RESOURCES *for the* FUTURE

Government Revenue from Fossil Fuels in the US: History and Projections

Written comments prepared for the Senate Budget Committee

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Introduction

Senator Whitehouse, Senator Grassley, and distinguished members of the Committee:

Thank you for the opportunity to provide testimony to the Budget Committee today.

My name is Daniel Raimi. I am a Fellow at Resources for the Future (RFF) and the Director of RFF's Equity in the Energy Transition Initiative. I am also a lecturer at the Gerald R. Ford School of Public Policy at the University of Michigan. RFF is an independent, nonprofit research institution in Washington, DC. RFF's mission is to improve environmental, energy, and natural resource decisions through impartial economic research and policy engagement. The institution is committed to being the most widely trusted source of research insights and policy solutions leading to a healthy environment and a thriving economy.

While RFF researchers are encouraged to offer their expertise to inform policy decisions, the views expressed here are my own and may differ from those of other RFF experts, its officers, or its directors. RFF does not take positions on specific legislative proposals.

Background

The energy system in the United States, and around the world, is changing. Over the last decade, dramatic improvements in technologies, particularly horizontal drilling and hydraulic fracturing, have made the US the world's largest producer of oil and natural gas. At the same time, coal production has declined dramatically while renewables—particularly wind and solar—have become significant parts of the energy mix.

In the years ahead, continuing improvements in technology, as well as new policies such as the Inflation Reduction Act, are projected to reduce domestic demand for coal, oil, and natural gas.[1, 2] The outlook for domestic *production* of these fuels, however, is highly uncertain and will depend on global energy prices, the evolution of technology, and policies both at home and abroad.

There are hundreds of communities across the United States that depend on the production of fossil fuels for jobs and tax revenue.[3] For these communities, uncertainty over the trajectory of the energy system is not an abstract concept. Instead, it is a central issue that will directly affect local economic growth, jobs, and community wellbeing. One particularly important challenge for these communities and, indeed, the entire nation, is the issue of government revenue from the production, transportation, refining, and use of fossil fuels, especially oil and natural gas.

My research has focused on this critical issue, in particular how a potential decline in these revenues may affect energy communities. Along with colleagues, I have collected extensive data on how fossil fuels currently contribute to government revenue for the federal government, Native nations, states, and local governments. Based on this historical data, my colleagues and I have used stylized scenarios of future energy development to provide projections for how these revenues change through 2050. This work, based upon research with

[1] bp, 2023, *Energy Outlook 2023*.
[2] US EIA, 2023, *Annual Energy Outlook 2023*, US Department of Energy, Washington, DC.
[3] D. Raimi, Carley, S., Konisky, D., 2022b, Mapping county-level vulnerability to the energy transition in US fossil fuel communities. *Sci Rep* 12, 1–10. https://doi.org/10.1038/s41598-022-19927-6.

colleagues Emily Grubert (University of Notre Dame), Jake Higdon (formerly Environmental Defense Fund, currently US Department of Energy), Gilbert Metcalf (Tufts University), Sophie Pesek (Resources for the Future), and Devyani Singh (Environmental Defense Fund), has been published on **RFF's website** and accepted for publication in the peer-reviewed journal *Review of Environmental Economics and Policy*.[4]

While this research assesses the risks of government revenue losses from reducing society's reliance on carbon-intensive energy sources, I do not view these risks as justification for delay or inaction on climate change mitigation. The projected damages from climate change easily outweigh the projected revenue losses I will describe in today's testimony. A vast body of research across the physical and social sciences clearly demonstrates that the damages that we, and future generations, could experience from climate change pose enormous risks to our future.[5, 6] And the most recent peer-reviewed literature in environmental economics shows clearly that the benefits of well-designed climate change mitigation policies will easily outweigh their costs.[7, 8, 9]

Historical Fossil Fuel Revenues

Although researchers have understood for years that fossil fuels provide a major source of government revenue, no analysis had previously attempted to quantify the full scale of this contribution across the United States. My coauthors and I gathered data from thousands of public government records at the local, state, tribal, and federal levels to establish a baseline for how fossil fuels contribute to government revenue. We gathered data from 2015 through the most recent available year, which was typically 2019 or 2020.

Methods and Data

We began by gathering data on government revenue for the federal government, Native nations, and state and local governments in twenty-one states: Alaska, Alabama, Arkansas, California, Colorado, Illinois, Indiana,

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[4] D. Raimi, Grubert, E., Higdon, J., Metcalf, G., Pesek, S., Singh, D., 2022c, The Fiscal Implications of the US Transition Away from Fossil Fuels, Resources for the Future Working Paper 22-3, Washington, DC, https://www.rff.org/publications/working-papers/the-fiscal-implications-of-the-us-transition-away-from-fossil-fuels/.

