

**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)
Construct, Own, Operate, Control, Manage, and)
Maintain a High Voltage, Direct Current) **Case No. EA-2014-0207**
Transmission Line and an Associated Converter)
Station Providing an Interconnection on the)
Maywood - Montgomery 345 kV Transmission Line.)

STAFF’S RESPONSE TO GRAIN BELT EXPRESS’ ADDITIONAL INFORMATION

COMES NOW the Staff of the Public Service Commission of the State of Missouri (“Staff”) and in the attached Staff memorandum provides its responses to the additional information Grain Belt Express Clean Line, LLC filed on April 13, 2015, in response to the Commission’s February 11, 2015, *Order Directing Filing*. In that memorandum Staff continues to recommend to the Commission that it should reject Grain Belt Express’ application for a certificate of convenience and necessity, recommends what conditions the Commission should impose should the Commission decide to grant Grain Belt Express a certificate of convenience and necessity, and provides directive-by-directive Staff’s views of Grain Belt Express’ compliance with the Commission’s directives of the additional information Grain Belt Express was to file.

Based on Staff’s review, Grain Belt Express has satisfied only certain conditions that Staff recommended accompany any granting of the Application. Commission questions related to those conditions follow: Conditions related to questions: 2, 13e, 13f, 13h, 13i, 13j, 13k, 13l, and 13m.

Based on Staff’s review, Staff recommends that any Commission determination to grant the Application continue to contain the following conditions related to

Commission questions that Grain Belt Express has not yet met: Conditions related to Commission questions: 1, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13a, 13b, 13c, 13d, 13g and 13n.

Based on Staff's review, Staff recommends that any Commission determination find that there is no reliable information in the record to estimate the impact of the Project on wholesale electric rates, Missouri retail electric rates, carbon emissions, or other environmental consequences.

Respectfully submitted,

/s/ Nathan Williams

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CERTIFICATE OF SERVICE

I hereby certify that copies of the foregoing have been mailed or hand-delivered, transmitted by facsimile or by electronic mail to all counsel of record on this 13th day of May, 2015.

/s/ Nathan Williams

MEMORANDUM

TO: Missouri Public Service Commission Official Case File
Case No. EA-2014-0207

FROM: Daniel I. Beck
Sarah Kliethermes
Michael Stahlman
Shawn E. Lange

/s/ Natelle Dietrich 05/13/15
Director-Tariff, Safety Economic
and Engineering Analysis / Date

/s/ Nathan Williams 05/13/15
Deputy Staff Counsel / Date

SUBJECT: Staff Response to Grain Belt Express' Additional Information Filed In Response
To Order Directing Filing

DATE: May 13, 2015

Summary and Recommendations

Staff has reviewed the information filed on April 13, 2015, by Grain Belt Express Clean Line LLC. Nothing contained in that filing causes Staff to change its recommendation that the Commission should reject the Application of Grain Belt Express for a Certificate of Convenience and Necessity ("Application").¹

Based on Staff's review, Grain Belt Express has satisfied only certain conditions that Staff recommended accompany any granting of the Application. Commission questions related to those conditions follow:

Conditions related to questions: 2, 13e, 13f, 13h, 13i, 13j, 13k, 13l, and 13m.

Based on Staff's review, Staff recommends that any Commission determination to grant the Application continue to contain the following conditions related to Commission questions that Grain Belt Express has not yet met:

Conditions related to Commission questions: 1, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13a, 13b, 13c, 13d, 13g and 13n.

Based on Staff's review, Staff recommends that any Commission determination find that there is no reliable information in the record to estimate the impact of the Project on wholesale electric rates, Missouri retail electric rates, carbon emissions, or other environmental benefits or detriments.

¹ See "Staff's Positions on Issues," filed 11/7/2014, in Case No. EA-2014-0207.

Staff Analysis of Grain Belt Express' Response

1. Grain Belt Express shall provide a list of all properties on the selected project route in Missouri and designate for which properties easements have been acquired or are yet to be acquired to facilitate completion of the proposed Clean Line Energy project.

Staff analysis of Grain Belt Express' response: Although a list was provided as Supplemental Exhibit 1, the list is based on a tract number system and a key or map for that system was not provided. Grain Belt Express has provided information indicating that Grain Belt Express has obtained easement agreements for 45 of 724 tracts along the route, that there are 525 individual landowners and that Grain Belt Express has spoken with 409 individual landowners.

Staff comments/recommendation: Staff maintains that this is not the list that the Commission requested. Grain Belt Express has not complied with the Commission's Order.

2. Grain Belt Express shall set forth the status of its efforts to obtain the assent of the county commissions required by Section 229.100, RSMo, in the eight counties crossed by the selected project route in Missouri and provide supporting documentation thereof, including any letters of assent from those eight county commissions.

