CLIMATE LEADERSHIP COUNCIL

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EXCEEDING PARIS

How The Baker-Shultz Carbon Dividends Plan Will Significantly Exceed the U.S. Paris Commitment & Achieve 50% U.S. CO_2 Reduction By 2035

Foreword by

Ted Halstead

George P. Shultz

Lawrence Summers

Rob Walton

Christine Todd Whitman

Janet Yellen

ABOUT THE AUTHORS

of Foreword

TED HALSTEAD is the founder, chairman & CEO of the Climate Leadership Council. Previously, he founded New America, a leading public policy think tank. He is co-author of *The Radical Center: The Future Of American Politics*.

ROB WALTON served as chairman of the board of Walmart from 1992 to 2015. He serves on the board of Conservation International and co-chairs the Board of the Julie Ann Wrigley Global Institute of Sustainability at ASU.

GEORGE P. SHULTZ served as Secretary of State under President Ronald Reagan, and as Secretary of Treasury and Labor under President Nixon. He is the Thomas W. and Susan B. Ford Distinguished Fellow at the Hoover Institution.

CHRISTINE TODD WHITMAN served as Administrator of the Environmental Protection Agency from 2001 to 2003 under President George W. Bush. She previously served as Governor of the State of New Jersey from 1994 to 2001.

LAWRENCE SUMMERS served as Secretary of the Treasury under President Clinton and Director of the National Economic Council under President Obama. He is President Emeritus and the Charles W. Eliot University Professor at Harvard University.

JANET YELLEN served as Chair of the Board of Governors of the Federal Reserve under Presidents Obama and Trump. She is a Distinguished Fellow in Residence at the Brookings Institution and is Professor Emerita at UC Berkeley.

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At the 2015 Paris Climate Conference, the United States committed to reduce its net greenhouse gas emissions by 26-28% below 2005 levels by 2025. Even though the Trump administration has announced its intention to withdraw from the Paris agreement, it remains the initial benchmark by which any U.S. climate plan is judged.

But it is only a starting point. Even if all nations meet their Paris commitments, the best studies[1] indicate that far greater emissions reductions will be necessary for the world to maintain global temperatures below the agreed-upon 2 degrees Celsius threshold. The goal of U.S. climate policy should therefore be to exceed Paris.

> **The Baker-Shultz plan would reduce U.S. greenhouse gas emissions by 32% by 2025, far exceeding our Paris commitment. By 2035, it would cut U.S. carbon emissions in half**

The Baker-Shultz Carbon Dividends Plan, based on a gradually rising carbon fee, stands out as the most politically-viable pathway to not only meet but exceed the U.S. Paris commitment. It would also be the most ambitious carbon price enacted by any major emitter nation[2]. The following two charts illustrate the emissions reductions that could reasonably be expected.

The first chart compares the Baker-Shultz plan to other domestic pathways for meeting the U.S. Paris commitment. Whereas all Obama-era climate regulations, had they remained in place, would have achieved approximately 18% in greenhouse gas reductions by 2025, the Baker-Shultz plan would achieve approximately 32% in reductions by 2025, thereby exceeding our Paris commitment by a wide margin. For additional detail on the projections underlying this chart, please see the accompanying analysis by the Climate Leadership Council.

The second chart summarizes modeling of the Baker-Shultz plan through 2035 undertaken by Resources for the Future[3]. RFF modeled the Council's plan based on a carbon fee starting in 2021 at $43 per ton with an escalation rate of 5% above inflation. RFF found this would reduce U.S. energy-related CO_2 emissions to a level of 39% below 2005 by 2025[4], and to 51% below 2005 by 2035. RFF's technical analysis of this modeling appears in the final section of this report.

To ensure that intended emissions reductions are met, the Climate Leadership Council will add an *Environmental Assurance Mechanism* to its overall plan, under which the carbon fee would increase faster if key emissions reductions benchmarks are not met.

The Baker-Shultz Carbon Dividends Plan is not only the most environmentally ambitious plan, but also the most politically-viable

The Baker-Shultz Carbon Dividends Plan is not only the most environmentally ambitious plan, but also the most politically-viable. Why? Because it addresses the legitimate concerns of all key stakeholders in the climate debate and enables each to realize an important victory.

The plan would accomplish this through a series of grand bargains, including trading a robust and rising carbon price for regulatory relief, thereby appealing to environmentalists, businesses and conservatives at the same time. Just as important, it appeals to the American people by rebating all of the revenue raised directly to them. This would allow the majority of American families to win economically from solving climate change.[5, 6]

At the heart of this grand bargain is the environmental ambition of the Baker-Shultz plan, which unlocks the political viability of its other components. The plan's effectiveness in reducing emissions substantially raises the environmental bar, while its reliance on a market-based carbon fee makes it – according to economists of all stripes – the most cost-effective climate solution.

