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## Analysis of the American Opportunity Carbon Fee Act of 2015 (S. 1548)

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### Key Points

- Under the carbon fee scenario in the proposed American Opportunity Carbon Fee Act, emissions in 2030 are projected to be 64 percent of the business-as-usual baseline—that is, emissions fall almost 36 percent from 2016 to 2030.
- With respect to the commonly used 2005 benchmark year, emissions in 2030 would be 43 percent below the level of emissions in 2005.
- The US pledge under the UN Framework Convention on Climate Change promises emissions levels 26–28 percent below 2005 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, 60-65 percent of the emissions reductions emanate from the electricity generation sector.

### Introduction

In June 2015, Sheldon Whitehouse (D-RI) and Brian Schatz (D-HI) released proposed legislation, the [American Opportunity Carbon Fee Act](#). The act would levy a fee (tax) on US greenhouse gas (GHG) emissions (largely upon carbon dioxide, CO<sub>2</sub>). Senator Whitehouse remarked that the act would significantly lower GHG emissions in the United States while generating substantial revenue—all of which would be returned to the American people.

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

- The fee would start at the administration's central social cost of carbon estimate (\$45 per metric ton in 2016) and increase annually by a real 2 percent, ensuring emitters would be held responsible for the harm they are offloading onto the American people.
- When emissions fall below the target level—80 percent below 2005 emissions—the annual adjustment would fall to 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 Department of the Treasury would assess and collect the fee, consulting the Environmental Protection Agency and Energy Information Administration to ensure the best methods and data.

Just prior to the release of the proposed legislation, we 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 tax. We have since reassessed the emissions reductions using an updated version of the E3 model. The model now utilizes 2013 data for its benchmark year (previously 2010), is expanded to 35 sectors (previously 25), and uses US Energy Information Administration forecasts (*Annual Energy Outlook 2015*) to develop business-as-usual forecasts of emissions in the absence of act.

## Model Characteristics

The E3 CGE Model is an economy-wide model of the United States with international trade. 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 with a detailed tax treatment, allowing for interactions of environmental policy and pre-existing taxes on capital and labor, and its attention to capital dynamics, important for analyzing how policies impact the economy over time. The model is solved at yearly intervals beginning in 2013.

The E3 CGE model has 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, *US Climate Policy Options: A General Equilibrium Assessment*, from Columbia University Press.

The E3 model is described in the RFF discussion paper "[Tax Reform and Environmental Policy: Options for Recycling Revenue from a Tax on Carbon Dioxide.](#)"

## 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 impact of the fee on CO<sub>2</sub> emissions is modeled. Emissions from the other five greenhouse gases (methane, nitrous oxide, HFCs, PFCs, and SF<sub>6</sub>) are not included in this analysis.
- The fee is applied at a rate \$45 per ton (in \$2013) of CO<sub>2</sub> emitted in the combustion process.
  - The legislation uses an initial tax rate of \$45 in year 2016.
- The fee is initially imposed in 2016.
- Define NEAY: National Emissions Target Attainment Year (NEAY) is a year in which US emissions of all greenhouse gases do not exceed 20 percent of emissions in 2005. We define a new NEAY that includes only CO<sub>2</sub> emissions rather than all greenhouse gases such that all CO<sub>2</sub> emissions do not exceed 20 percent of the emissions of CO<sub>2</sub> in 2005.
- The tax rate rises each year by 2 percent plus an adjustment for inflation for each successive year following a year that was not a NEAY.
  - In other words, if emissions in any calendar year do not exceed the emissions defined by 20 percent below 2005 levels, the tax rate does not rise.
- The same fee is imposed on CO<sub>2</sub> emissions from sources emitting more than 25,000 tons annually where the emissions arise from processes other than combustion.
  - The model is only able to capture emissions arising from the use of fossil fuels.
- Revenue from the carbon fees is recycled as equal lump-sum rebates to all households.

