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California Energy Commission
Docket Office, MS-4
Re: Docket No. 12-OIR-1
1516 Ninth Street
Sacramento, CA 95814-5512

Docket No. 12-OIR-1

In the Matter of:

Rulemaking to Consider Modification of Regulations Establishing a Greenhouse Gases Emission Performance Standard For Baseload Generation of Local Publicly Owned Electric Utilities

Re: Comments of Calpine Corporation in Response to the California Energy Commission's Request for Reply Comments Regarding Docket No. 12-OIR-1

Dear Chairman Weisenmiller:

Calpine Corporation (hereinafter, "Calpine") appreciates the opportunity to provide these comments in response to the California Energy Commission's ("CEC") August 31, 2012 Request for Reply Comments regarding Docket No. 12-OIR-1, the rulemaking to consider modifications to the CEC's greenhouse gas ("GHG") Emission Performance Standard Regulation, California Code of Regulations, tit. 20, sections 2900 *et seq.* ("EPS" or "Regulation") for baseload generation of Publicly Owned Electric Utilities ("POUs").

I. INTRODUCTION AND SUMMARY

The EPS, established pursuant to Senate Bill ("SB") 1368, prohibits POUs from investing in or contracting with baseload generation plants that exceed the EPS.[1] The EPS is set at 1100 pounds ("lbs") of carbon dioxide ("CO_2") per megawatt hour ("MWh") of electricity ("lbs CO_2/MWh"),[2] which is calculated on an annualized basis.[3] Sierra Club and the Natural Resources Defense

[1] EPS § 2902(b). "Baseload generation" means electricity generation from a powerplant that is designed and intended to provide electricity at an annualized plant capacity factor of at least 60 percent. *Id.* § 2901(b).

[2] *Id.* § 2902(a). The California Public Utilities Commission ("CPUC") established a parallel EPS, set at the same level, for the state's three investor-owned utilities ("IOUs") (i.e., Pacific Gas & Electric ("PG&E"), San Diego Gas & Electric ("SDG&E"), and Southern California Edison ("SCE")).

[3] See *id.* § 2903(a). A powerplant's compliance with the EPS is determined by dividing the plant's annual average CO_2 emissions in pounds by the plant's annual average net electricity production in MWh. This determination is

Council ("NRDC") (collectively, "Petitioners")[4] recommend that the CEC lower the EPS to somewhere between 825 and 850 lbs CO_2/MWh.[5]

In turn, the CEC requests comments from stakeholders replying to the Petitioners' proposal. Specifically, the CEC requests input with respect to "adjustments [to the recommended EPS level] that might be necessary to reflect California specific conditions."[6] Additionally, the CEC stated that it "is interested in receiving input on the extent to which a lower EPS may impact the design or ability of natural gas power plants to operate more flexibly for integrating renewable resources, since the cycling of these plants entails lower efficiencies and requires fast ramp capabilities, and thereby a potential increase in emissions."[7]

Calpine is a long-time advocate for low-carbon and renewable electricity generating resources and has consistently supported efforts to ensure a clean energy future, for instance, by supporting the California Air Resources Board's ("CARB") Cap-and-Trade Regulation. Further, Calpine is a strong proponent of establishing an output-based metric for power generation, as perhaps best exemplified by our agreement to voluntarily establish the first "Best Available Control Technology" ("BACT") limits in a federal Prevention of Significant Deterioration ("PSD") permit, which we did for Russell City Energy Center, before EPA affirmed that such limits were required upon promulgation of its PSD and Title V Greenhouse Gas Tailoring Rule. We are proud that the BACT limitations established by the Russell City PSD permit, which were developed in cooperation with both the permitting agency and interested stakeholders, including Sierra Club, have since served as an example for EPA in its development of guidance on how to regulate greenhouse gas ("GHG") emissions under the Clean Air Act.

As the largest independent power producer in California and the operator of the largest fleet of highly efficient combined cycle and combined heat and power facilities in the state, we believe the EPS can be lowered. We would caution, however, that, before doing so, the CEC should first commence a rigorous and detailed evaluation process to establish the appropriate level for a revised EPS in coordination with the CPUC, CARB, and the California Independent System Operator ("CAISO"). This is particularly true, given the evolving role that combined cycle gas-fired power plants will play in facilitating the integration of intermittent renewable resources to

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based on capacity factors, heat rates, and corresponding emissions rates that reflect the expected operations of the plant and not on full load heat rates.

