How Master Limited Partnership (MLP) Eligibility for Renewables, Storage, Energy Efficiency and CCS Projects Will Lower Financing Costs and Cut Carbon Emissions

An Evaluation of the Investment and Carbon Emissions Impact of the Financing Our Energy Future Act (FOEFA) Cosponsored by Senators Coons and Moran

Jeff Brown and Dan Reicher
Stanford University

January 22, 2021

Summary

Last year, the U.S. House of Representative enacted the Financing Our Energy Future Act[1] (FOEFA)[2]. FOEFA would significantly expand the number of equity investors and lower the cost of financing a variety of projects deploying renewable energy, electricity storage, co-generation, energy efficiency, carbon capture and storage (CCS), and low-carbon fuels. More equity investors and lower financing costs will increase the number and pace of such clean energy projects deployed and help cut U.S. carbon emissions significantly.

In this paper we analyze how much additional capital spending FOEFA would stimulate in two important carbon mitigation categories: U.S. wind, solar and electricity storage deployment and CCS deployment at remaining U.S. natural gas and coal-fired power plants.[3] We then estimate the carbon emissions reductions resulting from this investment.

We estimate that FOEFA, if enacted, would increase wind, solar and electricity storage annual capital spending ~$15 billion/ year, with other covered technologies adding significantly more, but being harder to quantify. In rough terms, that increased spending would translate to 20 million annual metric tons (MT)of CO2 reduction capacity added each year. After 5 years of this level of stimulus, 5 years' worth of projects would then be cumulatively reducing CO2 by 100 million MT/yr.[4] To put this in perspective, opening up MLPs to solar, wind and electricity storage projects would result in emissions reductions that are more than 6 percent of total U.S. power plant emissions,[5] or equivalent to the individual carbon emissions of 50 million Americans.[6]

[1] https://www.congress.gov/bill/116th-congress/house-bill/2/text at 2195-2199
[2] FOEFA was formerly titled the MLP Parity Act.
[3] There are twelve categories of clean energy/decarbonization projects/revenues listed in FOEFA. These are two representative examples selected from the longer list.
[4] Calculation: $15 billion would create 15,000 MW/yr at an average wind/solar cost of 1 million per MW. 15,000 MW x 8760 hrs/yr x 30% average capacity factor x 0.5 MT CO2 saved per MWh = 19.7 million MT per year.
[5] Total U.S. power sector emissions of CO2 from electricity generation was 1618 million MT in 2019. https://www.eia.gov/tools/faqs/faq.php?id=77&t=11#:~:text=In%202019%2C%20emissions%20of%20carbon,emissions%20of%205%2C146%20(MMmt).
[6] https://www.sciencedaily.com/releases/2008/04/080428120658.htm

We also estimate that FOEFA would increase CCS capital spending $5 billion/year — assuming continuation and/or improvement of the existing Section 45Q tax credit. The $5 billion/year would not be solely attributable to access to the MLP market. Rather, the existing value of Section 45Q—without FOEFA—falls short of the subsidy needed to trigger a significant number of carbon capture projects at remaining fossil power plants. Adding MLP status to carbon capture projects appears to be just enough help to carry a significant number of projects successfully over the goal line. Each $5 billion per year deployed on power plant CCS would yield on the order of 20 million MT/yr captured. After 5 years of this level of stimulus, 5 years' worth of projects would then be cumulatively reducing CO2 by 100 million MT/yr.[7] To put this in perspective, opening up MLPs to CCS projects would result in emissions reductions that are more than 6 percent of total U.S. power plant emissions[8] or the equivalent to the carbon emissions of 50 million Americans.[9]

Business enterprises that are organized as MLPs merge the *tax benefits* of a traditional *limited partnership* (avoidance of double taxation) with the *liquidity benefits* of a *publicly traded company* (ability to issue and easily trade equity interests on public stock exchanges). Under current law, only partnerships that make money by exploiting non-renewable mineral/energy resources and timber are eligible to be structured as MLPs. FOEFA creates a level playing field by adding income and gains derived from a variety of decarbonization businesses to the statutory list of "qualifying income" types for an MLP.

