Policy Brief

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Supporting Low-Carbon Energy Through a New Generation of Tax Credits

By Gilbert E. Metcalf | *September 2021*

This policy brief describes opportunities for Congress and the Biden Administration to refine existing mechanisms for cost-effective, sustainable, and economically beneficial deployment of low-carbon energy technologies.

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Despite record heat waves, forest fires, droughts, and floods that the United States has experienced in the past few months, the current polarization in the U.S. Congress has dampened the prospect that comprehensive climate legislation will be enacted this session. The most likely candidate for substantive, bilateral Congressional action is support for expanding the scope of clean energy tax credits. Energy-related tax credits, the two most significant being the investment tax credit (ITC) and the production tax credit (PTC) in the electricity sector, have historically garnered bipartisan support.[1] Senate Finance Committee Chair Ron Wyden (D-OR) introduced the Clean Energy for America Act (S. 2118) in June 2021. S. 2118 would consolidate the more than 40 credits to 3 credits — for clean electricity, clean transportation, and energy efficient buildings.[2] The Biden Administration has also included a number of changes and additions to the set of clean energy tax incentives as detailed in the American Jobs Plan. Among other things, the Administration proposes to expand investment tax credits for energy storage and transmission grid upgrades, as well as to expand credits for nuclear power, electric vehicles, and low-carbon hydrogen.[3] At the same time, the Administration has stated it aims to increase transparency of equity into Federal outlays and integrate equity into federal agencies' evaluation of financial performance and risk.[4]

Historically, tax credits have been an important source of support for energy activities in the United States.[5] Figure 1 shows federal energy-related support in 4 categories for the years 2010, 2013, and 2016, based on an analysis by the U.S. Energy Information Administration (2018). Federal support peaked in 2010 at $38 billion due to the temporary provisions of the American Recovery and Reinvestment Act. As the figure shows, tax credits have been an important instrument for delivering support for energy-related investment and production. In 2016, tax credits accounted for 59 percent of all support at $8.8 billion. Nearly 90 percent of the energy-related tax credits went to renewables, end use activities, and energy conservation. These latter activities include credits for residential energy efficiency investments and clean-burning vehicles, for the most part.[6]

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1 Metcalf (2007) provides a history and assessment of various energy related tax provisions.

2 This description comes from a Senate Finance Committee press release, dated April 21, 2021.

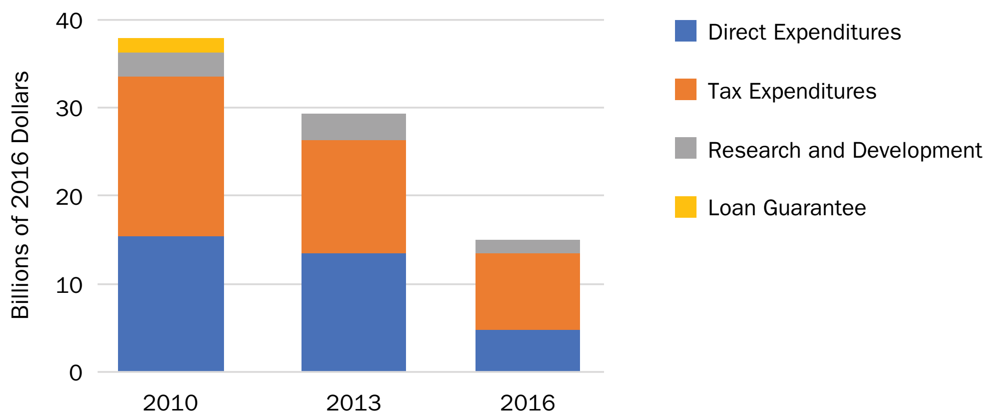
3 While no legislation has yet been filed for the American Jobs Plan, a White House fact sheet provides considerable detail as does the Department of the Treasury (2021) description of its FY2022 revenue proposals (the Treasury Greenbook).

4 See the update provided by the White House August 6, 2021.

5 This brief focuses on federal tax credits. Many states also have various tax credits for zero carbon technologies. Over half the states also have Renewable Portfolio Standard Programs which subsidize zero carbon electricity generation.

6 Calculations from Tables 3 and 10 of the EIA report. In calculating the percentage share, I omitted data for natural gas and petroleum liquids. The tax expenditure for this category is negative reflecting earlier tax credits that have shifted tax liability into the future and which now lead to higher taxes in 2016. See Metcalf (2018) for a discussion of the limitations of using tax expenditures as an estimate of the subsidy value to firms.

