Synapse
Energy Economics, Inc.

# The Risks of Building and Operating Plant Washington

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**AUTHOR**
**David Schlissel**

22 Pearl Street
Cambridge, MA 02139
www.synapse-energy.com
617.661.3248

## 1. Introduction and Conclusions

Power4Georgians is a consortium of ten of Georgia's Electric Membership Corporations ("EMCs") that is proposing to build and operate Plant Washington, an 850 megawatt ("MW") supercritical pulverized coal plant, in Washington County, Georgia. Synapse Energy Economics was asked to assess the risks associated with Power4Georgians' proposed Plant Washington and to evaluate, in particular, construction costs, costs of $CO_2$ regulations, and alternatives to the proposed plant.

Our conclusions are as follows:

1. There are significant uncertainties associated with building and operating the proposed Plant Washington:

    - Uncertainty as to the plant's ultimate construction cost and schedule
    - Uncertainty as to the greenhouse gas emissions reductions that ultimately will be required as a result of federal, regional or state action.
    - Uncertainty as to future carbon dioxide emissions allowance prices.
    - Uncertainty whether post-combustion carbon capture and sequestration will prove to be technically and economically viable as a retrofit for pulverized coal plants like Plant Washington.
    - Uncertainty as to what the costs of post-combustion carbon capture and sequestration for pulverized coal plants will be, if it does prove technically viable.
    - Uncertainty as to whether the federal government will adopt a national Renewable Portfolio Standard.
    - Uncertainty as to the levels of energy efficiency that will be found to be economic and that will be implemented.

    In light of these significant uncertainties, it would be better to adopt a resource plan that allows for the flexibility to modify course as circumstances change. Making a fixed commitment to a coal plant that is likely to cost in excess of $2 billion, even without considering financing costs, and whose permitting and construction are likely to take 5-6 years or longer, is a mistake in such uncertain times.

2. Increasing numbers of proposed coal-fired power plants have been cancelled and delayed by public and investor-owned utilities or have been rejected by state regulatory commissions in large part due to the uncertainties regarding construction costs and future $CO_2$ emissions costs.

3. It is reasonable to expect that the actual cost of building Plant Washington will be substantially higher than Power4Georgians now claims given:

a. The continuing worldwide competition for power plant design and construction resources, commodities and equipment.

b. The significant cost increases experienced in recent years by other coal-fired power plant construction projects.

c. The estimated costs of other power plants that are further along in the design and construction process than Plant Washington.

d. The inability of power plant owners in the current construction environment to obtain fixed price contracts.

4. Coal is the most carbon intensive fuel. A comprehensive system for Federal regulation of greenhouse gas emissions is inevitable. The costs of this regulation will have a significant impact on the cost of generating power at Plant Washington and on the relative economics of the proposed plant versus lower- and non-carbon emitting resources.

5. Cobb EMC has just released a Cost Analysis that it says was used in the decision process for building Plant Washington as a supercritical coal power generation plant. Even a brief review of the single page posted by Cobb EMC reveals that this Cost Analysis is biased by out-of-date information obtained in large part from industry sources. For example, the Cost Analysis:

a. Acknowledges that the cost information was compiled over one and one half years ago. As this report will demonstrate, coal plant construction costs have skyrocketed in recent years. Prudent resource planning requires that decisions be based on the most recent available data and be re-examined in light of significantly changed circumstances. However, there is no evidence that Cobb EMC or any of the other members of Power4Georgians have re-examined their commitment to Plant Washington in light of any changed circumstances such as higher construction costs or the accumulating evidence that state regulatory commissions and many public or investor-owned utilities have decided to reject, cancel or significantly delay more than 60 proposed coal power plant projects in just the past two years.

b. Says that Cobb EMC looked at a range of coal plant construction costs of between 2,400 and 2,800 dollars per kilowatt ("$/kW"). However, as this report will show, recent estimates of coal plant construction costs have ranged as high as 3,500 to 3,865 $/kW, significantly above the range assumed in the Cobb EMC cost analysis.

c. Reveals that Cobb EMC did not include any costs for carbon dioxide ("$CO_2$") mitigation measures or for purchasing $CO_2$ emissions allowances. This failure significantly biases the analysis in favor of coal, the most carbon-intensive fuel. It is widely accepted that a comprehensive federal program for reducing $CO_2$ emissions is inevitable, especially in light of the recent elections.

d. Assumes very high costs for renewable wind and biomass alternatives while using out-of-date and low estimates for new coal construction costs.

e. Relies to a very large extent on information from coal-industry sources and appears to ignore less biased and more independent and objective sources.

6. There are a number of lower cost demand-side and renewable alternatives to the proposed Plant Washington that should be investigated in detail before an EMC makes a long-term commitment to purchase what may be very expensive power from Plant Washington. These alternatives include energy efficiency and demand-side management programs, renewable resources such as biomass, wind and solar, and, if necessary, building new gas-fired capacity. A portfolio of these alternatives would offer greater flexibility and would limit the EMC's exposure to the inevitable comprehensive federal regulation of greenhouse gas emissions.

## 2. The Risks of Building and Operating Plant Washington

Risk and uncertainty are inherent in all enterprises. But the risks associated with any option or plan need to be balanced against the expected benefits from each such option or plan. In particular, parties seeking to build new generating facilities face a host of major uncertainties. The most significant risks associated with building and operating new coal-fired generating plants like the proposed Plant Washington are the potential for significant increases in the project's construction cost and the inevitability of future restrictions on $CO_2$ emissions. There also are other potential uncertainties and risks for new coal plants including the potential for higher fuel prices, fuel supply disruptions that could affect plant operating performance and fuel prices and the potential for increasing stringency of the regulations for current criteria pollutants (such as $NO_x$, $SO_2$ and mercury).

Power4Georgians claims that there will be significant negative effects on the residential and business customers of its member EMCs if the proposed coal-fired Plant Washington is not built. For example, Power4Georgians says that without Plant Washington, its member EMCs will have to pay substantially more for the power they buy from the wholesale market – assuming it is available – meaning that their members would see their electricity become less and less affordable. As a result, according to Power4Georgians, residential members of the EMCs may then have to choose between electricity and other priorities in their lives, while commercial and small industrial members may be faced with the decision of whether or not to relocate if electric costs put them at a competitive disadvantage. However, publicly available information suggests that the cost of building the proposed Plant Washington will be significantly higher than Power4Georgians has acknowledged, that Power4Georgians will incur significant $CO_2$ mitigation or emissions allowance costs, and that there could be less expensive and less risky alternatives to building a new coal-fired power plant in today's uncertain economic environment.

## 3. Uncertainty over Construction Costs and Future $CO_2$ Costs Has Led to Coal Power Plant Cancellations, Delays and Rejections by State Regulatory Commissions

Since late 2006, more than twenty proposed coal-fired power plants have been cancelled. More than three dozen others have been delayed. State regulatory Commissions in North Carolina, Florida, Virginia, Oklahoma, Washington State, Oregon, and Wisconsin have rejected proposed power plants. The Secretary of Health and Environment of the State of Kansas also has rejected permits for two 700 MW coal-fired power plants.