The full list of new MLP qualifying income types under FOEFA would include revenues from sales of electricity, commodities, or services generated by: renewable electricity generation technologies currently eligible for PTC or §48 ITC; electric and thermal energy storage; combined heat & power and waste heat to power; renewable thermal energy generation; renewable fuels and chemicals production and associated infrastructure; fuels made from captured CO_2; gasification with carbon capture; and electric generation with carbon capture.[10] We refer to these listed project types below as "Decarbonization Projects."

Decarbonization Projects, as with nearly all independently owned infrastructure and energy projects, are typically organized and taxed as partnerships, rather than corporations.[11] However, Decarbonization Projects are now restricted to raising partnership capital from a small pool of institutional investors. FOEFA, by opening up MLPs, would give Decarbonization Projects access to the full universe of individual retail investors, just as oil and gas pipelines have enjoyed since the 1980s, when they were authorized by Congress to form MLPs. As one of us put it in a NY Times op-ed: "There's another benefit to expanding the pool of renewable energy investors: It would help democratize, and thus build support for, these new energy sources. Today, all American taxpayers fund renewable energy subsidies, but only a deep-pocketed few can cash in on the tax benefits. Publicly traded master limited

[7] Calculation: $15 billion would create 15,000 MW/yr at an average wind/solar cost of 1 million per MW. 15,000 MW x 8760 hrs/yr x 30% average capacity factor x 0.5 MT CO2 saved per MWh = 19.7 million MT per year.
[8] Total U.S. power sector emissions of CO2 from electricity generation was 1618 million MT in 2019. https://www.eia.gov/tools/faqs/faq.php?id=77&t=11#:~:text=In%202019%2C%20emissions%20of%20carbon,emissions%20of%205%2C146%20(MMmt).
[9] https://www.sciencedaily.com/releases/2008/04/080428120658.htm
[10] See FOEFA at §2(a)(4) with list running from (ii) to (xiii). https://www.congress.gov/116/bills/s1841/BILLS-116s1841is.pdf
[11] They are organized as partnerships primarily because "flow through" federal partnership tax treatment avoids the double taxation attendant to taxation as a corporation.

partnerships….would empower all Americans to invest and have a stake in the transition to cleaner energy."[12]

Discussion

Usually, a business has to choose between the benefit of being taxed as a partnership and the benefit of being able to access the public equity markets—except if it can qualify as an MLP.

- Ordinarily a *partnership* (including a Limited Liability Corporation or LLC, taxed under Subchapter K of the tax code) has the benefit of not directly paying taxes, instead only creating taxable income (or losses and credits) that are "flowed through" to its partners. However, the downside—*with one exception*—is that such a partnership/LLC cannot sell partnership interests in public stock markets. Selling partnership interests on a stock exchange (like NYSE or NASDAQ) would make the partnership a Publicly Traded Partnership **(PTP)** that the IRS would then tax as a corporation.
- A *corporation* (taxed under Subchapter C of the tax code) suffers from double taxation—once at the corporate level and again on dividends received at the shareholder level. On the plus side, a corporation can issue shares and be publicly traded, giving it broad access to all types of investors, including individuals.
- There is one exception to the rules above: a partnership that gets at least 90% of its gross income from certain qualifying income types *is* allowed to be a PTP, with an MLP being the best-known type of PTP. *An MLP is taxed as a "flow through vehicle", i.e., only one layer of taxation, but is nonetheless also allowed to issue new equity interests that are listed on a public exchange in the manner normally limited to corporations*.

In general, under current federal law, income garnered from exploiting natural resources *is qualifying income* for MLPs, and income generated from electricity sales is *non-qualifying income*. Current law defines *qualifying income* as *"income and gains derived from the exploration, development, mining or production, processing, refining, transportation (including pipelines transporting gas, oil, or products thereof), or the marketing of any mineral or natural resource (including fertilizer, geothermal energy, and timber), industrial source carbon dioxide, or the transportation or storage of [certain types of alternative fuels]."* [13] [14] No type of electricity sales revenue is currently qualifying income for purposes of meeting this 90% test.

