BEFORE THE
PUBLIC SERVICE COMMISSION OF WISCONSIN

Joint Application of Wisconsin Power & Light Company, Wisconsin Public Service Corporation, and Madison Gas and Electric Company for a Certificate of Authority to Install Emissions Reductions Systems at the Columbia Energy Center Units 1 and 2	)))))))	**DOCKET NO. 05-CE-138**

DIRECT TESTIMONY OF DAVID A. SCHLISSEL
ON BEHALF OF
JOHN MUIR CHAPTER OF THE SIERRA CLUB

PUBLIC VERSION –
PROTECTED MATERIALS REDACTED

SEPTEMBER 25, 2009

List of Exhibits

1. Introduction

Q. What is your name, position and business address?

A. My name is David A. Schlissel. I am a Senior Consultant at Synapse Energy Economics, Inc, 22 Pearl Street, Cambridge, MA 02139.

Q. Please describe Synapse Energy Economics.

A. Synapse Energy Economics ("Synapse") is a research and consulting firm specializing in energy and environmental issues, including electric generation, transmission and distribution system reliability, market power, electricity market prices, stranded costs, efficiency, renewable energy, environmental quality, and nuclear power.

Synapse's clients include state consumer advocates, public utilities commission staff, attorneys general, environmental organizations, federal government, state governments and utilities. A complete description of Synapse is available at our website, www.synapse-energy.com.

Q. Please summarize your educational background and recent work experience.

A. I graduated from the Massachusetts Institute of Technology in 1968 with a Bachelor of Science Degree in Engineering. In 1969, I received a Master of Science Degree in Engineering from Stanford University. In 1973, I received a Law Degree from Stanford University. In addition, I studied nuclear engineering at the Massachusetts Institute of Technology during the years 1983-1986.

Since 1983 I have been retained by governmental bodies, publicly-owned utilities, and private organizations in 28 states to prepare expert testimony and analyses on engineering and economic issues related to electric utilities. My recent clients have included the General Staff of the Arkansas Public Service Commission, the U.S. Department of Justice, the Attorney General of the State of New York, cities and towns in Connecticut, New York and Virginia, state consumer advocates, and national and local environmental organizations.

I have testified before state regulatory commissions in Arizona, New Jersey, California, Connecticut, Kansas, Texas, New Mexico, New York, Vermont, North Carolina, South Carolina, Maine, Illinois, Indiana, Ohio, Massachusetts, Missouri, Rhode Island, Wisconsin, Iowa, South Dakota, Georgia, Minnesota, Michigan, Florida and North Dakota and before an Atomic Safety & Licensing Board of the U.S. Nuclear Regulatory Commission.

A copy of my current resume is attached as Exhibit 400 (DAS-1).

Q. On whose behalf are you testifying in this case?

A. I am testifying on behalf of the John Muir Chapter of the Sierra Club. ("Sierra Club")

Q. Have you testified previously before the Public Service Commission of Wisconsin ("PSCW")?

A. Yes. I have testified in PSCW Dockets Nos. 6630-CE-209, 6630-CE-197, 6690-UR-115, 05-EI-136, 6690-CE-187, 6630-EI-113 and 6680-CE-170.

Q. What is the purpose of your testimony?

A. Synapse was retained by the Sierra Club to assist in reviewing whether the proposed emissions reduction systems at Columbia Units 1 and 2 are economic for the companies' ratepayers and should be approved. In particular, Synapse was asked to examine (1) the reasonableness of the Applicants' EGEAS modeling of the installation of the scrubber and ACI system at Columbia Units 1 and 2 and their proposed alternatives to the project, (2) the reasonableness and feasibility of continuing to operate the Columbia Units 1 and 2 and/or other coal-fired units owned by the Applicants in light of anticipated CO_2 emissions regulations and/or legislation and other regulatory emission reduction requirements and (3) the reasonableness of the Applicants' assumptions concerning future CO_2 prices and coal prices.

This testimony presents the results of our analyses.

Q. Please summarize your conclusions.

A. Our conclusions are as follows:

1. The Applicants' EGEAS modeling analyses are biased in favor of the completion of the emissions reduction project and the continued operation of Columbia Units 1 and 2 by a number of unreasonable assumptions concerning future CO_2 prices, the impact that greenhouse gas regulation will have on natural gas prices, and future coal prices.

2. The Applicants have modeled a number of Futures scenarios that include no monetization of CO_2. The Commission should give no weight to any EGEAS modeling scenario that does not include a future CO_2 cost in any year of the period 2010 through 2039.

3. In the Applicants' Futures scenarios that include monetization of CO_2, the Applicants have modeled only a single, relatively low, set of CO_2 prices. Relying on a single set of CO_2 prices is unreasonable given the uncertainty about the specific emissions caps and design features of future federal regulation of greenhouse gas emissions. It would be more reasonable to consider a range of future CO_2 prices such as the Synapse Mid, High and Low forecasts that reflects the potential for higher emissions costs than the Applicants have modeled.

4. The Applicants have arbitrarily increased natural gas prices by 30 percent in most of the Futures scenarios they modeled with CO_2 monetization to reflect what they claim would be the impact of federal regulation of greenhouse gases. Although it is possible that natural gas demand, and, consequently, natural gas prices could be higher due to greenhouse gas emissions regulations in some circumstances, the effect is very

complicated and will depend on a number of factors. Therefore, it is very difficult to determine, at this time, the amount by which natural gas prices might be raised, if at all, due to CO_2 emissions regulations or legislation.

5. The results of independent modeling analyses of the Waxman-Markey bill and other climate change legislation do not provide any evidence for the Applicants' assumption that regulation of greenhouse gas emissions will increase natural gas prices by 30 percent beginning two years *before* that regulation goes into effect and continuing throughout the entire planning period. In fact, the modeling by the U.S. EPA, Energy Information Administration (EIA of the DOE) and others shows that there are many scenarios in which natural gas prices would *remain approximately the same or would decrease* as a result of federal regulation of greenhouse gas emissions. Even in those scenarios in which natural gas prices rise in some years as a result of greenhouse gas emissions, they do not increase by 30 percent in any single year, let alone in every year between 2013 and 2039, as the Applicants have assumed.

6. The combination of low CO_2 prices and much higher natural gas prices biases the Applicants' EGEAS modeling analyses in favor of coal (that is, the completion of the emissions reduction project and the continued operation of Columbia Units 1 and 2) and against the natural gas-fired alternatives.

7.

