Projected CO_2 Emissions Reductions under the American Opportunity Carbon Fee Act of 2019

Issue Brief 19-02 by **Marc Hafstead** — April 2019

Introduction

In April 2019 Sheldon Whitehouse (D-RI) and Brian Schatz (D-HI) reintroduced the **American Opportunity Carbon Fee Act**, with new co-sponsors Martin Heinrich (D-NM) and Kirsten Gillibrand (D-NY). The act would levy a fee on US greenhouse gas (GHG) emissions (largely on carbon dioxide [CO_2]). In describing the bill, Senator Whitehouse remarked, "Nearly every economist who has seriously studied climate change has concluded that a carbon fee needs to be a big part of the solution. A carbon fee will unleash the power of the markets, reducing emissions by making polluters pay the American people for harm caused by their products, and boosting carbon reduction industries by strengthening their business case." Senator Schatz added, "A price on carbon pollution is one of the best options we have for bipartisan action, and it is one of the best options we have for tackling climate change. By putting a price on pollution, our bill provides a market-based solution for dealing with the planetary emergency that is climate change."

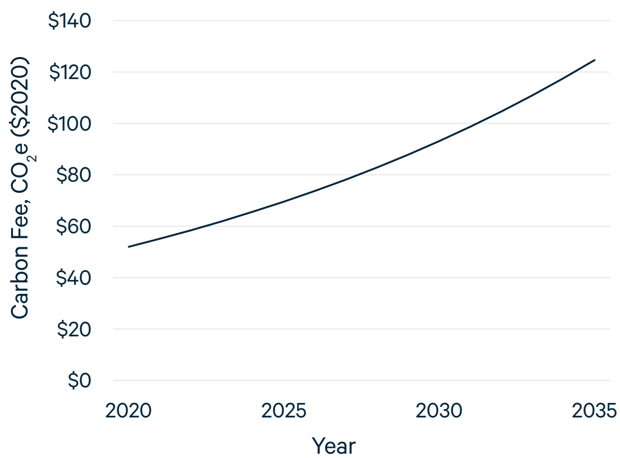
The legislation imposes a carbon fee on fossil fuels where they are mined, processed, refined, or imported. The fee starts at $52 per metric ton CO_2e and rises at 6 percent above inflation annually. By 2035, the fee would be about $125 per metric ton (in $2020).

The fee would also apply to large emitters of non-fossil-fuel-related carbon dioxide emissions, producers and importers of other greenhouse gases with high global warming potential. Further, the fee on fossil fuels would be increased to account for the amount of methane that escapes during the extraction and distribution of these fuels.

The proposed legislation also proposes to protect households from higher energy prices through refundable tax credits for workers.[1] The legislation would also protect trade-vulnerable, energy-intensive industries through border adjustments. The Treasury secretary would collect tariffs on goods imported from countries that do not price greenhouse gas emissions and issue refunds on American exports to those nations.

This issue brief focuses on projecting how domestic energy-related emissions of carbon dioxide would respond to the proposed carbon fee. Further analysis on the economic impacts of the proposed legislation is forthcoming.

Figure 1: Carbon Fee by Year



Economic Model of Carbon Emissions

To evaluate the impact of the proposed legislation on energy-related carbon dioxide emissions, we utilize the Goulder-Hafstead Energy-Environment-Economy E3 CGE Model, an economy-wide model of the United States with international trade. Production is divided into 35 industries, with particular emphasis on energy-related industries such as crude oil extraction, natural gas extraction, coal mining, electric power (represented by four industries), petroleum refining, and natural gas distribution. The model is unique in its detailed tax treatment, which allows for interactions of environmental policy and pre-existing taxes on capital and labor, and its attention to capital dynamics, which are important for analyzing how policies impact the economy over time. The model utilizes 2013 benchmark data and solves for impacts at one-year intervals beginning in 2013. Baseline technology and preference forecasts are calibrated to the 2016 Annual Energy Outlook (AEO) from the Energy Information Administration (EIA).

In *Confronting the Climate Challenge: US Policy Options*, published by Columbia University Press (co-authored by Lawrence Goulder of Stanford University), the E3 model is used to evaluate carbon taxes, cap-and-trade programs, clean energy standards, and increases in the federal gasoline tax. The model has also been featured in three peer-reviewed journal publications, and it participated Stanford's Energy Modeling Forum (EMF) 32: Inter-model Comparison of US Greenhouse Gas Reduction Policy Options. For further analyses of a carbon tax using the E3 model, including a wider range of impact results, see **www.rff.org/carbontax**.

Results

Figure 2 displays projected US energy-related carbon dioxide emissions[2] under a baseline scenario without a federal carbon tax and under the proposed legislation.[3] Figure 3 reports emissions relative to the 2005 benchmark.

In 2018, US energy-related carbon dioxide emissions were approximately 5.25 billion metric tons, or 87 percent below 2005 levels. Under the AEO 2019 baseline, emissions are projected to fall slightly over time, to 4.83 billion metric tons by 2035. Under the proposed legislation, emissions are projected to fall substantially in the first year of the policy in 2020—25 percent relative to the baseline level of emissions—and projected to continue to decline as the carbon fee rises over time. In 2025, emissions are projected to be 3.29 billion metric tons, a 45 percent reduction relative to 2005 levels, substantially surpassing the 26-28 percent Paris agreement target. And by 2029 emissions are projected to be 49 percent of 2005 levels (or a 51 percent decline relative to 2005) and by 2035 emissions are projected to be 43 percent of 2005 levels (or a 57 percent decline relative to 2005).

