RESOURCES *for the* FUTURE

Cost Analysis and Emissions Projections under Power Sector Proposals in Reconciliation

Issue Brief 21-15 by **Nicholas Roy**, **Dallas Burtraw,** and **Kevin Rennert** — October 2021

1. Introduction

Resources for the Future (RFF) deployed its electricity market model, Haiku, to examine the expected effects on the electricity sector of three policy proposals being considered for the budget reconciliation process: Clean Energy for America Act (CEAA) tax credit extensions, the Clean Electricity Performance Program (CEPP), and a carbon fee. Policy impacts were evaluated in terms of clean electricity generation, emissions reductions and cost burden on consumers. We find:

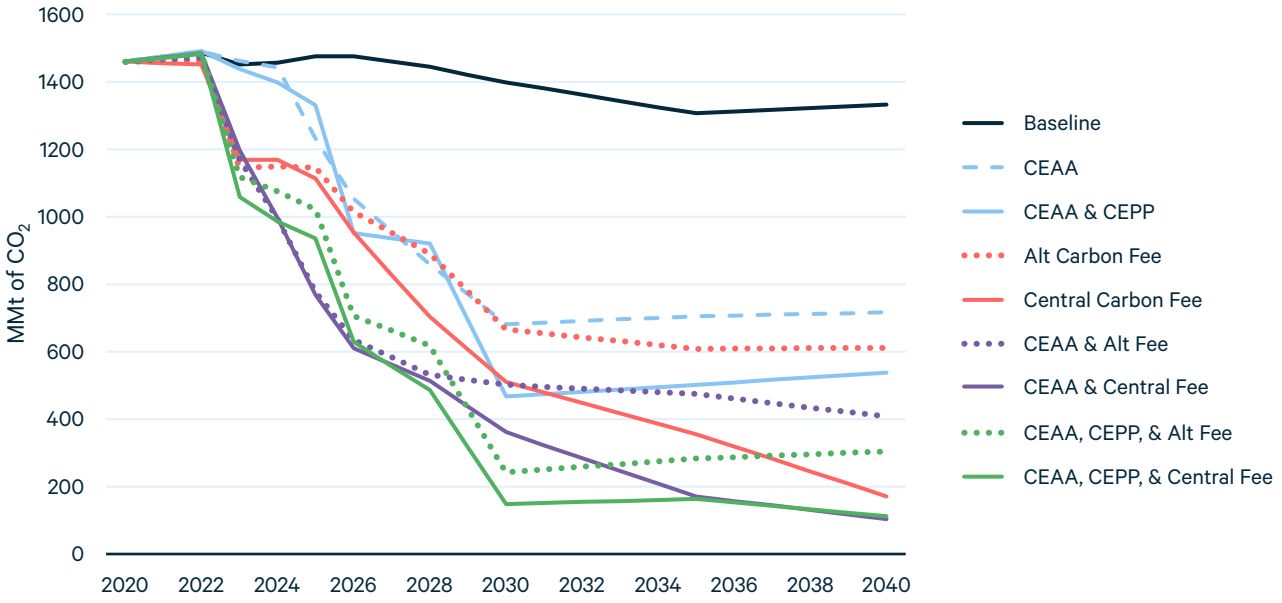
- In 2030, the CEAA tax credit extensions achieve 69 percent clean generation, the CEAA combined with the CEPP achieves 78 percent clean generation, and the CEAA, CEPP, and a central case carbon fee achieve 91 percent clean generation.
- In 2030, the CEAA and CEPP together achieve 81 percent reduction from 2005 emissions levels in the electricity sector. Adding the central case carbon fee yields a 94 percent reduction.
- The combination of the CEAA, CEPP, and a central case carbon fee yields a 4.3 percent reduction in nationally averaged retail electricity prices for the 2022-2031 period.