8. In a study for the Commission, the Energy Center of Wisconsin has projected that by 2018, the cumulative energy efficiency savings for the State of Wisconsin could reach 13.0 percent of total electricity sales and 12.9 percent of electricity peak demand. At a minimum, the Applicants should have run sensitivity studies that modeled this level of energy efficiency as part of the portfolio of alternatives to the emissions reduction project at Columbia Units 1 and 2. However, they have failed to do so by apparently limiting their energy efficiency assumptions to the levels required under Act 141.

9. Instead of including increased spending on energy efficiency and DSM, above Act 141 levels, as one of the portfolio of alternatives to the emissions reduction project at Columbia Units 1 and 2, the Applicants have instead focused on a number of expensive, and in some cases very expensive, alternatives. It is unreasonable to focus on these expensive supply-side options without considering that additional energy efficiency and DSM can offer less expensive alternatives, at least in large part, to the expenditure of what the Applicants now predict will be $627 million for emissions control equipment at Columbia Units 1 and 2.

Q. Are there other members of the Synapse project team who are presenting testimony in this proceeding?

A. Yes. Christopher James and Thomas Sanzillo also are presenting testimony in this proceeding.

Q. Were there other members of the Synapse project team who also assisted in the analyses undertaken by Synapse as part of its evaluation of the proposed emissions reduction project at Columbia Units 1 and 2?

A. Yes. Dr. David White, Alice Napoleon, Rachel Wilson and Nick Doolittle from Synapse also were members of our project team. Copies of their resumes are available at www.synapse-energy.com.

FUTURE CO_2 EMISSIONS COSTS

Q. Have the Applicants adequately considered the potential financial risks of future CO_2 emissions in their modeling analyses?

A. No. In fact, the Applicants did not include any monetized value for CO_2 emissions in three of the alternate "Futures" that they examine – that is, Futures 1, 3 and 4. Moreover, in the remaining seven "Futures" examined by the Applicants, i.e., Futures 2 and 5 through 10, the Applicants only considered a single price trajectory that begins with a $12/ton price in 2015 and that increases to $38/ton in 2025 and $53/ton in 2039 (all in nominal dollars).[1]

Relying on a single CO_2 price trajectory, as the Applicants have done, is unreasonable. Given the uncertainty about the specific emission caps and design features of the future federal regulation of greenhouse gas emissions, it would have been more reasonable to consider a range of future CO_2 prices rather than the single price trajectory assumed by the Applicants.

Q. Should the Commission give any weight to the results of the modeling scenarios in which the Applicants did not assume any monetized value for CO_2 emissions?

A. No. As the Commission indicated in its Strategic Energy Assessment for 2014, regulation of greenhouse gas emissions is inevitable and the Applicants' plans

[1] Application, Appendix C, at page 19 of 44 and Table 8 in Non-Confidential Attachment A.

should include CO_2 monetization.[2] Given the trends in the legislation that has been introduced and considered in the U.S. Congress in recent years, it is unreasonable to assume that there will not be any regulation of CO_2 emissions (and, hence, no monetized values for CO_2 emission) at any time before the year 2039. There may be uncertainty over the specific monetized values for CO_2 emissions, but federal regulation of greenhouse gas emissions is a matter of when and how, not if.

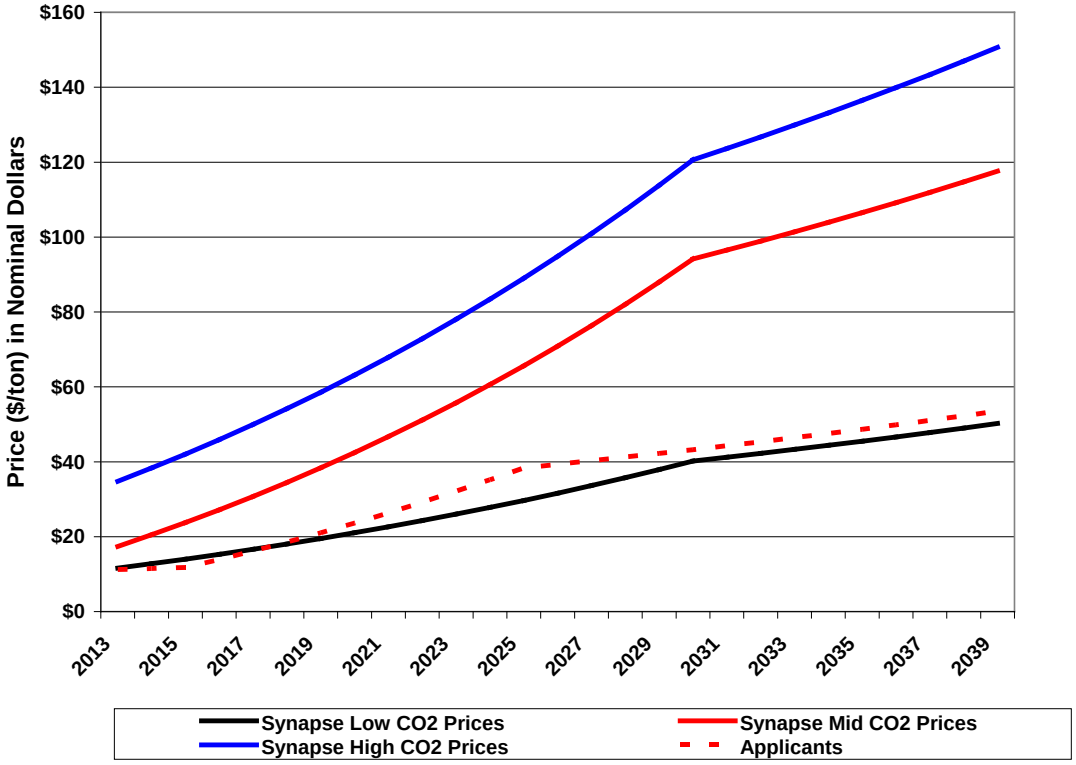
Q. How does the monetized value that the Applicants have assumed for CO_2 emissions compare with other CO_2 price forecasts?

A. Figure 1 below compares the annual CO_2 emissions prices that the Applicants have assumed in their Futures 2 and 5 through 10 with the current Synapse Mid, High and Low CO_2 price forecasts.[3] These annual emissions prices are in nominal dollars.

[2] Exhibit 401 (DAS-2) *Strategic Energy Assessment: Energy 2014 – Ensuring the Availability, Reliability, and Sustainability of Wisconsin's Electric Energy Supply, Final Report,* April 2009, Docket 5-ES-104, at pages XI to XII.

[3] Additional information about the Synapse CO_2 price forecasts is presented in Exhibit 402 (DAS-3).

