MISSOURI PUBLIC SERVICE COMMISSION

STAFF

REBUTTAL REPORT

GRAIN BELT EXPRESS CLEAN LINE, LLC

CASE NO. EA-2016-0358

Jefferson City, Missouri
January 24, 2017

** **Denotes Highly Confidential Information** **

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GRAIN BELT EXPRESS CLEAN LINE, LLC
CASE NO. EA-2016-0358

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STAFF REBUTTAL REPORT
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CASE NO. EA-2016-0358

I. Executive Summary

On August 30, 2016, Grain Belt filed the *Application of Grain Belt Express Clean Line, LLC for a Certificate of Convenience and Necessity* ("Application") seeking a certificate of convenience and necessity ("CCN") authorizing it to construct, own, operate, control, manage, and maintain in Missouri, the approximately 206 mile segment of a high voltage, direct current ("HVDC") transmission line that will traverse Missouri from Kansas across Illinois and into Indiana, and, in Ralls County, Missouri, an associated converter station and alternating current ("AC") interconnecting facilities, including an AC switching station and related transmission lines. The proposed HVDC transmission line and converter station facilities are an inter-regional (i.e., crossing multiple regional transmission operator ("RTO") regions) transmission project that will span the footprints of the Southwest Power Pool, Inc. ("SPP"), Midcontinent Independent System Operator, Inc. ("MISO"), and PJM Interconnection, LLC ("PJM") and, in Missouri, traverse Buchanan, Clinton, Caldwell, Carroll, Chariton, Randolph, Monroe and Ralls Counties. According to the Application, the proposed project "will provide economic and reliability benefits by delivering low-cost, wind-generated energy from western Kansas to load and population centers in Missouri and other states in the region."[1] In the Application, Grain Belt also requests relief from certain reporting requirements of rule 4 CSR 240-3.145, 3.165, 3.175 and 3.190.

[1] Application of Grain Belt Express Clean Line LLC for a Certificate of Convenience and Necessity. Page 2, paragraph 1, August 30, 2016.

Staff reviewed Grain Belt's Application based on the five factors the Commission listed in *In Re Tartan Energy*, GA-94-127, 3 Mo.P.S.C.3d 173, 177 (1994) – need, qualified to own, operate, control and manage the facilities and provide the service, financial ability, economic feasibility and promotion of the public interest ("Tartan Criteria"). In addition, Staff reviewed county consents, or lack thereof, safety issues related to the proposed Project, public comments received to date, and the requests for relief from rule reporting requirements.

Although, based on the evidence adduced in Grain Belt's prior case, Case No. EA-2014-0207, Grain Belt once had the consents of the Buchanan, Clinton, Caldwell, Carroll, Chariton, Randolph, Monroe and Ralls County commissions for its proposed transmission line to cross the public roads and highways in their respective counties, Grain Belt no longer has the consent of the Caldwell County Commission to cross the public roads and highways in that county. By judgment dated October 7, 2015, entered in Case No. 14CL-CV00222, the Caldwell County Circuit Court held that the Caldwell County Commission violated the Missouri Sunshine Law when it gave its consent, rendering it a nullity. Grain Belt currently has the consent of Monroe County for its transmission line to cross the public roads and highways in Monroe County, but the legality of that consent is being challenged in pending Monroe County Case No. 14MN-CV00164.

As was its position in Case No. EA-2015-0146, it is still Staff Counsel's position that, not only must Grain Belt have the consent from each of the Missouri county commissions for its transmission line to cross the public roads and highways in their respective county before a Commission certificate for the line is effective, Grain Belt must have those consents before the Commission can lawfully issue the certificate, *i.e.*, those consents are prerequisites to the certificate.

In its Report and Order in Case No. EA-2015-0146, the Commission stated,

> ATXI does not have assent from any of the counties through which Mark Twain would run. ATXI must get assent from each county through which Mark Twain would run before the certificate becomes effective. The Commission believes the plain language of § 229.100 RSMo and its own rules require as much.

One of the parties to Case No. EA-2015-0146, Neighbors United, has challenged the legality of the Commission's Report and Order in the Western District Court of Appeals, in part, on the basis that the county assents are a prerequisite to the Commission grant of the certificate, and ATXI did not have them. The Western District Case No. is WD79883, and Staff anticipates that court will issue its opinion in the spring or summer of 2017.

1. Five Tartan Criteria

a. Whether there is a need

Staff expert/witness Daniel I. Beck, PE notes several issues with Grain Belt's loss of load expectation analyses attached to the direct testimony of Grain Belt witness Edward C. Pfeiffer, including an assumption that 500 MW of capacity is guaranteed to be delivered to Missouri at any given time. Mr. Beck also expresses concerns because the generation portfolio used in the studies does not include all of the generation sited in Missouri, but also includes many generating units that are sited outside Missouri. Mr. Beck notes that even if the assumption that 500 MW will always be available was reasonable, and if the modeling database were corrected, the results of the modeling should not be relied upon to evaluate the possible effects on service reliability, since the loss of load expectation value does not provide insight into the effect that a 500 MW interconnection on the Maywood-Montgomery 345kV transmission line would have on reliability. Mr. Beck also discusses Grain Belt's statement in its Application that access to wind power provided by the Project will help fulfill the objectives and requirements of Missouri's

renewable energy standard ("RES"). Mr. Beck explains that no Missouri investor-owned electric utility "needs" to purchase energy directly from a renewable source to meet its 2021 RES compliance requirements, and only one, Ameren Missouri, does not already have sufficient renewable sourced energy to meet the 2021 RES standard.

b. Whether the applicant is qualified to own, operate, control and manage

Staff is not questioning the qualifications of the staff that Grain Belt has in place to date. However, Staff witnesses Shawn E. Lange and Kathleen A. McNelis, PE identify issues, including engineering and safety issues, that have not yet been resolved, and which will require additional expertise that Grain Belt does not yet have in place.

c. Whether the applicant has the financial ability

Staff expert/witness David Murray explains that Staff's investigation into Grain Belt's financial capability primarily focused on changes that may have occurred to the investors and the investment plan since its recommendation in Case No. EA-2014-0207 that Grain Belt is financially capable to be granted a CCN. Other than the addition of a new investor and additional equity capital investments, Staff did not discover any new information; therefore, Staff is of the opinion that Grain Belt has the financial ability to construct, own, operate, control, manage and maintain the Project.

d. Whether the proposal is economically feasible

Various Staff witnesses express concerns with Grain Belt's testimony and the way it portrays the manner in which the Project would function as a part of the larger transmission system, and how it would function in terms of improved transmission system reliability or as a resolution of Missouri SPP/MISO "seams" issues. Staff also addresses Grain Belt testimony that conflates the impact of the Project with the impact of building additional renewable generation in

Southwest Kansas. Similarly, Staff addresses the testimony of Grain Belt's witnesses who represent that the Missouri converter station will be capable of taking energy from Missouri onto the line so the energy can flow both in and out of Missouri; however, to Staff's knowledge, MISO has to approve such a proposal, and a process to do so is not yet in place. Staff also addresses various RTO studies that Grain Belt witnesses discuss or that are yet to be completed.

e. Whether the Project promotes the public interest

Many of the issues previously discussed overlap the public interest determination, so those issues will not be repeated here. Staff expert/witness Michael L. Stahlman discusses economic benefits that Grain Belt witnesses tout, such as increased employment and tax revenue. Staff cautions the Commission about the weight it gives these factors when considering whether to grant or deny the requested CCN, since the increased employment and tax revenue benefits cited by Grain Belt are incidental to the Project's construction.

2. Safety issues

Staff expert/witness Shawn E. Lange discusses Grain Belt's Emergency Restoration Plan, and expresses concerns with the current lack of specificity related to manpower, the lack of time frames and contracts for major equipment, and the lack of details related to storage of all major material, noting Grain Belt witnesses indicate the details will not be completed until after final Project design. Mr. Lange also discusses issues related to electric magnetic fields ("EMF"). Based on the various studies reviewed and statements by the World Health Organization ("WHO"), Mr. Lange recommends the Commission not rely on public concerns related to EMF as a basis for denying the Application.

Staff expert/witness Kathleen A. McNelis, PE discusses the potential effects of the Grain Belt line on other Missouri utility facilities, many of which are natural gas pipelines.

Ms. McNelis explains that Grain Belt's Application and direct testimony do not clearly address any potential harmful effects on existing utility facilities or explain the measures that Grain Belt will implement to protect nearby facilities. In response to Staff Data Requests Grain Belt explains that it does not yet have the exact location of gas and petroleum pipelines since these are categorized as critical infrastructure. Ms. McNelis explains Staff's concerns related to the proximity of the Project to existing utility facilities, including the effect of the overhead HVDC transmission line and potential current flows through the earth; and, what will happen in the event of a lightning strike or natural disaster that results in current entering the ground.

3. Summary and Recommendations

In summary, based on Staff's review: 1) Grain Belt does not have the consent of the Caldwell county commission for its proposed transmission line to cross the public roads and highways in that county, the validity of its consent from the Monroe County Commission is being challenged in court, and, presently, the prefiled evidence does not include any such consents by the county commissions of Buchanan, Clinton, Caldwell, Carroll, Chariton, Randolph, Monroe and Ralls Counties; 2) There is not a clear need for the Project; 3) Grain Belt is qualified to construct, own, operate, control and manage the Project, but additional expertise will be needed once engineering and safety issues have been resolved; 4) Grain Belt has the financial ability to undertake the Project; 5) It is not clear whether the Project is economically feasible due to the lack of various RTO studies and the uncertainties surrounding the ATXI Mark Twain transmission line and its effects on the Missouri converter station and corresponding congestion; 6) A determination cannot be made at this time as to whether the Project is in the public interest since there is still uncertainty related to the economic feasibility and the safety of the Project.