Figure 1. Federal Energy-Specific Subsidies and Support



Source: U.S. Energy Information Administration (2018)

In 2016 the top four tax credits were the biodiesel production tax credit at $2.6 billion, the credit for residential energy efficient property (sec. 25D) at $1.4 billion, the renewable energy production credit (sec. 45) at $1.4 billion, and the renewable energy investment credit (sec. 48) at $1.2 billion. These numbers have shifted over time. In FY 2020, the top four tax credits were the renewable energy investment credit (sec. 48) at $4.5 billion, the renewable energy production credit (sec. 45) at $4.3 billion, residential energy efficient property (sec. 25D) at $1.7 billion, and the expensing of exploration and development costs for fossil fuels at $1.0 billion.

This policy brief highlights problems with tax credits that are only partially addressed by S. 2118. It puts forward possible changes to the legislation that would sharpen its focus and make it a more cost-effective instrument for reducing our greenhouse gas emissions. This brief does not address the broader concerns with tax credits raised by Metcalf (2009). In that analysis, I point out the drawbacks of tax credits for zero-carbon energy sources relative to putting a price on carbon pollution, whether through a carbon tax or cap and trade system. A carbon price uses the power of the market to ensure emissions are reduced at the lowest economic cost to society. Tax credits, in contrast, are inefficient in providing subsidies for actions that would have been taken anyway (so-called inframarginal investments) and can lead to investments in emission reductions with high marginal costs of abatement even though low marginal abatement cost opportunities are available but not incentivized by policy.

Having said that, this brief starts from the premise that carbon pricing is not likely at the national level in the next few years and needs significantly more bipartisan political will and more widespread public advocacy to be a future possibility. When limiting attention to politically feasible policies, clean energy tax credits look decidedly more attractive.

BACKGROUND

The federal tax code has been used to incentivize clean energy investment and production starting with the Energy Tax Act of 1978 (PL 95-618). This act created the Section 48 investment tax credit (ITC) and initially provided a temporary 10 percent tax credit for energy investments (other than oil and natural gas) and was made refundable for solar and wind projects (refundability ended with the Windfall Profit Tax Act of 1980 (PL 96-223)). The credit was increased over time to 30 percent with eligibility expanded to other energy sources. Eligibility for wind projects lapsed with the Tax Reform Act of 1986 (PL 99-514).[7] Production tax credits were introduced in the Energy Policy Act of 1992 (PL 102-486) for a number of energy sources, most importantly for wind. The 1.5 cent per kWh tax credit was made available for electricity generation over the first 10 years of operation. The PTC is indexed for inflation and currently is set at 2.5 cents per kWh. Muehlegger (2021) summarizes the evidence on the effectiveness of energy-related tax credits. He argues that consumer-focused tax credits (e.g. tax credits

7 See Congressional Research Service (2021) for a more detailed history of energy-related investment tax credit policy.

for EV or PHEV car purchases) have been effective at increasing adoption rates, whereas the evidence for commercial focused tax credits varies with the technology. Whether tax credits are effective at encouraging greater rates of product innovation is less clear given the limited empirical research.[8]

More research has been done analyzing who benefits from these tax code subsidies. As detailed by Muehlegger, the evidence suggests consumers receive most of the benefit from consumer-based tax credits and that the credits are disproportionately used by higher income households, both because their higher incomes make them more likely to invest in EVs, PHEVs, and energy efficiency (the major items for which consumer-based tax credits are provided) and because they have the tax liability (appetite) that the tax credits can reduce.

Given the interest both by the Biden Administration through the American Jobs Plan and by the Democratically controlled Congress and Senate Finance Chairman Ron Wyden's Clean Energy for America bill, this is an opportune time to consider how tax credits might be improved and more sharply focused on the market failures they are meant to address.

PROBLEMS WITH TAX CREDITS

As mentioned above, clean energy tax credits, along with other forms of subsidies, suffer from a number of problems relative to pricing polluting activities directly (e.g. Metcalf , 2019). Those problems include, among others, providing inframarginal subsidies (subsidies for projects that would have occurred anyway) that lower the price of energy and so close off a demand response channel to reducing energy related pollution. Conditional on using tax credits as a policy instrument to address energy related carbon pollution, the existing suite of credits suffer from three major problems: policy durability, leakage of funding to the agents making the energy investments, and poor relationship of the credit size to the underlying externality.

Policy durability has historically been a significant problem with both the Section 45 production and Section 48 investment tax credits. These programs have been subject to lapsed authorization and threatened sunsetting of the programs numerous times over the years. This policy uncertainty affects long term planning for energy projects, a particular problem for developers who need to make investment decisions taking into account tax provisions well into the future. It can also lead to boom and bust investment cycles that can raise the costs of investments due to bottlenecks during booms and bankrupted firms during busts. Metcalf (2010) documents the impact of unexpected lapses in the production tax credit over the years and its negative impact on wind investment.[9]

A second problem is that tax credits often cannot be fully utilized by potential project developers. For either the production or investment tax credit, a developer must have sufficient tax burden against which to offset the tax credit.[10] This incentivizes project developers to partner with firms with sufficient tax obligations to utilize the tax credits. Developers receive cash infusions in return for giving up the tax credits to a partner who can best utilize them. But the tradeoff comes at a cost. Investors providing cash in exchange for tax credits want a return on their investment, reducing the amount that directly supports project developers. Thus, for firms, project cash flow-based grants or payments can be more valuable than tax credits. An analysis of wind projects benefitting either from cash grants as part of the 2009 American Recovery and Reinvestment Act or production tax credits found that developers on average valued 85 cents in grant funding as much as a dollar of PTC (Johnston, 2019).

