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MISSOURI PUBLIC SERVICE COMMISSION

CASE NO. EA-2014-0207

SURREBUTTAL TESTIMONY OF

**DAVID BERRY
EXECUTIVE VICE PRESIDENT – STRATEGY AND FINANCE**

ON BEHALF OF

GRAIN BELT EXPRESS CLEAN LINE LLC

October 14, 2014

GBE Exhibit No. 120
Date 11-14-14 Reporter KF
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1 **I. INTRODUCTION**

2 **Q. Please state your name and business address.**

3 A. My name is David Berry. My business address is 1001 McKinney Street, Suite 700,
4 Houston, Texas 77002.

5 **Q. By whom are you employed and in what capacity?**

6 A. I am employed by Clean Line Energy Partners LLC ("Clean Line") as Executive Vice
7 President – Strategy and Finance. Clean Line is the ultimate parent company of Grain
8 Belt Express Clean Line LLC ("Grain Belt Express" or "Company"), the Applicant in
9 this proceeding.

10 **Q. Have you previously submitted prepared testimony and exhibits in this proceeding?**

11 A. Yes, I have previously submitted (1) direct testimony, dated March, 26, 2014, along with
12 accompanying schedules DAB-1 through DAB-7 and (2) additional direct testimony
13 dated June 27, 2014, both in support of the Company's Application for a Certificate of
14 Convenience and Necessity ("CCN") to construct, own and operate the Grain Belt
15 Express Project ("Project"), as defined on page 3 of the Application.

16 **Q. What is the purpose of this surrebuttal testimony?**

17 A. I am responding to issues raised in the rebuttal testimonies of other parties in this
18 proceeding, including witnesses representing Commission Staff, the Missouri
19 Landowners Alliance ("MLA"), the Eastern Missouri Landowners Alliance, d/b/a Show
20 Me Concerned Landowners ("Show Me"). I also address certain comments made at the
21 local public hearings on the Project's CCN and through the Commission's Electronic
22 Filing and Information System ("EFIS").

23 **Q. Please summarize your testimony's organization and conclusions.**

24 A. Section II of my testimony addresses the need for the Project and the benefits the Project

1 creates for the State of Missouri. This section elaborates on the relationship of the
2 Project with the Southwest Power Pool (“SPP”), Midcontinent Independent System
3 Operator (“MISO”), and PJM Interconnection LLC (“PJM”) regional transmission
4 organizations (“RTOs”). These RTOs will ensure the reliability of the Project through
5 the interconnection process, but will not decide whether it is needed. This Commission
6 must decide on the need for the Project as it considers the Company’s Application for a
7 CCN.

8 In addition, Section II summarizes additional studies prepared by Grain Belt
9 Express in response to the request by Commission Staff witness Sarah Kliethermes. In
10 the surrebuttal testimonies of Robert Cleveland and Robert Zavadil, Grain Belt Express
11 provides the studies requested by Ms. Kliethermes. Mr. Cleveland’s studies show that
12 the Project will decrease Missouri wholesale power prices and the cost to serve retail
13 customers. This finding remains true even when accounting for lower revenues to utility-
14 owned generation assets for power sales to the MISO and SPP markets. Mr. Zavadil’s
15 studies indicate that the Project will not introduce a meaningful amount of new system
16 variability, and therefore will not have a substantial impact on ancillary service rates.

17 Section III responds to the rebuttal testimony of Show Me witness Dr. Michael
18 Proctor and Commission Staff witness Michael Stahlman regarding the economic
19 feasibility of the Project. First, I update the levelized cost of energy (“LCOE”) model
20 presented in my direct testimony to include the results of the Project’s recently received
21 PJM System Impact Study. This update responds to, and resolves, concerns expressed by
22 Mr. Stahlman that network upgrades might make the Project economically unfeasible. I
23 then show that when Dr. Proctor’s analysis of the Project is corrected, it actually supports

1 the Grain Belt Express Application. Dr. Proctor's criticisms of my model do not hold up
2 under scrutiny. Many are incorrect, while others improperly portray a minor difference
3 in a calculation method as a "mistake."

4 In Section IV, I summarize Grain Belt Express' position with respect to the
5 conditions proposed by Commission Staff.

6 Section V concludes by addressing other issues raised by intervenor rebuttal
7 testimony.

8 **II. PROJECT NEED AND BENEFITS**

9 a. RTOs will assure Project reliability, but the Commission must determine the need

10 **Q. At page 4 of her rebuttal testimony, Staff witness Sarah Kliethermes states that**
11 **Grain Belt Express should commit not to seek cost allocation from an RTO. Will**
12 **Grain Belt Express agree to such a condition?**

13 **A. Yes. In my Additional Direct Testimony, I stated the Company's willingness to agree to**
14 **a condition in its CCN that addresses Staff's concern. The proposed text of this condition**
15 **is given below. The words in bold have been added at the suggestion of Commission**
16 **Staff.**

17 Grain Belt Express will not recover any Project cost from Missouri retail
18 ratepayers through MISO or SPP regional cost allocation without first obtaining
19 an approval from the Missouri Public Service Commission in a new proceeding
20 initiated by Grain Belt Express. As used in the prior sentence, the Project refers
21 to the approximately 750 mile HVDC transmission line to be built by the
22 applicant, including the HVDC converter stations **and the AC feeder lines**
23 **connecting the HVDC Project to wind generation facilities.** (Berry Additional
24 Direct Testimony at p. 2)

25 The condition resolves Staff's concern that the Project could deviate from its shipper-
26 pays or "merchant" business model. Under this condition, Grain Belt Express would file
27 a new application if it wished to seek regional cost allocation that would affect Missouri

1 ratepayers. Absent this new proceeding and Commission approval, Grain Belt Express
2 cannot recover costs from Missouri ratepayers through regional cost allocation, and can
3 only construct and operate the Project under a shipper-pays business model.

4 To be clear, Grain Belt Express is not seeking – and has no plans to seek –
5 regional cost allocation. SPP, MISO and PJM do not currently have a process in place
6 that would allow for the cost-allocation of an interregional project across their three
7 footprints. The condition recommended by Staff, which Grain Belt Express accepts,
8 deals with a hypothetical circumstance based on future policy changes.

9 **Q. In light of the foregoing condition, will Grain Belt Express obtain from an RTO a**
10 **finding of need, a cost-benefit analysis or similar report?**

11 A. No. SPP, MISO and PJM do not have a process to determine the need for or to analyze
12 the benefits of an inter-regional merchant transmission line. PJM, MISO and SPP have
13 each confirmed to the Company that they do not evaluate the need for merchant projects.¹

14 The RTO planning process identifies projects to be paid for according to the cost
15 allocation methods set forth in the tariffs and business practices of the RTO. RTOs do
16 not identify or evaluate proposals to build transmission lines to be paid for by other
17 means, such as the Grain Belt Express Project, which will be paid for by its specific
18 users. The “cost-benefit” methods used by the RTOs compare the expected benefits of a
19 transmission project to its expected costs in the form of increased transmission rates.
20 Such analysis is not necessary for the Grain Belt Express Project since there are no
21 transmission rate increases that need to be compared with potential benefits.

¹ Dr. Gray also agrees that no such process has been used or exists. MLA Responses 1-3 to Grain Belt Express’ Second Set of Data Requests.

1 **Q. Will the RTOs be able to assure that the Project is reliable even if Grain Belt**
2 **Express is not studied for “need” through an RTO process?**

3 A. Yes. As described in the direct and surrebuttal Testimony of Dr. Wayne Galli, the
4 Company is engaged in extensive interaction with SPP, MISO and PJM through their
5 interconnection processes, which assure the reliable interconnection of the Project to the
6 electric grid. The RTOs assure the reliable interconnection of projects like the Grain Belt
7 Express Project under the oversight of FERC and the North American Electric Reliability
8 Corporation (NERC).

9 **Q. In her rebuttal testimony at p. 36, Staff witness Sarah Kliethermes compares the**
10 **Grain Belt Express Application with other cost-allocated transmission lines that**
11 **have sought a CCN from the Commission, stating that these other projects based**
12 **their demonstration of need on the RTO process. Why is this comparison not**
13 **relevant here?**

14 A. Whereas the Grain Belt Express Project has not – and will not – seek cost allocation, all
15 of the examples Ms. Kliethermes cites are regionally cost-allocated transmission lines.
16 The Lutesville-Heritage line was included by MISO in its transmission plan to solve a
17 particular reliability issue. The Iatan-Nashua and Sibley-Nebraska City lines were
18 included in SPP’s Balanced Portfolio and Priority Projects, respectively.

19 **Q. Has Grain Belt Express presented the Commission with analysis that is similar to**
20 **MISO and SPP’s analyses of the projects that Ms. Kliethermes discusses?**

21 A. Yes. The Direct Testimony of Company witness Gary Moland and the Surrebuttal
22 Testimony of Company witness Robert Cleveland (who adopts Mr. Moland’s testimony)
23 present the Commission with production cost modeling, including demand cost and

1 adjusted production cost metrics. These analyses are very similar to the analyses
2 contained in the cost/benefit studies of SPP's Priority Projects and MISO's Multi-Value
3 Portfolio ("MVP") projects. The levelized cost of energy model discussed in my direct
4 Testimony and in this surrebuttal testimony quantifies the benefits of accessing higher
5 capacity factor and lower cost wind resources than would be possible without
6 transmission expansion. Both the MVP Projects and the Priority Projects included
7 similar benefits in their cost-benefit analysis.

8 Finally, the jobs analysis presented by the direct and surrebuttal Testimony of
9 Company witness Dr. David Loomis is similar to the economic impact analysis
10 conducted for the SPP Priority Projects. A detailed comparison of the Grain Belt Express
11 benefit studies in this proceeding with those of the MVP Projects and the SPP Balanced
12 Portfolio and Priority Projects, appears in Schedule DAB-8.1. This schedule shows that
13 the benefits offered by the Project are similar to the SPP Priority Projects and MVP
14 Projects, and that Grain Belt Express has estimated the Project's benefits with techniques
15 similar to those used by the RTOs. And, the Project's benefits will occur without
16 increases in regional transmission rates.

17 b. The Project will lower retail electric rates in Missouri

18 **Q. Staff witness Sarah Kliethermes discusses the impacts of the Grain Belt Express**
19 **Project on Missouri electric rates in her rebuttal testimony at pages 6-7. Please**
20 **summarize how the Project will affect electric rates.**

21 A. By assuring an abundant supply of affordable clean energy, the Project will keep
22 generation rates low even as the Missouri's renewable energy standard ("RES"),
23 increasing federal environmental regulation, and coal plant retirements drive changes in
24 the generation fleet. Section III of this testimony addresses in detail why the Project is a

1 very cost-competitive option to meet Missouri's energy needs. The Project also has a
2 secondary effect on the cost of generation through its reduction of wholesale power
3 prices. The Project will not have a direct effect on transmission rates because its costs
4 will not be recovered from ratepayers through regional cost allocation, but it may
5 eliminate the need for future cost-allocated projects that would enable low-cost wind
6 resources, thereby reducing transmission rates. Finally, the Project's variable energy
7 injection should have a negligible impact on the cost of ancillary services due to the very
8 small amount of additional system variability it causes.

9 **Q. What is the direct effect of the Project on the cost to procure generation in**
10 **Missouri?**

11 A. As described in Section II(B) of my direct testimony and Section III(b) of this surrebuttal
12 testimony, the energy delivered by the Project to Missouri is lowest cost of all alternative
13 generation sources. Therefore, purchasing low-cost wind energy delivered by the Project
14 can reduce the generation component of electric rates. The Project will deliver 2.2 – 2.6
15 million MWh per year to Missouri. If, for example, its delivered energy is \$5 per MWh
16 cheaper than the alternatives, which is more than plausible in light of the LCOE analysis
17 presented in Section III(b) below, the resulting annual savings for consumers are \$11-13
18 million.

19 In addition to offering a lower cost generation alternative, the Project will lower
20 wholesale market electric prices in Missouri, as shown in Mr. Moland's direct testimony
21 and Mr. Cleveland's surrebuttal testimony.

22 **Q. How will this decrease in wholesale power prices affect the electric rates of retail**
23 **customers?**

1 A. Generally speaking, lower wholesale power prices will reduce rates.² In their rebuttal
2 testimonies, Ms. Kliethermes (pp. 6-7) and Show Me witness Michael Proctor (p. 39)
3 suggest that Grain Belt Express should perform an analysis of the impact of lower
4 wholesale prices on the revenues received from the generation plants owned by Missouri
5 utilities. Robert Cleveland performs this analysis in his surrebuttal testimony, measuring
6 the change in “Adjusted Production Cost” that results from the Project. Adjusted
7 Production Cost is a widely used metric that measures the rate impact of wholesale power
8 market effects, taking into account the revenue received by utility generation plants. Mr.
9 Cleveland’s analysis concludes that the decrease in revenue to utility generation plants is
10 substantially less than the savings that are gained from the Project’s lower cost to serve
11 load. This responds to and resolves the concerns raised by Ms. Kliethermes and Dr.
12 Proctor. Even accounting for the reduced generation revenues of Missouri utilities, a
13 substantial benefit accrues to Missouri ratepayers.

14 **Q. In her rebuttal testimony, Ms. Kliethermes performed a rough calculation of**
15 **Adjusted Production Cost for Ameren Missouri, stating at page 9: “I would expect**
16 **Ameren Missouri’s net cost of energy to be higher with the Project than without the**
17 **Project.” What is your response?**

18 A. Ms. Kliethermes admits at page 9 on line 12 that her rough calculation is a “crude
19 analysis” based on the Company’s response to a Staff data request, and is not a complete
20 analysis performed by Staff. Her analysis is insufficient to determine the Adjusted
21 Production Cost impacts of the Project. Ms. Kliethermes recommends that the Company

² This point is discussed in more detail in my direct testimony on p. 33.

1 provide additional model results on this topic, which it has done in Mr. Cleveland's
2 surrebuttal testimony.

3 Ms. Kliethermes' crude analysis is problematic on several accounts. She assumes
4 at page 8 of her rebuttal that "most of the generation that will be displaced in the MISO
5 Day Ahead market by the Missouri wind injection would be generated by Ameren
6 Missouri." In fact, the modeling results presented in her rebuttal testimony in the table
7 on page 22 show that Ameren Missouri's generation is only a small fraction of the energy
8 displaced by the Project's Missouri injection. Because MISO dispatches generation on a
9 system-wide basis, plants across the entire MISO footprint, not just where the Project
10 injects power, are re-dispatched in response to the Project's injection of low-cost power.
11 Because Ms. Kliethermes' assumption about how much Ameren Missouri generation
12 would be re-dispatched is incorrect, her estimate of the decrease in Ameren Missouri's
13 off- system sales is not valid.

14 Additionally, Ms. Kliethermes assumes at page 8, lines 9-10, of her rebuttal
15 testimony that only one-third of the Missouri demand cost savings provided by the
16 Project will accrue to Ameren Missouri customers. This is not based on any actual
17 calculation of how much of the demand cost savings are enjoyed by Ameren customer.

18 Finally, Ms. Kliethermes does not estimate the fuel cost savings to Ameren
19 Missouri. In contrast, the PROMOD results presented by Mr. Cleveland in his surrebuttal
20 testimony include a detailed calculation of fuel cost savings based on the reduced
21 dispatch of plants and plant-specific heat rates. Because she only counts reduced revenue
22 but not fuel cost savings, Ms. Kliethermes does not arrive at an accurate estimate of the
23 rate impact of the lower wholesale market prices caused by the Project.

1 **Q. In her rebuttal testimony at pages 6 and 24, Ms. Kliethermes suggests that Grain**
2 **Belt Express is injecting power into an already constrained area of the Missouri**
3 **grid, and may worsen that congestion. What is your response?**

4 A. Ms. Kliethermes does not define the areas she refers to as “congested” or explain how she
5 reaches this conclusion. There is no evidence that the Palmyra tap, where the Project will
6 inject 500 MW of energy, is a substantially congested area. An historical analysis of
7 MISO LMPs near the point of injection does not show substantial congestion compared
8 to the Ameren Missouri load hub.³ Further, in Grain Belt Express’ production cost
9 modeling, congestion at the Palmyra Tap injection point is not substantial. The average
10 congestion component of LMP in the business-as-usual case is \$0.06 per MWh without
11 the Project, and \$0.21 per MWh once the Project is added. As described in the Direct
12 Testimony of Wayne Galli, in MISO’s feasibility study, no thermal constraints were
13 identified, meaning the Project’s power was deliverable to MISO load without any
14 uneconomic redispatch of units or congestion. See A.W. Galli Direct Testimony at p. 14
15 and Schedule AWG-6.

16 **Q. Ms. Kliethermes states at page 17, lines 4-7, of her rebuttal testimony that “Grain**
17 **Belt Express’ results demonstrate that the Missouri converter station does have an**
18 **impact on increasing the energy component of the LMPs experienced throughout**
19 **the MISO, by increasing the level of congestion in Missouri.” Is her statement**
20 **correct?**

³ LMP data can be downloaded from the MISO web site. From January 1, 2013 through June 30, 2014, the average LMP at the Audrain generation station was \$29.63, compared to \$30.17 at the Ameren Missouri load hub – a difference of less than \$0.50 per MWh.

1 A. No, it is not. The Project does not increase the energy component of LMPs. Staff filed a
2 correction to the table on page 16 of her rebuttal testimony on September 26, 2014. The
3 corrected table shows that the energy component of LMP at the Palmyra substation
4 decreases with the addition of the Project.

5 **Q. In interpreting Grain Belt Express' production cost modeling, Ms. Kliethermes**
6 **claims on page 17, lines 22-23, of her rebuttal testimony that the Project "causes \$11**
7 **million of uneconomic dispatch." Is this correct?**

8 A. No. Ms. Kliethermes misunderstands the reporting of load congestion costs in Mr.
9 Moland's PROMOD runs in his direct testimony. In the business-as-usual scenario, total
10 annual congestion costs to Missouri load are positive \$3,789,851. This means that the
11 cost to serve Missouri demand through the market is \$3,789,851 higher due to
12 transmission congestion that exists between Missouri load and the applicable market
13 reference buses.⁴

14 The addition of the Project causes congestion costs for Missouri load to *decline* to
15 negative \$8,065,458. A negative congestion cost indicates that it is *less* expensive to
16 supply the marginal unit of power to Missouri load than to supply power to the applicable
17 reference buses.

18 Ms. Kliethermes should have interpreted the difference between positive
19 \$3,789,851 and negative \$8,065,458 as a decrease in congestion costs to load. Instead
20 she attempts to conclude something about overall system congestion based on the
21 changes in Missouri load congestion costs.

⁴ The reference bus is an RTO-wide load-weighted bus—i.e., the average price to supply load in a given hour in the entire RTO.

1 The changes in congestion charges reveal that with the Project it is cheaper to
2 supply energy to load compared to the applicable reference buses. Without the Project, it
3 is more expensive to supply energy to load as compared to the applicable reference buses.

4 Ms. Kliethermes incorrectly attempts to interpret the absolute value of Missouri
5 load congestion costs as a measure of overall system congestion. She actually
6 miscalculates this figure. The change in magnitude of congestion charges to Missouri
7 load, without regard to whether they are positive or negative, is \$4,275,607 (that is,
8 \$8,065,458 less \$3,789,851), and not \$11 million.⁵

9 In any event, the magnitude of congestion charge to load is not actually a measure
10 of uneconomic dispatch. The total value of uneconomic dispatch cannot be calculated by
11 looking solely at the magnitude of congestion costs to load. Rather, uneconomic dispatch
12 must be measured by the increase in variable production costs (fuel, emissions, and
13 operations) due to transmission congestion. In his surrebuttal testimony, Mr. Cleveland
14 shows that the variable production costs in the Eastern Interconnection actually *decrease*
15 with the addition of the Project. In other words, the generation fleet's operation are more
16 economic, on a unit basis, with the Project than without it.

17 **Q. Does the decrease in congestion charges to load mean that the Project is creating**
18 **congestion in northeast Missouri, as suggested by Ms. Kliethermes on page 11 of her**
19 **rebuttal?**

⁵ On page 17, lines 19-20 of her rebuttal, Ms. Kliethermes appears to misapprehend the congestion components discussed there as "experienced at the Palmyra node." They are actually measured at the Missouri load hub.

1 A. No. As discussed above, congestion charges to load are not a measure of overall system
2 congestion. Further, load LMPs measure congestion at the point where Missouri electric
3 load occurs – not where the Project injects power in northeast Missouri.

4 **Q. Do you agree with Ms. Kliethermes’ statement at page 14, lines 14-15, of her**
5 **rebuttal that the energy LMP tends to be quite low in the hours when the wind is**
6 **blowing?**

7 A. No. In the business as usual scenario of Mr. Moland’s PROMOD model, the average
8 LMP received by the wind generation delivered to Missouri in our model simulation is
9 only 2% lower than the 24x7 “around the clock” price at Palmyra. In other words, the
10 energy delivered by the Project is comparable in value to a flat block of energy.

11 **Q. Addressing Ms. Kliethermes’ concerns at page 11-15, how will the Project affect**
12 **real-time electric prices or the cost of ancillary services?**

13 A. Ms. Kliethermes states that the variability of the wind generation delivered by the Project
14 could cause increases in real-time electric prices or ancillary service costs. However, as
15 shown by the surrebuttal testimony of Robert Zavadil, the additional variability added to
16 the Ameren and Missouri system is very small compared to the variability that the
17 electric grid already manages. Therefore, the impacts on real-time electric prices and
18 ancillary services – which respond to system variability—will also be small.

19 **Q. At page 11 of her rebuttal testimony, Ms. Kliethermes expresses the concern that**
20 **the Company’s analysis of rate impacts “conflates” the impact of the Missouri**
21 **converter station and the Indiana converter station. Is her concern valid?**

22 A. No. Both the Missouri and Indiana converter stations are integral aspects of the Project
23 and its business case. The Project is being engineered, marketed, studied and financed

1 for a 500 MW injection level in Missouri and a 3,500 MW injection level in Indiana.
2 There is no reasonable scenario where the Project would only deliver 500 MW to
3 Missouri and not also deliver 3,500 MW to Indiana. As will be discussed later in my
4 testimony, Grain Belt Express is willing to condition its CCN on installing the Missouri
5 converter station.

6 **Q. At page 19 of her rebuttal, Ms. Kliethermes expresses concern that the Project could**
7 **cause MISO to order new cost-allocated transmission lines to be built, potentially**
8 **affecting transmission rates. What is your response?**

9 A. Ms. Kliethermes expresses the concern that the Project will increase congestion in MISO.
10 However, she bases her view on a mistaken interpretation of load congestion costs. A
11 wealth of evidence – MISO’s Feasibility Study for the Project, historical LMP analysis,
12 and Mr. Moland’s PROMOD analysis – all point to the fact that the Project will not
13 create a large amount of congestion, and therefore Ms. Kliethermes’ concern is
14 misplaced.

15 As Ms. Kliethermes notes, the Project will not directly increase transmission rates
16 because none of its costs will be recovered through regional cost allocation. The Project
17 will enable over 4,000 MW of new wind generation to reach high value markets without
18 any cost allocation to load.

19 On the other hand, if the Project does not proceed, it is likely that more cost-
20 allocated transmission lines will be needed to connect the cheapest renewable resources
21 to load. Therefore, approving the Project actually has the potential to decrease regional
22 transmission rates.

23 c. Missouri has a demand for low-cost clean energy

24 **Q. Some witnesses made statements at the local public hearings to the effect that**

1 **Missouri does not need the power delivered by the project or that the project has no**
2 **clear direct benefit to Missouri. Staff witness Natelle Dietrich summarizes similar**
3 **comments that have been submitted through the EFIS system on pages 4-7 of her**
4 **rebuttal testimony. What is your response to these concerns?**

5 A. By allowing Missouri utilities to buy the lowest-cost clean energy, the Project provides a
6 clear and direct benefit to the State. As discussed on page 35 of my direct testimony,
7 Missouri relies on coal for close to 80% of its electric mix. To comply with federal
8 environmental regulations – including the newly proposed Clean Air Act 111(d)
9 restrictions on carbon emissions, which as proposed would require Missouri to cut its
10 carbon emissions rate by about 23% in the electric sector – Missouri will look to cleaner
11 energy sources. And, even in the absence of regulation, low-cost, affordable energy
12 provides clear public benefit and is an important element of a sound economy.