It is Staff Counsel's position that the Commission cannot grant a CCN absent Grain Belt receiving all county consents. Due to the lack of county consents and uncertainties related to: the modeling and a demonstration of the need for the Project; outstanding RTO studies; the pending ATXI Mark Twain transmission line project appeal by Neighbors United and the ATXI Mark Twain litigation on county consents and their potential effect on Grain Belt's proposed Missouri converter station and corresponding congestion issues; and, the lack of details on Grain Belt's Emergency Response Plans, Staff cannot definitively state that the Application satisfies the requirements of Commission Rule, 4 CSR 240-3.105 and the Tartan Factors of Need, Economic Feasibility and Public Interest.

There are two potential outcomes as a result of these deficiencies: 1) The Commission can find the Application does not meet the criteria as outlined above and deny the CCN; or, 2) The Commission could grant the CCN conditioned upon Grain Belt obtaining county consents, providing completed RTO Interconnection Agreements and any associated studies, submitting a modified plan to address congestion should the ATXI Mark Twain project not proceed as planned, providing a completed emergency response and contingency plans, and requiring compliance with all conditions Staff recommends in Section VI of this Report. Unless otherwise noted, Staff recommends the Commission order that Grain Belt must comply with the conditions prior to acquiring involuntary easements or starting construction of the transmission line. Staff further recommends the conditions be subject to a demonstration to the Commission that the outstanding studies do not raise any new issues, and if they do, that the Commission is satisfied with Grain Belt's solution to address those issues. Finally, Staff recommends the Commission condition the CCN such that if the design and engineering of the Project materially

changes from what is presented in its Application, Grain Belt is required to file an updated application subject to further review and determination by the Commission.

Staff Expert/Witness: Natelle Dietrich

II. Does the Application Meet the Requirements of Commission Rule 4 CSR 240-3.105?

The Commission's rule titled, "Filing Requirements for Electric Utility Applications for Certificates of Convenience and Necessity," 4 CSR 240-3.105, includes requirements regarding government approvals. The requirements include the following language in 4 CSR 240-3.105(1)(D):

> When approval of the affected governmental bodies is required, evidence must be provided as follows:
>
> 1. When consent or franchise by a city or county is required, approval shall be shown by a certified copy of the document granting the consent or franchise, or an affidavit of the applicant that consent has been acquired; and
>
> 2. A certified copy of the required approval of other governmental agencies; . . . .

Grain Belt addresses this requirement in its Application as follows:

> 75. All 4 CSR 240-3.105(1)(D) governmental approvals required for the construction and operation of the Project in Missouri will be provided. If they are unavailable when this Application is filed, the Company will furnish such approvals once they have been acquired per 4 CSR 240-3.105(2).

At this time, the government approvals required by 4 CSR 240-3.105(1)(D) have not been filed with the Commission. Although, based on the evidence adduced in Grain Belt's prior case, Case No. EA-2014-0207, Grain Belt once had the consents of the county commissions of Buchanan, Clinton, Caldwell, Carroll, Chariton, Randolph, Monroe and Ralls Counties for its transmission line to cross the public roads and highways in their respective counties, Grain Belt no longer has the consent of the Caldwell County commission to cross the public roads and highways in that

county. By judgment dated October 7, 2015, entered in Case No. 14CL-CV00222, the Caldwell County Circuit Court held that the Caldwell County Commission violated the Missouri Sunshine Law when it gave its consent, rendering it a nullity. Grain Belt currently has the consent of Monroe County for its transmission line to cross the public roads and highways in Monroe County, but the legality of that consent is being challenged in pending Monroe County Case No. 14MN-CV00164.

As was its position in Case No. EA-2015-0146, it still is Staff Counsel's position that, not only must Grain Belt have the consent from each of the Missouri counties for its transmission line to cross the public roads and highways in them before a Commission certificate for the line is effective, Grain Belt must have those consents before the Commission can lawfully issue the certificate, *i.e.*, those consents are prerequisites to the certificate.

In its Report and Order in Case No. EA-2015-0146, the Commission stated,

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Staff notes the requirements of 4 CSR 240-3.105(1)(D)2 includes other government approvals, that is approvals other than the county consents, and Grain Belt has made no filings to satisfy 4 CSR 240-3.105(1)(D)2 to date.

Staff Expert/Witness: Daniel I. Beck, PE

III. Five Tartan Criteria

1. Whether there is a need for the facilities and service

In Grain Belt witness Edward C. Pfeiffer's direct testimony, starting on page 3, line 10, and continuing to page 5, line 9, he summarizes the loss of load expectation analysis that is attached to his testimony as Schedule ECP-1. On page 3, lines 6-7, witness Pfeiffer states that this study was performed by Quanta Technology and on page 2, line 17 he states that he collaborated with Alex Schneider, PE of Quanta Technology. On page 2, lines 18-22, witness Pfeiffer briefly describes Mr. Schneider's experience, but does not provide Mr. Schneider's job title.

This study does not provide any results that the Commission should consider when determining whether to grant Grain Belt a CCN for the Project because the analysis is flawed. The primary flaw is that the modeling assumes 500 MW of capacity is guaranteed to be delivered to Missouri at any given time. A secondary flaw is trying to limit the modeling to the geographical area of Missouri when many of the utilities who serve in Missouri also serve in adjoining states and many have generating units sited in other states, which is not correctly reflected in the generation database. Another flaw is related to interpreting the modeling results to be significant and valuable.

The primary flaw is that the modeling assumes 500 MW of capacity is guaranteed to be delivered to Missouri at any given time. Although not discussed in witness Pfeiffer's direct testimony, the second and third paragraphs in Section 2.7 Imports of the loss of load expectation analysis (his Schedule ECP-1) discuss how the Project "will provide the State of Missouri with access to diverse resources from the roughly 79,000 MW of installed capacity in the SPP integrated market." However, based on discussions with Grain Belt, in Staff's opinion, there is no way, at this time, to determine what amount of capacity will be tied to the SPP integrated

market, and it is possible that there will not be any direct tie to SPP. In addition, even if all of the 500 MW of capacity is directly tied to SPP, it is not logical that Missouri would somehow be given preferential access to SPP's resources at a time of system peak. The specific resources used in this model to represent Missouri generating capacity are also some of the roughly 79,000 MW of installed capacity in the SPP integrated market. The capacity that is being shown within the service areas of The Empire District Electric Company ("Empire"), Kansas City Power & Light Company ("KCPL"), KCP&L Greater Missouri Operations ("GMO"), and Westar Energy/Western Resources ("Westar") is all capacity in the SPP market. In addition, imported capacity from plants like the Wolf Creek Nuclear Plant, the Crossroads Combustion Turbines ("CTs"), Flat Ridge Wind, Elk River Wind, Gray County Wind, Waverly Wind, Slate Creek Wind, Cimarron II Wind, and Ensign Wind are all SPP controlled resources. New capacity that was not included in the study, but that is either already part of the SPP market or will be in 2017, include the 200 MW Osborn Wind Project and the 300 MW Rock Creek Wind Project as well as Empire's Riverton 12 Combined Cycle unit that is approximately 250 MW. Given the existing, imported, and new capacity that serves Missouri customers through the SPP market, a significant portion of the SPP market is already used to provide capacity to Missouri at any given time. It would be unreasonable to then assume that this capacity could also supply energy to the Grain Belt line or to assume that Missouri would be given access to all 79,000 MW of SPP market capacity to meet up to 500 MW of demand at the Missouri node.

A secondary flaw is trying to limit the modeling to the geographical area of Missouri when many of the utilities that serve in Missouri also serve in adjoining states. Although the difficulty with modeling a state and not a RTO region is not discussed by Grain Belt witness Pfeiffer in his direct testimony, he does, in Section III of his direct testimony, identify an issue

that makes modeling Missouri difficult: "Missouri is electrically diverse in that there are four Transmission Service Providers ("TSPs") that operate within the state – SPP, MISO, Associated Electric Cooperatives, Inc. and Southwestern Power Administration." In addition to the four TSPs, several of Missouri's electric utilities serve consumers in two or more states. KCPL, Empire and Associated Electric Cooperative Inc. ("AECI") all serve customers in other states. Empire serves customers in Missouri, Kansas, Oklahoma and Arkansas. KPCL serves customers in Missouri and Kansas. In the most recent Empire rate case in Missouri (Case No. ER-2016-0023), Staff proposed a Missouri energy allocator of 82.4% for the Missouri Jurisdiction and in the most recent KCPL rate case (Case No. ER-2016-0285) Staff is proposing a Missouri energy allocator of 56.1%. Although Staff is unable to determine what percentage of AECI's sales are to rural electric cooperatives that serve Missouri consumers, a review of a map of AECI's service territory shows that 15 of the 51 distribution cooperatives that make up AECI have service territory in either Oklahoma or Iowa. Since a significant portion of the loads of these utilities are not in Missouri, modeling Missouri not only is difficult, but modeling does not reflect the operational realities for Missouri utilities.