The majority of American families would win economically from solving climate change

The encouraging conclusion is that there is a politically-viable path for the United States to exceed its Paris climate commitment and restore its position as a global climate leader.

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[1] See, for instance, the UN Environment Emissions Gap Report 2017, which found that "The NDCs that form the foundation of the Paris Agreement cover only approximately one third of the emissions reductions needed to be on a least-cost pathway for the goal of staying well below 2 degrees C."

[2] World Bank and Ecofys. "State and Trends of Carbon Pricing 2018 (May)." World Bank, May 2018. DOI: 10.1596/978-1-4648-1292-7.

[3] Hafstead, Marc. "Analysis of Alternative Carbon Tax Price Paths for the Climate Leadership Council (CLC) Carbon Dividends Plan," *Resources for the Future Issue Brief 18-07.* June 2018. Updated March 2019.

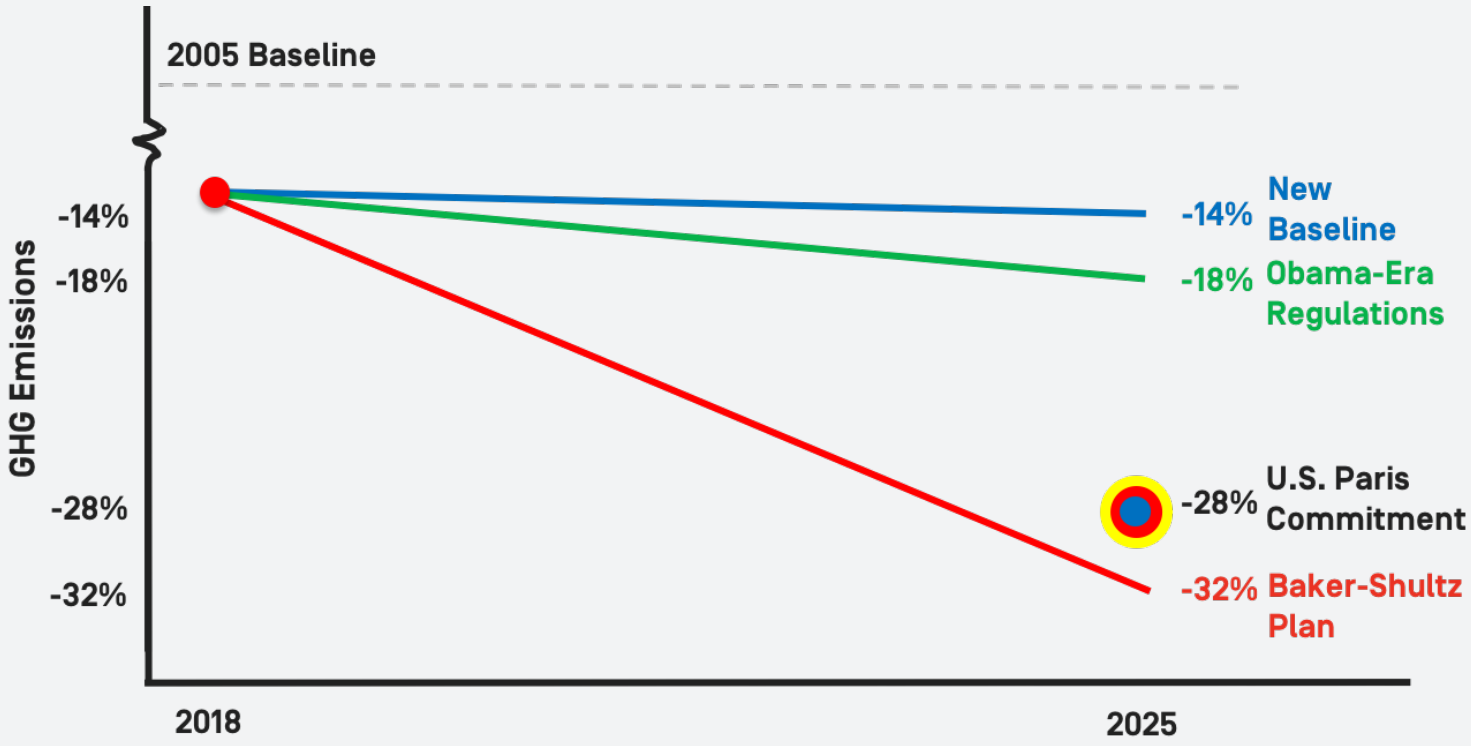
[4] The slight divergence between the 2025 results in the first and second charts is because the former includes all greenhouse gases whereas the latter includes only CO_2 emissions.

[5] Horowitz, John, Julie-Anne Cronin, Hannah Hawkins, Laura Konda, and Alex Yuskavage. *Methodology for Analyzing a Carbon Tax.* Working paper no. 115. Office of Tax Analysis, US Department of the Treasury. January 2017.

