



# Public Service Commission of Wisconsin

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Public Service Commission of Wisconsin  
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January 11, 2013

To the Electronic Service List in 6685-CE-110

Re: Application of WPPI Energy for a Certificate of Authority 6685-CE-110  
to Upgrade the Air Quality Control System on Unit 4 at the  
Boswell Energy Center in Cohasset, Minnesota

Comments Due:

**January 18, 2013 – Noon**

This docket uses the Electronic Regulatory  
Filing (ERF) system.

Address Comments To:

**Sandra J. Paske**  
**Secretary to The Commission**  
Public Service Commission  
P.O. Box 7854  
Madison, WI 53707-7854

A Briefing Memorandum in this docket is being provided to the parties for comments. In addition to comments on the factual content of the Briefing Memorandum, Commission staff is also interested in comments you may have on the substantive content of the memorandum, both regarding Commission staff's analysis and the project itself. Also, based on Commission staff's analysis, it is anticipated that in addition to the alternatives for Commission consideration to accept or reject the proposed project, a third alternative would be to accept the proposed project with conditions.

Comments must be received **Friday, January 18, 2013 by noon**. Party comments must be filed using the ERF system. The ERF system can be accessed through the Public Service Commission's website at <http://psc.wi.gov>. Members of the public may file comments using the ERF system or may file an original in person or by mail at:

Docket 6685-CE-100  
Public Service Commission  
610 N. Whitney Way  
P.O. Box 7854  
Madison, WI 53707-7854

Sincerely,

Robert Norcross  
Division Administrator  
Gas and Energy Division

RDN:TKK:cmk:DL:00634185

Attachment

# **PUBLIC SERVICE COMMISSION OF WISCONSIN**

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## **Memorandum**

January 11, 2013

TO: The Commission

FROM: Robert Norcross, Administrator  
Deborah Erwin, Program and Planning Analyst - Advanced  
Andrew Kell, Program and Planning Analyst  
Terri Kosobucki, Engineer  
Gas and Energy Division

RE: Application of WPPI Energy for a Certificate of Authority to Upgrade the Air Quality Control System on Unit 4 at the Boswell Energy Center in Cohasset, Minnesota 6685-CE-110

### **BRIEFING MEMORANDUM**

#### **STATEMENT OF THE PROCEEDING**

On October 11, 2012, WPPI Energy (WPPI), as a municipal electric company, filed an application under Wis. Stat. § 196.49 and Wis. Admin. Code §§ PSC 112.05 and 112.06, to upgrade the air quality control system (AQCS) on Unit 4 at the Boswell Energy Center in Cohasset, Minnesota (Project). ([PSC REF#: 174450](#), Confidential Version, and [PSC REF#: 174451](#), Public Version.) As the minority co-owner of Boswell Energy Center Unit 4 (BEC4), WPPI files this request for a Certificate of Authority for its participation in the Project, for which Minnesota Power (MP) is the majority co-owner and operating agent of BEC4.

On December 7, 2012, the Commission issued a Notice of Investigation. ([PSC REF#: 177611](#).) There were no requests from individuals or organizations to intervene in this proceeding.

WPPI is a municipal electric company formed pursuant to Wis. Stat. § 66.0825. It currently supplies all of the electric power requirements of its 51 municipal members, which operate electric utilities serving a combined population of approximately 195,000 customers in their respective cities and villages in Wisconsin, Upper Michigan, and Iowa. Forty-one of WPPI's municipal members are located in Wisconsin.

### **Summary of Application**

BEC4 is a 585 MW low-sulfur coal-fired generating unit located on the Mississippi River in Cohasset, Minnesota. MP owns and operates a total of nine coal-fired units, including four units at the Boswell site. BEC4 is the newest and largest generating unit in the MP system, being placed in operation in 1980.

On June 18, 1990, the Commission issued an order in Docket 6685-CE-101 authorizing WPPI to acquire a 20 percent ownership interest in BEC4. The remaining 80 percent ownership interest is held by MP. On August 6, 2009, the Commission issued an order in Docket 6685-CE-109 authorizing WPPI's participation in a steam turbine generator upgrade project at BEC4. The project improvements resulted in a 10 percent increase in energy output from BEC4 with no increase in fuel consumption. In 2010, WPPI completed a low NO<sub>x</sub> burner project that significantly reduced NO<sub>x</sub> emissions from BEC4, at a cost to WPPI that was below the threshold requiring Commission approval.