On page 4, line 8, of his direct testimony Grain Belt witness Pfeiffer states that "[t]he geographical scope of this analysis was the state of Missouri." He goes on to state "[t]he analysis considered limited interconnections to neighboring states representing the resources and obligations of Missouri utilities which are physically located outside of Missouri." The study includes Table 2-1, Generating Unit Population, that purports to show the megawatt ("MW") "capacity of units of each type, by owner". The study also shows imports and exports in Sections 2.7 and 2.8. While Table2-1 appears to provide the generating units that are located in the state of Missouri and the imports/exports appear to be the limited interconnections to

neighboring states, based on Staff's review of the information Grain Belt provided Staff determined that the information, especially Table 2-1, does not match the description in Grain Belt witness Pfeiffer's direct testimony.

Table 2-1 lists most of the generation in the state of Missouri, but does not include all of the generation in Missouri, and it includes many generating units that are sited outside of the state of Missouri. Staff determined that 6 coal units which account for 4230 MW of capacity are actually located outside of Missouri. These units are LaCygne (units 1 & 2), Jeffrey (units 1 – 3), and Plum Point, and are located in Kansas, Kansas, and Arkansas, respectively. In addition, utilities that serve Missouri customers only own/have contracted for a fraction of the total capacity of each of these plants, with that fraction being 50%, 8%, and approximately 37.5%, respectively. The imports/exports for base coal in the modeling did include a 700 MW export for LaCygne 2 and a 166 MW import for Jeffrey, but these do not correctly represent the concept of importing/exporting within the state of Missouri. The 700 MW export for LaCygne 2 when coupled with 1408 MWs that were included in Table 2-1 result in a net of 708 MW, which is approximately equal to KCPL's 50% ownership share of LaCygne, but since each unit at LaCygne would have different forced outages, assigning all of Unit 1 to KCPL and all of Unit 2 to Westar does not represent the actual operating characteristics of this shared ownership arrangement. For Jeffrey, the 2164 MW of capacity that Grain Belt included in Table 2-1 was increased by another 166 MW in the import analysis.[2] Since both the generation capacity and the import capacity increase the amount of capacity available from Jeffrey, the analysis resulted

[2] Grain Belt's response to MLA data request EP.39 provides a detailed list of the imports, including a 166 MW import described as "KPL-JEC Co-owner power minus losses based on 100% of co-owner share of output."

in a net capacity from Jeffrey for GMO[3] of 2,340 MW, even though the facility only has a capacity of 2,164 MW.

Similarly, natural gas-fired combustion turbines (NG CTs) that are sited in Illinois and Kansas, but included in Table 2-1, account for 33 units and 2,402 MW of the 6,589 MW of CT Gas capacity shown in Table 2-1. All of the Illinois NG CTs are owned by Ameren Missouri [4]and most of the Kansas NG CTs are owned by KCPL.[5] The remaining out-state units are the Keokuk hydro facility located in Iowa totaling 140 MW; the Spearville Wind facility located in Kansas totaling 249 MW and several internal combustion units totaling 39 MW that are located in Kansas.

Staff's review also determined that Table 2-1 does not include several generating facilities that are sited in the state of Missouri. Most notable are the newest wind generation facilities in Missouri and hydroelectric dams that are operated by the Army Corp of Engineers and administered by the Southwest Power Administration (SWPA). In particular, one wind project recently went online, the 200 MW Osborn Wind Project, and the 300 MW Rock Creek Wind Project is expected to be operational in 2017. There are four hydroelectric dams that are administered by SWPA in Missouri. Table Rock is 200 MW, Harry S. Truman is 160 MW, Stockton is 52 MW, and Clarence Cannon is 58 MW.[6] AECI receives 478 MW of capacity from SWPA and 14 Missouri municipal electric utilities receive another 198 MW in capacity from SWPA.[7] The total capacity shown in the SWPA 2015 Annual Report that goes to Missouri is 676 MW which is nearly identical to the 679 MW the total MWs attributed to SWPA in Grain

[3] GMO is the Missouri based utility that owns 8% share of the facility while Westar owns the remaining 92%.
[4] Goose Creek 1-6, Kinmundy 1-2, Pinckneyville 1-8, Raccoon Creek 1-4 and Venice 2-5 total to 1897 MW.
[5] The following NG CTs that are located in Kansas were included in Table 2-1: KCPL's Osawatomie 1 and West Gardner 1-4 totaling 450 MW; Empire's Riverton 9-11 totaling 46 MW and Ottawa Kansas's unit 1 totaling 9 MW.
[6] Capacities were gathered from SWPA's 2015 Annual Report.
[7] Ibid.

Belt's response to Missouri Landowners Association data request EP.39.[8] However, Table 2-1 shows that the 58 MW of capacity for Clarence Cannon Dam and 54.7 MW of capacity for Stockton Dam is directly credited to AECI; therefore, this capacity is being double counted. While the SWPA administered Missouri hydroelectric capacity could be modelled as internal or external units, it is not acceptable to double count the capacity of any facilities.

Staff also notes that there are various electric generating facilities in Missouri that are shown in a specific area but owned/operated by another entity. The largest that fits this description is the Dogwood combined cycle generating facility which in the model is shown as 693 MW in GMO's area, but is an independent power producer. Similarly, smaller facilities like the Jefferson City Landfill, Trigen-St. Louis's natural gas fueled steam turbine, Fulton's NG CT, and Chillicothe NG CT are also listed under the area where the facilities are sited and not under who owns their capacity.

Even if the assumption that 500 MW will always be available was reasonable and if the modeling database was corrected, the results of the modeling should not be relied on by the Commission to evaluate the possible effects on service reliability that the Project would have in Missouri. While a model that essentially treats the state of Missouri as a single delivery point does result in a loss of load expectation value, that value does not provide any insight into the effect on reliability that a 500 MW interconnection on the Maywood-Montgomery 345kV Transmission Line would have, which is the subject of the CCN Grain Belt is requesting.

Grain Belt witness Pfeiffer correctly states that "[a] LOLE or Loss of Load Probability ("LOLP") analysis is a statistical comparison of the electrical load of a given power system and

[8] Grain Belt's response to MLA data request EP.39 shows that 50 MW of gas CT capacity is sent by SWPA and received by SPRM. However, Staff believes that this response is in error and that the 50 MW is for hydroelectric capacity. SWPA's Annual Report shows that this 50 MW is similar 50 MW that City Utilities of Springfield receives from SWPA.

the available generation resources to supply that load." [Pfeiffer, Direct, Page 3, lines 12-14] He then goes on to describe the results of the model for the year 2022, which go from an estimated LOLE of 0.013 to 0.004 and includes a table which states that there is a -69% "Impact from the Project." As described earlier, the -69% impact is more of a reflection of the assumption that Missouri will have "access" to 500 MW of uninterrupted power than it is of any actual impact that access to 500 MW of capacity might have. However, it also implies that this "impact" is somehow important. In contrast, in Section 1.2 of Schedule ECP-1, includes the following statement: "An accepted target [LOLE] value in North America is 0.1 day per year." The results of this modeling are not significant because of the purported -69% Impact, but is instead an analysis that shows that the LOLE is below the target value of 0.1 day per year before and after the Project is introduced into the model. The fact that both values are below the target is more relevant than a percentage impact calculation. Staff suggests that the model does not provide any significant insight into the reliability of the transmission system the Grain Belt plans to interconnect with and; therefore, should not be used to support Grain Belt's request.

In paragraph 27 of its Application, Grain Belt states the following:

> The open access transmission service to be offered by Grain Belt Express will allow Missouri utilities to meet the requirements of Missouri's Renewable Energy Standard ("RES") set forth in Section 393.1020, et seq., as well as the renewable portfolio standard ("RPS") requirements of other states served by the MISO and the PJM energy markets. Approximately 12-15 million megawatt hours ("MWh") per year of renewable electricity will be needed by 2021 for Missouri's investor-owned utilities to meet their RES requirements. The access to wind power provided by the Project will help to fulfill the objectives and requirements of the RES.

In the previous Grain Belt CCN application case, Case No. EA-2014-0207, Staff testified that three of the four investor-owned electric companies in Missouri (Empire, KCPL and GMO) have existing capacity and new contracts that are projected to not only supply enough Renewable

Energy Credits ("RECs") for each to meet Missouri's 15% RES requirement for 2021, but also for each to have excess RECs to sell before then. This continues to be the case, although Staff clarifies here that the 15% RES requirement is a 0.3% requirement for solar energy and a 14.7% requirement for all other renewable energy. Missouri retail sales by Empire, KCPL, GMO and Ameren Missouri were 56.338 million MWh in 2015[9]; therefore, the 14.7% 2021 RES requirement is 8.3 million MWh, not the 12-15 million MWh that Grain Belt projected for them. Ameren Missouri's 2015 retail electric sales were 35.876 million MWh in 2015; therefore, the 14.7% 2021 RES requirement is 5.274 million MWh. Ameren Missouri's most recent Renewable Energy Standard Compliance Plan filing in Case No. EO-2016-0286 shows that Ameren Missouri expects to get approximately 1 Million RECs from its Keokuk hydro and Maryland Heights Landfill Gas facilities. In addition, Ameren Missouri gets the output from the 102.3 MW Pioneer Prairie Wind Farm located in Iowa, but the annual MWh output of that facility is highly confidential. Since a 102.3 MW wind facility, when coupled with the approximately 1 million RECs from Ameren Missouri owned renewable facilities, cannot generate all of the RECs that Ameren Missouri will need to meet the 2021 RES requirements, Ameren Missouri will need to acquire additional RECs to meet its 2021 obligations. Ameren Missouri has the option of purchasing RECs that are not directly associated with generation that it owns or has under contract. Therefore, Ameren Missouri does not "need" to purchase energy directly from a renewable source to meet its 2021 RES compliance requirements, but it does need to acquire additional RECs before 2021. Ameren Missouri's 2016 Integrated Resource Plan Update, filed on April 12, 2016, in Case No. EO-2016-0273 includes the following description of its current renewable activities:

[9] Missouri Public Service Commission 2016 Annual Report.