For example, the July 2007 decision of the Florida Public Service Commission in denying approval for the 1,960 MW Glades Power Project was based on concern over the uncertainties of plant construction costs, coal and natural gas prices, and future environmental costs, including carbon allowance costs.[1]

In April of this year, the Virginia State Corporation Commission rejected a proposed coal plant citing uncertainties of costs, technology, and unknown federal mandates.[2] The Commission concluded that "… [Appalachian Power Company] has no fixed price contract for any appreciable portion of the total construction costs; there are no meaningful price or performance guarantees or controls for this project at this time. This represents an extraordinary risk that we cannot allow the ratepayers of Virginia in [Appalachian Power Company's] service territory to assume."[3]

The Commission also noted the uncertainties surrounding federal regulation of carbon emissions and carbon capture and sequestration technology and costs and observed that the Company was asking for a "blank check."[4] On this basis, the Commission concluded that "We cannot ask Virginia ratepayers to bear the enormous costs – and potentially huge costs – of these uncertainties in the context of the specific Application before us."[5]

Within the last month, the Public Service Commission of Wisconsin rejected a coal power plant that had been proposed by Wisconsin Power & Light. The Commission decided that the $1.26 billion project was too costly when weighing it against other alternatives such as natural gas generation and the possibility of purchasing power from existing sources.[6] The Commission also said that "Concerns over construction costs and uncertainty over the costs of complying with future possible carbon dioxide regulations were all contributing factors to the denial."[7]

At the same time, a large number of investor-owned and public power utilities have announced that they were cancelling or delaying new coal-fired generating facilities. For example, Westar Energy announced in December 2006 that it was deferring site selection

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1 Order No. PSC-07-0557-FOF-EI, Docket No. 070098-EI, July 2, 2007.

2 Final Order in Case No. PUE-2007-00068, April 14, 2008. Available at http://scc.virginia.gov/newsrel/e_apfrate_08.aspx.

3 Id, at page 5.

4 Id, at page 10.

5 Id, at page 10.

6 The estimated cost of the proposed coal plant was $1.26 billion for a 326 MW facility.

7 *PSC Rejects Wisconsin Power & Light's Proposed Coal Plant*, issued by the Public Service Commission of Wisconsin on November 11, 2008.

for a new 600 MW coal-fired power plant due to significant increases in the facility's estimated capital cost of 20 to 40 percent, over just 18 months.

This prompted Westar's Chief Executive to warn: "When equipment and construction cost estimates grow by $200 million to $400 million in 18 months, it's necessary to proceed with caution."[8] As a result, Westar Energy suspended site selection for the coal-plant and is considering other options, including building a natural gas plant, to meet growing electricity demand. The company also explained that:

> most major engineering firms and equipment manufacturers of coal-fueled power plant equipment are at full production capacity and yet are not indicating any plans to significantly increase their production capability. As a result, fewer manufacturers and suppliers are bidding on new projects and equipment prices have escalated and become unpredictable.[9]

Tenaska Energy cancelled plans to build a coal-fired power plant in Oklahoma in July 2007 because of rising steel and construction prices. According to the Company's general manager of business development:

> ... coal prices have gone up "dramatically" since Tenaska started planning the project more than a year ago.
>
> And coal plants are largely built with steel, so there's the cost of the unit that we would build has gone up a lot… At one point in our development, we had some of the steel and equipment at some very attractive prices and that equipment all of a sudden was not available.
>
> We went immediately trying to buy additional equipment and the pricing was so high, we looked at the price of the power that would be produced because of those higher prices and equipment and it just wouldn't be a prudent business decision to build it.[10]

The publicly owned Great River Energy Generation & Transmission Cooperative ("GRE") in Minnesota announced in September 2007 that it was withdrawing from the proposed Big Stone II Project. According to GRE, four factors contributed most prominently to the decision to withdraw, including uncertainty about changes in environmental requirements and new technology and the fact that "The cost of Big Stone II has increased due to inflation and project delays."[11]

Similarly, in the spring of 2008, Associated Electric Cooperative, Inc., the wholesale power supplier for 57 electric cooperatives in Missouri, Southeast Iowa, and northeast

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8 Available at http://www.westarenergy.com/corp_com/corpcomm.nsf/F6BE1277A768F0E4862572690055581C/$file/122806%20coal%20plant%20final2.pdf.

9 Id.

10 Available at www.swtimes.com/articles/2007/07/09/news/news02.prt.

11 See www.greatriverenergy.com/press/news/091707_big_stone_ii.html.

Oklahoma, delayed its plans to build the Norborne 660 MW coal-fired power plant due to increasing costs and other uncertainties. According to AECI:

> The Norborne project costs have significantly increased in less than three years and are now estimated at $2 billion due to worldwide demand for engineering, skilled labor, equipment and materials.
>
> The U.S. Department of Agriculture Rural Utilities Service, a traditional funding source for rural electric cooperatives, is currently unable to finance baseload generation for cooperatives. Although AECI's AA credit rating is one of the strongest ratings among all electric utilities nationally, seeking private lending would further increase project costs.[12]
>
> There also is increasing uncertainty in the regulatory environment, and Congress continues to debate the environmental and economic impact of reducing greenhouse gas emissions, making the cost of reducing carbon dioxide from power plants unknown.[13]

At the same time, AECI noted that it would continue to look at energy efficiency initiatives, natural gas, renewable and nuclear resources to address future generation needs.

These are only four examples of the many public and investor-owned utilities that have decided to cancel or significantly delay their proposed coal-fired power plants due to the risks associated with rising construction costs and potential $CO_2$ mitigation costs.

## 4. The Cost of Building Plant Washington is Likely To Be Much Higher than Power4Georgians Has Claimed

Coal power plant construction costs have risen dramatically in recent years as a result of a worldwide competition for design and construction resources, equipment and commodities like concrete, steel, copper and nickel. Terms like "staggering" and "skyrocketing" have been used to describe these cost increases. Coal-fired power plants that were estimated to cost $1,500 per kilowatt in 2002 are now projected to cost in excess of $3,500 per kilowatt. The rapid increases in estimated coal plant construction costs are illustrated in Figure 1, below, which shows the increases that were experienced between late 2005 and October 2008 by the proposed Meigs County coal plant in Southern Ohio.

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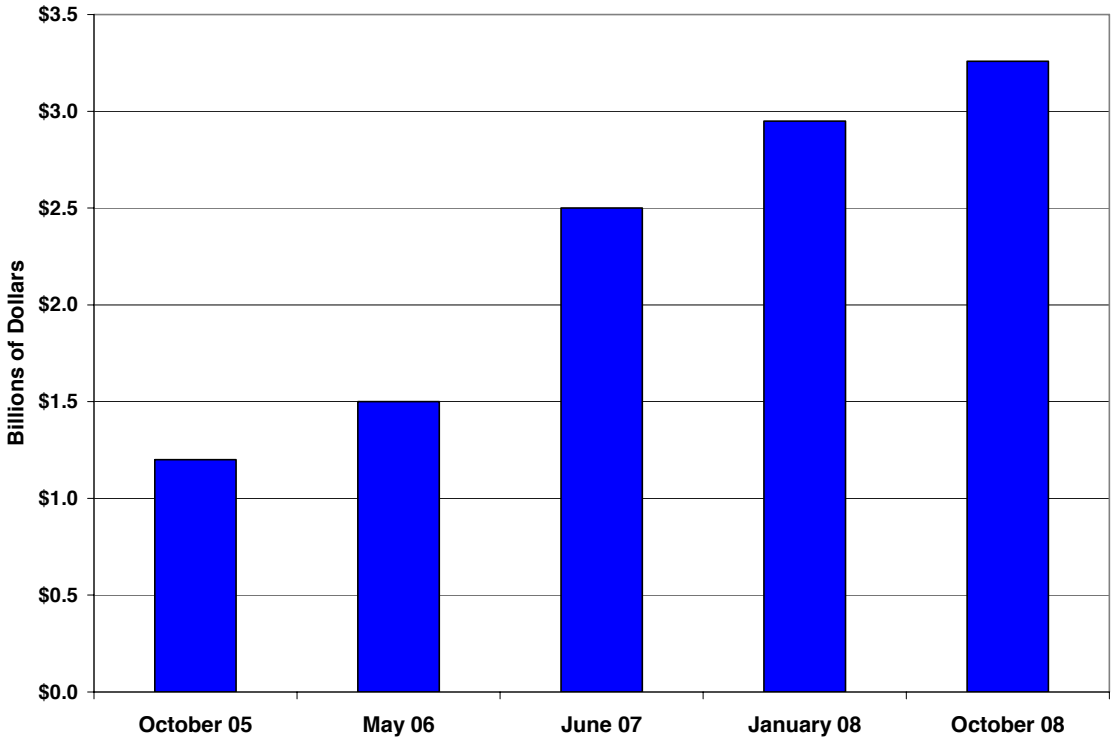
12 The Rural Utilities Service of the U.S. Department of Agriculture announced in early March 2008 that it was suspending the program through which it makes loans to rural cooperatives to build new coal-fired power plants. In a letter to Congress, the Administrator of Utility Programs for the Department of Agriculture indicated that loans for new base load generation plants would not be made until the RUS and the federal Office of Management and Budget can develop a subsidy rate to reflect the risks associated with the construction of such plants.