[5] IPCC, 2022, *Climate Change 2022: Mitigation of Climate Change*, Contribution of Working Group III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change (Cambridge University Press, Cambridge, UK and New York, NY, USA).

[6] J. Rogelj, Shindell, D., Jiang, K., Fifita, S., Forster, P., Ginzburg, V., Handa, C., Kheshgi, H., Kobayashi, S., Kriegler, E., Mundaca, L., Séférian, R., Vilariño, M.V., 2018. Mitigation Pathways Compatible with 1.5°C in the Context of Sustainable Development, in *Global Warming of 1.5°C. An IPCC Special Report on the Impacts of Global Warming of 1.5°C above Pre-Industrial Levels and Related Global Greenhouse Gas Emission Pathways, in the Context of Strengthening the Global Response to the Threat of Climate Change, Sustainable Development, and Efforts to Eradicate Poverty*, ed. Masson-Delmotte, V., Zhai, P., Pörtner, H.-O., Roberts, D., Skea, J., Shukla, P.R., Pirani, A., Moufouma-Okia, W., Péan, C., Pidcock, R., Connors, S., Matthews, J.B.R., Chen, Y., Zhou, X., Gomis, M.I., Lonnoy, E., Maycock, T., Tignor, M., Waterfield T.

[7] T. Carleton, Greenstone, M., 2022, A Guide to Updating the US Government's Social Cost of Carbon, *Review of Environmental Economics and Policy*.

[8] K. Rennert, Errickson, F., Prest, B.C., Rennels, L., Newell, R.G., Pizer, W., Kingdon, C., Wingenroth, J., Cooke, R., Parthum, B., Smith, D., Cromar, K., Diaz, D., Moore, F.C., Müller, U.K., Plevin, R.J., Raftery, A.E., Ševčíková, H., Sheets, H., Stock, J.H., Tan, T., Watson, M., Wong, T.E., Anthoff, D., 2022, Comprehensive evidence implies a higher social cost of CO_2, *Nature* 610, 687–692. https://doi.org/10.1038/s41586-022-05224-9.

[9] K.-I. van der Wijst, Bosello, F., Dasgupta, S., Drouet, L., Emmerling, J., Hof, A., Leimbach, M., Parrado, R., Piontek, F., Standardi, G., van Vuuren, D., 2023, New damage curves and multimodel analysis suggest lower optimal temperature. *Nat. Clim. Chang.* 1–8, https://doi.org/10.1038/s41558-023-01636-1.

Kansas, Kentucky, Louisiana, Mississippi, Montana, New Mexico, North Dakota, Ohio, Oklahoma, Pennsylvania, Texas, Utah, West Virginia, and Wyoming. In 2019, these states, coupled with federal and tribal lands and waters, accounted for 99.8, 99.5, and 97.3 percent of US oil, natural gas, and coal production, respectively. We include revenues from severance taxes, lease revenues from public lands and waters, property taxes on fossil energy production property, income taxes from individuals and businesses in relevant sectors, and sales taxes applied to mining sector purchases. Data coverage was comprehensive or near comprehensive for most of these sources in most states. However, data were more limited for income and sales tax revenues in several states, so our baseline revenue estimates may understate revenues from these sources (see paper Appendix for details).

Next, we gathered data on government revenues from the transportation of fossil fuels (e.g., oil and gas pipelines), refining, and use (e.g., at power plants and in vehicles). Because these activities take place across the United States, we gathered data and—in some cases—generated estimates for the entire United States. Public data on revenue for tribes from these sources are very limited, although we were able to gather revenue data from the Navajo Nation, the largest tribe in the United States by land area and membership.[10] I am currently working with a team of researchers and multiple Native nations to better understand how fossil fuels contribute to their revenues, and to provide analysis to support their decision-making about future energy development.

Table 1 provides a summary of major revenue types that we gathered in this analysis, organized by fuel and the level of government that is the primary recipient of the revenues.

Table 1. Major Fossil Fuel Revenue Sources

Revenue types assessed	Coal	Oil	Gas	Primary recipient(s)
Severance taxes	X	X	X	States, some tribes
Production on public lands	X	X	X	Federal, tribes, states
Property taxes				Local, some tribes
Production property	X	X	X	
Pipelines		X	X	
Refineries		X		
Power plants	X	X	X	
Petroleum product taxes		X		States, federal, some tribes
Sales taxes	X	X	X	Local, states, some tribes
Income taxes (corporate and personal)	X	X	X	States, federal

Fossil Fuel Revenues from 2015 through 2019

Our analysis finds that, on average from 2015 through 2019, fossil fuels generated $138 billion per year for governments across the United States in 2019 dollars (all figures are in 2019 dollars unless otherwise noted).