Figure 2: Energy-Related Carbon Dioxide Emissions by Year

Figure 3: Energy-Related Carbon Dioxide Emissions Relative to 2005

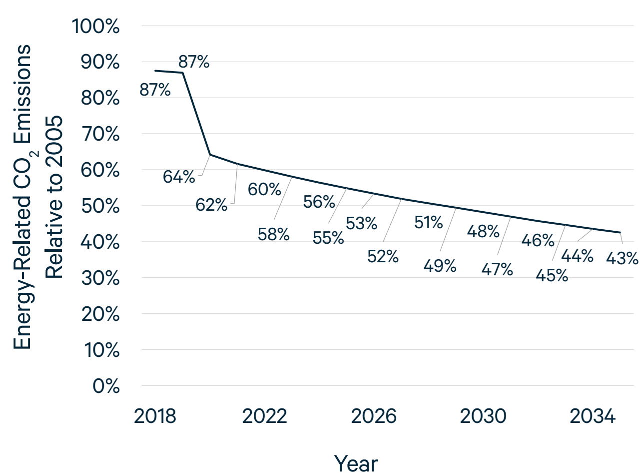
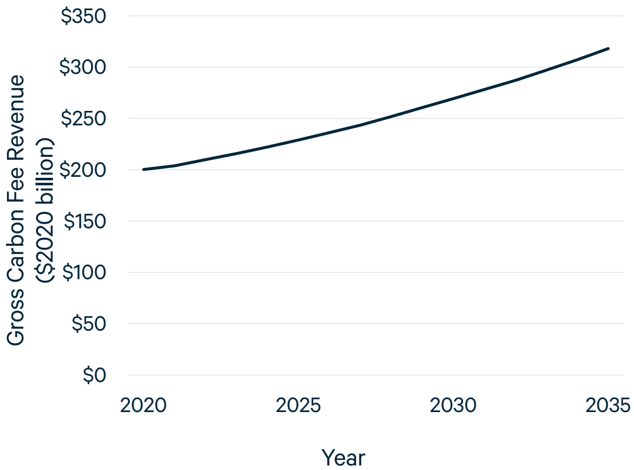


Figure 4: Carbon Fee Revenue Projections, 2020-2035.



Though the carbon fee levied by the Whitehouse-Schatz proposed bill would be applied to the carbon content of all fossil fuels including petroleum, the bulk of the emissions reductions are derived from fuel-switching within the electricity generation sector. Transportation emissions, on the other hand, are less responsive to the carbon fee, especially in the early years of the policy.

Despite significant reductions in emissions between 2020 and 2035, revenues from the fee on energy-related carbon dioxide emissions are projected to increase over time as the increasing fee offsets declining emissions. Figure 4 displays these revenue projections. In the first year of the policy, the revenues are projected to be approximately $200 billion; over the first 10 years, revenues are projected to be about $2.3 trillion.

Important Note

Projections are not forecasts because they depend on values for a number of variables whose future values are uncertain. Projections in the E3 model represent central estimates of future outcomes conditional on a large number of parameter and model assumptions. Changes to any single assumption may alter projections. Key sources of uncertainty include both baseline forecasts and price elasticities. Chen, Hafstead, and Goulder (2018), available for free download **here**, evaluate the sensitivity of E3's projected emissions to baseline forecasts such as fossil fuel prices, economic growth and the rate of energy efficiency improvements in nonenergy sectors. In future work, we plan to evaluate the sensitivity of emissions to price elasticities to determine appropriate confidence intervals for long-run emissions projections.

Terms of Reference for the Analysis

The model analysis was structured by the specific elements below.

- The fee is imposed on all fossil fuels (coal, petroleum, and natural gas) combusted within the United States.
- The fee is based on the carbon content of these fuels.
- Only the effect of the fee on energy-related CO_2 emissions is modeled. Emissions from the other five greenhouse gases (methane, nitrous oxide, HFCs, PFCs, and SF6) and non-energy-related CO_2 emissions are not included in this analysis.
- The fee is applied at a rate $52 per ton (in $2020) of CO_2 emitted through combustion.
- The fee is initially imposed in 2020 and increases annually at a rate of 6 percent above inflation.
- Revenue from the carbon fee rebated to households through refundable tax credits.
- Border adjustments are only considered in the model for imports and exports of secondary fossil fuels (such as gasoline).

Notes

1 **RFF analysis** of a similar carbon fee suggests that using returning revenues to households with lump-sum rebates (similar to refundable tax credits) would benefit low-income households, as the value of the rebates exceeds the increase in energy expenditures for those households.

2 This analysis uses the EIA definition of energy-related carbon dioxide emissions. The EPA's Inventory of Greenhouse Gas Emissions and Sinks reports levels of energy-related carbon dioxide emissions that exclude emissions from international bunker fuels and includes emissions from US territories.

3 Emissions under the baseline scenario are from EIA's AEO 2019. Emissions under the carbon tax are derived from multiplying the percentage change in emissions from the E3 model with a different reference case to the AEO baseline emissions. As shown in Chen, Goulder, and Hafstead (2018), the percentage change in emissions from a carbon tax are approximately independent of reference case forecast assumptions.

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Marc Hafstead is a Fellow and the director of the Carbon Pricing Intiative at RFF. He is a leading researcher on the evaluation and design on climate and energy policies. With Stanford professor and RFF University Fellow Lawrence H. Goulder, he wrote *Confronting the Climate Challenge: US Policy Options* (Columbia University Press) to evaluate the environmental and economic impacts of carbon taxes, cap-and-trade programs, clean energy standards, and gasoline taxes using a sophisticated multi-sector model of the United States. He is also an expert on the employment impacts of carbon pricing and the design of tax adjustment mechanisms to reduce the emissions uncertainty of carbon tax policies.