Since gross income received from the sale of products and services of Decarbonizaton Projects is not currently qualifying income for an MLP, financing costs for these projects are driven up at two different stages.

- *At inception*, these non-MLP projects must hunt for construction financing from a limited group of corporate and institutional partners, one-by-one, in private markets, with no public market access allowed. These illiquid private markets are a far more expensive funding source than accessing

[12] Dan Reicher in https://www.nytimes.com/2012/06/02/opinion/how-to-make-renewable-energy-competitive.html

[13] 26 USC 7704(d)(1)(e). See related IRS regulations for the 90% test. Note that real estate, interest, and dividends are also qualifying income sources for a PTP.

[14] Note: Although sale of "industrial source carbon dioxide" is qualifying income now, problems arise when the carbon is captured from thermal power generation plants. The power plant income is "bad MLP income" even though the carbon capture creates "good MLP income", which means that the power plant and carbon capture cannot be in the same partnership. Further, "geothermal energy" income under current law appears to be interpreted as income from sale of steam, not the sale of electricity generated from geothermal steam.

public markets through an MLP. This means that achieving project financial feasibility is far harder. Instead of needing to earn profits of $20 per per MT of CO2 captured, the non-MLP projects may have to earn $30 per MT to satisfy investors.

- *Later*, *after the project is well-established,* the original investors face a different financing challenge when they seek to liquidate their investment. They cannot sell the Decarbonization Project to an existing MLP, since their non-qualifying income would create a problem for the potential MLP acquiror. Instead, they must find a replacement partner in illiquid private merger markets. If the original investors expect to be selling out to a limited investor universe, earning limited sales profits, they will demand even higher profit rates during the time they own the project.

For financial analysis purposes, it is hard to disentangle the near-term impacts of gaining MLP status (lower returns required by initial investors) vs. long-term impacts of gaining MLP status (lower required returns when original investors sell out to other investors). Original investors compute a combined life-of-investment return based on the profits exacted while they own the project and anticipated profits when they sell out.

In this paper we discuss the impact of FOEFA on two classes of of Decarbonization Projects: First we look at the broad class of wind, solar, and storage projects, using the specific example of a P.V. solar project to quantify the benefits of FOEFA. Second, we look at the broad class of fossil fuel generation facilities (natural gas, coal and other) with carbon capture, using the specific example of a natural gas/CCS project to quantify the benefits of FOEFA.

- The wind, solar, storage class of projects are important because they are the largest current annual investment category among the Decarbonization Projects covered by FOEFA, as well as being in transition because of the ultimate elimination of wind PTCs , reduction to 10% for commercial solar project ITCs, and no broad existing incentives for storage.
- The class of fossil power plants with carbon capture is important as a cost-effective low-carbon backup mechanism for renewables, but current tax law creates a development barrier splitting projects in half: income from carbon capture qualifies for MLP status, while the income from electricity sales does not.

Overall, FOEFA would enable clean power and decarbonization projects of all types—not just the broad classes and specific examples selected for this study — to be both more tax-efficient and fundraising-efficient.

FOEFA for Wind, Solar and Electricity Storage

In most cases, for most utilities, renewables are acquired to meet the requirements of state Renewable Portfolio Standards (RPS) and Clean Energy Standards (CES) —standards that are likely to tighten over time, unless compliance drives up ratepayer bills to a politically unacceptable degree. Storage resources are acquired to provide backup to "firm up" the intermittent production of some renewables.

Despite recent brief extensions[15], once renewable PTCs and solar ITCs ultimately end, renewable projects are going to be paying more tax. Most storage resources have not had PTCs or ITCs, so they

[15] The wind PTC received a one-year extension, with a single extra start-of-construction year (2021) at 60% of original PTC amounts. Solar received a two-year extension, with the ITC dropping to a permanent 10% in start-of-construction year 2024 instead of 2022 for commercial projects.

already face higher tax bills. [16] With grid integration costs rising substantially as well (as renewables penetrate to higher levels of total generation) there is likely to be rising, rather than falling, ratepayer impact. Rising power prices would undercut support for stronger RPS and CES pursued by state governments and likely impede progress toward meeting the state targets. That context highlights the importance of FOEFA's benefits that allow renewable projects to be both tax-efficient and fundraising-efficient.