### **Minnesota Review Process**

On August 31, 2012, MP filed with the Minnesota Pollution Control Agency (MPCA) and the Minnesota Public Utilities Commission (MPUC) a plan to upgrade the AQCS on Unit 4 at the Boswell Energy Center. The environmental retrofit project will reduce mercury, particulate matter (PM), sulfur dioxide (SO<sub>2</sub>), and other hazardous air pollutants in order to

achieve compliance with the Minnesota Mercury Emission Reduction Act (MERA) (Minn. Stat. § 216B.68 - 216B.688), the U.S. Environmental Protection Agency (EPA) Mercury and Air Toxics Standard (MATS), and other enacted or pending federal and state environmental rulemakings regulating air and water emissions and solid byproducts from coal-fired power plants.

Under MERA, the filing with the MPCA must include a plan to achieve 90 percent mercury reduction, as well as one or more alternative plans that are designed to come as near as technically possible to the 90 percent goal without imposing excessive costs. The MPCA is required to evaluate the plan and provide its findings to the MPUC. The MPCA's evaluation must: (i) consider the environmental and public health benefits of the proposed plan options to control mercury; (ii) assess the technical feasibility and cost effectiveness of the technologies proposed; and (iii) advise the MPUC on the appropriateness of the plan. The MPUC will then generally approve the plan if it achieves the emissions reductions required by law in a manner that provides for increased environmental and public health benefits without imposing excessive costs on the utility's customers.

The MPCA must make its recommendation to the MPUC within 180 days of the plan's initial filing. The MPUC then has 180 days from receipt of the MPCA's recommendation to approve the plan. There is no regulatory provision requiring MPUC approval of the compliance plan before commencement of project construction, and MP does not expect to receive MPUC approval before Project construction is scheduled to commence in April 2013. MP followed a similar permitting and construction schedule for the MERA compliance project at its Boswell 3 unit (MPUC Docket #M-06-1501). Construction of that project commenced in the spring of 2007, prior to MPUC approval of the emission reduction plan petition in October 2007.

**BEC4 Pollution Control Technology**

BEC4 was originally constructed with first generation low NO<sub>x</sub> burners and a close coupled over-fire air system, in addition to a wet spray tower absorber/particulate removal system. The system removes more than 85 percent of the SO<sub>2</sub> and over 97.5 percent of PM.

In 2008, Selective Non-Catalytic Reduction (SNCR) technology was installed for the removal of NO<sub>x</sub> at BEC4. Boiler injection ports are used to deliver urea into the boiler to chemically transform NO<sub>x</sub> emissions into nitrogen gas and water vapor. In 2010, the low NO<sub>x</sub> burners were replaced with state-of-the-art low NO<sub>x</sub> burners and separated over-fire air technology to minimize NO<sub>x</sub> in the coal combustion process. These NO<sub>x</sub> controls provide a reduction in annual NO<sub>x</sub> emissions of approximately 55 percent.

BEC4 currently utilizes a wet particulate scrubber system for PM control, coupled with a spray tower absorber for SO<sub>2</sub> control. A small portion of the flue gas bypasses the scrubber and absorber. This bypass stream is then treated by an electrostatic precipitator for PM control before being blended with the remainder of the flue gas, where it acts to reheat the flue gas treated by the scrubber. This process results in keeping the flue gas dry after it exits the spray tower absorber and passes through the induced draft (ID) fans, ductwork, and then through the stack.

The proposed Project would replace BEC4's existing PM and SO<sub>2</sub> emission control system with a Circulating Dry Scrubber (CDS) system incorporating a fabric filter, and with installation of a Powdered Activated Carbon (PAC) injection system. The Project would reduce emissions of SO<sub>2</sub>, PM, mercury, and acid gases, including hydrogen chloride and trace metals.