[4] On November 14, 2011, Sierra Club and NRDC submitted a joint petition requesting that the CEC revise the Regulation. On December 14, 2011, the CEC granted the petition and directed staff to draft an Order Instituting Rulemaking ("OIR") to consider the issues raised in the petition. *See* CEC, Order Instituting Rulemaking, Docket No. 12-OIR-1, Order No. 12-0112-7 (Jan. 12, 2012).

[5] Sierra Club and NRDC, Joint Comments of the Natural Resources Defense Council and the Sierra Club in Response to the Energy Commission's Notice of Rulemaking Workshop, Docket No. 12-OIR-1, at 5 (July 27, 2012) (hereinafter, "Petitioner Joint Comments").

[6] CEC, Requests for Reply Comments, Docket No. 12-OIR-1, at 4 (Aug. 31, 2012).

[7] *Id.* at 4-5.

the grid. Accordingly, Calpine offers the following summary of its comments, which are detailed in the Analysis section below:

- Calpine supports a reasonable tightening of the EPS: Calpine believes that the current EPS of 1100 lbs CO_2/MWh can be tightened. We look forward to offering our knowledge and experience as the operator of the largest fleet of combined cycle facilities to advance the discussion of how to establish a standard that will best support California's ambitious renewable portfolio standard ("RPS") and other environmental goals, including the goals of the Global Warming Solutions Act (Assembly Bill ("AB") 32).

- The CEC should coordinate with the CPUC, CARB, and CAISO in revising the EPS: The CEC and the CPUC currently have the same EPS. A consistent EPS is ultimately fairer for California utilities and ratepayers and, for that reason, the CEC should coordinate its EPS revision efforts with the CPUC. In addition, pursuant to the mandate of SB 1368, Calpine would also recommend that the CEC undertake a comprehensive process for evaluation of the appropriate level for a revised EPS in conjunction with the CPUC, CARB, CAISO and other interested stakeholders.

- The revised EPS must account for the unique challenges of the California electricity market: Natural gas-fired combined cycle ("NGCC") facilities will likely startup, shutdown, and cycle more frequently than they have in the past, but may still remain above the EPS's 60 percent capacity factor cut-off for the definition of "baseload generation." Startup, shutdown, and ramping events result in higher CO_2 emissions rates than true baseload operations. Therefore, because the EPS currently accounts for startup, shutdown, and ramping events in its calculation of a power plant's emissions rate and these events are forecasted to occur much more frequently to support the integration of intermittent renewables to the grid, the CEC should undertake a rigorous assessment of whether an EPS of 825 to 850 lbs CO_2/MWh is, in fact, achievable or appropriate for NGCC facilities in the California electricity market. Based on our preliminary discussions with representatives of the Petitioners, we are optimistic that stakeholders can work together to develop a standard that will assure procurement from the most efficient resources, while acknowledging the evolving role of NGCC facilities in the California electricity market. We look forward to working with both the Petitioners and CEC to develop such a standard.

II. DISCUSSION

A. Calpine Supports A Reasonable Tightening Of The EPS

SB 1368 required that the CEC establish the EPS "for all baseload generation of local publicly owned electric utilities at a rate of emissions of greenhouse gases that is no higher than the rate

of emissions of greenhouse gases for combined-cycle natural gas baseload generation."[8] The CEC, in initially justifying an EPS of 1100 lbs CO_2/MWh, stated that the standard "was reached by evaluating the performance of existing combined cycle natural gas baseload powerplants throughout the west."[9] The CEC continued, "[s]pecial attention was paid to the performance of units within California, and the standard was set so that new, clean units in adverse conditions such as high altitude or hot temperatures would not be crowded out by a standard that was too restrictive."[10] The CEC, therefore, set the EPS at a level that was supported by the emissions data of baseload NGCC facilities, the emissions rate of which represent the statutory standard for establishing the EPS.[11]

