Statement of Joseph E. Aldy
Professor of the Practice of Public Policy, Harvard Kennedy School
University Fellow, Resources for the Future
Faculty Research Fellow, National Bureau of Economic Research
Senior Adviser, Center for Strategic and International Studies

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Good morning Chairman Khanna, Ranking Member Norman, and members of the Subcommittee on Environment.

My name is Joe Aldy, and I am a Professor of the Practice of Public Policy at the Harvard Kennedy School. My research and teaching focus on the rationale for, design, and evaluation of energy, environmental, and regulatory policy.[1]

This hearing addresses fossil fuel subsidies and our policy response to the climate crisis. Thank you for the opportunity to testify on this critically important topic. I have worked on this issue as a former government official, in my research, and in my teaching. Indeed, for today's hearing I have drawn from similar testimony I gave on a similarly themed Congressional hearing (Aldy 2017). I am grateful nonetheless to share my insights, especially as we have new leadership in the White House and new voices in Congress prepared to combat the climate crisis with the urgency that this challenge demands.

The United States Government continues to subsidize the production of oil, gas, and coal through tax policy and energy policy. To enable an evaluation of these subsidies, I will open my testimony with a brief presentation of policy principles that inform energy and climate policy. Given the various interpretations of what constitutes a fossil fuel subsidy, I will then describe several of the most significant subsidies in current law. I will draw from the evidence in the research literature to address a series of questions on how fossil fuel subsidies fare under these policy principles.

Before I turn to policy principles, let me preview my bottom line. Fossil fuel subsidies represent a government failure. They are a form of spending, paid for by American taxpayers, to businesses in an industry that has long been profitable with negligible impact on production or employment. To the extent U.S. production subsidies increase hydrocarbon consumption, the adverse public health, climate change, and labor productivity losses from pollution resulting from fossil fuel combustion could exceed the market value of these fuels. These adverse public health and climate damages are disproportionately borne by low-income households and communities of color. The continuation of U.S. fossil fuel production subsidies undermines our government's efforts to engage partners from across the world to reform and eliminate fossil fuel subsidies as a key step in our response to the climate crisis.

[1] I have appended a bio at the end of this testimony. In addition, one may access my CV, published papers, etc. at https://scholar.harvard.edu/jaldy.

**Policy Principles for Energy and Climate Policy**

Let me offer and briefly explain five public policy principles for evaluating energy and climate policy.

***Correct Market Failures***: Well-functioning markets do not need government interventions. Indeed, government interventions in markets operating efficiently risk introducing inefficiencies that reduce social welfare; i.e., they are government failures. If a market is suffering from a market failure, then a policy intervention could be merited. For example, if energy firms fail to account for the social costs of their pollution—such as emissions of fine particulate matter that increase premature mortality or of carbon dioxide that contribute to climate change—then public policy could address the market failure and increase well-being. A similar case could be made for policy interventions to spur innovation, given the public good problem in innovation that results in private sector under-investment in innovation.

***Promote Cost-Effectiveness****:* A market failure is not sufficient to justify government intervention. Energy policy should also be well-designed to mitigate the market failure. If the policy targets the market failure effectively, then it can improve the well-being of the whole of our population. The most cost-effective instrument for correcting a market failure should be pursued. Cost-effective design ensures that the American taxpayer gets the biggest possible social return—such as improved public health from cleaner air and fewer threats from a changing climate—for a given tax expenditure or policy cost. Cost-effective policies free up resources that can be dedicated to other critical dimensions of the climate crisis, such as investing in our communities to enhance their resilience to climate change.

***Contribute to Fairness and Justice*****:** A more fair and just approach to energy and climate policy should address several dimensions of distribution. First, a fairer policy framework would create a level playing field. Common eligibility and generosity of tax expenditures for a given investment activity as well as common application of regulatory requirements for sources of a given market failure ensures that all businesses face the same incentives. Second, a more just policy framework recognizes the disproportionate historic burden of environmental pollution and infrastructure siting, and creates processes and focuses on outcomes to reduce such disparities.

***Enhance International Leadership***: Over 2017-2020, the U.S. Government abdicated its leadership globally on many policy fronts, including on climate change. Actions the U.S. Government takes to combat climate change have the potential to amplify actions in other countries and thereby multiply the benefits of our own domestic policy. By demonstrating effective energy and climate policy, the U.S. Government would be in a stronger position to leverage comparable actions by other major economies around the world. Leading ambitious and comparable policy actions among major economies can also mitigate potentially adverse competitiveness impacts of energy and climate policy.