The situation under current MLP law is quite simple. Income received from sale of electricity generated from a renewable energy project or released from a storage project is not qualifying income for an MLP. In the past, this MLP ineligibility situation was not such a major issue because the prevailing tax credit regime was so attractive. The 30% Investment Tax Credit applicable to solar P.V. and the ~$25/MWh Production Tax Credit applicable to other renewables were so large that the industry's main focus was to create complex tax partnership structures that could "monetize" the credits. Even though the "tax equity market" was generally viewed as illiquid and inefficient[17], it worked reasonably well if the economy was not in recession. That changed with the onset of the current COVID recession combined with tax law changes. Market sources now say that ever-increasing volumes of wind and solar deals are not finding "tax equity" investors for their transactions because of: (i) reduced corporate tax rates, with the 35% rate having dropped to 21% under recent law; (ii) enactment of the Base Erosion and Anti-Abuse Tax ("BEAT")[18]; and (iii) reduced corporate profits in many sectors due to the COVID-induced recession. Once PTCs phase out entirely in 2022 and the commercial solar ITC drops to 10% in 2024, new renewable projects will no longer be attractive candidates for investment by tax equity investors whose primary focus has been tax credits. Allowing these projects to have the same access to low-cost MLP capital as the fossil fuel industry, e.g. oil and gas pipeline projects, is the logical and permanent next step.

We analyzed FOEFA's impact on a typical utility-scale solar project[19] vs. the status quo of MLP ineligibility.[20]

- In the status quo case, with the solar ITC dropping to 10% for 2024 vintage projects, we found that the power price needed to be **$44.46/MWh** in order to have an adequate annual cash flow to safely service debt and also to meet a 10% required equity after-tax rate of return.[21]

---

[16] Currently batteries that are part of a solar project are eligible for an ITC, but standalone banks of batteries and other storage technologies are not.

[17] The "tax equity market" is non-transparent to outsiders, but knowledgeable experts have estimated that two Wall Street firms—JP Morgan and Bank of America—make up half the market, with the top five firms making up 80% of the market. Financial Times, December 12, 2020, "U.S. renewables look to fill funding gap as pandemic hits tax incentives." https://www.ft.com/content/f54cd9b7-eee8-4a45-b0bb-f441960a5359

[18] The BEAT primarily applies US companies that have significant foreign ownership, but nonetheless has been stated by some experts to have reduced the number of investors in the tax equity market. See: https://www.taxequitytimes.com/wp-content/uploads/sites/15/2018/03/2018-and-Onward-The-Impact-of-Tax-Reform-Energy-Law-Report-tax-reform.pdf

[19] $1.0 million per MW capital cost, 1% of capital cost for O&M, and a 25% capacity factor.

[20] The benefits of FOEFA to wind and storage projects are will be, roughly proportionate to those calculated for PV solar projects, since access to MLP financing comes from lowering the cost of financing the original capital investment. That financing cost benefit is not technology specific. The benefit of cutting cost of equity capital 1% on a $100 million solar project is roughly the same as for a $100 million wind project.

[21] A key assumption made was that for marginal projects, projects that do not find "tax equity" for the reasons cited, federal tax losses are not immediately usable to offset partners' tax bills and must be carried forward until partnership profits are sufficient to utilize these loss carryforwards. If the wind or solar project is a subsidiary of an MLP that problem would be mitigated: profits from older, fully depreciated projects owned by the MLP can be offset by losses from a wind or solar project to reduce overall the tax bill passed through to investors.

- In the MLP case, having adopted FOEFA, the needed power price dropped to **$37.49,** with the same safety margin on debt service and meeting a lower 9% equity after-tax rate of return. The return target is slightly lower for two reasons: first, the likelihood of fully using federal tax benefits is higher if a tax credit-generating solar project can be aggregated into a tax-credit using MLP; second, the competition among investors to own the solar assets is fiercer, since an entirely new sector of buyers (MLPs) has joined the fray.
- The 16% drop in the electricity sales price needed is important, because it would help keep solar projects attractive to state policy makers and voter-ratepayers.

