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U.S. Environmental Protection Agency
RE: Docket ID No. EPA–HQ–OAR–2016–0033

Comments of Clean Air Task Force on Clean Energy Incentive Program Design Details, 81 Fed. Reg. 42,940 (June 30, 2016).

Clean Air Task Force ("CATF") respectfully submits these comments on the proposed Clean Energy Incentive Program ("CEIP") Design Details to the U.S. Environmental Protection Agency ("EPA" or "Agency"). Founded in 1996, CATF seeks to help safeguard against the worst impacts of climate change by working to catalyze the rapid global development and deployment of low carbon energy and other climate-protecting technologies, through research and analysis and public advocacy leadership.

CATF previously submitted comments to the Agency on its proposals to reduce carbon pollution from new power plants, including the January 2014 proposed "Standards of Performance for Greenhouse Gas Emissions from New Stationary Sources: Electric Utility Generating Units, 79 Fed. Reg. 1,430 (Jan. 8, 2014) and its "Notice of Data Availability" in support thereof, 79 Fed. Reg. 10,750 (Feb. 26, 2014);[1] EPA's proposed "Carbon Pollution Standards for Modified and Reconstructed Stationary Sources: Electric Utility Generating

[1] Comment submitted by Ann Brewster Weeks *et al.*, Senior Counsel and Legal Director, Clean Air Task Force (CATF), Doc. ID: EPA-HQ-OAR-2013-0495-9664 (May 9, 2014) *and* Comment submitted by Andres Restrepo, *et al.*, Sierra Club, Doc. ID: EPA-HQ-OAR-2013-0495-9514 (May 9, 2014); CATF also submitted extensive comments on the Agency's subsequently withdrawn 2012 New Source Performance Standards for this industry, Comments of Clean Air Task Force and Conservation Law Foundation, Docket Nos. EPA-HQ-OAR-2011-0060-9662, EPA-HQ-OAR-2011-0060-9663 (June 25, 2012).

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Units," 79 Fed. Reg. 34,960 (June 18, 2014);[2] EPA's carbon reduction proposals for existing power plants: EPA's proposed "Clean Power Plan," i.e., "Carbon Pollution Emissions Guidelines for Existing Stationary Sources: Electric Utility Generating Units," 79 Fed. Reg. 34,830 (June 18, 2014); *and* "Notice of Data Availability in Support," 79 Fed. Reg. 64,543 (Oct. 30, 2014); *and* "Technical Support Document: Translation of the Clean Power Plan Emission Rate-Based CO_2 Goals to Mass-Based Equivalents," (availability noticed: 79 Fed. Reg. 67,406 (Nov. 13, 2014));[3] as well as EPA's "Federal Plan Requirements for Greenhouse Gas Emissions from Electric Utility Generating Units Constructed on or before January 8, 2014; Model Trading Rules; Amendments to Framework Regulations; Proposed Rule," 80 Fed. Reg. 64,966 (Oct. 23, 2015).[4]

I. Introduction

The Clean Power Plan ("CPP"), published October 23, 2015, sets emission guidelines in the form of state emission targets, based on commonly utilized measures, for states to follow in developing plans to reduce carbon dioxide ("CO_2") emissions from existing fossil fuel-fired power plants. 80 Fed. Reg. 64,662. States have broad authority to design plans and set performance standards for existing power plants in order to meet the emission guidelines during the CPP compliance period: 2022-2030. *Id.* at 64,667-68. Power plants are not confined to those pollution reduction measures that serve as the basis for the emission guidelines to meet their standards of performance, and states have the option to allow plants to trade either emissions rate credits ("ERCs") or mass-based allowances for compliance. *Id.* at 64,710. The CPP is a flexible regulatory scheme, which harnesses market forces to foster innovation and achieve cost-effective emission reductions. *Id.* at 64,655-56. EPA explicitly finalized the CPP so as "to provide states and utilities with broad flexibility and choice in meeting [the] requirements in order to minimize costs to ratepayers and to ensure the reliability of electricity supply." *Id.* at 64,665; *see also id.* at

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[2] Comment submitted by James P. Duffy, Legal Fellow and Ann Brewster Weeks, Senior Counsel and Legal Director, Clean Air Task Force (CATF), Doc. ID: EPA-HQ-OAR-2013-0603-0280 (Oct. 16, 2014).

[3] Comment submitted by Ann Brewster Weeks, Legal Director, *et al.*, Clean Air Task Force (CATF), Doc. ID: EPA-HQ-OAR-2013-0602-22612 (Dec. 1, 2014).

[4] Comment submitted by James P. Duffy, Associate Attorney, *et al.*, Clean Air Task Force (CATF) and Conservation Law Foundation (CLF), Doc. ID: EPA-HQ-OAR-2015-0199-0878 (Jan. 21, 2016).

64,666 ("final guidelines…empower affected EGUs to pursue a broad range of choices for compliance").

During the CPP compliance period, low- and zero-emitting resources in states with a rate-based plan can generate ERC and allowances. 80 Fed. Reg. at 64,906. These resources must be incremental and can include natural gas combined cycle ("NGCC") plants, solar, wind, geothermal, tidal, wave, hydro, demand side energy efficiency, combined heat and power, waste heat power, electricity transmission and distribution improvements, nuclear energy and carbon capture and sequestration ("CCS"). *Id*. at 64,895. EPA also includes a provision that would allow any additional category identified in a state plan and approved by EPA to generate ERCs. 40 C.F.R. 60.5800(a)(4)(vii). States with a mass-based budget allowance program have substantial flexibility in allocating allowances, and thus may allocate allowances to low- and zero-emission sources as part of a set-aside or otherwise. *Id*. at 64,892; 80 Fed. Reg. at 65,012; 81 Fed. Reg. at 42,949-50 n.24. Because these compliance instruments can be sold to affected sources for compliance with a performance standard, they are therefore valuable assets. 80 Fed. Reg. at 64,734.

EPA recognized, however, that this scheme may create incentives to delay construction or operation of new zero-emitting energy sources until the CPP compliance period commences and these valuable compliance instruments become available. *Id*. at 64,670. To offset any disincentive for early action and "help sustain the momentum toward greater RE investment," EPA included the Clean Energy Incentive Program in the CPP, 80 Fed. Reg. at 64,670, and has requested comments on the design details of the program in this proposal.[5]

Designed correctly, the CEIP can incentivize additional early investment in technologies with zero CO_2 stack emissions and counteract a potential near term shift in investment from zero-emitting power generation to investment in new NGCC generation before the first CPP compliance period begins in 2022. In response to federal, state and international regulatory signals, agreements and incentives, along with substantial cost reductions and corporate recognition of the climate imperative, technical innovations in reducing carbon emissions are advancing rapidly and significantly.

[5] The original comment deadline for the proposed CEIP was August 29, 2016. 81 Fed. Reg. 42,940. The deadline was extended to September 2, 2016, 81 Fed. Reg. 47,325 (July 21, 2016), and then further extended to November 1, 2016, 81 Fed. Reg. 59,950 (Aug. 31, 2016).

The CEIP provides a (voluntary) opportunity to further leverage regulatory signals for zero-emitting energy generation by creating additional incentives to early action in the form of a federal matching pool of 300 million additional short tons of CO_2. 81 Fed. Reg. at 42,940, 42,950. States may (but need not) set aside allowances or ERCs from their overall budget for the CEIP and EPA will award matching credits to participating states, *pro rata*. *Id*. at 42,943. Participating states may issue these additional allowances or ERCs to eligible projects commencing commercial operation on or after January 1, 2020. *Id*. at 42,946. Allowances and ERCs issued during the CEIP period may be used by affected power plants to comply with their emission standards during the CPP period. *Id*. at 42,943.

Clean Air Task Force is pleased to offer the Agency comments on the CEIP design.

II. Focus of CATF's comments

CATF's comments on EPA's CEIP proposal are focused on two key points:

1. Project eligibility to receive ERCs or allowances under the CEIP must be defined and determined on a technology neutral basis. Projects with zero CO_2 stack emissions, such as certain CCS projects and advanced nuclear, that can meet EPA's general eligibility criteria beyond those included in EPA's proposal (i.e., wind, solar, geothermal and hydroelectric) should be eligible to benefit from the program. CATF discusses particular projects below, as examples, which would meet all of EPA's eligibility: Lightbridge nuclear uprates, Nuscale advance nuclear projects, and NET Power CCS.
2. The CEIP must be designed and implemented carefully so as not to undermine the stringency of the CPP emissions guidelines. The CEIP adds a significant number of CPP compliance instruments to the market by creating a "matching pool" of allowances or ERCs equivalent to 300 million additional tons of CO_2 emissions beyond those available under the CPP. CEIP credits must be issued only to zero-emitting resources that are additional to business-as-usual in order to avoid weakening the CPP.

Also importantly, the CEIP reserves a portion of the federal matching pool of 300 million credits for low-income community projects. 81 Fed. Reg. at 42, 951-53. Cultivating environmental justice and assisting low-income communities already overburdened with pollution are important aspirations within the CPP, and EPA "designed the CEIP specifically to target the incentives it creates on investments that benefit low-income communities." 80 Fed. Reg. at 64.670. The ERCs and allowances set aside for low income communities can be awarded to demand-side energy efficiency projects implemented in low-income communities and solar projects that provide a direct electricity bill benefit to low-income ratepayers. 81 Fed. Reg. at 42,965. CATF commends measures taken to advance environmental justice. While CATF's view is that applying the above two principles to both Reserves supports that goal, the more detailed comments that follow are focused only on EPA's authority to act, and on the details of the Renewable Energy Reserve.