> In December 2015, Ameren Missouri issued a request for proposal (RFP) for wind generation with the intention of acquiring a minimum of 50 MWs of wind to be added to its generation portfolio no later than 2019. Responses were received on January 22, 2016 and are being reviewed and evaluated.

Staff is not aware of any public information on the results of that RFP process.

Most of the wind generation that existed in Missouri prior to 2016 was under contract or directly owned by Missouri rural electric cooperatives and municipal utilities. However, in 2016 the 200 MW Osborn Wind Farm, which is located in DeKalb County, Missouri, came online. In addition, the 300 MW Rock Creek Wind Farm, which is located Atchison County, Missouri, is expected to be operational by midyear 2017. These two wind farms will more than double the amount of wind capacity available in Missouri, which was previously approximately 458.5 MW. KCP&L[10] announced that it had contracted for the output of the Osborn and Rock Creek Wind Farms on April 7, 2016. It is possible that KCP&L might be willing to sell some of the RECs from these two wind farms, and since Missouri's RES includes a 25% premium for Missouri-sourced generation, Ameren Missouri would have an additional incentive to purchase these RECs.

Staff Expert/Witness: Daniel I. Beck, PE

2. Whether the applicant is qualified to own, operate, control and manage the facilities and provide the service

Staff is not questioning the qualifications of the staff that Grain Belt has in place to date. However, Staff witnesses Lange and McNelis identify issues, including engineering and safety issues, that have not yet been resolved, and which will require additional expertise that Grain Belt does not yet have in place.

Staff Expert/Witness: Natelle Dietrich

[10] The press release included the following definition of KCP&L: "Kansas City Power & Light Company and KCP&L Greater Missouri Operations Company use KCP&L as a brand name."

3. Whether the applicant has the financial ability for the undertaking

Because Staff and the Commission already determined that Grain Belt was financially capable to construct the proposed transmission line in Grain Belt's previous case, Case No. EA-2014-0207, Staff's investigation into Grain Belt's financial capability primarily focused on any changes that may have occurred to the investors and the investment plan for the proposed Project. Staff issued the same data requests as it did in the previous case to determine if any of the factors Staff relied on in Case No. EA-2014-0207 to conclude that Grain Belt was financially qualified changed enough to change Staff's opinion. Other than an additional investor providing capital to Clean Line, Staff did not discover any significant changes. Grain Belt has the financial capability to construct the Project based on its plan to use project financing once the Project is approved and Grain Belt receives subscriptions for a significant amount of capacity.[11]

Although Grain Belt's proposed method of using project financing does not allow for the identification of investors willing to provide debt financing to the project, it is highly unlikely that investors would be willing to commit capital before certain project milestones are met. Grain Belt witness David Berry's Direct Testimony identified the following major conditions that must be met before investors will be willing to commit debt financing: "(a) having all necessary permits, (b) having procured sufficient financing commitments to complete construction, and (c) having a high degree of certainty on budget and timeline."[12]

Although Staff believes it is logical that Grain Belt would not begin construction of the Project unless it has secured sufficient capital to ensure it can complete the entire Project, Staff recommends a safeguard from the last case to ensure that Grain Belt does not begin construction of any part of the Project until Grain Belt provides evidence that it has secured financing

[11] Expected to be approximately 70% based on Grain Belt witness David Berry's response to Staff Data Request No. 0082 in Case No. EA-2014-0207.

[12] Berry Direct, p. 22, ll. 6-8.

commitments that ensure there will be sufficient capital to complete the Project. Mr. Berry's testimony indicates that Grain Belt is willing to continue to commit to this condition.[13]

Grain Belt's commitment to continue to adhere to this condition affirms Staff's previous position that Grain Belt has the financial capability to complete the project when considering the commitment of start-up equity capital in Clean Line from GridAmerica Holdings, Inc. ("GridAmerica"), a subsidiary of National Grid USA, and by Clean Line Investor Corp., a subsidiary of ZAM Ventures, LP ("ZAM Ventures"). At the time Staff was reviewing Grain Belt's last Application, these two entities had invested a combined amount of approximately **_____ ** in Clean Line. In order to ensure that the original investors were still committed to the Clean Line projects, Staff requested information about whether the investor identified in Mr. Berry's direct testimony was an additional investor or a replacement of the original equity investors. Grain Belt indicated that the new investor was an additional investor providing **_____ ** of convertible preferred equity capital.[14] ZAM Ventures has contributed an additional ** _____ ** of additional equity capital since Grain Belt's last Application was considered in Case No. EA-2014-0207.[15] Of the approximately **_____ ** of capital invested in Clean Line Energy, approximately ** _____ ** has been invested in start-up costs for the Grain Belt Project.[16] No debt capital had been issued as of September 30, 2016.

Grain Belt expects that the Project will be capitalized by 100% equity contributions during the continued development stage. If the Project moves forward to the construction phase,

[13] Berry Direct, p. 22, l. 16, through p. 23, l. 9.
[14] Grain Belt Response to Staff Data Request No. 0018.
[15] Grain Belt Response to Staff Data Request No. 0019 (updated response to Staff Data Request No. 0087 in Case No. EA-2014-0207).
[16] Grain Belt's September 30, 2016 Balance Sheet provided in response to Staff Data Request No. 0019.

NP

then Grain Belt expects to issue project debt that will comprise approximately 50% of the capital shown on Grain Belt's balance sheet.

Other than the addition of a new investor and additional equity capital investments, Staff did not discover any issues that caused it to change its previous position that Grain Belt is financially capable to be granted a CCN. However, Staff recommends the Commission impose the condition Grain Belt agreed to in Case No. EA-2014-0207. The specific language of this condition is provided at the end of the report, but it essentially requires Grain Belt to make a showing that it has secured the necessary amount of total capital to complete the Project in its entirety.

Staff Expert/Witness: David Murray

4. Whether the proposal is economically feasible

In its Application, Grain Belt asserts four reasons for the Project being economically feasible:[17]

1) The HVDC technology of the Grain Belt Express Project is the most cost effective and efficient way to move large amounts of renewable energy over a long distance. High capacity factor wind generation from western Kansas is the cheapest form of renewable energy in the United States, and the Project's delivered energy cost to Missouri and neighboring states, including the cost of transmission, will be cheaper than alternatives to meet the demand for both renewable and non-renewable energy.

2) Because the Grain Belt Express Project will build a bridge between untapped, low-cost wind resources in western Kansas and the demand for renewable energy in Missouri and other states in the region, it is economically feasible.

3) It is "an interregional transmission project that is consistent with the goals of FERC [the Federal Energy Regulatory Commission's] Order 1000" and is completing the RTO interconnection studies and agreements.

4) Grain Belt Express and its investors will assume all of the financial risk of the Project, including any cost overruns.

[17] Application of Grain Belt Express Clean Line LLC For A Certificate of Convenience and Necessity field in EA-2016-0358 ("Application"), pp. 13-14.

As discussed further in this Report, Staff's opinion is that the prefiled evidence at this time is insufficient for Staff to conclude that Project is economically feasible.

RTO Interconnection Studies

Grain Belt has not completed all the necessary RTO interconnection studies for the Project. The purpose of the interconnection studies is to identify the impacts of interconnecting a new generator[18] to the transmission system and the impacts of using the transmission system to deliver power from a new generator. These studies also identify and estimate the cost of upgrading transmission facilities due to the new generation. Because these studies are incomplete, any potentially necessary transmission upgrades are unknown, and Staff is unable to determine the economic feasibility of the Project.

The MISO Generation Interconnection Procedures are described in Attachment X of its Open Access Transmission Tariff ("OATT").[19] Generally, after receiving an application, MISO enters the project into its generation interconnection queue[20] and conducts a feasibility study.

> [This] study consists of short circuit/fault duty, steady state (thermal and voltage) and stability analyses. The short circuit/fault duty analysis would identify the Interconnection Facilities required and the Network Upgrades necessary to address short circuit issues associated with the Interconnection Facilities. The stability and steady state studies would identify necessary upgrades to allow full output of the proposed Generating Facility and would also identify the maximum allowed output, at the time the study is performed, of the interconnecting Generating Facility without requiring additional Network Upgrades.[21]

[18] MISO treats an interconnection request of HVDC transmission identically to new generation with the exception of limiting Network Resource Interconnection Service to the confirmed megawatts in the transmission service request. "[PJM's] merchant transmission interconnection process is similar to PJM's large generator interconnection process" (Direct Testimony of Dr. Anthony Wayne Galli, P.E, p. 23, ll. 1-2).

[19] Although the following focuses on MISO's Generation Interconnection process, the description of its generation interconnection process is similar for PJM and SPP.

[20] Grain Belt's current project number is J255. Additionally, Grain Belt had previously proposed terminating a 3500 MW project near St. Francois, which was reviewed by MISO under project number J115 and withdrawn by Grain Belt on June 27, 2012.

[21] MISO OATT, Attachment X version 61.0.0 effective February 15, 2017, paragraph 3.2.1.2.

Upon completion of the feasibility study, an interconnection customer has the option of entering the Definitive Planning Phase ("DPP") or performing a System Planning and Analysis study ("SPA"). The SPA allows the customer to delay the DPP without losing its position in the queue. If 18 months pass without entering the DPP or performing a SPA, the project is withdrawn.