13 As explained in my direct testimony at page 12, and as shown in Schedule DAB-
14 1, Missouri utilities will need 5-6 million additional MWh of renewable energy to comply
15 with their statutory renewable energy targets. Ameren Missouri's recent integrated
16 resource plan (IRP) called for the purchase of 400 MW of new wind power. The IRP
17 states that "wind energy resources exhibit the lowest cost on an LCOE basis among all
18 candidate resource options."⁶ In addition to the investor owned utilities, other Missouri
19 load serving entities also have a strong demand for clean energy, even though it is not
20 required by state law. On October 6, 2014, the City Council of Columbia, Missouri,
21 adopted a resolution expressing the Council's support for the Grain Belt Express Project

⁶ Ameren Missouri 2014 IRP. Chapter 6, p. 1. Available at <https://www.ameren.com/-/media/Missouri-Site/Files/environment/renewables/irp/irp-chapter6.pdf?la=en> (last accessed on October 12, 2014).

1 as an economically feasible renewable energy option to serve the City's customers and
2 help the City fulfill its Renewable Energy Ordinance of 15% renewable energy usage by
3 2017. Columbia Water & Light, the municipal utility of Columbia, Missouri,
4 recommended that the City Council approve the resolution. This resolution, attached as
5 Schedule DAB-8, states in part that "greater access to low-cost renewable energy such as
6 that anticipated to be delivered by the Project serves the public interest."

7 d. The Project produces several other economic and environmental benefits

8 **Q. MLA witness Mr. Louis Donald Lowenstein asserts in his rebuttal at page 27 that it**
9 **is "impossible" to estimate property taxes to be paid by the line. Is this true?**

10 **A.** No. All taxpayers deal with the uncertainties of future property valuations which are
11 subject to the judgment of taxing authorities. However, the valuations are governed by
12 clear legal standards and procedures that are known to the public. Individuals who are
13 knowledgeable about Missouri property taxes can come to a reasonable estimate of how
14 much Grain Belt Express will pay. Attached as Schedule DAB-9 is a letter to the editor
15 by Randolph County Assessor Richard Tregnago containing his estimates of property
16 taxes the line will pay, as well as the letter he presented to the Commission when he
17 testified at the local public hearing conducted in Moberly on August 14, 2014 (marked as
18 Ex. 20). Mr. Tregnago stated in Ex. 20: "If projections are as stated, then Randolph
19 County may have \$31,500,000 of new construction to be assessed locally the first year,
20 then, the project may become State Assessed after that. Annual property tax estimates
21 may exceed \$500,000 annually to various districts within [Randolph C]ounty depending
22 on their individual levies." *See also* Transcript, Vol. 5, Local Public Hearing (Aug. 14,
23 2014) at 25-32.

1 **Q. How do you respond to Mr. Lowenstein’s rebuttal testimony at pages 23-26 that**
2 **some property taxing districts will not receive any revenue from the line?**

3 A. The Company will not pay taxes to a district where it has no taxable property. However,
4 Grain Belt Express will pay property taxes to all districts through which the line passes, a
5 fact which Mr. Lowenstein does not dispute.⁷

6 **Q. How would you respond to Mr. Lowenstein’s statement at pages 27-28 of his**
7 **rebuttal that it is “misleading” for Grain Belt Express to provide property tax**
8 **estimates based on the cost method of valuation and for only the first year of**
9 **operations?**

10 A. Mr. Lowenstein appears to be referring to a Company response to an MLA data request
11 that asked for an estimate of property taxes. In preparing this response, the Company
12 used the cost method approach to valuation because it is more objective and less subject
13 to interpretation than an income or market valuation method. Generally, I would expect
14 the cost method to result in a figure that is equal to or lower than that produced by a
15 market value or income methods. In addition, the Company estimated taxes for the first
16 year of operations because this is the year in which we have the most certainty about
17 taxes owed.

18 **Q. What is the chance that the Project could suffer an impairment in the future due to**
19 **changes in law or the disappearance of tax credits, as Mr. Lowenstein claims at page**
20 **10 of his rebuttal?**

21 A. This is very unlikely. The Company’s business model, as described in my Direct
22 Testimony at pages 8-9, is to enter into long-term contracts with creditworthy entities.

⁷ MLA Response 7 to Second Set of Grain Belt Express Data Requests

1 These contracts will not have fuel price risk, volume risk or market price risk. While one
2 can imagine a change in law that might impair the Company's assets, the United States
3 provides a stable legal environment in which to do business. The financial markets
4 recognize contracted U.S. infrastructure assets like the Grain Belt Express Project as
5 among the lowest risk assets and therefore some of the least likely to be impaired.

6 **Q. At page 29 of his rebuttal testimony, Mr. Lowenstein cites the *Rural Missouri***
7 **newsletter to support his claim that renewable energy is "expensive" and**
8 **"unreliable." What is your response?**

9 A. The article takes no position against new infrastructure like the Project to enable low-cost
10 renewable energy. On the contrary, the article touts the fact that Associated Electric
11 Cooperative Inc. ("AECI"), which published the newsletter, already relies on power from
12 renewable energy and purchases the output of six wind farms to supply 16% of its
13 electricity.

14 Further, the article does not say renewables are "unreliable." AECI's experience
15 shows that renewable energy can be reliably integrated. As to the expense of renewables,
16 as shown in the LCOE model in my direct testimony at pages 13-22 and in Section III
17 below, this depends on the location of the renewable resource and the technology used.

18 Wind energy from western Kansas is very cost effective.

19 **III. ECONOMIC FEASIBILITY**

20 a. An updated LCOE model proves the Project's economic feasibility

21 **Q. Have you reviewed the rebuttal testimony of Dr. Michael Proctor?**

22 A. Yes, I have reviewed his testimony in detail, along with the supporting workpapers and
23 calculations Dr. Proctor provided. His testimony presents a levelized cost of energy
24 ("LCOE") analysis at pages 4-27 similar to the one in my direct testimony.

1 **Q. Based on your review of Dr. Proctor’s testimony, do you still believe the LCOE**
2 **results presented in your original testimony are valid?**

3 A. Yes. Dr. Proctor did point out one minor correction to the natural gas price forecast used
4 in my model, which I have updated. The result is that the fuel cost of the “combined
5 cycle gas” alternative is about 2% lower than in my original testimony. However, none
6 of Dr. Proctor’s other criticisms hold up under scrutiny, as I explain below, and the result
7 of the LCOE analysis in my direct testimony remains true—the Grain Belt Express
8 Project is economically feasible because it is lower cost than other alternatives, including
9 both renewable energy and fossil fuel generation.

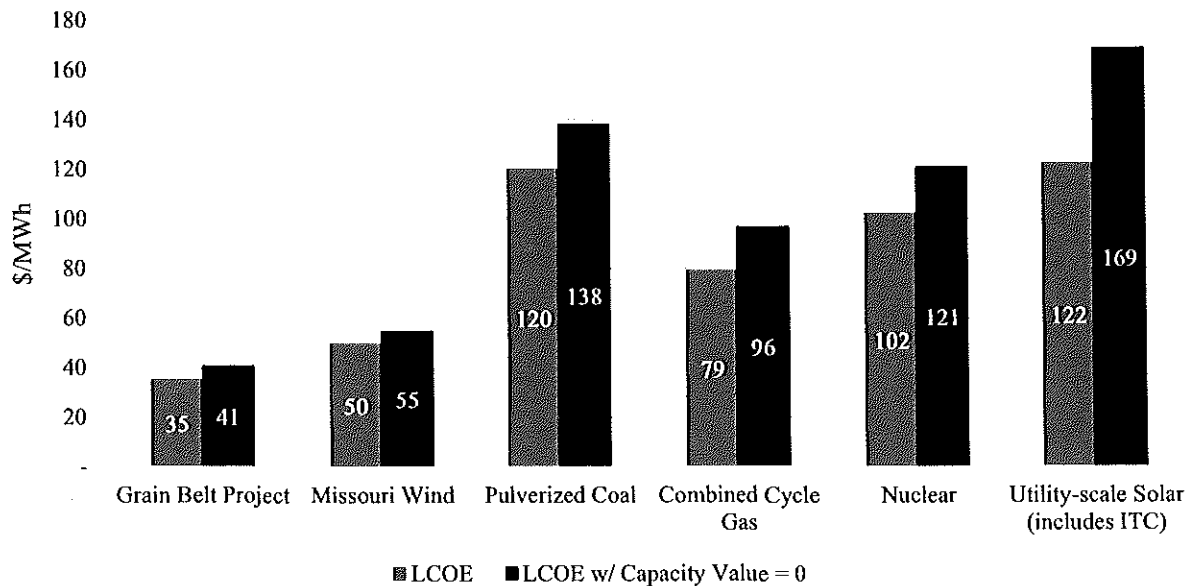
10 **Q. Have you made any other changes to the LCOE model presented in your direct**
11 **testimony?**

12 A. Yes, in response to the rebuttal testimony of Mr. Stahlman at page 7, I have updated the
13 capital cost of the Project to include the results of the PJM System Impact Study that the
14 Company received on October 1, 2014. Dr. Galli’s surrebuttal testimony discusses the
15 PJM System Impact Study in more detail.

16 **Q. Did the two changes described above alter the results described in your direct**
17 **testimony?**

18 A. Not substantially. After applying the changes discussed above, I reran the LCOE model.
19 The LCOE of the Grain Belt Project increased by about 3%, and the “combined cycle
20 gas” alternative decreased by about 2%. The Grain Belt Project’s delivered energy
21 remains the lowest cost option in the base case results.

Levelized Cost Of Energy



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In addition, the Project remains a cost-competitive resource across a wide range of future scenarios. Using the updated LCOE model, I ran sensitivities around the presence of the federal production tax credit for wind energy; higher and lower natural gas prices; the future cost of carbon dioxide emissions (if any); the capacity factor of Kansas wind; and the capacity factor of Missouri wind. I varied these inputs using the ranges listed in Schedule DAB-10. The various combinations of inputs led to 162 different scenarios considered in the LCOE analysis. I found that the Grain Belt Express Project's delivered energy is cheaper than combined cycle gas generation in 89% of all scenarios and also cheaper than Missouri wind generation in 89% of scenarios. Additional detail on these results is presented in Schedule DAB-10.

12

Q. On pages 7 to 11 of his rebuttal testimony, Staff witness Mr. Stahlman describes several alleged concerns about the economic feasibility of the Project. Do the results of your LCOE model, described above, resolve these concerns?

13

14

15

A. Yes. Mr. Stahlman's first concern is that the Project will need to pay for interconnection

1 upgrades with SPP, MISO and PJM. All three RTOs have now provided Grain Belt
2 Express with studies describing and estimating the cost of the required interconnection
3 upgrades. In the case of SPP and MISO, no upgrades beyond those at the location of the
4 interconnection are needed. In the case of PJM a new 765 kV line is required, the cost of
5 which is approximately \$500 million. I have incorporated this additional cost into my
6 LCOE model, which shows that the Grain Belt Express is economically feasible with the
7 cost of interconnection upgrades included.

8 Mr. Stahlman's second concern is that Grain Belt Express has not yet fully
9 developed its operational arrangement for the Project. However, Grain Belt Express has
10 obtained estimates for Project maintenance costs from third party vendors and discussed
11 its operational cost assumptions with its major shareholder, National Grid USA. My
12 LCOE model reflects all of these estimates and discussions and shows the Project to be
13 economically feasible. In addition, the annual, operational costs of an HVDC line are
14 usually one percent or less of the overall capital costs and therefore represent a small
15 portion of its total lifecycle costs.

16 Mr. Stahlman's third concern is that Grain Belt Express has not obtained the
17 rights to inject power into SPP. Injecting energy into SPP is not part of Grain Belt
18 Express' business plan. The LCOE model, discussed above, includes no revenue from
19 East-West transfer capacity to support SPP injections. Nevertheless, the Project is still
20 more economic than alternatives, showing that East-West transmission service is not
21 needed to make the Project economically feasible.

22 Mr. Stahlman's fourth concern is that demand for wind energy from Missouri
23 customers may not be large. I discuss Missouri's demand for low-cost renewable energy

1 earlier in this testimony in section II(b). In light of the Missouri RES, interest from
2 municipal customers like Columbia Water & Light, the likelihood of federally mandated
3 carbon reductions, Ameren's recent integrated resource plan calling for 400 MW of new
4 wind purchases, and the excellent economics of the Grain Belt Express Project compared
5 to alternatives, Missouri's demand for low-cost wind energy will be substantial.

6 Mr. Stahlman's suggestion, at page 11 of his rebuttal testimony, that the demand
7 for the Project may come from Kansas wind generators, not Missouri utilities, presents a
8 false dichotomy. If Kansas wind generators buy transmission service to move their low-
9 cost power to Missouri, they still deliver power to the State of Missouri. The demand for
10 the delivered, renewable energy still comes from Missouri. The Project still lower
11 wholesale power prices and rates in Missouri. And, it is Missourians who consume the
12 low-cost energy delivered by the Project.

13 In summary, the LCOE model, together with other evidence presented in my
14 direct and surrebuttal testimony, responds to and resolves all four of Mr. Stahlman's
15 concerns about economic feasibility.

16 **Q. Returning to Dr. Proctor's LCOE analysis, what are the principal differences**
17 **between Dr. Proctor's methodology and your methodology?**

18 **A.** Dr. Proctor uses a traditional regulated utility revenue requirement model. In his model,
19 all assets are part of a depreciating rate base. He calculates the annual revenue
20 requirement based on this depreciating rate base. The result is a series of annual revenue
21 requirements that vary and decline over time. Dr. Proctor then calculates the present
22 value of these declining revenue requirements, and finally solves for a "levelized" annual
23 revenue figure that yields the same present value.

1 On the other hand, my model directly calculates the levelized revenue
2 requirement that provides investors with a return on assets equal to their cost of capital.
3 This is the method used by merchant transmission lines and independent power producers
4 that are not rate-regulated public utilities with regulated rate bases.

5 **Q. Which methodology is more appropriate, yours or Dr. Proctor's?**

6 A. I believe my method is more appropriate for analyzing the LCOE of wind projects and
7 the Grain Belt Express Project. To date, most of the wind energy purchased by Missouri
8 utilities has been through power purchase agreements with non-rate regulated wind
9 generation companies, not through utility ownership of regulated generation assets. My
10 methodology is more appropriate for wind farms whose output is purchased through a
11 PPA. In addition, Grain Belt Express will not have a depreciating rate base, and will set a
12 levelized transmission charge to recover its costs from specific users of the line.

13 **Q. Do both of your models take into account the variability of wind energy in
14 comparing to a dispatchable power plant?**

15 A. Yes. The Proctor model adds a cost to wind energy in order to provide backup
16 generation. My model, on the other hand, calculates the capacity value of all resources
17 based on the avoided cost of a simple-cycle gas turbine. In my model, wind has a much
18 lower capacity value than dispatchable resources. My model also includes a "time-of-
19 day" adjustment to the value of energy that values wind energy based on the time of day
20 it is actually generated. Dr. Proctor's does not. In both cases, the models reward
21 dispatchable generation versus wind generation that does not have the same ability to
22 dispatch in peak hours.

23 **Q. Does it matter which model is used for determining which is the lowest cost resource**

1 **option?**

2 A. Not necessarily. Both my LCOE model, presented in section III(a) above, and Dr.
3 Proctor’s rebuttal testimony indicate that the Project’s delivered energy is cheaper than
4 wind generation located in Missouri. Dr. Proctor’s rebuttal testimony suggests that
5 combined cycle gas generation is about \$6 per MWh, or 7%, less expensive than the
6 Project’s delivered wind energy.⁸ However, as I will show, once five corrections are
7 made to Dr. Proctor’s model, it actually supports the same finding as in my direct
8 testimony – that Grain Belt’s delivered energy is less expensive than both Missouri wind
9 and combined cycle gas generation.

10 b. With five corrections, Dr. Proctor’s model supports the Project

11 **Q. Did Dr. Proctor provide you with a copy of his revenue requirement calculations?**

12 A. Yes, he did. He provided me with all of the calculations behind the figures presented in
13 his testimony. Using these workpapers, I was able to run his revenue requirement model
14 incorporating the corrections described below.

15 **Q. What is the first correction to Dr. Proctor’s model that you made?**

16 A. Dr. Proctor arbitrarily increased the capital cost of the Project by 30%, which increases
17 the delivered cost of energy. I removed this increase and used the Project’s latest capital
18 cost estimate, including the results of the PJM System Impact Study, discussed above.

19 **Q. What was Dr. Proctor’s explanation for this increase?**

20 A. At page 18-19 of his rebuttal testimony, Dr. Proctor states without any citation that “[t]he
21 SPP has found preliminary cost estimates for transmission projects to be 30% lower than
22 actual costs.” In response to a data request, Dr. Proctor provided as sources a 2011 white

⁸ Schedule MSP-1.

1 paper written by SPP and a presentation entitled “Addressing Cost Estimates and Cost
2 Increases.”⁹ In reviewing these documents, I found that Dr. Proctor’s rebuttal testimony
3 mischaracterizes SPP’s conclusions.

4 **Q. Why is the SPP report an inappropriate basis to increase the capital cost of the
5 Project for an LCOE analysis?**

6 A. The documents Dr. Proctor provided say that SPP expects final project costs “to be
7 within a -30% to + 30% variance” from what SPP calls a “Study Estimate.” SPP did not
8 say that it had performed a historical review of costs and found an average 30% cost
9 overrun. Further, the “Study Estimate” as defined by SPP occurs before a line route is
10 determined, before a detailed schedule is developed, before environmental constraints are
11 identified, before state approvals are obtained, and before line engineering is completed.¹⁰
12 Grain Belt Express has a route developed for over two-thirds of the line; a detailed
13 schedule prepared; a detailed understanding of environmental constraints; state approvals
14 in two of the four states; and has already selected its transmission conductor and family
15 of structures. In light of all these differences between what SPP calls a “Study Estimate”
16 and the current state of the Project, the white paper’s plus or minus 30% cost range is not
17 applicable. The current status of the Project resembles what SPP calls the “CNPC Project
18 Estimate” or the “NTC Project Estimate,” both of which have a plus or minus 20 percent

⁹ See Show Me Response to Grain Belt Express’ Third Set of Data Request; Response 7(e). The PCTF white paper is available at <http://www.spp.org/publications/PCTF%20Whitepaper%20Final%2020110719.doc> (last accessed October 13, 2014). The presentation entitled “ PCTF Presentation to MOPC” is available at http://www.spp.org/publications/PCTF%207_19_11%20Meeting%20Materials.zip (last accessed on October 13, 2014).

¹⁰ PCTF white paper, page 11.

1 cost target – the same range I used in my direct testimony.¹¹ When read properly, SPP’s
2 research on transmission project costs actually supports the approach taken in my direct
3 testimony, and it does not support Dr. Proctor’s approach.

4 Several other considerations highlight the unreasonableness of Dr. Proctor’s 30%
5 increase in the Project cost. The price per mile of line construction assumed in the
6 Project construction budget (about \$2.0 million per mile) is 14% higher than the current
7 estimated cost per mile of the double circuit 345 kV SPP Priority Projects, even
8 accounting for post-proposal increases.¹² Double-circuit 345 kV lines usually have
9 slightly larger structures and more conductor than HVDC lines of the Project’s voltage
10 level, but their costs are generally analogous. In addition, the capital cost estimate in my
11 financial model already has a substantial contingency in it, equal to about 17% of the line
12 cost. Thus, Grain Belt Express is already taking account of the potential for future cost
13 overruns, and an additional contingency is unwarranted. Finally, Grain Belt Express has
14 a very strong incentive to manage cost overruns because, unlike the regulated public
15 utility transmission owners of the SPP Priority Projects, we do not have a rate base from
16 which to recover cost overruns. Therefore, it is Grain Belt Express and our investors, not
17 the Missouri public that bear the risk of cost overruns.

18 **Q. Did Dr. Proctor apply a construction cost increase to any other alternative in his**
19 **model?**

20 **A.** No, he did not.

¹¹ PCTF white paper, page 12-13.

¹² The current estimate, as of October 13, 2014 is \$1.58 million. See <http://www.spp.org/publications/Q3%202014%20Quarterly%20Project%20Tracking%20Report.pdf> (last accessed October 13, 2014) for the underlying cost data.

1 **Q. What is the second correction you applied to Dr. Proctor's model?**

2 A. Dr. Proctor's model does not properly account for potential production tax credits
3 available to wind generators. Both Dr. Proctor's model and my model run scenarios with
4 and without production tax credits. The correction I made only affects scenarios with the
5 production tax credit.

6 **Q. What is the nature of this correction?**

7 A. When calculating the revenue that would not be needed because of the tax credit, Dr.
8 Proctor did not "gross-up" the tax credit for the applicable income tax rate. Basically, he
9 assumed that \$1.00 of tax credits is worth \$1.00 of revenue. However, investors are
10 taxed on revenue, but not on tax credits. Therefore, \$1.00 of tax credits is worth an
11 amount of revenue equal to \$1.00 grossed up for taxes, i.e., divided by the quantity of one
12 minus the tax rate.

13 By way of analogy, an individual who pays a 33% tax rate needs \$1.50 of
14 earnings to make up for \$1.00 of lost income. The same logic applies for a corporate
15 taxpayer when valuing a tax credit.

16 **Q. What is the third correction you made to Dr. Proctor's model?**

17 A. Dr. Proctor assumes that wind generation operations and maintenance expenses increase
18 by about 5% each year. On the other hand, he assumes that natural gas power plant
19 operations and maintenance ("O&M") expenses never increase. I changed his model to
20 assume that natural gas O&M expenses increase at half the rate of wind power
21 generation, or 2.5% per year.

22 **Q. What basis did Dr. Proctor provide for his O&M assumptions?**

23 A. With respect to the wind operation costs, he performed a review of wind expenses based

1 on data from an industry report. I did not change his estimate when I reran his model.
2 With respect to natural gas turbines, Dr. Proctor claimed to review “forecast evidence” to
3 conclude that operational costs do not escalate. In response to a data request, Dr. Proctor
4 did not provide any cost data or evidence that he reviewed. Rather, Dr. Proctor state that
5 he could not find a recommended annual increase for its natural gas O&M expenses on
6 the EIA web site.¹³ However, EIA does not provide an estimate for wind O&M
7 escalation either, and Dr. Proctor still applied a 5%. The inconsistency should be
8 corrected.

9 **Q. Why do wind O&M expenses for wind farms increase over time?**

10 A. The first reason is the general rate of inflation. Over time, a dollar is worth less, and the
11 cost of labor and materials increases in nominal dollar terms. Second, major
12 maintenance, such as replacing major parts, becomes more common over time as the
13 plant ages and original parts wear out.

14 **Q. Would the same logic apply to thermal power plants?**

15 A. Yes. A major component of all power plant maintenance is labor costs. Workers will
16 demand higher wages each year, at a minimum to keep up with inflation. In addition,
17 thermal power plants, like wind plants, must undergo more frequent and more expensive
18 maintenance because they experience more wear and tear. Major equipment components
19 eventually require replacement, and preventative maintenance and monitoring must be
20 performed more often.

21 **Q. In light of the previous answers, can you discern any reason why Dr. Proctor chose**
22 **to escalate wind operational costs by 5% and gas power plant operational costs by**

¹³ Show Me Response 23 to Grain Belt Express’ Third Set of Data Request

1 0%?

