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ATTACHMENT 10

BIG STONE PRO FORMA ECONOMIC ANALYSIS – MODELING RESULTS

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January 3, 2011

Mr. Mark Rolfes
Manager, Generation Development
Otter Tail Power Corporation
215 South Cascade Street
Fergus Falls, MN 56538

Re: Big Stone Plant Pro Forma Economic Analysis – Modeling Results
BMcD Project No. 57975

Dear Mr. Rolfes:

Burns & McDonnell (BMcD) has been retained by Otter Tail Electric Power Company (Otter Tail) to perform a pro forma economic analysis (Analysis) of the air quality control system (AQCS) proposed to be installed on the existing Big Stone Plant (BSP). The AQCS option will be compared to several alternatives for providing energy from a generation resource other than BSP. The Analysis includes preparing a pro forma economic model for each of the following cases.

- BSP with AQCS
- BSP Retrofitted to Burn Natural Gas (BSP on NG)
- A Combined Cycle Plant to Replace BSP (CCGT)
- A Combined Cycle Plant Combined with Wind Energy Purchases to Match the BSP Energy Production (CCGT + Wind)

Screening level pro forma economic models were prepared to determine the levelized cost of power for each alternative over a 20 year planning period. These levelized energy costs can be compared to one another to determine the relative economic attractiveness of each of the options under consideration.

Modeling Inputs

The following inputs were provided to BMcD from Otter Tail's recently filed Integrated Resource Plan (IRP).

- O&M Inflation — 3.0% per annum
- Capital Cost Inflation — 4.0% per annum
- Interest Rate [TRADE SECRET DATA BEGINS
- Return on Equity
- Discount Rate

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- Market Price of Wind Power (2009 $, excluding PTC)
- Fuel Cost Forecast — Table 1

Table 1 – Fuel Cost Forecast

Year	Coal ($/MMBtu)	Natural Gas ($/MMBtu)

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The following inputs were provided to BMcD based on Otter Tail's internal estimates for the BSP options.

- BSP with AQCS
  - Net Plant Output — 475 MW
  - Net Plant Heat Rate — 10,715 Btu/kW
  - Net Plant Capacity Factor — 75%
  - Capital Cost of AQCS (2016 $) — $490 million

- Annual O&M Cost (Fixed & Variable 2016 $) — $27.3 million

- BSP on NG
  - Net Plant Output — 475 MW
  - Net Plant Heat Rate — 10,023 Btu/kW
  - Net Plant Capacity Factor — 75%
  - Conversion Capital Cost (2016 $) — $147 million
  - Annual O&M Cost (Fixed & Variable 2016 $) — $13.0 million

- CCGT and CCGT + Wind
  - BSP Decommissioning Cost (2016 $) — $21.3 million

- All Natural Gas Fired Options
  - Linear Facility Capital Cost (2016 $) — $120 million

The following inputs were developed by BMcD from recent project experience.

- CCGT
  - Net Plant Output — 475 MW
  - Net Plant Heat Rate — 6,680 Btu/kW
  - Net Plant Capacity Factor — 75%
  - Capital Cost (2010 $) — $402 million
  - Annual Fixed O&M Cost (2010 $) — $8.50/kW-year
  - Annual Variable O&M Cost (2010 $) — $4.30/MWh

- CCGT + Wind
  - Combined Cycle Net Plant Output — 475 MW
  - Combined Cycle Net Plant Heat Rate — 6,680 Btu/kW

- Combined Cycle Net Plant Capacity Factor 35%
- Combined Cycle Capital Cost (2010 $) $402 million
- Combined Cycle Annual Fixed O&M Cost (2010 $) $8.50/kW-year
- Combined Cycle Annual Variable O&M Cost (2010 $) $4.30/MWh
- Capacity Factor of Wind Purchases 40%
- Levelized Value of Production Tax Credit (PTC) (2009$) $20/MWh