The purpose of the DPP is to identify network upgrades that will reliably and efficiently integrate the proposed generation into the transmission system. The DPP involves two types of studies: the Interconnection System Impact Study ["SIS"] and the Facilities Studies. The DPP is conducted in three phases; the initial phase is designed to provide a preliminary detailed analysis of the impact of the Project on the reliability of the transmission system, and phases two and three update generation assumptions due to potential withdrawal of Interconnection Requests throughout the process. The second phase of the DPP also begins the first portion of the Interconnection Facilities Study.

> The preliminary Interconnection System Impact Study will consist of a short circuit analysis, stability analysis, and a power flow analysis. If Transmission Provider determines in accordance with Good Utility Practice that any such analyses are needed, any stability analysis performed in a preliminary Interconnection System Impact Study may include transient stability, large and small signal, sub-synchronous stability, dynamic voltage stability, mid- and long-term stability, voltage flicker analyses and excessive neutral current. The preliminary Interconnection System Impact Study will also include analysis needed to determine the Generating Facility's reactive power capability required to maintain the Transmission Owner's voltage schedule and power factor criteria at the Point of Interconnection.[22]

The second portion of the Interconnection Facilities Study starts after the SIS is finalized in the third phase of the DPP. This portion estimates the cost and time required to build the necessary network upgrades identified in the final SIS, which is then used to draft a pro forma Generator Interconnection Agreement.

[22] MISO OATT, Attachment X version 61.0.0 effective February 15, 2017, paragraph 7.3.1.3.

Status of Grain Belt's RTO Interconnection Studies

MISO

In its Application, Grain Belt states that it "is entering the final phases of interconnection studies and agreements in the MISO and PJM Interconnection ("PJM") regions."[23] However, in his prefiled direct testimony, Dr. Anthony Wayne Galli, P.E., states that Grain Belt will not enter the MISO DPP process until after it receives approval from this Commission.[24] Therefore, in order to prevent the Project from being withdrawn from the MISO's generation interconnection queue, Grain Belt initiated a second SPA study. ** _____ _____ [25] _____ _____ _____ **

In his direct testimony, Dr. Galli states "Grain Belt Express does not expect any network upgrades (aside from the interconnection facilities just described) in order to obtain delivery service of the 500 MW from the Missouri HVDC Converter Station."[27] Although the preliminary studies have not identified any injection constraints for the full 500 MW of energy from the Project, Staff is concerned that Grain Belt may be underestimating the costs of interconnection. As discussed in Section IV.d. of this Report by Staff witness Shawn E. Lange, the point of interconnection is near the Audrain Power Station, which is currently limited by a special protection scheme, and the preliminary studies assumed the complete construction of the Ameren Transmission Company of Illinois' Mark Twain project.

[23] Application, p. 14.
[24] Direct Testimony of Dr. Anthony Wayne Galli, P.E, p. 30, ll. 5-9.
[25] Direct Testimony of Dr. Anthony Wayne Galli, P.E, p. 12 ll. 15-17.
[26] ** _____ **
[27] Direct Testimony of Dr. Anthony Wayne Galli, P.E, p. 30 ll. 18-21.

Additionally, as noted above, as part of the DPP the power factor criteria at the point of interconnection is examined. However, in response to Staff Data Request No. 0042, Grain Belt states, "Power factor ranges are not typical design requirements for a transmission line, including an HVDC transmission line, and thus Grain Belt Express does not intend to design for a specific power factor range." Despite undergoing MISO's and PJM's generation interconnection processes, Grain Belt stated in that same data request response, "It should be noted that the Missouri HVDC Converter Station is not a generator and therefore FERC orders specific to generator interconnections are not applicable to the Grain Belt Express Project's terminal interconnections with MISO."

The power factor is an alternating current phenomenon due to the way current and voltage phases become out of sync in the presence of reactive components; there is no power factor in a direct current circuit. Thus, if the Grain Belt converter station in Missouri is providing power to an AC transmission grid, it is effectively acting as a generator that would need to meet generation interconnection requirements; the Kansas wind farms that provide the power to the Project are irrelevant to the power factor at MISO or PJM because the power on an HVDC line has no current or voltage phases. Therefore, it is proper for MISO and PJM to examine the power factor criteria of the Grain Belt converter station at the point of interconnection in the DPP and the impacts on the AC transmission grid.

Finally, during the DPP there will be a determination of whether the proposed generator and other nearby generators will remain connected to the grid under various disturbance situations, such as line trips and equipment failures, and will include a fault duty analysis to determine whether existing system equipment can accommodate the increased short circuit fault duty caused by the new generator. This is a more in-depth assessment of the impacts of Grain

Belt's project on MISO's transmission system. Without this study, the necessary interconnection transmission upgrades and their costs are unknown.

SPP

On November 3, 2016, SPP filed with the FERC an executed Interconnection Agreement between Grain Belt and ITC Great Plains, LLC ("ITCGP") with SPP as signatory.[28] Among its provisions is the following:

> For the avoidance of doubt, it is the intent of the Parties and SPP that: (i) until the additional studies identified in Section III of this Exhibit B are completed and the facilities and upgrades identified therein, if any, are placed into service, ITCGP and SPP are not guaranteeing the availability of any level of interconnection capacity under this Agreement; (ii) this Agreement does not provide for any transmission or ancillary services, or right of injection or withdrawal of energy, under the SPP Tariff and such services or rights, as the case may be, will be made available on a non-discriminatory basis pursuant to the SPP Tariff; and (iii) [Grain Belt] shall not have to demonstrate the availability of firm transmission service under the SPP Tariff or pay for transmission upgrades on the SPP-controlled transmission system that are required for such firm service in order to obtain an interconnection under this Agreement.[29]

As noted by Grain Belt witness Dr. Galli in his direct testimony, the current SPP Criterion 3.5 studies for the Project, which were completed in 2013, were based on a 3,500 MW delivery rather than the proposed 4,000 MW.[30] Thus the Interconnection Agreement requires Grain Belt to produce "a fully documented model for the converter station, with particular attention to commutation failure, voltage thresholds and limits, and frequency response limits" and perform additional powerflow studies, stability studies, a sub-synchronous resonance study, and harmonic

[28] FERC Docket No. ER17-296.

[29] Exhibit B of Interconnection Agreement Between Grain Belt Express Clean Line LLC and ITC Great Plains, LLC and Southwest Power Pool, Inc., Original Service Agreement No. 3221, entered into on October 17, 2016.

[30] Direct Testimony of Dr. Anthony Wayne Galli, P.E, p. 22 ll. 13-14.

interaction studies, with the understanding that these additional studies may identify additional upgrades or other changes.[31]

A key assumption of the current SPP Generation Interconnection Facilities Study Report is, "The ITCGP interconnection facilities require that no power interchanges occur, either real or imaginary or a combination, as this was the premise and understanding of the DC Interconnection."[32] Exhibit B of the Interconnection Agreement also states:

> Should [Grain Belt] desire to increase the power transfer level above the previously studied level in the required SPP Criteria Section 3.5 studies, [Grain Belt] will initiate another study under the Section 3.5 Criteria to review the proposed new transfer levels.[33]

Thus, while Dr. Galli states that customers of the Project can schedule power to SPP,[34] the current proposal for the Project prevents any power transfer from customers to or from SPP. Therefore, based on the language in Exhibit B of the Interconnection Agreement, a potential customer could not sink power into SPP from the Project unless Grain Belt first reinitiates another SPP Criteria Section 3.5 study and completes all the transmission and facility upgrades identified.

PJM

As of January 11, 2017, the most recent PJM Impact Study Report of the Project available to Staff is dated October 2014. In response to Staff Data Request No. 0011, Grain Belt stated that it is finalizing a review of a re-tooled impact study due to changes of other projects in the PJM interconnection queue. According to PJM's Merchant Transmission Queue website, as

[31] Exhibit B of Interconnection Agreement Between Grain Belt Express Clean Line LLC and ITC Great Plains, LLC and Southwest Power Pool, Inc., Original Service Agreement No. 3221, entered into on October 17, 2016.
[32] ITC Great Plains, LLC, (2015). "Generation Interconnection Facilities Study Report For GBX Clean Line High Voltage Direct Current Facility In Ford County, Kansas. March 19, 2015" p. 3.
[33] Exhibit B of Interconnection Agreement Between Grain Belt Express Clean Line LLC and ITC Great Plains, LLC and Southwest Power Pool, Inc., Original Service Agreement No. 3221, entered into on October 17, 2016.
[34] Direct Testimony of Dr. Anthony Wayne Galli, P.E, p. 31 ll. 18-22.

of January 11, 2017, the impact study for project X3-028 (the Project) is complete and a facilities study is in progress. Grain Belt further stated in response to Staff Data Request No. 0011 that it anticipates the beginning of negotiations of a PJM Interconnection Agreement as early as mid-2017.

> The predecessors for an Interconnection Agreement with PJM/AEP [American Electric Power] include 1) the AEP Facilities Study which will not commence until the PJM re-tool study has concluded as described above and 2) any additional "detailed studies" that may be required as a result of PJM's Manual 14E - *Additional Information for Upgrade and Transmission Interconnection Projects*.[1] The detailed studies described in Manual 14E are not required prior to execution of an Interconnection Agreement but rather are required prior to commercial operation.[35]

Based on this response, Staff anticipates that a PJM Interconnection Agreement would have similar conditions to the SPP/ITCGP Interconnection Agreement.