***Review and Reform:*** Combatting climate change necessitates a long-term policy program. We should design our policy to enable learning: to identify the priority risks to target, to assess what works and what does not, and to examine what experiences have important implications for broadening and deepening our climate change and energy policy program. There is considerable value in an act-learn-act approach to energy policy. For example, regulatory approaches to energy and environmental policy involve detailed benefit-cost analyses and periodic updating, such as for fuel economy standards, appliance efficiency standards, and some air quality standards. In contrast, it is uncommon for the government to estimate the impacts of energy tax expenditures on pollution, innovation, or measures of

economic activity. Moreover, the absence of an updating mechanism or sunsets for many fossil fuel tax expenditures precludes opportunities for review and reform.

In short, public policy that does not address a market failure risks being a government failure. A public policy that is not cost-effective risks being a government failure. A public policy that does not ensure a fair playing field or promote justice risks being a government failure. A public policy that undermines our international leadership and our potential to leverage actions by our partners around the world risks being a government failure. A public policy that is not designed to enable learning and reform risks being a government failure. U.S. fossil fuel production subsidies fail on each and every one of these criteria. The next section describes U.S. fossil fuel production subsidies, and the subsequent section interprets the evidence about the impacts of fossil fuel subsidies in light of these policy principles.

## Brief Description of Fossil Fuel Production Subsidies

This section begins with a characterization of fossil fuel tax expenditures,[2] and then concludes with a brief discussion of other implicit subsidies for fossil fuel production in U.S. energy policy.

### *Tax Expenditures*

For more than a century, fossil fuel extraction companies have received tax breaks that subsidize their activities. Most of these tax code provisions lower the cost of investing in oil, gas, and coal development projects, and they all lower in a preferential manner the corporate tax rate on a specific source of income (i.e., picking winners through the tax code). Historically, the three largest tax expenditures are the expensing of intangible drilling costs, percentage depletion for oil and gas wells, and the domestic manufacturing tax deduction for oil and gas. The eligibility and generosity of these programs differ between integrated companies—those that produce and refine oil and market petroleum products – and independent companies—those that only operate upstream in the extraction of oil and gas. Thus, supermajors such as ExxonMobil, BP, Chevron, and Royal Dutch Shell, that extract, refine, and retail oil can claim fewer subsidies per barrel of oil extraction than independent (and especially small independent) oil companies.

In the U.S. tax code, a firm investing in a capital project—say a new factory or office computers—typically depreciates the investment costs over the useful life of the capital.[3] In contrast, oil and gas firms expense all or most of their drilling-related expenditures that do not have salvage value, referred to as intangible drilling costs that typically include geological surveying, wages, fuel, repairs, and supplies associated with well development, in lieu of depreciating them over the economic life of a well. As a result, the provision effectively lowers the tax rate on income from such projects relative to capital investments elsewhere in the economy, distorting investment decisions. This has led to inefficiently low investment outside of the oil and gas sector and inefficiently high investment within the oil and gas sector.

[2] This case study draws from my previously published work in Aldy (2013, 2014, 2017).

[3] Note that the 2017 tax law allows taxpayers to expense 100 percent of the cost of qualified property (investment) made through 2022. Thus, through the end of 2022, the tax code provides less preference for fossil fuel production investment relative to other forms of investment. Note, however, that while the 100 percent depreciation provision of the tax law sunsets December 31, 2022, the fossil fuel tax expenditures described here are not subject to a sunset provision.

The provision specifically allows independent oil companies to expense all of their intangible drilling costs, while integrated oil companies can expense up to 70 percent of these costs and must depreciate the balance over five years. This skews investment in oil and gas development away from integrated oil firms and toward independent oil companies, although there is no public policy rationale for orienting development to one type of oil firm over another.

Since 1926, firms have had the choice of using cost depletion—writing off the initial costs of acquiring an oil and gas field over that field's production lifetime—or percentage depletion—deducting a percentage of revenues from oil and gas sales—to reduce their tax liabilities. While the former is consistent with standard depreciation practices for other industries, the latter may have little to no relationship to actual project costs because revenues reflect crude oil prices, which are driven by the oil market. When firms choose percentage depletion—which is more generous to oil and gas producers when oil prices are high, due to higher revenues—they enjoy a subsidy relative to standard tax depreciation rules.