The combined cycle cost estimates and performance values presented above for the CCGT and CCGT + Wind options are based on recent project experience. These values are based on a typical cost for an unfired 2 on 1 GE FA.05 combined cycle plant. Although a plant of this type will have an output in the range of approximately 600 MW, only the first 475 MW of capacity was considered in this Analysis, in order to compare the options on a consistent basis. The total capital cost presented above was calculated based on the dollar per kilowatt installed cost of an unfired 2 on 1 GE FA.05 combined cycle plant, multiplied by 475 MW. The heat rate values presented above are based on typical unfired 2 on 1 GE FA.05 combined cycle plant performance. The annual fixed O&M and variable O&M values are also based on typical unfired 2 on 1 GE FA.05 combined cycle plant costs and the variable O&M values included major maintenance costs.

The capacity factor for wind purchases considered in the Analysis is based on an assumed capacity factor for a typical wind farm in this region of the country. The levelized value of the PTC used in the analysis is based on the current legislation and the impact to the levelized cost of power for a typical wind farm, based on recent project experience.

Base Case Results

Each of the alternatives listed above was evaluated in a pro forma economic model to determine a screening level energy cost. These costs can be compared to determine the relative economic attractiveness of each of the alternatives considered.

The capital and O&M costs for BSP with AQCS and BSP on NG were provided to BMcD by Otter Tail in 2016 dollars. These values were input directly into the model without additional escalation applied, other than annual O&M escalation for year to year operations. The year to year escalation rate of three percent was used consistent with Otter Tail's IRP filing.

Capital and O&M costs for the CCGT option were taken from recent BMcD experience. These values were developed in 2010 dollars, and were escalated four percent per year for capital and three percent per year for O&M to 2016 dollars, consistent with Otter Tail's IRP modeling assumptions.

In the CCGT + Wind case, BMcD estimated that a 40% capacity factor could be provided by market wind energy purchases. The $71/MWh cost of market wind energy purchases in 2009 dollar provided by Otter Tail was used as a starting point to determine the price of market wind energy to use in this Analysis. The CCGT + Wind option evaluated in the base case included the value of the PTC. No option was considered in the base case without the PTC. A value of the PTC of $20/MWh in 2009 dollars was deducted from the market wind energy purchases price to arrive at a 2009 cost of wind power of $51/MWh including the value of the PTC. This value was escalated by four percent per year to 2016 dollars resulting in a levelized market price of wind energy of $67.11 to use in the economic modeling. The remaining energy would be produced by a combined cycle plant. For purposes of this Analysis, a 475 MW combined cycle plant was utilized, equivalent to BSP. This facility would operate at a 35 percent capacity factor to achieve an annual energy production equivalent to BSP. Current combustion turbine technology results in combined cycle plant net capacities in the range of 615 MW. The capital cost in this Analysis was based on the dollar per kilowatt estimates from for a 615 MW facility, assuming that Otter Tail would own a 475 MW share in a facility of this size.

For each of the alternatives to BSP with AQCS, $120 million was added to cover the costs of linear facilities required to support the project. This would cover the costs to run a new natural gas line to the BSP plant to convert the units to burn natural gas or construct a new combined cycle plant at that site. Alternatively, if a new combined cycle facility were to be constructed at another site, linear infrastructure would need to be constructed for natural gas, transmission service, and possibly water and discharge pipelines.

For the CCGT and CCGT + Wind options a cost of $21.3 million was also added to the capital costs to cover the decommissioning costs for BSP.

In addition to the decommissioning costs, Otter Tail estimated that an $82 million cost should be assigned to the CCGT and CCGT + Wind options to cover stranded asset costs if BSP would cease to operate. This cost represents the current book value of BSP. However, the economic modeling for the BSP with AQCS and BSP on NG options does not account for this remaining book value to be depreciated going forward. The BSP with AQCS and BSP on NG options only account for the capital cost to add the new AQCS equipment or to convert to fire with natural gas. The stranded asset cost was not included in the base case values, however this cost was modeled as an additional scenario to determine the impact it would have on the energy cost. It was determined that this scenario would add $3.81/MWh to the levelized energy cost for the CCGT and CCGT + Wind options.