The October 2014 PJM Impact Study Report noted that the Project failed to meet acceptable criteria for many of the studied contingencies in the Stability Study.[36] The report also highlights the need for additional studies and additional transmission upgrades:

> As X3-028 is required to stay connected to the system for all faults, an updated model that exhibits this behavior is needed. The results suggest that further transmission reinforcement may also be required; the extent of this reinforcement cannot be identified prior to an updated X3-028 dynamic model being available.[37]

The report also notes that it only identified the most severely overloaded conditions and that the Project may not be fully deliverable even if the identified upgrades are made.[38]

Based on Staff's review of the RTO Interconnection Studies and Agreements[39] made available to it, Staff recommends to the Commission that, because the RTOs have insufficient

[35] Grain Belt response to Staff Data Request No. 0011.
[36] PJM Interconnection (2014). "X3-028 System Impact Study Report" p. 13.
[37] PJM Interconnection (2014). "X3-028 System Impact Study Report" p. 13.
[38] PJM Interconnection (2014). "X3-028 System Impact Study Report" p. 12.
[39] RTO Interconnection Studies are also discussed by Staff witness Shawn E. Lange in the "Safety Issues" section of this Report.

information on the design of the Project to perform final and conclusive studies, there is insufficient information to conclude that the Project is economically feasible. All three RTOs require additional studies before the Project can begin commercial operation, and those studies may require additional upgrades and/or changes in design or operation.

Staff Expert/Witness: Michael L. Stahlman

Grain Belt asserts that the Project is economically feasible, providing several bases for this assertion, including (1) the Missouri Joint Municipal Electric Utility Commission ("MJMEUC") contract, (2) the level of cost to be incurred from non-subscribing Missourians, and (3) the relative costs and benefits of wind generation in Kansas. Staff recommends that the Commission not rely on these assertions for the reasons discussed below.

The MJMEUC contract as evidence of economic feasibility

Grain Belt asserts that the participant funding of the Project demonstrates the economic feasibility of the Project as an independent business venture.[40] The only evidence Grain Belt has presented to date of the participant funding of the Project is the MJMEUC contract. Staff does not agree that the MJMEUC contract demonstrates participant funding to satisfy the economic feasibility consideration as proposed by Grain Belt.

At page 32 of Grain Belt witness Suedeen Kelly's direct testimony, she states, "Taken together, the MJMEUC contract, the successful open solicitation, and the cost competitiveness of wind power delivered by the Project, provide additional strong evidence that Grain Belt Express is financially viable." Grain Belt witness Prescott Hartshorne at page 7 of his direct testimony states that "the Grain Belt Express Project is economically attractive, as it provides a valued service to customers as exemplified by the contract with MJMEUC."

[40] See direct testimony of Grain Belt witness Suedeen Kelly at page 30.

However, at page 7 of his direct testimony, Grain Belt witness David Berry characterizes the MJMEUC contract as a "first-mover" rate.

The MJMEUC contract accounts for up to 5.71% of the SPP-MISO capacity, and up to 0.63% of the MISO-PJM capacity. For the MJMEUC contract to demonstrate that the Project is economically feasible, the contract terms would need to support the operation and cost of the Project over the life of the Project. Assuming that the entire capacity were to be subscribed at the rates offered to MJMEUC, the annual revenue for the entire Project would be approximately $180 million for the first year, with a general escalation of 2% per year. In light of the approximately $2.9 billion estimated costs, the MJMEUC contract in and of itself does not demonstrate economic feasibility.

The level of cost to be incurred from non-subscribing Missourians

Grain Belt asserts that from the perspective of the Missouri public, the Project is economically feasible because Grain Belt alleges, in part, that there is no risk that Missourian's will bear any capital costs for the Project. Staff does not agree with Grain Belt's assumptions that underlie this conclusion.

At page 30 of her direct testimony, Grain Belt witness Suedeen Kelly states that the project is "economically feasible from the perspective of the Missouri public, which will receive the benefits of the project, without assuming the risk that it will cost more to construct or earn a lower profit than expected." Several Grain Belt witnesses make similar assertions that non-subscribing Missourian's bear any risk of the capital cost of the project.[41] However, at

[41] Grain Belt witness Skelly Direct, page 15; "The Project costs will not be recovered from Missouri ratepayers through either SPP or MISO regional cost allocation tariffs." "Company witnesses Suedeen Kelly and David Berry discuss the merits of a participant funded transmission line in their Direct Testimonies."; Kelly Direct, page 30; "As a participant-funded project, all costs of the Grain Belt Express Project are borne by Grain Belt Express and its investors." "As I explained above, in Section II of my testimony, these costs will not be recovered from Missouri's captive ratepayers."; Kelly Direct, page 30; David Berry Direct Testimony at 9; "In addition to using a

page 9 of his direct testimony, Grain Belt witness David Berry states that "Grain Belt Express will not seek to recover costs from Missouri ratepayers through MISO or SPP regional cost allocation without Commission authorization." It appears, that while Ms. Kelly states Missourians will not bear the risk, Grain Belt is not willing to commit to that concept since Mr. Berry states Grain Belt will not seek to recover costs *without Commission authorization* in the future.

Another concern with the assertion that costs will not be recovered from Missouri ratepayers is that if upgrades are necessary to the MISO grid associated with the Missouri converter station, and those upgrades are determined by MISO to address a local reliability concern, the pro rata share of those costs is recoverable through MISO from those entities deemed to be beneficiaries of the improvement, and ultimately incurred by Missouri ratepayers. While these amounts are not likely to be of such a magnitude to impact the economic feasibility of the Project one way or the other, the existence of the costs should not be discounted or ignored in evaluating the reasonableness of Grain Belt's assertions.

Generally, in discussing the cost of energy purchased from an entity that is using capacity on the Project, or the cost of energy purchased in Southwest Kansas and transmitted on the Project, Grain Belt ignores a calculation of the basis differential between the MISO converter station and the ultimate sink within MISO. These amounts are not likely to be of such a magnitude to impact the economic feasibility of the Project one way or the other, but the existence of the costs should not be entirely ignored, to the extent that the decision of a putative customer to secure capacity on the Project is evidence of economic feasibility.

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participant-funded model, Grain Belt Express has made an independent commitment not to seek regional cost allocation—if it were to become available—without express authorization from the Commission." "This commitment is discussed in Company witness David Berry's Direct Testimony."

Relative costs and benefits of wind generation

Finally, while Staff has not reviewed the RFP responses discussed by Mr. Berry, Staff would draw the Commission's attention to the statistics discussed by Mr. Berry. For example, at page 24, Mr. Berry states that "In January 2014, the Company completed a Request for Information ("RFI") to wind generators in western Kansas. The response to the RFI included 14 wind developers developing 26 wind farms totaling more than 13,500 MW. As part of their responses, generators provided indicative PPA pricing, which is their own calculation of their levelized cost of energy. The lowest-priced 4,000 MW of new wind generation was an average of 2.0 cents per kWh flat for 25 years." However, at page 30 of Mr. Skelly's testimony, Grain Belt states, "Second, many of the best regions in the U.S. for locating new wind generation facilities – the areas that are richest in wind resources and have the highest wind speeds – are located far from load and population centers. Such wind-rich regions include the Great Plains from western Texas and Oklahoma north through western Kansas up to the Dakotas. Transmission facilities dedicated to transporting the electricity produced in these regions hundreds of miles to load and population centers farther east are limited or non-existent." It is not reasonable to expect that the lowest-priced wind generators would also be the wind generators with the best capacity factors. Therefore, it is not reasonable to expect 2.0 cent wind to have a high capacity factor, and it is not reasonable to expect high capacity factor wind to be available for 2.0 cents.

Staff Expert/Witness: Sarah L. Kliethermes

Grain Belt's Project Design and Operation

Grain Belt's Project is still in the preliminary design stages.[42] As discussed in the "RTO Interconnection Studies" section of this Report, the RTOs stated that they had insufficient information on the Project's design to perform final and conclusive studies. As design becomes finalized it can change the Project's operational characteristics and the Project's ultimate cost.

Design

Multi-terminal HVDC projects like the Project are relatively rare, but not unprecedented. In response to Staff Data Request No. 0012, Grain Belt identified only six other multi-terminal HVDC projects currently in operation worldwide. Consequently, it would not be unexpected that actual construction costs for the Project would be different than current estimations because Grain Belt does not have the benefit of experience for knowing and estimating the problems that can occur during construction. However, Grain Belt's parent company, Clean Line Energy Partners LLC, is also in development of the Plains & Eastern Project, which is also a multi-terminal HVDC project. Grain Belt witness Dr. Galli states in his direct testimony, "The similarities between the Grain Belt Express Project and the Plains & Eastern Project will benefit the Grain Belt Express Project since much of the work that is being done for one project will be applicable to the other."[43] Therefore Staff anticipates that the cost estimates of the Project will become more refined as the construction of the Plains & Eastern Project proceeds.

Even in the Project's current preliminary development stage, it's unclear why Grain Belt has not further developed the design for this Project. For instance, in response to Missouri Landowners Alliance's ("MLA") Data Request G.57 which was an inquiry concerning the height of Grain Belt's structures at the Missouri and Mississippi river crossings, Grain Belt stated:

[42] In its response to Rockies Express Pipeline's ("REX") Data Request 2, Grain Belt did not disagree "that the design and engineering of the HVDC project is still in a preliminary state."
[43] Direct Testimony of Dr. Anthony Wayne Galli, P.E, p. 13 l. 21-p. 14 l. 2.

> Specific structure designs for the Grain Belt Express Project have not been produced since the location of structures plays a major role in the design of the structures. Once the route has been approved in Missouri, Grain Belt Express will perform a detailed structure spotting and then will commence structure design activities.