III. EPA has authority to develop the CEIP Details, the Model Trading Rule, and any other rulemaking, which does not require action from the states and affected sources, while the Clean Power Plan is stayed

CATF concurs with EPA's judgment that the Supreme Court's stay of the Clean Power Plan in *West Virginia v. EPA*[6] does not prevent EPA from moving forward in "coordinating and assisting in the development of CO_2 pollution prevention and control efforts of the states and local governments," such as the CEIP. 81 Fed. Reg. at 42,945. First of all, apart from the stay, it is clear that EPA has ample authority to proceed with its proposal to flesh out the design details of the CEIP. As EPA describes, the statutory basis for this authority includes sections 111, 301, 102 and 103 of the Clean Air Act. 81 Fed. Reg. at 42,944-45.

Turning to the potential impact of the stay in *West Virginia*, we note that the Court's decision was apparently the first time the Court has ever granted a stay of the "application of an agency rule before any court had reviewed it."[7] Thus, there is no direct precedent to turn to. Furthermore, the Court gave no indication in its five identically worded Orders as to the intended scope of the stay.[8] In any event, it is well settled that the purpose and function of a judicial stay is

[6] Order Granting Stay, *West Virginia v. EPA*, No.15A773 (Feb. 9, 2016).

[7] Lisa Heinzerling, *The Supreme Court's Clean-Power Power Grab,* 28 GEO. ENVTL. L. REV. 425, 430 (2016); See also generally, Richard L. Revesz & Alexander Walker, Inst. for Policy Integrity, *Understanding the Stay: Implications of the Supreme Court Stay of the Clean Power Plan*, (Apr. 2016), *available at*: http://policyintegrity.org/documents/CPP_Stay_PolicyBrief.pdf.

[8] Heinzerling at 437-38.

to preserve the status and rights of the parties during the pendency of the related litigation.[9] As the Supreme Court has stated in another recent decision: "[T]he authority to grant stays has historically been justified by the perceived need 'to prevent irreparable injury to the parties or to the public' pending review."[10]

In this case, EPA's CEIP Design Details proposal does not impact the status, rights or obligations of any party, and certainly does not cause any party irreparable injury. The CEIP imposes no mandatory requirements on anyone. Rather, it is a completely voluntary incentive program offered as an option that states may—or may not—choose to adopt to increase the flexibility of their CPP compliance options. 81 Fed. Reg. at 42,942-44. Therefore, EPA is correct in concluding that proposing and finalizing the CEIP Design Details is not prohibited during the pendency of the stay in *West Virginia*.

EPA further notes that "it is not clear whether and to what extent [CPP] deadlines will necessarily be tolled once the stay is lifted." 81 Fed. Reg. at 42,945. CATF encourages EPA to maintain the original compliance periods in light of the growing climate crisis and long lead times provided in the CPP, and will refer to those compliance periods throughout these comments. While CATF agrees with EPA that this question will likely not be addressed until the stay is lifted, we strongly urge EPA not to toll any CPP deadlines unless explicitly required to do so by a court of competent jurisdiction.

IV. EPA must expand the eligibility criteria for the Renewable Energy Reserve to include all additional, zero-carbon-emitting resources that commence operation during the CEIP period.

In the CPP, EPA limited CEIP eligibility for renewable energy projects to wind or solar resources that generate metered megawatt hours. 80 Fed. Reg. 64,830. In the CEIP Design Details, EPA proposes to expand CEIP eligibility to also include geothermal and hydropower energy resources. 81 Fed. Reg. 42,964-65. EPA's proposed criteria for expanding eligibility and determining CEIP-eligible technologies for the Renewable Energy Reserve are "that they are zero-emitting, and essential to longer term climate strategies, and require lead times of relatively shorter duration." *Id*. at 42,965. As indicated above, in the proposed rule, EPA clarifies that

[9] *See, e.g.,* Administrative Procedures Act, 5 U.S.C. § 705.

[10] *Nken v. Holder,* 556 U.S. 418, 432 (2009).

projects must "commence commercial operation" on or after January 1, 2020 and generate electricity during the years 2020 or 2021. *Id*. at 42,946.

As discussed above, EPA provides significant flexibility for states and sources to meet their obligations under the CPP. A wide array of zero-carbon-emitting resources can generate ERCs and allowances, which are available for compliance. In fact, technology neutrality is *required* under the Clean Air Act new source performance standard ("NSPS") program and while section 111 is technology forcing it does not allow EPA to choose winners and losers.[11] EPA recognized as much in the NSPS for the same source category: "[g]enerally, the EPA does not prescribe a particular technological system that must be used to comply with a standard of performance. Rather, sources generally may select any measure or combination of measures that will achieve the emissions level of the standard." 80 Fed. Reg. 64,510 at 64,527 (citing 42 U.S.C. 7411(b)(5) and (h)). While states set the performance standards for existing sources, section 111(d) is informed by 111(b) and CATF urges EPA to apply this same technology-neutral approach to the CEIP.

Clean Air Act section 111 was specifically designed to "create incentives for new technology," *Sierra Club v. Costle*, 657 F.2d 298, 347, n. 174 (citing 123 Cong. Rec. 26846 (1977) (remarks of Sen. Muskie)), by requiring "achievement of the maximum degree of emission reduction… while encouraging the development of innovative…means of achieving equal or better degrees of control," *Id*. (citing H.R. Rep. No. 95-294, 95th Cong., 1st Sess., at 189 (1977)). Throughout the Clean Air Act "there is a philosophy of encouragement of technology development. It is an encouragement to induce, to stimulate, and to augment the innovative character of industry in reaching for more effective, less-costly systems to control air pollution." *Id*. (citing S. Rep. No. 95-127, 95th Cong., 1st Sess., at 171 (1977)).

A frequently cited article reviewed different methods of regulating sulfur dioxide ("SO_2") and nitrogen oxides and found that flexible, technology-neutral approaches lower costs and lead to greater emission reductions. *See generally*, Byron Swift, *How Environmental Laws Work: An Analysis of the Utility Sector's Response to Regulation of Nitrogen Oxides and Sulfur Dioxide Under the Clean Air Act,* 14 TUL. ENVTL. L.J. 309 (2001). For example, the study estimated that

[11] "…nothing in this section shall be construed to require, or to authorize the Administrator to require, any new or modified source to install and operate any particular technological system of continuous emission reduction to comply with any new source standard of performance." 42 U.S.C. § 7411(b)(5).

mandating scrubbers for SO_2 reduction from power plants would cost $7 billion per year, while an emission cap with trading would result in compliance costs of $1.2 billion per year for equivalent emission reduction. *Id*. at 381. Cap and trade programs allow "use of any technology that could reduce emissions, and so promote the application of, refinement, and innovation in the broadest set of potential technologies." *Id*. at 384. While cap and trade programs are not appropriate for pollutants which (unlike CO_2), have local effects, these programs allow "use of any technology that could reduce emissions, and so promote the application of, refinement, and innovation in the broadest set of potential technologies." *Id*. at 384.

> The major benefits of a good cap-and-trade system are that it enacts a stringent and permanent cap on emissions, which serves society's interest in pollution reductions, while allowing the widest possible breadth of compliance options, hence allowing firms to reduce costs. Cap-and-trade approaches…also are technology-neutral, helping to move compliance away from the end-of-pipe controls promoted by rate standards toward the use of cleaner technologies. Because any reduction creates economic value to a firm, firms also face a continuous driver to reduce emissions and develop innovative technologies and methods. Cap-and-trade approaches also remove government from making case-by-case decisions about technologies, redirecting business effort away from contesting regulatory authority and towards competing in the marketplace.

Id. at 390-91.

The CPP and CEIP share many commonalities with cap-and-trade systems – they set emission guidelines and allow flexible market-based mechanisms for compliance. However, by limiting CEIP credits to four specific technologies, EPA is undercutting much of the value that results from such a flexible system during that period. "[T]he purpose [of using market mechanisms] is to allow least-cost avoiders in the private sector to determine strategies on the theory that market incentives (rather than government agencies) can more efficiently select among emissions reduction options."[12]

EPA provides very little rationale for its decision to pick and choose amongst zero-emitting technologies for CEIP eligibility. *See* 81 Fed. Reg. 42,864-65. Although commenters requested that other renewable energy technologies be eligible for the CEIP, EPA states, without explanation: "While we do not believe that it is appropriate to expand the list of eligible CEIP technologies to include all those suggested by

[12] Katherine Trisolini, *Holistic Climate Change Governance: Towards Mitigating and Adaptation Synthesis*, 85 U. COLO. L. REV. 615, 640 (2014).

commenters, we believe that two other RE technologies, specifically geothermal and hydropower, meet the criteria for CEIP eligibility." *Id*. at 42,865. EPA must, as CATF advocates, take a technology neutral approach to the CEIP or at least explain why other technologies do not meet its eligibility criteria -- that is, are not zero-emitting, are not essential to longer term climate strategies, or require more than relatively short lead times.

1. *Zero-emitting generation*

The stated purpose of the CEIP is to "counteract the potential shift in investment from RE to natural gas in the lead up to the start of the interim performance period." *Id*. Therefore, CATF supports the criterion that CEIP eligibility depends on the resource providing MWh with zero CO_2 stack emissions, noting that biomass burning, discussed in Section V. below, does not meet this criterion and therefore cannot be eligible for CEIP credits.

2. *Essential for longer term climate strategies*

EPA provides little explanation and no definition for what this eligibility criterion means. CATF recommends that EPA provide an explanation of this criterion and identify categories of generation sources that do and do not meet this criterion. Application of a criterion that has no definition or explanation leads to inconsistency and confusion.