The third significant problem is that tax credits may not be well aligned with the underlying market failure that called for government involvement in the first place. There are two significant market

8 Gerarden (2018) provides suggestive evidence that consumer subsidies for solar panels increased global demand and encouraged product innovation to reduce costs.

9 Frazier et al. (2019) model how a planned phase out of the PTC and ITC would affect investment. While important, the focus here is on unexpected lapses in programmatic authority.

10 Unused tax credits can be carried forward for as many as 20 years. But the time value of money erodes the value of the credit.

failures: early adoption risk and pollution. Developers may be hesitant to invest in new technologies given the uncertainty about the technology's performance and integration with the rest of the energy system. Early adoption does provide information about the technology, but it is difficult for early adopters to fully appropriate the innovation knowledge solely for themselves and thereby reap sustained related financial gains during their early entry into the market. That is because free riding on that use of the innovation knowledge by competitors reduces the period of financial benefits of innovation. Overall, as learning curve advantages shrink, it discourages innovation and leads to less new technology adoption taking place than is optimal. An investment tax credit can help overcome this hesitation to invest in new frontier technology. Because the extensive margin (whether to invest in a project) matters more for new technology risk than the intensive margin (how much that project will be utilized if built), the ITC is likely a better instrument for overcoming this market failure than a PTC.[11]

The pollution market failure reflects the reality that the full costs of burning fossil fuels, the climate damages in particular, are not accounted for in their price. Therefore, we overuse these climate damaging fuels and overinvest in capital propelling the continuation of their production. The classic economic prescription is to price the pollution so that market participants make decisions where prices reflect the full social costs of their actions.[12] But, as noted above, political opposition to carbon pricing means we must turn to alternative policies. If we cannot raise the price of carbon emitting energy, we can lower the price of zero-carbon energy. Either way helps to level the playing field between carbon emitting and zero-emission sources. Clean energy production tax credits are a way to lower the price of using clean energy sources and so incentivize higher utilization rates for preferred, cleaner fuels.

A fourth issue is one of energy justice. As alluded to above, tax credits are inherently regressive. In part this is because credits can only be used if taxpayers have tax liability against which to offset the credits. This skews credits to higher income households. In addition, many of the investments for which personal income tax credits can be taken tend to be investments more likely to be made by higher income households. Hybrid cars are disproportionately purchased by higher income households. Homeowning – a necessity for utilizing residential energy efficiency tax credits — rises with income. Energy justice considerations transcend pure income distributional considerations. Sunter et al. (2019) document disparities in rooftop solar PV investments, investments that are eligible for a 30 percent federal tax credit, between black and Hispanic households relative to white households, even after controlling for income and home ownership status.

Given these problems, tax credit policy reform should be directed towards:

- Reducing policy uncertainty to send strong and consistent signals to investors making long-lived energy investments requiring long planning lead times;
- Providing cash grant alternatives to tax credits wherever possible to maximize the amount of federal support going to project developers and allow firms with smaller tax liabilities to benefit;
- Focusing investment tax credits and other purchase subsidies to early-stage (or nascent) technologies to overcome new-technology investment risks;
- Setting production tax credits and other usage-based subsidies at levels consistent with the unpriced damages from competing polluting technologies; and
- Identifying and removing barriers to investments by underrepresented groups in energy technologies for which tax credits are available.

The next section discusses some possible changes to tax credit design to address these issues.

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11 Research and development funding support may also help overcome this hurdle. A companion policy brief by Gallagher and Nemet (2021) addresses this issue. Aldy et al. (2018) find that the ITC only modestly leads to more investment when the American Recovery and Reinvestment Act of 2009 allowed wind projects to substitute an ITC (or cash grant) for the PTC. The window for wind projects to utilize an ITC (or cash grant) was limited in duration and developers likely did not have time to fully react to the investment incentive.

12 Economists refer to this as a Pigouvian remedy as the early 20th century British economist Arthur C. Pigou first proposed this policy approach in his 1920 book, *The Economics of Welfare*.