13 http://www.aeci.org/NR20080303.aspx.

**Figure 1. Increases in the Estimated Cost of Building the 960 MW Meigs County Coal Plant (in nominal year dollars, no financing costs)**




Like Plant Washington, the proposed Meigs County plant, if built, will be a supercritical pulverized coal plant.

Moreover, almost all other proposed coal-fired power plants have experienced significant cost increases in recent years. For example, the estimated per unit construction cost of Duke Energy Carolina's Cliffside Project increased by 80 percent between the summer of 2006 and June 2007. Similarly, the projected construction cost of Wisconsin Power & Light's proposed Nelson Dewey 3 coal plant increased by approximately 47 percent between February 2006 and September 2008.[14]

Power4Georgians has announced that its proposed 850 megawatt Plant Washington power plant will cost approximately $2 billion to build, or about $2,353 per kilowatt.[15] Unfortunately, Power4Georgians has revealed few other details about this cost estimate and has not indicated whether this $2 billion figure represents only the estimated construction cost or also includes the cost of borrowing the funds needed for construction expenditures.

As shown in the last column of Table 1, below, even assuming that Power4Georgians' estimated $2 billion cost only includes the cost of construction and not financing costs,

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[14] A 15 percent increased in the construction cost of Kansas City Power & Light Company's Iatan 2 coal plant was announced in the spring of 2008, nearly three years into construction. This shows that even plants that are under construction are not immune to cost increases.

[15] http://power4georgians.com/wcpp.aspx

the plant's projected $2,353 per kilowatt construction cost is substantially lower than the recently estimated costs of other coal-fired power plants that are being proposed for approximately the same time frame as Plant Washington.[16]

**Table 1. Recent Coal-Fired Power Plant Cost Estimates (nominal year dollars, no financing costs)**

| Plant | Type of Coal Plant | Owner | Date of Estimate | Total Cost (Billions) | Size (MW) | Cost/ kW |
|---|---|---|---|---|---|---|
| Plant Washington | SCPC | Power4Georgians | January-08 | $2.00 | 850 | $2,353 |
| Turk | SCPC | SWEPCO | Spring 2008 | $1.52 | 600 | $2,533 |
| Karn-Weadock | SCPC | Consumers Energy | September-07 | $2.21 | 800 | $2,765 |
| Meigs County | SCPC | AMP-Ohio | October-08 | $3.26 | 960 | $3,394 |
| Nelson Dewey 3 | CFB PC | Wisconsin Power & Light | September-08 | $1.26 | 326 | $3,865 |
| Columbia 3 | SubCritical PC | Wisconsin Power & Light | September-08 | $1.28 | 326 | $3,936 |
| Marshalltown | SCPC | Interstate Power & Light | September-08 | $2.23 | 630 | $3,538 |

Note:
SCPC = supercritical pulverized coal power plant
CFB PC = circulating fluid bed pulverized coal plant
Sub Critical PC = subcritical pulverized coal plant

Cobb EMC's recently released Cost Analysis shows that it assumed a range of 2,400 to 2,800 $/kW for the cost of building a new coal plant.[17] As can be seen from Table 1, such a range would be significantly below the recently estimated costs of other proposed coal plants. Indeed, Cobb EMC says that the 2,400 to 2,800 $/kW range of estimated coal construction costs that it used in its Cost Analysis was based on information obtained about the estimated cost of the Nelson Dewey 3 plant in Wisconsin. However, as shown in Table 1, the last cost estimate for the Nelson Dewey 3 plant was 3,865 $/kW, much higher than the range of construction costs assumed by Cobb EMC. Moreover, as noted above, the Wisconsin Public Service Commission rejected the proposed Nelson Dewey 3 plant in mid-November of this year because it was too expensive when weighed against alternatives.

In fact, the recently estimated construction costs of only two of the proposed coal plants included in Table 1, i.e., Turn and Karn-Weadock, fall within the 2,400 to 2,800 $/kW range assumed by Cobb EMC in its Cost Analysis. However, Consumers Energy Company in Michigan has announced that the estimated cost for its proposed Karn-Weadock plant has increased above 2,765 $/kW but will not release a new estimate until early in 2009. Similarly, the builder of the Turk Plant, SWEPCO, has said that it already

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16 The announced $2 billion cost for Plant Washington would be even more inconsistent with the recently estimated costs of other coal plants if the $2 billion estimate shown in Table 1 includes both construction and financing costs. The estimated costs for the other coal plants in Table 1 include only estimated construction costs.

17 http://www.cobbemc.com/pdfs/Coal_Plant_Cost_Analysis.pdf

has purchased the equipment and many of the materials for the plant – therefore, its cost is not expected to increase as much as the costs of plants that are not as far advanced in the contract and purchasing process, such as Plant Washington. Thus, it is not surprising that the estimated cost of the Turk plant is lower than the costs of the other plants in Table 1.

It also must be emphasized that there are no guarantees that the estimated costs of any of the coal plants listed in Table 1 will not continue to increase as a result of the same worldwide competition for power plant design and construction resources, equipment and commodities that has fueled the recent surge in power plant construction costs. Even though there is now a worldwide economic slowdown, there still is great demand for power plant design and construction resources, equipment and commodities in nations like China and India. At the same time, a number of countries, most particularly the United States and China, have stated their intention to undertake very significant stimulus spending packages on infrastructure repairs and improvements. Such stimulus spending will increase the demand for the same resources and commodities that are used to build new coal-fired power plants.

The recently estimated costs of new coal-fired power plants shown in Table 1 strongly suggest that the actual cost of building Plant Washington will be significantly higher than both the $2 billion figure publicized by Power4Georgians and the 2,400 to 2,800 $/kW range that Cobb EMC says it assumed in its Cost Analysis. Some may argue that economies of scale lead to the cost discrepancies seen in Table 1 – that because Plant Washington is larger than most of the other plants in the table, the cost of building each kilowatt of capacity should be lower. This would lead to an overall dollar per kilowatt ($/kW) construction cost that is lower than for a smaller plant.

We have adjusted the $/kW construction costs of each of the proposed coal plants included in Table 1 to account for the difference between their planned MW size and the 850 MW size of the proposed Plant Washington. The results of this revised comparison are presented in Table 2 below. Consequently, Table 2 reflects what each plant would cost to build if its size were 850 megawatts like Plant Washington.