2 A. No.

3 **Q. What is the fourth correction you made to Dr. Proctor’s model?**

4 A. Dr. Proctor does not include the effects that property taxes would have to Missouri
5 wind’s levelized costs. While Kansas wind projects are exempt from property taxes,
6 Missouri wind farms are not, and so must be included in the analysis.

7 **Q. What is the fifth correction you made to Dr. Proctor’s model?**

8 A. Dr. Proctor reduced the Kansas wind capacity factor from 55% to 50%. Western Kansas
9 capacity factors are already over 50%, as shown by the responses to Grain Belt Express’
10 request for information (“RFI”). As Dr. Proctor acknowledges at page 9 of his rebuttal
11 testimony, the best 4,000 MW of respondents to the Grain Belt Express request for
12 information (RFI) reported an average capacity factor of 52%. For the purposes of
13 rerunning Dr. Proctor’s model in this section, I have used a 52% assumption, even though
14 in light of improving turbine technology, a 55% figure is certainly reasonable for wind
15 farms built in 2017 and 2018.

16 **Q. Based on the five changes described above, what do the results of Dr. Proctor’s
17 model show?**

18 A. They show that the Grain Belt Express Project’s delivered energy is less expensive than
19 the alternatives in Dr. Proctor’s base case model.

20 *Impact of five corrections to Proctor’s LCOE totals*

Alternatives	Proctor Total	Transmission Cost Correction	Gas Generation O&M Correction	Property Tax Correction	Capacity Factor Correction	Corrected Total	Corrected Total w/ PTC	PTC Correction	Corrected Total w/ Corrected PTC
Grain Belt	\$92.26	-\$3.93	\$0.69*	\$0.00	-\$2.84	\$86.18	\$70.50	-\$8.45	\$62.05
Missouri Wind	\$98.73	\$0.00	\$0.82*	\$6.29	\$0.00	\$105.84	\$89.33	-\$8.89	\$80.44
Combined Cycle	\$85.97	\$0.00	\$1.71	\$0.00	\$0.00	\$87.69	\$87.69	\$0.00	\$87.69

* Increases to Kansas Wind and Missouri Wind LCOE is due to a natural gas generation O&M corrections, which affect the capacity adder to wind generation.

21

1 **Q. Do you believe that the results above are more reliable than those presented in in**
2 **subsection III(a) of this testimony?**

3 A. No, I do not. I believe my results are reliable and based on a more reasonable set of
4 assumptions than those of Dr. Proctor's, even when corrected. The above table shows,
5 however, that only a small number of clear errors and inconsistencies in Dr. Proctor's
6 model need to be corrected to support the Project's economic feasibility.

7 c. MISO wind is riskier and likely more expensive than the Project

8 **Q. At pages 25-27 of his rebuttal, Dr. Proctor includes an alternative of MISO wind**
9 **from "windier" states like Iowa, Minnesota, and North and South Dakota. What is**
10 **your response to this alternative?**

11 A. This "alternative" to the Project's delivered energy is unlike all the other alternatives in
12 Dr. Proctor's LCOE analysis because the generation is not located within Missouri or
13 directly delivered to Missouri, the latter being case with the Project. Buying distant wind
14 through the AC system presents a number of risks and costs that are not present by the
15 direct delivery through an HVDC line. These risks include the costs of congestion and
16 losses on the AC system, the risk of curtailment, the cost of interconnection upgrades,
17 and the risk of deliverability for capacity purposes. None of these risks are present in
18 using a dedicated HVDC line like the Project. There are so many additional risks and
19 complications to moving wind through the AC system that it may not even properly be
20 considered an "alternative."

21 In recent years, many utility buyers of wind power have required wind generators
22 to deliver power near to the load served. However, wind generators typically balk at
23 accepting the congestion, losses, curtailment and other risks involved in moving power
24 through the AC system.

1 Dr. Proctor does not actually perform any transmission analysis to determine the
2 economic cost or the physical infrastructure needed to move a large amount of power
3 from distant MISO wind generation to Missouri. The MISO wind alternative he suggests
4 is therefore incomplete. However, when even some of the additional costs are
5 considered, it becomes clear that distant MISO wind is likely to be more expensive, not
6 less expensive than the Project's delivered energy.

7 **Q. Does buying distant MISO wind present the risk of congestion costs?**

8 A. Yes. Congestion costs occur whenever there is a difference in the nodal price of
9 electricity at the point where it is purchased compared to the point where it is consumed.
10 The best wind resources in MISO tend to be in low-load areas with relatively weak grids
11 and large amounts of congestion.

12 **Q. Did Dr. Proctor review the costs associated with buying distant wind through the
13 MISO system?**

14 A. Not really. His only review of these costs was to look at MISO's financial transmission
15 rights or FTR auction results. However, these results are not meaningful for several
16 reasons. First, they only include the "congestion" component of differences in LMPs
17 (locational marginal prices), not the differences in the loss component.¹⁴ Shippers
18 moving power from distant wind farms are exposed to differences in the loss components
19 of LMPs; therefore FTRs only provide partial coverage. Second, the FTR auction covers
20 only a short period of time—usually one to two years. Over the lifetime of a generation
21 asset, congestion patterns can change considerably.

¹⁴ Dr. Proctor has acknowledged this to be true. Show Me Response to Grain Belt Express' Third Set of Data Request; Response 20.

1 Third, FTRs cover a “block” of power – 24 hours a day by seven days a week.
 2 Congestion costs for wind farms are relevant only when the wind blows and power is
 3 actually produced. Fourth, and most importantly, the FTR auction covers all of MISO.
 4 The aggregate results Dr. Proctor discusses do not specifically relate to distant wind
 5 farms with high capacity factors and Missouri load centers where power is actually used.
 6 Aggregate FTR auction results are meaningless when studying transmission costs along a
 7 specific path.

8 **Q. Is there a more direct way to measure congestion costs?**

9 A. Yes. MISO publishes nodal LMPs for all wind farms and for load hubs. The below chart
 10 shows the total congestion costs (including the loss component of LMPs) from a selection
 11 of wind farms located in the windiest parts of MISO relative to the Ameren Missouri load
 12 hub. These wind farms experience a very high degree of congestion, posing a substantial
 13 cost and risk to moving power through the AC system. The cost of this congestion must
 14 be added to the MISO wind alternative.

15 *MISO wind average LMPs and components from 2013 to mid-2014 versus Ameren Missouri load hub. The LMPs and*
 16 *components are weighted by aggregate MISO wind generation from 2013 to mid-2014.*

\$/MWh	Δ LMP	Δ MCC	Δ MLC
Buffalo Ridge (MN)	(10.04)	(8.06)	(1.97)
Moraine (MN)	(13.44)	(11.17)	(2.27)
Eclipse (IA)	(11.56)	(10.34)	(1.22)
Pocahontas Prairie (IA)	(12.24)	(10.74)	(1.50)
Rolling Hill (IA)	(11.66)	(10.36)	(1.30)
Pioneer Prairie (IA)	(5.57)	(5.64)	0.07
Average MN	(11.74)	(9.62)	(2.12)
Average IA	(10.26)	(9.27)	(0.99)

17
 18 The congestion costs from distant wind farms are not only substantial, they are quite
 19 volatile. In some hours, the price of power in windy parts of MISO can go negative.
 20 This means that a utility buyer of this wind power must pay the grid to accept it. Directly

1 delivering power via an HVDC line to Missouri greatly reduces and likely eliminates this
2 risk.

3 **Q. Are there any more corrections to Dr. Proctor's analysis of MISO wind?**

4 A. Yes. As he did with Missouri, Dr. Proctor assumed other MISO wind farms do not pay
5 property taxes. The expense must be added to his model.

6 **Q. Did Dr. Proctor's rebuttal testimony consider MISO wind as an energy resource or
7 a capacity resource?**

8 A. He considered both options. In examining MISO wind as an energy only resource, he
9 ignored electric losses and assumed that no transmission upgrades were needed to deliver
10 the energy to Missouri, and he also assumed no capacity value for the purchased wind
11 energy. In examining MISO wind as a capacity resource, he made a rough estimate of
12 the required interconnection upgrades, but as I mentioned above, it was not actually
13 based on any transmission analysis.

14 **Q. Based on the addition of congestion costs and property taxes, what does Dr.
15 Proctor's model conclude about the cost effectiveness of MISO wind as an energy
16 only resource?**

17 A. I reran Dr. Proctor's model with the five changes discussed in Section III(b) above, along
18 with the addition of congestion costs and property taxes. In his rebuttal testimony at page
19 28, Dr. Proctor concludes that a capacity factor above 35% is needed in order for energy-
20 only wind located in MISO to be competitive with Kansas wind delivered by Grain Belt
21 Express. In fact, after correcting Dr. Proctor's model and adding in the full costs of
22 property taxes, transmission, congestion and loss charges to the cost of MISO wind,

1 Kansas wind delivered by DC transmission is always cost competitive with MISO wind.

2 And, as described above, direct delivery by an HVDC line inherently has fewer risks.

3 *Components of Levelized Cost calculations for Missouri and MISO wind alternatives.¹⁵*

Capacity Factors	Capacity Costs	Property Tax	O&M Expense	Levelized Costs	Capacity Adder	Inc Congestion	Total	Difference
Missouri Wind	\$46.17	\$6.29	\$11.73	\$64.19	\$45.91	\$0.00	\$110.10	(\$28.22)
MISO 30%	\$57.71	\$5.76	\$11.73	\$75.19	\$36.73	\$9.27	\$121.19	(\$39.32)
MISO 35%	\$49.47	\$4.94	\$11.73	\$66.13	\$31.87	\$9.27	\$107.27	(\$25.39)
MISO 40%	\$43.28	\$4.32	\$11.73	\$59.33	\$28.23	\$9.27	\$96.83	(\$14.95)
MISO 45%	\$38.47	\$3.84	\$11.73	\$54.04	\$25.40	\$9.27	\$88.70	(\$6.83)
MISO 50%	\$34.63	\$3.45	\$11.73	\$49.81	\$23.13	\$9.27	\$82.21	(\$0.33)
Grain Belt	Does Not Include Losses					\$0.00	\$81.87	

4
5 **Q. What if you consider MISO wind as a capacity resource?**

6 A. Accrediting distant MISO wind as a capacity resource would entail building the
7 necessary transmission upgrades to allow the power to be physically deliverable into
8 Missouri. This requires a detailed transmission study from MISO. As Dr. Proctor notes
9 on page 30 of his testimony, “resources located outside the utility’s transmission zone are
10 likely to have larger additional transmission charges” and “[b]ecause firm transmission
11 service is resource and load specific, it is not possible to provide a definitive estimate [of
12 costs].”

13 **Q. How does Dr. Proctor estimate the costs of transmission service from distant MISO
14 wind resources to Missouri?**

15 A. On page 35 of his testimony, Dr. Proctor bases his estimate SPP’s “safe harbor” for
16 transmission upgrades. I fail to see how SPP’s safe harbor is relevant for calculating
17 transmission upgrade costs for MISO wind. Further, SPP’s safe harbor concerns who

¹⁵ Following Dr. Proctor’s convention, losses are excluded from all alternatives in the “energy only” comparison.

1 pays for upgrades – amounts below the safe harbor are broadly cost allocated rather than
 2 allocated to the requesting transmission rights holder. The safe harbor is not an estimate
 3 of the actual upgrade costs required.

4 **Q. Setting aside the lack of transmission analysis to support this alternative in Dr.
 5 Proctor’s testimony, how do the changes to Dr. Proctor’s model you have described
 6 above affect the comparison?**

7 A. Once the necessary corrections (which I have described above) are made, Dr. Proctor’s
 8 model shows that the Grain Belt Project alternative is less expensive than the MISO wind
 9 alternative.

10 *MISO wind alternatives with additional transmission costs*

Capacity Factors	Capacity Costs	Property Tax	O&M Expense	Levelized Costs	Capacity Adder	Inc Trans Costs	Inc Congestion	Losses	LCOE with Δ Transmission	
									Without PTC	With PTC
MISO 30%	\$57.71	\$5.76	\$11.73	\$75.19	\$33.33	\$12.89	\$9.27	5%	\$137.56	\$113.43
MISO 35%	\$49.47	\$4.94	\$11.73	\$66.13	\$28.55	\$11.05	\$9.27	5%	\$121.05	\$96.91
MISO 40%	\$43.28	\$4.32	\$11.73	\$59.33	\$24.97	\$9.67	\$9.27	5%	\$108.67	\$84.53
MISO 45%	\$38.47	\$3.84	\$11.73	\$54.04	\$22.18	\$8.60	\$9.27	5%	\$99.03	\$74.90
MISO 50%	\$34.63	\$3.45	\$11.73	\$49.81	\$19.95	\$7.74	\$9.27	5%	\$91.33	\$67.19
Grain Belt	\$33.29	\$0.00	\$11.73	\$45.02	\$19.29	\$17.57	\$0.00	5%	\$86.18	\$62.05

11
 12 d. Dr. Proctor’s criticisms do not hold up under scrutiny

13 **Q. On pages 4-6 of his rebuttal testimony, Dr. Proctor criticizes the basic methods of
 14 the LCOE model presented in your direct testimony. Are these criticisms valid?**

15 A. No. I reviewed his comments in detail and concluded that no additional corrections
 16 (beyond the 2% adjustment to natural gas prices, discussed above) were needed to my
 17 original analysis.

18 **Q. Dr. Proctor states at page 4 of his rebuttal that “Mr. Berry did not perform his
 19 levelized cost analysis in the same way as is typically done for regulated utilities.”**

20 **What is your response?**

1 A. Dr. Proctor fails to explain why my original analysis is wrong simply because I used a
2 method that is not “typically done for regulated utilities.” In fact, my method more
3 closely matches the techniques that are used by an independent power producer or by a
4 merchant transmission company like Grain Belt Express.¹⁶

5 Dr. Proctor uses a model that is based on a utility with a fully regulated cost of
6 service rate base that owns all the capital assets analyzed. In such a model, the revenue
7 stream received by the owner declines substantially over time as the capital asset is
8 depreciated. After he calculates the declining revenue requirements, Dr. Proctor converts
9 them into a single levelized charge. As he states in his rebuttal testimony at page 5:

10 Each year of revenue requirements is discounted to obtain the NPV of the
11 annual revenue requirements over the asset life. The NPV of the revenue
12 requirements are then divided by the sum of the annual discount factors to
13 obtain a “levelized” (same dollar amount each year) revenue requirement.

14 Both Dr. Proctor and I arrive at a levelized revenue requirement. My approach calculates
15 the revenue requirement directly, while Dr. Proctor’s approach goes through the
16 intermediate step of calculating a utility rate base. Dr. Proctor’s extra step is not essential
17 or necessary.

18 **Q. Does Dr. Proctor’s decision to model declining revenue requirements based on a**
19 **depreciating rate base lead to materially different results than your LCOE model?**

20 A. No, it does not. Both my methodology and Dr. Proctor’s end up with the same answer in
21 terms of the most competitive resource if appropriate assumptions are used. As I have
22 discussed above, once corrected, Dr. Proctor’s model actually supports the economic

¹⁶ In Show Me Responses 6 and 7 to Grain Belt Express’ Third Set of Data Requests, Dr. Proctor acknowledges he has no experience or direct knowledge of how IPPs and merchant transmission companies price their energy and service.

1 feasibility of the Project.

2 **Q. Dr. Proctor claims in his rebuttal at page 5, line 14, that you erroneously calculated**
3 **the “capitalization factor” in your LCOE analysis. Did you perform this calculation**
4 **correctly?**

5 A. Yes. The capitalization factor was used to convert the present value of revenue
6 requirements into an annual revenue requirement. In my LCOE model, all costs and
7 revenues were discounted back to 2017—the middle year of the Project’s three-year
8 construction period. Therefore, the capitalization factor I calculated was also based on
9 discounting the revenue back to 2017. Dr. Proctor asserts that my capitalization factor
10 reflects an extra year of discounting because he thinks everything must be discounted to
11 2018. In fact, so long as both costs and revenue are discounted back to the same year, it
12 doesn’t affect the results.

13 As seen in Schedule DAB-11, using the value of capitalization factor suggested
14 by Dr. Proctor and discounting costs back to 2018 does not change the resulting LCOE.
15 This demonstrates that while I used a different calculation convention than Dr. Proctor
16 for the capitalization factor, my calculation yielded the correct result.

17 **Q. Dr. Proctor objects at page 16, lines 5-11 of his rebuttal to the way you calculate**
18 **capacity credit because it is not “a standard calculation of levelized costs.” What is**
19 **your response?**

20 A. Setting aside the relative merits of our two capacity credit methods, Dr. Proctor and I
21 agree that it is appropriate for an LCOE model to take into account the high level of
22 availability and reliability that dispatchable generation (such as combined cycle gas
23 generation) has during peak load hours. In addition, my LCOE model performs a further

1 "time of day" adjustment that values energy based on when it is delivered. As a result,
2 off-peak energy receives a lower value than peak energy based on simulated locational
3 marginal prices. Dr. Proctor's model does not include this adjustment.

4 Dr. Proctor provides no explanation or source of why his method is "standard."
5 He also asserts (on page 16, line 90 without explanation that my method is "not the
6 treatment that [a utility] would use in making a decision." My experience, which
7 includes following the resource plans of utilities around the country and involvement in
8 power purchase agreements for over 1,000 MW of wind farms, is that many utilities do
9 use the method described in my direct testimony.

10 By "capacity," Dr. Proctor and I seem to mean the same thing: the ability of a
11 generator to produce electricity during the highest hours of electric demand, when the
12 grid runs the risk of a generation shortage. Capacity can be available even if it is not
13 used. For example, an inefficient combustion turbine might be ready to run on a hot July
14 afternoon but not actually be called upon. This generator still contributes capacity.
15 Capacity is distinct from energy, which is the actual generation of electricity throughout
16 the day and year. All generation resources typically provide both capacity and energy.
17 For variable renewable resources like wind generators, they primarily provide energy, but
18 they also provide capacity to the extent they stand ready to produce electricity during
19 peak load hours. Less efficient combustion turbines mainly provide capacity since their
20 high variable cost means they do not run often.

21 In a levelized cost of energy analysis (LCOE), determining just the cost of
22 producing energy (as opposed to capacity) requires that the energy and capacity values of
23 each resource be separated. My model does this is by assigning a capacity value to each

1 resource based on its ability to meet peak demand and to be available during the greatest
2 strains on resource adequacy. This capacity value avoids another cost, which is the cost
3 of building an additional peaking unit that contributes the same capacity value. The
4 “avoided cost” of building this peaking unit then reduces the cost that must be recovered
5 through the energy produced by the generating plant.

6 **Q. How does Dr. Proctor’s approach different from what you have described above?**

7 A. He assumes that renewable resources must be paired with combustion turbines to
8 generate the same capacity value as a combined cycle gas plant. The cost of the
9 combustion turbine is added to the cost of the renewable energy. It is confusing and
10 somewhat misleading to call this a “levelized cost of energy.” Actually, it is a levelized
11 cost of both energy and capacity. In my LCOE model, all generation alternatives
12 generate the same amount of energy, however, higher capacity value resources see a
13 decrease in their cost of energy based on the avoided cost of a peaking plant. In Dr.
14 Proctor’s model, all generation resources generate the same amount of capacity, with
15 lower capacity value resources paying the cost for additional peaking units.

16 **Q. Which methodology of capacity credit is more appropriate, yours or Dr. Proctor’s?**

17 A. If the goal of the analysis is to fill a demonstrated capacity shortfall, i.e., a reserve
18 margin shortfall, then Dr. Proctor’s method may be appropriate. If, on the other hand, the
19 goal of the analysis is to determine which generation alternatives can produce low-cost
20 energy or meet a renewable energy target, as is the intent of the LCOE analysis in my
21 direct testimony, then my method is more appropriate.

22 **Q. Dr. Proctor claims at page 6, lines 3-4 of his rebuttal that you “confuse[d] inflation**
23 **rates with cost escalation over the asset life” resulting “in an overestimate of the**

1 **annual O&M costs for most alternatives.” Is this the case?**

2 A. No. Both Dr. Proctor’s model and my model are prepared in nominal dollars. As a
3 result, even costs that are assumed to be constant (in real dollars) must increase with an
4 assumed inflation rate. Otherwise, they actually decrease in real dollar terms.

5 Dr. Proctor’s claim that my analysis “confuses” inflation rates with cost escalation obscures the
6 real issue. The Dr. Proctor model assumes that gas generation O&M costs do not
7 increase and actually decline in real dollar value terms as a plant ages. Dr. Proctor
8 provides no support for this assumption which defies economic reality.¹⁷ My model
9 assumes, conservatively from the perspective of Grain Belt Express, that the natural gas
10 generation O&M costs stay constant in real dollar terms.

11 **Q. Did you “improperly” inflate natural gas prices as Dr. Proctor suggests on page 22**
12 **of his rebuttal?**

13 A. No. I used the nominal forecast for electric power plant natural gas prices provided by
14 the Energy Information Administration (EIA) of the U.S. Department of Energy. Dr.
15 Proctor uses the real dollar prices, then inflates them based on nominal increase in EIA’s
16 Henry Hub natural gas price forecast. A more direct approach is to use the prices that I
17 did. Schedule DAB-12 shows the EIA nominal dollar electric power plant gas price
18 forecast, the forecast used in my model and the forecast used in Dr. Proctor’s model.

19 **Q. Dr. Proctor’s rebuttal testimony states at various points, including pages 9 and 18,**
20 **that your levelized cost does not include losses or that “losses need to be taken into**
21 **account” based on the Project’s estimated delivered cost of energy. Did your LCOE**
22 **model include losses on the Grain Belt Express transmission line?**

¹⁷ Show Me Response to Grain Belt Express’ Third Set of Data Request; Response 23

1 A. Yes. My estimate of the delivered cost of the energy from the Project presented in my
2 pre-filed direct testimony included an estimate of losses of 5%, as shown in the
3 workpapers provided to Show Me.¹⁸ Dr. Proctor then adopted this same assumption in
4 his own analysis.

5 e. Many of Dr. Proctor's assumptions are less reasonable than Grain Belt Express'

6 **Q. In his rebuttal testimony on page 17, Dr. Proctor attributes a capacity credit to**
7 **Kansas wind generators of 14.5% of their nameplate capacity, compared to the**
8 **17.1% assumed in your analysis. Which is more reasonable?**

9 A. A capacity value of 17.1% is a more reasonable assumption. In his direct testimony,
10 Company witness Robert Zavadil performed a loss of load expectation ("LOLE")
11 analysis, using the same basic techniques that MISO uses in its capacity accreditation.
12 Mr. Zavadil calculated a capacity value of 33.0% in his direct testimony at page 8.
13 Because there is some uncertainty about future capacity value, I chose a more
14 conservative value of 17.1%, but this could be substantially higher.

15 **Q. What are the problems with Dr. Proctor's capacity value of 14.5%?**

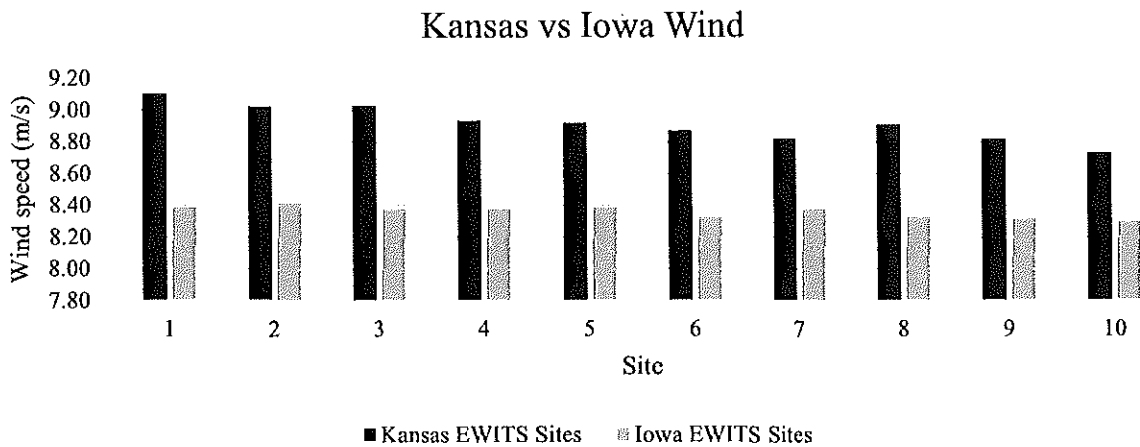
16 A. Dr. Proctor arrived at his value by averaging the western Minnesota/Dakotas region value
17 (15.8%) with the Iowa region value (13.7%). This rests on his incorrect assumption at
18 page 18 of his rebuttal that "[t]he wind in the northwestern Iowa also has the same annual
19 average wind speeds as western Kansas." Actually, western Kansas has appreciably
20 higher wind speeds.