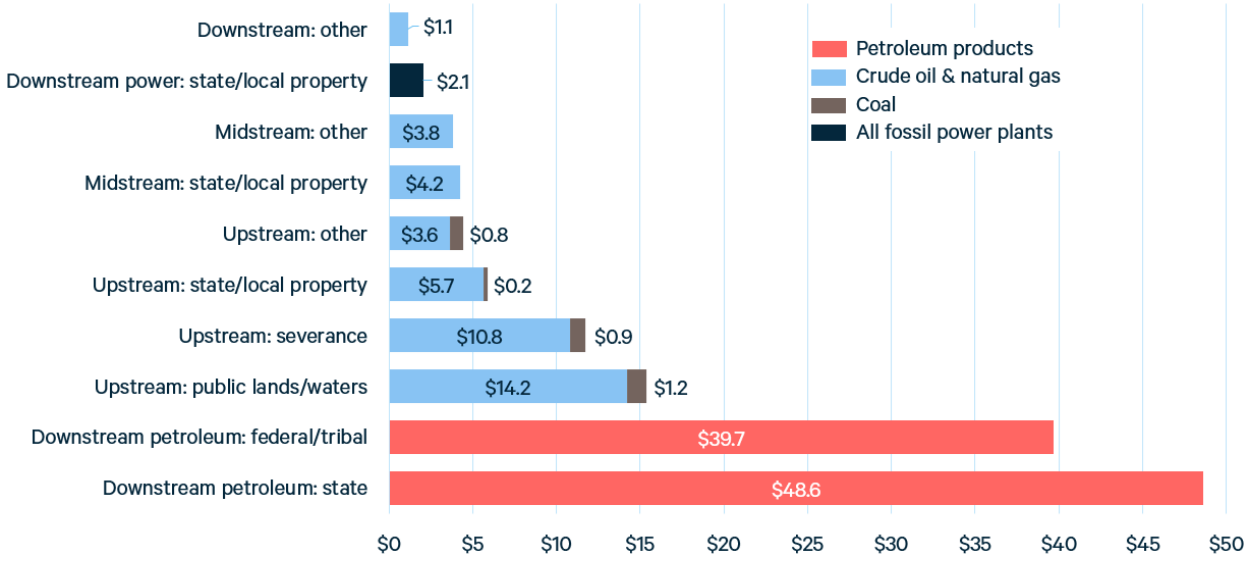
[10] Associated Press, 2021, Navajo Nation Surpasses Cherokee to Become Largest US Tribe, https://www.usnews.com/news/politics/articles/2021-05-19/navajo-nation-surpasses-cherokee-to-become-largest-us-tribe.

The single largest source of these revenues were petroleum product taxes, totaling $88.3 billion per year between states ($48.6 billion) and the federal government ($39.7 billion).

The second largest source is revenue from the production of oil and natural gas, which generates bonus payments and royalties for the federal government, Native nations, and states. This also includes severance taxes for states, property taxes for local governments, and several other smaller sources. Upstream oil and gas development generated $34 billion annually, led by $14 billion from production on federal, tribal, and state lands and waters; $11 billion from state severance taxes; and $6 billion from local property taxes.[11]

My coauthors and I estimate that the midstream oil and gas segment generates $8 billion annually, with roughly $4 billion from property taxes on refineries and pipelines, and $4 billion from state and federal income taxes. Upstream coal generated roughly $3 billion per year, led by revenue from leasing public lands ($1.2 billion) and state severance taxes ($0.9 billion). Finally, we estimate that fossil fuel-fired power plants and natural gas distribution pipelines generated $2 billion and $1 billion annually in local property taxes, respectively. Although these figures may appear small relative to larger revenue sources such as federal royalties or state severance taxes, they can play a major role for local tax bases, particularly in rural communities.[12] Figure 1 illustrates our national-level results.

Figure 1. Annual Average Fossil Fuel Government Revenue, 2015-2019 ($2019, billions)



Notes: "Other" includes corporate income, personal income, and sales taxes, along with the federal coal excise tax and local property taxes on natural gas distribution. Tribal petroleum product fees only include Navajo, which averaged $14 million annually.

The revenues highlighted here are not distributed evenly across the US; they are concentrated in producing states and communities. In aggregate terms, the states with the largest fiscal contribution from fossil fuels are Texas, California, Pennsylvania, and Wyoming. In Texas and Wyoming, the bulk of these revenues are related

[11] For the remainder of this testimony, I use the terms "upstream" to refer to extraction and initial processing, "midstream" for long-distance transportation and refining, and "downstream" for marketing and consumption, including at power plants.

[12] J.H. Haggerty, Haggerty, M.N., Roemer, K., Rose, J., 2018, Planning for the local impacts of coal facility closure: Emerging strategies in the US West, *Resources Policy* 57, 69–80. **https://doi.org/10.1016/j.resourpol.2018.01.010**.

to fossil fuel extraction, while in California and Pennsylvania, the large majority is from taxes on gasoline and diesel fuel.