Table 1. Power Sector Emissions and Clean Energy Projections

	Percent Clean in 2030	Percent Emissions Reductions in 2030 from 2005	Cumulative Emissions Reductions in Electricity Sector (billion metric tons of CO_2 from Baseline)	
			Budget Window (2022-2031)	2022-2040
Baseline	46%	-43%	-	-
CEAA	69%	-72%	3.82	9.42
CEAA & CEPP	78%	-81%	4.35	11.71
Alt Carbon Fee	64%	-73%	4.60	10.99
Central Carbon Fee	71%	-79%	5.47	14.59
CEAA & Alt Fee	73%	-80%	6.78	14.62
CEAA & Central Fee	79%	-85%	7.20	17.59
CEAA, CEPP, & Alt Fee	86%	-90%	6.85	16.23
CEAA, CEPP, & Central Fee	91%	-94%	7.70	18.35

Note: "Percent Clean" indicates the sum of generation from non-emitting sources (solar, wind, nuclear, geothermal, and biomass) divided by total electricity consumption.

Figure 1. CO_2 Emissions by Policy



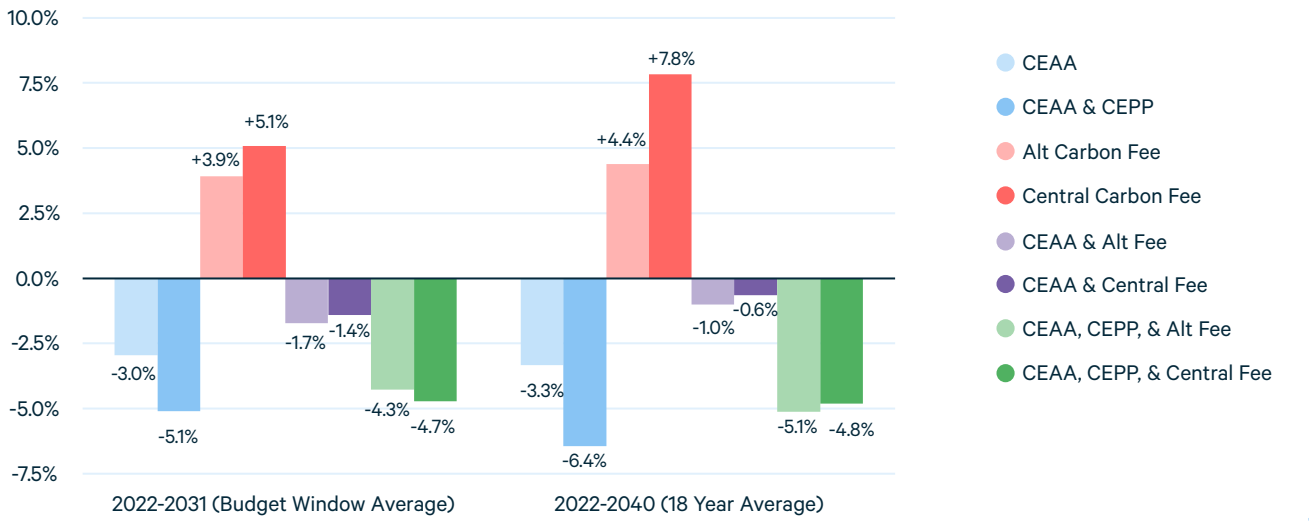
Policy scenario details can be found in the RFF issue brief **"Emissions Projections under Alternative Climate Policy Proposals"** and general modeling assumptions are detailed in the appendix of the issue brief **"Emissions Projections for a Trio of Federal Climate Policies."** The CEAA as modeled includes direct pay to generators but excludes the energy efficiency investments to allow for direct comparison of cost-effectiveness across different supply-side policy investments. The CEAA as written is technology neutral, but Haiku only represents new builds of solar and wind. The CEPP is modeled as a $150 per MWh incentive to new solar and wind generation for the first year of operation and does not include a penalty for not achieving performance targets.[1] We assumed policies are implemented as described without strategic behavior from load serving entities. All policies modeled are exclusive to electricity generation and do not account for economy wide electrification, demand response (consumption is fixed for all policy scenarios), revenue use, or a broader economy-wide carbon fee. All dollar values are reported in 2018 USD and emissions estimates in metric tons. The Haiku model solves over a 30-year time horizon with outputs from 2020 to 2040.

2. Emissions Reductions

Tax credits have been a reliable driver of renewable investments for decades. We find that the CEAA's ten-year extensions would lead to cumulative emissions reductions of 3.82 billion metric tons of CO_2 below the business-as-usual baseline during the budget window achieving 69 percent clean electricity by 2030 (Table 1). Adding the CEPP to the CEAA tax credit extensions yields an additional 500 million metric tons reduced from baseline reaching a 78 percent clean electricity grid—just shy of the administrative goal of 80 percent clean electricity by 2030. Emissions reductions plateau after the CEAA and CEPP expire at the end of the budget window (Figure 1).

