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INSIGHT

Tax Credits for "Clean Electricity"—Projected Effects on CO_2 Emissions and the Generation Mix

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Reducing greenhouse gas emissions was a key policy objective of recently enacted budget reconciliation legislation, commonly referred to as the Inflation Reduction Act of 2022 (IRA; P.L. 117-169). Experts view decarbonization of the electric power sector as necessary to achieve broader climate goals. Numerous analyses provide a range of projections on how the IRA is expected to affect greenhouse gas emissions over time. This Insight uses uniquely detailed information from National Renewable Energy Laboratory (NREL) model estimates to focus on the potential effects of tax policy on electric power sector emissions.

In December 2022, NREL released a set of 70 simulated electric power sector scenarios, based on a range of possible future conditions. These scenarios are projections developed using a set of sophisticated models. While models are often useful tools for informing energy policymaking, it is important to note that (1) models are sensitive to selected model inputs; and (2) models are often limited in their capacity to capture all potentially relevant real-world factors. Detailed information on the modeling methodology and assumptions can be found in NREL's 2022 Standard Scenarios Report.

The figures below rely on two of NREL's 70 scenarios to highlight modeled effects of the IRA's tax provisions in the electric power sector.

- The ***Base Case***, or mid-case, scenario is a current policy projection (i.e., includes the IRA) that uses "central assumptions for demand growth, resource availability, fuel price, and technology inputs." As the NREL report notes, this scenario is intended to serve as a reference point against which alternatives can be compared. The models do not attempt to include all elements of the IRA. NREL selected IRA's tax policies as potential major drivers of changes in the electric power sector.
- The ***No IRA*** scenario provides projections assuming that the IRA's tax credits for "clean electricity"—production tax credit (PTC), investment tax credit (ITC), tax credits for carbon capture and sequestration (CCS), and tax credits for nuclear power production—had not been enacted.

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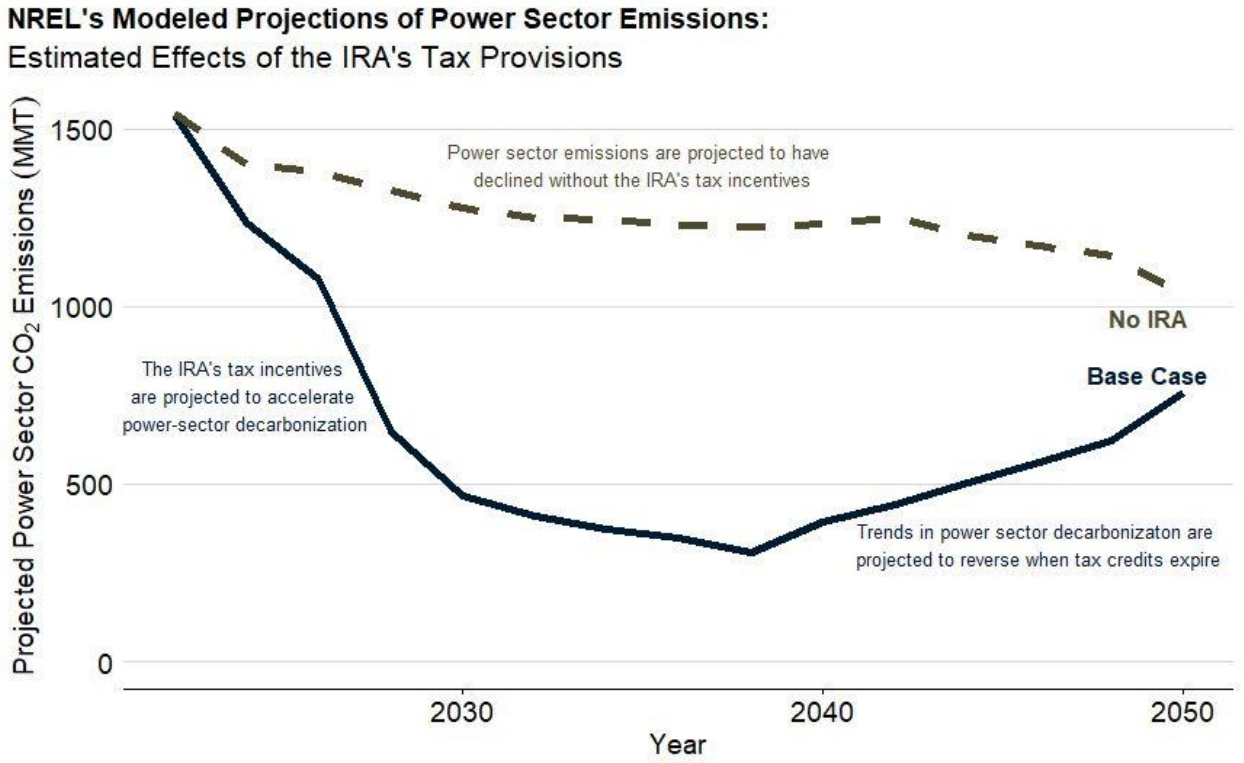
Comparing the "Base Case" and "No IRA" scenarios illustrates how NREL's projections suggest that the IRA's tax provisions are expected to be associated with relatively rapid CO_2 emissions reduction in the electric power sector into the 2030s. Absent the IRA's tax provisions (the "No IRA" case), NREL expects power sector emissions would have continued recent downward trends, although at a slower pace than is expected with the IRA.