Staff analysis of Grain Belt Express' response: Grain Belt Express states it has received approval from all eight counties on the following dates. Buchanan County, August 23, 2012; Clinton County, July 17, 2012; Caldwell County, September 5, 2012; Carroll County, July 16, 2012; Chariton County, July 16, 2012; Randolph County, September 6, 2012; Monroe County, July 30, 2012; and Ralls County, August 23, 2012. Grain Belt Express states that it understands that four other county commissions (Clinton, Caldwell, Monroe and Ralls) have taken actions which purport to alter their Section 229.100 authorizations in various ways, although not all of them have officially notified the Company to this effect. The letters of assent are attached as Supplemental Exhibit 2. The various actions purporting to alter the authorizations are not attached, but reference to the location of these items in the record is provided.

Grain Belt Express provides additional discussion of the status of resolutions of support that had been provided by certain counties. Grain Belt Express states that if this Commission grants a CCN to the Company, it will obtain any necessary additional authority or clarification from these county commissions and submit evidence of such action to this Commission, as permitted by 4 CSR 240-3.105(1)(D)-(2).

As Staff stated in its reply brief, Schedule LDL-3 to the rebuttal testimony of its witness Louis Donald Lowenstein (Ex. 306) admitted into evidence includes copies of Grain Belt Express' Section 229.100 RSMo. county authorizations.

Staff comments/recommendation: Grain Belt Express has provided information responsive to this question.

3. Grain Belt Express shall provide descriptions and documentation, including, but not limited to signed contracts and letters of intent, of all commitments from Missouri utilities, municipalities, or cooperatives to obtain capacity, energy, and/or Renewable Energy Credits from the project.

Staff analysis of Grain Belt Express' response: After discussing issues like Ameren Missouri's IRP and a resolution adopted by the City Council of Columbia, Grain Belt Express explains that PPAs cannot be entered into until after Grain Belt Express is authorized to build the Project. Said another way, Staff understands that no Missouri utility, municipality, or cooperative has made any commitment or stated intent to obtain capacity, energy, and/or Renewable Energy Credits from the project. The information provided in this response is already contained in the record.

Staff comments/recommendations: Information requested by the Commission does not yet exist.

4. Grain Belt Express shall provide all interconnection agreements involving the proposed 500 MW substation in Ralls County, MO.

Staff analysis of Grain Belt Express' response: Grain Belt Express did not provide the MISO interconnection agreement, stating "Upon the completion of all the necessary interconnection studies, MISO will execute an interconnection agreement with Grain Belt Express and Ameren Missouri (as the relevant transmission owner)."

Staff comments/recommendation: Information requested by the Commission does not yet exist.

5. Grain Belt Express shall provide descriptions, blueprints, maps and project cost estimates of the proposed 500 MW substation in Ralls County, MO.

Staff analysis of Grain Belt Express' response: The information that Grain Belt Express provided pertains only to a "typical" HVDC converter station and is already contained in the record. The response also indicates that detailed engineering has not been performed, and that Grain Belt Express has not yet selected a vendor to design and construct the converter station. Supplemental Exhibit 3, Maps of the Converter Station location. Supplemental Exhibit 4, Single Line Diagram.

Staff comments/recommendation: Information requested by the Commission does not yet exist. Staff recommends the Commission condition any CCN on Grain Belt Express providing the description, blueprints, maps and project cost estimates of the proposed 500 MW substation in Ralls County, MO. Staff further recommends the Commission allow parties an opportunity to provide a response as to the sufficiency of the submitted material.

6. Grain Belt Express shall provide descriptions with supporting documentation of all commitments from wind energy producers to provide energy for this transmission project.

Staff analysis of Grain Belt Express' response: Grain Belt Express states that wind generators have responded to Grain Belt Express' open solicitation process. From the response, it appears that no bilateral agreements have been entered into at this time. The response states that "[w]ind generators who purchase capacity on the Project will connect directly to the Company's Kansas converter station via an AC collection system of tie lines," which is contrary to the project description provided by Grain Belt Express in the record to date².

Supplemental Exhibit (HC) 5 includes Grain Belt Express' summary of the open solicitation responses, although it is unclear which response terms pertain to which responders. It is unclear whether these responses constitute "commitments" within the meaning of the Commission's question. No supporting documentation is provided.

Staff comments/recommendation: Information requested by the Commission either does not yet exist, or it is not clear that the responses constitute "commitments."

7. Grain Belt Express shall provide documentation, including but not limited to orders, contracts and letters of intent, that it has obtained the state or federal siting approvals required by law to begin construction of the entirety of this transmission project that is sited outside the state of Missouri. Transmission line siting approvals from the Kansas, Illinois, and Indiana state utility commissions shall be sufficient to satisfy this condition. If any such application is pending, Grain Belt Express will provide the status of the application to the Commission.

Staff analysis of Grain Belt Express response: Grain Belt Express states the information concerning Kansas and Indiana is already in the record of this case. Grain Belt Express states it has filed a request in Illinois for an order of approval by December 2015.

Staff comments/recommendations: It appears that information responsive to the Commission's request is either in the record or not yet available as in the case of information specific to Illinois.

8. Grain Belt Express shall provide completed documentation of the Grain Belt Express plan, equipment, and engineering drawings to achieve compliance with the NERC standards for a project of this scope and size, National Electrical Safety Code for a project of this size and scope, rule 4 CSR 240-18.010, and the Overhead Power Line Safety Act, § 319.075 et seq., RSMo.

