

Virginia City Hybrid Energy Center
Response to Data Request
Bruce Buckheit, Member, Virginia Air Pollution Control Board

Question (Page No. 10):

Coal washing and the use of biomass will affect CO₂ emissions, and of course this issue is part of the discussion respecting IGCC. The cost analysis associated with each of these options should include some discussion on the impact of a Federal carbon tax. The discussion need not attempt to resolve the issue of what an appropriate tax might be, but merely lay out a short (two page) discussion the basis for the major competing proposals for the level of tax that might be imposed and a spreadsheet illustrating the effects of the different proposals on the assumed costs for coal washing and biomass. There may be materials in the record or in the open literature that could be cited in lieu of creating a new summary. Under a grant from NETL, Cornell University has developed a model for comparing GHG emissions see, http://www.iecm-online.com/iecm_dl.html, and <http://www.iecmonline.com/PDF%20Files/Rubin%20et%20al,%20NETL%20CSS%20May%202001.pdf>. Cornell also maintains a listing of over 45 relevant technical papers <http://www.iecm-online.com/publications.html>

Response:

Any coal can be washed; however, there are significant trade-offs and costs that increase as the amount of coal washing increases as described in more detailed below.

A majority of the legislative proposals in Congress are not structured as a carbon tax, but rather are focused on the creating of a Federal cap and trade approach to regulating carbon emissions. Nonetheless, Chairman Dingell of the House Energy and Commerce Committee, which has jurisdiction over clean air issues, put forward a carbon tax proposal in early 2007 and two carbon tax bills were introduced in the 110th Congress.

Chairman Dingell introduced a proposal that would have placed a tax of \$50 per ton of carbon (phased in over 5 years and then adjusted for inflation). He recently issued a public statement (Attachment 1) indicating that this proposal is no longer under consideration. In his statement, he commented that he believes comprehensive climate legislation is important, but that now is not the time to impose any additional economic burden on the families of this nation.

In the 110th Congress, Representative Stark introduced a carbon tax bill, HR 2069, that would have “impose[d] an escalating \$10 excise tax on the carbon content of any taxable fuel sold by a manufacturer, producer, or importer.”¹ The bill defined taxable fuel “as

¹ <http://thomas.loc.gov/cgi-bin/bdquery/z?d110:HR02069:@@@D&summ2=m&>

coal (including lignite and peat), petroleum and any petroleum product, and natural gas.”² Specifically, the tax would have increased \$10 per year until the year after the target attainment year or the year when “the level of carbon dioxide emissions in the United States for the calendar year does not exceed 20 percent of the level of carbon dioxide emissions in the United States for calendar year 1990.” The bill was referred to the House Committee on Ways and Means on April 24, 2007, and has not been acted on since.

Also in the 110th Congress, Representative Larson introduced HR 3416, a carbon tax bill which would have imposed a \$15 escalating tax on any carbon substance sold by a manufacturer, producer, or importer. Specifically, this bill would have imposed a \$15 tax in 2008 and each year thereafter, the tax would have increased by the amount prescribed through the following equation”

SEC. 4691. IMPOSITION OF TAX. (b)(3)³
(B) YEARS AFTER 2008- For a calendar year after 2008, the applicable amount is the product of—
(i) the amount in effect under this paragraph for the preceding calendar year,
(ii) 1.1, and
(iii) 1 plus the cost of living adjustment determined under section 1(f)(3) for such calendar year, determined by substituting ‘calendar year 2007’ for ‘calendar year 1992’ in subparagraph (B) thereof.

Unlike with IGCC, the CFB design of the VCHEC allows the use of a wide range of fuels including coal, waste coal and biomass. Biomass is a carbon neutral fuel source and its contribution to the fuel mix would not be subject to a carbon tax. The attached spreadsheet (Attachment 2) shows the economic impact of using 5, 10, 15, and 20 percent biomass under a \$10, \$15, \$20, \$30, and \$50 tax as applicable to the proposals discussed above. The calculations range from \$72,451,347.15 to control the entire station’s carbon emissions with no biomass at a \$50 per ton tax on carbon content to \$12,316,729.02 to control the entire station’s carbon emissions with 20 percent biomass at a \$10 per ton tax on carbon content.

While coal can be washed as a matter of course, there are significant trade-offs and costs that increase as the amount of coal washing increases.