**Table 2. Estimated Construction Cost of Plant Washington vs. Other Recent Coal-Fired Power Plant Construction Cost Estimates (Adjusted for 850 MW Size of Proposed Plant Washington) (nominal dollars, no financing costs)**

| Plant | Type of Coal Plant | Owner | Date of Estimate | Total Cost (Billions) | Cost/kW Adjusted for 850 MW Size (MW) |
|---|---|---|---|---|---|
| Plant Washington | SCPC | Power4Georgians | January-08 | $2.00 | $2,353 |
| Turk | SCPC | SWEPCO | Spring 2008 | $1.94 | $2,282 |
| Karn-Weadock | SCPC | Consumers Energy | September-07 | $2.31 | $2,715 |
| Meigs County | SCPC | AMP-Ohio | October-08 | $2.99 | $3,520 |
| Nelson Dewey 3 | CFB PC | Wisconsin Power & Light | September-08 | $2.46 | $2,899 |
| Columbia 3 | SubCritical PC | Wisconsin Power & Light | September-08 | $2.51 | $2,952 |
| Marshalltown | SCPC | Interstate Power & Light | September-08 | $2.75 | $3,234 |

Thus, recent coal plant construction cost estimates remain significantly above the 2,400 to 2,800 $/kW range that Cobb EMC says it assumed in its Cost Analysis even if a conservative adjustment is made to reflect economies of scale that might be gained from building an 850 megawatt facility. The only two plants within the construction cost range assumed by Cobb EMC are the Turn and Karn-Weadock plants. As noted above, the estimated construction cost of the Karn-Weadock plant is currently being revised upward and there are a number of reasons for the lower cost of SWEPCO's proposed Turk plant.

Consequently, it is reasonable to expect that the actual cost of building the Washington County coal plant will be significantly higher than Power4Georgians has estimated. This will make the cost of power from Plant Washington more expensive and will make other alternatives, such as energy efficiency and biomass, more economically viable. With its current construction cost estimate, Power4Georgians is significantly underestimating the financial risk that this plant poses to the EMCs that will participate in the project and their members.

## 5. There Is No Evidence That Power4Georgians Has Considered the Likely Costs of Federal Regulation of Greenhouse Gas Emissions

There is widespread agreement that a comprehensive system for federal regulation of greenhouse gas emissions is inevitable. This is especially true in light of the results of the recent national elections. The question is not whether the United States will develop a comprehensive national policy addressing climate change, but when and how. Furthermore, it is clear that the electric sector will be a key component of any regulatory or legislative approach to reducing greenhouse gas emissions both because of this

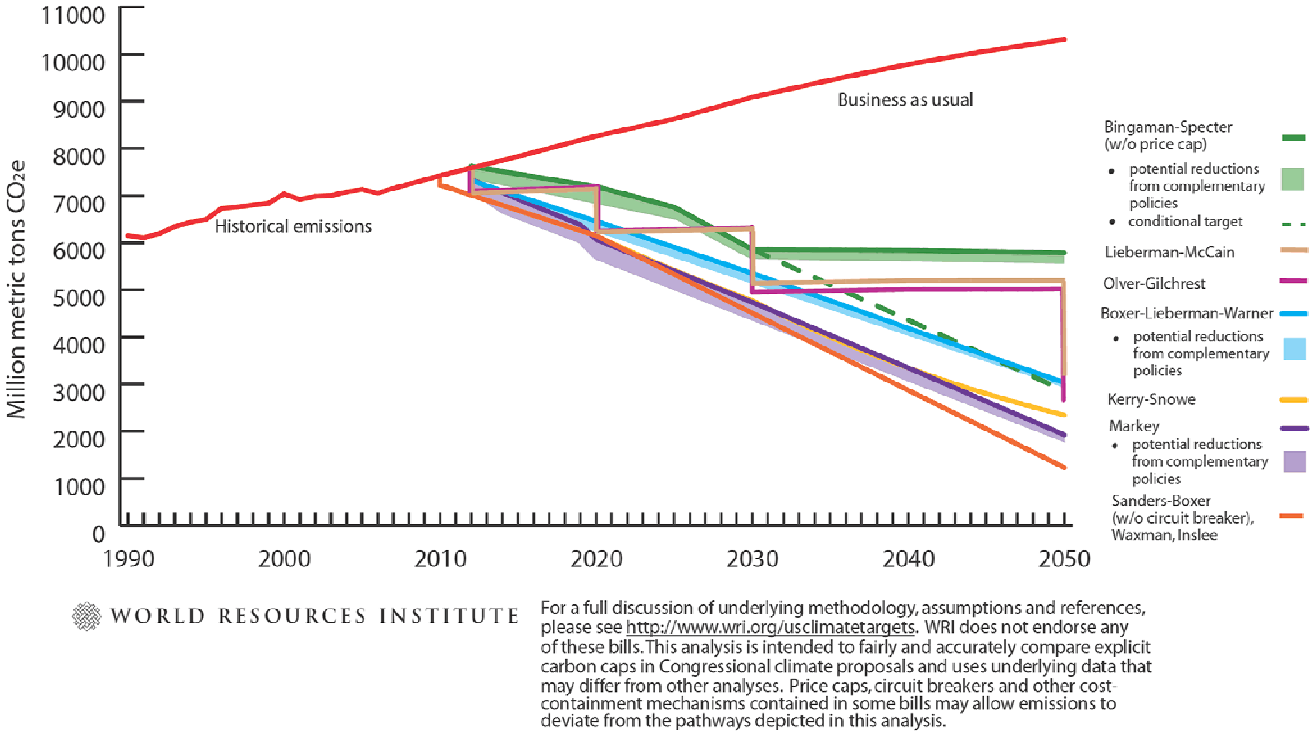
sector's contribution to national emissions and the comparative ease of regulating large point sources. There are, of course, important uncertainties with regard to the timing, the emission limits, and many other details of what a carbon policy in the United States will look like.

However, if Plant Washington were to be built, carbon regulation is not an issue that can definitely be addressed in the future, and at a reasonable cost, once the timing and stringency of federal emissions limits are known. This is because unlike for other power plant air emissions like sulfur dioxide and oxides of nitrogen, there currently is no commercially demonstrated, economically viable method for the post-combustion removal of $CO_2$ from pulverized coal plants at full scale. Some technologies are starting to be tested with plans for scale up. However, it might be years, if not decades, before there will be commercially viable post-combustion technology for the capture and sequestration of greenhouse gas emissions from pulverized coal-fired power plants like the proposed Plant Washington.

To date, the U.S. government has not established a specific set of mandated greenhouse gas emissions reductions. However, a substantial number of legislative initiatives for mandatory emissions reductions have been introduced in Congress. These proposals establish $CO_2$ emissions trajectories far below the projected business-as-usual emissions trajectories, and they generally rely on market-based mechanisms (such as cap-and-trade) for achieving the targets. The proposals also include various provisions to spur technology innovation, as well as details pertaining to offsets, allowance allocation, restrictions on allowance prices and other issues.

As shown in Figure 2 below, the federal proposals that have been introduced in the current $110^{th}$ U.S. Congress increasingly aim for emissions reductions of 60% to 80% from current levels by 2050 based on the scientific conclusion that these levels of reductions will be necessary to stabilize atmospheric $CO_2$ concentrations at levels that may avoid the most dangerous impacts of climate change.