Otter Tail also requested that BMcD consider the impact of a high environmental cost scenario. This scenario consists of the inclusion of mercury emissions control requirements and potential ash regulations. Otter Tail provided a $5 million additional capital cost and $2 million per year additional O&M cost to be included for mercury removal on the BSP with AQCS option. Also, $6.66 million in additional O&M was provided for handing ash if it is categorized as a hazardous waste. These three additional costs resulted in a $3.66/MWh increase in the levelized cost of energy for the BSP with AQCS option.

The results of the modeling using the base case assumptions are provided in Table 2 below.

Table 2 – Economic Modeling Base Case Results

20-YEAR LEVELIZED BUSBAR COSTS		BSP + AQCS	CCGT + Wind with PTC	CCGT	BSP on NG
Operations Summary					
Net Dispatchable Capacity (MW)		475	475	475	475
Net Dispatchable Generation Capacity Factor		75%	35%	75%	75%
Net Dispatchable Energy Generation (MWh)		3,120,750	1,456,350	3,120,750	3,120,750
Net Wind Capacity Factor		-	40%	-	-
Net Wind Energy Market Purchases (MWh)		-	1,664,400	-	-
Capital Cost (2016 $)		$ 490,000,000	$ 621,289,115	$ 621,289,115	$ 267,000,000
Depreciation & Interest Basis Energy Costs					
Fuel	(2016$ / MWh)	$ 39.49	$ 66.44	$ 66.44	$ 99.69
O&M	(2016$ / MWh)	$ 12.09	$ 13.37	$ 9.55	$ 5.78
Depreciation	(2016$ / MWh)	$ 8.56	$ 23.25	$ 10.85	$ 4.66
Return	(2016$ / MWh)	$ 6.10	$ 16.58	$ 7.74	$ 3.32
Interest	(2016$ / MWh)	$ 4.91	$ 13.34	$ 6.22	$ 2.68
Income Taxes	(2016$ / MWh)	$ 2.03	$ 5.53	$ 2.58	$ 1.11
Levelized Revenue Requirement	**(2016$ / MWh)**	**$ 73.18**	**$ 138.50**	**$ 103.38**	**$ 117.24**
Cost of Wind Energy	**(2016$ / MWh)**	**$ -**	**$ 67.11**	**$ -**	**$ -**
Combined Levelized Energy Cost	**(2016$ / MWh)**	**$ 73.18**	**$ 100.42**	**$ 103.38**	**$ 117.24**
Stranded Asset Cost Scenario Adder	**(2016$ / MWh)**	**$ -**	**$ 3.81**	**$ 3.81**	**$ -**
Total Energy Cost Including Stranded Asset Cost	**(2016$ / MWh)**	**$ 73.18**	**$ 104.23**	**$ 107.18**	**$ 117.24**
High Environmental Cost Scenario Adder	**(2016$ / MWh)**	**$ 3.66**	**$ -**	**$ -**	**$ -**
Total Energy Cost Including High Environmental Cost	**(2016$ / MWh)**	**$ 76.85**	**$ 100.42**	**$ 103.38**	**$ 117.24**

Based on the results of the base case Analysis presented above, BSP with AQCS is the most economically attractive alternative under the base case assumptions. The second most attractive alternative is the CCGT + Wind option, however, this option results in a 37 percent higher cost of energy than BSP with AQCS. Adding in the stranded asset costs to the CCGT + Wind option increases the differential in cost of energy between these two options to 42 percent. Adding in the high environmental cost scenario adder reduces these differentials in levelized energy costs to 31 percent and 36 percent respectively.