[6] Diamond, John W., and George R. Zodrow. *The Effects of Carbon Tax Policies on the US Economy and the Welfare of Households.* Report. Edited by Noah Kaufman. SIPA Center for Global Energy Policy, Columbia University. July 2018.

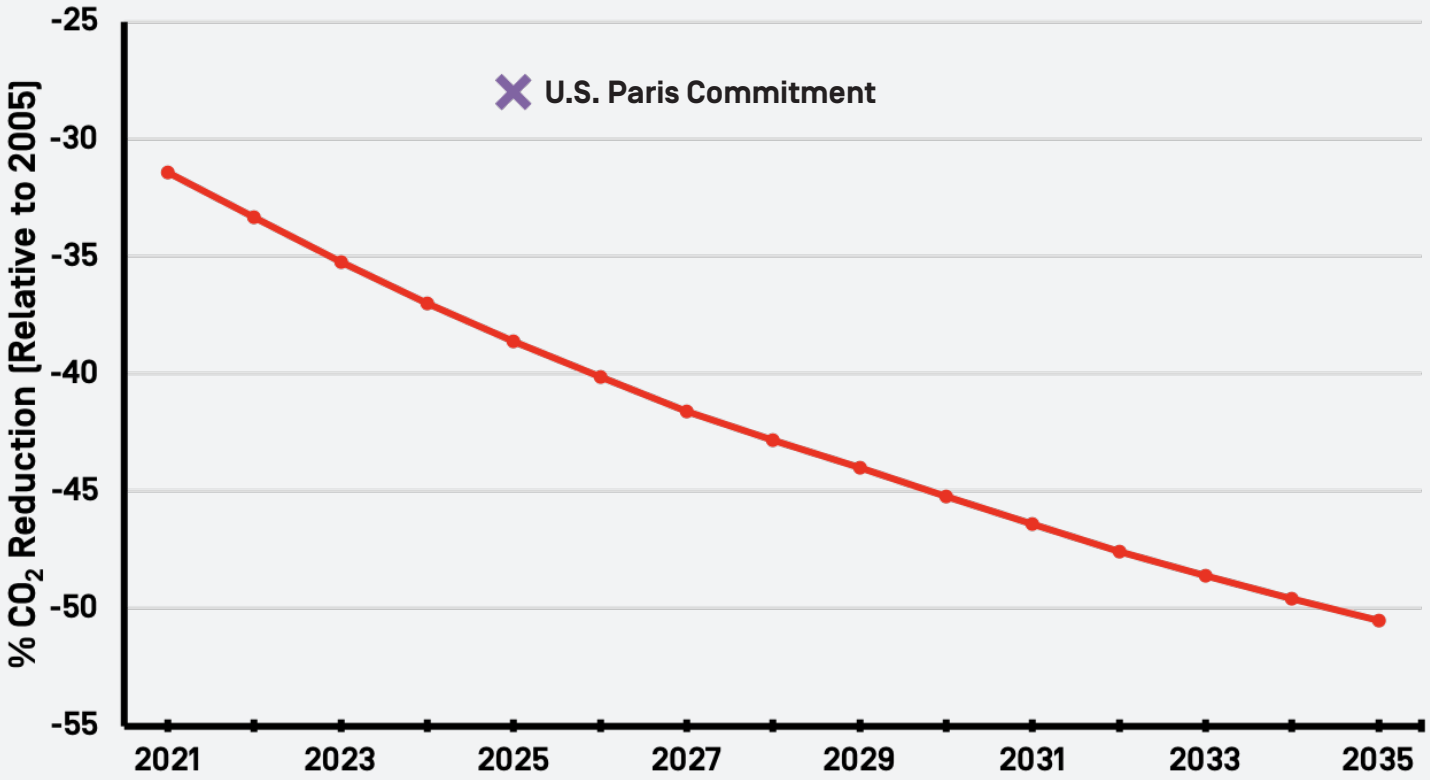
This report reflects the views of the Climate Leadership Council, and not necessarily those of its Founding Members. The Council has not decided upon a carbon tax escalation rate; the range included in this report is for illustration purposes only.

Chart 1: Emission Reductions of the Baker-Shultz Plan vs. Other Policy Paths



Source: Bailey, David, and Greg Bertelsen. *A Winning Trade.* Climate Leadership Council, June 2018.

Chart 2: Projected CO_2 Reductions from the Baker-Shultz Plan



Source: Hafstead, Marc. "Analysis of Alternative Carbon Tax Price Paths for the CLC Carbon Dividends Plan." *Resources for the Future Issue Brief 18-07.* June 2018. Updated March 2019.