A CDS is a type of semi-dry flue gas desulfurization system. Flue gas enters a vertical reactor tower before exiting to a fabric filter where additional emission capture and collection

takes place. Flue gas enters at the base of the vertical reactor tower and flows upward through a venturi and mixes with a fluidized bed, which is comprised of a mixture of dry lime and fly ash. The intensive gas-solid mixing occurring at this point in the CDS process promotes reaction of sulfur oxides in the flue gas with the dry lime particles. Water is introduced for flue gas humidification, and to enhance the reactivity of the lime and physical absorption for more effective SO<sub>2</sub> removal. PAC is injected into the vertical reactor tower for the purpose of capturing mercury and is collected along with the PM in the fabric filter. Introducing the PAC prior to the flue gas entering the fabric filter allows for the necessary reaction time to maximize mercury removal.

As a result of the proposed Project, SO<sub>2</sub> emissions at BEC4 are expected to decrease about 39 percent, from the current average emission rate of 0.049 lb/MMBtu to approximately 0.030 lb/MMBtu. This amounts to an expected annual decrease in SO<sub>2</sub> emissions from 1061 tons to 647 tons.

PAC is used to remove mercury from the flue gas. The injected carbon compound absorbs the vaporized mercury from the flue gas and combines the mercury with carbon and fly ash particulate. The particulates are then captured by a fabric filter. This system, in combination with a fabric filter, is expected to achieve approximately a 90 percent mercury removal at BEC4.

The fabric filter uses fiberglass or other fabric bags to collect filterable PM and fly ash. The fly ash is periodically cleaned from the fabric bags and sent to the waste ash handling system. When combined with a CDS system, a portion of the fly ash is recirculated to the absorber tower to assist in SO<sub>2</sub> removal.

The proposed Project is expected to decrease filterable PM emissions by about 80 percent, from the current average emission rate of 0.06 lb/MMBtu to approximately

0.012 lb/MMBtu. This is expected to result in an annual decrease in PM emissions from 1,275 tons to 259 tons.

The proposed Project is also expected to decrease mercury emissions approximately 89 percent, with emission rates of mercury decreasing from 5.283 lb/TBtu to 0.60lb/TBtu.

Conversion of BEC4 to a CDS system would also change the way waste fly ash is currently managed in the existing Boswell Energy Center ash disposal system. The BEC4 dry fly ash and flue gas desulfurization (FGD) solids would be transported pneumatically from the BEC4 CDS to a newly constructed BEC4 fly ash silo, then transported to the ash disposal area via truck for deposition with dry coal combustion residuals from Units 1, 2, and 3 at the Boswell Energy Center's on-site ash storage system. Upgrades to the Boswell Energy Center's ash disposal infrastructure would be needed to accommodate the increased volume of fly ash generated by the BEC4 CDS. The necessary upgrades would include expansion of the bottom ash foundation base layer in the pond disposal area, larger final cover construction projects, an increased storm water sedimentation pond, access ramp and haul road improvements, and additional equipment to transport the additional fly ash.

### **Certificate of Authority Standards**

The Commission reviews this application under the standards in Wis. Stat. § 196.49(3)(b).

That statute provides:

**196.49 (3)(b)** Except as provided in par. (d), the commission may require by rule or special order under par. (a) that no project may proceed until the commission has certified that public convenience and necessity require the project. The commission may refuse to certify a project if it appears that the completion of the project will do any of the following:

1. Substantially impair the efficiency of the service of the public utility.
2. Provide facilities unreasonably in excess of the probable future requirements.
3. When placed in operation, add to the cost of service without proportionately increasing the value or available quantity of service unless the public utility

waives consideration by the commission, in the fixation of rates, of such consequent increase of cost of service.

Additionally, the Commission may include conditions in its decision under Wis. Stat.

§§ 196.395 and 196.49(3)(c). Those provisions state:

**196.395 Test, conditional, emergency and supplemental orders; waiver of conditions in orders.** The commission may issue an order calling for a test of actual results under requirements prescribed by the order, during which test period the commission may retain jurisdiction of the subject matter. The commission may issue conditional, temporary, emergency and supplemental orders. If an order is issued upon certain stated conditions, any party acting upon any part of the order shall be deemed to have accepted and waived all objections to any condition contained in the order.

**196.49(3)(c)** The commission may issue a certificate for the project or for any part of the project which complies with the requirements of this section, or the commission may attach to the issuance of its certificate such terms and conditions as will ensure that the project meets the requirements of this section. The issuance of a certificate under this section shall not be a condition precedent to the exercise of eminent domain under ch. 32.