In their comments, Petitioners observe that "[i]t has been over five years since the original EPS of 1,100 tons [sic] lbs/MWh was adopted."[12] Petitioners also state that "[u]pdating the standard would continue to fulfill the purpose of SB 1368 by ensuring that California continues to procure only highly efficient energy resources."[13]

Calpine agrees with Petitioners that five years is a significant amount of time that has allowed marked innovation in NGCC technology. Indeed, the U.S. Environmental Protection Agency recently proposed an Electric Generating Unit ("EGU") GHG New Source Performance Standard ("EGU GHG NSPS") to be set at 1,000 lbs CO_2/MWh. In justifying the proposed performance standard, EPA stated that "nearly 95% of [NGCC] facilities meet the proposed standards on an annual basis", which takes into account different geographic locations, operational characteristics, and sizes.[14] While Calpine has reservations with using national NGCC facility data to support revising the California EPS,[15] the EGU GHG NSPS at least demonstrates that an EPS of 1,100 lbs CO_2/MWh is no longer pushing environmental performance forward. As was recently suggested by CARB in this rulemaking docket, a strong EPS has an important and continuing rule to play in California's transition to a low-carbon economy pursuant to AB 32, notwithstanding the establishing of a GHG cap-and-trade program.

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[8] Pub. Util. Code § 8341(e)(1). SB 1368 defines "baseload generation" as electricity generation from a powerplant that is designed and intended to provide electricity at an annualized plant capacity factor of at least 60 percent and "Combined-cycle natural gas" as a combination of one or more gas turbines and steam turbines in which electricity is produced in the steam turbine from otherwise lost waste heat exiting from one or more of the gas turbines in a power plant. *Id.* §§ 8340(a), (b).

[9] CEC, Initial Statement of Reasons, Docket No. 06-OIR-1, at 3 (Feb. 2007).

[10] *Id.*

[11] SB 1368 requires that the CEC establish the EPS "at a rate of emissions of greenhouse gases that is no higher than the rate of emissions of greenhouse gases for combined-cycle natural gas baseload generation." Pub. Util. Code § 8341(e)(1).

[12] Petitioner Joint Comments, at 5.

[13] *Id.*

[14] EGU GHG NSPS, 77 Fed. Reg. 22394, 22414 (2012).

[15] *See* section II.C.2 *infra* regarding the use of national emissions data for revising the EPS.

B. The CEC Should Coordinate With The CPUC, CARB, And CAISO To Revise The EPS

The CEC should coordinate its efforts under this rulemaking with the CPUC to ensure a consistent EPS for all California utilities. SB 1368 states that, "[t]he greenhouse gases emission performance standard established by the [CEC] for local publicly owned electric utilities shall be consistent with the standard adopted by the [CPUC] for load-serving entities."[16] This statutory language evinces a strong intent on the Legislature's behalf that the CEC and CPUC EPSs be consistent. While the CEC and the CPUC initially established their respective EPSs at the same level and in a joint proceeding, Petitioners' suggestion has moved the CEC to consider undertaking a revision to its EPS for POUs. Calpine is glad that Petitioners have advanced the discussion, but believes that both Petitioners and other stakeholders would agree that the better policy for California utilities and ratepayers is for both agencies to consider tightening the existing EPS in a coordinated fashion.

Relatedly, SB 1368 states that the CEC must establish the EPS for POUs "in consultation" with the CPUC and CARB.[17] Additionally, SB 1368 mandates that the CEC consider the effects of its EPS on system reliability and overall costs to ratepayers "in consultation" with CAISO.[18] An EPS of 825 to 850 lbs CO_2/MWh could preclude even some of the most efficient units built today from playing the role expected of them in the changing California electricity market and, as a consequence, could have significant impacts on electricity costs, electricity system reliability and achievement of the State's environmental goals, including the goals set forth by the RPS, AB 32 and the State Water Quality Control Board's ("SWRCB") Once-Through Cooling policy. Accordingly, Calpine urges the CEC to study the appropriate level of a revised EPS with the CPUC, CARB, and CAISO.