The electric sector must be transformed and drastically decarbonized to avoid the worst climate change impacts. Decarbonization will require a combination of zero-emitting electricity resources including renewable energy, nuclear, and plants equipped with CCS.[13] NGCC plants can operate for upwards of 60 years and therefore any NGCC plants that are built during the CEIP period will lock in emissions for decades to come. It therefore is critical to the ability to achieve our long term climate strategy for programs to

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[13] *See generally*, e.g., Intergovernmental Panel on Climate Change, Working Group III – Mitigation of Climate Change, Presentation, slides 32-33, *available at*: http://www.slideshare.net/IPCCGeneva/fifth-assessment-report-working-group-iii; International Energy Agency, World Energy Outlook 2014, at 396; UN Sustainable Solutions Network, "Pathways to Deep Decarbonization,"at 33 (July 2014); Global Commission on the Economy and Climate, "Better Growth, Better Climate: The New Climate Economy Report" (September 2014), Figure 5 at page 26; Joint Global Change Research Institute, Pacific Northwest National Laboratory, presentation to Implications of Paris, First Workshop, College Park, MD, (May 4, 2016) (JGCRI, College Park, MD, 2016), *available at*: http://bit.ly/JCRI-Paris.

encourage zero-emitting baseload generation – such as nuclear and certain CCS projects – which would play the same role in the interconnected grid as would a new NGCC.

3. *Require lead times of relatively shorter duration given the time limited nature of the CEIP*

A generation resource will not receive CEIP credits unless it commences commercial operation on or after January 1, 2020. Therefore, there is no risk to a technology-neutral approach that does not differentiate by lead times because even if the resource is *eligible* for CEIP credits, it will not receive any unless it is operational during 2020 or 2021.

Additionally, EPA seems to assume that costs, development and construction times and even the world of available technologies will remain static for the next six years, but given the incentives associated with the CEIP and the technology-forcing nature and goals of the statutory scheme, as well as the already rapid advancement of zero-emitting technologies, it is impossible to predict what innovations may emerge. Indeed, "[t]he general theoretical underpinning of cap-and-trade is to harness market forces to find the cheapest greenhouse gas emissions reductions by allowing emitters to trade allowances in search of the most efficient reductions."[14] It is unnecessary and unwise to stifle these market forces, which continue to generate exciting innovations.

EIA recently reviewed new electricity generating technologies and determined the lead times and the first year available for various new electricity-generating technologies (see table below).[15] EPA must have concluded that the lead times for solar (2 years), wind (3 years), hydropower (4 years), and geothermal (4 years), are of "relatively shorter duration," because EPA found that they are CEIP-eligible. Yet, every other technology EIA reviewed, save advanced nuclear, also has a lead time of 4 years or less. And EIA found that every technology listed was projected to first be available by 2022, including advanced nuclear.

[14] Ann E. Carlson, *Designing Effective Climate Policy: Cap-and-Trade and Complementary Policies*, 49 HARV. J. ON LEGIS. 207, 210 (2012).

[15] U.S. EIA, Cost and Performance Characteristics of New Generating Technologies, Annual Energy Outlook 2016, (June 2016), *available at*: http://www.eia.gov/forecasts/aeo/assumptions/pdf/table_8.2.pdf.

Table 8.2. Cost and performance characteristics of new central station electricity generating technologies

Technology	First Available Year[1]	Size (MW)	Lead time (years)	Base Overnight Cost in 2015 (2015 $/kW)	Contingency Factors: Project Contingency Factor[2]	Contingency Factors: Technological Optimism Factor[3]	Total Overnight Cost in 2015[4] (2015 $/kW)	Variable O&M[5] (2015 $/MWh)	Fixed O&M (2015 $/kW/yr)	Heatrate[6] in 2015 (Btu/kWh)	nth-of-a-kind Heatrate (Btu/kWh)
Coal with 30% carbon sequestration (CCS)	2019	650	4	4,640	1.07	1.03	5,098	6.95	68.49	9,750	9,221
Conv Gas/Oil Comb Cycle	2018	702	3	911	1.05	1.00	956	3.42	10.76	6,600	6,350
Adv Gas/Oil Comb Cycle (CC)	2018	429	3	1,000	1.08	1.00	1,080	1.96	9.78	6,300	6,200
Adv CC with CCS	2018	340	3	1,890	1.08	1.04	2,132	6.57	32.83	7,525	7,493
Conv Comb Turbine[7]	2017	100	2	1,036	1.05	1.00	1,087	3.42	17.12	9,900	9,600
Adv Comb Turbine	2017	237	2	632	1.05	1.00	664	10.47	6.65	9,800	8,550
Fuel Cells	2018	10	3	6,217	1.05	1.10	7,181	44.21	0.00	9,500	6,960
Adv Nuclear	2022	2,234	6	5,700	1.10	1.05	6,100	2.25	98.11	10,449	10,449
Distributed Generation-Base	2018	2	3	1,448	1.05	1.00	1,520	7.59	17.94	9,004	8,900
Distributed Generation - Peak	2017	1	2	1,739	1.05	1.00	1,826	7.59	17.94	10,002	9,800
Biomass	2019	50	4	3,480	1.07	1.01	3,765	5.41	108.63	13,500	13,500
Geothermal[8,9]	2019	50	4	2,553	1.05	1.00	2,687	0.00	116.12	9,541	9,541
MSW - Landfill	2018	50	3	7,954	1.07	1.00	8,511	9.00	403.97	14,360	18,000
Conventional Hydropower[8]	2019	500	4	2,191	1.10	1.00	2,411	2.62	14.70	9,541	9,541
Wind[10]	2018	100	3	1,536	1.07	1.00	1,644	0.00	45.98	9,541	9,541
Wind Offshore	2019	400	4	4,605	1.10	1.25	6,331	0.00	76.10	9,541	9,541
Solar Thermal[8]	2018	100	3	3,895	1.07	1.00	4,168	0.00	69.17	9,541	9,541
Photovoltaic[8,11]	2017	150	2	2,362	1.05	1.00	2,480	0.00	21.33	9,541	9,541

EPA's CEIP eligibility test is vague and confusing and its application is arbitrary. Therefore, CATF urges EPA to expand the "Renewable Energy Reserve," and rename it as the "Zero-Carbon-Emitting Reserve." EPA should list those types of resources that are zero-carbon-emitting and essential to longer term climate strategies as CEIP-eligible. As in the CPP, EPA should include a provision allowing categories not listed to apply for eligibility. Any project that 1) has zero CO_2 stack emissions 2) is essential to long-term climate strategy; and 3) commences commercial operation during the CEIP should be eligible.

Renewable energy, such as solar, wind, geothermal, and hydro are certainly examples of zero-carbon-emitting generation critical to long term climate strategies that can commence commercial operation during the CEIP; however, they are by no means the only technologies capable of satisfying the criteria. Additional resources include, for example, uprates at existing nuclear plants, new nuclear units (including small modular light water reactors and non-light water reactors) and innovations in zero-emitting carbon capture and sequestration plants. Other zero-carbon-emitting resources that EPA cannot now predictably identify, may emerge during the CEIP period and should be able to access early action incentives. To demonstrate that the current technology prescription in the proposed CEIP may miss important opportunities to support promising innovative resources, we describe below three innovative technologies that meet all of EPA's proposed eligibility criteria.

a. Nuclear Uprates and Small or Modular Nuclear Plants

Nuclear power plants provide the largest source of reliable, zero-carbon, baseload generation to our electric grid – nearly double the power of wind, solar and hydro combined.[16] Providing 20 percent of the country's electricity with no attendant carbon emissions, nuclear avoids over 531 million tons of CO_2 per year and preserving and expanding this zero-carbon energy is essential to any long term climate strategy. *Id.* Further, nuclear has very high capacity factors (see table below) and does not experience the variability some other zero-emitting resources do. *Id.* at 4-6. While developing, permitting and constructing a nuclear plant can be a lengthy process, nuclear uprates and innovative nuclear technologies can be operative in the near term and at low cost.

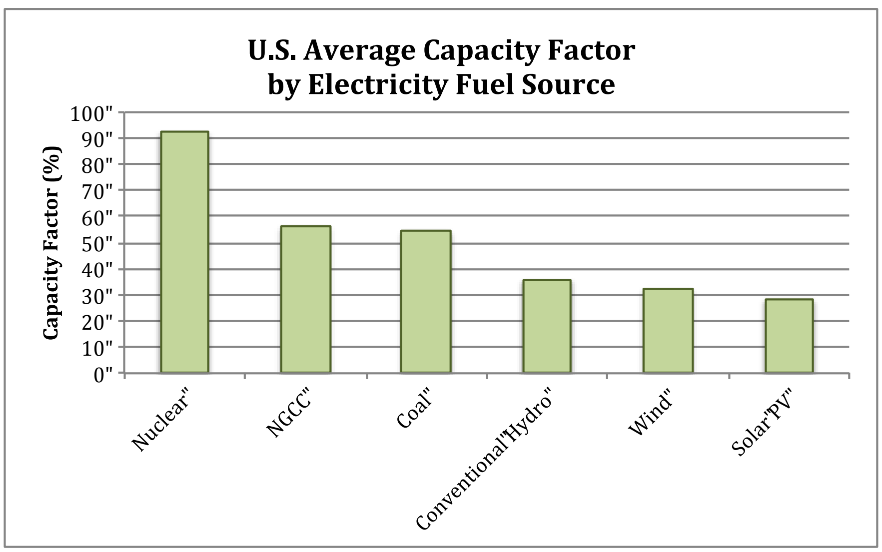


Figure 1. U.S. Average Capacity Factor by Electricity Fuel Source, 2015. ***Source*****: EIA.**[12]