The percentage depletion tax provision also disproportionately benefits smaller firms. The oil and gas firms producing less than 1,000 barrels per day may deduct a percentage of their revenues, while firms with larger volumes must deduct the capital cost of the wells. Indeed, with high oil prices, small firms may be able to claim deductions through percentage depletion over the life of a well that significantly exceed the capital cost of the well. In contrast to some oil tax expenditures that phase out with higher oil prices, such as the credit for enhanced oil recovery projects, the effective subsidy from percentage depletion increases as oil prices rise. This also lowers the effective tax rate on these projects and skews investment away from non-oil and gas capital projects and oil and gas development by larger and integrated firms.

In 2002, a World Trade Organization ruling found that US tax law effectively subsidized manufacturing exports and thus violated the international agreement regarding trade and subsidies. As a result, Congress struck the WTO-illegal tax provision and replaced it with a domestic manufacturing tax deduction. While oil and gas development are not part of the manufacturing sector, Congress determined that these activities could also claim the manufacturing tax deduction. This provision permits oil and gas producers to claim a 6 percent deduction and a related provision allows coal producers to claim a 9 percent deduction of taxable income. Like the other subsidies, this provision provides a lower rate on a favored source of income.

The last Obama Administration budget proposal, for FY2017, itemized various tax expenditures that subsidized fossil fuels (Table 1). Their estimate for FY2017 is that these tax expenditures would result in nearly $37 billion in foregone revenues over ten years. While the composition of the subsidies has evolved since 2017, due to changes in tax law and energy markets, the overall magnitude of U.S. fossil fuel production subsidies in the tax code has not changed. Specifically, the Made in America Tax Plan fact sheet indicates that the Treasury Department Office of Tax Analysis estimates that eliminating fossil fuel tax expenditures "would increase government tax receipts by over $35 billion in the coming decade" (U.S. Department of the Treasury 2021). I would expect the upcoming Biden Administration budget proposal to itemize these tax expenditures.

Table 1. Provisions of the U.S. Tax Code that Subsidize Fossil Fuel Extraction, 2016 Estimates

| Tax Provision | 10-Year Revenue Score (billions) |
|---|---|
| Expensing intangible drilling costs | $10.0 |
| Domestic manufacturing tax deduction for oil and gas | $9.1 |
| Enhanced oil recovery credit | $8.8 |
| Percentage depletion for oil and gas wells | $5.0 |
| Increase geological and geophysical expenditure amortization for independents | $1.5 |
| Percentage depletion for hard mineral fossil fuels | $1.1 |
| Capital gains treatment for royalties | $0.5 |
| Expensing of coal exploration and development costs | $0.3 |
| Domestic manufacturing tax deduction for coal | $0.2 |
| Deduction for tertiary injectants | $0.1 |
| Exception for passive loss limitations for working interests in oil and gas properties | $0.1 |
| Credit for oil and gas produced from marginal wells | $0 |
| Total | $36.7 |

Notes: The last provision in this table is not expected to have a revenue impact because it phases out at oil prices below the levels expected over the 10-year scoring window.
Source: Summary Tables S-9, FY2017 Administration Budget, Office of Management and Budget.

***Implicit Subsidies in Energy Policy***

U.S. energy policy also provides implicit subsidies through liability rules and federal leasing program implementation. The Oil Pollution Act of 1990 limits the liability for oil spill damages to $75 million, except in cases of gross negligence or the violation of applicable Federal regulations. This liability limit weakens the financial incentive for firms involved in offshore drilling to mitigate the potential harm associated with an accident. Eleven years ago today the *Deepwater Horizon* sank to the bottom of the Gulf of Mexico, and we learned over the course of that spring and summer how the damages—the loss of life, lost shrimping and fishery seasons, declines in tourism, and damage to our beaches, wetlands, and marine ecosystems—could dramatically exceed the $75 million liability limit threshold. Removing the liability limit would provide a stronger financial incentive for improved safety and would also increase the likelihood that liable private firms, as opposed to taxpayers, would compensate those harmed by future spills. Eliminating the liability limit would draw the attention of major shareholders and senior management of firms engaged in offshore drilling to the importance of drilling safety within their company operations and in their business relationships (e.g., among lease operators, rig operators, and various contractors) (Aldy 2011).