CLIMATE LEADERSHIP COUNCIL

ANALYSIS OF THE BAKER-SHULTZ PLAN VS. OTHER POLICY PATHWAYS THROUGH 2025

By David Bailey and Greg Bertelsen*

EXECUTIVE SUMMARY

This report estimates the greenhouse gas (GHG) emission reductions of the carbon dividends plan put forward by the Climate Leadership Council compared to the reductions in 2025 that the U.S. committed to achieve under the Paris Agreement. It compares the Council's policy to two other policy paths: first, if all the Obama-era climate regulations had been left in place, and second, the current policies under President Trump, which assumes that most Obama-era regulations are repealed.

Based on the EIA's latest Energy Outlook, together with recent modeling by Resources for the Future (RFF) and the Rhodium Group, current policies would likely result in U.S. emissions being 14% below 2005 levels by 2025. This would represent a small reduction in current emission levels, which EPA estimated to be already 12.5% below 2005 levels in 2016.

Had all the policies in place at the end of the Obama administration been allowed to continue, we estimate these reductions would have been around 18% below 2005 levels by 2025. Both of these policy outcomes fall short of the U.S. Paris commitment of a 26-28% reduction in emissions by 2025.

Assuming the Council's carbon dividends plan – also known as the Baker-Shultz plan – were implemented in 2021 with a starting carbon tax rate of $40 per ton (2017$), modeling shows that U.S. emissions could reasonably be around 32% below 2005 levels by 2025. As illustrated in the summary Chart 1, this is more than three times the emission reductions from 2016 onwards than the Obama policies would have achieved.

This also means that the Council's proposal, on its own, would exceed the high-end of the U.S. 2025 commitment under the Paris Agreement by a wide margin and would continue to generate substantial reductions beyond 2025.

*David Bailey is Research Director and Greg Bertelsen is Senior Vice President at the Climate Leadership Council. This analysis was first published as part of *A Winning Trade*, Climate Leadership Council, June 2018.

The Climate Leadership Council Proposal

This study assumes that the Council's carbon dividends plan would be legislated in 2019 and implemented in 2021. It would start at the rate of $43/ton CO_2 in 2021 (which equates to a 2017 rate of $40 per ton, adjusted for expected inflation). From there, the carbon tax rate would increase annually based on a standard escalator rate plus inflation as measured by the Consumer Price Index (CPI).

For illustration purposes, the RFF modeling described here includes 3% and 5% real escalation rates, with the 4% mid-point used in Chart 1. The Council has not yet settled on a final escalation rate.

The carbon tax would apply to all domestic fossil fuels and non-fuel CO_2 emissions, as well as imported fossil fuels, fossil fuel products and imported energy-intensive manufactured products. The carbon tax would be rebated for exports of these fuels and goods. The proposal would return the revenue raised from the tax directly to households through flat-rate quarterly or monthly dividend checks, likely administered by the Social Security Administration. There would also be a significant phase-out of carbon regulations that are no longer necessary.

This analysis shows how the U.S. emission reductions arising from the Council's proposal compare to:

1. A 2025 current policy baseline, which assumes the repeal of many major Obama-era carbon regulations;

2. Our assessment of the 2025 outcome assuming all Obama-era policies had remained in place, including implementing the Clean Power Plan (CPP) as per EPA's original schedule; and

3. The U.S. Paris commitment of 26-28% reduction in net greenhouse gases from 2005 levels by 2025.

Scope of Analysis

As described above, the Council's proposal would tax CO_2 emissions only. While CO_2 emissions (mostly from burning fossil fuels) represent roughly 80% of greenhouse gas (GHG) emissions, for various reasons[1] a tax-based approach may not be as well suited or practical for the other gases such as methane and hydrofluorocarbons (HFCs). In this analysis we have sought to show how a range of assumptions about changes in the emission of the other GHG gases could affect the overall picture.

Basis for Projections Through 2025

Our analysis draws on EIA's latest Energy Outlook (AEO 2018)[2] as well as modeling by Resources for the Future[3] and the Rhodium Group's 2017 Taking Stock study[4]. The RFF model is one of the most widely-respected in the field. Rhodium's study is valuable in that it models the expected changes in non-CO_2 GHGs and sinks in a way few other studies have attempted. An RFF Issue Brief on its model appears on page 10, and some technical background on the Rhodium model is described in Annex 2.

The most comprehensive listing of current and historical GHG emission performance is the EPA's annual Inventory of Greenhouse Gas Emissions, the latest version covering emissions in 2016[5]. The previous administration's expectations for 2025 were contained in the U.S. government's last biennial report to the United Nations Framework Convention on Climate Change[6]. We have updated those projections for this study. The most recent data are summarized in Table 1, together with our assessment of the outlook for 2025 based on Obama-era policies and on current policy.

How Would the Council's Carbon Dividends Plan Reduce Emissions?

