%	45-66%	<del>66-100+%</del>		
60#2	WHELAN ENERGY CTR 2	3,712	2,048	2,005	333	26,268	24,543		

- Subcritical, PRB Coal, 738 MW
- CO<sub>2</sub> Rate Approximates Proposed Limit at Full Load, Minor Increase to 50% Load



			Average C	Average CO2 Hourly Emission		Number of Hours Within Load				
			Ra	Rate (lbs/MWh)			Range			
	Unit ID	Unit Name	0-45%	45-66%	<b>66-100+%</b>	0-45%	45-66%	66-100+%		
	6096#2	NEBRASKA CITY 2	3,370	1,964	1,907	2,063	7,601	68,218		
~ .		Dete Tread Pile Lead						24		

- Subcritical, PRB Coal, 300 MW
- CO<sub>2</sub> Rate Meets Proposed Limit at Full Load, Increase to Exceed Rate 50% Load



		Average C	Average CO2 Hourly Emission			Number of Hours Within Load			
		Ra	Rate (lbs/MWh)			Range			
Unit ID	Unit Name	0-45%	45-66%	<b>66-100+%</b>	0-45%	45-66%	66-100+%		
6195#2	SOUTHWEST 2	2,064	2,036	1,888	5,756	24,535	28,516		

- Subcritical, PRB Coal, 878 MW
- CO<sub>2</sub> Rate Exceeds Proposed Limit at Full Load, Further Increase to 50% Load



			Average CO2 Hourly Emission Rate (Ibs/MWh)			Number of Hours Within Load Range		
Ur	nit ID	Unit Name	0-45%	<b>45-66%</b>	<b>66-100+%</b>	0-45%	<b>45-66%</b>	<b>66-100+%</b>
70	97#2	SPRUCE 2	2,246	2,037	2,032	6,641	6,233	41,952

- Subcritical, PRB Coal, 458.1 MW
- CO<sub>2</sub> Rate Meets Proposed Limit at Full Load, Exceeds Limit Below 80% Load



			Average CO2 Hourly Emission		Number of Hours Within Load			
			Rate (lbs/MWh)			Range		
	Unit ID	Unit Name	0-45%	45-66%	66-100+%	0-45%	45-66%	66-100+%
	8223#4	SPRINGERVILLE 4	3,666	2,013	1,888	820	18,465	48,607
_								·

- Subcritical, Bit Coal, 230.1 MW
- CO<sub>2</sub> Rate Meets Proposed Limit at Full Load, Exceeds Limit Below 80% Load



		Average CO2 Hourly Emission Rate (lbs/MWh)			Number of Hours Within Load Range			
Unit ID	Unit Name	0-45%	45-66%	66-100+%	0-45%	45-66%	66-100+%	
963#4	DALLMAN 4	2,154	2,035	1,915	8,022	20,599	38,542	

## SMALL UNITS

- Subcritical, PRB Coal, 90 MW
- CO<sub>2</sub> Rate Significantly Exceeds Proposed 2,000 Ibs/MWh Limit at Full Load, Erratic at 50% Load



		Average CO2 Hourly Emission Rate (lbs/MWh)			Number of Hours Within Load			
					Range			
Unit ID	Unit Name	0-45%	45-66%	<del>66</del> -1 <b>00</b> +%	0-45%	45-66%	66-1 <b>00</b> +%	
56319#001	WYGEN II	3,198	2,249	2,314	173	127	90,848	

 Subcritical, PRB Coal, 116.2 MW

 CO<sub>2</sub> Rate Exceeds
 Proposed
 Limit (2,000
 lbs/MWh) at
 Full Load,
 Erratic at 50%
 Load



		Average CO2 Hourly Emission			Number of Hours Within Load			
		Rate (lbs/MWh)			Range			
Unit ID	Unit Name	0-45%	45-66%	66-100+%	0-45%	45-66%	66-1 <b>00+%</b>	
56596#001	WYGEN III	2,850	2,141	2,141	212	248	70,475	

# OBSERVATIONS

- Lower CO<sub>2</sub> Observed at High Load in Almost All Cases
- Eight Supercritical, Large
  - Five exceed 1,900 for high, low load
  - Two attained 1,900 both high, low load
  - One attain 1,900 at high but exceeds at low
- Ten Large, Subcritical
  - Seven exceed 1,900 at both high, low load
  - Three attain limit at high, but exceed at low load
- Two Small Subcritical: Both Exceed 2,000 at High, Low load