Since the 1970s, the U.S. Nuclear Regulatory Commission ("NRC") has been approving

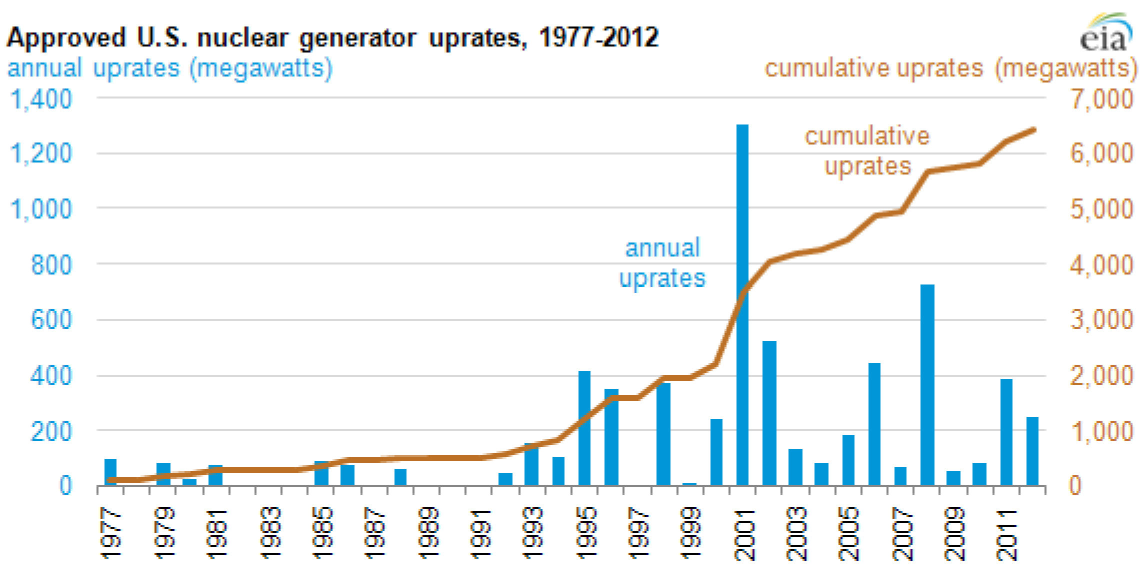
[16] The Horinko Group, Nuclear Power and the Clean Energy Future, at 3 (Sept. 2016) , http://www.nuclearmatters.com/resources/reports-studies/document/Nuclear_Power_and_the_Clean_Energy_Future.PDF.

nuclear uprates, which increases the maximum amount of power a plant can generate generally through a physical modification.[17] There are three types of uprates:

- Measurement uncertainty recapture uprates generally increase electrical output less than 2 percent and generally involve improved methodologies to calculate power and replacement of instruments from analog to digital.
- Stretch uprates increase electrical output by 3-7 percent and do not involve major modifications to the plant. Older components and materials are replaced and upgraded.
- Extended uprates increase electrical output by more than 7 percent and can be as large as 20 percent. These involve significant plant modifications.

U.S. EIA, "Uprates can increase U.S. nuclear capacity substantially without building new reactors," (July 17, 2012), https://www.eia.gov/todayinenergy/detail.php?id=7130.

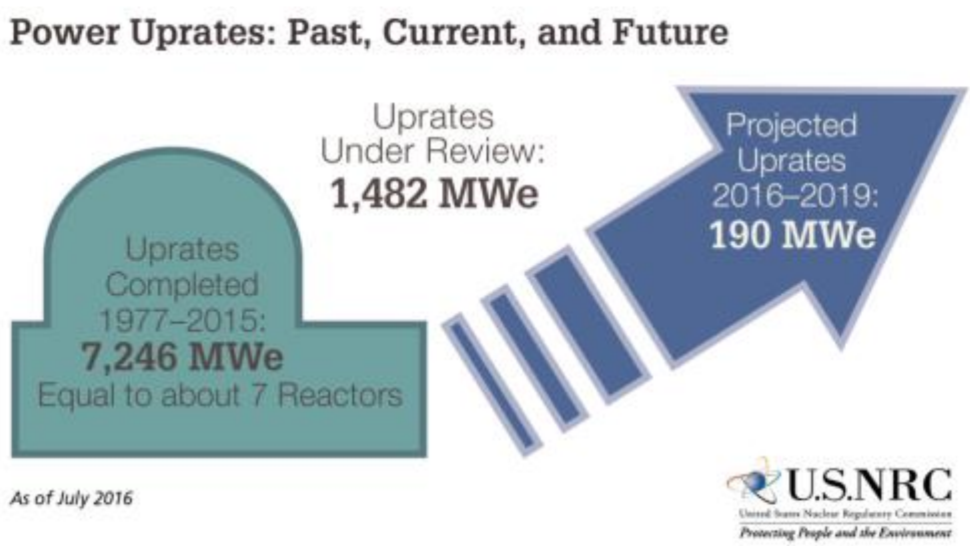
From 2005-2014, the Nuclear Regulatory Commission ("NRC") approved an average of five nuclear uprates per year.[18]



[17] *See* Neil Sheehan, U.S. NRC, "Refresh: The Power of Power Uprates," (July 28, 2016), https://public-blog.nrc-gateway.gov/2016/07/28/refresh-the-power-of-power-uprates/.

[18] U.S. NRC, "Backgrounder on Power Uprates for Nuclear Plants," http://www.nrc.gov/reading-rm/doc-collections/fact-sheets/power-uprates.html.

Just this year, NRC approved an uprate at the Catawba Nuclear Station in South Carolina. U.S. NRC, "Amendment to Renewed Facility Operating License," Doc. No. 50-413 (Apr. 29, 2016). Three applications are currently under review for Brown's Ferry Nuclear Plant in Alabama, and NRC expects to complete review in the Fall of 2017.[19] NRC expects to receive ten more uprate applications by the end of September 2017.[20]



A new prospect for uprates is emerging in fuel technology being developed by Lightbridge Corporation. Based in Reston, Virginia, Lightbridge is developing a metallic fuel that can be used in currently operating reactors to enable power uprates of up to 17 percent, or in new build reactors to enable uprates of up to 30 percent.[21] Lightbridge's fuel is expected to begin irradiation testing under commercial power operating conditions in 2017 in Norway's Halden Research Reactor.[22] Lightbridge is expected to apply for NRC licensing in 2017 for initial use in

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[19] U.S. NRC, "Pending Applications for Power Uprates," http://www.nrc.gov/reactors/operating/licensing/power-uprates/status-power-apps/pending-applications.html.

[20] *See* Neil Sheehan, U.S. NRC, "Refresh: The Power of Power Uprates," (July 28, 2016), https://public-blog.nrc-gateway.gov/2016/07/28/refresh-the-power-of-power-uprates/.

[21] "Lightbridge Fuel Faces Lower Hurdle to Regulatory Approval and Commercial Use Than New Reactors," Bloomberg BNA (July 2, 2015), *available at*: http://ir.ltbridge.com/releasedetail.cfm?ReleaseID=920559.

[22] *Id.*

operating commercial reactors in the U.S. in 2020.[23] Lightbridge fuel can also extend the refueling cycling for existing nuclear power plants, and may improve their economic competitiveness.

In addition to traditional nuclear technology there are game-changing new technologies emerging in the form of small modular reactors ("SMRs"). *See* Mary Anne Sullivan, *et al*., The Future of Nuclear Power, 27 ELEC. J. 7, 10-14 (May 2014). "SMRs are smaller, less capital-intensive, and more flexible than their large-scale counterparts." *Id*. at 13. These models can be built in factories allowing for standard designs and decreasing construction time significantly. *Id*. Modular designs allow the plant to expand over time to accommodate demand. *Id*. As compared with traditional technology, SMRs also have increased thermal efficiency, a shorter and more efficient supply chain, lower operation and maintenance costs and simpler decommissioning. Travis S. Carless, *et al*., *The Environmental Competitiveness of Small Modular Reactors: A Life Cycle Study*, 114 ENERGY 84, 85 (2016). The levelized cost of a 45 MWe SMR ranges from $77 to $240 per MWh, and a 225 MWe is $65 to $120 per MWh. Ahmed Abdulla, *Expert Assessment of the Cost of Light Water Small Modular Reactors*, 110 PROC. NAT'L ACAD. SCI. 9686-91 (2013). Maintaining our nuclear fleet and developing advanced nuclear, which provide zero-emitting, baseload electric generation, is critical to our long term climate strategies. A 2014 study found that the costs of keeping global mean temperature rise below 2°C are lower with SMRs than without. Gokul Iyer, *et al*., *Implications of Small Modular Reactors for Climate Change Mitigation*, 45 ENERGY ECONOMICS 144 (2014).

Several companies are developing SMR designs including Babcock & Wilcox, Holtec, NuScale Power, and Toshiba-Westinghouse. *Id*. A 2012 technology review concluded that "new small reactors have no insurmountable technical and regulatory issues to hinder their development and deployment," Jasmina Vujic, *et al*., *Small Modular Reactors: Simpler, Safer, Cheaper?*, 45 ENERGY 288, 295 (2012), and that conclusion has only been reinforced since that time, Marcin Karol Rowinski, *et al*., *Small and Medium Sized Reactors (SMR): A Review of Technology*, 44 RENEWABLE AND SUSTAINABLE ENERGY REVIEWS 643 (2015) (reviewing 25 original small and medium sized reactor designs currently under development).