POSSIBLE REFORMS

Investment tax credits with broader appeal and clearly defined targets and phase-outs
Policy consistency is essential for clean energy investments given the long-lived nature of those investments and the long planning horizons needed before construction begins. S. 2118 addresses this problem by authorizing the consolidated clean energy tax credits until clearly specified targets are met. For clean electricity credits, the credits fully phase out four years after emissions from the electricity sector fall by 75 percent relative to 2019 levels. For EVs, the target is EV sales equaling 50 percent of new vehicle sales. Clearly specified targets certainly contribute to policy consistency.[13]

As noted above, early technology market failures that deter investments in clean energy can be best addressed with an investment tax credit. The credit either should be refundable or provided as a cash grant to avoid diluting the value of the government subsidy for developers with limited tax appetite. Once a sufficient number of projects using this new technology have been implemented, the ITC should phase out. The Clean Energy for America phase-out of the EV subsidy is a good example of a clearly delineated target for ending the subsidy.

Production tax credits tied to the Social Cost of Carbon
Once the new technology market failure is overcome, an unequal playing field still exists since fossil fuel capital does not bear the cost of its carbon pollution. If pricing carbon pollution is not possible, subsidizing clean energy is an alternative way of leveling the playing field. The current production tax credits for wind and other Section 45 technologies were set at 1.5 cents per kWh in the 1992 legislation and inflation adjusted to maintain their real value over time. The current PTC rate is 2.5 cents per kWh. This rate does not directly reflect the value of displacing fossil fuel generation. The rate would do a better job of leveling the playing field if it were tied to the official Social Cost of Carbon (SCC) estimates (currently $51 per ton for carbon dioxide emissions in 2020). One way to do that would be to provide a subsidy equal to the current year SCC times carbon dioxide emissions from electric generating plants divided by total electricity generation in the year. Given electricity-related emissions and generation in 2019 (the most current year for which data are available), the PTC rate for zero-carbon electricity would be 2.3 cents per KWh. Under this revised approach, the PTC would be available for the life of the project (rather than 10 years), but the rate would be adjusted periodically as the emissions per kWh rate changed as well as the official SCC number is updated. As the electricity sector moves to full decarbonization, the PTC rate would go to zero. As with the ITC, there should be an option to receive a cash payment in lieu of the production tax credit to address tax appetite concerns. Such an approach could also be taken with some consumer-focused subsidies.

Balancing eligibility for both investment tax credit and production tax credit
Perhaps the most significant departure from current law in our recommendations would be to allow projects to receive both the ITC and the PTC. The ITC addresses the innovation market failure while the PTC addresses the pollution market failure. But allowing both credits on the same project risks providing overly generous benefits to projects. To address this, the phase out for the new technology ITC should be fairly short—much shorter than the current phase-outs for EVs and PHEVs as well as the phase outs put forward in S. 2118. If a capacity threshold of 3 percent for electric generation investment were set, for example, the ITC for wind would have phased out in 2009 and for utility-scale solar photovoltaics in 2019.[14]

Address environmental justice barriers to renewable investments and use of federal incentives
As noted above, there are legitimate environmental justice concerns that many consumer-targeted clean energy tax credits are regressive and disproportionately taken up by non-minority households (also see the summaries in Metcalf, 2019 and Muehlegger, 2021). S. 2118 does little to address

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13 Credibility matters as well. Congress can set clear targets but then change them in the future. Nothing prevents Congress from changing policy and so undermining policy certainty, but it should be mindful of the potential effects of this policy uncertainty on incentives to invest in long-lived energy capital.

14 S. 2118 provides for a ten percent increase in the production tax credit for "nascent technologies," defined as technologies with a market penetration rate of less than 3 percent.

environmental justice issues beyond putting a cap ($80,000) on the purchase price of vehicles eligible for the EV tax credit. Consumer-focused energy tax credits (e.g. home improvement credits) could include a multiplier to increase benefits for lower income households. Perhaps, more important, tax credits for individuals could be made refundable (possibly subject to an income limit) or converted to an instant rebate to address liquidity issues. The Department of Energy, perhaps in conjunction with the Department of the Treasury, could initiate a high-level study to identify and suggest solutions to market barriers that have led to disproportionately low rates of investment by underrepresented groups even after controlling for income and home ownership status. There may be limits, however, to how much can be done on this front. Many of the personal technologies (high efficiency heat pumps and hybrid vehicles) may simply be more appealing to higher income households and efforts to diffuse purchases across the income spectrum, for example, may hinder overall deployment rates which can be critical to bringing prices down and fostering broader consumer acceptability.

CONCLUSION

Some of the ideas described above are already contained in both Biden Administration proposals as well as Democratic legislation in Congress. We urge policy makers to consider these critical elements to the legislation and to ensure they do not get discarded as legislation advances. Meanwhile, lawmakers should consider these other ideas to increase the effectiveness of clean energy tax credits. Adopting these proposals would help reduce policy risk that impedes clean energy investments, would generate more bang for the buck by making the federal dollars go further, and would more clearly link credit levels to the damages from climate change.

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