Table 2 State and Local Government Fossil Fuel Revenue by State, 2015-2019 Average ($2019)

Total government fossil revenue (millions)[1]		Per capita government fossil revenue[2]		Government fossil revenue as share of state and local own-source revenue[3]	
Texas	$14,591	Wyoming	$7,339	Wyoming	54%
California	$7,823	North Dakota	$3,854	North Dakota	29%
Pennsylvania	$4,422	Alaska	$2,713	Alaska	20%
Wyoming	$4,624	New Mexico	$1,303	New Mexico	14%
North Dakota	$2,917	West Virginia	$698	West Virginia	9.0%
New Mexico	$2,726	Montana	$613	Montana	7.5%
Ohio	$2,563	Oklahoma	$550	Oklahoma	7.2%
Louisiana	$2,518	Louisiana	$540	Louisiana	6.8%
Oklahoma	$2,163	Texas	$516	Texas	6.3%
Colorado	$2,110	Colorado	$356	Colorado	3.7%

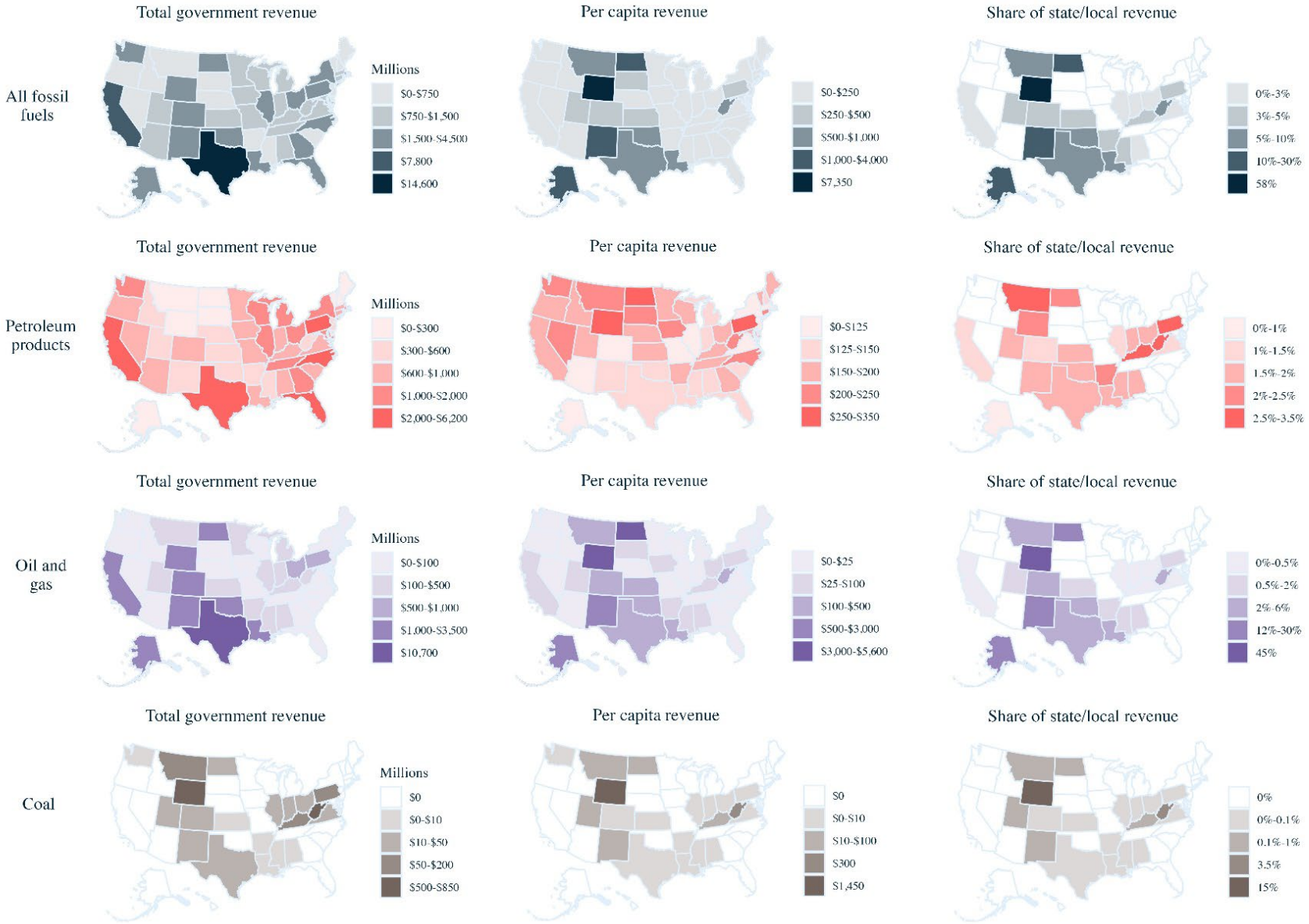
1: Includes petroleum product taxes. 2: Fossil fuel revenues divided by state population from the 2017 US Census. 3: Fossil fuel revenues divided by total state and local own-source revenues, which consist of all local and state internal revenue (i.e., excludes intergovernmental transfers) averaged from 2015 to 2019.