NuScale Power indicates that if CEIP credits were available to accelerate investment in fabrication and construction, a reactor could be in commercial operation before the expiration of

[23] *Id*.

the CEIP period.[24]The NRC is updating its regulations to accommodate SMRs[25], and has engaged with various companies on pre-application activities. NuScale Power[26] received funding from the Department of Energy ("DOE") and this partnership anticipates a complete reactor design by mid-2019. DOE indicates that the NuScale design is an impressive mix of safety, scalability, transportability, and economics, as well as an advanced state of design maturity.[27] The NRC issued the final sections of the NuScale Small Modular Reactor Design Specific Review Standard on August 5, 2016,[28] which is designed to provide NRC technical staff with guidance when it reviews the Design Certification Application ("DCA"). NuScale's proposed reactor building is designed to hold 12 SMRs, each 50 MWe for a total capacity of 600 MWe.[29] NuScale is scheduled to submit its DCA to the NRC by December 31, 2016.[30] Utah Associated Municipal Power Systems recently chose a location at the DOE's Idaho National Laboratory to site a nuclear plant utilizing NuScale technology.[31]

NRC has also engaged in pre-application design certification interaction on SMRs with BWXT mPower, which is teamed with Bechtel Power and the Tennessee Valley Authority and

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[24] Christopher Colbert, Chief Strategy Officer, NuScale, Personal Communication (Oct. 27, 2016).

[25] U.S. NRC, "Policy Issues Associated with Licensing Advanced Reactor Designs," http://www.nrc.gov/reactors/advanced/policy-issues.html (database housing Commission papers and staff requirements memoranda related to licensing advanced reactor designs).

[26] *See* "Comment Submitted by Chris Colbert, Chief Strategy Officer, NuScale Nonproprietary, NuScale Power, LLC," (Sept 26, 2016), Doc. ID: EPA-HQ-OAR-2016-0033.

[27] U.S. DOE, "Initiatives > Nuclear Reactor Technologies > Small Modular Reactors (SMRs)," http://www.energy.gov/ne/nuclear-reactor-technologies/small-modular-nuclear-reactors.

[28] U.S. NRC, "Design-Specific Review Standard for NuScale Small Modular Reactor Design" (Aug. 5, 2016), *available at*: http://www.nrc.gov/docs/ML1535/ML15355A295.html.

[29] U.S. NRC, "NuScale" http://www.nrc.gov/reactors/advanced/nuscale.html; *see also* NuScale Power, "How NuScale Technology Works," http://www.nuscalepower.com/our-technology/technology-overview; see also D.T. Ingersoll, *et al.*, *NuScale Small Modular Reactor for Co-generation of Electricity and Water*, 340 DESALINATION 84, 85-87 (2014) (providing an overview of the NuScale SMR plant).

[30] U.S. NRC, "Pre-Application Review of the NuScale Design," http://www.nrc.gov/reactors/advanced/nuscale/review.html.

[31] World Nuclear News, "Preferred Site Chosen for NuScale SMR," (Aug. 11, 2016), http://www.world-nuclear-news.org/NN-Preferred-site-chosen-for-NuScale-SMR-1108167.html.

in a cooperative partnership with DOE.[32] The BWXT mPower reactor is 180 MWe and up to ten can be placed at each plant.[33] NRC is also in pre-application design certification discussions with Holtec on their SMR-160 design.[34]

On May 12, 2016, the Tennessee Valley Authority submitted an application to NRC for an Early Site Permit for SMR units at the Clinch River Nuclear Site in Oak Ridge Tennessee. 81 Fed. Reg. 40,929 (June 23, 2016). The particular SMR has not yet been selected although the application indicates that four different designs are being considered:

[32] U.S. DOE, "Initiatives > Nuclear Reactor Technologies > Small Modular Reactors (SMRs)," http://www.energy.gov/ne/nuclear-reactor-technologies/small-modular-nuclear-reactors.

[33] BWXT, http://www.bwxt.com/nuclear-energy/utility-solutions/smr/bwxt-mpower.

[34] U.S. NRC, "SMR-160," http://www.nrc.gov/reactors/advanced/holtec.html.

- The BWXT mPower SMR is an advanced iPWR that generates 530 MWt, with an estimated power output of 180 MWe. The mPower reactor uses standard PWR fuel with a shorter fuel assembly length. The iPWR is located in a below-grade containment. The mPower SMR is designed to be built in multiples of two reactors per plant, and up to two plants (four reactors) would be placed on the CRN Site.

- The NuScale SMR is an advanced iPWR that generates 160 MWt, with an estimated power output of 50 MWe. The NuScale SMR uses standard light water reactor fuel with a shorter fuel assembly length. The reactor sits within a containment vessel, and up to 12 reactors can be housed in one below-grade shared pool. The NuScale SMR is a multi-unit configuration that is designed to include up to 12 reactors per plant, and up to 12 reactors would be placed on the CRN Site.

- The Holtec Inherently-Safe Modular Underground Reactor (HI-SMUR) SMR-160 is an advanced pressurized water reactor design that generates 525 MWt, with an estimated power output of 160 MWe. This reactor design does not use standard fuel. Instead, it uses a unitary cartridge containing all fuel that is replaced entirely each refueling. The reactor, steam generator, and spent fuel pool are located inside the containment structure. The reactor core is located below grade. Each unit is built as a stand-alone plant, and up to four SMR-160 reactors would be placed on the CRN Site.

- The Westinghouse SMR is an advanced iPWR that generates 800 MWt, with an estimated power output of 225 MWe. It uses standard PWR fuel, with a shorter fuel assembly length. The iPWR vessel is housed in a containment located below grade. Each unit is built as a stand-alone plant, and up to three Westinghouse SMRs would be placed on the CRN Site.[35]

Nuclear uprates and advanced nuclear designs are zero-emitting resources essential to longer term climate strategies and have lead times relevant to the CEIP period. "Decisions to build new nuclear capacity, uprate existing reactors, or extend their operating lifetimes depend on the cost-competitiveness of nuclear generation in electric power markets." U.S. EIA, Annual Energy Outlook 2016, at MT-19 (Aug. 2016). The competitiveness of nuclear generation will be

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[35] Barry Castle, *Four Nuclear Designs Being Evaluated for TVA's Clinch River Project in Tennessee, Power Engineering* (June 22, 2016), *available at*: http://www.power-eng.com/articles/2016/06/four-nuclear-designs-being-evaluated-for-tva-s-clinch-river-project-in-tennessee.html.

undermined if other zero-emitting resources are provided an incentive withheld from new nuclear and uprates during the CEIP period.

b. Zero-Emitting Carbon Capture and Sequestration Equipped Plants

For the foreseeable future, fossil fuel-fired power plants will provide a significant portion of electricity in the U.S.[36] Therefore, to "meet demand projections, grid reliability requirements and [CO_2] emissions goals, [CCS] will be necessary for many power generation facilities."[37] CCS separates CO_2 from power plant emissions, compresses it and injects it underground for permanent storage. It is the *only* technology currently available that allows fossil fuel-fired power plants to operate without emitting CO_2. Therefore, CCS is undoubtedly critical to any long term climate strategy. "If CCS is removed from the list of emissions reduction options in the electricity sector, the capital investment needed to meet the same emissions constraint is increased by 40 [percent]."[38] In fact, if CCS is not part of the international emission reduction strategy, the ability *ever* to achieve target [CO_2] levels, is reduced by 0.5°C – or 25 percent of the 2.0°C target.[39]

Recent developments in CCS turbine-based oxy-combustion cycle technology[40] may lead to dramatic cost reductions in capturing 100 percent of CO_2 emissions when coupled with storage (or sequestration). Generally, capturing carbon from a fossil-fired power plant requires the

[36] U.S. EIA, *Annual Energy Outlook 2016*, at Table IF1-3. In 2030, under an interregional trading approach to the Clean Power Plan, natural gas accounts for 35% of total electricity generation, while coal accounts for 22%.

[37] Elizabeth Burton, *et al*., *California' s Policy Approach to Develop and Carbon Capture, Utilization and Sequestration as a Mitigation Technology*, 37 ENERGY PROCEDIA 7639, 7645 (2013).

[38] IEA, *Technology Roadmap: Carbon Capture and Storage*, at 8 (2013); *See also generally* Krishna Priya G.S. *et al.*, *Power system planning with emission constrains: Effects of CCS retrofitting*, 92 PROCESS & SAFETY ENVTL. PROT. 447 (2014) (finding that allowing CCS retrofit of existing plants reduces costs significantly).

[39] Gunnar Luderer *et al*., *Economic mitigation challenges: how further delay closes the door for achieving climate targets,* 8 ENVTL. RESEARCH LETTERS 034033 at 7 (2014) (finding that existing sources have already consumed much of the 2.0°C target and delaying comprehensive emissions reductions another 15 years may push the target out of reach). Ruth Nataly Echevarria Huaman and Tian Xiu Jun, *Energy related CO_2 emissions and progress on CCS projects: A review*, 31 RENEWABLE AND SUSTAINABLE ENERGY REVIEW 368, 369 (2014) (each year of delay will result in a global cost of $500 billion in terms of mitigation costs from 2014 to 2030).

