Researchers calculate the cost of CO2 emissions, call for carbon tax

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Photo of natural gas production plant. Credit: Wikipedia

Two Rice University researchers are calling on policymakers to encourage the transition from coal-based electricity production to a system based on natural gas through a carbon tax.

Such a mechanism would help limit carbon dioxide (CO_2) emissions. At the United Nations Climate Change Conference in Copenhagen last December, the United States pledged to reduce the 2005 levels of CO_2 emissions by 17 percent by 2020.

Dagobert Brito, the George A. Peterkin Professor of Political Economy, and Robert Curl, the Kenneth S. Pitzer-Schlumberger Professor Emeritus of Natural Sciences and winner of the 1996 Nobel Prize in chemistry, made this recommendation in a paper published by Rice

University's Baker Institute for Public Policy.

Brito and Curl argue that there are three important unresolved questions in the current debate on the reduction of carbon dioxide emissions: "First, what is the range of prices on carbon dioxide emissions that will be necessary to achieve the desired reductions? Second, should electrical generators and transport fuels be regulated jointly or separately? Third, should the restrictions be in the form of a quantity limit such as cap and trade or in the form of a carbon tax?"

The authors calculated the cost of CO_2 emissions by modeling the transition from coal-based electricity generation to a system based on natural gas. Because coal-based electricity generation accounts for about a third of U.S. CO_2 emissions (some 2 billion metric tons), Brito and Curl describe it as "the 900-pound gorilla in the room." Replacing coal generators with natural gas, they believe, "is the most economical way to achieve a target of reducing carbon dioxide emissions by 20 percent."

The United States is already moving from coal-based electricity production to a system based on natural gas. The authors said policymakers should encourage this transition, but they doubt whether natural gas supplies will be adequate to maintain this shift in the long run. Development of nuclear and renewable electricity generation will need to continue at a rapid pace. Natural gas, however, can be the transition technology to carbon-neutral electrical generation. "Unless or until there is a technological breakthrough in carbon sequestration," Brito and Curl wrote, "the carbon intensity of coal means that 'clean coal' cannot be an important factor in reducing carbon dioxide. Replacing existing coal generation capacity with modern coal generation plants can only reduce total carbon dioxide by 5 percent."

The authors noted that the efficiency of coal generators is very concentrated. For instance, "at current prices for fuels, a carbon price of

approximately $30/ metric ton (MT) will shut down 10 percent of coal generator capacity," they wrote. "An additional increase of $15 — resulting in a carbon dioxide price of $45/MT — will shut down 90 percent of coal generator capacity."

The narrow range for the price of carbon dioxide means that coal generator capacity is very sensitive to the price of carbon dioxide emissions. Consequently, small variations in the price of carbon dioxide emissions can lead to large variations in the amount of electricity supplied by coal generators. The market in carbon dioxide permits could possibly create volatility in the market for electricity.

As a result of the risk of high volatility, the authors back a carbon tax to assist the transition from coal to natural gas. They also assert "it is possible to decouple the pricing of allocations for transportation fuel from the allocations for the production of electricity," because the rise in carbon prices needed to effect the shift in electricity generation would have very little impact on transportation fuels.

More information: A PDF of the paper can be viewed at www.bakerinstitute.org/publica … s/BI-pub-BritoCurlCO_2 ElecEcon-070210.pdf/view

Provided by Rice University