However, Grain Belt witness James G. Puckett states that the location of the Missouri River crossing is known based on the route in Kansas[44] and that the Mississippi River crossing location was determined with "[i]nput from the public and government agencies, as well as engineering and natural resource considerations" (Emphasis added).[45] Additionally, based on the testimony of Mr. Puckett, the location of these river crossings had not changed since Grain Belt's prior application in 2014.[46]

Operation

The Project is currently being designed to be capable of delivering 500 MW of power to the Ralls County, Missouri converter station and 3,500 MW of power to the Illinois converter station from a converter station near Dodge City, Kansas. Grain Belt anticipates the construction of approximately 4,600 MW[47] in new wind farms that will connect directly to the Kansas converter station through Grain Belt's 345 kV AC collector system.[48] It is anticipated that the wind farms will likely originate within a 40 mile radius of the Kansas converter station.[49] Based on the SPP interconnection studies and agreement, there is likely to be no power transfer from the Project into SPP.[50] Grain Belt anticipates transferring functional control of the Project to

[44] Direct Testimony of James G. Puckett, p. 4, ll. 16-18.
[45] Direct Testimony of James G. Puckett, p. 5, ll. 2-4.
[46] Direct Testimony of James G. Puckett, p. 13, ll. 15-22.
[47] Response to MLA Data Request JC.43.
[48] Direct Testimony of Dr. Anthony Wayne Galli, P.E, p. 4 l. 16-p. 5 l. 4.
[49] Grain Belt Response to MLA Data Request JC.42.
[50] ITC Great Plains, LLC, (2015). "Generation Interconnection Facilities Study Report For GBX Clean Line High Voltage Direct Current Facility In Ford County, Kansas. March 19, 2015" p. 3.

PJM.[51] Based on Grain Belt's response to Staff Data Request No. 0035, it is likely that all wind farms connecting to the Project will complete a PJM generation interconnection request (thus becoming PJM market participants) to connect their facilities, in order to minimize exposure to other RTO's OATT charges. Therefore, and based upon a review of PJM OATT schedules, the rate that MISO customers would pay for service from Kansas would likely include additional PJM OATT schedules, including, but not limited to Schedules 1 and 1A. At this time, Staff is unclear how ancillary services will be maintained on Grain Belt's AC collector system, which could impact the application of additional PJM schedules. Grain Belt's response to Staff Data Request No. 0046 on this matter is pending as of the writing of this Report.

The converter stations of the Project are functionally capable of converting AC to DC or DC to AC.[52] As mentioned earlier, since there is currently no plan for energy flow between the Project and SPP, it is unlikely that the Kansas converter station will operate as a DC-to-AC converter.[53] Additionally, given the anticipated capacity of wind at the Kansas converter station with the capacity constraints of the Illinois converter station and that a transmission request from MISO to PJM would need to be separately studied,[54] Staff does not anticipate that an option to use the Project to deliver energy from MISO to PJM would be exercised.

Staff presumes that Grain Belt will complete all transmission upgrades necessary to make the Project capable of delivering 3500MW to PJM.[55] However, the Project's current design is functionally limited as a transmission resource. The current studies and agreement

[51] Grain Belt Response to Staff Data Request No. 0035.

[52] Direct Testimony of Dr. Anthony Wayne Galli, P.E, p. 7 ll. 8-9.

[53] ITC Great Plains, LLC, (2015). "Generation Interconnection Facilities Study Report For GBX Clean Line High Voltage Direct Current Facility In Ford County, Kansas. March 19, 2015" p. 3.

[54] Grain Belt Response to MLA Data Request G.36.

[55] As discussed in the "RTO Interconnection Studies" section of this Report, the MISO generation interconnection process is incomplete and the most current version of the PJM System Impact Study Report states that the Project may not be fully deliverable even if the identified upgrades made.

prevent power transfers between the Project and SPP. Additionally, it is unclear how much transmission capacity would be available to transfer energy from MISO to PJM due to the large amount of anticipated capacity of wind at the Kansas converter station. Additionally, Grain Belt states that a transmission request from MISO to PJM would need to be separately studied.[56] As discussed by Staff witness Sarah L. Kliethermes, MISO currently has no process to perform such study. Staff expects limited operations from MISO to PJM. Therefore, the Project design is more reminiscent of a line to connect generation to the grid rather than an interregional transmission line. Grain Belt can undergo additional studies that could improve the Project's functionality as an interregional transmission line,[57] but Staff is unaware of any plan to do such.

Staff Expert/Witness: Michael L. Stahlman

Financial Risk

Grain Belt states in its application that the project is economically feasible because "Grain Belt Express and its investors will assume all of the financial risk of the Project, including any cost overruns."[58] However, Grain Belt and its investors are not solely at risk, the landowners of parcels with Grain Belt easements are as well. Some of these easements could be tied to annual payments from Grain Belt;[59] if the Project fails, it is unclear if those payments would continue. Grain Belt has also proposed a "Decommissioning Fund"[60] to be used if it must remove all of the Project's facilities and structures,[61] but in response to MLA Data Request DL.14, Grain Belt said, "Grain Belt Express has not finalized details of the Decommissioning

[56] Grain Belt Response to MLA Data Request G.36.
[57] Exhibit B of Interconnection Agreement Between Grain Belt Express Clean Line LLC and ITC Great Plains, LLC and Southwest Power Pool, Inc., Original Service Agreement No. 3221, entered into on October 17, 2016.
[58] Application, p. 14.
[59] Application, p. 27.
[60] The Decommissioning Fund is also discussed by Staff witness Daniel I. Beck, PE in the "Grain Belt/Landowner interactions" section of this Report.
[61] Application, p. 5.

Fund, and thus does not have any additional documents to provide." Grain Belt witness Deann K. Lanz also states that the Decommissioning Fund will "[commence] no earlier than the 20th anniversary of the completion of the Project."[62] Grain Belt further states that it is making no commitment to take the decommissioning actions described on pages 12-13 of Deann K. Lanz's direct testimony, which includes terminating and releasing all transmission line easements, before the 20th anniversary of the Project.[63]

Further, while Staff recognizes that obtaining finances may provide supporting evidence of economic feasibility, in Staff's opinion, such evidence is not conclusive. Only 45% of startup companies in an industry category identified as "Transportation, Communication and Utilities" remained in operation after four years, which was the second highest failure rate of all industry categories.[64] While the category is broad, Grain Belt's business model is atypical of the utilities that are generally granted regulatory protections by this Commission.[65]

Staff Expert/Witness: Michael L. Stahlman

5. Public Interest

Grain Belt witness Ms. Kelly makes several statements which she asserts demonstrate the Project's satisfaction of the Public Interest prong that overlap with her assertions concerning the Economically Feasibility prong. They will not be separately discussed here.[66]

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[62] Direct Testimony of Deann K. Lanz, p. 13, l. 6.

[63] Grain Belt Response to MLA Data Request DL.20.

[64] Statistic Brain (2016). "Startup Business Failure Rate By Industry" http://www.statisticbrain.com/startup-failure-by-industry. (1/13/2017).

[65] Application, p. 18.

[66] "The Project provides Missouri utilities access to lower-cost power supplies than would otherwise be available, including an estimated savings to MJMEUC of $10 million per year and additional savings possible for other Missouri utilities;" at page 32.

"The Project's participant-funded business model protects Missouri's captive electric customers from the costs and risks inherent in traditional, rate-based transmission;" at page 32.

; and The Project will be a source of economic development to Missouri through increased property taxes, construction jobs, and manufacturing jobs ." at page 33.

Grain Belt asserts that the Project is in the public interest, providing several bases for this assertion, including (1) impact on regional generation and the cost for Missouri utilities to serve load, and (2) impact on reliability and regional planning. Staff recommends the Commission not rely on these assertions for the reasons discussed below.

Ms. Kelly asserts at page 32 that "[t]he Project will reduce wholesale electricity prices and the cost for Missouri utilities to serve their electric load; The Project will reduce the emissions of carbon dioxide, nitric oxides, and sulfur dioxides." Staff identifies two separate issues with these assertions.

Impact on regional generation and the cost for Missouri utilities to serve load

First, it should be simply noted that as retail rates are set in Missouri, a simple reduction in wholesale electricity prices does not necessarily result in a reduction to retail rates due to the offset of off-system sales against a commission-regulated utility's retail revenue requirement. These amounts are not likely to be of such a magnitude to impact the public interest considerations of the Project one way or the other, but the existence of these increases to retail rates should not be entirely ignored, to the extent that the reduction of wholesale energy costs is considered evidence that the Project is in the public interest.

Second, this assertion conflates the addition of wind generation that may or may not occur otherwise with the Project itself. Similar changes to generation dispatch in the eastern interconnection would be expected based on the addition of renewable energy anywhere in that footprint, which induce the modeled changes to both the cost of wholesale energy and the environmental benefits Grain Belt discusses. Similarly, the manner in which the production modeling was done does not account for any increase in emissions that will result

from the ancillary service activities such as regulating reserves necessary to integrate any increase in wind generation.

Impact on reliability and regional planning

Ms. Kelly asserts at page 32 of her direct testimony that "[t]he Project meets the clear need for interregional transmission—and provides the multiple benefits of interregional transmission --while avoiding the contentious and problematic cost allocation processes across multiple RTOs;" and Ms. Kelly asserts at page 32 that "[t]he The Project provides a major new source of electric generation and links four regions and three RTOs, which increases reliability during times of peak load or generator outages."