Figure 1: Applicant and Synapse CO_2 Prices



As can be seen, the single set of annual CO_2 prices used by the Applicants in their EGEAS modeling fairly closely tracks the Synapse Low CO_2 price forecast but is significantly lower than the Synapse Mid CO_2 price forecast, let alone the Synapse High CO_2 price forecast.

Q. Have the Applicants acknowledged that the Synapse CO_2 price forecasts are reasonable for use in resource planning?

A. Yes. The Applicants have acknowledged that the Synapse CO_2 price forecasts are reasonable for resource planning.[4] However, the Applicants also have said that while all three of Synapse's CO_2 price forecasts (Mid, High and Low) "may be reasonable for purposes of utility resource planning, the low and mid forecasts should be given a significantly higher probability of occurrence than that accorded to the high forecast."

Q. But isn't it correct that the Applicants did not include the Synapse Mid CO_2 price forecast in any modeling scenario?

A. That is correct. As shown in Figure 1, the single set of CO_2 prices assumed by the Applicants in their Futures 2 and 5 through 10 was only marginally higher than the Synapse Low Forecast. The Applicants have not examined the viability of continued operation of Columbia Units 1 and 2 with the emissions reductions equipment under any higher set of CO_2 prices, including the Synapse Mid CO_2 price forecast.

Q. Are the Synapse CO_2 price forecasts consistent with the results of the CO_2 prices being projected for the Waxman-Markey bill that has recently being approved by the U.S. House of Representatives and is currently being deliberated in the U.S. Senate?

A. Yes. Figure 2 below compares the CO_2 emissions prices that the Applicants have assumed in their Figures 2 and 5 through 10 and the Synapse CO_2 price forecasts with the results of the independent modeling of the legislation that has been introduced in the U.S. Congress in recent years. The CO_2 emissions prices in Figure 2 are levelized prices in 2009 year dollars.

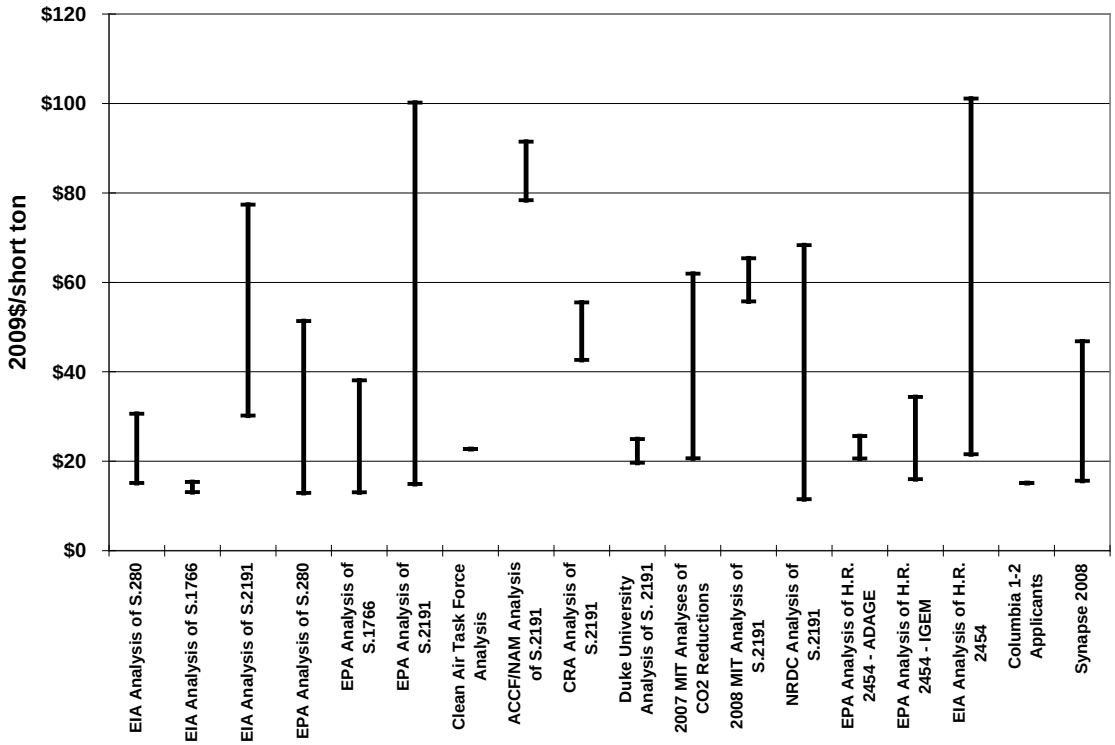
In this Figure:

- S.280 refers to the McCain Lieberman bill introduced in 2007 in the 110th U.S. Congress
- S.1766 refers to the Bingaman-Specter bill introduced in 2007 in the 110th U.S. Congress
- S. 2191 refers to the Lieberman-Warner bill introduced in 2007 in the 110th U.S. Congress
- HR. 2454 refers to the Waxman-Markey bill introduced in 2009 in the current 111th U.S. Congress

[4] For example, see the Application, EGEAS Summary Report, Appendix C, at page 21 of 44.

The modeling analyses in Figure 2 includes studies prepared by the U.S. EPA, the Energy Information Administration ("EIA") of the US Department of Energy, the Clean Air Task Force, the American Council for Capital Formation and the National Association of Manufacturers, CRA, International, Duke University, the Massachusetts Institute of Technology ("MIT") and the Natural Resources Defense Council ("NRDC").

Figure 2: Applicant and Synapse CO_2 Prices Compared to Results of Modeling of Proposed Federal Legislation



This comparison clearly demonstrates that the range of the Synapse CO_2 price forecasts remains reasonable when the results of the EPA and EIA modeling of H.R. 2454, the Waxman-Markey legislation, are included. Figure 2 also clearly demonstrates that the single set of CO_2 prices assumed by the Applicants in their modeling of Futures 2 and 5 through 10 are too low when compared to the ranges

of possible CO_2 costs that have been projected in the EPA and EIA's modeling of HR. 2454, the Waxman-Markey legislation.[5]

Q. Have you seen any more recent CO_2 price forecasts that have been prepared by or for the Applicants?

A. **[REDACTED]**

[6]

[5] The results of the US EPA and EIA's modeling of the Waxman-Markey bill are included as the 3rd, 4th and 5th bars from the right in Figure 2.

[6] Exhibit 404 (DAS-5) WPSC Confidential – Not Shared with Co-Owners. WPSC's response to Data Request No. 3(WPSC)-SC/RFP-22.

