



## Projected CO<sub>2</sub> Emissions Reductions under the American Opportunity Carbon Fee Act of 2017

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### Key Points

- Under the carbon fee scenario in the proposed American Opportunity Carbon Fee Act of 2017, energy-related carbon dioxide emissions in 2030 are projected to be 67 percent of the business-as-usual baseline level of emissions.
- With respect to the commonly used 2005 benchmark year, energy-related carbon dioxide emissions in 2030 would be 39 percent below the level of emissions in 2005.
- In 2016 the US pledged to reduce greenhouse gas emissions levels to 26–28 percent below 2005 levels by 2025. Modeling suggests the American Opportunity Carbon Fee Act would yield considerably more reductions in 2025 than outlined in the pledge.
- Although the carbon fee levied by the proposed bill would be applied to the carbon content of all fossil fuels, including petroleum, 62–65 percent of the emissions reductions emanate from the electricity generation sector.

### Introduction

In July 2017 Sheldon Whitehouse (D-RI) and Brian Schatz (D-HI) released their proposed legislation titled the American Opportunity Carbon Fee Act. The act would levy a fee on US greenhouse gas (GHG) emissions (largely on carbon dioxide [CO<sub>2</sub>]). Senator Whitehouse remarked, “This bill would fight carbon pollution with the full power of the free market, driving down emissions and leveling the playing field for carbon-free energy.”

The CO<sub>2</sub> fee elements of the act are provided below.

- The fee would start at \$49 per metric ton in 2018 and increase annually at a rate of 2 percent plus the rate of inflation.

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- When emissions fall below the target level—80 percent below 2005 emissions—the annual adjustment of the fee would fall to the rate of inflation.
- The fee would be assessed on fossil fuels when mined, extracted, or imported, on large emitters of non-fossil-fuel-based greenhouse gases, and on producers and importers of industrial gases with high global warming potential.
- The fee on fossil fuels would be increased to account for the amount of methane—a potent greenhouse gas—that escapes during the extraction and distribution of these fuels.
- The Treasury Department would assess and collect the fee, consulting the Environmental Protection Agency (EPA) and Energy Information Agency to ensure the best methods and data.
- Trade-vulnerable, energy-intensive industries would be protected through border adjustments. The Treasury secretary would collect tariffs on goods imported from countries that do not price carbon and issue refunds on American exports to those nations.

RFF experts utilized a large-scale, computable general equilibrium model of the US economy (the Goulder-Hafstead Energy-Environment-Economy [E3] CGE Model) to assess the reduction in domestic emissions of CO<sub>2</sub> that would result from the imposition of the fee.

### Model Characteristics

The E3 CGE Model is an economy-wide model of the United States with international trade.<sup>1</sup> Production is divided into 35 industries, with a 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, allowing for interactions of environmental policy and preexisting 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 is solved annually beginning in 2013. The model is calibrated to approximate emissions projections from the 2016 *Annual Energy Outlook* (AEO) from the Energy Information Administration (EIA).

The E3 model has previously been used to model cap-and-trade programs, carbon taxes, and clean energy standards. It has been featured in two peer-reviewed journal articles; is participating in Stanford's Energy Modeling Forum (EMF) 32: Inter-model Comparison of US Greenhouse Gas Reduction Policy Options; and is the focus of a forthcoming book, *Confronting the Climate Challenge: US Policy Options* (Columbia University Press).

### 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<sub>2</sub> emissions is modeled. Emissions from the other five greenhouse gases (methane, nitrous oxide, HFCs, PFCs, and SF<sub>6</sub>) and non-energy-related CO<sub>2</sub> emissions are not included in this analysis.
- The fee is applied at a rate \$49 per ton (in \$2018) of CO<sub>2</sub> emitted through combustion.

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<sup>1</sup> The E3 model is described in greater detail in an RFF discussion paper: [Tax Reform and Environmental Policy: Options for Recycling Revenue from a Tax on Carbon Dioxide](#).

- The fee is initially imposed in 2018.
- National Emissions Target Attainment Year: The act defines a National Emissions Target Attainment Year (NEAY) as a year in which US emissions of all greenhouse gases do not exceed 20 percent of emissions in 2005. To match E3’s modeling scope, we define a new NEAY-CO<sub>2</sub> that includes only energy-related CO<sub>2</sub> emissions rather than all greenhouse gases such that all energy-related CO<sub>2</sub> emissions do not exceed 20 percent of the emissions of energy-related CO<sub>2</sub> in 2005.
- The fee rate rises each year by 2 percent plus an adjustment for inflation for each successive year following a year that was not a NEAY-CO<sub>2</sub> status.
  - In other words, if emissions in any calendar year exceed the emissions defined by 20 percent of 2005 levels, the fee rises the following year at 2 percent above inflation.
- Revenue from the carbon fee is used to finance a reduction in the federal corporate income tax rate from 35 percent to 29 percent. The remainder of the revenue is recycled as lump-sum rebates to households.
- Border adjustments are only considered in the model for imports and exports of secondary fossil fuels (such as gasoline).