Quantifying FOEFA's Impact on Renewable & Storage Deployment and Carbon Emissions Reduction: We estimate that FOEFA provisions would increase wind, solar, and electricity storage annual capital spending ~$15 billion/ year, with the other types of renewables adding significantly more but being harder to quantify. In rough terms, that increased spending would translate to 20 million annual MT of CO2 reduction each year. After 5 years of this level of stimulus, 5 years' worth of projects would then be cumulatively reducing CO_2 by 100 million MT/yr.[22] To put this in perspective, opening up MLPs to solar PV and wind projects would result in emissions reductions that are more than 6 percent of total U.S. power plant emissions[23] or the equivalent to the individual carbon emissions of 50 million Americans.[24] Opening up an array of other technologies to MLPs, as provided in FOEFA, would add substantially to these totals.

The calculated 16% reduction in the required power price needed to safely service debt and repay partners does not inexorably translate into a certain number of extra projects deployed. If ratepayers and politicians in the states are committed to aggressively adding incremental wind and solar generation regardless of cost, making wind and solar cheaper might not matter. But the opposite is probably the case: ratepayers and politicians are sensitive to rising rates. *The International Energy Agency's most recent forecast shows that between today and 2040, the U.S. needs to be investing $76 billion/year in renewables, up from about $46 billion/year in recent years.[25]That 60% annual increase is unlikely to happen without some policies to fill in the void created by expiring PTCs and declining solar ITCs*.

We based the $15 billion/year estimate upon the amount of wind and solar projects that market experts have found to be economically vulnerable in earlier situations in which incentives were either difficult to utilize or were facing expiration. The prior estimates did not include storage; but as wind and solar reach ever higher-grid penetration, storage to firm these resources is tightly linked to renewable deployment. These estimates include:

- Bloomberg reported in July 2020 that "As much as $23 billion in capital [from tax equity] needed for U.S. clean energy projects could dry up amid the economic fallout from the coronavirus pandemic --

[22] Calculation: $15 billion would create 15,000 MW/yr at an average wind/solar cost of 1 million per MW. 15,000 MW x 8760 hrs/yr x 30% average capacity factor x 0.5 MT CO2 saved per MWh = 19.7 million MT per year.
[23] Total U.S. power sector emissions of CO2 from electricity generation was 1,618 million MT in 2019. https://www.eia.gov/tools/faqs/faq.php?id=77&t=11#:~:text=In%202019%2C%20emissions%20of%20carbon,emissions%20of%205%2C146%20(MMmt).
[24] https://www.sciencedaily.com/releases/2008/04/080428120658.htm
[25] Spreadsheets provided to the authors directly from IEA. Partial information can be obtained from the backup spreadsheets provided to purchasers of the IEA's annual flagship report.

threatening the growth of renewables into next year."[26] That $23 billion, over an 18-month period, as described in the article, would be approximately a $15 billion per year impact.,

- A similar-sized annual impact was estimate by NREL in 2016 when evaluating the future impact of the December 2015 extension (with a phase out) of the wind PTC and solar ITC. The difference in annual installations of wind and solar per annum in 2016-2020 (with and without the extension) averaged 10,300 MW per year.[27] At then-average wind and solar construction costs (~$1.5 million per MW), NREL was effectively also showing approximately a $15 billion per year capital spending impact of continued incentives.

Conclusion re Renewables/Storage Projects and FOEFA: Some renewables have had the benefit of strong ITC and PTC tax incentives that, despite some drawbacks, provided a strong impetus for investment by a small number of investors. Some projects that inherently support renewables such as storage, as well as a number of other Decarbonization Project types enumerated in FOEFA, have had few, if any, support mechanisms. As demonstrated by the calculations with respect to a solar PV project, access to a permanent and more efficient source of equity capital could create billions of additional dollars of investment each year, with the effects rapidly compounding to additional GHG emissions reductions measured in the hundreds of millions of MT annually.