21 Schedule DAB-13 shows a wind map for the Kansas and Iowa as developed by
22 AWS Truepower and NREL. The average wind speeds at 80m for northwest Iowa is

¹⁸ Grain Belt Express Response to Show Me Data Request 1.2, Attachment 01.

1 around 8-8.5 m/s, whereas much of the area surrounding Dodge City, near the proposed
 2 converter station, has average wind speeds of around 8.5-9 m/s. The below graph also
 3 indicates this difference. The average wind speeds of ten Kansas sites modeled in the
 4 Eastern Wind Integration and Transmission Study (“EWITS”) near Dodge City is
 5 compared against the wind speeds of ten Iowa sites with the highest capacity factors in
 6 the state.

7 *Comparing the 3 year average wind speeds over 3 years (2004-2006) of 10 Kansas EWITS sites and the 10 highest capacity*
 8 *factor Iowa EWITS sites*



9
 10 In addition, the MISO capacity values used by Dr. Proctor were calculated in 2012. As
 11 will be discussed below, wind capacity factors are improving substantially over time. As
 12 capacity factors improve, capacity values will also improve because more wind-generated
 13 electricity will be generated during peak load hours. Finally, Dr. Proctor’s calculation is
 14 not based on any actual modeling of the reliability contribution of the Project’s delivered
 15 energy. Mr. Zavadil performed this analysis in his direct testimony, and estimated a
 16 capacity value of 33% of nameplate capacity, which I have conservatively reduced to
 17 17.1% in my LCOE model.

18 **Q. Dr. Proctor says at page 19 of his rebuttal that your capacity factor assumption of**

1 **55% for Kansas wind generation is too high. He uses 50% instead. Is this reduction**
2 **justified?**

3 A. No, as discussed above, western Kansas capacity factors are already over 50%.
4 Additional improvements in capacity factors between now and when the Project is
5 constructed are extremely likely. General Electric, the country's largest wind turbine
6 supplier, recently submitted guidance to the Tennessee Valley Authority's IRP, which
7 indicated an estimated 4-5% improvement to net capacity factor over the next two to four
8 years. A 55% capacity factor assumption is therefore more reasonable than 50%.

9 **Q. Dr. Proctor claims that the inflation rate you use for several variables in your**
10 **model is too high. What is your response?**

11 A. In my LCOE analysis, I consistently used a long-term inflation rate of 2.5%. In January
12 2012, the Federal Reserve Bank explicitly established an inflation rate for personal
13 consumption expenditures (PCE) of 2.0%. However, a slightly higher figure is warranted
14 for several reasons. First, PCE inflation has averaged about 0.3% below headline CPI
15 increases over recent years. Second, over long periods of time, one can foresee
16 substantial periods of time when the rate of CPI increase rises above the Federal
17 Reserve's target for a period of time until corrective measures, such as interest rate
18 increases, reduce the inflation rate back in line with the target.

19 The assumed inflation rate is applied consistently across the analysis in my LCOE
20 analysis. In contrast, Dr. Proctor applies an inflation adjustment to some model inputs,
21 like natural gas prices and the PTC value, but not others, like natural gas generation
22 O&M and carbon pricing.

23 **Q. Dr. Proctor expresses a concern at page 15 of his rebuttal that the production tax**

1 credit (“PTC”) for wind farms may not be available in the future. What is your
2 response?

3 A. It is appropriate to consider scenarios where the PTC is extended and where it is not. We
4 regularly review these scenarios in assessing the business case of the Project. The LCOE
5 analysis presented in my direct pre-filed testimony includes sensitivities with and without
6 the production tax credit. While a PTC renewal is uncertain, Congress has a history of
7 renewing the PTC, with some of the extensions retroactive. Including retroactive
8 extensions, the PTC has been continuously available since 1992.¹⁹

9 Without the PTC, the demand for clean energy, including the Missouri
10 renewable portfolio standard (“RPS”) and the many other regional RPS I discuss in my
11 direct testimony at pages 22-26, would not simply disappear. The absence of a tax credit
12 would affect all renewable energy technologies, not just the Kansas wind energy
13 connected to the Grain Belt Express Project. The cost of the Project, relative to other
14 clean energy alternatives, would therefore not be affected, and it would remain the low-
15 cost way to meet RPS. And, without the PTC, the Project remains cost-effective. Even
16 Dr. Proctor’s analysis shows that the wind energy delivered by the Project is competitive
17 with combined cycle gas generation *without the PTC*. In his model the Project’s

¹⁹ Following its initial enactment in the Energy Policy Act of 1992, Pub.L. No. 102-486, 106 Stat. 3020, §1914, the PTC has been extended or renewed by Congress on eight occasions: Ticket to Work & Work Improvement Act of 1999, Pub.L. No. 106-170, 113 Stat. 1922, §507; Job Creation & Worker Assistance Act of 2002, Pub.L. No. 107-147, 116 Stat. 59, §603; Working Families Tax Relief Act of 2004, Pub.L. No. 108-311, 118 Stat. 1181, §313; Energy Policy Act 2005, Pub.L. No. 109-58, 119 Stat. 986, §1301; Tax Relief & Health Care Act of 2006, Pub.L. No. 109-432, 120 Stat. 2944, §201; Energy Improvement & Extension Act of 2008, Pub. L. No. 110-343, 122 Stat. 3808, §101; American Recovery & Reinvestment Act, Pub.L. No. 111-5, 123 Stat. 319, §1101; and American Taxpayer Relief Act of 2012, Pub.L. No. 112-240, 126 Stat. 2340, §407.

1 delivered energy is about \$4/MWh more expensive than combined cycle gas without the
2 PTC. See Dr. Proctor Rebuttal at p. 20 (Kansas Wind at \$89.76 v. Combined-Cycle at
3 \$85.97). However, when the corrections that I discussed in Section III(b) above are
4 applied to the Dr. Proctor model, it shows that the Project's delivered wind energy is
5 cheaper than combined cycle gas generation *even without PTCs*.

6 In sum, approval of the Grain Belt Express Project would position Missouri to
7 benefit from a PTC extension if it occurs, but also helps assure that Missouri will have
8 access to abundant, low-cost clean energy resources even if the PTC is not extended.

9 **Q. Dr. Proctor objects to the carbon price forecast used in your LCOE model at pages
10 20-21 of his rebuttal. What is your response?**

11 A. First, my LCOE analysis included a sensitivity on the price of carbon to account for
12 potential uncertainty in the value, so it is incorrect to suggest I used a single price.
13 Second, I used a third-party forecast by the firm Synapse Energy Economics that is
14 expressed in real dollars. Dr. Proctor uses the same forecast in his analysis, but he failed
15 to convert it to nominal dollars properly. Inexplicably, Dr. Proctor escalates the price of
16 carbon dioxide to 2019 with inflation, but applies no inflation adjustment thereafter. The
17 result is a levelized price of carbon that is too low.

18 **Q. Have you rerun Dr. Proctor's model using Grain Belt Express' more reasonable
19 assumptions about capacity value (17.1%) , capacity factor (55%), natural gas price
20 forecasts, inflation, and carbon pricing?**

21 A. Yes, I have. When these assumptions are incorporated, Dr. Proctor's model shows that
22 the Grain Belt Express Project is clearly economically feasible, as is shown in the tables
23 below. The Project alternative is cheaper than sourcing "energy only" from other wind

1 sources:

2 *Levelized Costs for Wind as an energy-only resource and Capacity from Combustion Turbines*

Alternatives	Total	Total w/ PTC
Missouri Wind	\$112.80	\$85.30
MISO 30%	\$121.53	\$94.04
MISO 35%	\$107.61	\$80.12
MISO 40%	\$97.17	\$69.67
MISO 45%	\$89.04	\$61.55
MISO 50%	\$82.55	\$55.06
Grain Belt	\$78.02	\$50.53

3 ** Does not include transmission losses*

3

4

In addition, the Grain Belt Express Project is cheaper than other MISO wind resources

5

when considering them as capacity resources:

6

Levelized Costs for MISO and Kansas wind resources as energy and capacity

Alternatives	Total	Total w/ PTC
MISO 30%	\$136.23	\$110.11
MISO 35%	\$120.39	\$94.27
MISO 40%	\$108.51	\$82.39
MISO 45%	\$99.26	\$73.15
MISO 50%	\$91.87	\$65.76
Grain Belt	\$82.13	\$56.01

7 ** Includes 5% losses*

7

8

Finally, the Grain Belt Express Project is cheaper than Missouri wind combined cycle gas

9

alternatives:

Levelized Cost comparison for generation alternatives.

Alternatives	Total	Total w/ PTC
Grain Belt	\$82.13	\$56.01
Missouri Wind	\$109.39	\$81.90
Combined Cycle	\$95.01	\$95.01

f. An analysis of risk factors favors the approval of the Grain Belt Express

Q. Do you agree with Dr. Proctor’s statement at page 24 of his rebuttal that it is appropriate for the Commission to consider the risk implications of different alternatives?

A. Yes. It is important to consider ranges of future variables. For this reason, the analysis I presented in direct testimony (and updated in this testimony) included sensitivities around Kansas wind capacity factors, Missouri wind capacity factors, PTCs, carbon prices, and future natural gas prices. As shown on Schedule DAB-4 to my direct testimony and Schedule DAB-10 to this testimony, I varied these input assumptions not only individually but in tandem, resulting in a total of 162 scenarios considered. As Dr. Proctor notes at page 25 of his rebuttal testimony, future natural gas prices over the 30+ years are uncertain. However, his model includes only three scenarios and includes no sensitivities around future natural gas prices. The additional scenarios considered by my model make the results more robust.

Q. Do you agree with Dr. Proctor’s assessment at page 25 of his rebuttal that the risks of Kansas wind capacity factors and future natural gas prices are “offsetting”?

A. No, certainly not from the perspective of the Missouri public. If wind power is purchased through a power purchase agreement (PPA) with an independent power producer (IPP), as most wind procured by Missouri utilities has been to date, the IPP takes the risk of

1 lower than expected energy production, *not the utility and its ratepayers*. The PPA has a
2 price per MWh, and if the wind farm generates less energy, it receives less revenue. The
3 utility typically only pays for what is generated, while the wind farm owner takes the risk
4 of how much energy is produced due to wind conditions. In contrast, both PPAs for
5 natural gas plants and utility-owned natural gas plants allow for fuel cost recovery,
6 meaning consumers ultimately face the risk of fluctuating fuel prices. This means higher
7 than expected natural gas prices will increase the electric bills of consumers.

8 **Q. Is it appropriate for the Commission to approve the Grain Belt Express Project**
9 **even with some future uncertainty about its cost-effectiveness relative to other**
10 **alternatives?**

11 A. Yes, for two reasons. First, as mentioned above, the total size of regional RPS
12 requirements is so large that building the Project and building other renewable generation
13 are not mutually exclusive alternatives. Total demand for renewable energy in MISO and
14 PJM states in 2020 will be about 175 million MWh.²⁰ Cost effectively meeting the
15 regional RPS requirements will not require only the Project or more wind installations in
16 MISO; it will require both. Regional RPS compliance is directly relevant to individual
17 states like Missouri. Since RECs and renewable energy can be bought and sold across
18 states, this must be viewed as a regional market with linked pricing, just like the regional
19 market for wholesale electricity.²¹ Similarly, improving air quality and reducing the
20 emissions of coal-fired power plants pursuant to EPA regulations will not require only
21 new combined- cycle gas generation or new renewable generation. It will require both.

²⁰ Berry direct testimony, page 23.

²¹ Berry direct testimony, pages 22-23.

1 Second, uncertainty is inherent in any cost-benefit analysis. The benefits of new
2 transmission lines accrue over periods of decades, and the cost of transmission projects
3 can also vary due to commodity prices, design factors, schedule, and other
4 considerations. Because of the timeframes and uncertainties involved, utilities and
5 regulators cannot avoid making informed forecasts about the future. The Grain Belt
6 Express Project, however, presents a different circumstance than almost all the other
7 transmission projects that the Commission has approved because Grain Belt Express,
8 not Missouri ratepayers, bear most the risks regarding the Project's costs and benefits.
9 If the Project's anticipated benefits decrease between now and when Grain Belt Express
10 begins construction, the Company must address those market realities. If the Project's
11 cost is higher than expected, Grain Belt Express bears that risk, not Missouri consumers.
12 The Project's shipper-pays business model offers the Missouri public the opportunity to
13 benefit from additional competition without taking the risk that the Project's benefits are
14 lower than expected, or that the Project's costs are higher than expected.

15 **Q. Is your LCOE analysis and Dr. Proctor's analysis based on the same delivered cost**
16 **of energy to Missouri as to Indiana?**

17 A. Yes, they are. Both of our analyses are conservative with respect to the cost-
18 effectiveness of the Project for Missouri. Depending on market needs, Grain Belt
19 Express can offer a lower transmission price to Missouri because of the shorter length of
20 transmission line from Kansas.

21 **Q. What is the size of this difference?**

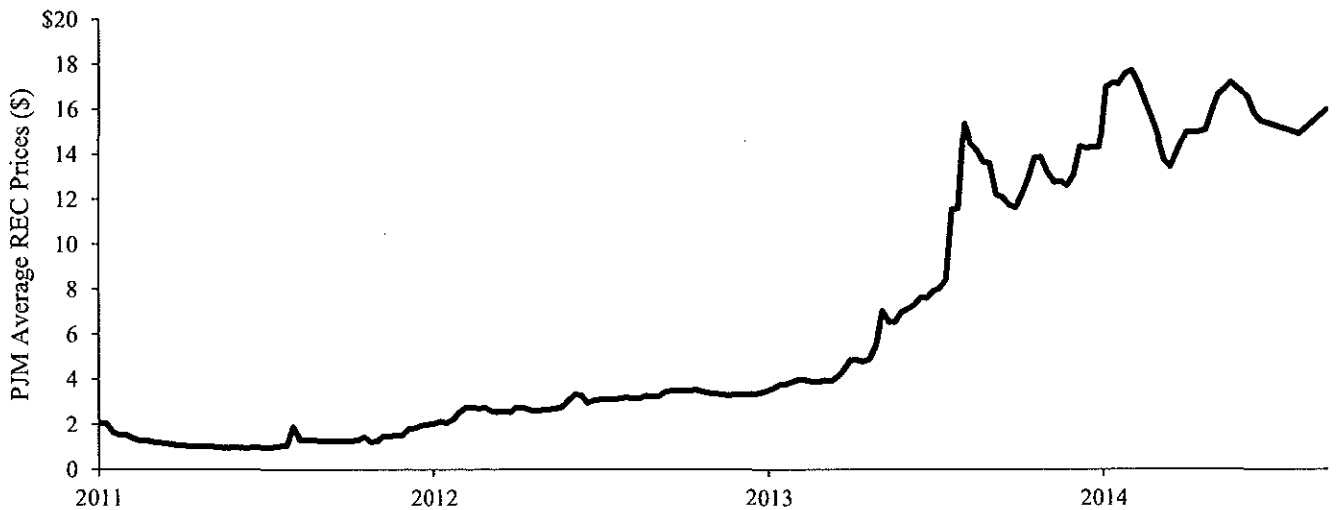
22 A. Depending on market conditions, the transmission costs to Missouri could be 25-33%
23 lower than to Indiana, resulting in a lower delivered to cost to Missouri of \$4-6/MWh.

1 Grain Belt Express would need to recover this revenue by charging slightly more to
2 shippers that use the Project to move power to PJM.

3 **Q. Why can PJM buyers afford to pay more for renewable power?**

4 A. The PJM market has a huge demand for renewable energy, but has no access to wind
5 with a high capacity factor in its region. This supply-demand imbalance has been driving
6 up PJM renewable energy credit prices. As the following graph shows, these prices have
7 reached \$16-18/MWh, which is in the range of the transmission charge on the Grain Belt
8 Express Project to Indiana.

9 *Average historical REC prices of Class 1/Tier 1 Maryland, New Jersey, and Pennsylvania RECs. Source: SNL*



10
11 **Q. Why is PJM's demand for renewable energy important for establishing the
12 economic feasibility of the Project?**

13 A. PJM's huge demand underlines that the Project's transmission capacity from western
14 Kansas to PJM is valuable, and that even if it is necessary to charge less to deliver power
15 to Missouri, the Project can still proceed. However, the analysis in the section of my
16 surrebuttal testimony and Dr. Proctor's model, once corrected, demonstrates that the
17 Project is economically feasible even when the same transmission charge is assessed to

1 move power to Missouri and to PJM.

2 **IV. STAFF CONDITIONS TO GRAIN BELT EXPRESS CCN**

3 **Q. The rebuttal testimony of Daniel Beck summarizes at pages 16-22 the conditions**
4 **recommended by Commission Staff. Has Grain Belt Express reviewed these**
5 **conditions?**

6 A. Yes, we have reviewed these conditions in detail, and Grain Belt Express can agree to the
7 majority of the proposed conditions. The Company's position regarding each condition
8 is contained in the surrebuttal testimony of the Company witness with the appropriate
9 expertise. For convenience, my Schedule DAB-14, attached to this surrebuttal,
10 summarizes the conditions proposed by Staff; the Company's position on each condition;
11 and a citation to the Grain Belt Express surrebuttal testimony addressing the condition.

12 **Q. What is the Company's general response to the conditions proposed by Staff?**

13 A. With the modifications we propose in my Schedule DAB-14, Staff's conditions allow
14 Grain Belt Express to proceed with development under continuing Commission oversight
15 without delaying or jeopardizing the benefits the Project can provide to Missouri. The
16 conditions recognize that there is a necessary sequence to the development of a large
17 transmission line following the shipper-pays model, and that it is essential that Grain Belt
18 Express obtain a CCN as a necessary precondition for obtaining financing to construct
19 the Project. Requiring the filing of financing agreements with the Commission after a
20 CCN is granted allows the Commission and Staff to monitor Grain Belt Express without
21 unduly delaying the development of the Project.

22 Many of the Company's suggested changes to the conditions reflect a desire not
23 to file a large number of documents that require the Commission to affirmatively

1 “accept” or “approve” what is filed. It is not clear how an acceptance or approval process
2 would work, or whether it would create a series of post-hearing proceedings that would
3 be burdensome, as well as cause uncertainty for the Project. Even without a formal
4 acceptance requirement, the Commission would retain broad authority to review,
5 investigate, or open a new docket with respect to any information filed by Grain Belt
6 Express.

7 **Q. In his rebuttal at page 17, Mr. Beck proposed that a CCN condition that “the cost of**
8 **the Project and any AC Collector System owned by Grain Belt Express will not be**
9 **recovered through the SPP cost allocation process or from Missouri ratepayers.”**
10 **What is your response to this condition?**

11 A. Grain Belt Express has no objection to the intent of this condition, but it requires
12 clarification. First, the condition should also reference MISO cost allocation, not just
13 SPP cost allocation. Second, the condition should apply only to Grain Belt Express. If
14 some other entity desires to seek cost recovery (for example, recovery of the cost of
15 buying transmission service), it should be free to do so through the appropriate regulatory
16 process. Since Grain Belt Express has no ability to control other entities, the condition in
17 the Company’s CCN should be limited to Grain Belt Express. I have proposed revised
18 text for this condition in Section II of this testimony, above.

19 **Q. Should Grain Belt Express also commit not to recover costs from any transmission**
20 **system upgrades, as suggested by Ms. Kliethermes in her rebuttal testimony at page**
21 **10?**

22 A. No. A commitment not to recover any costs of interconnection upgrades through cost
23 allocation is overly broad and inappropriate. Under the relevant RTO rules, Grain Belt

1 Express already must pay for the upgrades it needs to assure reliability of the Project's
2 interconnection.²² However, a single transmission upgrade may address multiple
3 concerns and serve multiple purposes. For example, a new line could alleviate an
4 overload from the Project's interconnection *and* alleviate a pre-existing reliability
5 concern. In such situations, an RTO may allocate part of the cost of the upgrade to Grain
6 Belt Express, and part of the cost of the upgrade through regional cost allocation. The
7 amount allocated to load through regional cost allocation would be commensurate with
8 the benefits provided. And, importantly, it would be the transmission owner that owns
9 the upgrade recovering costs, not Grain Belt Express. Obviously, Grain Belt Express has
10 no control over what another party does or does not recover, or how.

11 The Commission can rely on the RTOs existing rules that allocate Grain Belt
12 Express its share of upgrades. Consequently, no condition is needed for the case where
13 Grain Belt Express is the sole cause of an upgrade because current RTO rules require the
14 Company to fund the upgrade and cost allocation is not available. If there are multiple
15 causes of the upgrade, then the relevant RTO rules should apply, and the Commission
16 and Staff could monitor any such "multi-purpose" upgrades through the relevant RTO
17 planning process.

18 Grain Belt Express has no objection, however, to committing not to recover the
19 costs of the feeder lines it will own in western Kansas (as discussed by Ms. Kliethermes
20 in footnote 12 on page 10 of her rebuttal). The single purpose of these lines is to connect
21 wind generation to the Project's Kansas converter station.

²² The single exception is MISO, which still requires interconnection customers to pay 90% of the cost of network upgrades above 345 kV.

1 **Q. Ms. Kliethermes suggests at page 10 and 41 of her rebuttal that Grain Belt Express**
2 **should commit only to use 500 MW of capacity of the Missouri converter station.**
3 **See Beck Rebuttal at p. 20. What is your response?**

4 A. Grain Belt Express has no objection to this condition. 500 MW is the intended size of the
5 Missouri converter station. However, as will be discussed below, this condition
6 contradicts another condition recommended by Staff witness Michael Stahlman, which
7 would require Grain Belt Express perform RTO studies on the converter at a 1,000 MW
8 deliver capacity.

9 **Q. Staff proposed two conditions related to the financing of the Project, one sponsored**
10 **by Mr. Beck in his rebuttal on pages 18-19, and the other by David Murray in his**
11 **rebuttal at page 10 (also noted by Mr. Beck at page 22 of his rebuttal). What is your**
12 **response to these conditions?**

13 A. These two conditions can be treated as one. The condition proposed by Mr. Murray is
14 less clear with respect to the “projected amount of debt needed to complete the line,”
15 while the condition proposed by Mr. Beck more clearly ties the amount of financing
16 needed to the cost to construct the Project. The Company suggests the following text for
17 the combined condition, with the **bold** language representing text added to Mr. Beck’s
18 proposed condition to reflect the concepts in Mr. Murray’s condition:

19 Grain Belt Express will not install transmission facilities for the Grain Belt Express Clean
20 Line Project on easement property until such time as Grain Belt Express has obtained
21 commitments for funds in a total amount equal to or greater than the total project cost. To
22 allow the Commission to verify its compliance with this condition, Grain Belt Express shall
23 file the following documents at such time as Grain Belt Express is prepared to begin to install
24 transmission facilities:

25 a) On a confidential basis, equity and loan or other debt financing agreements and
26 commitments entered into or obtained by Grain Belt Express or its parent company for the
27 purpose of funding the Grain Belt Express Clean Line Project that, in the aggregate, provide
28 commitments for funds for the total project cost;

1 b) An attestation certified by an officer of Grain Belt Express that Grain Belt Express has not,
2 prior to the date of the attestation, installed transmission facilities on easement property; or a
3 notification that such installation is scheduled to begin on a specified date;

4 c) A statement of the total project cost, broken out by the components listed in the definition of
5 "total project cost," above, and certified by an officer of Grain Belt Express, along with a
6 reconciliation of the total project cost in the statement to the total project cost as of the
7 Application of \$2.2 billion; and property owned in fee by Grain Belt Express including the
8 converter station sites;

9 d) A reconciliation statement, certified by an officer of Grain Belt Express, showing that (1)
10 the agreements and commitments for funds provided in (a) are equal to or greater than the total
11 project cost provided in (c) and (2) the contracted transmission service revenue is sufficient to
12 service the debt financing of the project (taking into account any planned refinancing of
13 debt).