The criteria in Wis. Stat. § 196.49(3)(b)1. to 3. are discretionary and provide a basis for rejecting an application. WPPI contends in its application that the third standard in Wis. Stat. § 196.49(3)(b) regarding cost of service does not apply to its application, because of the existence of Wis. Stat. § 66.0825(10). WPPI claims that the cost of service impacts of the proposed project are solely subject to local governmental oversight and that Commission oversight of WPPI's rates to its members is unnecessary. Regardless of this claim, WPPI asserts that the Commission can easily conclude that the cost impacts are reasonable and appropriate and that WPPI has satisfied all of the requirements of Wis. Stat. § 196.49.

As an environmental retrofit project for an existing plant, it appears that the project will not substantially impair the efficiency of WPPI's service; rather, it would allow WPPI to continue to use a plant that it is currently relying upon to provide electric service. Based on the discussion of need and cost below, it appears that the proposed project will not provide facilities



unreasonably in excess of the probable future requirements, nor will the project add to the cost of WPPI's service without proportionately increasing the value or available quantity of service.

## **Need and Cost Analysis**

### **Need as a Resource**

As a wholesale provider of forty-one municipal retail electric providers in Wisconsin, and ten additional municipal providers in Iowa and Michigan, WPPI has an obligation to secure capacity and energy resources to serve retail electric customers within these municipal territories. In the executive summary of the Application ([PSC REF#: 174551](#), p. 1, Public Version), WPPI describes BEC4 as a Minnesota-based, anchor baseload resource within its power supply portfolio. WPPI's 20 percent share of BEC4, 117 MW, has served a significant portion of its capacity requirements since WPPI began minority ownership of the unit in 1990. WPPI also stated on page four of the Application that it has recently entered into separate power supply contracts with each of its members through 2037. Additionally, in its response to Commission staff data request 01.03 ([PSC REF#: 177585](#), p. 1, Public Version), WPPI anticipates an end-of-service date for BEC4 in the year 2035. Therefore, BEC4 has the ability to serve 117 MW of WPPI members' capacity needs, as well as over 800,000 MWh of annual energy, for almost the entirety of the recently established long-term WPPI power supply contracts.

WPPI's members observed a new high peak demand of 1048 MW in July of 2012 ([PSC REF#: 174551](#), p. 4, Public Version). Assuming BEC4 was running at full capacity at the time, about 11 percent of this peak demand was supported by WPPI's portion of BEC4's output. As a baseload resource, BEC4 supports a higher percentage of WPPI's load during off peak times. WPPI states on page twenty-one of the Application that without BEC4 "WPPI would be significantly short of capacity resources immediately", and with forecasted peak load growth in

consideration “the loss of [BEC4] would exacerbate [WPPI’s] existing need for additional capacity resources starting in 2017”. Further analysis of the content available in Table 7-1 of the Application ([PSC REF#: 174550](#), p 22, Confidential Version) indicates that BEC4 serves a significant capacity need for WPPI. Even with no peak load growth, loss of BEC4 would require WPPI to acquire 117 MW of capacity resources available at times of peak load.

### **Cost Overview of the Project**

WPPI’s share of the total cost of the Project according to WPPI’s estimate is \$95.94 million ([PSC REF#: 174551](#), p. 16, Public Version). This includes the installation of a CDS, fabric filter, PAC injection system, ductwork, ash handling system, indirect installation costs and financing costs. Applied to WPPI’s share of capacity for BEC4, the cost is \$820/kW.

As discussed above, WPPI states that this Project is needed to comply with Minnesota and federal air emission regulations. In a report titled “EPA Impact Analysis: Impacts from the EPA Regulations on MISO”<sup>1</sup>, MISO staff provide high-level estimates on what they believe may be impacts of upcoming EPA regulations, including the Cross-State Air Pollution Rule and MATS. On page 23 of the report, MISO staff present a table of emission control technologies and average costs for these technologies, which are based on stakeholder data that were provided to MISO. A “Dry Scrubber” is listed as \$450/kW, and “Activated Carbon Injection with Fabric Filter” is listed as \$275/kW. Added together, the average cost for these combined technologies is \$725/kW. In Table 4-1 on page sixteen of the Application, WPPI lists its share of Project costs for “CDS/Fabric Filter”, which represents both a circulating dry scrubber and a fabric filter, at \$69 million, and lists the PAC System at \$2.5 million. Added together and divided by WPPI’s share of BEC4’s capacity, the proposed Project costs for these technologies comes to a total of