1 Resource cost estimates of government grants to incentivize clean electricity do not include the first new MWhs equivalent to 1.5 percent of load. The model does not include a penalty for noncompliance; however, a penalty is essential to provide incentives for individual firm investment decisions. The model does not address questions of integration of renewables into the electricity system, which becomes increasingly relevant at high levels of clean generation as a percent of total load.

Figure 2. Cost Impact on Consumer Retail Electricity Prices (Percent of AEO 2021 Forecast)



We also modeled two carbon fees beginning in 2023. Our central case carbon fee ("Central Fee"), which starts at 15 $/metric ton and increases gradually to 30 $/metric ton by 2028 followed by a $10 annual increase through the end of the modeling period (2045), achieved 71 percent clean in 2030 on its own, 79 percent clean when paired with the CEAA, and 91 percent clean when paired with the CEAA and CEPP. Cumulative emissions reductions of this carbon fee are 5.47 billion metric tons during the budgetary period and 7.70 billion metric tons below baseline when combined with the CEAA and CEPP policies. An alternative carbon fee ("Alt Fee"), starting at the same price and rising at 5 percent per year, reaches 64 percent clean by 2030 on its own, and 86 percent clean when combined with the CEAA and CEPP.[2] Without the CEAA and CEPP, the alternative fee yields reductions of 4.59 billion metric tons, similar to the reductions of 4.35 billion metric tons achieved by the CEAA and CEPP. Only policy combinations including the CEAA, CEPP, and a carbon fee achieve greater than 80 percent clean generation in our modeling.

The carbon fee drives substantial immediate emissions reductions due to cost-effective fuel switching from coal to natural gas generation in the early years. The CEAA and CEPP policies encourage renewable investment but do not distinguish between emissions from fossil sources, so they do not incentivize a similar near-term shift from coal to natural gas.