The carbon tax would increase the relative price of fossil fuels according to their CO_2 emissions. In 2021, bituminous coal without carbon capture technology, for example, would incur a tax of $96 per ton of coal (around 200% of the average 2017 price); each thousand cubic feet (MCF) of natural gas would be taxed about $2.28 (around 74% of the average 2017 Henry Hub wholesale price and around 20% of the average residential price); and

each barrel of crude oil taxed about $18 (around 32% of the 2017 average U.S. crude price)[7].

While some of these increased costs of the tax would be borne by the producers, most would likely be reflected in the prices paid by consumers (the 2021 $43/ton carbon tax could translate to approximately 38 cents per gallon of gasoline). These are substantial impacts at the wholesale level, and they would have three main effects:

1. The overall cost of fossil energy would increase, thereby encouraging **more efficient usage**.

2. The tax would encourage **fuel switching.** It would immediately increase the relative attractiveness of natural gas to coal in the power sector, and nuclear and renewables to all fossil fuel sources.

3. Over time, the most significant impact would be **increased investments** to reduce energy use and to replace facilities using higher carbon fossil fuels with those using lower- or zero- carbon fuels.

The relationship between reductions in emissions and the carbon tax rate is not linear. As the tax rate increases the percentage reduction for each additional dollar of tax is lower – mainly because the existing capital base becomes a bigger factor in changing fuel sources the greater the amount of emissions reduced. In addition, a much higher tax rate is needed to secure significant emissions reductions in the transport sector.

Impact on Emissions in 2025

To determine an indicative estimate of the impact of the Council's carbon dividends plan on emissions in 2025 (the Paris target year) we commissioned new modeling by RFF.

The RFF modeling covered a range of possible escalation rates for a $43/ton CO_2 ($40 2017$) tax taking effect in 2021. RFF only modeled a tax on energy-related CO_2 emissions. We show in Table 2 the results for escalation rates 3%, 4% and 5% above inflation each year.

In Chart 1 and the tables we use the 4% escalation rate emissions scenario as the basis for the overall assessment.

Other Emissions

In order to estimate the full effect of the Council's plan on overall U.S. emissions it is necessary to make assumptions about what will happen to non-energy CO_2 emissions and to the emissions of other GHGs. We propose two alternate scenarios of what to expect in these areas through 2025, one based largely on Rhodium estimates (essentially assuming President Trump continues to emphasize rollback of the Obama programs) and the other on application of comparable policies to the Council carbon tax to non-energy CO_2 emissions and other GHGs.

Non-Energy CO_2 Emissions

Rhodium forecast an increase in non-energy CO_2 emissions through 2025 from today's levels. In our first case in Table 3, we assumed these increases would occur.

The Council's carbon tax would also apply to non-energy CO_2 emissions. In our second case we therefore assumed that non-energy CO_2 emissions will be reduced from Rhodium's assumed higher 2025 levels at half of the rate of energy-related CO_2 reductions from 2016, reflecting pressure from both increased natural gas feedstock use and more expensive costs of emission reductions in this area.

Other Greenhouse Gases

The Rhodium study also developed estimates for the impact of the continuing Trump administration policy on other greenhouse gases, which we regard as credible. These gases are not currently addressed by the Council's tax proposal. The Council expects eventually to propose measures to cover other greenhouse gases. The nature of those proposals, whether tax, regulation or other means, has not yet been decided, and it is possible that they might not be implemented in time to have much impact in 2025.

In our first case in Table 3 we adopted the Rhodium Group estimates for 2025 methane, nitrous oxide and fluorinated gas emissions. As a relatively

Table 1: U.S. Greenhouse Gas Emissions, Actual and Projected

	2005 Actual (baseline for U.S. Paris pledges) as updated in EPA 2018 GHG Inventory	2016 Actual	Obama Policy 2025 (assumes all Obama-era policies remained)	Current Policy 2025 (assumes most Obama-era policies are repealed)[8]
Energy-related CO_2	5,747	4,966	4,922[9]	5,031
Non energy related CO_2	385	345	332[10]	444
Methane	689	657	608[11]	632
Nitrous Oxide	358	370	345[10]	345
Fluorinated Gases	143	173	90[12]	90
Total Emissions	7,322	6,511	6,297	6,542
Sinks (Land Use, Land Use Change & Forestry Sequestration)	-699	-717	-870[13]	-870
Total Net Emissions	6,623	5,794	5,427	5,672
Change from 2005		-829	-1,164	-951
% Change from 2005	n/a	-12.5%	-18.1%	-14.4%

(All figures are in Millions of Metric Tons (MMT) CO_2-equivalent.)

Table 2: RFF Modeling of Energy-Related CO_2 Emissions from Council Plan

Escalation Rate	3%	4%	5%
Energy-related CO_2 Emissions Reduction in 2025 (vs. 2005)	-34.1%	-34.7%	-35.3%

Table 3: Comparisons and Conclusions

The emissions "bottom lines" of these projections are summarized below.