The leasing of federal lands for hydrocarbon development may also provide subsidies to producers. For example, Bureau of Land Management lease auctions for coal are not competitive. Over 1990-2014, the BLM conducted 113 lease auctions for coal. 104 of these 113 auctions had only 1 bidder and only 1 auction had more than two bidders. One does not need to work through the extensive economics literature on auction theory to recognize that 1-bidder auctions may not maximize auction revenue for the government. With more than 90 percent of coal auctions comprised of only one bidder, the bidder in any given auction has a strategic interest to submit a bid lower than its valuation of the lease.

## Evaluating Fossil Fuel Production Subsidies

In order to assess fossil fuel production subsidies through the five public policy principles, let me first address the question of whether such subsidies affect production, and hence other measures of policy importance, such as employment and pollution.

### *Do Fossil Fuel Tax Production Subsidies Promote Fossil Fuel Production?*

Empirical evidence on the effect of tax expenditures on oil and gas production is limited. As Chief Economist of the Department of the Treasury, Alan Krueger testified before Congress on the impacts of eliminating fossil fuel tax expenditures in 2009. Krueger (2009) stated that the Treasury Department estimated a less than 0.5 percent decline in domestic oil production (and comparable effect on oil and gas extraction employment) as a result of phasing out these subsidies. He noted that it would have an insignificant impact on oil prices. Krueger pointed out that since small independent firms are the main beneficiaries from these tax expenditures, eliminating these tax expenditures could shift production from independent drilling companies to the large integrated firms that also engage in refining and marketing petroleum products (Krueger 2009).

Allaire and Brown (2009, 2012) and National Research Council (2013) employed the U.S. Energy Information Administration's National Energy Modeling System (NEMS) to estimate the impacts of eliminating oil and gas tax expenditures. Allaire and Brown estimated a reduction in domestic production of 26,000 barrels per day (about 0.2 percent of 2019 production). The NRC focused on the impacts of eliminating percentage depletion for domestic natural gas production and found that in doing so domestic extraction of natural gas would fall by about 0.5 percent.

Some more recent studies suggest the impacts on hydrocarbon production could be modestly larger. For example, Metcalf (2018) develops and calibrates a model that indicates that long-term U.S. oil production would be about 5 percent lower than it would be otherwise. As in other studies, the impact on oil prices estimated in Metcalf (2016) would be negligible—a change of ½ to 1 percent, which at today's oil prices would translate to about 1 penny per gallon of gasoline.

A Bloomberg Government report (Costello 2009) estimated that a repeal of all oil and tax expenditures would not affect larger integrated producers but would reduce drilling by independents. On net, total domestic drilling would fall 3.7 percent in this study. A Wood Mackenzie (2013) report commissioned by the American Petroleum Institute, the oil and gas industry's trade association, estimated that repealing intangible drilling costs expensing would result in 3,300 fewer wells drilled each year (approximately 20 percent of drilling activity in 2012). In neither study are the methods and data sufficiently transparent to permit a replication or proper description here. Importantly, given the heterogeneity in reserves and

their production, it is not clear how to interpret percentage changes in drilling activity—especially if concentrated in smaller firms—on U.S. production activity.

These are very small changes in production—and infinitesimal changes in prices—for an industry that has undergone dramatic transformation in the United States since our post-World War II trough in oil production in 2008. Every year since 2008, the annual spot price of crude oil has been lower than the nearly $100 per barrel experienced in that year. By 2019, the crude oil price was 42 percent below the 2008 level. U.S. oil production, however, was 144 percent higher in 2019 than 2008. The annual spot price of natural gas fell more than 70 percent between 2008 and 2019, while U.S. natural gas production increased 59 percent during that time period.[4] The technological transformation of oil and gas extraction has dramatically greater impacts on production than any changes in the tax code.

Erickson et al. (2017) have estimated larger impacts of U.S. fossil fuel subsidies on production. As their paper carefully emphasizes, the impact of subsidies depends critically on the market price for crude oil, and there are high and low oil-price scenarios in their analysis which show negligible impacts of subsidies on production.

***Do Fossil Fuel Production Subsidies Correct Market Failures?***

No, fossil fuel production subsidies do not correct market failures. The subsidies listed in Table 1 do not focus on innovative or pollution-reducing activities. The limited liability for damages associated with offshore drilling does not promote innovation or reduce pollution. The implicit subsidy in hydrocarbon leasing does not address innovation or pollution.