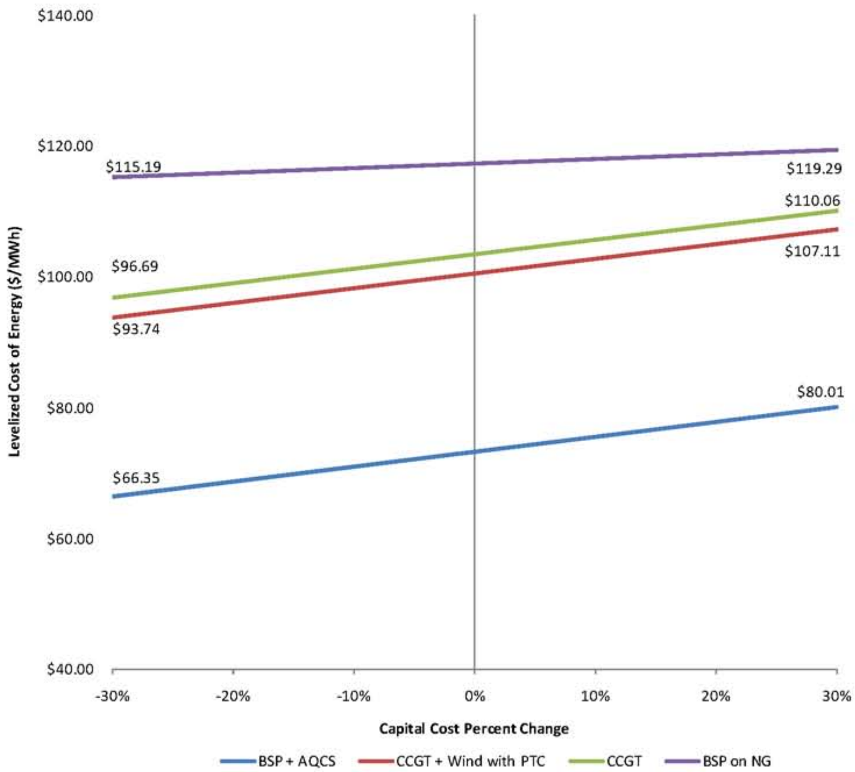
Sensitivity Analysis

A sensitivity analysis was prepared for each of the alternatives evaluated in the Analysis under the following cases:

- Capital Cost (plus or minus 30%)
- Fuel Cost (plus or minus 20%)
- O&M Costs (plus or minus 20%)
- CO_2 Tax (\$0 to \$34/ton CO_2 Tax)

A sensitivity analysis was performed to determine the impact of changes to the capital costs of each option. The results of the capital cost sensitivity analysis are presented in Figure 1 below.

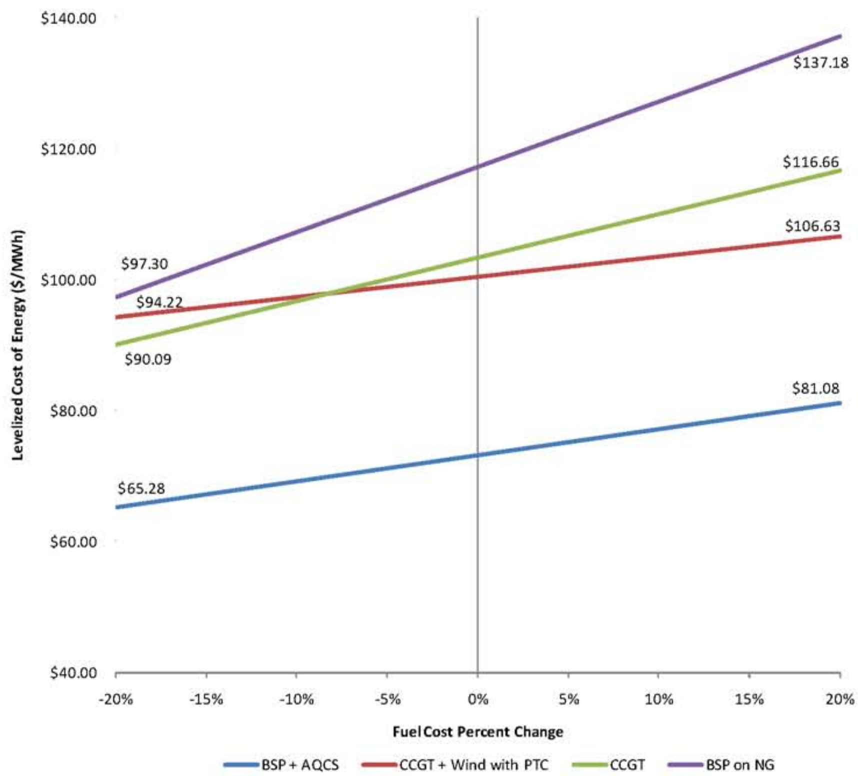
Figure 1 – Capital Cost Sensitivity Levelized Energy Costs