Staff analysis of Grain Belt Express' response: Grain Belt Express has attached as Supplemental Exhibit (HC) 6 its proposed NERC Compliance Plan, which is only 19 pages. Grain Belt Express states that the preliminary information requested by this Commission

² See Rebuttal Testimony of Michael I. Stahlman, Page 2, line 12 – page 3, line 2.

question is already part of the record. Grain Belt Express does not state when it will provide completed information as requested by this question.

Staff comments/recommendations: Information requested by the Commission is not available at this time. Staff recommends the Commission condition any CCN on Grain Belt Express providing the completed documentation and engineering drawings, Staff further recommends the Commission allow parties an opportunity to provide a response as to the sufficiency of the submitted material.

9. Grain Belt Express shall provide a detailed description and related documentation of any final project design elements that were not previously described to the Commission or have changed since the hearing in this case.

Staff analysis of Grain Belt Express' response: Grain Belt Express provided as Supplemental Exhibit (HC) 7 a 35 page document that is the HVDC Transmission Line Development Agreement between Grain Belt Express Clean Line LLC and Quanta Electric Power Services, LLC (Feb. 23, 2015). Grain Belt Express states that the preliminary information requested by this Commission question is part of the record. It also states that final designs and cost estimates will be developed after key regulatory approvals are received.

Staff comments/recommendations: Staff recommends the Commission condition any CCN on Grain Belt Express providing the final designs and cost estimates. Staff further recommends the Commission allow parties an opportunity to provide a response as to the sufficiency of the submitted material.

10. Grain Belt Express shall provide a list of businesses with whom Grain Belt has entered into an agreement to provide materials or services for this transmission project and, for each, provide copies of these agreements, including, but not limited to contracts and letters of intent and provide the estimated cost of these materials or services and whether such business is located in the state of Missouri.

Staff analysis of Grain Belt Express' response: Grain Belt Express provided copies of three "preferred supplier agreements" with businesses located in Missouri: 1) Hubbell Power Systems, Inc., Supplemental Exhibit (HC) 8; 2) General Cable Industries, Inc., Supplemental Exhibit (HC) 9; and 3) ABB Inc., Supplemental Exhibit (HC) 10. These agreements were discussed in the record but Staff was not able to find where the documents were part of the record. In addition Grain Belt Express states that it has signed two "preferred supplier agreements" with businesses located outside Missouri. Letters describing "what the supplier agreements contemplate for each company" are part of the record. Grain Belt Express states that it will finalize additional contracts with preferred suppliers for the Project once detailed design work is completed with Quanta.

Staff comments/recommendations: Grain Belt Express provided available information as responsive to this question. Staff recommends the Commission require Grain Belt Express to submit additional contracts with preferred suppliers as that information is available.

11. Grain Belt Express shall provide an update as to: 1) what amount of funds have been invested in the project by Grain Belt Express, its affiliates, or any other entity, 2) what amount of funds have been spent on the project, and 3) the total project cost.

Staff analysis of Grain Belt Express' response: No new information was provided. Grain Belt Express states that preliminary information requested by this Commission question is part of the record. Grain Belt Express does not state when it will provide completed information as requested by this question.

Staff comments/recommendations: Staff recommends the Commission require Grain Belt Express to submit information responsive to this question.

12. Grain Belt Express shall perform the following studies and file the results of the studies in this case with any analysis it deems relevant. These studies should be designed after Staff and other parties have had the opportunity to provide meaningful input regarding the quality of the data and the reasonableness of the inputs used for (1) load assumptions for the year 2019, (2) generator capacities, efficiencies, dispatch stack, or bid amounts for the year 2019, (3) the wind delivery used for the year 2019, (4) the level of precision used in modeling factors such as generator heat rate curve, transmission loading curves, or other inputs to the PROMOD model used for the studies:

a. Production modeling that incorporates:

- (1) day-ahead market prices to serve load;**
- (2) real-time market prices to serve load;**
- (3) ancillary services prices to serve load;**
- (4) day ahead market prices realized by Missouri-owned or located generation;**
- (5) real-time market prices realized by Missouri-owned or located generation;**
- (6) ancillary services prices realized by Missouri-owned or located generation;**
- and**
- (7) an estimate of the impact of Grain Belt Express' transmission project on the operational efficiency of Missouri-owned or located generation.**

b. Production, transmission, and economic modeling or analysis to determine:

- (1) the cost of transmission upgrades that may be necessary to resolve any transmission constraints that its energy injections will cause or exacerbate;**
- (2) the net impact to Missouri utilities of picking up Missouri energy by day for export to PJM or SPP; and**
- (3) whether the variability of the injected wind could be better managed in the SPP prior to injection.**

If Grain Belt Express cannot complete any of these studies due to lack of access to necessary data, it shall file proof that the data is inaccessible and complete the studies to the extent possible.