C. The EPS Must Be Consonant With State Energy Policy And Tailored For California's Unique Electricity Market

1. The CEC Should Study Whether An EPS Of 825 To 850 Lbs CO_2/MWh Could Potentially Conflict With Other State Policies And Whether It Could Be Technically Inconsistent With The Projected Operational Profile Of NGCC Facilities In California

[16] Pub. Util. Code § 8341(e)(1).

[17] *Id.* ("the [CEC], at a duly noticed public hearing and in consultation with the [CPUC] and [CARB], shall establish a greenhouse gases emission performance standard for all baseload generation of local publicly owned electric utilities...").

[18] *See id.* § 8341(e)(7) ("[i]n adopting and implementing the greenhouse gases emission performance standard, the [CEC], in consultation with [CAISO], shall consider the effects of the standard on system reliability and overall costs to electricity customers.").

As suggested above, the CEC should ensure coherence between the EPS and two additional policies that will significantly affect POU electricity generation needs in the future: California's RPS and the SWRCB's Once-Through-Cooling ("OTC") Policy. SB X 1-2, enacted in 2011, largely made the requirements of the RPS program applicable to POUs. Specifically, POUs must procure renewable energy resources equal to 20 percent of retail sales by December 31, 2013; 25 percent of retail sales by December 31, 2016; and, 33 percent of retail sales by December 31, 2020 and in all subsequent years.[19] While POUs have a small degree of flexibility in meeting these RPS targets,[20] if any POU does not, CARB may bring an enforcement action against the offending POU.[21]

The CEC should also consider the impact of the SWRCB's OTC Policy on resource availability and adequacy in crafting a revised EPS. The OTC Policy establishes technology-based standards to reduce the environmental effects associated with OTC cooling water intake structures of power plants.[22] The OTC Policy applies to 19 existing OTC power plants, which have staggered compliance schedules ranging from 2010 to 2029.[23] Many POUs rely on electricity from OTC power plants, especially the largest POU: the Los Angeles Department of Water and Power ("LADWP").[24]

These statewide policies will significantly impact the California electricity market and, particularly, how NGCC facilities are dispatched. The CAISO[25] states that "reliably operating

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[19] *Id.* §§ 399.30(c)(1), (2). For the January 1, 2011 to December 31, 2013 compliance period only, a POU may average retail sales to achieve the 20 percent target. *Id.* § 399.30(c)(1).

[20] *See id.* §§ 399.30(d)(1)-(3). POUs may adopt the following flexibility measures: (1) rules permitting the utility to apply excess procurement in one compliance period to subsequent compliance periods; (2) conditions that allow for delaying timely compliance in limited circumstances; and, (3) cost limitations for renewable energy procurement expenditures.

[21] *See id.* § 399.30(o)(1).

[22] SWRCB, Statewide Water Quality Control Policy on The Use of Coastal and Estuarine Waters for Power Plant Cooling § 2 (2010, amended in 2012) ("OTC Policy").

[23] SWRCB, Factsheet: Once-Through Cooling Policy Protects Marine Life and Insures Electric Grid Reliability, at 2, *available at*: http://www.swrcb.ca.gov/publications_forms/publications/factsheets/docs/oncethroughcooling0811.pdf.

[24] ICF Jones & Stokes, Electric Grid Reliability Impacts from Regulation of Once-Through Cooling in California, Table 1-1 (2008), *available at* : http://www.swrcb.ca.gov/water_issues/programs/ocean/cwa316/docs/reliability_study.pdf (demonstrating the ownership and usage of OTC plants by state utilities).

[25] The CEC is supposed to consult with CAISO in determining the electricity reliability impacts of the EPS. Pub. Util. Code § 8341(e)(7). Additionally, while CAISO is not the system operator for all California POUs, the rationale of CAISO's studies applies equally to non-CAISO covered POUs: *all* utilities will need flexible capacity resources to effectively integrate intermittent renewable generating resources and thereby comply with the RPS. The CAISO control area consists of the former control areas of the three IOUs (*i.e.*, PG&E, SDG&E, and SCE) and

the grid with a 33 percent [RPS] and the potential retirement of 12,079 megawatts of [OTC] generation units requires California to maintain a fleet with flexible capacity resources both now and into the future."[26] Further, "[t]his need for flexible capacity resources increases with the level of intermittent resources typically used to meet RPS requirements."[27]