14 **Q. Mr. Murray at page 11 of his rebuttal suggests a condition requiring ZAM Ventures**
15 **to guarantee Clean Line Investor Corp.'s obligations with respect to its investment in**
16 **Grain Belt Express. See also Beck Rebuttal at p. 22. What is your response?**

17 **A.** This requirement is not appropriate. First, it imposes a condition on ZAM Ventures
18 requiring it to do something. ZAM Ventures is an investor in Clean Line but not a
19 participant in this proceeding. Second, it is unclear what obligations would be covered by
20 the suggested guarantee. ZAM Ventures invests in Clean Line Energy Partners LLC,
21 which in turn provides the equity capital to Grain Belt Express. The board of directors of
22 Clean Line Energy Partners LLC, not ZAM Ventures, manages the expenditures of and
23 contributes equity capital to Grain Belt Express.

24 If ZAM Ventures participates in the project financing of Grain Belt Express, the
25 Project's lenders will assure the appropriate credit support is behind the equity
26 commitment. Grain Belt Express is willing to make information about future financings
27 part of its informational filings with the Commission, but the Commission should not
28 mandate specific forms of credit support from investors in Clean Line Energy Partners

1 LLC. The financial markets will address this issue adequately without additional
2 regulatory requirements.

3 **Q. Staff witness Michael Stahlman recommends at page 18 of his rebuttal that the**
4 **Commission require Grain Belt Express to complete and make public all RTO**
5 **studies with the Missouri converter rated at 1,000 MW “and with the potential for**
6 **exporting energy from the MISO and the PJM, and importing energy into the SPP”**
7 **before commencing any eminent domain proceedings. See also Beck Rebuttal at**
8 **p.22. What is your response?**

9 A. The condition is unnecessary and inappropriate. Grain Belt Express is willing to make
10 public all the necessary RTO studies prior to commencing construction. This
11 commitment is already in a separate condition proposed by Staff, which Grain Belt
12 Express has accepted. There is no need to duplicate it.

13 In addition, Grain Belt Express has agreed to another condition that requires it to
14 return to the Commission for permission before increasing the delivery amount of the
15 Missouri converter station above its intended capacity of 500 MW. Therefore, it
16 unnecessary and wasteful to require the Company to complete RTO studies for a
17 hypothetical scenario that is contrary to a condition in its CCN.

18 Finally, Grain Belt Express has no business plans to use the line to export energy
19 from MISO and PJM into SPP. The Commission should not require Grain Belt Express
20 to study uses of the Project that are not part of its current business plan. The requirement
21 would represent a material delay in the Project’s development because it would restart the
22 Project’s interconnection studies which already have been underway for four years.

1 Q. Mr. Stahlman at page 18 of his rebuttal also recommends that any use of eminent
2 domain by Grain Belt Express not occur “until after the actual construction of at
3 least 25% of the completed cost” of the Missouri converter station. See Beck
4 Rebuttal at p. 22. What is your response?

5 A. Mr. Stahlman’s condition should not be adopted because it creates ambiguity and
6 unnecessarily complicates the timely completion of the Project. The procurement process
7 and contracts for converter stations do not typically provide a separate price for each
8 station, so calculating the percentage called for by the text condition is problematic. The
9 condition is also unclear regarding the meaning of “construction of at least 25% of the
10 completed cost.”

11 Moreover, the condition links two unrelated issues—the converter station and
12 land acquisition—in a way that does not fit with the Project’s schedule. The payment
13 schedule for a vendor providing converter stations is normally weighted toward the
14 middle and end of the construction period. On the other hand, easement acquisition must
15 be completed in advance of a transmission line’s construction. Therefore, Staff’s
16 condition creating a serious potential for costly delays.²³

17 A more direct and effective way to address Mr. Stahlman’s concern is to
18 condition the Company’s CCN on installing the Missouri converter station, which is an
19 integral part of the Project. Grain Belt Express will agree to install the Missouri
20 converter station and has no objection to formalizing this commitment.

²³ To be clear, Grain Belt Express would only exercise eminent domain authority after exhausting reasonable efforts to obtain easements through voluntary means.

1 Q. Staff witness Sarah Kliethermes recommends at pages 3-4 of her rebuttal that the
2 Commission order Grain Belt Express to perform a number of studies and provide
3 them for Commission approval “in compliance with the Tartan Criteria and other
4 applicable law.” *See also Beck Rebuttal at p. 19.* What is your response?

5 A. Grain Belt Express believes it has provided Staff and the Commission with the
6 appropriate studies and modeling work to reach the necessary conclusions about the
7 Project. The Company has presented an extensive amount of studies in this proceeding in
8 our direct and surrebuttal testimony. In the course of this proceeding, we also provided
9 Staff with additional model runs which examined the Missouri converter station in
10 isolation (i.e., without the Indiana interconnection) – even though we do not consider this
11 a plausible scenario. And, in response to Ms. Kliethermes’ rebuttal testimony, the
12 Company performed additional analysis on ancillary services and the Project’s effect on
13 generation owned by Missouri load- serving entities, as discussed in the surrebuttal
14 testimony of Rorbet Cleveland.

15 With respect to very detailed studies of ancillary services, as discussed in Robert
16 Zavadil’s surrebuttal testimony, these are best performed on a regional and RTO-wide
17 basis, not with respect to a specific project. Grain Belt Express has no objection to a
18 condition on its CCN requiring it to provide data and inputs into any future RTO-wide
19 studies of wind integration and ancillary services.

20 In Schedule DAB-15 I have provided a list of the studies that we have conducted
21 to support the Application. All of this modeling work and the clarifications provided in
22 this proceeding are sufficient to allow the Commission to find that Grain Belt Express

1 meets the Commission's CCN criteria. The additional studies requested by Ms.
2 Kliethermes should not be required.

3 **V. OTHER ISSUES RAISED IN INTERVENOR TESTIMONY**

4 a. The Project must follow the development sequence it has proposed

5 **Q. MLA witness Dr. Jeffery Gray suggests at pages 11 and 17 of his rebuttal that Grain**
6 **Belt Express must sign capacity contracts in order to demonstrate need for the**
7 **service and obtain a CCN. What is your response?**

8 A. Dr. Gray's suggestion that Grain Belt Express first obtain capacity contracts and only
9 then seek a permit from the Commission is neither practical nor possible. Without a
10 CCN from the Commission, Grain Belt Express cannot commit to a schedule to provide
11 service on a known route. Only with the Commission's authorization can the Project be
12 built. Before entering into large transmission service commitments, shippers, whether
13 generators or load- serving entities, demand to know the schedule on which service can
14 be provided, the route of transmission line, and whether the line can in fact be built.

15 Further, the Company has presented extensive information regarding the
16 economic feasibility of the Project, including a detailed levelized cost of energy model
17 showing the Project's delivered energy cost compared to other alternatives, as I discuss in
18 Section III, above. This analysis shows that Grain Belt Express is the lowest cost source
19 of clean energy available to Missouri, and in most scenarios is cheaper than conventional
20 generation as well. In addition, as I discuss in my direct testimony at page 15, the
21 Company determined that the average price of energy from the most competitive 4,000
22 MW of wind suppliers in its RFI was 2.0 cents per kWh.

23 Grain Belt Express has presented extensive evidence in this proceeding regarding
24 the need for the service by both generators, who need transmission infrastructure to

1 connect to markets, and load-serving entities, who need low-cost clean energy. Of
2 particular note, Grain Belt Express conducted a request for information (RFI) to which
3 over 13,500 MW of high capacity factor wind projects responded with interest, as
4 discussed in my direct testimony at page 15. In addition, the Company has presented
5 extensive information on the substantial renewable energy demand in Missouri and, more
6 broadly, in the MISO and PJM markets, as I describe in my direct testimony at pages 11-
7 12 and 22-23. The Commission can rely on this evidence without creating an
8 unworkable “Catch-22” for Grain Belt Express, which is what would occur if the
9 Commission followed Dr. Gray’s suggestion.

10 Finally, the conditions proposed by Staff, as agreed to by Grain Belt Express,
11 assure that when the Project proceeds to construction, it will have the necessary contracts
12 in place. These contracts are a precondition to project financing and are essential to
13 satisfy the financing conditions on the Company’s CCN.

14 **Q. Why must Dr. Gray’s recommendations regarding capacity contracts be rejected?**

15 A. If the Commission were to deny the Application without prejudice and require Grain Belt
16 Express to return once it has signed capacity contracts, it would place the Company in an
17 unresolvable “chicken and egg” dilemma. On the other hand, if the Application is
18 granted now, the conditions proposed by Staff assure that the Project will proceed to
19 construction only after contracts have been signed and the construction costs fully
20 financed. Grain Belt Express and its investors, not the public, will bear the risk of having
21 in place adequate contracts and financing for the Project.

22 b. Grain Belt Express is capable of financing the Project

23 **Q. Do you agree with Staff witness Mr. Murray at page 3 of his rebuttal that Grain**
24 **Belt Express “has the financial qualifications to be granted a CCN for the**

1 **transmission line, and converter stations?”**

2 A. Yes, I do. Mr. Murray came to this conclusion after reviewing the financial strength of
3 the Company’s investors and the validity of its financing plan.

4 **Q. MLA witness Jeffrey Gray states at page 17 that the Grain Belt Express financing**
5 **plan is “aspirational.” Is this accurate?**

6 A. No. While the permanent financing for the Project is not in place because it is not yet
7 needed, the Project’s financing plan is far from aspirational. Grain Belt Express has a
8 detailed financing plan which was presented in my direct testimony at pages 37-52. The
9 capital markets have a clear history of supporting projects like the Grain Belt Express
10 Project. The management of Grain Belt Express has extensive experience in project
11 finance and is developing the Project to meet investors’ requirements. Finally, Clean
12 Line’s investors National Grid USA and ZAM Ventures are very capable of supporting
13 the Project financially as it reaches additional milestones.

14 **Q. Dr. Gray argues at pages 18-19 of his rebuttal that some of the transactions cited in**
15 **your direct testimony are not relevant precedents for Grain Belt Express. Why are**
16 **these transactions relevant?**

17 A. These transactions demonstrate the successful track record of transmission lines raising
18 many billions of dollars of capital on a project financing basis. Dr. Gray attempts to draw
19 distinctions between different transmission transactions, but none of these differences
20 change the basic fact that the project finance community is eager to invest in properly
21 supported transmission lines with a variety of specific characteristics.

22 Dr. Gray states that, unlike the Project, the CREZ (competitive renewable energy
23 zone) lines in Texas were rate-regulated. The CREZ transmission owners have the right

1 to recover their capital and operating costs through rate cases filed at the Texas Public
2 Utility Commission. Grain Belt Express, on the other hand, will recover its capital and
3 operating costs from negotiated contracts with specific shippers. However, there is
4 nothing unusual or untested about large infrastructure projects relying on bilateral
5 contracts to recover their costs. Hundreds of billions of dollars of independent power
6 plants, pipelines, and liquefied natural gas facilities have been financed on the basis of
7 bilateral contracts. In fact, bilateral contracts have some advantages over regulated rate
8 recovery. Bilateral contracts have no risk of disallowed costs or adverse decisions in rate
9 cases, and they have less exposure to risk from changes in energy policy or utility
10 regulation. Both regulated rate recovery and bilateral contracts provide a strong basis for
11 successful project financing.

12 Dr. Gray argues at page 18 that the Neptune and Hudson underwater HVDC lines
13 are also substantially different from the Project. He points out the Neptune and Hudson
14 lines linked two different points on the AC grid. However, the Grain Belt Express
15 Project also connects three high- voltage substations on the AC grid in SPP, MISO and
16 PJM. The description of the Project as a “generator lead line” is simply inaccurate.
17 Though the Project’s primary purpose is to move wind power directly connected to the
18 Kansas HVDC terminal, it is still connected to the AC grid. Dr. Gray points out the
19 Neptune and Hudson projects have a reliability justification, but the Grain Belt Express
20 Project also improves reliability, as explained in the direct and surrebuttal testimony of
21 Company witness Robert Zavadil. While the rationale for the Project is important to grid
22 planners, lenders and investors care primarily about the underlying revenue stream. Dr.
23 Gray points out that Neptune and Hudson had known customers. Grain Belt Express,

1 too, will have known customers at the time of its financing. Finally, Dr. Gray points out
2 that the Neptune and Hudson projects avoided land-use impacts by being located
3 underwater. This is not entirely correct. Both had an onshore component in highly
4 populated areas. Further, the challenges of embedding transmission cable on the sea
5 floor are substantial and create additional risk to project execution and maintenance. In
6 sum, the successful financing of the Neptune and Hudson projects is relevant to the
7 financing of the Grain Belt Express Project.

8 c. Renewables will be the primary or exclusive source of power for the Project

9 **Q. On page 13 of her rebuttal testimony, Ms. Reichert asserts that “dirty energy” could**
10 **be transported on the transmission line. MLA witness Dr. Gray raises a similar**
11 **concern on p. 15 of his rebuttal testimony. Is there any uncertainty that generators**
12 **connecting to the Project will be wind generators?**

13 **A. No.** Dr. Gray’s and Ms. Reichert’s only argument in support of their position is that
14 Grain Belt Express cannot refuse service requests to non-renewable generators. The
15 Company’s inability to prefer renewable energy is hardly unique. To my knowledge,
16 FERC has never approved a preference for renewable generation. Despite this, many
17 billions of dollars of new transmission has been approved and constructed on the basis of
18 enabling low-cost wind.

19 To the contrary, it is safe to assume the generation connecting to the Project will
20 be high capacity factor wind generation based on (1) the plentiful wind resource in
21 western Kansas, (2) the cost advantage of wind generation in western Kansas versus in
22 other states to the East, (3) the lack of such cost advantage for other generation besides
23 wind, (4) the high level activity of wind developers, (5) the low level of activity of
24 developers of other kinds of power plants in western Kansas, and (6) several precedents

1 (including the MISO MVP Projects) which made rational assumptions about the location
2 of new wind generation.

3 **Q. What factors did Grain Belt Express consider in deciding to locate the western
4 converter station of the Project in Ford County, Kansas?**

5 A. Grain Belt Express looked for a location near an existing high-voltage transmission line
6 that could provide the needed voltage support and that is in close proximity to an
7 excellent wind resource area that could produce very low-cost wind energy. In
8 determining that Ford County is such a location, the Company relied on wind studies
9 performed by meteorology firms and the Department of Energy's National Renewable
10 Energy Laboratory (NREL), discussions with wind developers, our own management
11 team's experience in developing wind farms in western Kansas, and our experience with
12 transmission constraints in western Kansas that prevent further build out of generation.

13 **Q. What is the level of activity of wind developers in the vicinity of the Project's
14 western converter station?**

15 A. Fourteen developers advancing 26 wind farms totaling more than 13,500 MW responded
16 with interest to Grain Belt Express' RFI. There are even more wind projects under
17 development in the area that did not respond to the RFI.

18 **Q. How does this compare to the development activity of thermal power plants in
19 western Kansas?**

20 A. I am aware that Sunflower Electric Power Corporation, an electric cooperative located in
21 Hays, Kansas, is considering expanding its Holcomb Station coal power plant. The
22 expansion would primarily serve members of the Tristate Generation Cooperative in
23 Colorado, New Mexico, Nebraska and Wyoming. However, this expansion is the subject

1 of ongoing environmental litigation and a contested permitting process. Further,
2 Sunflower has shown no interest in using the Grain Belt Express to ship power. Other
3 than the Holcomb Station, I have no knowledge of any thermal generation under active
4 development, meaning the developer is acquiring land and working on obtaining permits.
5 Nor am I aware of any plans by owners of existing thermal generation in western Kansas
6 to connect to the Grain Belt Express Project to export power eastward.

7 **Q. In response to Dr. Gray's rebuttal testimony at page 13, why does wind generation**
8 **have a geographic advantage by locating in western Kansas?**

9 A. Wind speeds are higher in western Kansas and the surrounding region than they are in
10 other locations to the east. These higher wind speeds result in higher capacity factors and
11 lower costs to generate wind energy. In addition, in my experience the cost to construct
12 wind farms is cheaper in western Kansas than in locations farther east. Larger wind
13 farms are possible in western Kansas due to lower population density and higher
14 prevalence of windy land areas. These larger wind farms result in economies of scale in
15 construction. They are cheaper to construct, on a unit cost basis, than a smaller wind
16 farm.

17 **Q. Do any other types of generation resources have a similar geographic advantage**
18 **compared with western Kansas and the surrounding region?**

19 A. No, they do not, which explains the failure of other kinds of generators to subscribe for
20 long-term capacity on the Grain Belt Express Project. As shown in the LCOE analysis
21 presented in this testimony, only natural gas power plants are cost-competitive with wind
22 generation in western Kansas. However, based on the cost of natural gas, generators do
23 not enjoy a large advantage by locating in Kansas instead of Missouri. From January

1 2010 until July 2014, average monthly “city gate” natural gas prices were \$0.54/MMBtu
2 lower in Kansas than in Missouri.²⁴ Natural gas heat rates, the measure of how much
3 natural gas is necessary to produce one kilowatt-hour of electricity, typically range from
4 7,000 to 10,000 BTU/kWh. Using EIA’s average price difference as a proxy for the
5 difference in natural gas prices between Missouri and Kansas it would be on average,
6 0.38 cents to 0.54 cents more expensive per kilowatt-hour to burn natural gas in Kansas
7 than in Missouri to generate electricity. This is much less than Grain Belt Express’
8 anticipated transmission charge. Therefore, there is no economic advantage to burning
9 gas in western Kansas and shipping it east using the project, and no reason to build new
10 gas generation in order to subscribe for long-term capacity on the Grain Belt Express
11 Project.

12 **Q. Responding to Mr. Gray’s questions at pages 13-14 regarding the information you**
13 **provided to Company Witness Gary Moland, what specific assumptions did you**
14 **make about the generation connected to the Kansas converter station for purposes**
15 **of Mr. Moland’s modeling?**

16 **A.** I selected ten wind farm sites for which modeled output was available from NREL’s
17 Eastern Wind Integration and Transmission Study. I selected sites so that the sum of
18 their capacity is 4,700 MW. I do not believe that the specific sites selected are critical.
19 There is more than enough wind resource potential in western Kansas to fill the Project’s
20 capacity many times over. Moreover, the seasonal and diurnal patterns of wind
21 generation in western Kansas are relatively consistent. To prove this, I selected a
22 different set of wind farms in western Kansas that produce the same amount of energy as

²⁴ EIA. See <http://www.eia.gov/dnav/ng>. Last accessed October 3, 2014.

1 the original eight I selected. Schedule DAB-16 shows that the production profiles of the
2 two sets of wind farms are substantially similar.

3 **Q. Is it common practice to make assumptions about the location of new generation to**
4 **study the benefits of planned transmission lines?**

5 A. Yes. For example, in performing the cost-benefit analysis for the MISO MVP lines,
6 MISO made assumptions about the locations of new wind generation based on where the
7 lowest cost generation could be sited. Of note, MISO did not include only wind
8 generation with signed power purchase agreements or interconnection agreements. The
9 location of the new wind generation was based on (1) NREL wind mapping data, similar
10 to the data used by Grain Belt Express in this proceeding, to identify locations where
11 wind generators are likely to be developed, and (2) the estimated costs to produce
12 electricity in particular wind resource regimes. A substantial component of the benefits
13 of the MVP transmission lines is in improving the ability of electricity from remote wind
14 generators to flow to areas where it is demanded.²⁵

15 The Southwest Power Pool, the California Independent System Operator, and the
16 Electric Reliability Council of Texas (ERCOT) have done similar analyses to measure the
17 benefits for transmission lines which have been approved for construction and, in many
18 cases, have gone into service. All of these transmission planners have justified the
19 construction of major new transmission lines to support wind energy by making reasoned
20 assumptions about the location of new wind generation. Importantly, all of these studies
21 relied on wind resource analysis and wind developer activity, not on signed

²⁵ The MISO MVP benefit study is available at <https://www.midwestiso.org/Planning/Pages/MVPAnalysis.aspx>. Last accessed October 13, 2014.

1 interconnection or transmission service agreements. Schedule DAB-17 provides a more
2 detailed overview of these studies.

3 **Q. Staff witness Mr. Beck suggests at page 8, lines 18-20 of his rebuttal that wind**
4 **projects in western Kansas have not entered construction because they have not**
5 **obtained financing commitments, not because of a lack of transmission**
6 **infrastructure. What is your response?**

7 **A.** Adequate transmission access, along with access to markets with a demand for renewable
8 energy, is a precondition for successful project financing. That wind farms in western
9 Kansas have not obtained project financing does not imply that they do not need
10 transmission and market access. In fact, large amounts of capital exist to support wind
11 farm developments with proper transmission and market access, but this capital will only
12 be deployed when the necessary transmission infrastructure is permitted, approved, and
13 its construction underway.

14 d. Grain Belt Express Clean Line is qualified to sell the service offered

15 **Q. MLA witness Dr. Gray comments at page 19 of his rebuttal that Grain Belt Express**
16 **is only qualified to provide service to the extent of National Grid's involvement. Do**
17 **you agree with his assessment?**

18 **A.** No. Dr. Gray states that Grain Belt Express is not qualified because it has never built a
19 transmission line before. If the Commission were to take this approach, no new entity
20 could ever be authorized to construct a transmission line. The actual experience of a
21 legal entity like Grain Belt Express is far less relevant than the qualifications of its
22 management personnel. As detailed in Schedule MPS-1 to Michael Skelly's Direct
23 Testimony, the employees of Clean Line that manage the Grain Belt Express Project have
24 extensive experience in developing, constructing, and operating energy infrastructure in

1 general, and transmission lines in particular. The experience of Clean Line employees
2 with other companies and on other projects is directly relevant to the successful execution
3 of the Project.

4 **Q. Will National Grid be involved in Grain Belt Express' construction and operations?**

5 A. Yes. As detailed in the testimony of Stanley Blazewicz, Vice President of U.S. Business
6 Development at National Grid USA, National Grid is one of the most experienced HVDC
7 installers and largest network infrastructure owners in the world. It will be deeply
8 involved in the management of the Project's construction and operation. Grain Belt
9 Express will be able to benefit from National Grid's expertise and experience wherever
10 needed.

11 f. Additional issues

12 **Q. At page 17 of her rebuttal testimony, Ms. Kliethermes recommends that Grain Belt**
13 **Express study whether it is more beneficial to manage wind variability in SPP prior**
14 **to shipping the power east to MISO and PJM. What is your response to this**
15 **suggestion?**

16 A. Grain Belt Express has considered this alternative but does not consider it to be feasible.
17 Grain Belt Express has not requested the interconnection rights necessary to interconnect
18 over 4 GW of wind directly to the SPP system. Nor is the system in western SPP strong
19 enough to accommodate such a large interconnection. The interconnection rights needed
20 to manage the wind variability in SPP would therefore not be available even if Grain Belt
21 Express had requested. Further, moving the wind variability to the much larger MISO
22 and PJM markets will allow for a lower cost integration. SPP already has over 3,000
23 MW of wind generation in the Texas Panhandle, Oklahoma Panhandle and western
24 Kansas region. All of these areas have a correlated wind resource, meaning wind farms

1 tend to ramp up and down at the same time. In contrast, the wind resources of MISO and
2 PJM are not correlated with the western Kansas wind resource, as discussed in the
3 surrebuttal testimony of Robert Zavadil. Combining geographically diverse wind
4 resources will smooth overall wind variability and reduce integration costs.