Staff analysis of Grain Belt Express' response: In its direct case, Grain Belt Express filed testimony that the Project would reduce Missouri retail rates and would reduce carbon emissions

and create positive environmental benefits. Grain Belt Express based this testimony on comparing the results of various scenarios of PROMOD modeling for the year 2019. Staff reviewed this modeling, and the inputs used to create this modeling, and determined that the modeled results are not reliable for the purposes of determining the difference in retail rates in Missouri with and without the Project, nor for the purposes of determining the level of carbon emissions in Missouri with and without the Project, nor for determining the level of other environmental benefits with and without the Project.

Staff recommended that new modeling be performed to support these stated purposes. In response to discussions with Staff, Grain Belt Express has stated that it is not possible for it to create reliable models to create reasonable estimates of these matters.

Attached as Schedule 1 is the document “Staff comments to Grain Belt Express related to Item 12 of the Commission’s Order Directing Filing of Additional Information,” (“Staff Comments”). Based on discussions with Grain Belt Express, Staff expected items 1-4 on this list to be addressed fully in Grain Belt Express’ revised modeling. Staff was not provided an opportunity to review the inputs or modeling assumptions prior to conducting the additional modeling, and Staff received no response to the Staff Comments document.

Attached as Schedule 2 is a marked-up version of the Staff Comments document, which indicates the extent to which Grain Belt Express incorporated the suggested items. Significant items not addressed relate to heat rate curve assumptions and natural gas prices. Because the level of gas generation is significantly different between Grain Belt Express’ modeled scenarios, Staff reasonably expects the natural gas heat rates and natural gas prices assumed by Grain Belt Express to have significant impact on the outcomes of the scenarios. Grain Belt Express also has not provided an estimate of the cost of energy for Missouri load serving entities. Without these estimates, it is impossible to estimate the modeled impact of the project on retail rates.

Staff comments/recommendations: Information requested by the Commission remains outstanding. While Staff is not asserting that the Commission can or should reject the Application on the basis of retail rate impact, carbon emission impact, or the level of other environmental benefits, Grain Belt Express asserts that the Application should be approved on those bases.

13. Grain Belt Express shall provide the following for the proposed transmission project:

- a. completed Storm Restoration Plans,**
- b. the Interconnection Agreement with SPP,**
- c. the Interconnection Agreement with MISO,**
- d. the Interconnection Agreement with PJM,**
- e. the MISO Feasibility Study/Studies,**
- f. the MISO System Planning Phase Study,**
- g. the MISO Definitive Planning Phase Study (all cycles),**
- h. the SPP Dynamic Stability Assessment,**
- i. the SPP Steady State Review,**

- j. the SPP System Impact Study,**
- k. the PJM Feasibility Study/Studies,**
- l. the PJM System Impact Study,**
- m. the PJM Facilities Study, and**
- n. each other study necessary or required for interconnection with SPP, MISO or PJM.**

Staff analysis of Grain Belt Express' response: Information requested by the Commission remains outstanding on the following items:

- a. completed Storm Restoration Plans

While Grain Belt Express provided a preliminary emergency response flow chart, a completed Storm Restoration Plan as requested by the Commission remains outstanding. Grain Belt Express does state that the plan will be updated and revised following regulatory approvals and final engineering and construction of the project. A specific date when a final Storm Restoration Plan will be completed was not provided.

- b. the Interconnection Agreement with SPP

Grain Belt Express states it is negotiating an interconnection agreement with ITC Great Plains and SPP. The pro forma SPP interconnection agreement can be found in appendix 6 to SPP's Generator Interconnection Procedures. Grain Belt Express does not state when it will provide completed information as requested by this question.

- c. the Interconnection Agreement with MISO

Information requested by the Commission remains outstanding. Grain Belt Express does not state when it will provide completed information as requested by this question.

- d. the Interconnection Agreement with PJM

Information requested by the Commission remains outstanding. Grain Belt Express states once the facilities Study is complete, Grain Belt Express will execute an interconnection agreement with American Electric Power and PJM. A specific date when a final agreement would be completed was not provided.

- e. the MISO Feasibility Study/Studies

Information requested is part of the record in schedule AWG-6 to Direct of A.W. Galli (EX 111).

- f. the MISO System Planning Phase Study

Information requested is part of the record in Exhibit 150.

- g. the MISO Definitive Planning Phase Study (all cycles)

Information requested by the Commission remains outstanding. Grain Belt Express states the MISO DPP will depend on the PJM Retool Study, which is currently expected to be completed in the 3rd quarter of 2015.

h. the SPP Dynamic Stability Assessment

This executive summary of the March 2013 assessment was attached as Supplemental Exhibit 18.

i. the SPP Steady State Review

The January 7, 2013 review was attached as Supplemental Exhibit 19.

j. the SPP System Impact Study

Information requested is part of the record AWG-4 to Direct of A.W. Galli (EX 111)

k. the PJM Feasibility Study/Studies

This study was completed in January 2013 and was attached as Supplemental Exhibit 20

l. the PJM System Impact Study,

Information requested is part of the record AWG-10 to Direct of A.W. Galli (EX 113)

m. the PJM Facilities Study

A copy of this agreement was attached as Supplemental Exhibit 21.

n. each other study necessary or required for interconnection with SPP, MISO or PJM.