What "flexible capacity" means in practical terms is more frequent startup, shutdown, and ramping events for *all* natural gas-fired resources, including NGCC facilities with capacity factors above the EPS's cut-off for baseload generation (i.e., above 60 percent). Indeed, even with a 20 percent RPS, CAISO simulations indicated that NGCC starts increase "by 35 percent compared to a reference 2012 case that assumed no new renewable capacity additions beyond 2006 levels. Also, energy production from [NGCC] units decreased by roughly 9 percent on an [sic] average, with greater reductions during off-peak hours when wind production is highest. This indicates the dispatchable fleet would be cycled more often."[28]

The 33 percent RPS will increase the need for flexible capacity even further. CAISO predicts that the maximum one-hour ramp rate need will increase from 66 MW/ minute in January 2011 to 134 MW/ minute in January 2020.[29] Additionally, the maximum continuous ramp duration will decrease from 9.8 hours in July 2011 to 3.6 hours in July 2020.[30] Finally, resources will need to ramp up by 8 gigawatts ("GW") within 2 hours in the morning peak and 13.5 GW within 2 hours in the evening peak under the CAISO's 2020 high load scenario.[31]

Effectively, the CAISO's predictions mean that NGCC resources in the future will not operate as traditional baseload facilities. Rather, they will be starting up and shutting down twice per day or significantly ramping up and down twice per day. Other independent analysts confirm that the increased penetration of intermittent renewable resources requires a more flexible fleet that cycles more often.[32]

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the service areas of some of the POUs. It does not include the Sacramento Municipal Utilities District ("SMUD") or LADWP. *See* Berkeley Lab, "Current Energy", http://currentenergy.lbl.gov/ca/mapInfo.html.

[26] CAISO, Flexible Capacity Procurement: Market and Infrastructure Policy Straw Proposal, at 4 (Mar. 7, 2012).

[27] *Id.*

[28] *Id.* at 7-8.

[29] Presentation by Mark Rothleder, CAISO, R.11-10-023: RA Flexibility Workshop, Flexible Capacity Procurement Proposal, slide 4 (Aug. 13, 2012).

[30] *Id.* at slide 7.

[31] *Id.* at slide 9.

[32] Massachusetts Institute of Technology, The Future of Natural Gas, at 89 (2011), *available at*: http://web.mit.edu/mitei/research/studies/documents/natural-gas-2011/NaturalGas_Chapter4_Electricity.pdf (stating that "our short-term analysis shows that the most significant impacts of a quick deployment of additional wind or solar at any given future year will most likely be both a reduction in production from, and an increase in cycling of,

Finally, the POUs' resource adequacy ("RA") plans highlight the need for flexible generating resources. CEC staff has stated that the RA filings for the fifteen largest POUs demonstrate that, by 2018, "additional capacity from natural gas-fired plants is planned to meet forecast peak loads while supporting integration of renewables and reducing dependence on coal-fired energy."[33] Therefore, the convergence of state policies, namely the RPS and OTC Policy, are shaping an electricity market where POUs will need flexible NGCC facilities more than ever.

Ultimately, NGCC facilities will likely startup, shutdown, and cycle more than they have in the past, but may still remain above the EPS's 60 percent capacity factor cut-off for the definition of "baseload generation." This future operational profile is highly relevant for the purposes of this rulemaking because startup, shutdown, and ramping events have much higher CO_2 emissions rates than true baseload operations. Whereas an emissions rate between 825 to 850 lbs CO_2/MWh may be achievable for an NGCC plant when it is operating at an optimized, steady-state condition, that emissions rate range is not achievable for NGCC plants during startup, shutdown, and ramping events.