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<sup>1</sup> The MISO report can be viewed on-line here:  
<https://www.midwestiso.org/Library/Repository/Study/MISO%20EPA%20Impact%20Analysis.pdf>

about \$611/kW, which is less than the average costs that MISO estimates. WPPI's Project costs include indirect and financing costs integrated into these technology costs, whereas MISO's estimates may or may not include these costs. The other major capital cost items proposed in the Application are "Ductwork" and "Ash Handling System", which are not directly addressed in the MISO report. Using MISO estimates as a basis of cost comparison, the majority of capital costs of the Project appear comparable to, if not less than, the average costs of similar emission control technologies.

### **Emission Control Alternatives**

MP and WPPI reviewed three alternatives to the Project for compliance with MERA and MATS emission limits. The first option was a PAC injection without a fabric filter system. It employs the injection of halogenated activated carbon along with a solution of calcium bromide in conjunction with the existing wet venturi and FGD scrubber. Although mercury removal rates with this alternative averaged 65–75 percent, with upwards of 90 percent for short periods of time, further testing showed that the average removal rate over time would be significantly less than required to meet the MATS mercury limit. In addition, the PM limit in the MATS rule would not be met, and it would create unacceptable opacity standards compliance limitations.

As a result of the testing of PAC injection with the existing AQCS, it was determined that the installation of a fabric filter system is the only viable option to meet the mercury and PM limits in MATS. The installation of a fabric filter, however, changes the operation of the existing spray tower absorber by removing the fly ash that is currently utilized for SO<sub>2</sub> capture, thereby requiring the spray tower absorber system to be either upgraded or replaced.

The second option considered was a wet FGD with installation of a fabric filter system. It includes the installation of a wet limestone forced oxidation FGD system, along with a fabric

filter and activated carbon injection system. The wet FGD option would require new ID fans and extensive ductwork to connect the new fabric filter, wet FGD, and ID fans into the existing plant and chimney. It would also require demolition and relocation of the Boswell Energy Center's administrative building and warehouse. This option would meet MATS requirements and provide Best Available Control Technology (BACT) - level reduction of SO<sub>2</sub>, PM, and mercury. This option would also aid in meeting anticipated coal combustion residuals (CCR) rules as the fly ash would be dry, however the wet FGD would still produce a wet slurry that may not fully comply with potential future CCR regulations. Studies further found that the cost of retrofitting a wet FGD system was approximately 40-50 percent higher than the cost of the semi-dry FGD, and would also have higher operating and maintenance costs. Because of its higher cost, site constraints, and inability to possibly comply with future CCR regulations due to the wet FGD slurry, this option was not chosen for BEC4.

The third option reviewed was to upgrade the existing FGD system to meet current technology removal efficiencies. New ID fans, a fabric filter, and an activated carbon injection system would be installed. This option would meet MATS requirements and provide BACT-level reduction of SO<sub>2</sub>, PM, and mercury, but it would also be the most expensive option as it would require major modifications to the existing FGD system. In addition, this option would require a number of outages to tie in the new and/or upgraded components. This option would aid in meeting future CCR rules as the fly ash would be dry, however the FGD would still produce a wet slurry. This option was dismissed as it would be more expensive and less efficient to retrofit the existing 30-year old scrubber than the proposed CDS system.

The proposed CDS system, along with a fabric filter and PAC injection system, was determined to be the best option for meeting the requirements of MERA, MATS, and other

pending and potential environmental requirements. The fabric filter would provide the needed mercury reduction, while the CDS option would have a lower capital and operating cost than either the option of installing a new wet FGD system or the option of upgrading the existing FGD system. In addition, the proposed CDS option would provide for dry handling of FGD solids, which would comply with the forthcoming CCR rule and steam electric power generating effluent guidelines.

### **Energy Priority Laws**

Wisconsin Stat. §§ 1.12 and 196.025 are known as the Energy Priority Laws. Relevant parts of these statutes provide:

**1.12(3) GOALS.** (b) *Renewable energy resources.* It is the goal of the state that, to the extent that it is cost-effective and technically feasible, all new installed capacity for electric generation in the state be based on renewable energy resources, including hydroelectric, wood, wind, solar, refuse, agricultural and biomass energy resources.