Information requested by the Commission remains outstanding. Grain Belt Express states that studies will be conducted by the HVDC vendor to ensure all converter stations meet performance requirements prescribed by SPP, MISO, PJM and all interconnecting utilities.

Staff comments/recommendations: Staff recommends the Commission condition any CCN on Grain Belt Express providing all outstanding information responsive to this question. Staff further recommends the Commission allow parties an opportunity to provide a response as to the sufficiency of the submitted material.

**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 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 - Montgomery 345 kV)
Transmission Line)

File No. EA-2014-0207

AFFIDAVIT OF DANIEL I. BECK

STATE OF MISSOURI)
) ss
COUNTY OF COLE)

Comes now, Daniel I. Beck on his oath declares that he is of sound mind and lawful age; that he contributed to the attached Staff Memorandum; and that the same is true and correct according to his best knowledge and belief.

Further the Affiant sayeth not.



Daniel I. Beck

Subscribed and sworn to before me this 13th day of May, 2015.

SUSAN L. SUNDERMEYER
Notary Public - Notary Seal
State of Missouri
Commissioned for Callaway County
My Commission Expires: October 28, 2018
Commission Number: 14942086



Notary Public

Staff comments to Grain Belt Express related to Item 12 of the Commission's
Order Directing Filing of Additional Information
March 12, 2015

1. Refine wind energy injection shapes for:
 - a. Reduced diversity to account for windfarm-specific delivery contracts.
 - b. Any sharp drop off associated with hitting the operational minimum of each converter station (inputting and outputting).
 - c. Reasonableness of hours of maximum throughput.
 - d. Reasonableness of hours of 0 throughput.
2. Describe company protocols and identify impact on model for:
 - a. Segregating output of the Missouri and Indiana converter stations on a scheduled basis.
 - b. Segregating output of the Missouri and Indiana converter stations operationally.
 - c. Dealing with curtailment of overbuild wind generation on a scheduled basis.
 - d. Dealing with curtailment of overbuild wind generation operationally.
3. Model a representative increment of intrahour variation to determine change to ancillary and reserve requirements, accounting for the items in 1 & 2.
4. Revise PROMOD model to account for:
 - a. Operational impacts and limitations determined in item 3 above, accounting for items 1 & 2.
 - b. Known or reasonably anticipated changes in generation plant characteristics including, but not limited to:
 - i. AQCS systems at LaCygne, Jeffrey, and Asbury.
 - ii. Riverton 12 conversion to combined cycle.
 - iii. KCPL/GPE announcement that Sibley 1 & 2, Montrose 1, 2, & 3 and Lake Road 6 would cease burning coal prior to or around the 2019 time period.
 - iv. Addition of O'Fallon solar farm
 - v. Position of Ameren Missouri that "we recently decided 9 to retire our Meramec Energy Center no later than 2022, and it may be retired earlier, if necessary, to comply with new environmental rules." (Pg. 13, Direct Testimony of Moehn in Case No. ER-2014-0258).
 - c. Representative (if estimated) heat rate curves instead of average heat rates across all capacity stages.
 - d. Any omitted plants or improperly modeled plants. If the generator data tab in the Missouri Study Assumptions xls file is meant to be an exhaustive list for Missouri IOU owned generators.
 - i. Missouri owned wind generators have been left off.
 - ii. Modeling multiunit plants as one unit (Taum Sauk).
 - iii. Retirement of units not captured (Asbury 2).
 - iv. Lack of Ameren Missouri CTs located in Illinois (Raccoon Creek).
 - v. Lack of Missouri IOU minority ownership coal plants (Jeffrey, Plum Point).
 - vi.
 - e. Any reasonable updates or corrections of assumptions, including but not limited to:
 - i. Fuel prices,
 - ii. Emissions prices,

- iii. Load shapes
 - 1. Level of solar penetration,
 - 2. Penetration of Demand Side Management and Energy Efficiency,
 - 3. Items not captured in the 10 year load-shape normalization period, for example, changes in usage characteristics after the Joplin tornado.
- 5. Using the outputs of items 3 & 4, provide for the Commission's review:
 - a. A reasonable estimate of the **generation and reserve operations** of each generation facility located in Missouri, or owned by a Missouri-serving utility, or from which power is purchased to serve Missouri load by a Missouri-serving utility (with and without a Missouri converter station).
 - b. A reasonable estimate of the **operating costs and market revenues** of each generation facility located in Missouri, or owned by a Missouri-serving utility, or from which power is purchased to serve Missouri load by a Missouri-serving utility (with and without a Missouri converter station).
 - c. A reasonable estimate of the **emissions released** by each generation facility located in Missouri, or owned by a Missouri-serving utility, or from which power is purchased to serve Missouri load by a Missouri-serving utility (with and without a Missouri converter station).
 - d. A reasonable estimate for each Missouri-serving utility of the **cost of serving its load** (with and without a Missouri converter station).
 - e. A reasonable estimate for each Missouri-serving utility of the **gross value of its energy output** of its associated generation fleet (with and without a Missouri converter station).
 - f. A reasonable estimate for each Missouri-serving utility of the **cost of producing its energy output** from its associated generation fleet (with and without a Missouri converter station).
 - g. A reasonable estimate for each Missouri-serving utility of the **level of emissions released** by its associated generation fleet (with and without a Missouri converter station).
 - h. A reasonable estimate for each Missouri-serving utility of the level of the **operational efficiency** of its associated generation fleet (with and without a Missouri converter station).
 - i. A reasonable estimate of transmission upgrades in MISO zones 4 and 5 that may be made economical given the congestion conditions that will exist with a Missouri converter station.
 - j. A reasonable estimate of the economic and operational feasibility of exporting energy through the Missouri converter station in hours when capacity is available.
 - k. A reasonable estimate of the economic and operational feasibility of managing the variability of injected wind at or before the Kansas converter station.