The GHG BACT conditions of the PSD permits for two NGCC facilities illustrate this point. The GHG BACT emissions rate for the Russell City Energy Center in California is based on the best achievable design base heat rate of 6852 Btu/KWh (which is approximately equivalent to an emissions rate of 792-815 lbs CO_2/MWh, depending on which CO_2 emissions factor is used).[34] However, Russell City Energy Center must only demonstrate compliance with this emissions rate *once per year*, which means that compliance can be demonstrated when the facility is operating at its most optimized, baseload level. On the other hand, the GHG BACT emissions rate for the Thomas C. Ferguson Power Plant in Texas, which has a heat rate limit almost equivalent to Russell City's heat rate limitation, is an annual standard of 0.459 ton CO_2/MWh (i.e., 918 lbs CO_2/MWh) measured as a *365-day rolling average*.[35]

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gas-fueled NGCC plants."); *see also* PA Consulting Group, Los Angeles Department of Water and Power: Power System Financial Review and Rate Restructuring Analysis, at 4, *available at*: http://www.dwpreform.lacity.org/documents/CostReductionReport20120823.pdf (stating that "the effort to add more quick start capability and voltage support will serve LADWP well as it seeks to integrate increasing quantities of intermittent renewable resources in future years.").

[33] CEC, Staff Report, An Assessment of Resource Adequacy and Resource Plans of Publicly Owned Utilities in California, at 1 (2009), *available at*: http://www.energy.ca.gov/2009publications/CEC-200-2009-019/CEC-200-2009-019.PDF.

[34] *See* Bay Area Air Quality Management District, Responses to Public Comments, Federal "Prevention of Significant Deterioration" Permit, Russell City Energy Center, Application No. 15487, at 34 (2010), *available at*: http://www.baaqmd.gov/~/media/Files/Engineering/Public%20Notices/2010/15487/PSD%20Permit/B3161_nsr_15487_res-com_020410.ashx?la=en.

[35] *See* EPA, Region 6, PSD Permit, Lower Colorado River Authority (LCRA) Thomas C. Ferguson Power Plant, at 8 (2011), *available at*: http://www.epa.gov/region6/6pd/air/pd-r/ghg/lcra_final_permit.pdf.

As a result of our initial discussions with Petitioners regarding this proceeding, we believe that there are significant opportunities to tighten the EPS, without precluding NGCC facilities from being dispatched as may reasonably be expected, in light of increasing penetration of intermittent renewable generating sources. This could take the form of an efficiency based performance standard, like Russell City's BACT standard, which will assure the achievement of a minimum operating efficiency on a periodic basis, in conjunction with a long-term average emissions rate that is adjusted to reflect the increasing cycling anticipated for NGCC facilities in coming years.

At the very least, if an *annual* emissions rate of 918 lbs CO_2/MWh is considered the "best available" for a new NGCC facility, then the CEC should proceed cautiously, before deciding that a level significantly lower than 918 lbs CO_2/MWh would be appropriate for *existing* facilities. Because the EPS accounts for startup, shutdown, and ramping events in its calculation of an NGCC facility's emissions rate and these events are forecasted to occur much more frequently in the future, a revised EPS of 825 to 850 lbs CO_2/MWh could simply be unachievable, even for facilities that would be designated "BACT" today. Accordingly, the most prudent course of action is for the CEC to undertake a comprehensive analysis of the most appropriate level for a revised EPS in coordination with the CPUC, CARB, and CAISO.

2. National NGCC Emissions Rate Data Is Likely Unsuited For The Purposes Of Benchmarking An Appropriate Revision To The EPS

Petitioners note that "[p]ublicly available design and emission data for existing units demonstrates that commercially available NGCC [electric generating units] EGUs can and have emitted CO2 at less than 825 – 850 lb/MWh on a net emissions basis."[36] Specifically, Petitioners utilize national CO_2 emissions data from the EPA's Clean Air Markets Division ("CAMD") to recommend a revised EPS of 825 to 850 lbs CO_2/MWh.[37] The CEC has requested comment on whether the use of such national data is appropriate for the California EPS, especially in light of the fact that the data does not include the emissions associated with selective catalytic reduction ("SCR") in some cases.[38]

The CEC should be skeptical of whether the national CAMD data is appropriate for the purposes of CEC's selection of a revised EPS for several reasons. First, the past operating profile and emissions rate of any NGCC facility in not predictive of the projected flexible capacity needs of California POUs, when the integration of intermittent renewable generating resources will require NGCC units to cycle more often and could require startup and shutdown sequences twice every day. As stated previously, startup, shutdown, and cycling events all result in higher emissions rates than optimized baseload operations.

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[36] Petitioner Joint Comments, at 6.