5 **Q. MLA witness Jeffery Gray argues at page 16 of his rebuttal that Grain Belt Express**
6 **should establish financial security for the removal of the transmission line, noting**
7 **that wind turbines often do so. Do you agree with his recommendation?**

8 A. No, I do not. Grain Belt Express has committed to remove any structures in place when
9 the Project ceases operations and to restore the land subject to easement. This
10 commitment is part of Grain Belt Express's standard easement agreement. An
11 abandoned transmission line is extremely unlikely. For over 100 years, electric
12 transmission lines have been constructed in the United States, and I am unaware of a
13 single transmission line that has been constructed and then abandoned. Nor did Dr. Gray
14 provide any such examples.

15 **Q. Several witnesses who testified at the local public hearings, including Representative**
16 **Jim Hansen (transcript Vol. 2 at 66), proposed that developing additional wind**
17 **farms in Missouri would be a more cost-effective method of meeting the RPS than**
18 **transporting wind power to the state from Kansas. Can you explain the challenges**
19 **to building new wind projects within the state?**

20 A. The wind resource in Missouri is not as robust as in Kansas. As a result, the cost to build
21 and produce energy from a wind farm in Missouri is significantly more than it would be
22 for a wind farm in western Kansas where wind speeds are much higher. Both my LCOE
23 model and Dr. Proctor's model show Missouri wind to be substantially more expensive

1 than the energy delivered by the Project. In addition, land use constraints have an impact
2 on the feasibility of developing wind farms. For instance, land parcels in Missouri are
3 generally smaller and have more varied topography than in western Kansas, which
4 reduces suitability for wind farm development. Finally, environmental constraints limit
5 development in some areas of Missouri where the wind resource is the strongest. For
6 example, Element Power was planning to develop the 200 MW Mill Creek Wind Farm
7 project in Holt County Missouri, only to cancel the project due to environmental
8 constraints and the high cost of development.

9 **Q. On page 16 of his testimony, Charles Kruse states, “In my opinion, Grain Belt’s**
10 **plan provides at best only a minimal public good that is far outweighed by the**
11 **negative impacts of this project on the citizens of Missouri.” Do you believe that the**
12 **Project’s benefits to Missouri outweigh the concerns that Mr. Kruse expresses?**

13 **A.** Yes, I do. While we take very seriously the issues raised by Mr. Kruse about land use
14 impact and eminent domain, we also believe that the Project provides an important and
15 beneficial service to the state. Abundant access to clean and affordable energy sources is
16 an essential public good. The Project can deliver clean energy to Missouri at large scale
17 for a price that is equal to or less than fossil-fuel generation, create jobs in construction
18 and manufacturing, reduce pollution and water usage, and reduce electric rates.

19 **Q. Does this conclude your testimony?**

20 **A.** Yes, it does.

**BEFORE THE PUBLIC SERVICE COMMISSION
OF THE STATE OF MISSOURI**

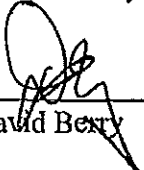
In the Matter of the Application of Grain Belt)
Express Clean Line LLC for a Certificate of)
Convenience and Necessity Authorizing it to) Case No. EA-2014-0207
Construct, Own, Operate, Control, Manage and)
Maintain a High Voltage, Direct Current)
Transmission Line and an Associated Converter)
Station Providing an Interconnection on the)
Maywood 345 kV transmission line.)

AFFIDAVIT OF DAVID BERRY

STATE OF TEXAS)
) ss
COUNTY OF HARRIS)

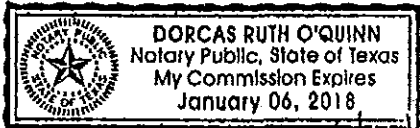
David Berry, being first duly sworn on his oath, states:

1. My name is David Berry. I am Executive Vice President – Strategy and Finance of Clean Line Partners, LLC.
2. Attached hereto and made a part hereof for all purposes is my Surrebuttal Testimony on behalf of Grain Belt Express Clean Line, LLC consisting of 71 pages, having been prepared in written form for introduction into evidence in the above-captioned docket.
3. I have knowledge of the matters set forth therein. I hereby swear and affirm that my answers contained in the attached testimony to the questions therein propounded, including any attachments thereto, are true and accurate to the best of my knowledge, information and belief.



David Berry

Subscribed and sworn to before me this 14th day of October, 2014.





Notary Public

My Commission Expires: 1/6/2018

Schedule DAB-8.1
Comparison of Grain Belt Express Benefit Studies to MISO MVP Projects
and SPP Priority Projects

Analysis Type	Clean Line	SPP Priority Projects ¹	MISO MVP Projects ²
Adjusted Production Cost (APC)	Surrebuttal Testimony of Robert Cleveland	Economic Modeling Tools – PROMOD, pages 21-23, 28	Section 8.1 Congestion and fuel savings, pages 49-54
	Schedule RC-2 Used PROMOD to calculate the APC in a base case and a change case (with the Grain Belt Project). Reported the decrease in APC as a benefit.	Used PROMOD to calculate the APC in a base case and a change case (with the Priority Projects). Reported the decrease in APC as a benefit.	Used PROMOD to calculate the APC in a base case and a change case (with the MVP Portfolio). Reported the decrease in APC as a benefit.
Levelized cost of energy (LCOE) model	Direct and Surrebuttal Testimony of David Berry	N/A	Section 4.2 Wind Siting Strategy, pages 16-17
	Used an LCOE model quantify the benefits of being able to access higher capacity factor and lower cost wind resources than would be possible without transmission expansion.	Wind was sited based on stakeholder input. Cost differentials were not considered for wind siting.	Used capital costs associated with transmission and generation, along with mesoscale wind data from NREL to calculate relative costs of sourcing wind from various zones. Quantified the overall system cost of siting wind in these zones and picked zones with the lowest cost.
Local economic development and jobs analysis	Direct and Surrebuttal Testimony Company witness Dr. David Loomis	Brattle Group Analysis, page 37.	Section 9.5 Local investment and job creation, page 77
	Estimated the economic impacts of the Grain Belt Project and the wind enabled by the project. Used the JEDI model to quantify the economic impact of the interconnected wind.	Estimated the economic impacts of the wind enabled by the SPP Priority Projects. Used JEDI model to quantify economic impact of the interconnected wind.	Estimated the economic impacts of the MISO MVP Projects. Used Brattle estimates to quantify economic impact of transmission investment.
Environmental benefits	Direct Testimony of Gary Moland and Surrebuttal Testimony of Robert Cleveland	N/A	Section 9.5 Carbon Reduction, pages 78-79
	Used PROMOD to quantify the carbon emissions reductions associated with generation displaced by Grain Belt Project-enabled wind.	Carbon reductions are mentioned as a benefit, but results were not quantified.	Used PROMOD to estimate the carbon emissions reductions associated with generation displaced by MVP Project-enabled wind.

Sources:

¹SPP Priority Projects Phase II Report. Published: February 1, 2010. <http://www.spp.org/publications/Priority%20Projects%20Phase%20II%20Report.pdf> Last accessed: 13 October 2014.

²Multi Value Project Portfolio: Results and Analysis. Published: January 10, 2012.

<https://www.misoenergy.org/Library/Repository/Study/Candidate%20MVP%20Analysis/MVP%20Portfolio%20Analysis%20Full%20Report.pdf> Last accessed: 13 October 2014.

Introduced by McDavid Council Bill No. R 191-14

Permanent Record
Filed in Clerk's Office

A RESOLUTION

expressing support for economically feasible renewable energy options to serve City of Columbia customers.

WHEREAS, the City of Columbia Water and Light Department's (hereinafter "City Water and Light") mission is to deliver reliable, safe and cost effective water and electric service to meet its citizen owners' needs while providing exceptional customer service and environmental stewardship; and

WHEREAS, City Water and Light serves more than 48,000 customers in and around the City of Columbia, Missouri; and

WHEREAS, the City of Columbia voters passed a Renewable Energy Standard that mandates that the City shall cost-effectively generate or purchase electricity from renewable energy sources, including wind energy, at the following levels: 15% by 2017; 25% by 2022; and 30% by 2028; and

WHEREAS, in 2013, renewable energy comprised 6.97% of City Water and Light's electric portfolio; and

WHEREAS, the City of Columbia's Renewable Energy Standard presents a need for economically feasible renewable energy and City Water and Light is seeking viable options for new renewable energy sources to serve its customers; and

WHEREAS, Grain Belt Express Clean Line is constructing a project which has the potential to provide Missouri consumers with a direct current link to low-cost renewable energy in western Kansas (the "Project"); and

WHEREAS, the Project resource area is characterized by high wind speeds and may offer some of the lowest cost wind energy in the United States; and

WHEREAS, greater access to low-cost renewable energy such as that anticipated to be delivered by the Project serves the public interest and may help the City of Columbia fulfill its Renewable Energy Standard; and


WHEREAS, the City of Columbia Water and Light Advisory Board has reviewed the Project and submitted its recommendation and request to the City Council to express support for consideration of low cost wind energy produced by the Project.

NOW, THEREFORE, BE IT RESOLVED BY THE CITY COUNCIL OF THE CITY OF COLUMBIA, MISSOURI, AS FOLLOWS:

SECTION 1. The City Council of the City of Columbia, Missouri hereby expresses its support of economically feasible renewable energy options to serve City customers, and will consider wind power accessed by the Project as an option for new affordable renewable energy to meet the City of Columbia's Renewable Energy Standard.

ADOPTED this 10th day of October, 2014.

ATTEST:

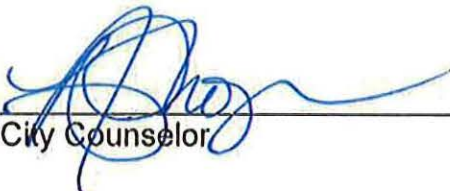


City Clerk



Mayor and Presiding Officer

APPROVED AS TO FORM:



City Counselor

Make an informed decision

Posted: Saturday, July 12, 2014 11:45 pm

This letter is to clarify a misconception promoted by some that a new power line from Grain Belt Express will provide a small amount of taxes to their county general revenue. Unfortunately, some county commissioners only look at their slice of the pie, ignoring the whole pie.

In Randolph County, Mo., the projected annual revenue from property taxes from this 21-mile long infrastructure project may exceed \$650,000, with 70 percent of that total going to local school districts. This is more estimated tax revenue from one project than revenue from 470 new houses built (assuming fair market value of \$150,000) or all of the taxes from our county's entire agricultural real estate.

This is an important new source of tax revenue to local schools, fire districts, libraries, county road districts and other tax districts, which could potentially delay new property tax increases to all the taxpayers in our county, or add needed services.

While some opponents may argue this type of project is unnecessary, I seriously doubt the majority of people would remain opposed knowing this may reduce our fossil fuel dependency. I believe the public wants reliable factual information disseminated in order to make an informed decision.

I sincerely believe we should look at the known science involved in these infrastructure projects and not rely only on hearsay when we choose to accept or condemn any project.

Richard Tregnago,

Randolph County assessor,

Huntsville, Mo.

Missouri Public Service Commission

**Public Hearing: Moberly, Mo. August 14, 2014 6:00 p.m.
Moberly City Auditorium**

Testimony in Favor of Grain Belt Express Transmission Line

**Richard Tregnago
Randolph County Assessor
110 South Main ST Suite E
Huntsville MO 65259-1009
660.277.4716**

Presented to members of the PSC, State of Missouri

Randolph County may have approximately 21 miles of the high voltage DC line being proposed. Grain Belt Express has indicated to the Missouri State Tax Commission a projected expense of 400 Million Dollars, with ¼ expense to a DC converter station in Ralls County, and, potential expenditures over 200 miles of right-of-way at approximately 300 Million Dollars, or, 1.5 Million Dollars per mile.

If projections are as stated, then Randolph County may have \$31,500,000 of new construction to be assessed locally the first year, then, the project may become State Assessed thereafter. Annual property tax estimates may exceed \$500,000 annually to various districts within the county depending on their individual levies.

The projected assessed value of the transmission line could surpass the total assessed value of all the agricultural land in Randolph County, if an assumption is made that cost may be similar to value of new construction.

**Witness Exhibit No. 20
Date 8-14-14 Reporter MSM
File No. EA 2014-0207**

Continued Page 2

A local concern I have is Randolph County currently has three coal fired electric generating stations known as the Thomas Hill Energy Center. Unit One was online in 1966 and is rated at 180 megawatts. Unit Two was online in 1969 and is rated at 285 megawatts. Unit Three was online 1982 and is rated at 670 megawatts, for a grand total of 1,135 megawatts of electric generating capacity.

The taxes paid by the owners, Associated Electric, exceed \$5,000,000 annually. Throughout the United States, older coal fired plants are closing. If Thomas Hill were to shut down Units One and Two, how would we make up 465 megawatts of power? Also, the erosion of the tax base would occur if 41% of the generating capacity is reduced.

One alternative would be to have alternate sources of electric power at an affordable rate. I believe many persons opposed to this construction are very sincere in their beliefs. I understand the towers and lines may be unsightly. I was raised near a large substation, and, a railroad, and after a period of time, both became somewhat invisible to everyday living. I would assume there are valid arguments with concerns of such high voltage lines emitting electrical magnetic fields. I have not yet been informed of any technical evidence presented by reputable physicists that offer a level of exposure or its' field of exposure at high risk levels. I am not a scientist/physicist or have expertise in those matters.

I am simply presenting a financial potential benefit to various taxing districts should this line be constructed. I also believe it would be better to have one right of way for the high voltage lines along a proposed 200 foot wide corridor, than to have several smaller capacity lines criss crossing the State with multiple avenues.

Sincerely


Richard Tregnago

Input sensitivities and updated assumptions

- Input Sensitivities
 - PTC: [0, 23] \$/MWh
 - Carbon dioxide price: [none, base, high]
 - None – no carbon costs in the future
 - Base – 15 \$/ton in 2020 to 60 \$/ton in 2040 and continued growth
 - High – 25 \$/ton in 2020 to 90 \$/ton in 2040 and continued growth
 - Natural gas price: [80, 100, 120]% of EIA AEO2014 projections, corrected for Mcf to mmBtu conversion
 - KS wind capacity factor: [50, 55, 60]%
 - MO wind capacity factor: [25, 30, 35]%
- Updated capital cost to reflect latest RTO studies – an increase by \$214 million to the upgrade costs in PJM

Input Sensitivities	Low	Med	High
PTC Value (\$/MWh)	0	X	23
Carbon Dioxide Price (Scenario)	None	Base	High
Natural Gas Price (% of EIA forecast)	80	100	120
KS Wind Capacity Factor (%)	50	55	60
MO Wind Capacity Factor (%)	25	30	35

*2*3⁴=162 scenarios considered*

The tables on the following pages show the levelized cost of the different generation methods including capacity value for each scenario. The numbers on the 2nd through 6th columns represent the low (0), med (1), and high (2) case as described above (except for the PTC column where 1 represents the high case). Values are in \$/MWh.

Kansas wind and Grain Belt Project levelized costs are lowest in 80% of all cases. It is lower than Coal, Nuclear, and Solar in every scenario, and is cheaper than Missouri wind in 89% and Gas in 89% of all scenarios.

Grain Belt Express

Updated LCOE Results

Scenario	PTC Value	Carbon Dioxide	Natural Gas	KS Wind CF	MO Wind CF	Grain Belt Project	Missouri Wind	Pulverized Coal	Combined Cycle Gas	Nuclear	Utility-scale Solar
1	0	0	0	0	0	68.65	90.39	79.70	50.65	102.23	122.20
2	0	0	0	0	1	69.73	77.32	79.70	50.65	102.23	122.20
3	0	0	0	0	2	70.50	67.99	79.70	50.65	102.23	122.20
4	0	0	0	1	0	62.96	90.39	79.70	50.39	102.23	122.20
5	0	0	0	1	1	64.04	77.32	79.70	50.39	102.23	122.20
6	0	0	0	1	2	64.81	67.99	79.70	50.39	102.23	122.20
7	0	0	0	2	0	58.22	90.39	79.70	50.39	102.23	122.20
8	0	0	0	2	1	59.30	77.32	79.70	50.39	102.23	122.20
9	0	0	0	2	2	60.07	67.99	79.70	50.39	102.23	122.20
10	0	0	1	0	0	68.65	90.39	79.70	61.23	102.23	122.20
11	0	0	1	0	1	69.73	77.32	79.70	61.23	102.23	122.20
12	0	0	1	0	2	70.50	67.99	79.70	61.23	102.23	122.20
13	0	0	1	1	0	62.96	90.39	79.70	60.98	102.23	122.20
14	0	0	1	1	1	64.04	77.32	79.70	60.98	102.23	122.20
15	0	0	1	1	2	64.81	67.99	79.70	60.98	102.23	122.20
16	0	0	1	2	0	58.22	90.39	79.70	60.98	102.23	122.20
17	0	0	1	2	1	59.30	77.32	79.70	60.98	102.23	122.20
18	0	0	1	2	2	60.07	67.99	79.70	60.98	102.23	122.20
19	0	0	2	0	0	68.65	90.39	79.70	71.82	102.23	122.20
20	0	0	2	0	1	69.73	77.32	79.70	71.82	102.23	122.20
21	0	0	2	0	2	70.50	67.99	79.70	71.82	102.23	122.20
22	0	0	2	1	0	62.96	90.39	79.70	71.56	102.23	122.20
23	0	0	2	1	1	64.04	77.32	79.70	71.56	102.23	122.20
24	0	0	2	1	2	64.81	67.99	79.70	71.56	102.23	122.20
25	0	0	2	2	0	58.22	90.39	79.70	71.56	102.23	122.20
26	0	0	2	2	1	59.30	77.32	79.70	71.56	102.23	122.20
27	0	0	2	2	2	60.07	67.99	79.70	71.56	102.23	122.20
28	0	1	0	0	0	68.65	90.39	120.05	68.62	102.23	122.20
29	0	1	0	0	1	69.73	77.32	120.05	68.62	102.23	122.20
30	0	1	0	0	2	70.50	67.99	120.05	68.62	102.23	122.20
31	0	1	0	1	0	62.96	90.39	120.05	68.36	102.23	122.20
32	0	1	0	1	1	64.04	77.32	120.05	68.36	102.23	122.20
33	0	1	0	1	2	64.81	67.99	120.05	68.36	102.23	122.20
34	0	1	0	2	0	58.22	90.39	120.05	68.36	102.23	122.20
35	0	1	0	2	1	59.30	77.32	120.05	68.36	102.23	122.20
36	0	1	0	2	2	60.07	67.99	120.05	68.36	102.23	122.20
37	0	1	1	0	0	68.65	90.39	120.05	79.20	102.23	122.20
38	0	1	1	0	1	69.73	77.32	120.05	79.20	102.23	122.20
39	0	1	1	0	2	70.50	67.99	120.05	79.20	102.23	122.20
40	0	1	1	1	0	62.96	90.39	120.05	78.94	102.23	122.20
41	0	1	1	1	1	64.04	77.32	120.05	78.94	102.23	122.20
42	0	1	1	1	2	64.81	67.99	120.05	78.94	102.23	122.20
43	0	1	1	2	0	58.22	90.39	120.05	78.94	102.23	122.20
Scenario	PTC Value	Carbon Dioxide	Natural Gas	KS Wind CF	MO Wind CF	Grain Belt Project	Missouri Wind	Pulverized Coal	Combined Cycle Gas	Nuclear	Utility-scale Solar

Grain Belt Express

Updated LCOE Results

Scenario	PTC Value	Carbon Dioxide	Natural Gas	KS Wind CF	MO Wind CF	Grain Belt Project	Missouri Wind	Pulverized Coal	Combined Cycle Gas	Nuclear	Utility-scale Solar
44	0	1	1	2	1	59.30	77.32	120.05	78.94	102.23	122.20
45	0	1	1	2	2	60.07	67.99	120.05	78.94	102.23	122.20
46	0	1	2	0	0	68.65	90.39	120.05	89.78	102.23	122.20
47	0	1	2	0	1	69.73	77.32	120.05	89.78	102.23	122.20
48	0	1	2	0	2	70.50	67.99	120.05	89.78	102.23	122.20
49	0	1	2	1	0	62.96	90.39	120.05	89.53	102.23	122.20
50	0	1	2	1	1	64.04	77.32	120.05	89.53	102.23	122.20
51	0	1	2	1	2	64.81	67.99	120.05	89.53	102.23	122.20
52	0	1	2	2	0	58.22	90.39	120.05	89.53	102.23	122.20
53	0	1	2	2	1	59.30	77.32	120.05	89.53	102.23	122.20
54	0	1	2	2	2	60.07	67.99	120.05	89.53	102.23	122.20
55	0	2	0	0	0	68.65	90.39	141.50	78.14	102.23	122.20
56	0	2	0	0	1	69.73	77.32	141.50	78.14	102.23	122.20
57	0	2	0	0	2	70.50	67.99	141.50	78.14	102.23	122.20
58	0	2	0	1	0	62.96	90.39	141.50	77.88	102.23	122.20
59	0	2	0	1	1	64.04	77.32	141.50	77.88	102.23	122.20
60	0	2	0	1	2	64.81	67.99	141.50	77.88	102.23	122.20
61	0	2	0	2	0	58.22	90.39	141.50	77.88	102.23	122.20
62	0	2	0	2	1	59.30	77.32	141.50	77.88	102.23	122.20
63	0	2	0	2	2	60.07	67.99	141.50	77.88	102.23	122.20
64	0	2	1	0	0	68.65	90.39	141.50	88.73	102.23	122.20
65	0	2	1	0	1	69.73	77.32	141.50	88.73	102.23	122.20
66	0	2	1	0	2	70.50	67.99	141.50	88.73	102.23	122.20
67	0	2	1	1	0	62.96	90.39	141.50	88.47	102.23	122.20
68	0	2	1	1	1	64.04	77.32	141.50	88.47	102.23	122.20
69	0	2	1	1	2	64.81	67.99	141.50	88.47	102.23	122.20
70	0	2	1	2	0	58.22	90.39	141.50	88.47	102.23	122.20
71	0	2	1	2	1	59.30	77.32	141.50	88.47	102.23	122.20
72	0	2	1	2	2	60.07	67.99	141.50	88.47	102.23	122.20
73	0	2	2	0	0	68.65	90.39	141.50	99.31	102.23	122.20
74	0	2	2	0	1	69.73	77.32	141.50	99.31	102.23	122.20
75	0	2	2	0	2	70.50	67.99	141.50	99.31	102.23	122.20
76	0	2	2	1	0	62.96	90.39	141.50	99.05	102.23	122.20
77	0	2	2	1	1	64.04	77.32	141.50	99.05	102.23	122.20
78	0	2	2	1	2	64.81	67.99	141.50	99.05	102.23	122.20
79	0	2	2	2	0	58.22	90.39	141.50	99.05	102.23	122.20
80	0	2	2	2	1	59.30	77.32	141.50	99.05	102.23	122.20
81	0	2	2	2	2	60.07	67.99	141.50	99.05	102.23	122.20
82	1	0	0	0	0	39.71	62.61	79.70	50.65	102.23	122.20
83	1	0	0	0	1	40.79	49.55	79.70	50.65	102.23	122.20
84	1	0	0	0	2	41.57	40.22	79.70	50.65	102.23	122.20
85	1	0	0	1	0	34.02	62.61	79.70	50.39	102.23	122.20
86	1	0	0	1	1	35.10	49.55	79.70	50.39	102.23	122.20
Scenario	PTC Value	Carbon Dioxide	Natural Gas	KS Wind CF	MO Wind CF	Grain Belt Project	Missouri Wind	Pulverized Coal	Combined Cycle Gas	Nuclear	Utility-scale Solar