Schedule 2

Natural Gas Heat Rate Curves (Item 12 (4) of Commission Order)

GBE did not incorporate any improvements to its modeling of generator heat rate curves in its revised modeling. GBE's modeling, both direct-filed and revised, uses a horizontal heat rate curve for gas-fired generation. Use of a horizontal curve means that GBE assumes a gas-fired plant will have the same efficiency across all levels of production. This is like assuming you will experience the same miles per gallon in your car whether you are traveling 2 mph, 55 mph, or 120 mph. This is not a reasonable assumption.

Because the level of gas generation is significantly different between GBE's modeled scenarios, Staff reasonably expects that varying the heat rate curves to a more reasonably-estimated slope would significantly impact the outcomes of the scenarios.

Staff does understand that GBE does not have access to the quality of generator and transmission line data that MISO and other RTO's possess. Staff recommended that GBE revise its modeling to incorporate "[r]epresentative (if estimated) heat rate curves instead of average heat rates across all capacity stages." (Staff Comments, 4.c.) Based on discussions with Mr. Cleveland, Staff understood that GBE's revised modeling would use at least a straight-line diagonal curve, if not a quadratic curve, based on publicly-available representative curves.

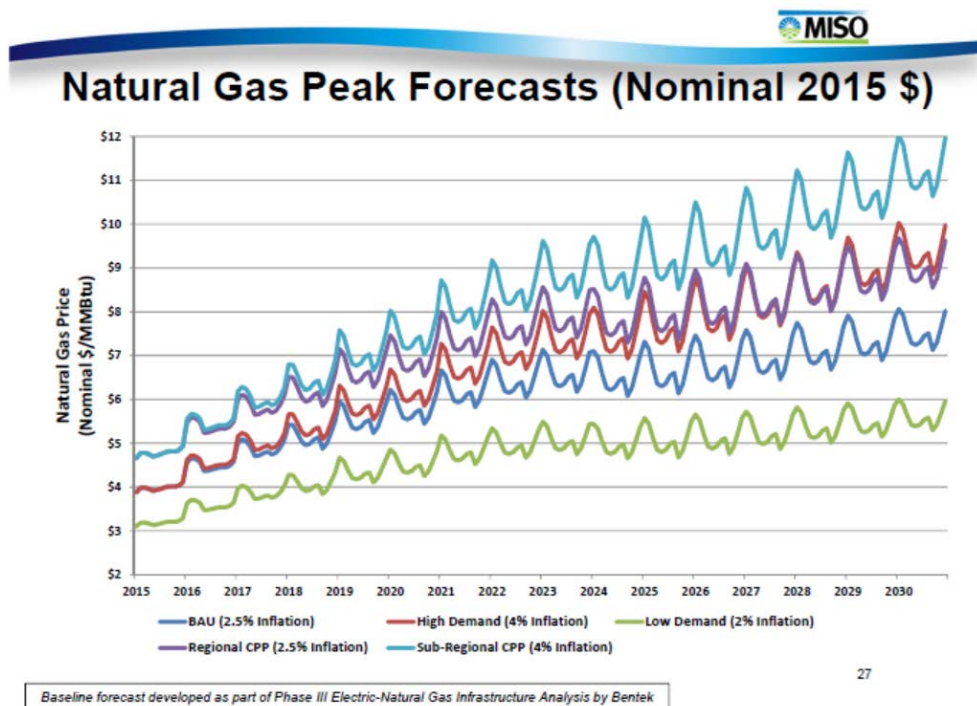
GBE's revised modeling assumes horizontal heat rate curves for gas generation. GBE's assumption of a horizontal heat rate curve for gas generation is unreasonable, and modeling relying on this assumption is unreliable for purposes of estimating the impact of the Project on plant-level operations.

Natural Gas Prices

GBE did not adjust the assumed price of natural gas. At page 7 of SUPP Exhibit 13, GBE asserts that:

[T]he natural gas price forecast used by Leidos is almost identical to MISO's. The nominal gas price used by Leidos for the year 2019 was \$4.74/MMBtu in 2019 dollars, or \$4.29/MMBtu in 2015 dollars (assuming 2.5% inflation). The MTEP 2016 uses an assumed natural gas of \$4.30/MMBtu in 2015 dollars. The prices are already very similar and the study assumptions were not adjusted.