[37] *Id.* at 9 (stating that "there were 30 units that commenced operation since 2005, whose highest reported annual emissions have been below 850 lb/MWh (net) since 2005.").

[38] CEC, Requests for Reply Comments, Docket No. 12-OIR-1, at 4.

Second, the CAMD data is national in scope and, therefore, does not reflect the operating profile of NGCC facilities in California. According to the CAMD data, the 30 highest-performing units only include *one* facility in California: the Inland Empire Energy Center.[39] Many of these highest-performing units operate in states on the East Coast and in the South, where they operate as true baseload facilities and do not have to accommodate increasing levels of intermittent renewable generating resources because the state in question has a less strict RPS than California or no RPS at all.[40]

Third, the CAMD data presented by Petitioners does not include the capacity factors for the highest performing units. Calpine agrees that an emissions rate of 825-850 lbs CO_2/MWh is achievable when the facility's capacity factor is 85 percent. Indeed, EPA recently stated that an NGCC capacity factor of 85 percent corresponds to an emissions rate of 820 lbs CO_2/MWh.[41] However, an NGCC facility could operate at 61% capacity (and thereby be covered by the EPS as a baseload facility), but have frequent startup, shutdown, and ramping events, all of which result in much higher emissions rates than operations at the optimized steady-state. Accordingly, the CAMD data is only useful in revising the EPS if it is combined with capacity factor data for each high-performing facility.

Fourth, the CAMD data ultimately supported EPA's proposed EGU GHG NSPS, which EPA proposes to be set at 1,000 lbs CO_2/MWh. In justifying the proposed performance standard, EPA stated that "nearly 95% of [NGCC] facilities meet the proposed standards on an annual basis", which takes into account different geographic locations, operational characteristics, and sizes, and complies with the NSPS statutory standard of "best system of emission reduction."[42] Calpine ultimately supports a reasonable tightening of the EPS. However, if 95 percent of NGCC facilities would comply with a standard of 1,000 lbs CO_2/MWh, it seems doubtful that the same data would support the establishment of an EPS of 825 lbs CO_2/MWh, when the EPS is supposed to be set at the level that even *existing* NGCC facilities can satisfy when operating at 60 percent capacity or higher.

Finally, the CAMD data does not appear to account for pieces of process equipment that are parasitic on the net load of an NGCC facility, such as SCR and air-cooled condensers. This is significant because California NGCC facilities typically must employ SCR and regulators may require air-cooled condensers more often in the future, given California's water scarcity problems. SCR can reduce electricity output by 0.5 percent and an air-cooled condenser,

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[39] Petitioner Joint Comments, at 9, Table 1.

[40] *See* Database of State Incentives for Renewables & Efficiency, "RPS Data", http://www.dsireusa.org/rpsdata/index.cfm.

[41] Regulatory Impact Analysis for the Proposed Standards of Performance for Greenhouse Gas Emissions for New Stationary Sources: Electric Utility Generating Units, at 5-21 (2012), *available at*: http://epa.gov/carbonpollutionstandard/pdfs/20120327proposalRIA.pdf (showing, in Table 5-5, the illustrative emissions profiles of new coal and natural gas-fired generating units).

[42] EGU GHG NSPS, 77 Fed. Reg. 22394, 22414.

compared to a wet cooling tower, can reduce overall plant efficiency by over one and half percent.[43] Overall, the CAMD data should not be the technical basis for the CEC's revision of the EPS due to these significant differences between the CAMD data and the operational profile of California NGCC facilities.

3. In Revising The EPS, The CEC Should Consider The Limitations Of More Frequent NGCC Maintenance As A Means Of Lowering GHG Emissions Rates

Petitioners state that, "[t]here are a number of options that may be available to utilities subject to the EPS to make modifications to existing units, or the manner in which they are operated to reduce CO_2 emission rates." [44] Among these, Petitioners argue, are "increased frequency of cleaning and other routine maintenance to limit degradation [and] increased frequency of major overhauls to restore degraded units to near new performance levels."[45] Calpine agrees that there are opportunities for existing units to operate more efficiently; however, there are two significant limitations on the ability of existing NGCC facilities to increase the frequency of routine maintenance and major maintenance overhauls, which could otherwise reduce CO_2 emission rates.