FOEFA for Natural Gas Power Plants with Carbon Capture

FOEFA would fix a strange glitch in current MLP provisions that discriminates uniquely against power plants that invest in carbon capture equipment. For a fossil power plant, such as a natural gas or coal generating station, the electric generation and the carbon capture operation are likely to be tightly linked, both from an engineering and economic point of view. However, even though gross income generated by sale of CO2 captured at the power plant (such as sales of CO2 to oilfields) *is* MLP qualifying income[28], the gross income from electricity *is not*.[29] This anomalous situation means that optimal tax treatment for the CCS-enabled power plant would require splitting the equipment (including combustion turbine or boilers, heat recovery, steam turbine, and capture equipment) into two business entities—one for the power plant pieces (non-MLP) and another for the capture equipment (MLP). In practical terms, so doing is mind-numbingly complex and would generate major legal and accounting bills, as well as undermining the ability to access debt financing. Splitting the two pieces apart—as is effectively required without FOEFA— also makes it even harder to use the Section 45Q credit Congress created to promote carbon capture. On the other side of the ledger, an existing, fully depreciated power plant with little debt is likely to be paying taxes that could be reduced by being linked, through an MLP, to the carbon capture operation's tax credits, accelerated depreciation, and interest expense. In essence, the old host natural gas or coal plant could make good use of the tax credits created by the new capture equipment if they were combined in an MLP.

---

[26] https://www.bloomberg.com/news/articles/2020-07-15/covid-likely-created-23-billion-shortfall-for-u-s-clean-energy

[27] "Impacts of Federal Tax Credit Extensions on Renewable Deployment and Power Sector Emissions", NREL, Technical Report NREL/TP-6A20-65571 February 2016. See p. 32 for figures in low gas price scenario. The impact averaged $13 billion/yr in the higher natural gas price scenario.

[28] The captured CO2 is treated as a product of "processing" a depleting natural resource (coal or natural gas).

[29] In contrast if a company makes fertilizer from natural gas or coal feedstock and captures the CO2, both the fertilizer operation and the carbon capture operation are eligible to be in the same MLP.

We analyzed the impact of adding carbon capture to a natural gas combined cycle power plant as an example of the benefits of FOEFA in fixing the existing technical glitch in the MLP statutory provisions explained above. Without FOEFA, the carbon capture asset would reside in its own MLP vehicle, operating at arm's length from the power plant. With FOEFA, the carbon capture asset and the power plant would be combined in the same integrated business entity. Carbon capture activities are eligible for §45Q tax credits in two different ways: either earning $50/MT if the CO2 is injected into underground passive storage; or earning $35/MT if the CO2 is sold to oil companies for CO2-Enhanced Oil Recovery (CO2-EOR). Thus, we have four cases: with and without FOEFA, and with CO2 going to either saline or CO2-EOR.

The table below shows the degree of additional subsidy/payment beyond 45Q that would be needed to reach economic feasibility in each of the four cases. For example, the $34.90 in the top left corner means revenues/credits per tonne are $34.90 too low to allow the project to proceed. We assumed the power plant carbon capture equipment would cost $420 per MT/year of capture capacity at a 75% Net Capacity Factor (NCF), with a power sales price of $40/MWh for net energy produced from the CO2-abated NGCC unit.

Additional Subsidy/Payment or CO2-EOR Sales Price per MT to Reach Feasibility for Combined Cycle Gas with Carbon Capture Retrofit—Assumes Non-Refundable Current §45Q Tax Credit Levels		
	CO2 capture operation in standalone MLP *[13% Min. Unlevered Equity Returns]*	**FOEFA— CO2 capture + power plant combined MLP *[10% Min. Unlevered Equity Returns}***
CO2→Saline: Extra Subsidy Needed	$34.90	$7.44 ($27.46 improvement)
CO2→EOR Break-even CO2 price	$40.89	$12.64 ($28.25 improvement)
CO2→EOR Implied WTI Oil Price	$107 oil	$33 ($74 lower oil price required)

The benefits in the combined MLP case (i.e., assuming FOEFA enactment) are significant:

- The saline case is only $7.44/MT away from feasibility having improved by $27.46/MT. At that point, even minor improvements in power prices ($40/MWh→$43/MWh—*not shown*) or slightly higher net capacity factors (NCF) (75% NCF→82% NCF—*not shown*) would make the project feasible.
- The CO2-EOR case has moved from requiring $107/bbl oil prices down to $33/bbl, with the required CO2 sales price to oil operators dropping from $40.89/MT to only $12.64/MT. Such CO2 prices are easily achievable in geographic areas with EOR operations.