[REDACTED]

Q. What is your conclusion concerning the CO_2 prices assumed by the Applicants in their EGEAS modeling?

A. As I noted earlier, the Commission should not give any weight to any scenario that does not include any CO_2 prices – it is unreasonable to expect that there will not be any regulation of greenhouse gases at any time before 2039.

In addition, the single set of CO_2 prices assumed by the Applicants, while just within the zone of reasonableness, was too low to use as the only CO_2 price considered. The Applicants should have modeled a range of future CO_2 prices such as the Synapse Low, Mid and High forecasts.

Q: What impact does the limited modeling of CO2 prices have?

A: By ignoring the potential for higher CO_2 prices, the Applicants have biased their EGEAS modeling analyses in favor of the continued operation of Columbia Units 1 and 2 because coal is the most carbon intensive fuel.[7]

IMPACT OF GREENHOUSE GAS REGULATION ON NATURAL GAS PRICES

Q. Do the Applicants adjust natural gas and/or coal prices to reflect federal regulation of greenhouse gas emissions?

A. Yes. The Applicants have increased natural gas prices by 30 percent beginning in 2013 and have decreased coal prices by 10 percent in their Futures 5 through 10 scenarios that include a monetized value for CO_2 emissions.[8]

---

[7] For example, a typical new combined cycle plant is expected to emit on the order of 1000 to 1200 lbs of CO_2 per MWh. The average CO_2 emissions from Columbia Units 1 and 2 was approximately 2200 lbs per MWh during 2007 and 2008.

Q. In what years do the Applicants apply these increased natural gas and decreased coal prices?

A. Remarkably, in Futures 5 through 10, the Applicants raise natural gas prices by 30 percent and decrease coal prices by 10 percent starting in 2013 even though the monetized values for CO_2 emissions do not start until 2015. Raising natural gas prices two years before carbon regulation even begins (that is in 2013) is unreasonable and biases the analyses against natural gas options and in favor of the continued operation of Columbia Units 1 and 2.

Q. Do you agree with the Applicants' assumption that natural gas prices would increase by 30 percent if the federal government adopts legislation or regulations to regulate and reduce greenhouse gas emissions?

A. No. It is possible that natural gas demand could be somewhat higher due to CO_2 emission regulations and, as a result, natural gas prices could be expected to be somewhat higher than otherwise would be the case. However, the effect is very complicated and will depend on a number of factors, such as how much new natural gas capacity is built as a result of the higher coal-plant operating costs due to the CO_2 emission allowance prices, how much additional DSM and renewable alternatives are added to the U.S. system, the levels and prices of any incremental natural gas imported into or developed in the U.S., and changes in the dispatching of the electric system. Indeed, depending on future circumstances there may be some periods in which the prices of natural gas may be lower as a result of CO_2 regulations. Thus it is very difficult to determine, at this time, the amount by which natural gas prices might be increased, if at all, due to the regulation of CO_2 emission.

In fact, as I will discuss below, the detailed modeling of proposed greenhouse gas legislation does not support any assumption that the price of natural gas would

[8] For example, see WPL's Response to Data Request No. 1(WPL)-SC/INT-1.

increase by anything close to 30 percent as a result of a federal program for regulating greenhouse gas emissions.

Q. Has Synapse examined the impact that the enactment of CO_2 emissions regulations might have on natural gas prices?

A. Yes. As part of our work on climate change issues, Synapse has reviewed the publicly available modeling results concerning the impact that adoption and implementation of CO_2 regulatory legislation could have on natural gas prices. The results of our review are presented in Figure 4, below.

More particularly, Figure 4 shows the levelized percentage changes in natural gas prices (i.e., increases or decreases from the base case that has no regulation of greenhouse gas emissions) in a large number of scenarios from the major climate change proposals that have been introduced in the U.S. Congress in recent years. Each data points shown in Figure 4 reflects the levelized change in the natural gas prices in a modeled scenario and the levelized CO_2 price for that scenario.

The levelized CO_2 prices and natural gas price changes presented in Figure 4 have been developed from the results of modeling by the Joint Program at MIT on the Science and Policy of Global Change, the U.S. EPA, and the EIA of the Department of Energy , and cover multiple climate change proposals in the 110th U.S. Congress: Senate Bill S.280 (the McCain-Lieberman bill), Senate Bill S.1766 (the Bingaman-Specter bill), Senate Bill S.2191 (the Lieberman-Warner bill) and House Bill 2454 in the 111th Congress (the American Clean Energy and Security Act of 2009, "Waxman-Markey").

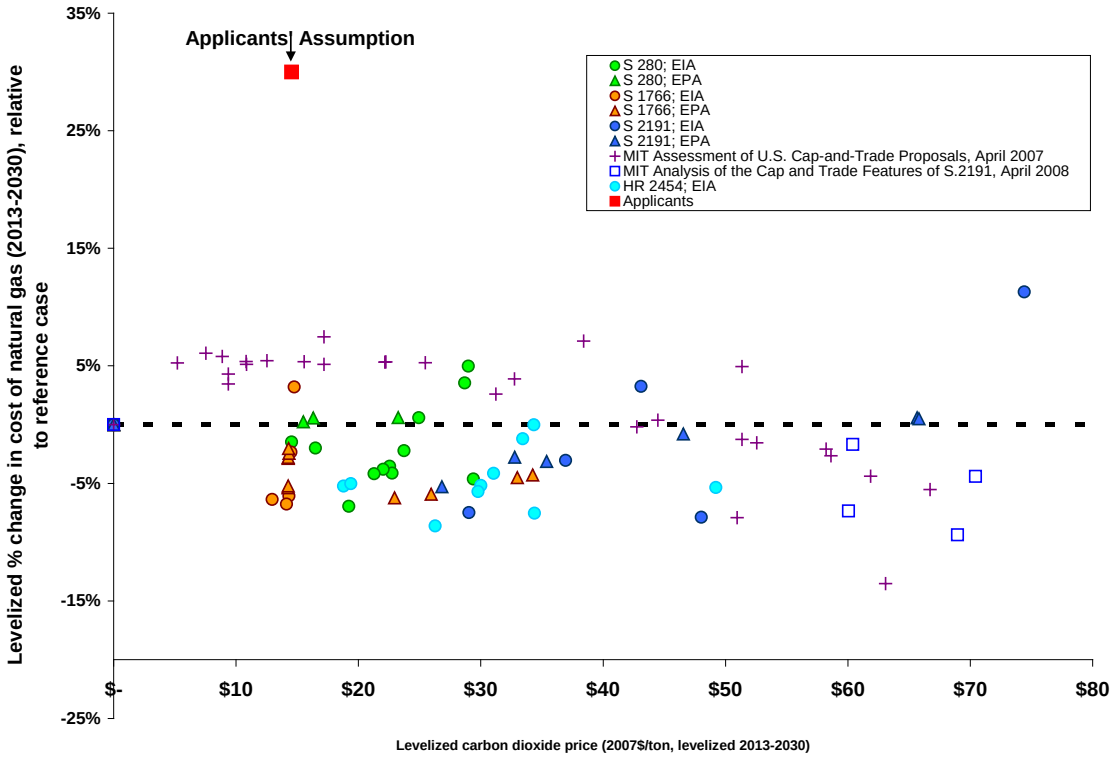


Figure 4: The relationship between CO_2 emissions allowance prices and natural gas prices.

