EXAMINING A "NO REGRETS" POLICY TO FACILITATE A TRANSITION TO A LOWER CARBON FUTURE

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Overview

Given the lack of political consensus in the U.S. regarding the value of reducing greenhouse gas emissions, it is important to focus attention on policies and low carbon technologies that provide co-benefits while facilitating a transition to a lower carbon future. One such policy is expansion of the existing sequestration tax credit that is designed to incentivize permanent sequestration of carbon dioxide while also providing less expensive sources of CO_2 for use in enhanced oil recovery (EOR). The policy could also provide support for the declining coal industry and make use of the country's abundant coal and natural gas resources by incentivizing carbon capture technologies in the power and industrial sectors.

Currently EOR producers rely primarily on CO_2 from natural underground reservoirs. The CO_2 sequestered by power plants and industrial facilities that employ carbon capture technology and that qualify for the tax credit can provide EOR businesses with a reliable and cheaper source of CO_2 for their production needs. The credit would also apply to CO_2 captured at facilities and permanently sequestered in geologic formations such as saline aquifers.

This study uses a version of the National Energy Modeling System (NEMS) called SEQ-NEMS[1] to analyze the potential impact of an expanded sequestration tax credit policy on carbon capture technology deployment and EOR production. The study also examines the sensitivity of policy impacts to key assumptions regarding lower oil and natural gas resources and associated technology improvements and carbon capture technology costs. The study concludes that the tax credit is most effective when combined with favorable technology costs and market conditions.

Methods

SEQ-NEMS is based on the version of NEMS used in EIA's Annual Energy Outlook (AEO) 2017. As an integrated U.S. energy model, it represents all sectors of the energy economy and projects key energy system variables on an annual basis through 2050. Carbon capture and storage (CCS) technologies are explicitly represented in the power sector both for new coal and natural gas capacity and as retrofit options for existing coal capacity. Transport costs for CO_2 to EOR fields and saline storage sites are explicitly represented through a network model, and are used along with potential EOR revenues in evaluating CCS options. At the same time, the delivered cost of CO_2 is passed to the oil and gas module where EOR production opportunities are evaluated.

The model was modified to represent a sequestration tax credit of \$35/ton for CO_2 captured from power and industrial facilities and used for EOR, and a higher credit of \$50/ton for CO_2 captured and permanently sequestered in saline formations. Reference case assumptions include higher electricity demand growth, higher macroeconomic growth and lower costs for EOR production than assumed in the AEO 2017. In addition to reference and policy cases, two sensitivity cases are analyzed to assess the impact of technology and market assumptions on future CCS deployment and EOR production. One sensitivity case examines the role of lower oil and natural gas resources and

[1] The version of the model used in this paper is called "SEQ-NEMS" to distinguish it from the version of NEMS developed and maintained by the US Energy Information Administration (EIA). .

technology improvements which indirectly favor increased use of enhanced oil recovery and lead to higher natural gas prices which favor new coal generation. Another sensitivity case combines the lower oil and gas resources with more optimistic technology characteristics for CCS technologies in the power sector that might result from R&D or innovation in response to economic opportunity. Improved technology characteristics include lower capital and O&M costs, greater efficiency and earlier availability for deployment.

Results

The impact of an expanded sequestration tax credit depends heavily on market conditions and CCS technology characteristics. While the policy alone increases both CCS deployment and the use of CO_2 for EOR significantly above levels in the no policy reference case, these levels increase further when combined with lower oil and natural gas resource conditions which enhance the value of EOR in the market and attractiveness of coal CCS. When the policy and lower resources are also combined with more optimistic CCS technology characteristics, CO_2 EOR production peaks at a level that is more than 40 percent higher than reference case levels and CCS deployment in the power sector more than doubles compared to the combined case with reference technology assumptions. The amount of CO_2 sequestered from the power sector in the combined cases is much greater than the EOR market can absorb, so an increasing amount of the CO_2 captured over time is sent to saline formations for permanent storage. Power sector sources of CO_2 also compete for EOR market share with limited amounts of CO_2 captured at industrial facilities that also qualify for the credit.

Conclusions

An expanded sequestration tax credit can be an effective “no regrets” policy for reducing CO_2 emissions by stimulating additional CCS deployment while also providing a less expensive CO_2 source for enhanced oil recovery. The impact of the tax credit is magnified if other oil and gas resources are lower or more expensive than expected. The inclusion of a tax credit for geologic storage incentivizes continued expansion of power sector CO_2 capture even when the EOR production CO_2 demands are met. Finally, lower CCS technology costs stimulate greater EOR production in the mid-term due to greater availability and lower cost CO_2 while leading to more geologic storage in the longer term.