The states with the highest dependence on fossil fuels for local and state revenue are Wyoming, North Dakota, Alaska, and New Mexico. In each of these states, fossil fuels contribute more than $1,000 per person per year and at least 14 percent of state and local own-source revenue (“own source” refers to government revenue excluding transfers from higher levels of government). In Wyoming, government revenues from fossil fuels average more than $7,000 annually for each resident and account for more than half of all state and local own-source revenue. In each of these states, upstream oil and natural gas production are the leading revenue sources.

Although they do not rely as heavily on fossil fuel revenues as the top four states, West Virginia, Montana, Oklahoma, Louisiana, Texas, and Colorado are also reliant on fossil fuels for substantial shares of government revenue. Even within states, there is a wide range of reliance on fossil fuel revenues. For example, California is not heavily reliant on fossil fuel revenues as a share of total government revenue. However, Kern County, California is a major oil producer, and is heavily reliant on the industry to provide tax revenue for schools, roads, public safety, and other essential services. States such as Illinois, Indiana, Kansas, Ohio, and Utah, are also home to regions where fossil fuel extraction plays an important role in supporting local government revenue.

Figure 2 illustrates our state-level results by energy type.

Figure 2. Average Annual State and Local Government Fossil Fuel Revenues, 2015-2019



In summary, fossil fuels provide a large amount of revenue for governments across the United States, and some states and communities are heavily reliant on these revenues to provide essential services to their residents.

Projections of Future Fossil Fuel Revenues

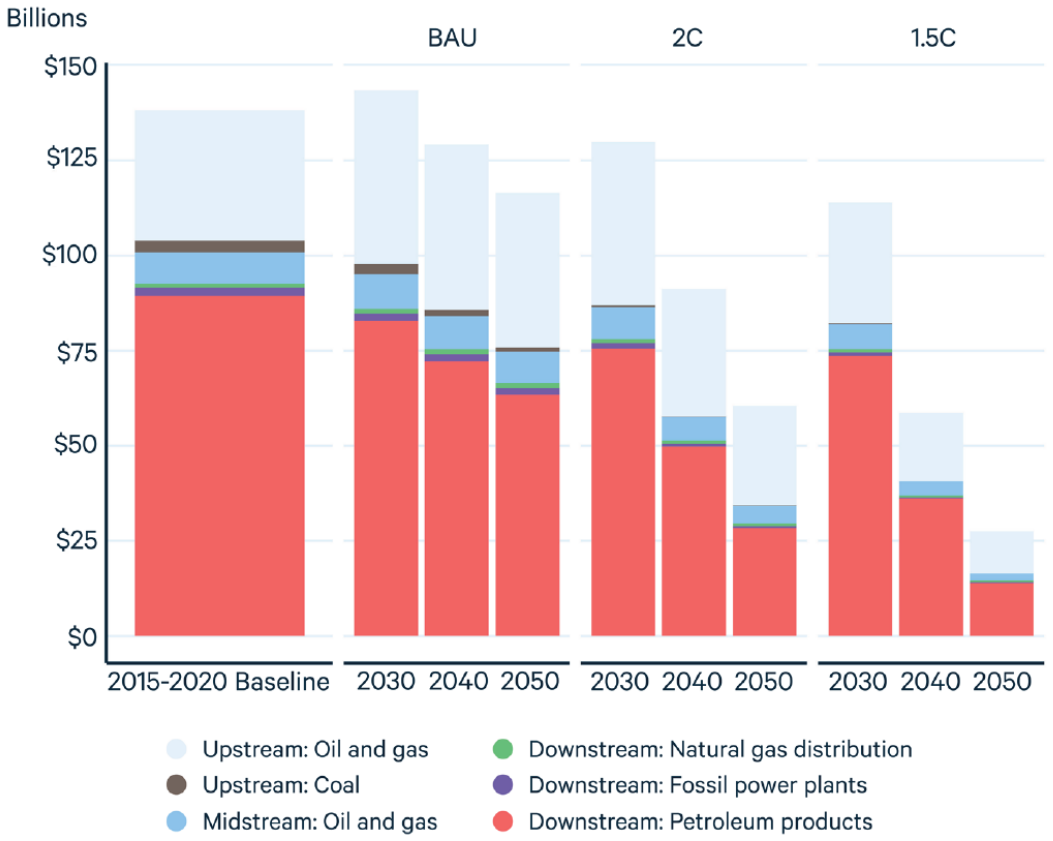
The future of fossil fuel production and consumption is uncertain and will depend on a variety of factors. To understand how government revenues from fossil fuels may change in the years ahead, my coauthors and I used three different scenarios projecting energy supply and demand through the year 2050 published by the energy company bp in its 2020 Energy Outlook, the most recent available outlook at the time of our analysis.