Indeed, if these subsidies have any positive impact on production and subsequently overall consumption of hydrocarbons, they make worse already quite severe pollution externalities. If these tax expenditures increase oil and coal production, then emissions of fine particulates that contribute to premature mortality and of carbon dioxide that contribute to climate change could increase (Erickson et al. 2017). Potentially increasing socially harmful externalities would illustrate how fossil fuel tax expenditures are a government failure on a second dimension.

Consider the case of coal. The monetized damages from coal combustion—when we estimate how much people would be willing to pay to avoid dying prematurely from exposure to particulate matter and when we estimate the damages associated with carbon dioxide emissions—are greater than the value-added of coal-fired electricity generation in the United States (Muller et al 2011). Indeed, in their 2011 analysis, Muller et al. found that these monetized damages could be five times as great as the value of coal in energy markets as a source of electricity. Given more recent scholarship on the damages of climate change, this factor would likely be higher today.

Consider the case of crude oil. The average spot price for crude oil last year was about $39 per barrel. Accounting for some of the latest insights in climate damage research, Carleton and Greenstone (2021) recommend a measure for monetizing these damages that would have been effectively equal to the price of oil last year. If a subsidy increased production of oil by 1 barrel last year, then the economic

[4] All statistics in this paragraph are based on U.S. Energy Information Administration annual spot price and annual U.S. production data available at www.eia.gov. Given the COVID-19 macroeconomic shock in 2020, I have focused on the 2019 data here. The 2020 data show even lower spot prices for oil and gas, about 8 percent lower crude oil production and approximately level natural gas production in comparison with 2019.

benefit of that barrel to the consumers of petroleum products would have been offset completely by the costs of climate change.

While one may claim that the modest impacts of subsidies on production create jobs, it is important to take a comprehensive perspective on labor market impacts. The gross job creation in one industry often draws jobs from other industries, and thus the subsidies for investment in fossil fuels may offset employment gains in other industries. Moreover, the impact of fossil fuel production on labor markets should account for the adverse impacts fossil fuel combustion has on labor productivity. Recent scholarship has shown how exposure to ambient ozone concentrations—even at levels below the current federal air quality standard—reduces the productivity of agricultural workers (Graff Zivin and Neidell 2012). Moreover, exposure to more days at higher temperatures has resulted in workers reducing their hours of work in the U.S. labor market (Graff Zivin and Neidell 2014). Higher temperatures also adversely affect student performance in schools, and thus could inhibit long-term labor productivity improvements (Park 2021; Park et al. 2020).

***Are Fossil Fuel Tax Production Subsidies Cost-Effective?***

Since these tax expenditures do not remedy market failures, by definition they cannot be a cost-effective approach to correcting market failures. In addition, given the very small impacts on production, they would appear to be a costly way to increase production. Between 2008 and 2016, U.S. oil production increased more than 75 percent. This is not because of any changes in these tax expenditures (there were no changes to these tax provisions during this time) but is a result of the innovation in the industry driving down extraction costs and higher oil prices than what we experienced in the 1990s and 2000s. Based on the Allaire and Brown analysis, the government may be spending billions of dollars per year for about 26,000 barrels per day. If an oil company spent that much money for such a small amount of production, it would go out of business.

***Do Fossil Fuel Production Subsidies Contribute to Fairness and Justice?***

No, fossil fuel production subsidies work counter to principles of fairness and justice. These subsidies treat the same kind of investment—drilling an oil and gas well—differently depending on the characteristics of the taxpayer. To the extent that these subsidies do not meaningfully influence production, then they are simply an increase in profits to the owners of oil, gas, and coal companies. This would simply represent a transfer from taxpayers—who have to make up for tax expenditures through higher taxes elsewhere in the economy—to the disproportionately wealthy owners of equity in these companies. To the extent that these subsidies influence production and consumption of fossil fuels, then low-income and minority communities that bear both disproportionate risks of exposure to the pollution arising from fossil fuel combustion and disproportionate risks from a changing climate would be made worse off.