	2025 Trump Baseline (Where We Are Headed)	Obama-Era Policies (Had They Remained)	Case 1: Council Plan[14] with Rhodium Non-Energy CO_2 and Other GHGs	Case 2: Council Plan[13] plus Council Non-Energy CO_2 Reductions and 10% Reduction in Other GHGs
Total Net 2025 Emissions	5,672	5,459	4,553	4,399
Change vs. 2005 Base	-14.4%	-18.1%	-31.3%	-33.6%
Change from 2016 Actual	-2.1%	-6.3%	-21.4%	-24.3%

Note - Sinks were standardized in each projection to the midpoint of the Rhodium estimates (see note 13)

conservative alternative, in the second case in Table 3 we assumed that the Council's proposal would reduce these other greenhouse gases by 10% of Rhodium's forecast values in 2025.

In our Findings and in Chart 1, we take the mid-point (roughly 32%) between these two cases - Council's plan with Rhodium's non-energy CO_2 assumptions and with the more aggressive impact on non-energy CO_2 and other gases. We believe this provides a reasonable estimate of what the Council's carbon dividends plan can achieve.

Findings

The impact of a carbon tax at around these levels has been well studied[15], making the findings of this report quite robust. The current analysis suggests that the effect of the Council's plan would be to deliver around a 32% reduction in overall emissions by 2025 from 2005 levels, well beyond the 28% high-end of the U.S. Paris commitment and more than three times what the regulatory policies as of the end of the Obama administration would have achieved from 2016 to 2025. It is also many times more than what can be expected under the Trump administration policies, even if several of the Obama-era regulations on non-CO_2 GHGs are retained.

Conclusions

Our analysis leads to the following conclusions:

1. If all Obama-era regulatory measures had remained in place, that would likely have resulted in an 18.1% reduction in greenhouse gas emissions from 2005 levels by 2025;

2. Current policies will likely result in a 14% reduction in emissions below 2005 levels by 2025;

3. Compared to 2016, emissions would be 2.1% lower in 2025 under the current policies approach and 6.3% lower under the Obama-era policies; and

4. The Council's plan – based on a $43/ton carbon tax, implemented in 2021 – would reduce emissions by around 32% compared to 2005 and about 23% compared to 2016, meaning the United States would exceed the upper end of its 2025 Paris commitment.

Notes

1. Some of these reasons are described in *Methodology for Analyzing a Carbon Tax,* Treasury OTA Working Paper 115, 2017., pp. 8-9.
2. https://www.eia.gov/outlooks/aeo
3. http://www.rff.org/blog/2017/introducing-e3-carbon-tax-calculator-estimating-future-co2-emissions-and-revenues
4. http://rhg.com/wp-content/uploads/2017/05/RHG_ENR_Taking_Stock_24May2017.pdf
5. https://epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks-1990-2016
6. Our projection of the Obama policies starts from the *Second Biennial Report of the United States of America Under the United Nations Framework Convention on Climate Change*, U.S. Department of State, 2016; available at: https://unfccc.int/files/national_reports/biennial_reports_and_iar/submitted_biennial_reports/application/pdf/2016_second_biennial_report_of_the_united_states_.pdf
7. Climate Leadership Council calculations, based on EIA data for carbon content at https://www.eia.gov/tools/faqs/faq.php?id=73&t=11 and 2017 average fuel prices for petroleum and gas at https://www.eia.gov/outlooks/steo/
8. The Trump baseline forecast is based on EIA AEO 2018 energy CO_2 estimates net of international bunker fuels (-116.6MT, the 2016 value) and U.S. territories (+41.4MT, the 2016 value). We also adjusted for the possible removal of the Federal 2022-2025 vehicle GHG standards (estimated at +54MT in 2025), discounting that reduction by 50% given the uncertainty of how this will turn out in practice. For all other sources we use Rhodium (2017).
9. Assumes energy CO_2 emissions in 2025 are in line with EIA AEO 2018 (including Clean Power Plan (CPP)) reference case, net of international bunker fuels (-116.6MT, the 2016 value) and U.S. territories (+41.4MT, the 2016 value).
10. Calculated from *Second Biennial Report* based on the split of total CO_2 between energy and non- energy sources in the latest data available when it was written, i.e. the 2014 EPA GHG inventory.
11. Rhodium (2017) forecast, reduced by expected impact of proposed Obama-era methane regulations (24MT)
12. We use the Rhodium (2017) numbers – which assume the Kigali Amendment and other HFC initiatives that remain in place will be effective. The Obama administration biennial report (in early 2016, pre-Kigali) expected a rapid increase in these emissions, to 264MTCO_2e by 2025.
13. The 2016 biennial report used a 2025 range of -908 to -1201 MT. This does not seem plausible. We took the midpoint of the range estimated by Rhodium (766 to 963MT) and held it constant in all our comparisons so it does not impact the conclusions. We are skeptical of the higher end of even this range. Since 1990 the actual sink number has varied between 685 and 830 MT.
14. In each case using RFF modeling for the 4% real escalation factor. As mentioned above, the Council has not arrived at a final conclusion on the escalation factor.
15. For example, as cited in the original *A Winning Trade*, *Using a Carbon Tax to meet U.S. International Carbon Pledges*, Chen & Hafstead, RFF 2016; *Analysis of the American Opportunity Carbon Fee Act of 2015*, Hafstead & Kopp, RFF 2016 and Treasury op cit (2017).