Grain Belt Express

Updated LCOE Results

Scenario	PTC Value	Carbon Dioxide	Natural Gas	KS Wind CF	MO Wind CF	Grain Belt Project	Missouri Wind	Pulverized Coal	Combined Cycle Gas	Nuclear	Utility-scale Solar
87	1	0	0	1	2	35.87	40.22	79.70	50.39	102.23	122.20
88	1	0	0	2	0	29.28	62.61	79.70	50.39	102.23	122.20
89	1	0	0	2	1	30.36	49.55	79.70	50.39	102.23	122.20
90	1	0	0	2	2	31.13	40.22	79.70	50.39	102.23	122.20
91	1	0	1	0	0	39.71	62.61	79.70	61.23	102.23	122.20
92	1	0	1	0	1	40.79	49.55	79.70	61.23	102.23	122.20
93	1	0	1	0	2	41.57	40.22	79.70	61.23	102.23	122.20
94	1	0	1	1	0	34.02	62.61	79.70	60.98	102.23	122.20
95	1	0	1	1	1	35.10	49.55	79.70	60.98	102.23	122.20
96	1	0	1	1	2	35.87	40.22	79.70	60.98	102.23	122.20
97	1	0	1	2	0	29.28	62.61	79.70	60.98	102.23	122.20
98	1	0	1	2	1	30.36	49.55	79.70	60.98	102.23	122.20
99	1	0	1	2	2	31.13	40.22	79.70	60.98	102.23	122.20
100	1	0	2	0	0	39.71	62.61	79.70	71.82	102.23	122.20
101	1	0	2	0	1	40.79	49.55	79.70	71.82	102.23	122.20
102	1	0	2	0	2	41.57	40.22	79.70	71.82	102.23	122.20
103	1	0	2	1	0	34.02	62.61	79.70	71.56	102.23	122.20
104	1	0	2	1	1	35.10	49.55	79.70	71.56	102.23	122.20
105	1	0	2	1	2	35.87	40.22	79.70	71.56	102.23	122.20
106	1	0	2	2	0	29.28	62.61	79.70	71.56	102.23	122.20
107	1	0	2	2	1	30.36	49.55	79.70	71.56	102.23	122.20
108	1	0	2	2	2	31.13	40.22	79.70	71.56	102.23	122.20
109	1	1	0	0	0	39.71	62.61	120.05	68.62	102.23	122.20
110	1	1	0	0	1	40.79	49.55	120.05	68.62	102.23	122.20
111	1	1	0	0	2	41.57	40.22	120.05	68.62	102.23	122.20
112	1	1	0	1	0	34.02	62.61	120.05	68.36	102.23	122.20
113	1	1	0	1	1	35.10	49.55	120.05	68.36	102.23	122.20
114	1	1	0	1	2	35.87	40.22	120.05	68.36	102.23	122.20
115	1	1	0	2	0	29.28	62.61	120.05	68.36	102.23	122.20
116	1	1	0	2	1	30.36	49.55	120.05	68.36	102.23	122.20
117	1	1	0	2	2	31.13	40.22	120.05	68.36	102.23	122.20
118	1	1	1	0	0	39.71	62.61	120.05	79.20	102.23	122.20
119	1	1	1	0	1	40.79	49.55	120.05	79.20	102.23	122.20
120	1	1	1	0	2	41.57	40.22	120.05	79.20	102.23	122.20
121	1	1	1	1	0	34.02	62.61	120.05	78.94	102.23	122.20
122	1	1	1	1	1	35.10	49.55	120.05	78.94	102.23	122.20
123	1	1	1	1	2	35.87	40.22	120.05	78.94	102.23	122.20
124	1	1	1	2	0	29.28	62.61	120.05	78.94	102.23	122.20
125	1	1	1	2	1	30.36	49.55	120.05	78.94	102.23	122.20
126	1	1	1	2	2	31.13	40.22	120.05	78.94	102.23	122.20
127	1	1	2	0	0	39.71	62.61	120.05	89.78	102.23	122.20
128	1	1	2	0	1	40.79	49.55	120.05	89.78	102.23	122.20
129	1	1	2	0	2	41.57	40.22	120.05	89.78	102.23	122.20
Scenario	PTC Value	Carbon Dioxide	Natural Gas	KS Wind CF	MO Wind CF	Grain Belt Project	Missouri Wind	Pulverized Coal	Combined Cycle Gas	Nuclear	Utility-scale Solar

Grain Belt Express

Updated LCOE Results

Scenario	PTC Value	Carbon Dioxide	Natural Gas	KS Wind CF	MO Wind CF	Grain Belt Project	Missouri Wind	Pulverized Coal	Combined Cycle Gas	Nuclear	Utility-scale Solar
130	1	1	2	1	0	34.02	62.61	120.05	89.53	102.23	122.20
131	1	1	2	1	1	35.10	49.55	120.05	89.53	102.23	122.20
132	1	1	2	1	2	35.87	40.22	120.05	89.53	102.23	122.20
133	1	1	2	2	0	29.28	62.61	120.05	89.53	102.23	122.20
134	1	1	2	2	1	30.36	49.55	120.05	89.53	102.23	122.20
135	1	1	2	2	2	31.13	40.22	120.05	89.53	102.23	122.20
136	1	2	0	0	0	39.71	62.61	141.50	78.14	102.23	122.20
137	1	2	0	0	1	40.79	49.55	141.50	78.14	102.23	122.20
138	1	2	0	0	2	41.57	40.22	141.50	78.14	102.23	122.20
139	1	2	0	1	0	34.02	62.61	141.50	77.88	102.23	122.20
140	1	2	0	1	1	35.10	49.55	141.50	77.88	102.23	122.20
141	1	2	0	1	2	35.87	40.22	141.50	77.88	102.23	122.20
142	1	2	0	2	0	29.28	62.61	141.50	77.88	102.23	122.20
143	1	2	0	2	1	30.36	49.55	141.50	77.88	102.23	122.20
144	1	2	0	2	2	31.13	40.22	141.50	77.88	102.23	122.20
145	1	2	1	0	0	39.71	62.61	141.50	88.73	102.23	122.20
146	1	2	1	0	1	40.79	49.55	141.50	88.73	102.23	122.20
147	1	2	1	0	2	41.57	40.22	141.50	88.73	102.23	122.20
148	1	2	1	1	0	34.02	62.61	141.50	88.47	102.23	122.20
149	1	2	1	1	1	35.10	49.55	141.50	88.47	102.23	122.20
150	1	2	1	1	2	35.87	40.22	141.50	88.47	102.23	122.20
151	1	2	1	2	0	29.28	62.61	141.50	88.47	102.23	122.20
152	1	2	1	2	1	30.36	49.55	141.50	88.47	102.23	122.20
153	1	2	1	2	2	31.13	40.22	141.50	88.47	102.23	122.20
154	1	2	2	0	0	39.71	62.61	141.50	99.31	102.23	122.20
155	1	2	2	0	1	40.79	49.55	141.50	99.31	102.23	122.20
156	1	2	2	0	2	41.57	40.22	141.50	99.31	102.23	122.20
157	1	2	2	1	0	34.02	62.61	141.50	99.05	102.23	122.20
158	1	2	2	1	1	35.10	49.55	141.50	99.05	102.23	122.20
159	1	2	2	1	2	35.87	40.22	141.50	99.05	102.23	122.20
160	1	2	2	2	0	29.28	62.61	141.50	99.05	102.23	122.20
161	1	2	2	2	1	30.36	49.55	141.50	99.05	102.23	122.20
162	1	2	2	2	2	31.13	40.22	141.50	99.05	102.23	122.20
Scenario	PTC Value	Carbon Dioxide	Natural Gas	KS Wind CF	MO Wind CF	Grain Belt Project	Missouri Wind	Pulverized Coal	Combined Cycle Gas	Nuclear	Utility-scale Solar

Schedule DAB-11 Capitalization Factor

The examples below are from the original LCOE model (provided to Dr. Proctor as GBX Response to Show Me-1.2.Attachment 01), looking at the cost components for Kansas Wind. The examples show that the year to which the costs and revenues are discounted does not affect the final LCOE.

Kansas Wind	
Discounting back to 2018	(\$mm)
NPV of Capacity Revenue	\$147.92
NPV of Expenses	(\$342.94)
NPV of Capital Costs	(\$939.02)
NPV of PTC Revenue	\$515.13
NPV of Tax Depreciation	\$268.04
NPV of Other Income Taxes	\$68.25
	(\$282.61)
Capitalization Factor	10.87
Annual Required Revenue (After-tax)	\$26.00
Annual Required Revenue (Pre-tax)	\$39.99
LCOE (\$/MWh)	15.08

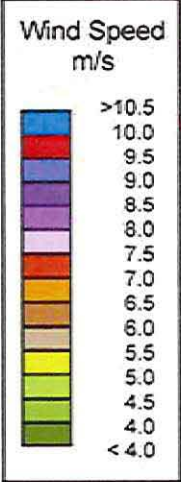
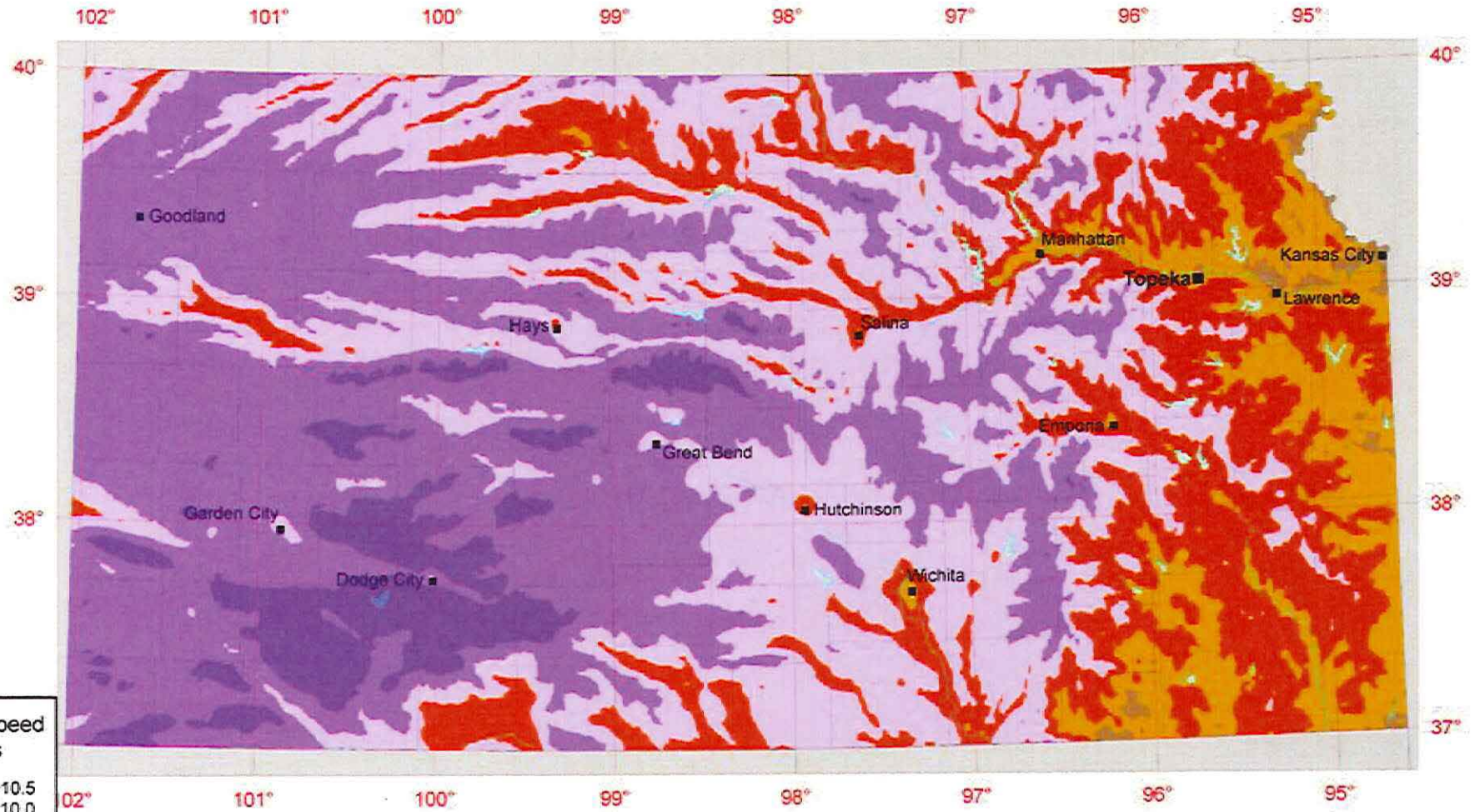
Kansas Wind	
Discounting back to 2017	(\$mm)
NPV of Capacity Revenue	\$137.24
NPV of Expenses	(\$318.16)
NPV of Capital Costs	(\$871.18)
NPV of PTC Revenue	\$477.91
NPV of Tax Depreciation	\$248.67
NPV of Other Income Taxes	\$63.32
	(\$262.19)
Capitalization Factor	10.09
Annual Required Revenue (After-tax)	\$26.00
Annual Required Revenue (Pre-tax)	\$39.99
LCOE (\$/MWh)	15.08

Schedule DAB-12 Gas Price Forecasts Comparison

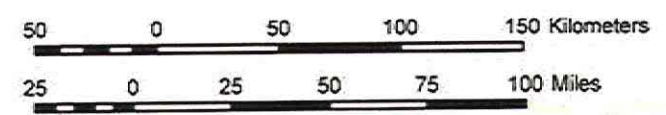
Forecasts for Natural Gas used for Electric Power

Source:	<i>EIA Annual Energy Outlook 2014</i> <i>http://www.eia.gov/oiaf/aeo/tablebrowser/</i>		<i>GBX Response to Show Me- 1.2.Attachment 01</i>	<i>Proctor Workpaper Entitled "Levelized Fixed Charges MPWP"</i>
Year	EIA AEO 2014 (\$/Mcf Nominal)	Berry (\$/Mcf Nominal)	Proctor (\$/Mcf Nominal)	
2019	1	\$5.90	\$5.90	\$5.58
2020	2	\$5.87	\$5.87	\$5.77
2021	3	\$6.17	\$6.17	\$6.00
2022	4	\$6.33	\$6.33	\$6.39
2023	5	\$6.59	\$6.59	\$6.68
2024	6	\$6.96	\$6.96	\$6.98
2025	7	\$7.25	\$7.25	\$7.18
2026	8	\$7.45	\$7.45	\$7.47
2027	9	\$7.69	\$7.69	\$7.69
2028	10	\$7.99	\$7.99	\$7.97
2029	11	\$8.43	\$8.43	\$8.26
2030	12	\$8.93	\$8.93	\$8.54
2031	13	\$9.28	\$9.28	\$8.89
2032	14	\$9.63	\$9.63	\$9.20
2033	15	\$10.12	\$10.12	\$9.60
2034	16	\$10.57	\$10.57	\$10.16
2035	17	\$11.09	\$11.09	\$10.77
2036	18	\$11.77	\$11.77	\$11.54
2037	19	\$12.12	\$12.12	\$12.28
2038	20	\$12.46	\$12.46	\$13.07
2039	21	\$13.09	\$13.09	\$13.51
2040	22	\$13.82	\$13.82	\$14.12
2041	23		\$14.52	\$14.85
2042	24		\$15.24	\$15.59
2043	25		\$16.00	\$16.36
2044	26		\$16.80	\$17.15
2045	27		\$17.64	\$17.97
2046	28		\$18.53	\$18.81
2047	29		\$19.45	\$19.67
2048	30		\$20.43	\$20.55

Kansas - Annual Average Wind Speed at 80 m

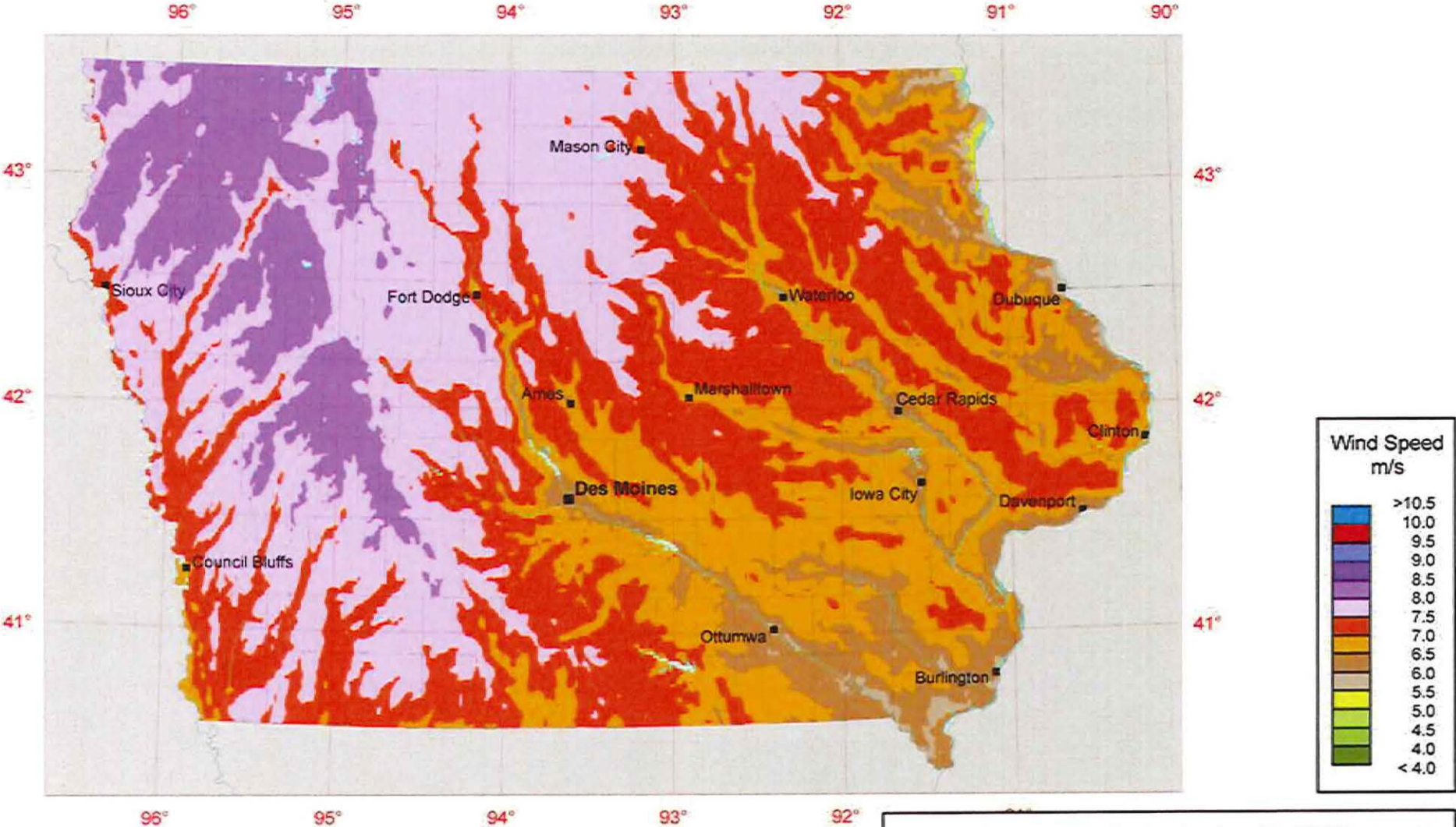


Source: Wind resource estimates developed by AWS Truepower, LLC for windNavigator®. Web: <http://www.windnavigator.com> | <http://www.awstruepower.com>. Spatial resolution of wind resource data: 2.5 km. Projection: UTM Zone 14 WGS84.

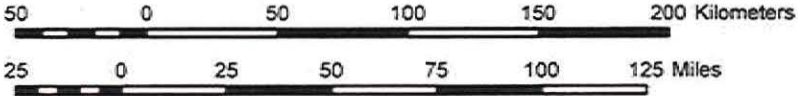


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Iowa - Annual Average Wind Speed at 80 m



Source: Wind resource estimates developed by AWS Truepower, LLC for windNavigator®. Web: <http://www.windnavigator.com> | <http://www.awstruepower.com>. Spatial resolution of wind resource data: 2.5 km. Projection: UTM Zone 15 WGS84.



SCHEDULE DAB-14
 GRAIN BELT EXPRESS RESPONSE TO
 CONDITIONS RECOMMENDED BY STAFF
In re Grain Belt Express Clean Line LLC Application for CCN
 No. EA-2014-0107 (Mo. P.S.C.)