In that outlook, bp projects future supply and demand across the energy sector under three scenarios: Business as Usual (BAU), 2 Degrees Celsius (2C), and 1.5 Degree Celsius (1.5C). The 2C and 1.5C scenarios are designed to reduce emissions consistent with long term global mean temperature rise of 2° and 1.5° Celsius, respectively, while BAU represents bp's view on the energy future given policies in place as of late 2019. We chose these scenarios because: (1) they provide a plausible yet wide range of futures, including scenarios with deep decarbonization; (2) detailed scenario results are publicly available; and (3) they include country-level projections for the United States, whereas other organizations (e.g., the International Energy Agency) provide data for North America in aggregate.[13] Projections from the US Energy Information Administration were excluded because, as of 2020, their outlooks did not include scenarios consistent with long-term international climate targets.[14]

As seen in Figure 3, fossil fuel revenues for US governments decline under all three scenarios by 2050, with wide variation. Total annual revenues in the BAU scenario increase above the baseline by four percent ($5 billion) in 2030, then fall by sixteen percent ($22 billion) below the baseline by 2050. In the 2C scenario, total annual revenues fall by six percent ($8 billion) by 2030 and fifty-six percent ($78 billion) by 2050. In the 1.5C scenario, total annual revenues fall by eighteen percent ($24 billion) by 2030 and eighty percent ($111 billion) by 2050.

[13] IEA, 2020, *World Energy Outlook 2020*, Paris.
[14] EIA, 2021, *Annual Energy Outlook 2021*, Department of Energy, Washington, DC.

Figure 3. Baseline and Projected Fossil Fuel Government Revenues under Three Scenarios



Petroleum Product Taxes

Under the BAU scenario, petroleum product taxes fall roughly thirty percent ($26 billion) by 2050. Under the 2C and 1.5C scenarios, rapid deployment of electric vehicles and enhanced energy efficiency reduces these revenues by sixty-nine percent ($60 billion) and eighty-five percent ($75 billion), respectively, relative to the baseline.

These findings are consistent with other analyses highlighting the growing gap between tax revenue from fuel sales and the level of revenue needed to maintain domestic highway infrastructure.[15, 16, 17] A variety of policy options exist that could raise the revenue necessary to maintain highway performance and ensure the long-term solvency of the Highway Trust Fund, which I discuss later in this testimony.

Oil and Natural Gas

Upstream oil and gas revenues, which primarily flow to state and local governments, do not decline as quickly under our analysis. Under BAU, annual revenues are thirty-seven percent ($11 billion) higher than the baseline

[15] CBO, 2020, *Reauthorizing Federal Highway Programs: Issues and Options*, Washington, DC.
[16] J. Kile, 2021, Testimony on Addressing the Long-Term Solvency of the Highway Trust Fund, Congressional Budget Office testimony to Committee on Environment and Public Works United States Senate, Washington, DC.
[17] M. Schultz., Atkinson, R.D., 2009, *Paying Our Way: A New Framework for Transportation Finance*, National Surface Transportation Infrastructure Financing Commission, Washington, DC.

in 2030 and twenty-two percent ($6 billion) higher in 2050. In the 2C scenario, annual revenues in 2030 are twenty-eight percent ($9 billion) higher, then decline to twenty-one percent ($8 billion) below the baseline by 2050. Under the 1.5C scenario, annual revenues decline by eight percent ($3 billion) by 2030, then fall rapidly to sixty-eight percent ($23 billion) below the baseline by 2050. Production does not fall to zero by 2050 because in these (and virtually all other) long-term energy scenarios, hydrocarbons continue to provide a feedstock for petrochemicals production, and are often coupled with carbon capture and storage for other applications.[18]

Government revenue generated from midstream infrastructure such as pipelines and refineries, which primarily flow to local governments, follow a similar trajectory to the upstream segment. By 2050, annual midstream revenues increase by two percent ($0.2 billion) under BAU but decline by forty-two percent ($3.4 billion) and seventy-eight percent ($6.3 billion) under 2C and 1.5C, respectively. Intuitively, higher levels of production and consumption under BAU lead to higher levels of pipeline and refinery throughput, which translates into higher levels of public revenues.