***Do Fossil Fuel Subsidies Enhance International Leadership?***

No, fossil fuel production subsidies undermine our nation's international leadership. Eliminating these subsidies could enable the U.S. government to leverage reforms of fuel pricing in countries around the world. At the 2009 Pittsburgh G-20 summit, the United States spearheaded an agreement among the leaders of the twenty largest developed and developing economies to phase out fossil fuel subsidies. While this agreement received attention at G-20 meetings through 2016, including formal peer review processes, the progress in delivering on this objective has been mixed. This includes the fact that

Congress has failed to act on proposals to eliminate fossil fuel tax expenditures. Leadership via the action of eliminating these subsidies would empower the United States to encourage other large developed and developing economies to reduce their subsidies (Aldy 2015). Eliminating fossil fuel subsidies in the developing world—which typically support consumption through lower-than-market prices—would yield significant economic, energy, and environmental benefits. Global carbon dioxide emissions contributing to climate change could fall by 10 percent through a policy that would, on net, increase economic output by removing costly distortions in developing economies (Aldy 2014, 2015).

***Are There Opportunities for Review and Reform of Fossil Fuel Production Subsidies?***

In contrast to many energy tax provisions—such as the production tax credit for wind power and investment tax credit for solar power—fossil fuel tax expenditures do not have a sunset provision. They are a part of the tax code until Congress takes action to change them. Sunset provisions create milestones that can motivate evaluation of the effectiveness of policy. These provisions leverage the democratic process so that the case can be made for continuing, reforming, or eliminating the policy intervention. A modest reform would be to include sunset provisions on these tax expenditures in order to motivate such a debate over their merits.

As noted previously, there is much less rigorous review of the impacts of tax provisions intended to address market failures than for regulatory interventions in the federal government. Given the expertise in the Federal government, for example at the Congressional Budget Office and the Energy Information Administration, it would benefit the public debate about energy policy to task these experts to evaluate the impacts of these fossil fuel production subsidies. As agencies develop learning agendas under the Foundations for Evidence-Based Policymaking Act, there may be opportunities to synthesize cross-department expertise—such as among the Department of Energy, Department of the Interior, Department of Treasury, and the Environmental Protection Agency—to evaluate such policies.

For that matter, such review and analysis could address more broadly energy and climate policy. Such an analysis could address an array of important questions: What are the incremental impacts of a given policy instrument on production? What are the incremental impacts of multiple, overlapping policies? What impacts do policies have on energy prices? What are the distributional impacts of energy and climate policies? What effects do these instruments have on innovation and the production of knowledge? What are the impacts of the energy and climate policies on air pollution, such as fine particulate matter and carbon dioxide? How do tax expenditures interact with other policy instruments, such as spending and regulations, to affect markets, consumers, and pollution? Rigorous, independent analysis of these questions could substantially improve the policy debate about energy and climate policy.

## Conclusions

In light of this analysis, I have previously proposed eliminating fossil fuel subsidies on several occasions (Aldy 2011, 2013, 2014). I recognize that the political economy of reforming these subsidies is more complicated than evident in an analysis of how they reduce social welfare. As the University of Chicago economist George Stigler noted in his seminal paper on how industry captures the benefits of government intervention: “The most obvious contribution that a group may seek of the government is a direct subsidy of money” (Stigler 1971, p. 4). Once firms have secured such subsidies, especially those

narrowly tailored to their activities, then they have a strong vested interest in the continuation of these subsidies.

Some recipients of these subsidies may dispute that they are in fact subsidies. While this cannot be squared with how the tax code preferentially favors investment in fossil fuel projects relative to other industries, there is an active debate about the definition of fossil fuel subsidies. For example, the International Monetary Fund employs two definitions of fossil fuel subsidies. The first definition is in line with what I have described above. The second definition, however, includes the fact that we fail to fully account for the adverse impacts of pollution from fossil fuel combustion on premature mortality and climate change. On this measure, the U.S. fossil fuel subsidies are several orders of magnitude larger than what is reported in Table 1 and represent the largest fossil fuel subsidies of any country in the world (IMF 2015; Aldy 2015). The economic incidence of the failure to tax fossil fuels for their environmental impacts is such that this may be much more generous to oil, gas, and coal companies than the direct benefit of tax expenditures (Kotchen 2021). Such an approach would be consistent with a general policy objective—regardless of whether it is implemented through a tax instrument or regulation or alternative policy approach—to appropriately price the pollution costs of energy production and use (Greenstone and Looney 2012; Jorgenson 2012).