**Figure 2. Emissions Reductions That Would Be Required Under the Climate Change Bills in Current U.S. Congress**




It is uncertain which, if any, of the specific climate change bills that have been introduced to date in Congress will be adopted. Nevertheless, the general trend is clear; and it would be a mistake to ignore it in long-term decisions concerning electric resources. Over time the proposals are becoming more stringent as evidence of climate change accumulates and as the political support for serious governmental action grows.

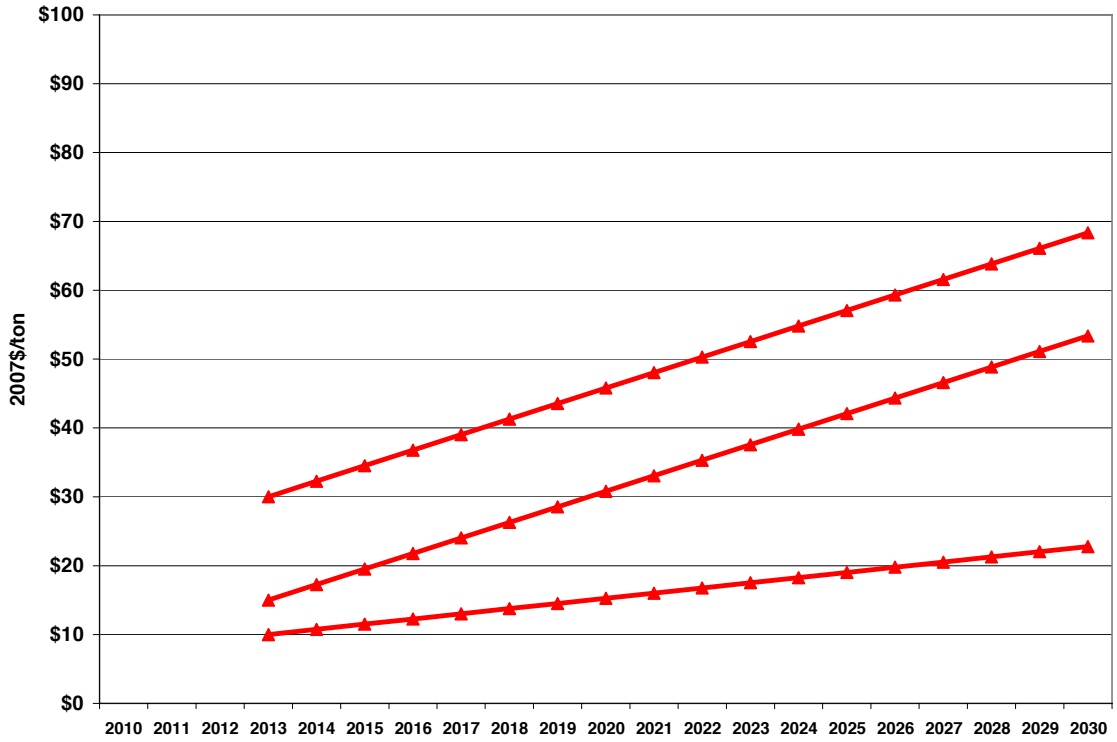
## The Expected $CO_2$ Emissions from Plant Washington

Coal is the most carbon intensive fuel. If it operates at an average annual 85 percent capacity factor, the 850 MW Plant Washington will emit approximately 6 million tons of $CO_2$ each year for what can reasonably be expected to be a 60 year operating life.

## $CO_2$ Price Forecasts

Synapse has developed a set of $CO_2$ price forecasts that we believe should be used in resource planning and to evaluate proposed projects like Plant Washington. These forecasts are presented in Figure 3:

**Figure 3: Synapse 2008 $CO_2$ Price Forecasts**




As can be seen from Figure 3, the 2008 Synapse Low $CO_2$ Price Forecasts starts at $10/ton in 2013, in 2007 dollars, and increases to approximately $23/ton in 2030. This represents a $15/ton levelized price over the period 2013-2030, in 2007 dollars. The 2008 Synapse High $CO_2$ Price Forecast starts at $30/ton in 2013, in 2007 dollars, and rises to approximately $68/ton in 2030. This High Forecast represents a $45/ton levelized price over the period 2013-2030, also in 2007 dollars. Synapse also has prepared a Mid $CO_2$ Price Forecast that starts close to the low case, at $15/ton in 2013, in 2007 dollars, but then climbs to $53/ton by 2030. The levelized cost of this Mid $CO_2$ price forecast is $30/ton, in 2007 dollars.

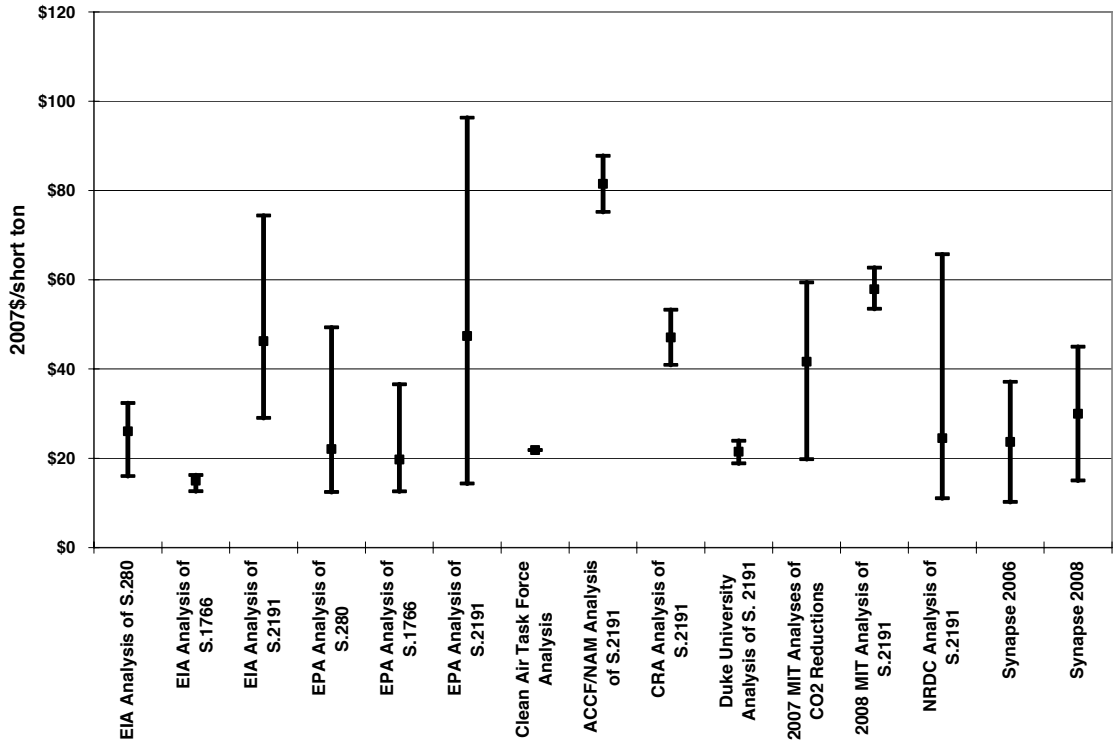
Synapse originally developed a set of $CO_2$ price forecasts in the spring of 2006. However, significant developments since that time led Synapse to re-examine and raise those $CO_2$ price forecasts this past summer to ensure that they reflect an appropriate level of financial risk associated with greenhouse gas emissions.[18] Most importantly, the political support for serious climate change legislation has expanded significantly in Federal and State governments, as well as in the public at large, as the scientific evidence of climate change has become more certain. Concurrently, the new greenhouse gas regulation bills under consideration in the 110th U.S. Congress contain emissions reductions that are significantly more stringent than would have been required by proposals introduced in earlier years. Moreover, an increasing number of states have adopted policies, either

[18] See the July 2008 report *Synapse 2008 CO2 Price Forecasts* available at http://www.synapse-energy.com/Downloads/SynapsePaper.2008-07.0.2008-Carbon-Paper.A0020.pdf

individually and/or as members of regional coalitions, to reduce greenhouse gas emissions. In addition, additional information has been developed regarding technology innovations in the areas of renewables, energy efficiency, and carbon capture and sequestration, leading to greater clarity about the cost of emissions mitigation; however, cost estimates for many of these technologies are still in the early stages. Taken together these developments lead to higher financial risks associated with future greenhouse gas emissions and justify the use of higher projected $CO_2$ emissions allowance prices in electricity resource planning and selection for the period 2013 to 2030.