- Coal Washing is a trade-off
 - Marginal reductions in sulfur may be achievable but at a cost exceeding \$26,948 per ton.

² <http://thomas.loc.gov/cgi-bin/query/z?c110:H.R.2069>:

³ <http://thomas.loc.gov/cgi-bin/query/z?c110:H.R.3416>:

- Mercury can be washed and possibly reduced on a lbs per year basis. But, this Mercury will stay at the processing facility and be placed in a waste coal pile or slurry impoundment.
- As proposed, mercury generated from ROM coal will be safely secured within project's lined landfill subject to DEQ authority
- Ratepayer to Pay More → Cost per lb of Hg removal (\$2,500,000/lb)
- Coal Washing increases ratepayer costs significantly- and creates negative environmental externalities
- Coal washing will limit the ability of the boiler to burn biomass, actually increasing the amount of CO₂
- Mercury and Washing Issues
 - Some Hg can be removed with washing
 - The washed Hg goes to a GOB pile and/or slurry impoundment
 - GOB piles and impoundments are not impervious like the cementitious ash properties of VCHEC.
 - GOB piles occasionally spontaneously combust resulting in uncontrolled release to the atmosphere
 - Hg that goes through the CFB boiler is captured, chemically binds to carbon and then stored in a safe, lined landfill
- BACT analysis shows that coal washing is not required. However, coal washing can be done. The question is how to balance the trade-offs.
 - Unlike Pennsylvania coal (Northern Appalachian Coal), washed Virginia (Central Appalachian) coal is low in pyritic sulfur -> washing will not remove significant amounts of additional sulfur.
 - Washing Virginia coal may remove additional mercury; however, Mercury from washed coal will be left at processing facility rather than in DEQ permitted, lined landfill
 - To wash coal - coal is crushed and washed with water to separate the rock (ash) from the coal by density separation
 - Central Appalachian Coal (Virginia) is low in pyritic sulfur. Sulfur is generally contained in the coal (carbon), and the Mercury is generally contained in the ash (rock), Accordingly,
 - The Pyritic Sulfur that could be removed from coal is low
 - Mercury can be reduced by removing the ash (rock) from the coal. Mercury is then left at the processing plant
 - The end result, is little removal of sulfur, some removal of Hg, high use of water, creation of waste coal piles (gob) that contain the mercury removed from washing the coal, creation of carbon fines which have inherent issues within themselves, and a reduction of heat recovery of the coal from 98% to 63% (fuel inefficiency = higher cost).
- Dominion did not plan on washing coal because:
 - Coal washing is not as cost effective as other control technologies (e.g. redundant with CFB dry-scrubbing)
 - Coal washing will increase waste-coal piles (in conflict with DMME goals & objectives)

- Coal washing may use an additional 1MG of water per day - doubling the Project's daily water needs
- Minimizing water use was a priority for this project. For example, the project will employ an air cooled condenser to minimize regional water use by 90%
- Washing process will remove Chlorine- effectively reducing the efficiency of the boiler to remove Hg
- Washing coal will limit biomass consumption from 20% to 5% (- 90 mW equivalent of output)
- This limitation of use of biomass will increase CO2 emissions
- Washing will create slurry & fines that create operational issues for fuel handling and combustion
- Coal Washing will:
 - Increase Thermal NOx
 - Reduce economic advantages to smaller local mining operations
 - Increase coal costs (less suppliers more demand for washed-coal)
 - Washing coal throws away up to approximately 15% of the heat energy into a gob pile. A ROM product in a CFB will recover up to 98% of the energy
 - Additional mining required to extract the equivalent of the lost energy due to washing the coal

ATTACHMENT 1

NEWS FROM

Congressman John D. Dingell

Serving Michigan's 15th Congressional District



NEWS RELEASE

April 15, 2008

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Dingell Takes Carbon & Gas Tax Proposals Off the Table

Congressman Declares Policies Too Burdensome on Working Families During Economic Downturn

Washington, DC - Congressman John D. Dingell (D-MI15) put out the following statement today in response to the continued economic slump plaguing American families:

“Economists and other experts continue to inform us that a carbon tax is the most effective and efficient way at getting at the problem of global warming. A few months back I put forward for conversation the idea of a carbon fee, a gas tax and a reduction in the mortgage interest deduction for very large McMansions - policies intended to reduce our carbon emissions and combat global warming. When I initially began looking at this proposal, the price of a gallon of gas was significantly lower than it is today and the economy was not in recession. Times have changed; our economy has taken a hard downward turn and now is not the time for us to put any additional financial burden on the working families of Michigan or this nation.