The improved results arise for several different reasons. First, since the combined operation is eligible to be rolled into an existing MLP that has taxable income that can be sheltered by the tax benefits of the carbon capture project, we are able to assume a lower cost of equity investment (10% vs. 13%), which accounts for a significant share of the benefits shown in the table. Second, the combined operation includes small net power sales revenues that modestly increase net operating cash flows per MT captured. Third, since the power plant and the CO2 capture are in the same economic entity, the overall revenue stream and mortgageable asset base of the business are bigger, thus being more attractive to financing markets. Finally, the transaction is easier to negotiate. If the power plant and the capture

equipment are in the same business, then sharing of infrastructure, water, steam, and power can be done internally, without the need for complex arm's length transfer pricing agreements.

Quantifying FOEFA's Impact on Carbon Capture Deployment and Carbon Emissions Reduction : We estimate that FOEFA could make an incremental $5 billion/year spending difference—assuming continuation and/or improvement of existing Section 45Q. The $5 billion/year would not be solely attributable to access to the MLP market. Rather, the existing value of Section 45Q—without FOEFA—falls short of the subsidy needed to trigger capture deployment at a significant number of fossil power plants. Adding MLP status appears to be just enough help to bring a significant number of projects successfully over the goal line. Each $5 billion per year deployed on power plant CCS would yield approximately 20 million MT/yr captured. After 5 years of this level of stimulus, 5 years' worth of projects would then be cumulatively reducing CO2 by 100 million MT/yr.[30] To put this in perspective, opening up MLPs to CCS projects would result in emissions reductions that are more than 6 percent of total U.S. power plant emissions[31] or the equivalent to the carbon emissions of 50 million Americans.[32] Opening up an array of other technologies to MLPs, as provided in FOEFA, would add substantially to these totals.

These figures are derived from International Energy Agency forecasts of required U.S. deployment of carbon capture, with the IEA's forecasts showing massive simultaneous deployment of renewables combined with a major shift from coal generation to gas generation. The IEA forecasts show that by 2040, most large natural gas power plants and virtually all remaining U.S. coal plants will need carbon capture. The implication of this forecast is that even with roughly 70% of total U.S. generation being from zero-carbon sources under the IEA forecasts, the U.S. will still need to be capturing approximately 350 million MT per year of CO2 from coal and gas plants to achieve overall zero-carbon generation. At today's equipment prices, that would represent about $100 billion of capital expenditure on fossil power plant carbon capture equipment (through 2040)—or about $5 billion/year. That expenditure and deployment of carbon capture is far more likely to occur with the lower additional subsidies and/or lower needed CO2 sales price with FOEFA in effect.

A Real-World Carbon Capture Example

One of the authors is currently advising a developer seeking to add $300 million of carbon capture equipment to an existing coal power plant currently owned by a third party. In this project the "carbon capture" processes are inextricably interwoven with the electric generation itself. The carbon capture project requires new equipment upstream of the existing coal plant (an air separation unit to make oxygen), at the existing boiler (to reduce air leakage, add heat exchangers, and add SO_2 control), and downstream of the boiler (for CO2 separation, clean-up, and compression).

If, as a result of enactment of FOEFA, both sales of the captured CO_2 and the sales of the now low-carbon electricity were qualifying income for an MLP, the current coal plant owner and the developer would contribute both the coal power assets and the new carbon capture equipment into a single new MLP-eligible partnership. That partnership could be then marketed to a wide pool of existing or new MLPs.