There are effectively three ways to correct the fundamental externalities in our energy system today: we can subsidize zero-polluting energy alternatives to fossil fuels (e.g., the investment tax credit for solar power), we can prescribe regulations to reduce emissions (e.g., tailpipe carbon dioxide emission standards), or we can tax fossil fuel energy (e.g., through a carbon tax or implicitly through a clean electricity standard or cap-and-trade program). In other words, we can either lower the price of non-fossil energy through subsidies or raise the price of fossil fuel energy through regulations, taxes, or emission markets.

Given the scale of the climate crisis—and the need to transform the energy foundation of the modern economy—I continue to believe that economy-wide approaches to pricing carbon will be a critical component of any successful climate policy program. Pricing pollution in the tax code could generate the revenues that would enable us to address the most pressing distributional concerns in energy and climate policy (Morris 2013; Taylor 2015; Aldy 2016). Such policies could be implemented in a way that clearly corrects an externality, does so cost-effectively, and could enable review and reform over time (Aldy 2020). Revenues could be targeted in ways to ensure that the net effect of the policy is progressive. And it would enable the United States to demonstrate serious action on climate change that would enable our government to leverage more ambitious actions by our partners around the world.

This would represent a significant improvement over a status quo in which we spend money on tax expenditures that do not increase social welfare and impose real opportunity costs on society by requiring higher taxes elsewhere in the economy. Evidence-based reform of energy and climate policy could increase returns to the American taxpayer and make the whole of American society better off.

**References**


Aldy, Joseph E. 2011. Real-time Economic Analysis and Policy Development During the BP *Deepwater Horizon* Oil Spill. *Vanderbilt Law Review* 64(6): 1795-1817.

Aldy, Joseph E. 2013. Eliminating Fossil Fuel Subsidies. In: *15 Ways to Rethink the Federal Budget*, Michael Greenstone, Max Harris, Karen Li, Adam Looney, and Jeremy Patashnik, eds. Washington, DC: The Hamilton Project, Brookings Institution.

Aldy, Joseph E. 2014. Money for Nothing: The Case for Eliminating U.S. Fossil Fuel Subsidies. *Resources* 186: 32-37. http://www.rff.org/research/publications/money-nothing-case-eliminating-us-fossil-fuel-subsidies

Aldy, Joseph E. 2015. Policy Surveillance in the G20 Fossil Fuel Subsidies Agreement: Lessons for Climate Policy. *Climatic Change* doi:10.1007/s10584-015-1505-0.

Aldy, Joseph E. 2016. Long-term Climate Policy: The Great Swap. Report prepared for the Progressive Policy Institute. Washington, DC: Progressive Policy Institute. http://www.progressivepolicy.org/wp-content/uploads/2016/11/The-Great-Swap.pdf

Aldy, Joseph E. 2017. Testimony on "Federal Energy Related Tax Policy and Its Effects on Markets, Prices, and Consumers," Hearing of the Subcommittee on Energy, United States House Committee on Energy and Commerce, March 29, 2017.

Aldy, Joseph E. 2020. Carbon Tax Review and Updating: Carbon Tax Review and Updating: Institutionalizing an Act-Learn-Act Approach to U.S. Climate Policy. *Review of Environmental Economics and Policy* 14(1): 76-94.

Allaire, Maura, and Stephen Brown. 2009. Eliminating Subsidies for Fossil Fuel Production: Implications for U.S. Oil and Natural Gas Markets. Issue Brief 09-10. Resources for the Future, Washington, DC.

Allaire, Maura, and Stephen Brown. 2012. U.S. Energy Subsidies: Effects on Energy Markets and Carbon Dioxide Emissions. Prepared for The Pew Charitable Trusts, Philadelphia.

Carleton, Tamma, and Michael Greenstone. 2021. Updating the United States Government's Social Cost of Carbon. *University of Chicago, Becker Friedman Institute for Economics Working Paper* 2021-04.

Costello, Tony. 2011. Eliminating Oil and Gas Company Tax Breaks: Independent Producers Face a Funding Gap. Bloomberg Government Study, June 10.

Erickson, Peter, Adrian Down, Michael Lazarus, and Doug Koplow. 2017. Effect of Subsidies to Fossil Fuel Companies on United States Crude Oil Production. *Nature Energy* 2: 891-898.

Graff Zivin, Joshua, and Matthew Neidell. 2012. The Impact of Pollution on Worker Productivity. *American Economic Review* 102(7): 3652-73.