However, Staff's review of MISO's MTEP 16 natural gas prices indicate that the prices are generally much higher than GBE's assumption (See below).



1

GBE's assumptions for 2019 natural gas prices consisted of one of three dollar values **(\$4.74/MMBtu, \$1.74/MMBtu, and \$7.74/MMBtu)** for all four study scenarios.

¹ MTEP16 Futures, Planning Advisory Committee, March 18, 2015, Slide 27 of 35. <https://www.misoenergy.org/Library/Repository/Meeting%20Material/Stakeholder/PAC/2015/20150318/20150318%20PAC%20MTEP%20Futures.pdf> (12MAY2014).

Individual items in Paragraph 12

Green text indicates that GBE states that an item has been addressed in GBE's response, and Staff does not dispute that the item has been addressed.

Red text indicates that an item has not been addressed in GBE's response.

Orange text indicates that GBE states that the item has been addressed, but Staff disputes that the item has been addressed adequately.

Blue text indicates that the status of the item is unclear.

1. Refine wind energy injection shapes for:
 - a. Reduced diversity to account for windfarm-specific delivery contracts.
 - b. Any sharp drop off associated with hitting the operational minimum of each converter station (inputting and outputting).
 - c. Reasonableness of hours of maximum throughput.
 - d. Reasonableness of hours of 0 throughput.

SUPP EXHIBIT 13 – Page 6 states that revised modeling reflects items indicated in 1.

2. Describe company protocols and identify impact on model for:
 - a. Segregating output of the Missouri and Indiana converter stations on a scheduled basis.
 - b. Segregating output of the Missouri and Indiana converter stations operationally.
 - c. Dealing with curtailment of overbuild wind generation on a scheduled basis.
 - d. Dealing with curtailment of overbuild wind generation operationally.
3. Model a representative increment of intrahour variation to determine change to ancillary and reserve requirements, accounting for the items in 1 & 2.

SUPP EXHIBIT 13 – Page 8 states that revised modeling reflects items indicated in items 2 and 3.

4. Revise PROMOD model to account for:
 - a. Operational impacts and limitations determined in item 3 above, accounting for items 1 & 2.
 - b.

SUPP EXHIBIT 13 – Page 8 states that revised modeling reflects items indicated in items 2 and 3, as described in item 4. It is unclear if revised modeling incorporates an increase in required reserve margin as discussed in GBE's response.

- c. Known or reasonably anticipated changes in generation plant characteristics including, but not limited to:
 - i. AQCS systems at LaCygne, Jeffrey, and Asbury.
 - ii. Riverton 12 conversion to combined cycle.
 - iii. KCPL/GPE announcement that Sibley 1 & 2, Montrose 1, 2, & 3 and Lake Road 6 would cease burning coal prior to or around the 2019 time period.
 - iv. Addition of O’Fallon solar farm
 - v. Position of Ameren Missouri that “we recently decided to retire our Meramec Energy Center no later than 2022, and it may be retired earlier, if necessary, to comply with new environmental rules.” (Pg. 13, Direct Testimony of Moehn in Case No. ER-2014-0258).

SUPP EXHIBIT 13 – Page 5 states that revised modeling reflects items indicated in 4.b.

- d. Representative (if estimated) heat rate curves instead of average heat rates across all capacity stages.
- e.

SUPP EXHIBIT 13 – Pages 6 and 7 state that non-horizontal heat rates curves were used in original modeling. The documentation associated with the original modeling shows that horizontal heat rate curves were used for natural gas units. Item 4. c. is stated to have been addressed in revised modeling, but based on the discussion it has not been reasonably addressed. This concern is discussed in greater detail above.

- f. Any omitted plants or improperly modeled plants. If the generator data tab in the Missouri Study Assumptions xls file is meant to be an exhaustive list for Missouri IOU owned generators.
 - i. Missouri owned wind generators have been left off.
 - ii. Modeling multiunit plants as one unit (Taum Sauk).
 - iii. Retirement of units not captured (Asbury 2).
 - iv. Lack of Ameren Missouri CTs located in Illinois (Raccoon Creek).
 - v. Lack of Missouri IOU minority ownership coal plants (Jeffrey, Plum Point).

SUPP EXHIBIT 13 – Page 5 states that revised modeling reflects items indicated in 4.d.

- g. Any reasonable updates or corrections of assumptions, including but not limited to:
 - i. Fuel prices,

SUPP EXHIBIT 13 – Pages 6 and 7 state revised modeling reflects items indicated in 4.e.i., in that the reasonableness of fuel prices was studied, and was found to be reasonable. Staff is concerned that the assumption remains unreasonable, as discussed above.

- ii. Emissions prices,

SUPP EXHIBIT 13 – Pages 6 and 7 state the modeling was revised to reflect reduction in assumed carbon dioxide price as indicated in 4.e.ii.

iii. Load shapes

1. Level of solar penetration,
2. Penetration of Demand Side Management and Energy Efficiency,
3. Items not captured in the 10 year load-shape normalization period, for example, changes in usage characteristics after the Joplin tornado.