**Results**

Though E3 provides additional detailed model output, the current analysis focuses solely on the magnitude of the emissions reductions over a 13-year time frame (2018–2030). E3 model results are presented in Table 1 below. The rows of the table are model results by year. The second column presents US energy-related emissions under a business as usual (BAU) baseline. The third column presents the modeled emissions under the carbon fee scenario, while the fourth column presents the levels of the fee. The fifth and sixth columns present the carbon fee–induced emissions relative to the BAU path of emissions and relative to the emissions in 2005, the commonly used benchmark year for international climate agreements such as the Paris Agreement that was negotiated under the United Nations Framework Convention on Climate Change.

**TABLE 1. AMERICAN OPPORTUNITY CARBON FEE ACT OF 2017 ENERGY-RELATED CO<sub>2</sub> EMISSIONS**

Year	BAU Emissions (billion metric tons)	Emissions with Fee (billion metric tons)	Carbon Fee (\$2018)	Emissions with Fee Relative to BAU	Emissions with Fee Relative to 2005
2018	5.39	4.22	\$49.00	78%	70%
2019	5.40	4.15	\$49.98	77%	69%
2020	5.41	4.08	\$50.98	75%	68%
2021	5.42	4.03	\$52.00	74%	67%
2022	5.42	3.97	\$53.04	73%	66%
2023	5.43	3.92	\$54.10	72%	65%
2024	5.43	3.88	\$55.18	71%	65%
2025	5.44	3.84	\$56.29	71%	64%
2026	5.44	3.80	\$57.41	70%	63%
2027	5.44	3.76	\$58.56	69%	63%
2028	5.45	3.73	\$59.73	69%	62%
2029	5.45	3.70	\$60.93	68%	62%
2030	5.45	3.67	\$62.14	67%	61%

The carbon fee rises from \$49 in 2018 to over \$62 in 2030, in \$2018. Energy-related CO<sub>2</sub> emissions under the carbon fee scenario in 2030 are projected to be 67 percent of BAU baseline; that is, emissions would be about 33 percent lower in 2030 than in the absence of the climate policy. In comparison to the benchmark year of 2005, the climate policy is projected to have emissions in 2030 that are lower by 39 percent. E3 modeling of the 2017 American Opportunity Carbon Fee Act predicts that the carbon fee would yield energy-related CO<sub>2</sub> emissions levels in 2025 that are 36 percent below 2005 levels. Because the act also covers non-CO<sub>2</sub> emissions, which are not included in the current analysis, the total level of US greenhouse gas emissions reductions in 2025 can reasonably be expected to be considerably greater than the US 2016 Paris Agreement pledge to reduce greenhouse gas emissions by 26–28 percent of 2005 levels in that timeframe.

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 the electricity generation sector. Indeed, as displayed in Table 2 below, 60–65 percent of the emissions reductions would result from changes in electricity generation.

In 2005, the consumption of fossil fuels to generate electricity resulted in approximately 2.4 billion metric tons of CO<sub>2</sub> emissions. Under the Obama administration’s Clean Power Plan (currently under review by EPA through an executive order), EPA estimated that electricity-based emissions would fall to approximately 1.63 billion metric tons by 2030, representing a 32 percent reduction relative to 2005. Our modeling indicates that the proposed legislation would reduce electricity-based CO<sub>2</sub> emissions significantly more than EPA’s projections for the Clean Power Plan, to a level of 0.85 billion metric tons in 2030, a 65 percent reduction relative to 2005.

**TABLE 2. ENERGY-RELATED CO<sub>2</sub> EMISSIONS FROM THE ELECTRICITY GENERATION SECTOR UNDER THE AMERICAN OPPORTUNITY CARBON FEE ACT OF 2017**

Year	BAU Electricity Emissions (billion metric tons)	Electricity Emissions with Fee (billion metric tons)	Electricity Emission Reductions with Fee as % of Total Emission Reductions
2018	2.03	1.29	62%
2019	2.03	1.24	63%
2020	2.03	1.19	64%
2021	2.03	1.14	64%
2022	2.03	1.10	64%
2023	2.03	1.06	65%
2024	2.03	1.02	65%
2025	2.02	0.99	65%
2026	2.02	0.96	65%
2027	2.02	0.93	65%
2028	2.02	0.90	65%
2029	2.01	0.87	65%
2030	2.01	0.85	65%

**Find more analysis by RFF experts on the impacts of a US carbon tax at [www.rff.org/carbontax](http://www.rff.org/carbontax).**