First, electric generating facilities (including facilities owned by or contracted with POUs) within the CAISO's balancing area must obtain approval from the CAISO Outage Coordination Office ("OCO") before any maintenance outage.[46] The OCO reviews proposed maintenance outages submitted for a 15-month period to determine if any one or a combination of maintenance outage requests may violate CAISO's system reliability standards.[47] This ultimately ensures electricity reliability across the CAISO's balancing area. However, the requirement that individual facilities acquire CAISO's pre-approval for maintenance outages means that POUs and NGCC facilities have limited control over increasing the frequency of routine maintenance and major maintenance overhauls.

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[43] *See* "National Renewable Energy Laboratory, A Review of Operational Water Consumption and Withdrawal Factors for Electricity Generating Technologies, NREL/TP-6A20-50900, at 15 (Mar. 2011), *available at*: http://www.nrel.gov/docs/fy11osti/50900.pdf. ("Using national averages, the annual performance penalty for switching from wet cooling to dry cooling for nuclear plants is 6.8%, *combined cycle plants 1.7%,* and other fossil plants (including coal and natural gas steam plants) 6.9%.") (emphasis added).

[44] Petitioner Joint Comments, at 17.

[45] *Id.*

[46] A CAISO maintenance outage is a period of time during which an operator limits the capability of or takes its generating unit out of service for the purposes of carrying out routine planned maintenance, or for the purposes of new construction work.

[47] CAISO, Business Practice Manual for Outage Management, Version 7, at 3-4 (2012), *available at*: https://bpm.caiso.com/bpm/bpm/version/000000000000171. This review takes into consideration a number of factors, including: forecast peak demand conditions, other maintenance outages, potential to cause congestion, and impacts on the market. *Id.* at 3-4, 3-5.

Additionally, POUs must internally coordinate maintenance outages among facilities the POUs contract with or own. A power purchase agreement ("PPA") between a utility and an independent generator typically requires some sort of pre-approval by the utility for the generator to conduct maintenance activities in accordance with "good utility practice"[48] and limits the generator's opportunities for both routine maintenance and major maintenance. For instance, a PPA might limit routine maintenance to 140 hours/ year for each combustion turbine and major maintenance to 650 hours/ every 45,000 service hours for each combustion turbine. These are relatively narrow windows to complete complex maintenance activities on NGCC turbines. Thus, a NGCC facility might not be able to meet its availability commitments to its utility purchaser if it were to implement an unprecedented maintenance regime that increased the frequency of major maintenance activities. These availability commitments exist for a reason: the utility has not bargained for them arbitrarily, but to assure that it will meet reliability standards imposed by the CAISO and National Electricity Reliability Council ("NERC").

Moreover, even if a particular POU's contracts were to sanction more frequent maintenance activities, the combined impact of multiple NGCC turbines being offline for maintenance could eventually create a resource constraint for the POU. Therefore, it is simply not the case that either the utilities or NGCC facility operators could turn off their facilities to conduct more frequent maintenance (and thereby achieve reductions in CO_2 emission rates, as suggested by Petitioners), without resulting in some consequence to the overall grid. For this reason, Calpine would recommend the CEC undertake an assessment of whether maintenance activities, beyond what is mandated by good utility practices, are either feasible or desirable, before adopting an EPS that is premised upon more frequent major maintenance overhauls.

III. CONCLUSION

Calpine appreciates this opportunity to provide these written comments. As the operator of the largest fleet of efficient NGCC and combined heat and power facilities within California, we look forward to working with the CEC, the Petitioners and other interested agencies and stakeholders to develop a revised EPS that advances California's leadership in moving towards a low-carbon economy.

[48] "Good Utility Practice" generally means any of the practices, methods, and acts engaged in or approved by a significant portion of the electric utility industry during the time period of the PPA, or any of the practices, methods, and acts which, in the exercise of reasonable judgment in the light of the facts known at the time the decision was made, could have been expected to accomplish the desired result at a reasonable cost consistent with good business practices, reliability, safety, and expedition.

Please contact me with any questions or concerns.

Best regards,

Barbara McBride

Director, Environmental Services

Calpine, Western Region