Figure 4 below compares the range of $CO_2$ prices that Synapse now recommends be used for resource planning with the results of analyses of the $CO_2$ prices that would be required to achieve the emissions reductions that would be mandated by the legislation proposed in the current 210th U.S. Congress:

**Figure 4: $CO_2$ Prices Recommended by Synapse vs. Results of Modeling Analyses of Major Bills in Current U.S. Congress – Levelized $CO_2$ Prices (2013-2030, in 2007 dollars)[19]**



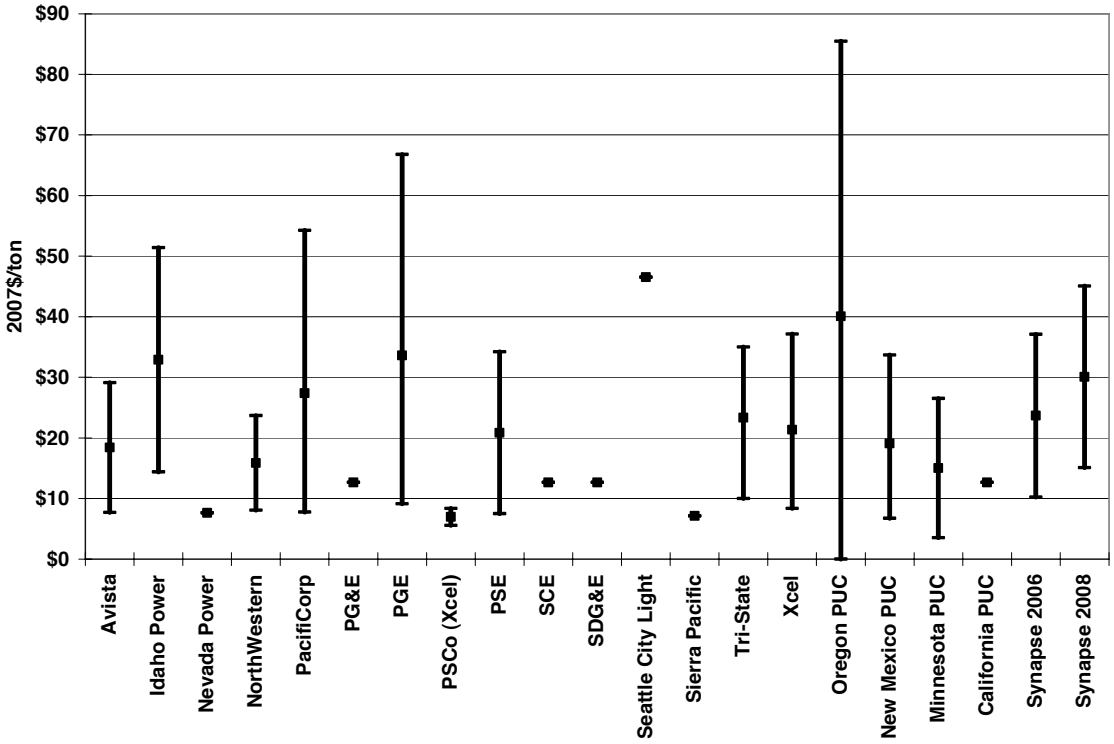

As can be seen, the $CO_2$ prices recommended by Synapse are very reasonable compared to the full range of $CO_2$ emissions allowance prices that could result from adoption of the major greenhouse gas regulatory legislation that has been introduced in the current U.S. Congress. In fact, there are a significant number of possible scenarios where $CO_2$

[19] The Congressional proposals included in Figure 5 are Senate Bill S. 280, sponsored by Senators Lieberman and McCain; Senate Bill S. 1766 sponsored by Senators Bingaman and Specter; and Senate Bill S. 2191, sponsored by Senators Lieberman and Warner.

emissions allowance prices could be substantially higher than the high ends of the price range that Synapse has recommended be used in resource planning assessments.

At the same time, as shown in Figure 5 below, the range of $CO_2$ prices that Synapse recommends be used for resource planning is consistent with the ranges of $CO_2$ prices used by an increasing number of state regulatory commissions and utilities in their resource planning analyses.

**Figure 5: Synapse 2008 $CO_2$ Price Forecasts vs. $CO_2$ Prices Used by Regulatory Commissions and Utilities in Resource Planning Analyses – Levelized $CO_2$ Prices (2013-2030, in 2007 dollars)**




## 6. Cobb EMC's Cost Analysis

Cobb EMC has just posted on its website a single page Cost Analysis that it says was used in the decision process for a supercritical pulverized coal power generation plant. Although Cobb EMC did not include any supporting workpapers or computer files, a number of factors suggest that this Cost Analysis was heavily biased in favor of a coal plant and against renewable alternatives.

a. As noted above, the range of coal plant construction costs used by Cobb EMC was unreasonably low compared to recent cost estimates for other proposed coal-fired power plants. In particular, there is no reason to expect that Plant Washington will be able to avoid the soaring price increases being experienced by other coal-fired power plant construction projects.

b. Cobb EMC does not appear to have included any $CO_2$ mitigation costs or any costs for purchasing $CO_2$ emissions allowances in its analysis. This failure strongly favors coal the most carbon-intensive fuel.

c. The Cost Analysis assumed very high wind and biomass costs.

d. The single page posted by Cobb EMC notes that it "represents cost information for various generation sources that were compiled over one and one half years ago…" Thus, the Analysis was based on information that is now out-of-date. Prudent planning requires that important decisions be revisited when important circumstances change. However, there is no evidence that Cobb EMC or any of the other members of Power4Georgians have done so as coal plant construction costs have skyrocketed and as the adoption of a comprehensive federal program for regulating greenhouse gas emissions has become more inevitable.

e. A review of the studies that Cobb EMC cites as the source of the information used in its Cost Analysis reveals that the Analysis relied to a large extent on coal industry and related sources.[20] Other than a few citations to hearings before the Wisconsin Public Service Commission concerning the proposed Nelson Dewey 3 coal plant, there is no evidence that Cobb EMC looked at a range of information from other utilities or from more independent and objective sources. Interestingly, as noted above, the Wisconsin Public Service Commission decided on November 11, 2008 to reject the proposed Nelson Dewey 3 coal plant (the plant on which Cobb EMC appears to rely for its estimated construction cost) because that plant was more costly when weighed against alternative sources and because of the risks associated with rising construction costs and federal regulation of greenhouse gas emissions.

## 7. The Price of Power from Plant Washington

The levelized busbar cost of power is the total cost, including construction, of generation from a new power plant when it enters the transmission grid. Levelized busbar cost analyses are traditionally used to screen possible alternatives as part of an integrated resource planning process to identify the most cost-effective supply-side and demand-side alternatives. These alternatives are then examined more completely in capacity expansion or production simulation models that analyze the financial specifics and also consider system costs and performance associated with each option. The best of those analyses also consider various risk factors in developing a preferred plan.