Graff Zivin, Joshua and Matthew Neidell. 2014. Temperature and the allocation of time: Implications for climate change. *Journal of Labor Economics* 32(1): 1-26.

Greenstone, Michael and Adam Looney. 2012. Paying Too Much for Energy? The True Costs of our Energy Sources. Daedalus 141(2): 10-30.

International Monetary Fund. 2015. Counting the Cost of Energy Subsidies. Washington, DC: IMF. http://www.imf.org/external/pubs/ft/survey/so/2015/new070215a.htm

Jorgenson, Dale W. 2012. Comprehensive Tax Reform and U.S. Energy Policy. Testimony before the U.S. Senate Finance Committee. http://scholar.harvard.edu/files/jorgenson/files/34_senatefinancecommittee4_6-12-2012.pdf

Kotchen, Matthew J. 2021. The Producer Benefits of Implicit Fossil Fuel Subsidies in the United States. *Proceedings of the National Academy of Sciences* 118(14): e2011969118.

Krueger, Alan B. 2009. Statement of Alan Krueger, Assistant Secretary for Economic Policy, Department of the Treasury, Senate Subcommittee on Energy, Natural Resources, and Infrastructure.

Metcalf, G. E. 2018. The Impact of Removing Tax Preferences for U.S. Oil and Natural Gas Production: Measuring Tax Subsidies by an Equivalent Price Impact Approach. *Journal of the Association of Environmental and Resource Economists 5*(1): 1-37.

Morris, Adele. 2013. The Many Benefits of a Carbon Tax. In: *15 Ways to Rethink the Federal Budget*, Michael Greenstone, Max Harris, Karen Li, Adam Looney, and Jeremy Patashnik, eds. Washington, DC: The Hamilton Project, Brookings Institution.

National Research Council. 2013. Effects of U.S. Tax Policy on Greenhouse Gas Emissions. Report of the Committee on Effects of Provisions in the Internal Revenue Code on Greenhouse Gas Emissions. Washington: National Academies Press.

Office of Management and Budget. 2016. Fiscal Year 2017 Analytical Perspectives of the U.S. Government. Washington, DC: The White House.

Park, R. Jisung. 2021. Hot Temperature and High Stakes Performance. *Journal of Human Resources,* forthcoming.

Park, R. Jisung, Joshua Goodman, Michael Hurwitz, and Jonathan Smith. 2020. Heat and Learning. *American Economic Journal: Economic Policy*, 12(2): 306-339.

Rentschler, Jun and Morgan Bazilian. 2017) Policy Monitor—Principles for Designing Effective Fossil Fuel Subsidy Reforms. *Review of Environmental Economics and Policy 11*(1): 138-155.

Stigler, George. 1971. The Theory of Regulation. Bell Journal of Economics and Management Science 2(1): 3-21.

Taylor, Jerry. 2015. The Conservative Case for a Carbon Tax. Niskanen Center Working Paper, March 23. https://niskanencenter.org/wp-content/uploads/2015/03/The-Conservative-Case-for-a-Carbon-Tax1.pdf

U.S. Department of the Treasury. 2021. The Made in America Tax Plan. https://home.treasury.gov/system/files/136/MadeInAmericaTaxPlan_Report.pdf

Wood Mackenzie. 2013. Impacts of Delaying IDC Deductibility (2014-2025). Prepared for API. www.api.org/~/media/Files/Policy/Taxes/13-July/API-US-IDC-Delay-Impacts-Release-7-11-13.pdf.

Joseph E. Aldy Bio

Joseph E. Aldy is a Professor of the Practice of Public Policy at the Harvard Kennedy School, a University Fellow at Resources for the Future, a Faculty Research Fellow at the National Bureau of Economic Research, and a Senior Adviser at the Center for Strategic and International Studies. His research focuses on climate change policy, energy policy, and regulatory policy. He also serves as the Faculty Chair of the Mossavar-Rahmani Center for Business and Government Regulatory Policy Program. In 2009-2010, he served as the Special Assistant to the President for Energy and Environment at the White House. Aldy previously served as a Fellow at Resources for the Future, Co-Director of the Harvard Project on International Climate Agreements, Co-Director of the International Energy Workshop, and worked on the staff of the President's Council of Economic Advisers. He earned his doctorate in economics from Harvard University and MEM and bachelor's degrees from Duke University.