**(4) PRIORITIES.** In meeting energy demands, the policy of the state is that, to the extent cost-effective and technically feasible, options be considered based on the following priorities, in the order listed:

- (a) Energy conservation and efficiency.
- (b) Noncombustible renewable energy resources.
- (c) Combustible renewable energy resources.
- (d) Nonrenewable combustible energy resources, in the order listed:
  - 1. Natural gas.
  - 2. Oil or coal with a sulfur content of less than 1 %.
  - 3. All other carbon-based fuels.

**196.025(1) STATE ENERGY POLICY.** (ar) *Consideration of energy priorities.* Except as provided in pars. (b) to (d), to the extent cost-effective, technically feasible and environmentally sound, the commission shall implement the priorities under s. 1.12(4) in making all energy-related decisions and orders, including strategic energy assessment, rate setting and rule-making orders.

### **Energy Conservation and Efficiency Alternative**

Energy conservation and efficiency is the highest priority listed in the Energy Priority Laws, but these statutes only require an energy priority to be used if it is cost-effective, technically feasible, and environmentally sound. WPPI has indicated that without BEC4, it

would immediately be short of baseload capacity resources. WPPI has also indicated an increasing future need for capacity resources. WPPI states that it does not have enough additional energy conservation potential to replace BEC4, since removing BEC4 from WPPI's resource profile would result in an immediate need for 117 MW of baseload capacity. ([PSC REF#: 174551](#), p. 21.) Based on WPPI's projected capacity needs, Commission staff estimates that in order for energy efficiency to lower WPPI's load sufficiently so that BEC4 or an equivalent baseload resource would not be needed, WPPI would need to reduce peak demand by approximately 10 percent.<sup>2</sup> Cost-effective energy conservation and efficiency is likely not available in sufficient quantity to reduce WPPI's peak load by this amount.

### **Renewable Resource Alternatives**

The next highest priority is noncombustible renewable energy resources – wind and solar. WPPI considered purchases from wind as a potential alternative to the project. WPPI states that its current wind resources have an average annual capacity factor of about 30 percent, with the least amount of energy being produced during the peak summer season. ([PSC REF#: 174551](#), p. 23.) WPPI determined that it would need more than 300 MW of wind to replace BEC4. WPPI's analysis shows that the project is lower cost than a wind alternative under all scenarios except when CO2 costs are high. ([PSC REF#: 178516](#), Public Version, Question 2.15.) WPPI's analysis of a wind alternative was conservative, however. It assumed extension of the Production Tax Credit, did not include the cost of additional capacity due to wind capacity being credited at about 13 percent of nameplate, and did not account for the possible effects of congestion if wind resources are located remotely from WPPI load. ([PSC REF#: 178516](#).)

WPPI did not consider a solar energy alternative; however, Commission staff estimates solar

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<sup>2</sup> Based on WPPI's projected future peak demand needs in its most recent Strategic Energy Assessment filing dated September 15, 2011. ([PSC REF#: 153299](#).) WPPI recently established a new peak demand of 1048 MW on July 17, 2012. ([PSC REF#: 174551](#), p. 4 PUBLIC VERSION)

photovoltaic resources to have a capacity factor of about 18 percent and the installed cost to be around \$230/MWh, making a solar alternative significantly more expensive than the proposed project.

The next highest priority is combustible renewable energy resources. WPPI considered biogas as a potential renewable resource alternative to the project, but concluded that availability of biogas generation of sufficient size to replace BEC4 is very limited, and the projected cost is higher than BEC4 under all scenarios. ([PSC REF#: 178516](#).) It does not appear that biogas is a viable alternative to the project. WPPI did not specifically consider biomass as a potential renewable resource alternative to the project. ([PSC REF#: 178516](#).) Based on cost information regarding the Rothschild biomass cogeneration project, Commission staff estimates biomass to have an installed cost of approximately \$123/MWh, making it likely a more expensive alternative than the proposed project.