[40] *See generally*, Luca Mancuso, *et al*., IEAGHG, *Oxy-combustion Turbine Power Plants*, (Aug. 2015) (reviewing available oxy-combustion cycle options); *see also* Fernando Climent Barba, *et al*., *A Technical Evaluation, Performance Analysis and Risk Assessment of Multiple Novel Oxy-Turbine Power Cycles with Complete CO_2 Capture*, 133 J. OF CLEANER PRODUCTION 971 (2016) (examining nineteen different oxy-turbine cycles, identifying the main parameters regarding their operation and development).

addition of a separate carbon capture and compression facility, however NET Power's cutting-edge, new design uses technology called the Allam Cycle[41] and captures CO_2 as part of the combustion process itself.[42]

NET Power incorporates several design changes that allow it to offer literally zero stack emissions. Incorporating the Clean Power Plan, 8Rivers' (NET Power developer) current sales plan, has plant commercial operation dates of one in 2020, five in 2023, six in 2024, six in 2025.[43] The CEIP credits could help accelerate that deployment schedule. NET Power uses oxy-combustion to produce an emissions stream of inherently pure CO_2. But unlike other oxy-combustion systems that operate at atmospheric pressure, NET Power operates at extremely high pressures. NET Power does this by substituting supercritical CO_2 for steam as the working fluid in the plant.[44] This makes NET Power more efficient because it avoids the phase changes (and resultant energy loses) from boiling water and then recondensing it.[45] And because the CO_2 must be compressed to supercritical conditions for NET Power to run, there is no further compression costs to make the CO_2 ready for transport and injection. As a result, Net Power is inherently clean because it produces a highly pure CO_2 stream that is injection ready.[46] It does so without post-combustion capture or compression equipment that is required with other CCS approaches.

Because both the inputs (natural gas fuel and oxygen used for combustion) and the outputs (water and CO_2) are under extremely high pressure, the gases that must be managed in the NET Power system occupy a very small volume. This allows Net Power to reduce the size and footprint of the plant, reducing capital costs (less steel and concrete). NET Power eliminates

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[41] R.J. Allam, *et al*., *High Efficiency and Low Cost of Electricity Generation from Fossil Fuels While Eliminating Atmospheric Emissions, Including Carbon Dioxide*, 37 ENERGY PROCEDIA 1135 (2013).

[42] *See*, Powerpoint, NET Power, *Truly Clean, Cheaper Energy*, at 3, California Energy Commission CO2 Capture Technology Workshop (Apr. 16, 2015); *see also* Roberto Scaccabarozzi, *et al*., T*hermodynamic Analysis and Numerical Optimization of the NET Power Oxy-combustion Cycle*, 178 APPLIED ENERGY 505 (2016) (presenting a thorough thermodynamic analysis and optimization of the NET Power Cycle).

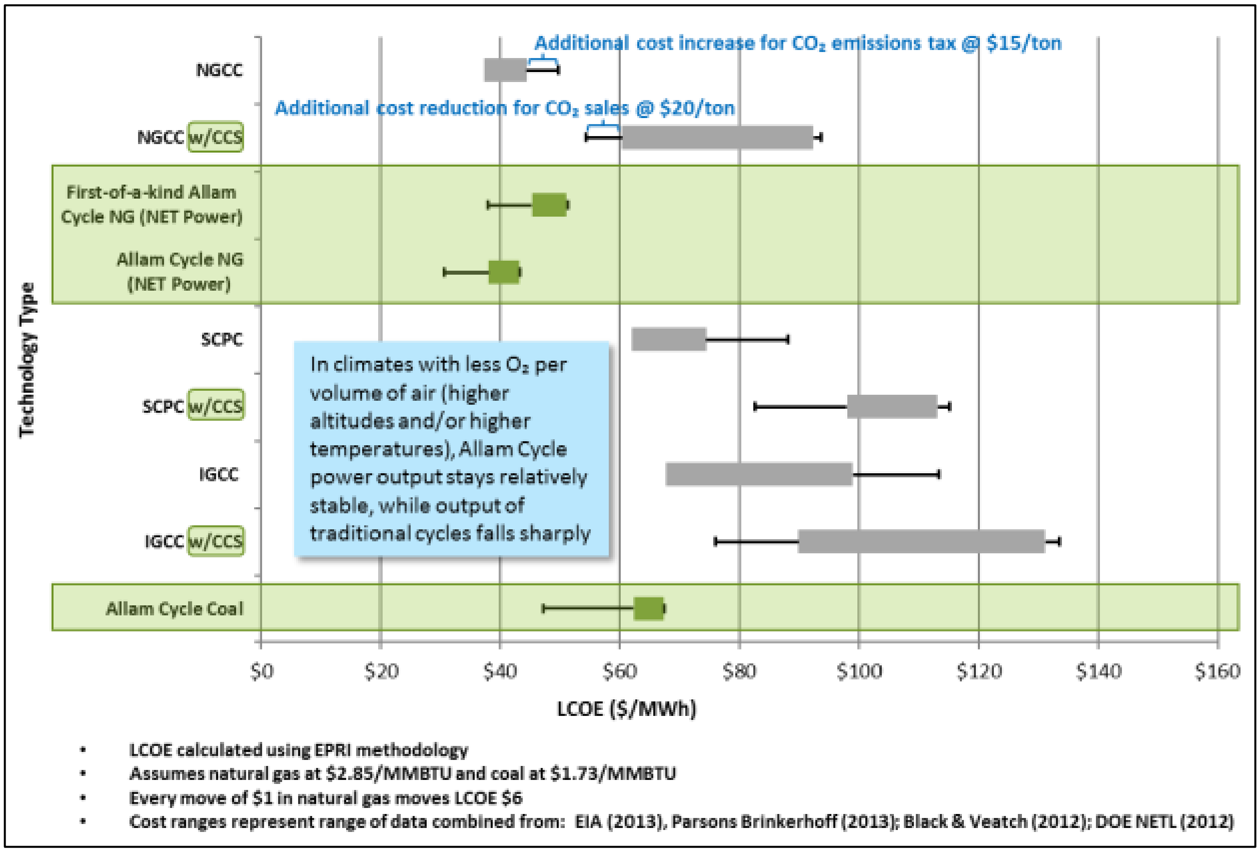
[43] Walker Dimmig, 8Rivers, Personal Communication (Oct. 24, 2016).

[44] "Gearing up for a New Supercritical CO2 Power Cycle System: Toshiba has Almost Completed Detailed Design in Preparation for a Turbine that will use Carbon Dioxide as the Working Fluid," Gas Turbine World, *available at*: http://www.gasturbineworld.com/gearing-up.html.

[45] *See*, *supra* note 42 at 5.

[46] Fernando Climent Barba, *et al*., *A Technical Evaluation, Performance Analysis and Risk Assessment of Multiple Novel Oxy-Turbine Power Cycles with Complete CO_2 Capture*, 133 J. OF CLEANER PRODUCTION 971, 972 (2016).

the costly steam heat recovery systems used at conventional plants and applies these cost savings to help offset the expensive air separation unit ("ASU") that Net Power needs to supply O_2.[47] The technology can generate power at a levelized cost comparable to NGCC: $60 – 80/MWh.[48]



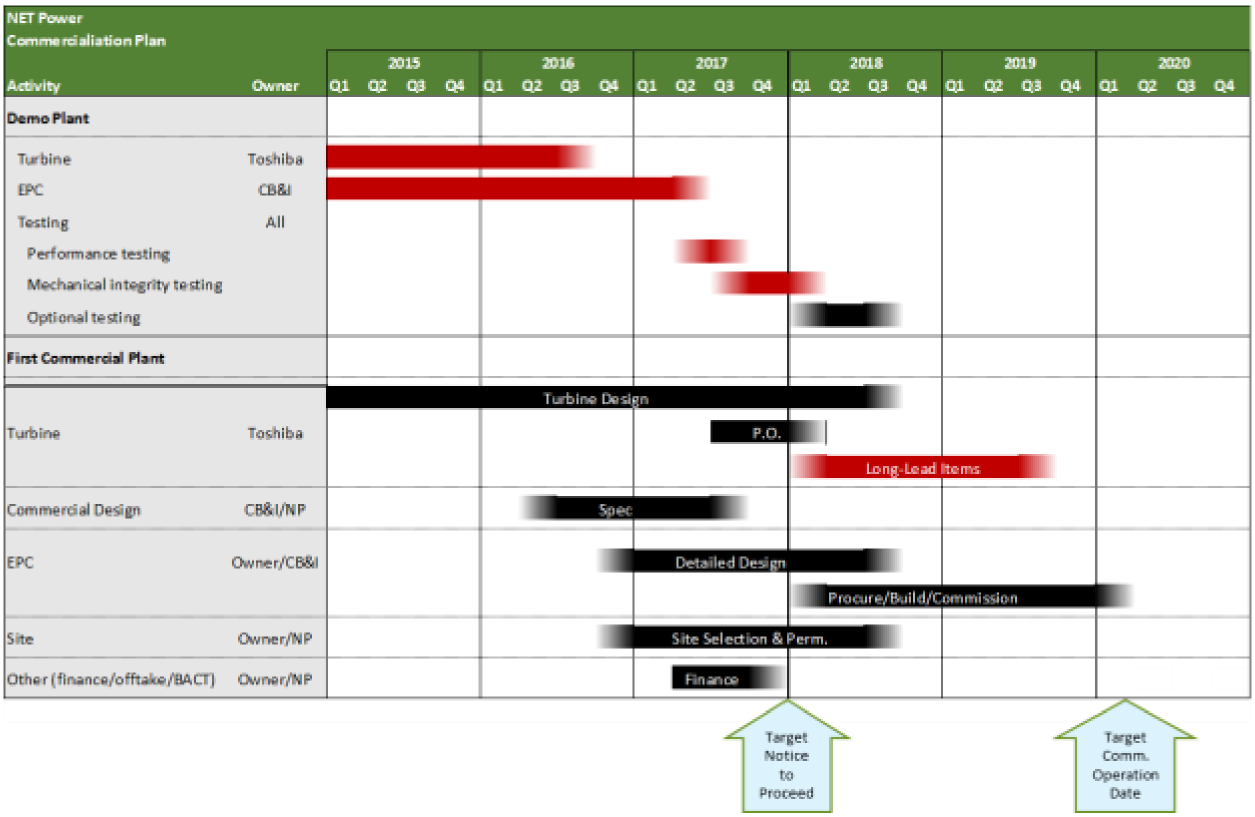
In March 2016, NET Power broke ground in La Porte, Texas on a 50 MW natural gas power plant, which will demonstrate the viability of this new technology.[49] Exelon Generation will operate the plant and Toshiba developed the key components, including the turbine. Toshiba

[47] *See*, *supra* note 42 at 6.