The red square at the top of Figure 4 reflects the Applicants' assumption that there would be a 30 percent increase in natural gas prices. The location of this red square also reflects the Applicants' assumption that there would only be a relatively low set of CO_2 prices. As shown clearly in Figure 4, *none* of the results of any of the independent modeling analyses support the Applicants assumption that regulation of CO_2 emissions will increase natural gas prices by 30 percent. Instead, the modeling evidence suggests that federal regulation of greenhouse gas emissions can be expected to have a much smaller impact on natural gas prices than the 30 percent increase that the Applicants have assumed in their EGEAS modeling. This is true even with CO_2 prices that are significantly higher than the CO_2 prices that the Applicants have assumed in their EGEAS modeling.

In fact, the results of the modeling of a substantial number of the CO_2 regulation scenarios represented in Figure 4 suggest that the adoption of greenhouse gas

regulation would lead to lower natural gas prices as the demand for and the use of natural gas decline due to its greenhouse gas emissions. Thus, there is no credible modeling evidence to support the Applicants' assumption that federal regulation of greenhouse gas emissions would inevitably lead to a 30 percent increase in the price of natural gas, particularly at relatively low CO_2 prices. In fact, there is no clear evidence that CO_2 prices in the range that the Applicants have used in their EGEAS will push natural gas prices higher at all.

Q. Does Figure 4, above, include the recent modeling of the HR 2454, the Waxman-Markey legislation that has been approved by the U.S. House of Representatives?

A. Yes. The results of the recent EIA modeling of the Waxman-Markey bill are included in Figure 4.

Q. Have you seen any other evidence that suggests that federal regulation of greenhouse gas emissions will not cause natural gas prices to increase by 30 percent as the Applicants have assumed in their EGEAS modeling?

A. Yes. Figure 5, below, presents the annual percentage changes in natural gas prices in each of the scenarios examined by the EIA in its recent modeling of the Waxman-Markey bill from the gas prices in the EIA's reference case without any regulation of CO_2 emissions. This information provides insight in the ranges of natural gas prices that could be expected from adoption of the Waxman-Markey bill.

Public - Protected Materials Redacted

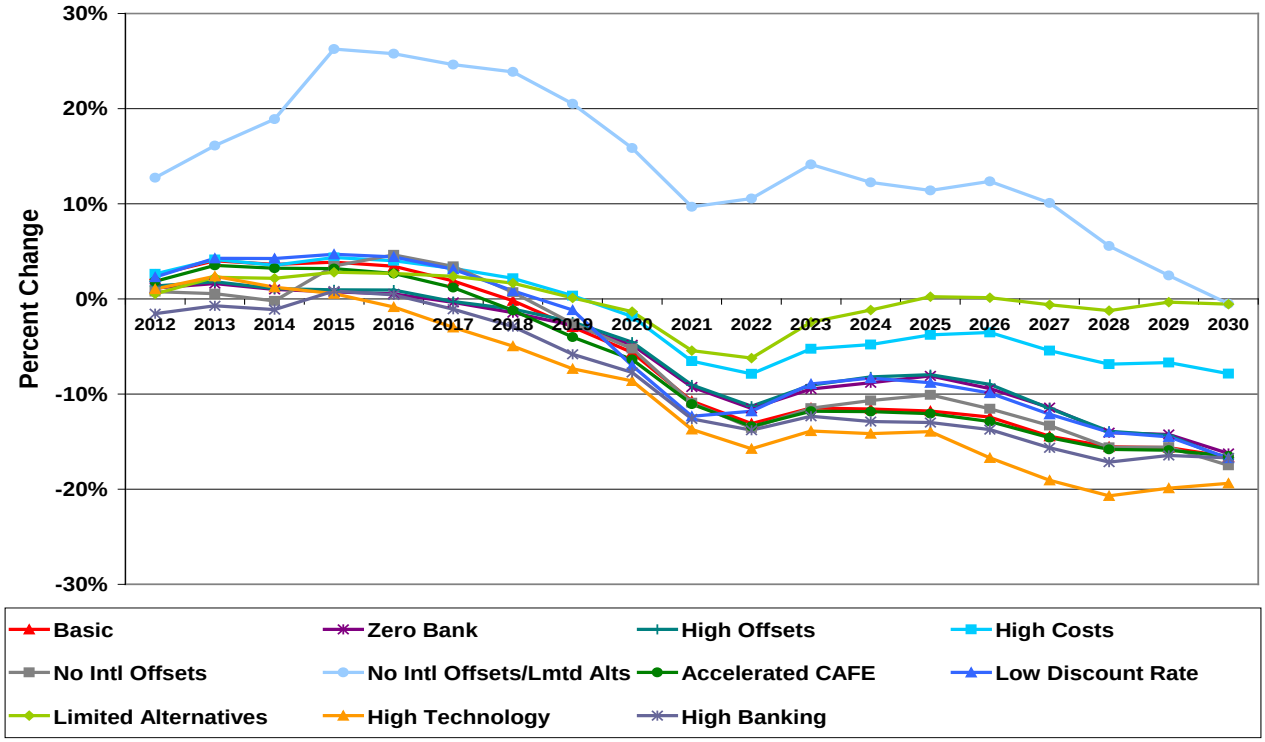


Figure 5: Annual Changes in Natural Gas Prices from Reference Case in EIA Modeling of Proposed Waxman-Markey Legislation

As can be seen from Figure 5, under the Waxman-Markey bill that has been passed by the House of Representatives, natural gas prices would not increase by 30 percent in any of the years in any of the scenarios studied by the EIA. At most, natural gas prices would spike above 20% for four or five years in the most restrictive scenario studied by the EIA, i.e., a scenario in which the numbers of international offsets are severely limited and the deployment of alternative technologies also is not increased above reference case levels. However, even in this restricted scenario, natural gas prices do not increase by 30 percent in any year through 2030.