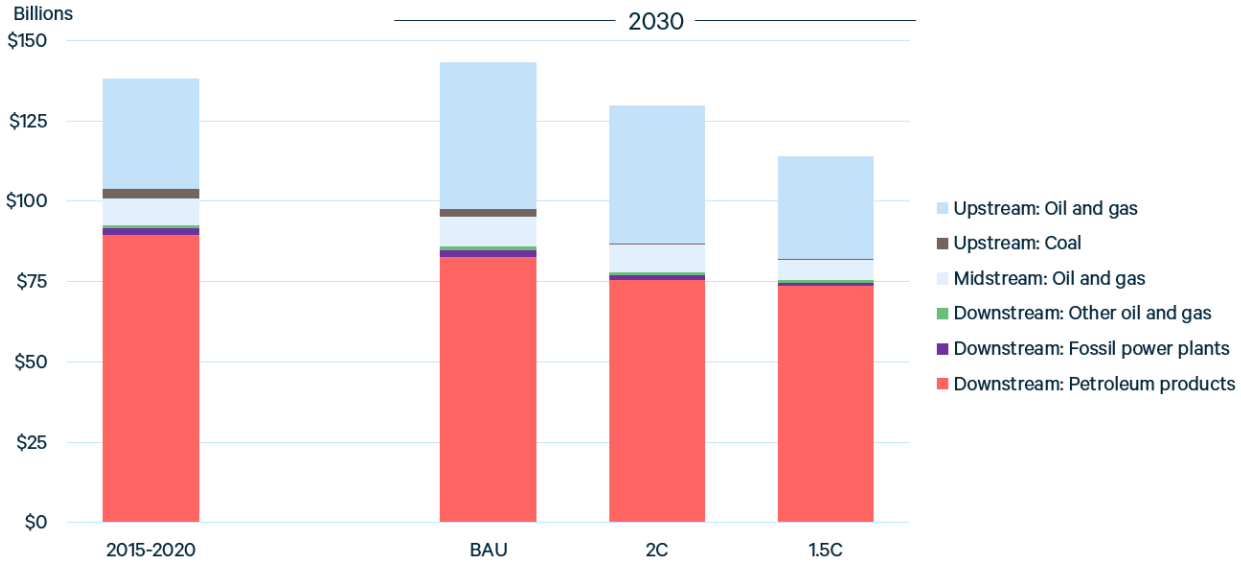
In the downstream segment, the dominant fossil fuel revenue sources are petroleum product taxes. The other major downstream revenue source from oil and gas comes from natural gas distribution systems, which provide natural gas service to homes and business across the US, and from natural gas-fired power plants. We estimate that natural gas distribution systems provide $987 million per year across the nation in local property taxes, and that these revenues grow by 18 percent by 2050 under BAU, but shrink by 42 and 66 percent under 2C and 1.5C scenarios, respectively. We are unable to estimate changes in revenue specifically for natural gas-fired power plants because our data do not distinguish between coal- and natural gas-fired power plants. We are currently working on an analysis that would provide data on public revenues for power plants of all types, including coal, natural gas, wind, and solar.

A Window of Opportunity

One important finding from this analysis is that under all scenarios, the overall level of fossil fuel revenue in 2030 does not differ dramatically from the historical baseline. Although coal revenues decline substantially under all scenarios by 2030, changes in oil and natural gas revenues are more modest. Compared with the baseline period, total oil and natural gas revenues are four percent higher under BAU, four percent lower under 2C, and 15 percent lower under the 1.5C scenario. For upstream oil and gas development, which most directly affects oil- and gas-producing communities, revenues range from a 26 percent increase by 2030 under BAU to a 10 percent decrease under the 1.5C scenario (Figure 4).

[18] D. Raimi, Campbell, E., Newell, R.G., Prest, B., Villanueva, S., Wingenroth, J., 2022a, *Global Energy Outlook 2022: Turning Points and Tension in the Energy Transition*, Resources for the Future Report, Washington, DC.

Figure 4. Baseline and 2030 Fossil Fuel Revenues



This implies that, regardless of near-term policy decisions, technological innovations, or other market or geopolitical developments, the states, tribes, and local governments that rely heavily on oil and natural gas for revenue likely have years to implement efforts to develop replacement revenue sources.

Options for New Revenue Streams

Governments that are heavily dependent on fossil fuels for government revenue have a range of options to ensure adequate funding for public services in the years ahead. However, implementing policies to ensure adequate public revenues would require substantial changes to tax policies across multiple dimensions.

The first, and most economically efficient approach to address climate change and government revenue shortfalls would be to price carbon emissions across the economy.[19, 20, 21] Such a policy, even if implemented at a modest level such as $40 or $50 per metric ton of CO_2, would raise hundreds of billions of dollars per year, and could grow over time depending on the design of the policy.[22]

These revenues could support a variety of priorities, including ensuring energy affordability for low-income households, reducing other taxes, as well as supporting communities dependent on fossil fuel-related revenues. A carbon pricing policy also incentivizes a shift away from emissions-intensive fuels, reducing greenhouse gas emissions and the climate damages they cause.

