Inside Energy

Published by the Caesar Rodney Institute
Center for Energy & Environment

RE: The Case for carbon capture at existing power plants
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A global energy shortage and skyrocketing prices are showing us the value of our existing affordable, reliable energy infrastructure. For example, the US Energy Information Agency reports[1] coal use for electric generation is up 23% so far this year as relatively stable coal prices shine compared to a price tripling of natural gas. A regulatory tsunami weeded out the oldest, least efficient coal-fired power plants and coal mines, and many of the remaining power plants have decades of life left. Capturing the carbon dioxide (CO_2) emissions from the exhaust stream at these facilities offers a potential free market solution to reducing emissions while preserving these valuable assets that offer fuel diversity.

Organic coal and natural gas are compositions of carbon and hydrogen, along with associated elements such as sulfur. Combustion is a reaction between these chemicals and oxygen from the air which releases heat. Natural gas has about one carbon atom for each four hydrogen molecules compared to coal's two and so emits about half as much CO_2 when burned. Technological breakthroughs in natural gas production of horizontal drilling and hydraulic fracturing to release natural gas from tight shale formations led to plentiful, low cost natural gas. Current public policies limit natural gas production so prices are rising.

Attempts to reduce the carbon content of coal before burning have proven to be very expensive. However, removing CO_2 from the exhaust is showing promise. The US Department of Energy[2] conducted a study of Wyoming power plants showing removal might cost $74/metric ton if done at scale at power plants with the most up to date technology for reducing air pollution emissions. With widespread on-going research it is not unreasonable to predict the cost may fall to $65/metric ton.

The captured gas has value[3]. It is used to make beverages fizzy and as a beverage decaffeinator, as a fire suppressant, spray can propellant, and refrigerant, in fertilizer, dry ice and methanol production, and in many other manufacturing processes. The compressed, or liquid food grade gas can be worth up to $175/ton[4]. It can also be pumped underground in oil and gas fields to enhance production without additional drilling, and stays underground permanently. At $60/barrel of oil the gas is worth about $30/ton according to the Wyoming study. Oil is currently selling for $84/barrel so the value might be $40/ton.

Besides the gas value many companies are interested in buying carbon offset credits. In Europe such credits were sold for almost $70/metric ton in May[5]. In Europe the market is mandatory, but there is a voluntary market in the US. The market might be helped here by having regional electric grid organizations certify the offsets with a program similar to how they track renewable energy credits[6].

Existing government policy also adds value to captured gas. Thirteen states currently require coal and natural gas-fired power plants by to buy allowances to emit CO_2. The latest auction price from the Regional Greenhouse Gas Initiative was over $9/ton[7], is forecasted to rise as high as $22/ton by 2030, and may average $15/ton over the next decade. In addition, there is an IRS tax credit known as "45Q" paying $35/ton for captured CO_2 from power plants[8], and proposed legislation may increase the size of the credit.

As an example NRG owns the Indian River coal-fired power plant in Millsboro, Delaware and has announced plans to close it in 2022. The grid operator, PJM, is studying whether the plant needs to stay

open for a time as it is the southern-most power plant on the three state Delmarva Peninsula and may be needed to maintain reliability. The plant has about 70 employees earning about $75,000 per year, and pays local and state taxes. In 2021 Delaware has imported 69% of its electricity from out-of-state compared to 28% in 2012[1]. The Indian River plant ran 68% of the time in 2012, but only 19% of the time so far in 2020[9]. That means higher electricity cost to pay line charges to bring power from farther away, plus transmission and congestion charges. It also means higher emissions from transmission losses, and from 15% lower efficiency[10] at the Indian River Power plant from more frequent up and down cycling.

The Wyoming study indicates carbon capture might require an investment of $251/metric ton captured, and a proposed North Dakota project estimates $285[11]. In 2012 the Indian River Unit 4 emitted 1.2 million metric tons[9] of CO_2 which would require a $300 to $350 million investment in carbon capture equipment. The CO_2 might sell for $40/ton, receive $35/ton in 45Q credits, and avoid $15/ton in RGGI allowance payments for a total of $90/ton in equivalent value compared to a $65 to $75/ton cost. Additional voluntary sales of carbon offsets are possible, and could eventually eliminate the need for 45Q tax credits allowing carbon capture investment choices as a free market option.

Delaware electric customers would avoid added transmission line and congestion costs, preserve the economic benefits of keeping the power plant open, and would see a net global reduction in emissions. This is a win/win for everyone. It's time to get serious about adopting carbon capture at existing power plants.

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