In fact, Figure 5 shows that in many of the cases studied by the EIA, natural gas prices would decrease over time as a result of the federal regulation of greenhouse gas emissions.

Figure 5 provides additional publicly available modeling evidence that contradicts the Applicants' assumption in their Futures 5 through 10 that natural gas prices will increase by 30 percent **two years before** CO_2 regulation begins and will remain 30 percent higher in every year through 2039.

Q. But doesn't common sense suggest that regulating greenhouse gas emissions will lead to less coal-fired generation and more of a dependence on natural gas – thereby increasing the demand for and price of natural gas?

A. Not necessarily, especially over the mid-to-longer term. In fact, there are several reasons why federal regulation of greenhouse gas emissions may not lead to any meaningful increases in the price of natural gas. First, natural gas plants also emit CO_2. Thus, there will be incentives as a result of federal regulation of greenhouse gases to shift away from use of natural gas to more carbon neutral options such as energy efficiency and renewable resources. This will act to reduce the demand for natural gas as well as coal-fired generation.

It also is generally accepted that strategies for reducing our national greenhouse gas emissions will require implementing complementary policies adding large amounts of new wind and energy efficiency. Thus, legislative proposals for regulation of greenhouse gases, such as the Waxman-Markey bill also included increased investments in these areas. Consequently, carbon legislation, when coupled with increasing amounts of new wind and energy efficiency, actually may lead to decreases in the demand for and, consequently, reduced costs for natural gas over the long term, counter to what the Applicants have assumed.

For example, a recent study by the U.S. Department of Energy's National Renewable Energy Laboratory examined the costs and benefits of achieving 20 percent wind energy penetration by 2030.[9] One of the benefits that this DOE study found was that wind generation could displace up to 50 percent of the

[9] *20 Percent Wind Energy by 2030*, available at http://www.20percentwind.org/20p.aspx?page=Report.

electricity that would be generated from natural gas – this, in turn, could translate into a reduction in national demand for natural gas of 11 percent.[10]

The identification of substantially increased natural gas supplies within the past year also will affect the impact that regulation of CO_2 emissions can be expected to have on natural gas prices. Indeed, the identification of these new supplies of natural gas has been described as a structural change in the natural gas market. This structural change has two important impacts on the resource planning for emissions reduction systems at Columbia Units 1 and 2. First, as a result of the existing and expected supply glut, current and projected prices of natural gas have been reduced. At the same time, the dramatically increased supplies of natural gas that are being identified should be able to accommodate any increased demands from fuel switching as a result of federal regulation of greenhouse gas emissions without causing significant increases in natural gas prices.

The structural change in the natural gas markets already has had a significant impact on utilities' resource planning. For example, in early April of this year, Entergy Louisiana informed the Louisiana Public Service Commission of its intent to defer (and perhaps cancel) a proposal to retire an existing gas-fired power plant and, in its place, to build a new coal-fired unit. Entergy explained that it no longer believes that a new coal plant would provide economic benefits for its customers due to its current expectation that future gas prices would be much lower than previously anticipated:

> Perhaps the largest change that has affected the Project economics is the sharp decline in natural gas prices, both current prices and those forecasted for the longer-term. The prices have declined in large part as a result of a structural change in the natural gas market driven largely by the increased production of domestic gas through unconventional technologies. The decline in the long-term price of natural gas has caused a shift in the economics of the Repowering Project, with the Project currently – and for the first

[10] Id, at pages 16 and 154.

time – projected to have a negative value over a wide range of outcomes as compared to a gas-fired (CCGT) resource.[11]

4. Recent Natural Gas Developments

Until very recently, natural gas prices were expected to increase substantially in future years. For the decade prior to 2000, natural gas prices averaged below $3.00/mmBtu (2006$). From 2000 through May 2007, prices increased to an average of about $6.00/mmBtu (2006$). This rise in prices reflected increasing natural gas demand, primarily in the power sector, and increasingly tighter supplies. The upward trend in natural gas prices continued into the summer of 2008 when Henry Hub prices reached a high of $131.32/mmBtu (nominal). The decline in natural gas prices since the summer of 2008 reflects, in part, a reduction in demand resulting from the downturn in the U.S. economy.

* * * *

However, the decline also reflects other factors, which have implications for long-term gas prices. During 2008, there occurred a seismic shift in the North American gas market. "Non-conventional gas" – so called because it involves the extraction of gas sources that previously were non-economic or technically difficult to extract – emerged as an economic source of long-term supply. While the existence of non-conventional natural gas deposits within North America was well established prior to this time, the ability to extract supplies economically in large volumes was not. **The recent success of non-conventional gas exploration techniques (e.g., fracturing, horizontal drilling) has altered the supply-side fundamentals such that there now exists an expectation of much greater supplies of economically priced natural gas in the long-run….**

* * * *

Of course, it should be noted that it is not possible to predict natural gas prices with any degree of certainty, and [Entergy Louisiana] cannot know whether gas prices may rise again. Rather, based upon the best available information today, it appears that gas prices will not reach previous levels for a sustained period of time

[11] Exhibit 405 (DAS-6). *Report and Recommendation Concerning the Little Gypsy Unit 3 Repowering Project*, submitted by Entergy Louisiana to the Louisiana Public Service Commission, April 1, 2009, at pages 6-8.

> because of the newly discovered ability to produce gas through non-traditional recovery methods…[12] [Emphasis added]

Entergy's conclusion that there has been a seismic shift in the domestic natural gas industry was confirmed in early June 2009 by the release of a report by the American Gas Association and an independent organization of natural gas experts known as the Potential Gas Committee, the authority on gas supplies. This report concluded that the natural gas reserves in the United States are 35 percent higher than previously believed. The new estimates show "an exceptionally strong and optimistic gas supply picture for the nation," according to a summary of the report.[13]

A Wall Street Journal Market Watch article titled "U.S. Gas Fields From Bust to Boom" similarly reported that huge new gas fields have been found in Louisiana, Texas, Arkansas and Pennsylvania and cited one industry-backed study as estimating that the U.S. now has enough natural gas to satisfy nearly 100 years of current natural gas-demand.[14] It further noted that

> Just three years ago, the conventional wisdom was that U.S. natural-gas production was facing permanent decline. U.S. policymakers were resigned to the idea that the country would have to rely more on foreign imports to supply the fuel that heats half of American homes, generates one-fifth of the nation's electricity, and is a key component in plastics, chemicals and fertilizer.
>
> But new technologies and a drilling boom have helped production rise 11% in the past two years. Now there's a glut, which has driven prices down to a six-year low and prompted producers to temporarily cut back drilling and search for new demand.[15]

The existence of higher natural gas reserves and the new recovery techniques discussed above should significantly reduce any impact on natural gas prices from the adoption of a federal program regulating greenhouse gas emissions.