SUPP EXHIBIT 13 – Page 5 states “Staff also commented that the load shapes should take into account extreme weather events, energy efficiency and distributed generation. Leidos uses load shapes provided by Ventyx, which take into account all of these factors. Since Staff did not provide any specific changes, Leidos concluded that no further adjustments were appropriate.” Staff was not informed that GBE would not perform these adjustments unless Staff provided the adjustments. Staff was not given an opportunity to review the data to determine if it does take into account these Missouri-specific factors.

5. Using the outputs of items 3 & 4, provide for the Commission’s review:
 - a. A reasonable estimate of the **generation and reserve operations** of each generation facility located in Missouri, or owned by a Missouri-serving utility, or from which power is purchased to serve Missouri load by a Missouri-serving utility (with and without a Missouri converter station).

SUPP EXHIBIT 13, Appendix B, Table B-1 provides modeled MWh of output. These results are not reliable because, among other reasons, PROMOD does not produce results that are accurate for producing plant-level data, and the natural gas related assumptions used in GBE’s modeling are not reasonable.

- b. A reasonable estimate of the **operating costs and market revenues** of each generation facility located in Missouri, or owned by a Missouri-serving utility, or from which power is purchased to serve Missouri load by a Missouri-serving utility (with and without a Missouri converter station).

SUPP EXHIBIT 13, Appendix B, Table B-2 provides modeled costs. SUPP EXHIBIT 13, Appendix B, Table B-3 provides modeled revenues. These results are not reliable because, among other reasons, PROMOD does not produce results that are accurate for producing plant-level data, and the natural gas related assumptions used in GBE’s modeling are not reasonable, as discussed above.

- c. A reasonable estimate of the **emissions released** by each generation facility located in Missouri, or owned by a Missouri-serving utility, or from which power is purchased to serve Missouri load by a Missouri-serving utility (with and without a Missouri converter station).

SUPP EXHIBIT 13, Appendix B, Tables B-4 - 7 provides modeled emissions. These results are not reliable because, among other reasons, PROMOD does not produce results that are accurate for producing plant-level data, and the natural gas related assumptions used in GBE's modeling are not reasonable.

- d. A reasonable estimate for each Missouri-serving utility of the **cost of serving its load** (with and without a Missouri converter station).

Energy cost estimates for Missouri load serving entities have not been provided. SUPP EXHIBIT 13, Appendix B, Table B-8 provides modeled demand costs. These results are not reliable because, among other reasons, PROMOD does not produce results that are accurate for producing plant-level data, and the natural gas related assumptions used in GBE's modeling are not reasonable, as discussed above.

- e. A reasonable estimate for each Missouri-serving utility of the **gross value of its energy output** of its associated generation fleet (with and without a Missouri converter station).

SUPP EXHIBIT 13, Appendix B, Table B-9 provides modeled values. These results are not reliable because, among other reasons, PROMOD does not produce results that are accurate for producing plant-level data, and the natural gas related assumptions used in GBE's modeling are not reasonable, as discussed above.

- f. A reasonable estimate for each Missouri-serving utility of the **cost of producing its energy output** from its associated generation fleet (with and without a Missouri converter station).

SUPP EXHIBIT 13, Appendix B, Table B-10 provides modeled costs. These results are not reliable because, among other reasons, PROMOD does not produce results that are accurate for producing plant-level data, and the natural gas related assumptions used in GBE's modeling are not reasonable as discussed above.

- g. A reasonable estimate for each Missouri-serving utility of the **level of emissions released** by its associated generation fleet (with and without a Missouri converter station).

SUPP EXHIBIT 13, Appendix B, Table B-11 provides modeled emissions. These results are not reliable because, among other reasons, PROMOD does not produce results that are accurate for producing plant-level data, and the natural gas related assumptions used in GBE's modeling are not reasonable as discussed above.

- h. A reasonable estimate for each Missouri-serving utility of the **level of the operational efficiency** of its associated generation fleet (with and without a Missouri converter station).

SUPP EXHIBIT 13, Page 10, Table 2-3 provides modeled average heat rates. These results are not reliable because, among other reasons, PROMOD does not produce results that are accurate for producing plant-level data, and the natural gas related assumptions used in GBE's modeling are not reasonable as discussed above.

- i. A reasonable estimate of transmission upgrades in MISO zones 4 and 5 that may be made economical given the congestion conditions that will exist with a Missouri converter station.

SUPP EXHIBIT 13 – Page 14 states this review has been conducted though conclusions are not clearly stated.

- j. A reasonable estimate of the economic and operational feasibility of exporting energy through the Missouri converter station in hours when capacity is available.

SUPP EXHIBIT 13 – Page 14 states this review has been conducted though conclusions are not clearly stated.

- k. A reasonable estimate of the economic and operational feasibility of managing the variability of injected wind at or before the Kansas converter station.

SUPP EXHIBIT 15 states that the SPP transmission system cannot accept injection of the wind the Project contemplates to transport, and cannot manage the variability of that wind within the SPP.