Annex 1 - Important Assumptions

2025
We confined our analysis in this paper to the impact in one year – 2025 – because that is the year to which the U.S. Paris commitments apply.

Border Adjustments
We also assumed for simplicity that the border adjustments in the Council's plan broadly negate each other in terms of emissions – i.e. emissions related to U.S. exports for which the carbon tax is rebated are matched by emissions related to U.S. imports that are taxed when they enter the country.

Acknowledgement: Our thanks to Marc Hafstead and RFF for their help with the modeling in this paper. We also thank David Bookbinder of the Niskanen Center and Kevin Kennedy of the World Resources Institute for their peer review. Errors and omissions are ours alone.

Annex 2 - Note On Models

RFF Model
See following RFF Issue Brief on page 10.

Rhodium Model
Rhodium models the impact of current policy on U.S. GHG emissions using RHG-NEMS, a modified version of the National Energy Modeling System used by EIA to produce its Annual Energy Outlooks augmented to project all GHG emissions, not just energy-related CO_2. For the Taking Stock Baseline Scenario, Rhodium uses the macroeconomic and oil and gas price assumptions from the EIA's AEO 2017 reference case, with updates to account for recently announced coal and nuclear power plant retirements. For renewable energy technology costs, Rhodium uses NREL's Annual Technology Baseline mid cost case.

For CO_2 emissions from sources other than fossil fuel combustion as well as all other GHG emissions contained in the baseline, Rhodium primarily relies on EPA best practice methods. Methane emission reductions from petroleum and natural gas systems from existing federal and state policy are derived from analysis conducted by the Clean Air Task Force. LULUCF sequestration projections are derived from the latest U.S. biennial report and calibrated to EPA's latest inventory.

RESOURCES *for the* FUTURE

Analysis of Alternative Carbon Tax Price Paths for the Climate Leadership Council (CLC) Carbon Dividends Plan

Issue Brief 18-07 by **Marc Hafstead** — June 2018; Revised March 2019

In February 2017, the Climate Leadership Council (CLC), led by Ted Halstead and Republican statesmen George P. Shultz and James A. Baker III introduced **"The Conservative Case for Carbon Dividends."** The CLC's Founding Members help refine the policy details of its carbon dividends plan. Individual Founding Members include leading economists such as Ben Bernanke, Larry Summers and Janet Yellen. Corporate Founding Members include oil and gas companies BP, ExxonMobil, Shell, and Total; General Motors; consumer good giants Johnson&Johnson, P&G, and Unilever; and other multi-national firms. NGO Founding Members include Conservation International, The Nature Conservancy and World Wildlife Fund.

CLC's Carbon Dividend Plan rests on four pillars:

- **A Gradually Increasing Carbon Tax:** "A sensible carbon tax should begin at $40 a ton and increase steadily over time."
- **Carbon Dividends for All Americans:** "All the proceeds from this carbon tax would be returned to the American people on an equal and monthly basis."
- **Border Carbon Adjustments:** "Border adjustments for the carbon content of both imports and exports would level the playing field and promote American competitiveness."
- **Regulatory Simplification:** "The elimination of regulations that are no longer necessary upon the enactment of a rising carbon tax."

The purpose of this RFF analysis is to assess the impacts of alternative carbon tax paths on US energy-related CO_2 emissions.[1] Our sole focus is on the emissions impact of CLC's first pillar and we do not consider the impacts of any pillars on households or industry.

Economic Model of Carbon 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

Table 1a displays projected E3 energy-related carbon dioxide (CO_2) emissions through 2035 across the four alternative growth rates and a baseline scenario without a federal carbon tax.[2] Table 1b reports emissions relative to 2005 emissions.