---

[12] Id, at pages 17, 18 and 22.
[13] *Estimate Places Natural Gas Reserves 35 percent Higher*, New York Times, June 9, 2009.
[14] Available at http://online.wsj.com/article/SB124104598912705 85.html.

Q. Have the Applicants provided any credible evidence to support their assumption that natural gas prices would immediately increase by 30 percent starting in 2013 and would be 30 percent higher in every year of the study period?

A. No. When asked to identify the basis of their assumption that natural gas prices would increased by 30% under CO_2 regulation, the Applicants cited a number of sources as purportedly supporting "changes in coal and gas forecasts if greenhouse gases are regulated."[16] However, these sources suffer from one or more of the following serious flaws:

- They make exaggerated claims about the impact that CO_2 regulation will have on natural gas prices without offering any supporting analyses or evidence.
- They assume that coal would be displaced only by natural gas and, consequently, don't allow for the displacement of coal by additional energy efficiency and renewable resources. This inflates the amount of natural gas that would be required and the impact on natural gas prices.
- They assume that very major CO_2 prices would be implemented in a single step, nearly overnight, rather than phased in over time. This is contrary to the greenhouse gas legislation that has been introduced in Congress in recent years in which CO_2 prices would start low and increase over time.

In addition, some of the sources cited by the Applicants assume much higher CO_2 prices than the Applicants have used in their EGEAS modeling for Columbia Units 1 and 2. For example, in support of their assumption that natural gas prices will increase 30%, the Applicants cite a study from the Cambridge Energy Research Associates ("CERA"), presented by WPL in Docket No. 6680-CE-170,

---

15 Id.
16 For example, see WPSC's Response to Sierra Club's Data Request No. 1(WPSC)-SC/INT-1.

which assumed assumed CO_2 prices of $40/metric tonne and $80/metric tonne.[17] The prices assumed by CERA, while within a range of reasonableness, were substantially higher than the CO_2 prices used by the Applicants in their EGEAS modeling in this proceeding. Thus to bolster their argument that CO_2 prices lead to gas price increases, the Applicants' attempt to use a high gas price that is connected to much higher CO_2 price without also using the much higher CO_2 price.

Clearly, the Applicants want the Commission to accept such scenarios that include low CO_2 prices and high natural gas prices that have been artificially increased by the assumption that the low CO_2 prices will have a substantial (i.e., 30 percent) impact on gas prices. However, as I have shown above, such a combination of low CO_2 prices and much higher gas prices is not supported by any analysis and improperly biases the EGEAS modeling analyses in favor of coal and against the natural gas alternatives.

At the same time that they have relied on flawed studies, in some instances the Applicants have been selective in the evidence from the various studies that they have chosen to rely on. For example, the very table from the EIA's April 2008 report on the Lieberman-Warner Climate Security Act of 2007 on which the Applicants want to rely for the assumption that CO_2 regulation will lead to higher delivered natural gas prices also shows that CO_2 regulation would lead to higher delivered coal prices.[18] However, the Applicants have chosen to selectively cite the finding that delivered natural gas prices would be higher due to federal greenhouse gas regulations while ignoring the finding that delivered coal prices also would be higher.

---

17 Exhibit___(KLY-1) in Docket No. 6680-CE-170, at page 18.

18 Both of these results are due to the fact that the delivered prices in this Table in the EIA report include the cost of the CO_2 emissions allowances.

Q. What assumption did WPL make in its 2008 EGEAS modeling in Docket No. 6680-CE-170 as to the impact that regulation of greenhouse gas emissions would have on natural gas prices?

A. In the EGEAS modeling runs in Docket No. 6680-CE-170 that compared the conversion of the Neenah facility to a combined cycle unit to the building of the proposed Nelson Dewey 3 plant, WPL assumed that natural gas prices would be raised by 10 percent in scenarios with monetized CO_2 emissions values.[19] Now, less than a year later, the same Company has assumed that the same set of CO_2 prices will lead to much higher 30 percent increases in natural gas prices.

Q. What are reasonable assumptions regarding the impact that CO_2 regulation will have on natural gas prices that should be used in the EGEAS modeling of the proposed emissions reduction systems at Columbia Units 1 and 2?

A. The base case analysis should assume that CO_2 regulation will not have a measurable impact on natural gas prices. At the same time, I would suggest that sensitivity cases be run which assume that gas prices might increase somewhat over time as a result of CO_2 regulation. As I testified in Docket No. 6680-CE-170, with the Synapse mid CO_2 prices, such sensitivity cases could assume that natural gas prices would be perhaps 5 percent higher than base case levels by 2015 or 2020 and 10 percent higher by 2025 or 2030. Although the results of the modeling that I have discussed suggests that natural gas prices actually could be lower over time as a result of CO_2 regulation, to be conservative I would recommend that such scenarios not be run at this time.

Intervenors have requested that the Applicants run several more reasonable EGEAS scenarios in which (1) natural gas prices are not increased as a result of CO_2 emissions regulations and (2) natural gas prices increase by 10 percent beginning in the year in which the regulation of CO_2 emissions also begins.

---

[19] Rebuttal Testimony of Randy Bauer in Docket No. 6680-CE-170, at page 17, lines 3-6.

THE APPLIANTS MODELING OF ENERGY EFFICIENCY

Q. Applicant witnesses Niccolls, Daavettila and Block have testified that existing levels of energy efficiency are included in the Applicants' EGEAS modeling analyses through the load forecasts and that existing levels of DSM impacts, such as interruptible load and direct load control are included through forecast adjustment, modeling of units or both.[20] Is it possible to determine, even approximately, what levels of energy efficiency and demand side management are reflected in each of the Applicants' EGEAS modeling analyses?

A. The answer is yes for WPL but, unfortunately, is no for WPSC and MGE.

Q. What information has WPL provided concerning the levels of energy efficiency and DSM in its EGEAS modeling?

A. **[REDACTED]**

[21]

Q. What levels of peak demand and energy requirements reductions did WPL then assume in its EGEAS modeling?

A. **[REDACTED]**

[20] Direct Testimony of J. Niccolls, S. Daavettila and J. Block, July 10, 2009, at page 46, lines 2-4.

[21] Exhibit 406 (DAS-7) WPL Response to Data Requests No. 2(WPL)-S/INT-24, parts a-d and Exhibit 407 (DAS-8) the Attachment to WPL's Response to Data Request No. 2(WPL)-CUB-CW/Inter-18.