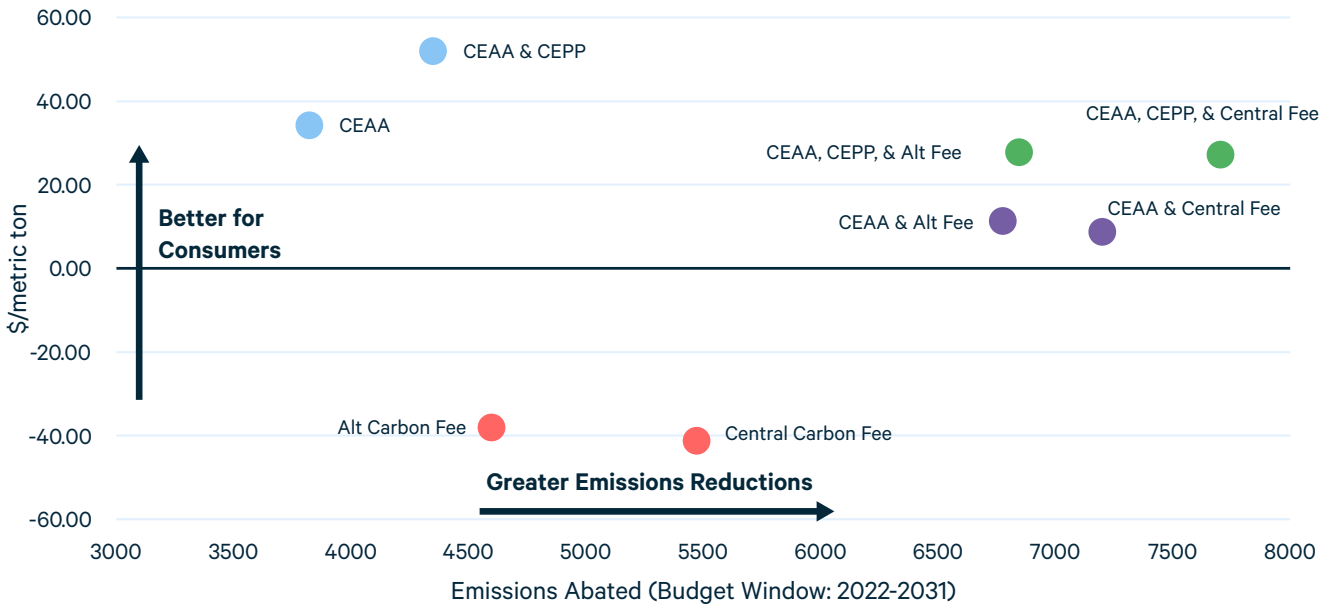
3. Cost of Electricity

A transition to a clean electricity grid will require substantial investment. The proposed CEAA and CEPP policies would provide hundreds of billions of dollars from the federal government to enable the transition, but additional private investment would also be required. The transition to renewables would also yield substantial fuel cost savings. The imposition of a carbon fee would add new costs to electricity supplies and raise revenues for the federal government. Federal revenues raised from a carbon fee could be used to offset effects on consumer electricity prices or for other purposes.

We analyzed the change in resource costs necessary to build and operate the electricity system under the modeled policies and evaluated the expected change in the consumer electricity price. Our findings indicate

2 The price path of both fees can be found in Figure 1 of **"Emissions Projections under Alternative Climate Policy Proposals."**

Figure 3. Consumer Resource Savings per Metric Ton



government investment in renewables through the CEAA and CEPP, coupled with fuel cost savings, leads to reduced costs for ratepayers. The addition of a carbon fee raises costs for ratepayers compared to a policy that used only clean energy incentives, but projected rates remain below the level in the baseline. In other words, a comprehensive package consisting of the CEPP, CEAA, and a carbon fee results in a reduction in projected electricity costs for consumers overall.

To quantify the effects of the policy combinations on consumer electricity costs we assessed the national change in resource cost from baseline necessary to meet consumer demand, subtracted the clean energy incentives provided by the federal government in the form of the CEAA and CEPP, and added the carbon fees when applicable. We then divided this estimate of the change in resource costs for the industry by total national consumption to calculate an estimate of the consumer burden for these policies compared to the baseline, represented in cents/kWh. We report percent changes from the *Annual Energy Outlook* (2021) baseline forecast of national average retail electricity prices, which is approximately 10.5 cents per kWh over the next two decades. The impact on consumers is shown in Figure 2. The CEAA and CEPP together reduce expected retail electricity prices by 5.1-6.4 percent. The carbon fees in the absence of other policies would increase costs 3.9-7.8 percent, though government revenues from the fee could be used to mitigate effects on consumers. The combined impact of clean energy incentive programs when paired with either carbon fee leads to cost reductions of approximately 4.3-5.1 percent for consumers.

We observe in Figure 2 that the addition of a carbon fee to the CEAA and CEPP has a synergistic effect. Although the carbon fee alone increases consumer costs compared to the baseline, the carbon fee incentivizes even greater deployment of clean electricity which is then eligible for federal funding under the CEAA and CEPP. The combination of CEAA, CEPP, and a carbon fee therefore results in consumer savings that are less than but proximate to savings achieved under the CEAA and CEPP alone.

Figure 3 illustrates the cost effectiveness of various policy combinations from a consumer perspective only, not accounting for changes in government revenues or producer profits. The figure illustrates that the CEAA,

for example, yields $34 dollars in retail electricity cost savings for consumers for every metric ton abated, and it achieves 3.82 billion metric tons emissions reductions within the budget window (as reported in Table 1). The CEAA and CEPP policies together yield savings to consumers, even when coupled with a carbon fee. The policy combinations that include both the CEAA and CEPP along with a carbon fee achieve the greatest emissions reductions.

4. Conclusion

The clean electricity incentives proposed in the CEAA and CEPP policies are projected to decrease costs to electricity consumers and reduce emissions. The carbon fees modeled achieve more rapid emissions reductions than the CEAA and CEPP by promoting a substitution from coal to natural gas, but they also could raise costs for consumers depending on what the government does with the revenue. The net effect of a policy combination that incorporates the CEAA and CEPP and a carbon fee is a savings for consumers relative to the baseline, even if revenue from the carbon fee is not used to compensate consumers. While all of these policies make substantial progress toward the Biden Administration's goal of an 80 percent clean electricity grid by 2030, none of these policies alone meet that objective. However, a comprehensive policy package combining incentives with a carbon fee achieves the Biden Administration's clean electricity goal while reducing costs to consumers.

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