In the base case scenario, projected power sector emissions begin to increase in the late 2030s. Under the IRA, the PTC and ITC for zero-emissions electricity phase out when greenhouse gas emissions from the electric power sector fall to 25% or less of 2022 levels, which is projected to occur in the mid-2030s in NREL's base case scenario. The CCS tax credits will not be available for projects beginning construction after December 31, 2032. The zero-emission nuclear power production credit is also set to terminate on December 31, 2032. As these tax credits expire, projections show the trend in power sector emissions reversing, with emissions rising from the late 2030s through 2050.



Source: CRS calculations and graphic based on NREL's 2022 Standard Energy Scenarios.

Notes: MMT=million metric tons. Projections span 2022 through 2050. See the 2022 Standard Scenarios Report for more information on modeling assumptions and limitations.

Examining the trends in generation across technology types can be helpful in understanding emissions trends. In NREL's modeling, the IRA's tax incentives are associated with increased overall electricity generation. Electricity generated using renewable resources is expected to increase at a faster rate with tax credits than the models indicate would have been the case had the tax credits not been enacted. Generation from coal and natural gas (without CCS) declines through the 2030s, although generation from these resources is projected to increase as tax credits for zero-emissions electricity phase out or expire.

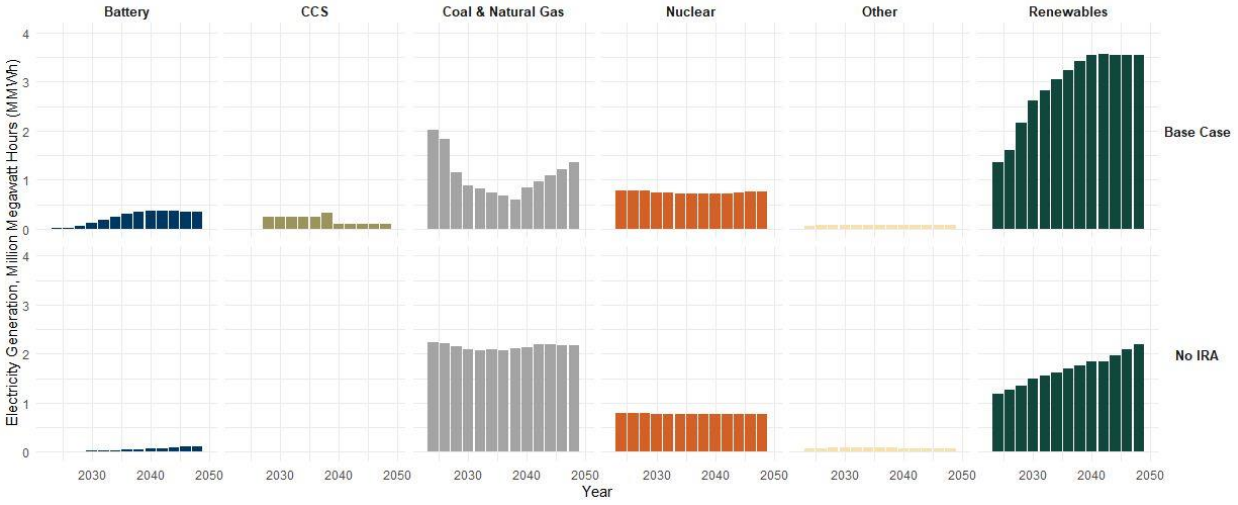
NREL's models suggest that the IRA's tax credits for coal and natural gas with CCS lead to generation using this technology, when the tax credits are available. Generation with CCS is expected to decline as the tax credits expire. NREL attributes this to natural gas plants with CCS operating below their capacity

factor once credits expire. Deployment of batteries is also supported by tax credits in the IRA, and the share of electricity generation attributable to batteries increases in the base case (under the IRA).

NREL's models suggest that electricity generation from nuclear is similar in the case with the IRA, which includes tax credits for nuclear power generation, or without. Nuclear power generation facilities are generally found not to be subject to retirement in either scenario, although new nuclear capacity is not added.

The IRA's Tax Incentives Increase the Total Amount of Electricity Generated

Renewable energy generation increases at a faster rate in the base case with the IRA than in the case without the IRA. Electricity generation from coal and natural gas initially declines when tax incentives supporting zero-emissions technologies are available, but increases as the tax credits expire.



Source: CRS calculations and graphic based on data and results from NREL's 2022 Standard Energy Scenarios.

Notes: Projections span 2022 through 2050. CCS is coal or natural gas with carbon capture and sequestration (CCS). The Other category is energy imported from Canada. See the 2022 Standard Scenarios Report for more information on modeling assumptions and limitations.

If emissions reduction in the electric power sector is not sustained when tax credits expire, this could be viewed as indicative of the need for additional policies if emissions reductions targets are to be met.

These trajectories are highly uncertain. For example, the IRA's tax incentives for advanced energy manufacturing are not explicitly included in these models. Thus, it is possible that more domestic advanced energy manufacturing could reduce the cost of low-emissions electricity equipment, leading to more deployment of renewables than modeled. Unaccounted for changes in transmission infrastructure and networks that support more renewables could also change the model's results. Unexpected changes in natural gas prices could also affect the pace of renewables deployment. While there is a high degree of uncertainty in these models, they might provide a benchmark for policymakers when evaluating the effectiveness of climate-related policies, including the tax credits for zero-emissions electricity in the IRA.

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