

Considering a Carbon Tax–Gasoline Tax Swap: Projected Energy-Related US CO₂ Emissions Reductions under the MARKET CHOICE Act

Marc Hafstead*

This analysis examines the impacts of a proposed carbon tax–gasoline tax swap in the MARKET CHOICE Act (Curbelo [R]) on energy-related US emissions of carbon dioxide (CO₂).¹

A Unique Economic Model of US Carbon Emissions

We use 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 (e.g., crude oil extraction; natural gas extraction and distribution; coal mining; electric power, represented by four industries; and petroleum refining). Our model is unique in its detailed tax treatment, allowing for interactions among environmental policy and preexisting taxes on capital and labor. The model also pays unique attention to capital dynamics, which are important for analyzing how policies impact the US economy over time. It utilizes 2013 benchmark data and solves for impacts at one-year intervals beginning in 2013. It is calibrated to approximate GDP and emissions intensity projections based on the US Energy Information Administration’s (EIA’s) 2016 *Annual Energy Outlook*.

The results of our analysis using the E3 model to evaluate carbon taxes, cap-and-trade programs, clean energy

standards, and increases in the federal gasoline tax are published in a recent book—*Confronting the Climate Challenge: US Policy Options* (Columbia University Press, 2017). The model has been featured in three peer-reviewed journal publications and also participated Stanford’s Energy Modeling Forum (EMF) 32: Inter-model Comparison of US Greenhouse Gas Reduction Policy Options. Further analyses of a carbon tax using the E3 model, including a wider range of impact results, are online at www.rff.org/carbontax.

Carbon Tax–Gasoline Tax Swap: Terms of Reference for the Analysis

The model analysis was structured to replicate the tax swap proposed in the MARKET CHOICE Act.

- The tax is imposed on all fossil fuels (coal, petroleum, and natural gas) combusted within the United States.
- The tax is based on the carbon content of these fuels.
- Only the effect of the tax on energy-related CO₂ emissions is modeled. Although the MARKET CHOICE Act does impose the tax on emissions of the other five greenhouse gases (methane, nitrous oxide, HFCs, PFCs, and SF₆) and non-energy-related CO₂ emissions, the impacts of the tax on these emissions are not included in this analysis.
- The tax is initially imposed in 2020.
- The tax is applied at a rate \$24 per ton (in \$2020) of CO₂ emitted through combustion.
- The tax increases annually at a rate of 2% above inflation.

Resources for the Future (RFF) is an independent, nonprofit research institution in Washington, DC. Its mission is to improve environmental, energy, and natural resource decisions through impartial economic research and policy engagement. RFF is committed to being the most widely trusted source of research insights and policy solutions leading to a healthy environment and a thriving economy.

* Fellow, RFF Energy and Climate Program; hafstead@rff.org. RFF does not take positions on specific legislative proposals and this memo is not an endorsement of any carbon tax–gasoline tax swap. Find more analysis by RFF experts on the impacts of a US carbon tax at www.rff.org/carbontax.

¹ This analysis uses EIA’s definition of energy-related CO₂ emissions. Alternatively, EPA’s Inventory of Greenhouse Gas Emissions and Sinks reports levels of energy-related CO₂ emissions that exclude emissions from international bunker fuels and include emissions from US territories.

- The federal gasoline tax of \$0.18 per gallon is repealed and the federal diesel tax of \$0.24 per gallon is repealed.
- The MARKET CHOICE Act allocates revenues to a new trust fund to distribute carbon tax revenues. A majority of the proceeds are returned to the National Highway Trust Fund. In the model analysis, all of the proceeds from the carbon tax, net of reductions in preexisting taxes and reimbursement of the National Highway Trust Fund, are returned through lump-sum rebates to households. This assumption has little impact on emissions projections.
- Although the MARKET CHOICE Act includes border adjustments to maintain international competitiveness in energy-intensive industries, border adjustments are only considered in the model analysis for imports and exports of secondary fossil fuels (such as gasoline). We anticipate that the border adjustments will not significantly alter overall projected US energy-related CO₂ emissions.

Results

Table 1 displays projected E3 energy-related CO₂ emissions through 2032 under a baseline scenario without a federal carbon tax–gasoline tax swap and with the proposed federal carbon tax–gasoline tax swap in the MARKET CHOICE Act.²

In 2025, energy-related CO₂ emissions are expected to be 27% below 2005 levels—reductions consistent with the US target under the Paris agreement for greenhouse gas emissions reductions of 26–28% below 2005 levels by 2025. By 2030, emissions decline to 29% below 2005 levels. Overall, repealing the federal gasoline tax has a relatively small impact on total energy-related CO₂ emissions.

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, Goulder, and Hafstead \(2018\)](#), 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.

The MARKET CHOICE Act includes mechanisms to adjust the level of the carbon tax to ensure GHG emissions targets are met. Every two years, the heads of EPA and the Treasury must determine if emissions in the previous year exceed specific targets. If they do, the tax rate would increase automatically by \$2 per ton the following year. These automatic adjustment mechanisms allow for prices to adjust upward in the case that emissions are less responsive to the carbon tax than projected. An analysis of the automatic adjustment mechanism is beyond the scope of this report; please see Hafstead, Metcalf, and Williams (2017) for a discussion on automatic adjustment mechanisms and Hafstead and Williams (forthcoming) for a quantitative analysis on automatic adjustment mechanism design.

² Emissions under the baseline scenario are derived from average rates of change in GDP and emissions intensity from EIA's 2018 Annual Energy Outlook. Emissions under the carbon tax are derived from multiplying the percentage change in emissions from the E3 model with a slightly different reference case to 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.

Table 1. US Energy-Related CO₂ Emissions (EIA) under a Carbon Tax–Gasoline Tax Swap, 2018-2032

Year	Carbon Price (\$2020)	Baseline Emissions	Carbon Tax Emissions (w/ swap)	Emissions Relative to 2005	Gross Carbon Revenue (\$2020 Billions)	Power Sector Baseline Emissions	Power Sector Carbon Tax Emissions	Power Sector Emissions Relative to 2005
2018	\$0.00	5.17	5.17	-14%	\$0.00	1.76	1.76	-27%
2019	\$0.00	5.19	5.19	-14%	\$0.00	1.76	1.76	-27%
2020	\$24.00	5.20	4.58	-24%	\$110.0	1.76	1.36	-44%
2021	\$24.48	5.21	4.53	-24%	\$110.9	1.76	1.32	-45%
2022	\$24.97	5.22	4.49	-25%	\$112.0	1.76	1.28	-47%
2023	\$25.47	5.23	4.44	-26%	\$113.2	1.76	1.25	-48%
2024	\$25.98	5.25	4.41	-27%	\$114.5	1.76	1.21	-50%
2025	\$26.50	5.26	4.37	-27%	\$115.9	1.76	1.19	-51%
2026	\$27.03	5.27	4.34	-28%	\$117.4	1.76	1.16	-52%
2027	\$27.57	5.28	4.32	-28%	\$119.0	1.76	1.13	-53%
2028	\$28.12	5.30	4.29	-28%	\$120.7	1.76	1.11	-54%
2029	\$28.68	5.31	4.27	-29%	\$122.5	1.76	1.09	-55%
2030	\$29.26	5.32	4.25	-29%	\$124.4	1.76	1.07	-56%
2031	\$29.84	5.33	4.23	-29%	\$126.3	1.76	1.05	-57%
2032	\$30.44	5.35	4.22	-30%	\$128.3	1.76	1.03	-57%

Note: Emissions in billions of metric tons