

## Incentives for CO<sub>2</sub> Avoided: Comparison of Renewables Production Tax Credit and Proposed 45Q Legislation

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The proposed extension and expansion of Section 45Q tax credits in the 115h Congress, in the form of the FUTURE Act (S 1353) and the Carbon Capture Act (HR 3761) is comparable to the dollar per tonne value of avoided carbon from the Section 45 production tax credits (PTC), utilized by renewable energy resources. The PTC has been offered to power developers since first adopted in the Energy Policy Act of 1992. During that time period, the levelized cost of electricity from wind power has dropped nearly 2/3rds<sup>1</sup>. The proposed changes to section 45Q are similarly focused on moving carbon capture and storage down the cost curve.

Congress prices carbon dioxide (CO<sub>2</sub>) indirectly and implicitly through the Section 45 PTCs for renewable energy providers. On the other hand, Congress sets CO<sub>2</sub> prices directly and explicitly through the Section 45Q tax credit for capturing carbon dioxide from industrial facility emissions. But, both tax incentives price the elimination CO<sub>2</sub>. One does it by pricing a tonne not emitted while the other pays to avoid venting CO<sub>2</sub> into the atmosphere.

The indirect price on CO<sub>2</sub> through the renewable PTCs has to be calculated depending on what fossil fuel is displaced. The benefits of the renewable tax incentives arise when increased electric generation from a renewable energy source correspondingly decreases generation from a particular source of fossil energy. We can determine the implicit price of CO<sub>2</sub> in the PTC by multiplying the \$23/MWh PTC times the number of displaced fossil-generated megawatt hours (MWh) needed to save a tonne of CO<sub>2</sub>. The amount of CO<sub>2</sub> avoided per MWh of fossil displaced depends on the type of fossil fuel that would have been used to generate the electricity in the absence of a renewable. Below are two examples:

- One MWh of power from a natural gas plant produces about 800 pounds (0.4 tonnes) of CO<sub>2</sub>. As a result, it takes 2.8 MWh of renewable generated electricity to displace natural gas fired electricity to save one tonne of CO<sub>2</sub> from being emitted.
- One MWh of power from reasonably efficient coal plant produces about 2,000 pounds of CO<sub>2</sub>. As a result, it only takes 1.1 MWh of renewable electricity to displace coal-fired electricity to save one tonne of CO<sub>2</sub>.

Nationally, of course, a mix of gas and coal sources is turned down when wind and solar are available. In 2016, the National Renewable Energy Laboratory (NREL) of the Department of Energy issued a technical report,<sup>2</sup> which estimated how much CO<sub>2</sub> might be saved by extending the Section 45 wind PTC. Developing this estimate also required the study to estimate the mix of fossil energy generating plants that would be displaced by increased wind energy.

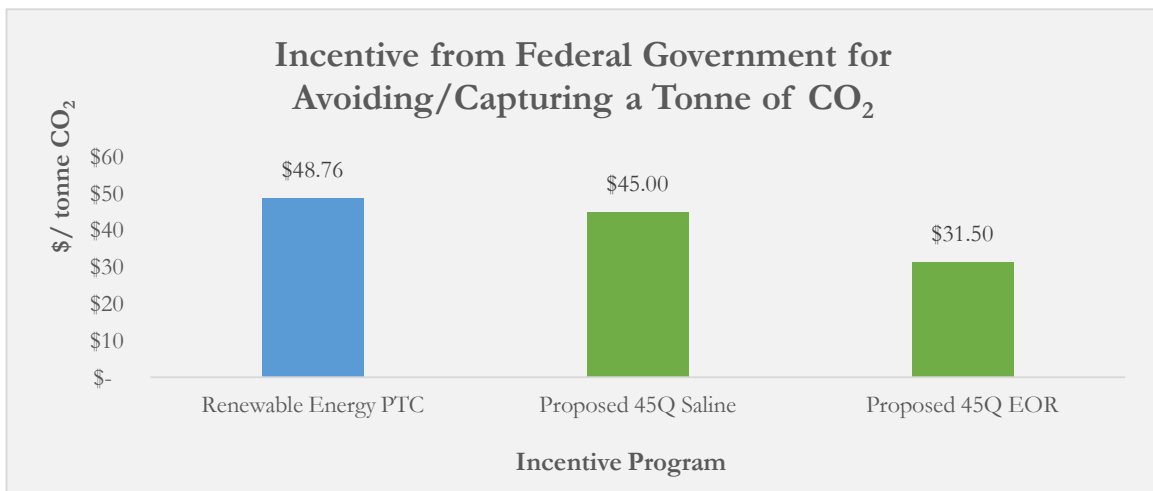


Figure 1

NREL's base case assumed that extra wind energy would mostly displace gas power plants, along with a little coal. The exact mix was 80% gas and 20% coal energy production would be displaced by increased wind energy production. The resulting displacement would be 0.47 tonne/MWh, which at \$23/MWh, results in an avoided cost of \$48.76/tonne.<sup>3</sup>

The FUTURE Act would provide a credit of \$50/tonne for saline storage and \$35/tonne for storage through utilization (including enhanced oil recovery). Assuming a 90% level of carbon capture, those incentive levels would result in avoided CO<sub>2</sub> costs of \$45 and \$31.5, respectively. As shown in Figure 1, the incentives currently being proposed for carbon capture will result in avoiding a tonne of CO<sub>2</sub> at a price range less than the support given through the renewables PTC for a tonne not emitted.

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<sup>1</sup> IEA Wind Task 26: The Past And Future Cost Of Wind Energy by Eric Lanz and Maureen Hand of the National Renewable Energy Laboratory and Ryan Wiser of Lawrence Berkeley National Laboratory (Technical Report, NREL/TP-6A20-53510, May 2012, Contract No. DE-AC36-08GO28308)

<sup>2</sup> Impacts of Federal Tax Credit Extensions on Renewable Deployment and Power Sector Emissions by Trieu Mai, Wesley Cole, Eric Lantz, Cara Marcy, and Benjamin Sigrin of the National Renewable Energy Laboratory (Technical Report, NREL/TP-6A20-65571, February 2016, Contract No. DE-AC36-8GO28308)

<sup>3</sup> Using the NREL Base Case weighted average (80% gas/20% coal) each MWh of electricity generated from renewable energy would reduce CO<sub>2</sub> emissions by 0.47 tonnes (80% gas x 0.36 tonnes/MWh + 20% coal x 0.91 tonnes/MWh). The implied cost of a tonne of CO<sub>2</sub> in this case would be equal to the amount of the PTC for a MWh of wind energy (\$23) divided by the amount of CO<sub>2</sub> avoided (0.47 tonnes) which is \$48.76/tonne of CO<sub>2</sub>.