The following conditions or recommendations were contained in the Rebuttal Testimony of Daniel I. Beck submitted on September 15, 2014:

Summary of Staff's Proposed Conditions	Grain Belt Express Position on or Modifications to Conditions	Grain Belt Express Witness on Conditions (Surrebuttal Testimony)
I. Daniel I. Beck (Overview)		
A. General.		
<p>1. Grain Belt Express ("GBX") CCN should be limited to the location of the lines specified in the Application and as represented to landowners in aerial photographs provided by GBX, unless a written agreement from the landowner is obtained with landowners is obtained or PSC grants a variance. (Beck p. 16, lines 22-26)</p>	<p>Grain Belt Express proposes following language should be added at the end of the condition:</p> <p>“; provided, however, minor deviations to the location of the line will be permitted as a result of surveying, final engineering and design, and landowner consultation.”</p>	<p>Lawlor, Section V</p>
<p>2. That absent a voluntary agreement for the purchase of private property rights, the line shall not be located so that an occupied residential structure will be removed. (Beck p. 17, lines 2-5)</p>	<p>Grain Belt Express accepts this condition as proposed.</p>	<p>Not applicable ("N/A")</p>

Summary of Staff's Proposed Conditions	Grain Belt Express Position on or Modifications to Conditions	Grain Belt Express Witness on Conditions (Surrebuttal Testimony)
<p>3. After the GBX line is constructed, a survey shall be conducted and the easement locations recorded with the appropriate county recorder of deeds and with the PSC. (Beck p. 17, lines 7-10)</p>	<p>Grain Belt Express accepts this condition as proposed.</p>	<p>N/A</p>
<p>4. Grain Belt Express shall follow the construction, clearing and other practices set forth in Schedule DB-2 (Beck p. 17, lines 12-14)</p>	<p>Grain Belt Express accepts all such conditions except for the four as described or modified in Section IV of the Mr. Lawlor's surrebuttal testimony.</p>	<p>Lawlor, Section IV</p>
<p>B. Reporting Requirements.</p>		
<p>1. GBX will provide Quarterly Updates while development and construction is in progress, and will summarize the Project's construction, operational and financial milestones. (Beck p. 17, lines 16-26)</p> <p>(a) Identify major construction vendors and contractors that have been hired.</p> <p>(b) Identify major operation and maintenance contractors hired.</p> <p>(c) Identify significant new debt and equity financings "at Petitioner level"</p> <p>(d) Significant changes in GBX or "Petitioner's" senior management.</p>	<p>Grain Belt Express accepts this condition as proposed.</p>	<p>N/A</p>

Summary of Staff's Proposed Conditions	Grain Belt Express Position on or Modifications to Conditions	Grain Belt Express Witness on Conditions (Surrebuttal Testimony)
<p>2. GBX will submit annual filing of information about any affiliates that own or control generation resources in the MISO or PJM regions. (Beck p. 117, lines 28-30)</p>	<p>Grain Belt Express accepts this condition as proposed.</p>	<p>N/A</p>
<p>3. Quarterly Progress Reports, including: (1) Percent completion of Project; (2) Amount spent to date; (3) Amount projected to have been spent to date; (4) Total budget with explanations of increases/decreases; (5) SPP agreements and invoices; (6) Agreements with other Missouri PSC-regulated utilities; (7) FERC filings; (8) Status of routing; (9) Status of public outreach/meetings; and (10) Status of right-of-way and property acquisition in Missouri. (Beck p. 17, lines 32-39 and p. 18, lines 1-4)</p>	<p>Grain Belt Express accepts this condition as proposed.</p>	<p>N/A</p>

Summary of Staff's Proposed Conditions	Grain Belt Express Position on or Modifications to Conditions	Grain Belt Express Witness on Conditions (Surrebuttal Testimony)
C. Other Conditions.		
<p>1. Cost Recovery: The cost of the Project and any collector system owned by Grain Belt Express will not be recovered through the SPP cost allocation process or from Missouri ratepayers. (Beck p. 18, lines 6-8)</p>	<p>Grain Belt Express agrees to the intent of the condition, but proposes the following language which is clearer: "Grain Belt Express will not recover any Project cost from Missouri retail ratepayers through MISO or SPP regional cost allocation without first obtaining an approval from the Missouri Public Service Commission in a new proceeding initiated by Grain Belt Express. As used in the prior sentence, the Project refers to the approximately 750 mile HVDC transmission line to be built by the applicant, including the HVDC converter stations and the AC feeder lines connecting the HVDC Project to wind generation facilities."</p>	<p>Berry, Sections II and IV</p>
<p>2. Siting Approvals: The Project will obtain state or federal siting approvals (approvals from state utility commissions sufficient) (Beck p. 18, lines 9-15)</p>	<p>Grain Belt Express accepts this condition as proposed.</p>	<p>N/A</p>
<p>3. Restoration: Once the Project is completed, GBX will have a duty to restore affected land to its pre-construction condition to the extent reasonably possible. (Beck p. 18, lines 17-19)</p>	<p>Grain Belt Express accepts this condition as proposed.</p>	<p>N/A</p>

Summary of Staff's Proposed Conditions	Grain Belt Express Position on or Modifications to Conditions	Grain Belt Express Witness on Conditions (Surrebuttal Testimony)
<p>4. Financing Commitments: GBX will not install transmission facilities on easement property until it has obtained commitments for funds in an amount equal to or greater than project costs. (Beck p. 18, lines 21-24)</p>	<p>Grain Belt Express accepts this condition as proposed.</p>	<p>Berry, Section IV</p>
<p>5. To allow the Commission to verify Compliance, GBX shall file following documents when GBX is prepared to begin to install transmission facilities sufficient to permit Staff verification: (Beck p. 18, lines 24-39; p. 19, lines 1-5)</p>	<p>Grain Belt Express accepts this condition as proposed.</p>	<p>Berry, Section IV</p>
<p>(a) Equity and debt financing commitments obtained by GBX or Clean Line to fund the total Project cost. (Beck p. 18, lines 28-31)</p>	<p>Grain Belt Express accepts this condition as proposed.</p>	<p>Berry, Section IV</p>
<p>(b) Attestation by GBX officer that transmission facilities have not been installed on easement property or a notice of when they are scheduled to begin. (Beck p. 18, lines 32-35)</p>	<p>Grain Belt Express accepts this condition as proposed.</p>	<p>Berry, Section IV</p>
<p>(c) Statement of total project costs by component with officer certification and reconciliation to the \$2.2 billion estimate, and information regarding property owned in fee by GBX, including converter station sites. (Beck p. 18, lines 36-39)</p>	<p>Grain Belt Express accepts this condition as proposed.</p>	<p>Berry, Section IV</p>

Summary of Staff's Proposed Conditions	Grain Belt Express Position on or Modifications to Conditions	Grain Belt Express Witness on Conditions (Surrebuttal Testimony)
<p>(d) Reconciliation statement certified by GBX officer that commitments for funds in 5(a) are equal to or greater than the total project costs provided in 5(c). (Beck p. 19, lines 3-5)</p>	<p>Grain Belt Express recommends adding the following text to Mr. Beck's proposed condition 5(d) (Beck rebuttal testimony, p. 19, lines 3-5) to reflect the concepts in Mr. Murray's condition: "and (2) the contracted transmission service revenue is sufficient to service the debt financing of the project (taking into account any planned refinancing of debt)."</p>	<p>Berry, Section IV</p>

Summary of Staff's Proposed Conditions	Grain Belt Express Position on or Modifications to Conditions	Grain Belt Express Witness on Conditions (Surrebuttal Testimony)
II. Sarah L. Kliethermes Conditions (production cost modeling)		
<p>A. GBX to perform studies regarding retail rate impact on Missouri customers of investor-owned utilities regarding: (Beck p. 19, lines 10-36)</p> <p>1. Production modeling that incorporates:</p> <ul style="list-style-type: none"> (a) Prices of day-ahead, real time and ancillary services to serve load. (Beck p. 19, lines 14-17) (b) Prices of day-ahead, real time and ancillary services "realized by" Missouri-owned or located generation. (Beck p. 19, lines 18-23) (c) Estimate of the impact of GBX project on "operational efficiency of Missouri-owned or located generation." (Beck p. 19, lines 24-25) <p>2. Production, transmission and economic modeling/analysis to determine: (Beck p. 19, lines 26-36)</p> <ul style="list-style-type: none"> (a) Cost of transmission upgrades that may be economical to resolve transmission constraints that GBX injections will cause or 	<p>Grain Belt Express believes it has provided Staff and the Commission with the appropriate studies and modeling work to reach the necessary conclusions about the Project. The additional studies requested by Ms. Kliethermes should not be required.</p>	<p>Berry, Section IV, Schedule DAB-13</p>

Summary of Staff's Proposed Conditions	Grain Belt Express Position on or Modifications to Conditions	Grain Belt Express Witness on Conditions (Surrebuttal Testimony)
<p>exacerbate. (Beck p. 19, lines 28-30)</p> <p>(b) Impact of using the entire design capacity of Missouri converter station. (Beck p. 19, lines 31-32)</p> <p>(c) Net impact to Missouri utilities "of picking up Missouri Energy by day for export to PJM or SPP." (Beck p. 19, lines 33-34)</p> <p>(d) "Whether the variability of the injected wind could be better managed in SPP prior to injection." (Beck p. 19, lines 35-36)</p>		
<p>B. GBX to provide documentation of: (Beck p. 19, lines 38-39; p. 20, lines 1-5)</p>		
<p>1. Commitment that GBX will not seek RTO cost allocation for the Project or for "any transmission system upgrades necessary to safely accommodate the Project." (Beck p. 20, lines 1-3)</p>	<p>Grain Belt Express does not accept this condition. A commitment not to recover any costs of interconnection upgrades through cost allocation is overly broad and inappropriate. The Commission can rely on the RTO's existing rules that allocate Grain Belt Express its share of upgrades. However, pursuant to Beck Condition C(1), above (Beck, p. 18, lines 6-8), Grain Belt Express will agree not to recover the cost of the Project without first obtaining an approval from the Commission.</p>	<p>Berry, Section II and IV</p>

Summary of Staff's Proposed Conditions	Grain Belt Express Position on or Modifications to Conditions	Grain Belt Express Witness on Conditions (Surrebuttal Testimony)
2. Commitment "to utilize only the studied portion of the Missouri converter station." (Beck p. 20, lines 4-5)	Grain Belt Express accepts this condition as proposed. <i>*Note that this condition contradicts a condition recommended by Staff witness Michael Stahlman, which would require Grain Belt Express to perform RTO studies on the converter station at a 1,000 MW delivery capacity.</i>	Berry, Section IV
III. Shawn E. Lange Conditions (safety and interconnection studies).		
A. GBX to provide for Commission "acceptance": (Beck p. 20, lines 9-26)	Grain Belt Express agrees to submit such reports to the Commission as they become available, but suggests replacing the phrase "to provide for Commission acceptance" with " to submit to the Commission when completed. "	Galli, Section II
1. Completed storm restoration plans for the project. (Beck p. 20, line 11)	Grain Belt Express accepts the condition as proposed.	Galli, Section II
2. Interconnection agreements with SPP, MISO and PJM. (Beck p. 20, lines 12-14)	Grain Belt Express accepts the condition as proposed.	Galli, Section II

Summary of Staff's Proposed Conditions	Grain Belt Express Position on or Modifications to Conditions	Grain Belt Express Witness on Conditions (Surrebuttal Testimony)
<p>3. RTO Studies related to Project:</p> <ul style="list-style-type: none"> (a) MISO Feasibility, System Planning Phase, and Definitive Planning Phase studies. (b) SPP Dynamic Stability Assessment, Steady State Review, and System Impact Studies. (c) PJM Feasibility, System Impact, and Facilities Studies. (d) Any further study necessary for interconnection with SPP, MISO or PJM. (Beck p. 20, lines 18-26) 	Grain Belt Express accepts the condition as proposed.	Galli, Section II
<p>B. GBX must comply with the appropriate NERC standards, the National Electric Safety Code, 4 CSR 240-18.010 (PSC rule that embodies National Electric Safety Code), and Overhead Power Line Safety Act, Section 319.075, et seq., Mo. Rev. Stat. (2000). (Beck p. 20, lines 28-31)</p>	Grain Belt Express accepts the condition as proposed.	Galli, Section II
<p>C. GBX to provide documentation of its plan, equipment and engineering drawings to comply with Condition (B), above. (Beck p. 20, lines 33-38)</p>	Grain Belt Express accepts the condition as proposed and will provide all as-built drawings and final design documentation.	Galli, Section II
<p>D. GBX to "meet a short-circuit ratio of two or more" at the Kansas, Missouri and Indiana converter stations. (Beck p. 21, lines 1-3)</p>	Grain Belt Express cannot accept this condition due to the issues described in Section II of the surrebuttal of Dr. Galli.	Galli, Section II

Summary of Staff's Proposed Conditions	Grain Belt Express Position on or Modifications to Conditions	Grain Belt Express Witness on Conditions (Surrebuttal Testimony)
E. GBX to provide documentation of its plan to comply with Condition (D), above, regarding achievement of "a short circuit ratio of at least two" for each converter station. (Beck p. 21, lines 5-8)	GBX cannot accept this recommendation due to the concerns discussed in Section II of the surrebuttal testimony of Dr. Galli, but agrees to provide, when completed, documentation that shows the Project meets all the requirements of the utilities and RTOs with which the Project will interconnect.	Galli, Section II
IV. Robert R. Leonberger Conditions (Design specifications; safety).		
A. GBX transmission line must be constructed with dedicated metallic return conductors. (Beck p. 21, lines 13-15)	Grain Belt Express accepts this condition as proposed.	Galli, Section II
B. GBX must install protection and control safety systems that will automatically de-energize the system when an abnormal or fault condition occurs. (Beck p. 21, lines 17-20)	Grain Belt Express accepts this condition as proposed.	Galli, Section II
C. GBX must submit proof to the Commission that safety systems are operational prior to the commercial operation of the Project. (Beck p. 21, lines 22-25)	Grain Belt Express accepts this condition as proposed.	Galli, Section II
D. If any studies show that mitigation measures are needed, such measures must be in place prior to GBX Project's commercial operation:	Grain Belt Express accepts this condition as proposed.	Galli, Section II

Summary of Staff's Proposed Conditions	Grain Belt Express Position on or Modifications to Conditions	Grain Belt Express Witness on Conditions (Surrebuttal Testimony)
<p>1. Studies should be made available to Staff and affected facility owners at least 45 days prior to commercial operation of the line. (Beck p. 21, lines 30-33)</p>		
<p>2. Such studies shall be conducted by persons knowledgeable in: (a) HVDC power lines ; (b) DC-to-AC converter stations; (c) Pipeline cathodic protection systems; (d) Corrosion of underground metallic facilities; (e) Interference with AC utility lines; (f) Interference with telecommunications facilities; (g) Effects of DC and AC interface on the facilities identified in Exhibit 3 to the Application (list of electric, gas, RR and telecom facilities that will be crossed by Project). (Beck p. 21, lines 34-38)</p>	<p>Grain Belt Express accepts this condition as proposed.</p>	<p>Galli, Section II</p>
<p>E. GBX must file "annual status updates" on discussions with Staff regarding need for additional studies, a summary of the results of additional studies, and any mitigation measures that have been implemented to address underground metallic structures, telecom facilities and AC lines." (Beck p. 22, lines 1-5)</p>	<p>Grain Belt Express accepts this condition as proposed.</p>	<p>Galli, Section II</p>

Summary of Staff's Proposed Conditions	Grain Belt Express Position on or Modifications to Conditions	Grain Belt Express Witness on Conditions (Surrebuttal Testimony)
V. David Murray Conditions (financial ability).		
<p>A. Capacity Commitments: Construction shall not begin until GBX demonstrates in a filing that it has "secured sufficient contracted capacity to service the projected amount of debt needed to complete the construction of the line." (Beck p. 22, lines 8-12)</p>	<p>Grain Belt Express recommends adding the following text to Mr. Beck's proposed condition 5(d) (Beck rebuttal testimony, p. 19, lines 3-5) to reflect the concepts in Mr. Murray's condition: "and (2) the contracted transmission service revenue is sufficient to service the debt financing of the project (taking into account any planned refinancing of debt)."</p>	<p>Berry, Section IV</p>
<p>B. Financial Guaranty: "ZAM Ventures shall guarantee Clean Line Investor Corp.'s obligations as it relates to its investment in Grain Belt Express Clean Line LLC through its equity interest in Clean Line Energy Partners LLC." (Beck p. 22, lines 14-16)</p>	<p>This requirement is not appropriate. ZAM is not a party to the proceeding and it is not clear what the guarantee would cover. If ZAM participates in the project financing, the lenders will ensure appropriate credit support.</p>	<p>Berry, Section IV</p>
VI. Michael L. Stahlman Conditions (feasibility).		
<p>A. GBX must complete and disclose all RTO interconnection studies:</p> <ol style="list-style-type: none"> 1. "... with the Missouri converter station at 1000 MW and with the potential for exporting energy from MISO and the PJM, and importing energy into the SPP" 	<p>This condition is unnecessary and inappropriate given the Applicant's agreement to Kliethermes Condition B(2). Grain Belt Express is willing to make public all the necessary RTO studies prior to commencing construction, as detailed in the conditions proposed by Shawn Lange (summarized at Beck p. 20, lines 18-26).</p>	<p>Berry, Section IV</p>

Summary of Staff's Proposed Conditions	Grain Belt Express Position on or Modifications to Conditions	Grain Belt Express Witness on Conditions (Surrebuttal Testimony)
<p>2. "... with an opportunity for parties to review the studies and bring issues before the Commission, prior to" GBX commencing eminent domain proceedings in Missouri. (Beck p. 22, lines 21-28)</p>		
<p>B. GBX cannot commence any eminent domain proceedings until after the construction of at least 25% of the Missouri converter station (excluding engineering, planning and land purchase costs). (Beck p. 22, lines 30-34)</p>	<p>This condition should not be adopted because it creates ambiguity and unnecessarily complicates the timely completion of the Project. Grain Belt Express will agree to the condition that it install the Missouri converter station, which is a crucial part of the project.</p>	<p>Berry, Section IV</p>

**Schedule DAB-15
Summary of Studies Requested by Staff**

Requested Study/Information (Kliethermes Rebuttal, page 40)	Description of Study Provided	Location Provided
Day ahead market prices to serve load	Provided as part of PROMOD results, which report a combination of day-ahead and real-time prices	Schedule RC-2
Real time market prices to serve load	Provided as part of PROMOD results, which report a combination of day-ahead and real-time prices	Schedule RC-2
Ancillary services prices to serve load	Net load analysis provided. Explanation provided for not providing additional study.	Surrebuttal testimony of Robert Zavadil
Day ahead market prices realized by Missouri-owned or located generation	Provided as part of PROMOD results, which report a combination of day-ahead and real-time prices. Adjusted production cost metric accounts for price received by utilities for off system sales.	Schedule RC-2
Real time market prices realized by Missouri-owned or located generation	Provided as part of PROMOD results, which report a combination of day-ahead and real-time prices. Adjusted production cost metric accounts for price received by utilities for off system sales.	Schedule RC-2
Ancillary service prices realized by Missouri-owned or located generation	Net load analysis provided. Explanation provided for not providing additional study.	Surrebuttal testimony of Robert Zavadil
An estimate of the impact of Grain Belt Express' Proposal on the operational efficiency of Missouri-owned or located generation Proposal on the operational efficiency of Missouri	Average cost per MWh and heat rate for Eastern Interconnection provided; APC metrics provide for Missouri	Surrebuttal testimony of Robert Cleveland; Schedule RC-2
Analysis to determine the cost of transmission upgrades that may be economical to resolve the transmission constraints that its energy injection will exacerbate	Explanation that the "congestion" referred to in Staff testimony is a result of temporary, not steady-state conditions. (Galli) Explanation that historical and predicted congestion at injection point in small. (Berry) Missouri-specific PROMOD results show congestion decreases with Project (Cleveland)	Surrebuttal testimony of Wayne Galli, David Berry, and Robert Cleveland
Analysis on the impact of using the entire design capacity of the Missouri converter station	PROMOD results provided to Staff based on 1,000 MW converter. Condition agreed to only use 500 MW of converter capacity.	Surrebuttal testimony of David Berry
Analysis on the net impact to Missouri utilities of picking up Missouri energy by day for export to PJM or SPP	No analysis performed as it is not part of Grain Belt Express' business plan, nor has it requested the necessary interconnection service	
Analysis on whether the variability of the injected wind could be better managed in the SPP prior to injection	Testimony provided on Grain Belt Express' review of this option.	Surrebuttal testimony of David Berry

Comparison of Different EWITS Sites

I selected a different set of ten Kansas EWITS sites that had an aggregate nameplate capacity of 4,700 MW. I call this profile the New Profile below and compare it to the original set of sites that composed the hourly energy profile I supplied to Mr. Moland. The Original Profile had an aggregate nameplate capacity of 4,700 MW as well. For each profile, one wind site out of the ten is adjusted to make the total 4,700 MW.

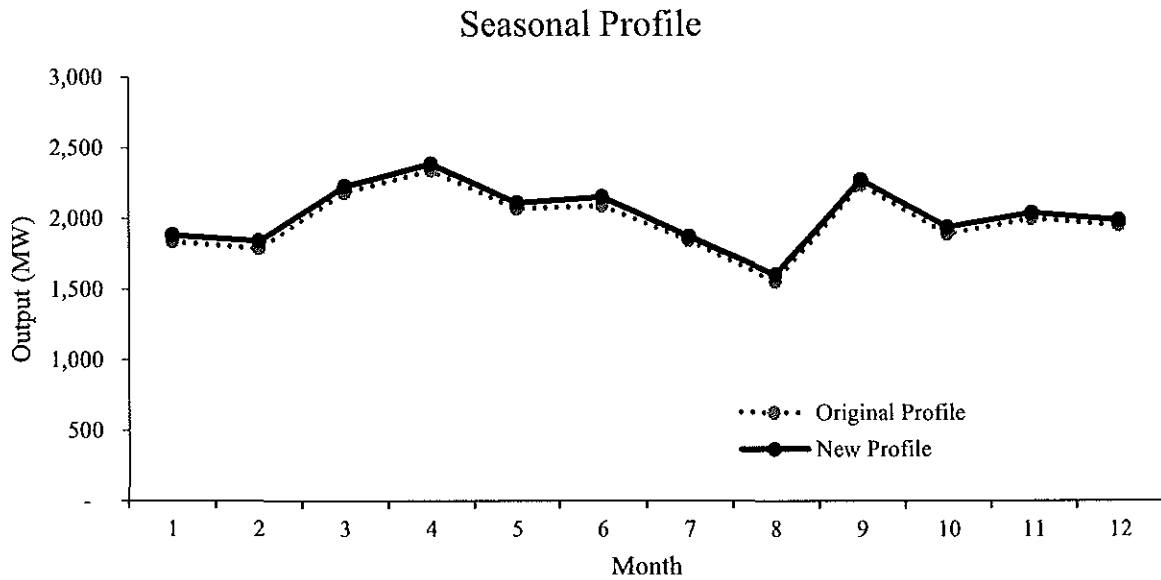


Figure 1: Comparison of seasonal profiles

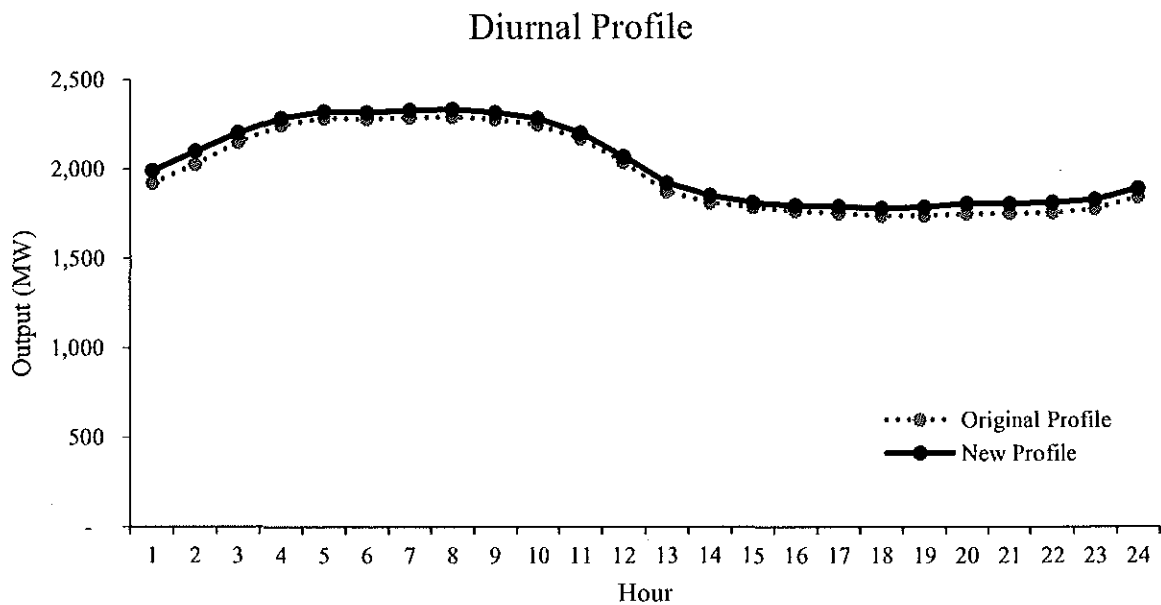


Figure 2: Comparison of diurnal profiles

Summary of Transmission Planning Studies Enabling New Wind Generation

Study Name	Wind Generation Enabled (MW)	Description of Siting Methodology	Link to Studies	Study Date
MISO MVP Project Report	6,193	Candidate wind resource zones identified using mesoscale wind data from NREL; sites selected by ranking lowest to highest combined cost of wind and transmission.	https://www.misoenergy.org/Library/Repository/Study/Candidate%20MVP%20Analysis/MVP%20Portfolio%20Analysis%20Full%20Report.pdf	January 10, 2012
Texas CREZ	18,500	Competitive Renewable Energy Zones designated by the Texas PUC based on developer activity; AWS wind resource modeling, and land-use considerations.	http://www.ercot.com/content/news/presentations/2007/AWS_Truewind_Wind_Generation_Assessment_Report.pdf ; http://interchange.puc.state.tx.us/WebApp/Interchange/Documents/33672_963_564300.PDF	January 9, 2007
SPP Priority Projects	3,200	Wind zones based on stakeholder input and generation queue requests (not signed interconnection agreements)	http://www.spp.org/publications/Priority%20Projects%20Phase%20II%20Report.pdf	February 1, 2010
CAISO Transmission Plan	3,300	Wind zones selected by California Public Utilities Commission RPS Calculator, which determines generation and transmission portfolio to cost effectively meet the state's 33% RPS	http://www.caiso.com/Documents/BoardApproved2012-2013TransmissionPlan.pdf	March 20, 2013