[48] *See*, *supra* note 42 at 7.

[49] "NET Power Breaks Ground on Demonstration Plant for World's First Emission-Free, Low-Cost Fossil Fuel Power Technology," PR Newswire (Mar. 9, 2016), *available at*: http://www.prnewswire.com/news-releases/net-power-breaks-ground-on-demonstration-plant-for-worlds-first-emissions-free-low-cost-fossil-fuel-power-technology-300233131.html.

sent the turbine to Texas today and the demonstration plant will start operation next year.[50] NET Power and its collaborators also are in the process of developing a full-size 295 MW plant, scheduled to enter operation in 2020, during the CEIP period (see table below describing commercialization plan).[51] NET Power reports that a pre-FEED study for this facility is underway, and several sites have already been selected for initial plants.[52]



While NET Power is currently the most developed oxy-combustion technology, many other advanced CCS technologies are currently under development. They are described below, not to suggest that this is a closed list of technologies that should receive consideration under the CEIP but rather to illustrate the kinds of innovations that may be available within the CEIP

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[50] Toshiba, Press Release, "Toshiba Ships Turbine for World's First Direct-Fired Supercritical Oxy-Combustion CO_2 Power Cycle Demonstration Plant," (Nov.1, 2016) http://www.toshiba.co.jp/about/press/2016_11/pr0101.htm#PRESS.

[51] David Roberts, "Fossil Fuel Electricity with No Pollution? This Company is Building a Power Plant to Prove it," Vox (Apr. 5, 2016), *available at*: http://www.vox.com/2016/4/5/11347962/net-power.

[52] Walker Dimmig, 8Rivers, Personal Communication (Oct. 21, 2016).

period. All such zero-emitting technologies must be CEIP-eligible.

- **Inventys[53]:** Inventys is the developer of the VeloxoTherm™ process, a CO_2 removal system that uses "structured adsorbents" housed in equipment that is similar to rotary air preheaters. The rotating platform brings fresh structured absorbents into contact with the flue gas. CO_2 is removed from the adsorbents with low-pressure steam. The temperature swing absorption process takes about 60 seconds. Inventys estimates that the price of the process could be significantly lower than existing post-combustion CO_2 capture technologies.

- **CES[54]:** Clean Energy Systems, Inc. ("CES") has a patented power generation technology that combines hydrocarbons with oxygen. CES's system produces high-energy steam that powers turbines to generate electricity and allows for CO_2 sequestration using technologies from the aerospace industry. CES is an oxy-fuel combustor adapted from rocket propulsion technology. This combustor can burn either a liquid or gas fuel in the presence of near-stoichiometric oxygen levels and recycled water. The combustion products are primarily steam and high pressure/temperature CO_2. Fuels that can be used for this technology include natural gas, syngas, and refinery wastes.

- **Ion Engineering[55]:** Ion Engineering has developed a patented solvent that has been tested at the National Carbon Capture Center in Alabama. In 2016, the company expects to scale up their technology at a 12 MWe facility in Norway's Technology Centre Mongstad. The company expects their highly efficient solvent will decrease the size (and cost) of capture equipment.

- **InnoSepra[56]:** InnoSepra is developing a physical sorbent process that combines processes innovation with new physical sorbents to reduce total regeneration energy requirements. The system has been bench and field tested at NRG's Indian River, Delaware plant. The company asserts that the process has the potential to capture carbon at less than $45 per metric ton and can be installed either before or after flue-gas desulfurization systems.

Recognizing that electricity will likely be generated from fossil fuels for decades to

[53] *See* Inventys, "The VeloxoTherm Process: Three Simple Steps," http://inventysinc.com/veloxotherm/.

[54] *See* Clean Energy Systems, Inc., "Oxyfuel Combustion," http://www.cleanenergysystems.com/technology/.

[55] *See* Ion Engineering, "Our Technology – The Ion Advantage," http://ion-engineering.com/our-technology/.

[56] *See* Ravi Jain, InnoSepra, PowerPoint, "InnoSepra's Physical Sorbent-Based CO2 Capture Process," (Aug. 2016) (Attachment 1).

come, CCS is a crucial part of longer-term climate strategies. New developments in CCS technology have led to shorter lead times, which renders NET Power and other zero-emitting technologies relevant for purposes of the CEIP.

c. Conclusion

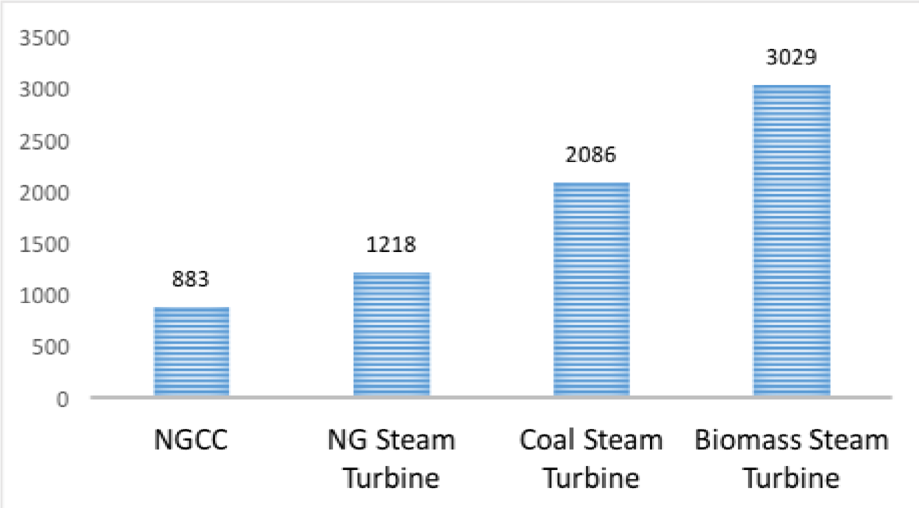
CATF provides these examples of innovative zero-emitting sources to illustrate the types of technologies that may be available during the CEIP period. Others could be stimulated if EPA chooses a technology-neutral approach to the CEIP. Technologies like Lightbridge, NuScale and NET Power have the potential to revolutionize electricity generation and have emerged from development into demonstration quickly. It would have been difficult for anyone to predict their availability six years ago, and therefore it is unwise to unnecessarily limit CEIP eligibility in the final CEIP design rule.

V. Biomass-generated electricity is not zero-carbon-emitting and should not be eligible for CEIP credit.

Power plants that burn wood and other forms of biomass cannot be eligible for CEIP credits because biomass power neither is zero CO_2 emitting nor is it a "technolog[y] with zero *associated* CO_2 emissions."[57]

To the contrary, CO_2 emissions are indisputably "associated" with biomass combustion. When a power plant burns biomass, it emits CO_2 into atmosphere (unless it uses CCS to capture 100 percent of its carbon emissions). Biomass-burning power plants emit about 3,000 pounds of CO_2 per megawatt-hour, which is almost 50 percent higher than the emissions rate of an uncontrolled coal-fired power plant and more than 200 percent higher than the emissions rate of a NGCC plant.

[57] 81 Fed. Reg. at 42,950/1 (emphasis added) ("EPA determined that the matching pool of 300 million short tons of CO_2 emissions was an appropriate reflection of the CO_2 emission reductions that could be achieved in 2020 and 2021 through additional early investment in technologies with zero associated CO_2 emissions"); *see also* 80 Fed. Reg. 64,662, 64,834/1 (Oct. 23, 2015) (describing an ERC as "a tradable compliance unit representing one MWh of electric generation (or reduced electricity use) with zero associated CO_2 emissions"); *id*. at 64,949 (*§60.5790 What must I do to meet my plan obligations?*) (indicating that CO_2 control measures can earn one ERC for every megawatt hour of actual energy generated or saved, *provided* that the megawatt hour has "zero associated CO_2 emissions").



CO_2 Emissions Rate (lbs. CO_2/MWh) for Select Fuels and Generating Technologies[58]

In addition, biomass power is not eligible for CEIP credits because the emission reductions that are sometimes attributed to the process are hypothetical, uncertain, and delayed. The basic argument that CO_2 from biomass combustion should be regulated differently than CO_2 from fossil combustion hinges on an assumption that biogenic CO_2 emissions will be recaptured as trees grow back. However, the forests from which biomass feedstocks are harvested may not regrow, or they may regrow only partially, in which case the combustion emissions are not offset. Furthermore, assuming *arguendo* that EPA is authorized to discount the actual volume of CO_2 emitted during biomass combustion on the basis of future forest regrowth,[59] any offsetting reductions would be significantly delayed – on the order of years, decades, or more than a century, depending on what type of biomass is used as fuel.