Over the range of capital costs evaluated in this sensitivity analysis, the BSP with AQCS option is preferred in all instances. Capital cost changes have a similar impact on BSP with AQCS, CCGT and CCGT + Wind options, since they all have relatively similar capital costs. Capital cost changes have the least impact on the BSP on NG option, since it requires the least capital cost investment.

A sensitivity analysis was performed to determine the impact of changes to the fuel costs for each option. The results of the fuel cost sensitivity analysis are presented in Figure 2 below.

Figure 2 – Fuel Cost Sensitivity Levelized Energy Costs



Over the range of fuel costs evaluated in this sensitivity analysis, the BSP with AQCS option is preferred in all instances. Fuel cost changes have the largest impact on the natural gas-fired options, since natural gas has a much higher base case cost than coal. The impact or fuel cost changes is reduced on the CCGT + Wind case, since more than half of the energy in that case is provided from wind power generation, which is unaffected by changes in fuel prices.

A sensitivity analysis was performed to determine the impact of a changes in O&M costs for each of the options. The results of the O&M cost sensitivity analysis are presented in Figure 3 below.

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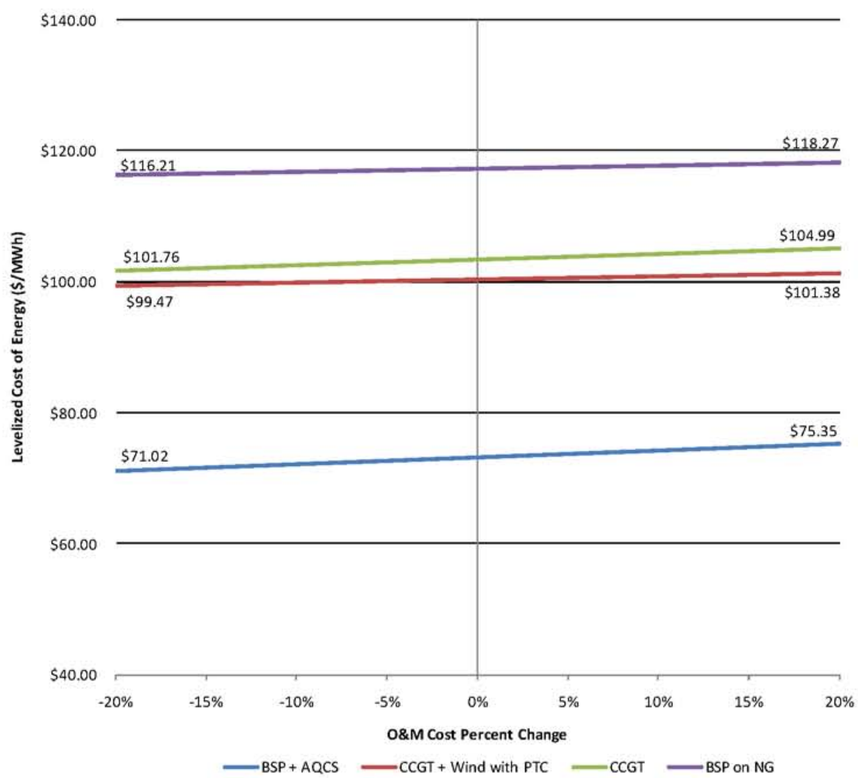
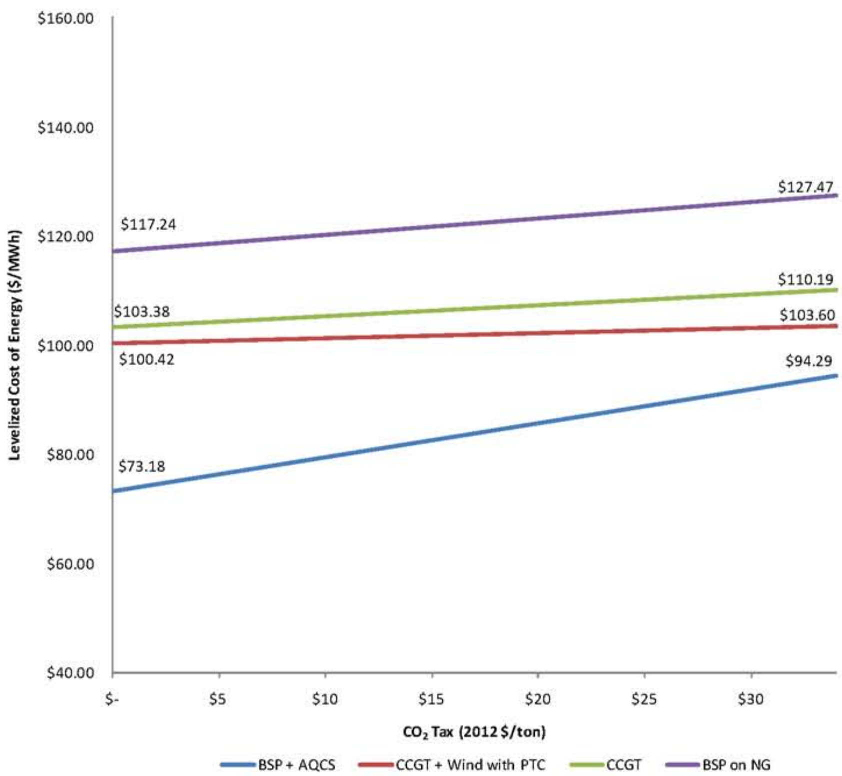
Figure 3 – O&M Cost Sensitivity Levelized Energy Costs



Over the range of O&M costs evaluated in this sensitivity analysis, the BSP with AQCS option is preferred in all instances. O&M cost changes have relatively insignificant impacts on all of the options considered.

A sensitivity analysis was performed to determine the impact of the implementation of a carbon tax on each of the options considered. Two carbon tax scenarios were evaluated. The first carbon tax scenario considered in this Analysis assumed that the carbon tax would not apply to the first ten years of operation. The carbon tax would begin to be applied to each option in the year 2026. This Analysis considered the impact of a carbon tax up to $34/ton in 2012 dollars. The carbon tax was escalated three percent per year throughout the term of the analysis. The impact of a carbon tax on each of the options under the first scenario considered is presented in the results shown in Figure 4 below.