### **Non-Renewable Alternatives**

After renewable resources, the Energy Priorities Laws list nonrenewable combustible energy resources, to be used in the following order:

1. Natural gas.
2. Oil or coal with a sulfur content of less than 1 percent.
3. All other carbon-based fuels.

### **Natural Gas-fired Generation Alternatives**

Natural gas-fired generation could potentially serve as a capacity and energy resource alternative to BEC4. There are two primary generation options that use natural gas as a fuel: a combustion turbine (CT), or a combined-cycle (CC) unit. CT units are typically less expensive to install in terms of overnight capital costs, but the unit efficiency is much less than a CC unit.

As a result of the improved efficiency gained by constructing a CC unit, the expected levelized costs of energy (LCOE) for CC units are lower than CT units. The U.S. Energy Information Administration (EIA) estimates in its 2012 Annual Energy Outlook reference case scenario that CT units starting service in 2017 across the country will achieve on average an LCOE between \$91.90/MWh and \$152.40/MWh. Under the same scenario, CC units will run between \$59.50/MWh and \$81.00/MWh. This means even the most costly and least efficient CC plants (\$81.00/MWh) will generate electricity at a lower cost than the least costly and most efficient CT plants (\$91.90/MWh).

In the confidential version of the Application ([PSC REF#: 174550](#), pp. 24-29, Confidential Version), WPPI describes its modeling efforts to compare two natural gas CC options against BEC4 with Project costs. One option is for WPPI to construct and retain full ownership of a small CC unit of 126.5 MW, and a second option is for WPPI to begin partial ownership of a larger 644.4 MW CC unit. Modeling both of these options, including various market forces and regulatory regimes, BEC4 achieves a lower LCOE than these CC options in most scenarios. As a result, the Project appears to be a low risk option when compared to the costs of owning new natural-gas fired generation.

### **Market Alternatives**

As mentioned above, BEC4 serves both energy and capacity resource needs for WPPI members. A market alternative to BEC4's energy output would be annual Location Marginal Price (LMP) purchases on the Midwest Independent Transmission System Operator, Inc. (MISO) market. Establishing a market alternative to the value of BEC4's capacity value is also required in order to develop a complete market alternative. This can be done by assessing WPPI's



potential participation in a MISO voluntary capacity market, also known as a Planning Resource Auction (PRA).

Any generation facility that will serve as a Planning Resource within the MISO market will have its rated capacity adjusted for planned maintenance, forced outages, etc., and then be assigned Zonal Resource Credits (ZRCs), which represent this adjusted capacity within the MISO resource zone it is located. WPPI then can use the ZRCs assigned to a generation unit, such as BEC4, within its Fixed Resource Adequacy Plan (FRAP). WPPI must submit a FRAP to MISO if it intends to fully self-supply its Resource Adequacy Requirements.

The market alternative to submitting a FRAP is participating in a PRA and paying for ZRCs at what the market clears in units of \$/MW-year. Supply and demand for ZRCs will determine the actual price within a capacity market, but MISO sets a floor price of \$0/MW-year, which Commission staff set as the lowest price within a forecasted ZRC price range. In order to develop an upper range for forecasted ZRC prices, Commission staff analyzed the Cost of New Entrant (CONE) that is established by MISO for each planning year. CONE is based primarily on the cost of capital, financing, and insurance for a new natural gas generation unit, which for the 2011-2012 planning year was \$95,000/MW-year on average across the MISO region<sup>3</sup>. This ZRC price range was used to estimate high and low capacity auctions costs, which were then added to LMP costs to estimate a complete energy and capacity market alternative to BEC4.

Commission staff reviewed WPPI forecasts for the LCOE for BEC4, including Project costs, versus WPPI's forecasts for LMP prices over the 2016 to 2037 planning period ([PSC REF#: 177584](#), Confidential Version, Page 6). Commission staff also analyzed high ZRC auction clearing price ranges over the planning period to account for ZRCs that WPPI would

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<sup>3</sup> See MISO Business Practice Manual 011: Resource Adequacy Planning Years 2013 and Beyond, Section 6, Page 4. <https://www.midwestiso.org/Library/BusinessPracticesManuals/Pages/BusinessPracticesManuals.aspx>

have to acquire in the MISO voluntary capacity market to replace the capacity value of BEC4. The LCOE of BEC4 with the proposed Project's costs will likely be lower than the complete market alternative in most scenarios when ZRC auction costs are added to LMP costs. Both LMP and ZRC auction prices would have to clear at very low levels consistently in the long-term in order for a complete market alternative to be competitive with the Project. Considering these factors, it appears that the Project would provide more certainty and cost less over the planning period than combined energy and capacity purchases from MISO markets.