## Results

While the E3 model is capable of addressing a great many questions concerning the use of carbon fees as a policy to reduce CO<sub>2</sub> emissions, the current analysis focuses solely on the magnitude of the emissions reductions over a 15 year time frame (2016–2030). E3 model results are presented in Table 1 below.

The rows of the table are model results by year. The second column presents US 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 a 2005 benchmark year emissions.

The tax rises from \$45 in 2016 to nearly \$60 in 2030. Emissions under the carbon fee scenario in 2030 are projected to be 64 percent of BAU baseline, that is, emissions would be about 36 percent lower in 2030 than in the absence of the climate policy. With respect to the

commonly used 2005 benchmark year, emissions in 2030 are 43 percent below emissions levels in 2005. Recall, the recent US pledge under the United Nations Framework Convention on Climate Change, referred to as an Intended Nationally Determined Contribution (INDC), was 26–28 percent below 2005 by 2025. E3 modeling of the American Opportunity Carbon Fee Act suggests the carbon fee approach would yield considerably more reduction in 2025 emissions (about 40 percent below 2005 levels) than contained in the US INDC pledge.

**TABLE 1. AMERICAN OPPORTUNITY CARBON FEE ACT EMISSION REDUCTIONS**

Year	BAU Emissions (Billion Metric Tons)	Tax Emissions (Billion Metric Tons)	Carbon Tax (\$2013)	Emissions Relative to BAU	Emissions Relative to 2005
2016	5.35	4.07	\$45.00	76%	68%
2017	5.36	3.99	\$45.90	75%	67%
2018	5.36	3.92	\$46.82	73%	65%
2019	5.36	3.86	\$47.75	72%	64%
2020	5.37	3.80	\$48.71	71%	63%
2021	5.37	3.75	\$49.68	70%	62%
2022	5.38	3.70	\$50.68	69%	62%
2023	5.38	3.66	\$51.69	68%	61%
2024	5.39	3.62	\$52.72	67%	60%
2025	5.39	3.58	\$53.78	66%	60%
2026	5.40	3.55	\$54.85	66%	59%
2027	5.40	3.52	\$55.95	65%	59%
2028	5.41	3.50	\$57.07	65%	58%
2029	5.41	3.47	\$58.21	64%	58%
2030	5.42	3.45	\$59.38	64%	57%

While 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 emission reductions are derived from the electricity generation sector. Indeed, as displayed in Table 2 below, 60–65 percent of the emission reductions emanate from the electricity generation sector.

In 2005, emissions from the consumption of fossil fuels to generate electricity resulted in approximately 2.4 billion metric tons of CO<sub>2</sub> emissions. Under the Clean Power Plan (the implementation of which was recently stayed by an unprecedented Supreme Court decision), EPA estimates that electricity-based emissions will fall to approximately 1.63 billion metric tons by 2030 (32 percent reduction relative to 2005). The proposed Whitehouse–Schatz bill would reduce electricity-based CO<sub>2</sub> emissions significantly more, to a level of 0.80 billion metric tons in 2030.

**TABLE 2. EMISSIONS FROM THE ELECTRICITY GENERATION SECTOR UNDER THE AMERICAN OPPORTUNITY CARBON FEE ACT**

Year	BAU Electricity Emissions (Billion Metric Tons)	Tax Electricity Emissions (Billion Metric Tons)	Electricity Emission Reductions as % of Total Emission Reductions
2016	2.03	1.26	60%
2017	2.03	1.20	61%
2018	2.04	1.15	61%
2019	2.04	1.11	62%
2020	2.05	1.07	62%
2021	2.05	1.03	63%
2022	2.05	0.99	63%
2023	2.06	0.96	64%
2024	2.06	0.93	64%
2025	2.07	0.91	64%
2026	2.07	0.88	64%
2027	2.07	0.86	64%
2028	2.07	0.84	65%
2029	2.08	0.82	65%
2030	2.08	0.80	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).**