[30] Calculation: $15 billion would create 15,000 MW/yr at an average wind/solar cost of 1 million per MW. 15,000 MW x 8760 hrs/yr x 30% average capacity factor x 0.5 MT CO2 saved per MWh = 19.7 million MT per year.
[31] Total U.S. power sector emissions of CO2 from electricity generation was 1618 million metric MT in 2019.
https://www.eia.gov/tools/faqs/faq.php?id=77&t=11#:~:text=In%202019%2C%20emissions%20of%20carbon,emissions%20of%205%2C146%20(MMmt).
[32] https://www.sciencedaily.com/releases/2008/04/080428120658.htm

As it is, the project is struggling to attract interest from the few tax equity investors still active. This is especially true since with the extension of renewable ITCs and PTCs, the tax equity investors are being offered low-technology risk through rapidly constructed wind and solar projects in volumes that vastly exceed those investors' tax planning needs. That is, there will already be more easy wind and solar projects than the tax equity market can handle. In that context, those investors have no motivation to consider carbon capture deals with new technology. The tax equity market is simply too small to meet our large national decarbonization funding needs.

Conclusion re Carbon Capture Projects and FOEFA: Current capital and operating costs, net of the Section 45Q credits, leave carbon capture projects for fossil fuel plants still somewhat "out of the money", or infeasible. However, the forecasts of the IEA (and a host of other forecasters) show that some remaining fossil electric generation, required for daily and seasonal load firming, is likely to remain even after massive renewable deployment. Without some additional help beyond current policies, deployment of carbon capture on these remaining fossil units is unlikely. The impact of FOEFA could be just enough to move projects into the black. That would be expected to cause ~$5 billion/year of capital spending that would yield ~20 million MT of CO2 sequestration capacity added per year – and ~100 million MT in sequestration capacity after 5 years – ultimately putting the U.S. on track to meet a cumulative 350 million MT/yr capture target per the IEA forecast above.

Table re PTC and ITC Extensions

The table below shows the effect of recent Congressional legislation on PTC and ITC renewable programs. It was sourced from an article by Mayer, Brown, & Platt.[33]

[33] https://www.lexology.com/library/detail.aspx?g=a112b232-5bbd-40d3-8a06-5d4d638f75d2

The following table summarizes the effect of the Relief Bill on the PTC and the ITC in lieu of the PTC for wind projects:

Construction Started:	Previous Law		Under Relief Bill	
	PTC Level[2]	ITC in Lieu of PTC Level	PTC Level	ITC in Lieu of PTC Level
2016	100% (1.5¢/kWh)	100% (30% of basis)	100% (1.5¢/kWh)	100% (30% of basis)
2017	80% (1.2¢/kWh)	80% (24% of basis)	80% (1.2¢/kWh)	80% (24% of basis)
2018	60% (0.9¢/kWh)	60% (18% of basis)	60% (0.9¢/kWh)	60% (18% of basis)
2019	40% (0.6¢/kWh)	40% (12% of basis)	40% (0.6¢/kWh)	40% (12% of basis)
2020	60% (0.9¢/kWh)	60% (18% of basis)	60% (0.9¢/kWh)	60% (18% of basis)
2021	0% (0¢/kWh)	0% (0% basis)	60% (0.9¢/kWh)	60% (18% of basis)
2022	0% (0¢/kWh)	0% (0% basis)	0% (0¢/kWh)	0% (0% basis)

The following table summarizes the effect of the Relief Bill on the ITC for solar projects and on the related statutory placed-in-service deadlines to be eligible for the related ITC percentage (not taking into account the Continuity Safe Harbor):

Construction Started:	Previous Law		Under Relief Bill	
	ITC Level	PIS Deadline	ITC Level	PIS Deadline
2019	30% of basis	12/31/2023*	30% of basis	12/31/2025*
2020	26% of basis	12/31/2023*	26% of basis	12/31/2025*
2021	22% of basis	12/31/2023*	26% of basis	12/31/2025*
2022	10% of basis	N/A	26% of basis	12/31/2025*
2023	10% of basis	N/A	22% of basis	12/31/2025*
2024 and onwards	10% of basis	N/A	10% of basis	N/A

*Otherwise, only 10% ITC is available. We would expect that, for projects that began construction in 2019 or 2020, taxpayers would attempt to meet the four-year Continuity Safe Harbor.