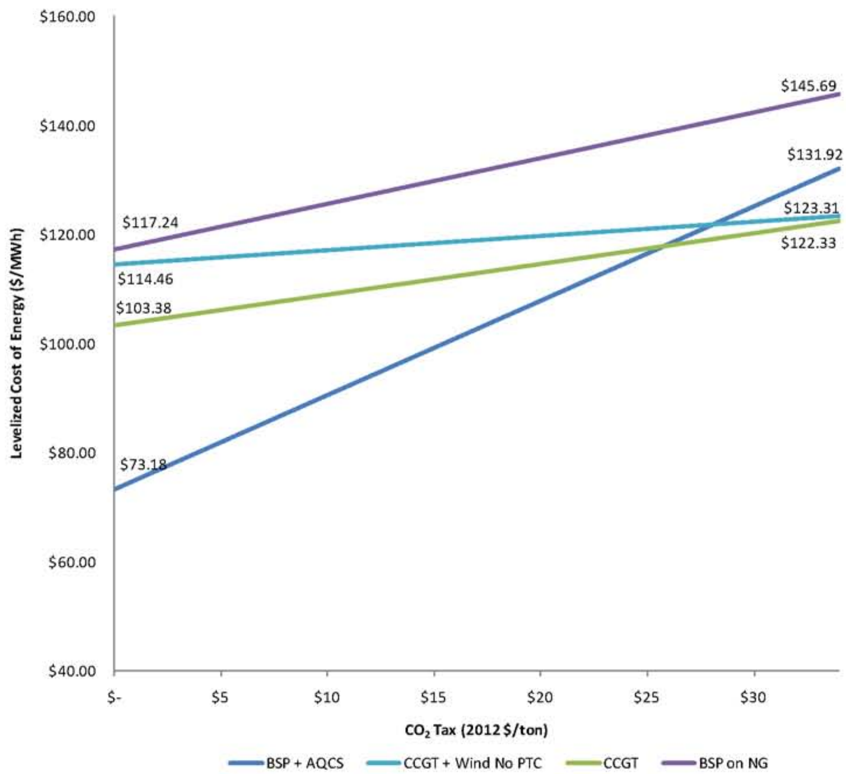
Figure 4 – CO_2 Tax Sensitivity Scenario 1 Levelized Energy Costs



A carbon tax has the greatest impact on a coal fired option, since a coal fired option will emit significantly more CO_2 than natural gas fired options. However, since the BSP with AQCS has such a lower levelized cost of energy than the other options under the base case assumptions, the implementation of a carbon tax does not have a significant enough impact to cause the levelized energy cost of BSP with AQCS to increase above the levelized cost of energy of the other options evaluated over the range of carbon taxes evaluated in this analysis.

A second carbon tax scenario was evaluated in which the carbon tax was applied to all carbon emissions beginning in 2016. In this analysis, it was assumed that the PTC would not be renewed if a tax on carbon emissions was implemented with no period of free allowances. The impact of a carbon tax on each of the options under the second scenario considered is presented in the results shown in Figure 5 below.

Figure 5 – CO_2 Tax Sensitivity Scenario 2 Levelized Energy Costs



The carbon tax considered in this scenario has an even greater impact on a coal fired option. Under this scenario, the CCGT option becomes economically more attractive than the BSP with AQCS option, if a carbon tax of $25 per ton or greater is implemented. It should be noted that neither of the scenarios consider in this Analysis include a feedback effect of a carbon tax on fuel pricing. If a carbon tax is enacted, there will likely be some fuel switching to natural gas resulting in upward pressure on natural gas pricing. If natural gas prices increased, the carbon tax crossover point would increase as well.

Conclusions

Based on the results of this Analysis, the BSP with AQCS is the most economically attractive alternative of the options considered for BSP under the majority of potential future scenarios. The BSP with AQCS option results in a significantly lower levelized cost of energy than the other options evaluated under the base case assumptions. BSP with AQCS option remains economically attractive relative to the other options considered over the range of sensitivities evaluated in this Analysis, with the exception of a carbon tax of greater than $25 per ton that is applied immediately to all carbon emissions in 2016 and beyond.

The impact on other Otter Tail resources and Otter Tail's integrated resource plan (IRP) was not evaluated in this Analysis. Otter Tail will need to determine how a change of resource type at the BSP site would impact other resources in Otter Tail's generation portfolio, as well as how a new resource would fit into Otter Tail's IRP.

If you have any questions regarding the results of this Analysis, please call Jeff Greig at 816-822-3392 or Jeff Kopp at 816-822-4239 to discuss.

Sincerely,

Jeff Greig
General Manager, Business & Technology Services

Jeff Kopp, PE
Development Engineer

JTK

cc: Mark Rolfes