Table 1a: Sensitivity of Energy-Related CO_2 Emissions to Different Rates of Growth of the Carbon Tax (billion metric tons)

Year	Baseline Emissions	Growth Rate of Carbon Tax 3%	4%	5%	6%
2021	5.1	4.1	4.1	4.1	4.1
2022	5.0	4.0	4.0	4.0	4.0
2023	5.0	3.9	3.9	3.9	3.9
2024	5.0	3.8	3.8	3.8	3.7
2025	5.0	3.7	3.7	3.7	3.6
2026	5.0	3.7	3.6	3.6	3.5
2027	4.9	3.6	3.5	3.5	3.4
2028	4.9	3.5	3.5	3.4	3.4
2029	4.9	3.5	3.4	3.3	3.3
2030	4.9	3.4	3.3	3.3	3.2
2031	4.9	3.4	3.3	3.2	3.1
2032	4.9	3.3	3.2	3.1	3.0
2033	4.9	3.3	3.2	3.1	3.0
2034	4.8	3.2	3.1	3.0	2.9
2035	4.8	3.2	3.1	3.0	2.8

In the absence of carbon pricing or other regulations, energy-related CO_2 emissions are expected to fall at a relatively slow rate through 2035. In 2021, with the initial CLC carbon price of $43, emissions are projected to drop by about one billion metric tons, a 19% reduction relative to business as usual. Emissions after 2021 depend on the growth rate of the tax over time. In 2025, emissions vary between 3.6 and 3.7 billion metric tons (38 – 39% below 2005 energy-related CO_2 emissions).[3] By 2035, the difference in emissions levels across growth rates becomes more pronounced – a difference of 0.4 billion metric tons between the lowest and highest growth rate scenarios. Under the 5% growth rate, energy-related carbon dioxide emissions are 51% below 2005 levels in 2035.

Table 1b: Energy-Related CO_2 Emissions (below 2005 levels), by Carbon Tax Growth Rate

	Growth Rate of Carbon Tax			
Year	3%	4%	5%	6%
2021	32%	32%	32%	32%
2022	33%	33%	34%	34%
2023	35%	35%	35%	36%
2024	36%	37%	37%	38%
2025	38%	38%	39%	39%
2026	39%	40%	40%	41%
2027	40%	41%	42%	43%
2028	41%	42%	43%	44%
2029	42%	43%	44%	45%
2030	43%	44%	45%	47%
2031	44%	45%	47%	48%
2032	45%	46%	48%	49%
2033	45%	47%	49%	51%
2034	46%	48%	50%	52%
2035	47%	49%	51%	53%

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 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 CO_2 emissions is modeled. Emissions of 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 tax is initially imposed in 2021.
- The tax is applied at a rate $43/per ton (in $2021) of CO_2 emitted through combustion. A fee of $43 is an increase from the original CLC proposal of $40 to account for inflation between 2018 and 2021.
- The tax increases annually at a rate of 3, 4, 5, or 6 percent above inflation.
- All of the proceeds from the carbon tax, net of reductions in pre-existing taxes, are returned to the American people on an equal basis.
- Border adjustments are only considered in the model for imports and exports of secondary fossil fuels (such as gasoline).

Notes

1 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.

2 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.

3 The Obama Administration's US Paris Agreement commitment was to reduce *net greenhouse gas* emissions to 26-28% below 2005 levels. Energy-related CO_2 emissions account for about 78% of gross greenhouse gas emissions. Under conservative estimates for changes in non-energy-related CO_2 emissions, non-CO_2 greenhouse gas emissions, and forestry sequestration, energy-related CO_2 emissions need to be reduced by about 30% from 2005 levels to achieve the 2025 28% net greenhouse gas reduction target.

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 does not take positions on specific legislative proposals and this memo is not an endorsement of the Carbon Dividends Plan.

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.

Financial support for this analysis was provided by the **Climate Leadership Council**. The Climate Leadership Council (CLC) is an international policy institute founded in collaboration with a who's who of business, opinion and environmental leaders to promote a carbon dividends framework as the most cost-effective, equitable and politically viable climate solution. Find more analysis by RFF experts on the impacts of a US carbon tax at **www.rff.org/carbontax**.

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Find out more at **www.clcouncil.org**.

THE FOUR PILLARS OF THE BAKER-SHULTZ CARBON DIVIDENDS PLAN

1. **A GRADUALLY RISING AND REVENUE-NEUTRAL CARBON TAX**
2. **CARBON DIVIDEND PAYMENTS TO ALL AMERICANS, FUNDED BY 100% OF THE REVENUE**
3. **THE SIMPLIFICATION OF CARBON REGULATIONS THAT ARE NO LONGER NECESSARY**
4. **BORDER CARBON ADJUSTMENTS TO LEVEL THE PLAYING FIELD AND PROMOTE AMERICAN COMPETITIVENESS**

2019 Update

This report was originally published in September 2018. It was updated in September 2019 to reflect newer modeling from Resources For the Future and the Climate Leadership Council's selection of an annual carbon fee escalation rate of 5% above inflation.

License

Note: This document was originally published in September 2018. In June 2019, Chart 2 on Page 3 was updated with new data from Resources For the Future. The enclosed Resources For the Future Issue Brief 18-07 has also been updated to reflect a revised version released in March 2019.

This report is a work product of the Climate Leadership Council and does not necessarily reflect the views of its organizational partners.

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