“The reality is that this proposal is off the table for now. I simply cannot support these policies at a time when families in my district are dealing with record gas prices, high levels of unemployment, a home foreclosure crisis and rising food costs. Families all across America, and particularly in Michigan where people are really hurting, are feeling the failed economic policies of the Bush Administration and they need relief. We need to focus our attention on ways of making groceries, utilities, and health care more affordable for working families. We need to make sure people are able to stay in their homes and do not go bankrupt paying for college. We must take bold action to stimulate our economy.

“I am pleased to have received so many comments on my carbon tax proposal since I put it out to begin the national conversation we need to have on the issue of global warming. The fact that more than 2,900 people took the time to look over the proposal and give me their thoughts proves that the issue of global warming, and how to most effectively address it, is a top priority of the American people.

“It may come as a surprise to some that 61.4 percent of the people who responded to the question ‘Do you approve of the idea of a carbon tax?’ responded ‘yes.’ Some of the respondents even pointed out that a properly designed and considered carbon tax could include an adjustment mechanism to address changing economic circumstances, and many nations have in fact employed this policy tool.

“In addition, 57 percent of those who responded to the question ‘Do you approve of the idea of a cap and trade system?’ responded ‘yes.’

“This leads me to one conclusion: people desperately want action on global warming.

“I will continue to work on a comprehensive climate change bill that will seek to reduce greenhouse gas emissions by 60-80 percent by 2050 and will include a cap-and-trade proposal.”

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[Congressman John D. Dingell Homepage](#)

ATTACHMENT 2

Carbon Tax Based on no Biomass

Carbon Tax Proposal	Carbon Content of the Coal	Tons of coal/year	Tons of carbon/year with no biomass	Total Carbon Tax
	10.00	0.411	3,525,613	1,449,027
	15.00	0.411	3,525,613	1,449,027
	20.00	0.411	3,525,613	1,449,027
	30.00	0.411	3,525,613	1,449,027
	50.00	0.411	3,525,613	1,449,027

Carbon Tax Based on 5 Percent Biomass

Carbon Tax Proposal	Carbon Content of the Coal	Tons of coal/year	Tons of carbon/year with 5 per biomass	Total Carbon Tax
	10.00	0.411	3,525,613	1376575.596
	15.00	0.411	3,525,613	1376575.596
	20.00	0.411	3,525,613	1376575.596
	30.00	0.411	3,525,613	1376575.596
	50.00	0.411	3,525,613	1376575.596

Carbon Tax Based on 10 Percent Biomass

Carbon Tax Proposal	Carbon Content of the Coal	Tons of coal/year	Tons of carbon/year with 10 per biomass	Total Carbon Tax
	10.00	0.411	3,525,613	1304124.249
	15.00	0.411	3,525,613	1304124.249
	20.00	0.411	3,525,613	1304124.249
	30.00	0.411	3,525,613	1304124.249
	50.00	0.411	3,525,613	1304124.249

Carbon Tax Based on 15 Percent Biomass

Carbon Tax Proposal	Carbon Content of the Coal	Tons of coal/year	Tons of carbon/year with 15 per biomass	Total Carbon Tax
	10.00	0.411	3,525,613	1231672.902
	15.00	0.411	3,525,613	1231672.902
	20.00	0.411	3,525,613	1231672.902
	30.00	0.411	3,525,613	1231672.902
	50.00	0.411	3,525,613	1231672.902

Carbon Tax Based on 20 Percent Biomass

Carbon Tax Proposal	Carbon Content of the Coal	Tons of coal/year	Tons of carbon/year with 20 per biomass	Total Carbon Tax
	10.00	0.411	3,525,613	1159221.554
	15.00	0.411	3,525,613	1159221.554
	20.00	0.411	3,525,613	1159221.554
	30.00	0.411	3,525,613	1159221.554
	50.00	0.411	3,525,613	1159221.554

Carbon content of the coal is 41.1%

Tons of coal per year is 3,525,613