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[19] A.R. Barron, Fawcett, A.A., Hafstead, M. a. C., McFarland, J.R., Morris, A.C., 2018, Policy insights from the EMF 32 study on US carbon tax scenarios. *Clim. Change Econ.* 09, 1840003, **https://doi.org/10.1142/S2010007818400031**.

[20] J. Larsen, Mohan, S., Marsters, P., Herndon, W., 2018, *Energy and Environmental Implications of a Carbon Tax in the United States*, Columbia Center on Global Energy Policy, New York.

[21] G. Metcalf, 2019, On the economics of a carbon tax for the United States, *Brookings Papers on Economic Activity*. Brookings Institution, Washington, DC.

[22] M. Hafstead, 2021, Carbon Pricing Calculator, Resources for the Future, Washington, DC.

One option to replace revenue from petroleum product excise taxes (the largest single fossil fuel-related revenue source for the federal government and most states) is a fee based on vehicle-miles-traveled (VMT). Recent analyses have suggested that a fee on VMT of roughly $0.012 per mile on passenger vehicles (and a higher rate for buses and heavy commercial vehicles) could provide revenues sufficient to maintain the solvency of the Highway Trust Fund.[23]

As vehicle fuel efficiency improves and electric vehicles become more prevalent on roadways, VMT-based approaches have a variety of advantages over liquid fuel taxes, and are currently being piloted in voluntary programs by over a dozen states in the US, including California, Texas, Utah, Wyoming, and others.[24]

For communities and states that are heavily reliant on fossil fuel production for government revenue, options are more limited in the near-term. In states such as Alaska, New Mexico, North Dakota, and Wyoming, local and state governments will likely need years, or perhaps decades, to develop new economic growth engines that can generate public revenues to provide essential services.

As communities and states seek to diversify their revenue bases, federal support will likely be needed to provide technical assistance and funding to support local economic development priorities. Currently, the federal Interagency Working Group on Coal and Power Plant Communities and Economic Revitalization is beginning to play this role, focusing on coal communities that have already experienced substantial downturns in employment, economic activity, and government revenue.

However, the oil and natural gas industry is a far larger employer and revenue generator than coal in the United States.[25] In addition, domestic oil and gas production is at an all-time high, providing revenue that local governments, states, Native Nations, and the federal government could use to begin supporting revenue diversification efforts today. This includes investing in long-term permanent funds that can provide stable government revenue regardless of future oil and gas production. Long-term permanent funds have been major sources of fiscal stability and have helped drive economic diversification in nations such as Norway, while states such as Alaska, New Mexico, Wyoming, have also made use of such policies.

Federal investments to support local economic resilience in oil and gas communities can also play an important role. However, these investments are more likely to be successful if federal resources and technical expertise are provided to support local priorities in a “bottom-up” approach, as opposed to a “top-down” model where federal priorities dictate how state or regions build economic resilience over the medium- to long-term.

Conclusion

Senators, in closing, I would like to emphasize four key findings of this work:

[23] U. Boesen, 2020, Who Will Pay for the Roads? (No. 725), Fiscal Fact. Tax Foundation, Washington, DC.
[24] GAO, 2022, Federal Highway Administration Should Develop and Apply Criteria to Assess How Pilot Projects Could Inform Expanded Use of Mileage Fee Systems (No. GAO-22-104299), Washington, DC.
[25] D. Raimi, Carley, S., Konisky, D., 2022b, Mapping county-level vulnerability to the energy transition in US fossil fuel communities. *Sci Rep* 12, 1–10. **https://doi.org/10.1038/s41598-022-19927-6**.

First, our society needs to reduce greenhouse gas emissions, and efforts to do so will almost certainly reduce government revenue from fossil fuels. These revenues are substantial, and are concentrated primarily in states and communities where oil and natural gas production occur at large scale.

Second, an economy-wide carbon price offers the most economically efficient route to address greenhouse gas emissions, and at the same time would raise ample revenue to replace declining fossil fuel revenues and support other spending priorities.

Third, there is a clear need to find alternative options for funding transportation infrastructure. The current excise tax on gasoline and diesel fuel is insufficient to maintain the Highway Trust Fund, but a new fee applied to vehicle miles traveled would offer a promising route to raise the needed revenue.

Finally, federal resources and technical assistance will likely be needed to support coal, oil, and gas producing communities in the years ahead. The federal government has taken initial steps in this direction, but more work will be needed—particularly in oil and gas producing communities—to ensure an equitable transition towards a net-zero emissions economy.

Senators, I thank you again for this opportunity to appear before you and all of the members of the Committee today on this panel. I will now conclude my remarks, and I look forward to taking your questions.

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