EPA has convened a panel under its Scientific Advisory Board to examine these complex *technical* emission accounting issues (the panel is neither qualified nor empowered to address the

[58] U.S. EIA, Carbon Dioxide Emission Coefficients (for NGCC, NG steam turbine, coal steam turbine; value for coal is for "all types"), *available at*: http://www.eia.gov/environment/emissions/co2_vol_mass.cfm; Oak Ridge National Laboratory, Biomass Energy Data Book v. 4 (2011) (assumes wood has higher heating value of 8,600 MMBtu/lb., is bone dry, and is composed of 50% carbon), *available at*: http://cta.ornl.gov/bed; *see also* Thomas Walker, *et al*. Biomass and Carbon Policy Study (report by the Manomet Center for Conservation Sciences at 103-104 (2010) *available at*: https://www.manomet.org/publications-tools/sustainableeconomies/biomass-sustainability-and-carbon-policy-study-full-report.

[59] But as CATF has explained in previous comments, EPA lacks the authority under Section 111(d) of the Clean Air Act and its implementing regulations to let regulated facilities comply on the basis of *net (lifecycle)* emission levels rather than *actual* emission levels. *See supra* note 4 at 52-54; and *supra* note 3 at 86-88

legal complications discussed above). Although it has not yet completed its work, the panel has repeatedly made it clear that emission reduction initiatives like the CEIP cannot ignore the climate impacts of biogenic CO_2 by simply treating biomass combustion as "carbon neutral." As the panel has told EPA, "carbon neutrality is not an appropriate *a priori* assumption" but rather "a conclusion that should be reached only after considering a particular feedstock's production and consumption cycle."[60]

In a recent letter, EPA Assistant Administrator Janet McCabe reinforced the idea that without additional analysis, EPA is not in a position to articulate a cogent scientific basis for treating some biomass-derived CO_2 differently than fossil fuel-derived CO_2:

> Peer-reviewed scientific literature reflects that all carbon emissions (both biogenic and fossil) once in the atmosphere drive climate change equally and endanger public health and welfare … [D]etermining how emissions from using biomass at power plants affects atmospheric carbon levels is a complex scientific question—one that must take into account the way biomass is produced and, in some cases, what would happen to the biomass if it is not used for energy.[61]

Biomass power is not "zero-emitting" and it cannot be counted on to deliver near-term emission reductions with any certainty. As such, EPA cannot allow power plants that burn wood and other forms of biomass to become eligible for CEIP credits.

VI. Maintaining the Stringency of the CPP's Emission Guidelines

CATF supports the basic goal of the CEIP to create incentives to invest in zero-emitting projects prior to the initial CPP compliance period in 2022,[62] thereby counteracting the potential that such sources will delay deployment until that time and NGCC plants with their associated emissions will be built in their stead. CATF also supports EPA's requirement that states electing to participate in the CEIP program must include in their state implementation plans a "mechanism that ensures that the allocation of early action allowances or issuance of early action ERCs to CEIP-eligible parties will not impact the CO_2 emission performance of affected EGUs

[60] EPA Science Advisory Board, "SAB Review of EPA's Accounting Framework for Biogenic CO2 Emissions from Stationary Sources (September 2011)," at 3 (Sept. 28, 2012), *available at*: https://yosemite.epa.gov/sab/sabproduct.nsf/0/57B7A4F1987D7F7385257A87007977F6/$File/EPA-SAB-12-011-unsigned.pdf.

[61] Janet McCabe, Letter to the Editor, "How Biomass Can Provide Carbon Benefits," WALL ST. J. (July 14, 2016), *available at*: http://www.wsj.com/articles/how-biomass-can-provide-carbon-benefits-1468525269.

[62] *See, e.g.*, 80 Fed. Reg. at 64,829.

required to meet rate-based or mass-based CO_2 emission standards during the plan performance periods." 80 Fed. Reg. at 64,830-31; 81 Fed. Reg. at 42,958-60. To ensure that CPP targets are not weakened, states must borrow their CEIP credits from the first interim CPP period and those credits along with the matching CEIP credits must only be awarded to zero-emitting generation sources that are additional to business-as-usual.

"The CEIP was designed primarily to encourage *additional* renewable deployment," 81 Fed. Reg. at 42,964, and to "incentivize reductions in emissions that *might not otherwise have occurred*," *Id*. at 42,965 (emphasis added). Without a rigorous mechanism to ensure that zero-emitting resources receiving CEIP incentives are indeed additional, extra compliance instruments will be available without any corresponding emission reduction from affected sources.

In particular, the CEIP was initially proposed in a world where the federal Renewable Electricity Production Tax Credit ("PTC") and Business Energy Investment Tax Credit ("ITC") would expire at the end of 2014 and 2016, respectively. In a situation where the PTC and ITC expired there could be a tendency for zero-emitting electric generation projects to wait until after the CPP compliance begins so that they could earn CEIP incentives. However, the Consolidated Appropriations Act of 2016, which became law in December of 2015 as Public Law 114-113, extended the PTC and ITC until 2020 and 2022 respectively.[63] As EPA notes, the extension of these tax credits has been projected by DOE's National Renewable Energy Laboratory ("NREL") to result in substantial additional deployment of new wind and solar capacity by the end of 2021. 81 Fed. Reg. at 42,952. NREL's analysis found that both natural gas prices and the availability of tax credits will impact the level of additional RE capacity additions prior to 2022. In the case with tax credit extensions and base-case gas prices, NREL projected over 100 gigawatts of additional wind and solar capacity by the end of 2021, almost 50 gigawatts more than would occur without the credit extensions.[64] The low-price gas case analysis found an even greater impact of the tax credit extensions; there, while slightly less new wind and solar capacity were projected to be added (almost 90 gigawatts), the incremental capacity projected by the

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[63] *See, e.g.*, U.S. DOE, "Renewable Electricity Production Tax Credit," http://energy.gov/savings/renewable-electricity-production-tax-credit-ptc; and U.S. DOE, "Business Energy Investment Tax Credit," http://energy.gov/savings/business-energy-investment-tax-credit-itc.

[64] Trieu Mai, *et al.*, National Renewable Energy Laboratory, *Impacts of Federal Tax Credit Extensions on Renewable Deployment and Power Sector Emissions*, NREL/TP-6A20-6551 (Feb. 2016), *available at:* http://www.nrel.gov/docs/fy16osti/65571.pdf.

credit extensions was greater (about 65 gigawatts).[65] Thus, in contrast to the situation facing EPA when it initially established the CEIP in the CPP and proposed its inclusion in the federal plan and model trading rule provisions, a substantial amount of wind and solar resources is now projected to come online before 2022 regardless of the CEIP.

EPA has requested comment on whether projects that receive PTC or ITC benefits should be excluded from CEIP eligibility "because one of the objectives of the CEIP is to incentivize reductions in emissions that might not otherwise have occurred, and projects receiving tax credits may already be induced by those incentives rather than the CEIP." 81 Fed. Reg. at 42,965. In view of the above, and of the vital importance in maintaining the stringency of the CPP emission standards as much as possible, projects receiving PTC or ITC tax incentives should not be eligible to receive any early action allowances or ERCs under the CEIP program. Because such projects would not be eligible for allowances or ERCs from the 300 million ton CEIP matching pool, those sources would not contribute to a relaxing of the CPP's overall stringency. CATF urges EPA to prohibit projects that receive PTC or ITC tax benefits from also receiving allowances or ERCs under the CEIP; states could enforce this prohibition by requiring projects to certify that they are not receiving any such benefits, per EPA's example set forth in its CEIP Details proposal. 81 Fed. Reg. at 42,953.

In the same vein of avoiding weakening of the CPP Emission Guidelines, CATF strongly supports EPA's proposal not to reallocate unused matching pool allowances or ERCs, but rather to retire them. 81 Fed. Reg. at 42,955-56. CATF does not support any reapportionment of unused matching allowances or ERCs. CATF further incorporates, by reference, those recommendations made in Section VI.B of Sierra Club, *et al*., Comments on the Clean Energy Incentive Program: "EPA Should Finalize Its Proposal to Require States to Maintain the Stringency of State CPP Targets, which are filed in this docket"

As Sierra Club, *et al*. describe: failure to ensure that CEIP credits are issued only to zero-emitting generation additional to business-as-usual could eliminate more than 11 percent of the total CO_2 reductions expected under the Clean Power Plan. It is of the utmost importance that EPA maintain the stringency of the CPP by limiting CEIP eligibility to only those projects that are truly zero-emitting and additional.

[65] *Id.*

VII. Apportionment of Matching State Credits

CATF incorporates by reference, Section V. of Sierra Club, *et al.*, Comments on the Clean Energy Incentive Program: "Apportionment of Matching State Credits.

VIII. Conclusion

CATF respectfully submits that eligibility for the Renewable Energy Reserve must be clarified and applied in a consistent manner. Doing so will result in a technology neutral program, consistent with the Clean Air Act, which will support all zero-carbon-emitting resources that can both commence commercial operation during the CEIP, and that play the same role in the electric system as NGCC plants, which would otherwise be constructed before 2022.

CATF's other primary concern is that the CEIP not weaken the CPP goals by failing to ensure that CEIP credits are limited to those zero-emitting resources that are truly additional to business as usual. In light of the extension of the PTC and ITC tax benefits, much of the wind and solar generation commencing operation prior to 2022 would occur without the CEIP. Therefore, projects receiving PTC or ITC benefits should not be eligible to participate in the CEIP program.

We look forward to working with EPA on this important program and thank you again for the opportunity to comment on the design elements of the CEIP.

Respectfully submitted,

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