Such modeling assessments are beyond the scope of this preliminary White Paper. Nevertheless, a levelized busbar comparison provides important insights into the expected cost of power from Plant Washington compared to the expected costs of other supply-side and demand-side options.

The levelized busbar cost of generating power at Plant Washington can be expected to be in the range of 7.5 to 7.6 cents per kilowatt hour ("kWh") assuming a relatively

[20] From such sources as Peabody Coal Company, the Coal Utilization Research Council, and the Coal to Liquids Coalition.

conservative (i.e., low) construction cost of $3,000 per kilowatt,[21] excluding financing costs. This price range of 7.5 to 7.6 cents per kilowatt hour does not reflect any costs related to paying for or controlling the carbon dioxide ($CO_2$) emissions from the plant. Adding in these costs will increase considerably the overall cost of generating power at Plant Washington. For comparison, the average retail price (which includes generation, transmission, distribution and administrative costs) paid by all Georgia customers in 2007 was 7.8 cents per kilowatt hour.[22]

However, under a federal cap-and-trade program, generators like Power4Georgians will either have to reduce the $CO_2$ emissions from their plants or buy emissions allowances that would be auctioned as part of a nationwide cap-and-trade system.

The major process for reducing $CO_2$ emissions from coal-fired power plants is called carbon capture and sequestration. However, there is currently no commercially viable industry scale technology for post-combustion capture and storage of $CO_2$ emissions that can be retrofitted onto pulverized coal power plants like Plant Washington.[23] Laboratory and pilot tests of a number of promising technologies are being conducted but it is unclear when, if at all, each of these technologies would be commercially viable for pulverized coal plants, and what the cost of capturing and storing the carbon dioxide emissions would be under each technology.

A number of independent sources such as Duke Energy, the electric industry's Edison Electric Institute, the Massachusetts Institute of Technology and the U.S. Department of Energy's National Energy Technology Laboratory have estimated that adding carbon capture technology would increase the cost of generating power at a pulverized coal-fired plant by 60 percent to 80 percent. If these costs of carbon capture were included, the projected cost of generating power at Plant Washington would jump to 12.2 cents to 13.7 cents per kilowatt hour. If shown to be technically and legally feasible, the costs of transporting and permanently sequestering the $CO_2$ in the ground may be expected to add another one to three cents per kilowatt hour to this cost, but even this cost range may be too low.

But if carbon capture and sequestration technology is not added to Plant Washington, the customers of the EMCs that are members of Power4Georgians instead would have to pay tens to hundreds of millions of dollars each year to buy allowances for the plant's $CO_2$ emissions – these allowances would be auctioned as part of the cap-and-trade climate change proposals that have been introduced in the U.S. Congress in recent years. The annual costs for purchasing the allowances for the approximate six million tons of $CO_2$ that Plant Washington would emit each year are shown in Figure 6 below. The annual costs in this Figure reflect the Synapse High, Mid and Low $CO_2$ price trajectories shown

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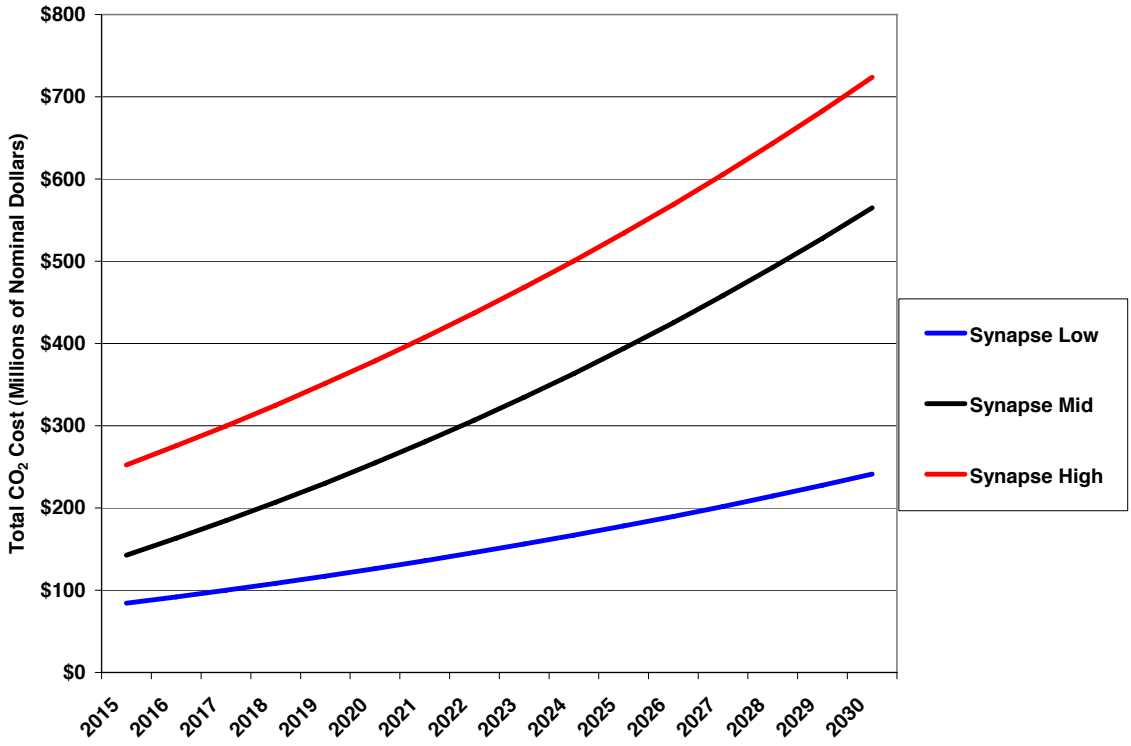
[21] See the Synapse *White Paper on the Construction Cost of Plant Washington* for a discussion of the appropriate construction cost to assume for Plant Washington. The cost of generating power at Plant Washington would be even higher if we assumed a construction cost of $3,500 per kW.

[22] Energy Information Administration (EIA) Electric Power Monthly, March 2008, Table 5.6.B.

[23] The post-combustion capture of $CO_2$ from pulverized coal plants like the proposed Plant Washington requires very different technology than the pre-combustion capture of $CO_2$ that would be used in an integrated gasification combined cycle plant.

in Figure 4, above. Although Figure 6 only goes through 2030, it is reasonable to anticipate that members of the EMCs would have to pay these increasing annual costs right through the end of Plant Washington's operating life or until the capability for carbon capture and sequestration is added to the facility.

**Figure 6: Plant Washington Annual $CO_2$ Costs –Operating at an Average 85 Percent Capacity Factor – Millions of Nominal Dollars**




The levelized busbar cost of energy from Plant Washington during the years 2015 to 2035 would range from 9.3 cents per kilowatt hour (Synapse Low $CO_2$ price forecast) to 11.3 cents per kilowatt hour (Synapse Mid $CO_2$ Price Forecast) to 12.7 cents per kilowatt hour (Synapse High $CO_2$ Price Forecast) when the costs of purchasing emissions allowances are considered.

## 7. The Price of Power from Alternatives to Plant Washington

Publicly available information strongly suggests that there are alternatives to Plant Washington that could provide less expensive power especially when the costs of paying for $CO_2$ emissions are considered.