### **“No Approval” Alternative**

In order to comply with MATS, either the proposed project or some other emissions control option must be completed, by April, 2015, or BEC4 must be shut down. ([PSC REF#: 174551](#), p. 21, Public Version.) MP, as operating agent for BEC4, has concluded that the proposed project represents the lowest-cost emissions control option for meeting the required emission reductions. ([PSC REF#: 177585](#), Question 1.05, Public Version) If Minnesota Power goes ahead with the proposed project, WPPI will be obligated to contribute its share of the cost so long as WPPI remains a part owner of BEC4, whether or not the Commission approves the Project. *Id.* (See also [PSC REF#: 177583](#), Confidential Version.)

### **Conclusion on Alternatives to the Project**

Energy conservation and efficiency are not available at this time in a quantity sufficient enough to replace BEC4 as a capacity resource. Further, renewable resources will be more costly across technologies than BEC4 in most scenarios. Among natural gas-fired generation options, a large CC unit would be most competitive with BEC4, but likely subject to more fuel cost uncertainty and is more costly in most modeled scenarios. Finally, while it would be possible for WPPI to replace both the energy and capacity value of BEC4 with market purchases

in MISO, only a scenario with continued low market prices would achieve competitiveness with BEC4 in the long run. Considering the ownership stake that WPPI has in BEC4, the continued BEC4 ownership with Project implementation offers a low-risk option when compared to the alternatives that were analyzed.

### **Project Cost Breakdown and Schedule**

As a minority owner of BEC4, WPPI is responsible for its pro-rata 20 percent share of the Project costs. WPPI's estimated share of the Project cost is \$95,940,000, as follows:

<u>Description</u>	<u>Estimated Cost</u>
CDS/Fabric Filter and PAC	\$9,720,000
Fly Ash Handling and Silo	1,505,000
Flue Gas Ductwork	1,299,000
Structural Steel	883,000
Electrical and Control Equipment	3,825,000
Civil Construction	6,972,000
Mechanical Construction	23,233,000
Electrical Construction	6,344,000
Misc. Subcontracts	364,000
Engineering, Construction Mngt, Indirect Costs	19,500,000
Owner Cost and Contingency	9,384,000
Ash Handling	1,160,000
WPPI Financing and Interest	<u>11,751,000</u>
<b>Total Cost</b>	<b>\$95,940,000</b>

Existing air emission control equipment, at a net book value of \$4,275,069, is expected to be retired as a result of this project.

WPPI intends to finance the Project through a combination of short-term and long-term fixed-rate tax-exempt bonds.

The proposed construction of the Project is anticipated to start in April 2013 with completion by December 2015.

### **Environmental Impacts of Proposed Action**

The proposed project is a Type III action under Wis. Admin. Code 410(3). Type III actions are proposed actions involving requests for Commission approval that normally do not have the potential to significantly affect the quality of the human environment. Commission staff has determined that neither the preparation of an environmental impact statement nor an environmental assessment are required under Wis. Stat. § 1.11. As an emissions control project designed to bring BEC4 into compliance with regulations that are intended to improve the quality of the human environment, the proposed project is expected to have a positive environmental effect. It also seems likely that whether or not WPPI contributes to the proposed project, the majority owner of BEC4 will likely undertake the project if it receives all of its requisite approvals.

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Attachments provided to Commission separately:

[PSC REF#: 174450](#) Application of WPPI Energy for a Certificate of Authority to Upgrade the Air Quality Control System on Unit 4 at the Boswell Energy Center in Cohasset, Minnesota, Confidential Version; [PSC REF#: 174451](#) Public Version

[PSC REF#: 177611](#) Notice of Investigation

[PSC REF#: 177584](#) WPPI data request response #1, Confidential Version; [PSC REF#: 177585](#) Public Version

[PSC REF#: 178511](#) WPPI revised data request response #1, Confidential Version; [PSC REF#: 178512](#) Public Version

[PSC REF#: 178587](#) WPPI data request response #2, Confidential Version; [PSC REF#: 177588](#) Public Version

[PSC REF#: 178515](#) WPPI revised data request response #2, Confidential Version; [PSC REF#: 178516](#) Public Version