Q. Did WPL assume that additional reductions in peak demands and energy requirements could be achieved through each year of the 2010-2039 planning period in its EGEAS modeling?

A. **[REDACTED]**

Q. What information did MGE provide concerning the energy efficiency and DSM savings it assumed in its EGEAS modeling in this proceeding?

A. Through discovery the Sierra Club asked MGE to identify the annual reductions it had assumed in its EGEAS modeling in its demand and energy requirements for each of the years 2010-2039 due to existing and new energy efficiency and DSM programs.[22] Instead of providing the requested quantification of the energy efficiency and DSM program savings assumed by MGE in its EGEAS modeling for either its existing or new efforts, MGE provided the following general response:

> Reductions in demand and energy due to energy conservation and load management efforts by MGE's customers, rather than being explicitly quantified, are reflected in the base historical data used in the peak electric demand and energy forecasts. The methods used by MGE to develop its peak electric demand and energy

[22] Exhibit 408 (DAS-9). MGE's Response to Data Request No. 2 (MGE)-SC/INT-24, parts a-d.

forecasts capture, by definition, any realized conservation and load management savings reflected in the marketplace.[23]

The only quantification that MGE did provide was that it had modeled three types of DSM impacts in its EGEAS modeling for its existing Power Control Program, Voltage Control Program and Interruptible Customer Program and that the estimated potential demand impact from these three DSM programs during summer peak periods are approximately 28 MW, 12 MW and 29 MW.[24] The peak demand savings from these three programs represent only 7.7 percent of MGE's load forecast in 2018. MGE otherwise has failed to provide any quantification of any savings in its energy requirements due to existing or new energy efficiency or DSM efforts that it included in its EGEAS modeling.

Q. What information has WPSC provided concerning the savings from energy efficiency and DSM that it assumed in its EGEAS modeling in this proceeding?

A.

[25]

[26]

[23] Exhibit 408 (DAS-9) MGE Response to Data Request No. 2 (MGE)-SC/INT-24, parts a-d.
[24] Exhibit 409 (DAS-10) MGE Response to Data Request No. 2 (MGE)-SC/INT-31, part b.
[25] Exhibit 410 (DAS-11) WPSC response to Data Request No. 3 (WPSC)-SC/INT-26, part a.
[26] Exhibit 410 (DAS-11) WPSC Response to Data Request No. 3(WPSC)-SC/INT-26, part b.

- [27]
- [28]
- [29] [30]

[27] Exhibit 411 (DAS-12) WPSC response to Data Request No. 3 (WPSC)-SC/INT-33. part a.
[28] Id.
[29] Exhibit 410 (DAS-11) WPSC response to Data Request No. 3(WPSC)-SC/INT-26, part d.
[30] Calculation based on information provided in Exhibit 412 (DAS-13) 'EPC Handout FCST200810 redacted.pdf, provided in response to Data Request No. 3(WPSC)-SC/INT-26, part k.

Q. Have the Applicants reasonably represented in their EGEAS modeling analyses the potential reductions in their peak demands and energy requirements from energy efficiency and DSM efforts?

A. As best as we can determine, no. According to the Energy Efficiency Potential Study prepared by the Energy Center of Wisconsin for the Commission, the cumulative energy efficiency savings for the State of Wisconsin could reach 13.0 percent of total electricity sales by 2018 and 12.9 percent of electricity peak demand.[31] As discussed above, there is no evidence that the Applicants have modeled these reductions in their EGEAS analyses nor have they shown that spending on additional energy efficiency and DSM efforts, above Act 141 levels, would not be a cost-effective alternative (or part of a portfolio of cost-effective alternatives) to the proposed emissions reductions project and continued operation of Columbia Units 1 and 2.

Q. Did any of the Applicants model any increased spending on energy efficiency or DSM, above the Act 141 levels, as an alternative to the Columbia Units 1 and 2 emissions reduction project?

A. No. Each of the Applicants has indicated that it did not model increased spending on energy efficiency or DSM as an alternative to the proposed emissions reduction project beyond what is required by Act 141.[32]

Q. Is the failure to include additional spending on energy efficiency and/or DSM as one of the set of alternatives to the proposed emission reduction project prudent?

A. No. Prudent planning would look at all cost-effective alternatives to the proposed emissions reduction project. From what I have seen, with only the minor

---

[31] *Energy Efficiency and Customer-Sited Renewable Resource Potential in Wisconsin for the Years 2012 and 2018*. Energy Center of Wisconsin, August 2009, at pages EE-20 and EE-21.

[32] See Exhibits 413 (DAS-4) MGE's Response to Data Request No. 2(MGE)-SC/INT-26.c, Exhibit 414 (DAS-15) WPSC's Response to Data Request No. 3(WPSC)-SC/INT-28 .c. and Exhibit 415 (DAS-16) WPL's Response to Data Request No. 2(WPL)-SC/INT-26.c.

exceptions noted above, the Applicants have focused on expensive, and in some cases, very expensive, supply-side alternatives to the emissions reduction project. It is unreasonable to focus on these expensive supply-side options without considering that additional energy efficiency and DSM can offer less expensive alternatives, at least in large part, to the expenditure of what the Applicants now predict will be $627 million for emissions control equipment at Columbia Units 1 and 2.

Q. To which options are you referring when you say that the Applicants have considered some very expensive supply-side alternatives in their EGEAS modeling?

A. The new nuclear plants that the Applicants made available to the EGEAS model (and appear to have forced the EGEAS model to add in Futures 6 and 7) would be very expensive alternatives even at the costs assumed by the Applicants. Moreover, given the uncertainties associated with the construction cost and schedules for any new nuclear power plants, the new nuclear units assumed by the Applicants in their EGEAS modeling can reasonably be expected to cost far more and be available far later than the Applicants have assumed. This is especially true given (1) the nuclear industry's very poor record of projecting the construction costs of the existing generation of nuclear power plants (i.e., nuclear plants actually cost 200 to 300 percent more than had been projected at the start of construction), (2) the fact that no new nuclear units have been built in the United States in decades, (3) the significant cost increases and regulatory delays that are being announced to new nuclear plants that are already in the licensing/construction pipeline and (4) the significant problems that have been experienced by new nuclear plant construction projects overseas. It is very likely that a new nuclear plant will cost significantly more than the Applicants have assumed in their EGEAS modeling and that any new nuclear units in Wisconsin (or even outside the state but partly owned by Wisconsin utilities) will not be

available until after 2025, the first year that the Applicants have assumed such units will be available.

Q. Does this complete your testimony?

A. Yes.