**Energy Efficiency**

We have not seen any evidence the Power4Georgians or the ten EMCs that are intending to participate in Plant Washington have analyzed the technical and economic potential for energy efficiency in their service territories and among their members. However, a 2005 report by ICF Consulting, *Assessment of Energy Efficiency Potential in Georgia*, that was prepared for the Georgia Environmental Facilities Authority, showed a substantial potential for energy efficiency in the state as a whole. For example, the study found that a

moderately to very aggressive energy efficiency program could achieve electricity sale savings of between 6.0 percent and 8.7 percent by 2010 and that additional savings in both energy sales and peak loads could be achieved in subsequent years.[24] The study also concluded that a range of energy efficiency measures produced cost savings that were 1.5 to 2.2 times the costs of implementation.[25]

Analyses in other states show that energy efficiency can achieve significant savings at very low costs of 2 to 3 cents per kilowatt hour and that even higher cost measures will produce significant energy and economic benefits. For example, an analysis by Duke Energy Carolinas has concluded that its sales in South Carolina could be reduced by 16 percent by 2026 through achievable cost effective energy efficiency measures with a lifetime cost of six cents per kilowatt hour or less.[26] Another analysis, prepared by GDS Associates, Inc. for the North Carolina Utilities Commission, concluded that statewide sales of electric energy could be reduced by 13.9 percent by 2017 through a series of energy efficiency measures with lifetime costs of less than five cents per kilowatt.[27] A similar study in Florida concluded that cost effective energy efficiency measures, costing seven cents per kilowatt hour or less, could lead to residential savings of 29 percent, commercial savings of approximately 30 percent and industrial savings of 24 percent by 2023.[28]

These studies suggest that a substantial portion of the power that would be produced by Plant Washington could instead be achieved through cost effective energy efficiency measures.

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24 At pages 3-5 and 3-6.

25 At page 1-7.

26 *Duke Energy Carolinas DSM Action Plan: South Carolina Draft Report,* July 24, 2007, at page 1.

27 GDS Associates Inc, December 2006, Report for the North Carolina Utilities Commission, *A Study of the Feasibility of Energy Efficiency as an Eligible Resources as Part of a Renewable Portfolio Standard for the State of North Carolina*, at page 1.

28 American Council for an Energy Efficient Economy, June 2007, *Potential for Energy Efficiency and Renewable Energy to Meet Florida's Growing Energy Demands*, at pages 9, 10, and 12.

**Renewable Resources such as Wind, Biomass and Solar**

Without any evidence of supporting analyses, Power4Georgians summarily rejects renewable alternatives as resource options because "many renewable energy technologies are still being developed and refined, they are substantially more expensive than coal on a per-kilowatt hour basis. Wind and sun may be free, but generating power from them is not."[29] However, an analysis of estimated costs for both wind and biomass options show that they are not "substantially more expensive than coal" on a per-kilowatt hour basis, especially when the costs of carbon dioxide emissions are considered. Analyses by the U.S. Department of Energy also suggest that, over time, the costs of solar resources will come down and be competitive with the cost of generating power at new coal-fired power plants.[30]

There is a significant potential in Georgia for burning biomass to produce electricity. Analyses presented in other states have shown levelized costs for biomass generation of between 5.0 and 9.4 cents per kilowatt hour for producing power through the burning of biomass.[31] Even at the high end of this range, a 9.4 cents per kilowatt hour price for generating power from burning biomass would be comparable to the cost of producing power at Plant Washington with Synapse's Low Forecast of future $CO_2$ prices and would be lower than the cost of generating power at Plant Washington assuming Synapse's Mid and High $CO_2$ prices.

There appears to be potential for both on-shore and off-shore wind in Georgia. For example, a 2007 report by the Southern Company and the Georgia Institute of Technology, *Southern Winds*, concluded that "the Georgia offshore wind resource represents one of the best opportunities available for harnessing large scale wind energy in the southeast."[32]

Studies from around the U.S. have estimated levelized busbar costs for wind power of between 4 and 11 cents per kilowatt hour for on-shore wind and between 8 and 16 cents per kilowatt hour for off-shore wind. For example, the *Southern Winds* report, cited above, reported a levelized busbar cost of power from a 100 MW offshore wind farm of approximately 10 cents per kilowatt hour while the cost of power from an off-shore 160 MW wind farm was reported as approximately 8 cents per kilowatt hour.[33] At these prices, the levelized busbar cost of off-shore wind generated power in Georgia would be less than the cost of generating power at Plant Washington when $CO_2$ costs are included.

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29 http://www.power4georgians.com/renewable.aspx.

30 For example, see http://www1.eere.energy.gov/solar/pdfs/solar_program_mypp_2008-2012.pdf.

31 Investment banking firm, Lazard Ltd, *Levelized Cost of Energy Analysis – Version 2.0*, June 2008.

32 *Southern Winds, Summary Project Report 2007*, at page 44.

33 Id, at page 43.

**Natural Gas-Fired Combined Cycle Generation**

Assuming a $1,200/kW construction cost and a reasonable forecast of future natural gas prices, the levelized busbar cost of energy from a new combined cycle gas-fired power plant during the years 2015 to 2035 would range from 9.5 cents per kilowatt hour (Synapse Low $CO_2$ price forecast) to 10.4 cents per kilowatt hour (Synapse Mid $CO_2$ Price Forecast) to 11.0 cents per kilowatt hour (Synapse High $CO_2$ Price Forecast).

A full and detailed analysis of the technical and economic potential of alternatives to Plant Washington needs to be completed. However, our preliminary levelized busbar screening analysis suggests that, contrary to the claims of Power4Georgians, there are a number of alternatives that could provide power at costs lower than Plant Washington.

**Table 3. Cost of Power from Plant Washington versus Energy Efficiency, Renewable Resources and Gas-Fired Combined Cycle Capacity**

| Resource Option | Cost with Synapse Low $CO_2$ Price Forecast | Cost with Synapse Mid $CO_2$ Price Forecast | Cost with Synapse High $CO_2$ Price Forecast |
|---|---|---|---|
| | (Cents per kWH) | (Cents per kWH) | (Cents per kWH) |
| Plant Washington | 9.3 | 11.3 | 12.7 |
| Energy Efficiency | 2 to 7 | 2 to 7 | 2 to 7 |
| Biomass | 5 to 9.4 | 5 to 9.4 | 5 to 9.4 |
| On-shore Wind | 4.5 to 11 | 4.5 to 11 | 4.5 to 11 |
| Off-shore Wind | 8 to 16 | 8 to 16 | 8 to 16 |
| Gas-Fired Combined Cycle | 9.5 | 10.4 | 11.0 |
| Illustrative portfolio of efficiency, biomass, wind, and combined cycle | 9.2 | 9.8 | 10.2 |

The illustrative portfolio option included in Table 3 is assumed to include 15 percent energy efficiency, a 100 MW biomass facility, 100 MW of on-shore and off-shore wind and a 600 MW gas-fired combined cycle facility. The levelized busbar cost of this portfolio would be lower than the cost of generating power at Plant Washington even if the high ends of the ranges of costs for each resource are considered.

Such a mixed portfolio of lower- and non-carbon emitting resources also would emit only about 2.5 million tons of $CO_2$ each year, as opposed to Plant Washington which would emit approximately 6 million tons of $CO_2$ each year. This portfolio approach to replacing Plant Washington would also provide flexibility such that the combustion cycle facility could be delayed or not operated as much if other options, i.e., more energy efficiency, more wind, more biomass, or purchasing power from other facilities were shown to be more economic alternatives, or if the EMCs loads and/or energy sales did not grow as now projected. Adding the 850 MW baseload Plant Washington coal unit would not offer

that same flexibility. The implementation of such a mixed portfolio of resources also would reduce future uncertainty and risk.