These assertions conflate the manner in which the proposed HVDC transmission line and converter stations would function as a part of the larger transmission system with the manner in which an AC line would function in terms of improved transmission system reliability. In an AC system, power seeks a lower voltage, unless switching prevents its flow. This is true whether or not the RTO functional control of the AC lines is under the same or separate RTOs. Under the current design of the Project, however, each converter station is in effect a new seam, not a resolution of an existing seam. Similarly, each converter station is a discrete source or sink, and it is Staff's understanding that Grain Belt will restrict the free flow of energy through each converter station. From the context of her testimony, it appears that Ms. Kelly's references to seams issues refers to a shortage of interconnection between RTOs, as opposed to the situation in Missouri where there are multiple interconnections between multiple RTOs. There is nothing to suggest that the Project would do anything to address the Missouri-specific seams issues concerning potentially uncompensated flows with which the Commission is familiar.

These additional seams and the discrete interconnection of the Project exacerbates the issues that Ms. Kelly appears to imply the Project would help to resolve at page 18 of her direct testimony, where she states;

> The ability of interregional transmission to import power from outside of a region also provides reliability benefits. In times of generation scarcity within a region, excess resources from another region can be imported using the interregional line. The availability of resources from outside a given region can also reduce the reserve margin necessary to ensure reliability for the region. Lowered reserve margins decrease consumer costs in the region, as ratepayers no longer have to support extra resources within the region.

In fact, Staff is not aware of any reason that the converter station would not cause the need for contingency planning of a sudden failure of a 500MW generator in Northeast Missouri. To the extent that contingency planning for the region would need to account for the sudden failure of a 500MW generator, this would increase reserve margin requirements to preserve existing reliability.

At pages 28-29 of her direct testimony, Ms. Kelly testifies, "The Project will go through the relevant interconnection study processes to determine whether it can be reliably interconnected to the transmission grid." As Grain Belt witness, Dr. Wayne Galli, explains in detail in his Direct Testimony at page 28-29, "the RTOs have extensive study processes to ensure that a new transmission line can safely and reliably connect to the grid." However, Ms. Kelly does not indicate that MISO is studying the Project as a generator, as opposed to studying it as a "transmission line."

A similar confusion about the interconnection status of the Missouri converter station is exemplified in the testimony of Dr. Galli, who provides the following exchange:

> Q. Can a customer within MISO obtain access to the Grain Belt Express Project Facilities to deliver power to SPP or PJM?

> A. Yes. Although the current MISO interconnection process is not designed to study energy withdrawals from the MISO market, anyone can request, and have studied, transmission service across the MISO system in order to access the Grain Belt Express Project facilities.

However, based on a conversation with Grain Belt personnel on November 8, 2016, not only is such a process not yet in place at MISO, the process to establish the process has not yet been established. In contrast, Mr. Lawlor on behalf of Grain Belt testifies at pages 2-3 of his direct testimony: "In addition, MJMEUC has agreed to purchase 25 MW of capacity (with the option to purchase another 25 MW) from the Missouri converter station to the Sullivan Substation in PJM Interconnection LLC ("PJM") ("Missouri-PJM Service.") This allows MJMEUC utilities the ability to directly make off-system sales into the PJM market and derive additional financial benefits." While Grain Belt has clarified this means that MJMEUC has the rights to capacity to transmit energy purchased in Kansas to Missouri – and then out of Missouri – from Missouri to the PJM, Grain Belt's characterization of this transaction is concerning in that it implies that the Missouri converter station will be capable of uploading Missouri energy. This is apparently not the case, or at least it has not yet undergone the necessary – and as yet to be developed – process for MISO approval.

These internally conflicting assertions do not constitute evidence that the Project is in the Public Interest.

Staff Expert/Witness: Sarah L. Kliethermes

Economic Benefits

Grain Belt cites increased employment and tax revenue as two economic benefits that support a finding that this Project is in the public interest.[67] Staff cautions the Commission in its consideration of this information as a basis to approve or reject Grain Belt's application. First,

[67] Application, p. 17, 18.

the analyses that determine the stated benefits typically ignore the opportunity costs; how the workers, land, and investment would otherwise be employed if the project is not constructed. Second, wages and taxes are part of the Project's cost, not benefits. For Grain Belt to earn a rate of return on the Project, these costs would need to be recovered from customers who take advantage of the Project. To the extent that Missouri customers take advantage of the proposed service, expenditures on wages and taxes increase the rate for the service, reducing the marginal benefit of taking service on the Project. Staff recommends that the Commission determine if the Project's service is an improvement that justifies its cost. If the Commission determines that the Project is an improvement justifying its cost, then it is unnecessary to review the impacts of increased employment and tax revenues as they are incidental to the Project's construction.

Staff Expert/Witness: Michael L. Stahlman

Grain Belt/Landowner interactions

Grain Belt witness Deann K. Lanz testifies on the issues of Right-of-Way Acquisition and Landowner Protocol. The Missouri Landowner Protocol is a 7 page document that is attached to witness Lanz's testimony as Schedule DKL-1 and states that the Protocol was established "to recognize and respect the interest of the landowners". In turn, the Missouri Landowner Protocol references the Missouri Agricultural Impact Mitigation Protocol ("MO Ag Protocol"), which is attached to the direct testimony of Grain Belt witness James L. Arndt, Ph.D., as Schedule JLA-2. Witness Arndt also sponsors the Agricultural Impact Mitigation Policy for Clean Line Energy Partners LLC as Schedule JLA-3.

Although the testimony of the various representatives of the landowners should be considered when setting the final landowner-company conditions, in recent transmission CCN cases, Staff has recommended that the Commission refer to its prior decision in Case No.

EO-2002-351 for possible conditions regarding landowner-company relations. In its Report and Order in Case No. EO-2002-351, the Commission conditioned the approval of the CCN on several conditions. Staff recommends that the Commission consider including some of those conditions if it grants Grain Belt a CCN. Specifically, conditions 2, 4, 6, and 7 are issues related to the easements that should be included as conditions to the grant of any CCN for Grain Belt. These conditions are listed below, with "Grain Belt" being inserted into the language where appropriate:

> 2. That the certificate is limited to the construction of this line in the location specified in the application, and as represented to the landowners on the aerial photos provided by Grain Belt, unless a written agreement from the landowner is obtained, or the company gets a variance from the Commission a particular property.
>
> 4. That absent a voluntary agreement for the purchase of the property rights, the transmission line shall not be located so that a residential structure currently occupied by the property owners will be removed or located in the easement requiring the owner to move or relocate from the property.
>
> 6. That Grain Belt shall survey the transmission line location after construction and record the easement location with the Recorder of Deeds in the appropriate counties. Grain Belt shall also file a copy of its survey in this case.
>
> 7. That Grain Belt shall follow the construction, clearing, maintenance, repair, and right-of-way practices set out in Exhibit A attached to [the Grain Belt] order.

Staff has reviewed the Missouri Landowner Protocol and the MO Ag Protocol and has determined that many of the construction, clearing, maintenance, repair and right-of-way practices that were in Exhibit A of the Case No. EO-2002-351 order have been addressed with these two Grain Belt documents. Staff also determined that the documents address issues that were not specifically addressed in the Commission's order in Case No. EO-2002-351. However, the topics covered in 2, 4 and 6 above are not expressly covered by the two protocol documents.

Staff also notes that the protocols in Sections 3, 4 and 7 of the Missouri Landowner Protocol, titled, "Compensation", "Update to Land Values", and "Binding Arbitration" are

beyond the scope of conditions the Commission has imposed in past CCN cases and Staff is not taking a position on Sections 3, 4 and 7 of the Missouri Landowner Protocol at this time.

The proposal in Section 8 "Decommissioning Fund" is also beyond the scope of conditions the Commission has imposed in past CCN cases, but does address an issue that was raised in the testimony of several witnesses at the Local Public Hearings held in this case in December of last year. Several witnesses raised the concern that structures could be abandoned and, therefore, the responsibility of the landowner. As such, the structure would not only require a significant landowner investment to remove it, but it could also be a safety hazard until it was removed. Grain Belt is proposing to begin contributing to the decommissioning fund no earlier than the 20th anniversary of the completion of the Project and may delay when it starts contributing even further if the remaining useful life is estimated to be in excess of ten years. While this decommissioning fund provides some level of landowner protection, it also provides no protection for the first 20 years of the Project. In addition, Grain Belt begins the Decommission Fund section by stating its belief that "[t]ransmission lines and their ROWs are rarely if ever retired from service"; therefore, it seems likely that Grain Belt would project that the remaining useful life of the Project is far into the future and it may never begin making contributions prior to the Project's actual retirement date. Given Grain Belt's apparent belief that transmission lines are rarely retired, it seems that the more likely scenario is that the project will one day experience a catastrophic failure and the cost to make repairs will be more than the benefit of restoring the line and, the decision to retire the line will occur with little or no advance warning. Therefore, Staff proposes that contributions to the decommissioning fund begin when the Project begins commercial operation. This would be consistent with the decommissioning funds that have been set up for the two nuclear plants that generate electricity used to serve

Missouri customers. This would also allow for the time-value-of -money to turn a relatively small investment into a sizeable decommissioning fund. Staff also notes that Staff's proposal still does not afford landowners complete protection, since there is the possibility, no matter how unlikely, that the Project could be abandoned during the construction phase. If the Commission wishes to also address this risk, then a requirement for insurance, a letter of credit, escrowed funds, or a bond could be required.

As an alternative to the language from the Case No. EO-2002-351 order, Staff recommends that conditions 2, 4, and 6 above be adopted as conditions of any CCN the Commission grants to Grain Belt in this case, and that the Missouri Landowner Protocol and the Missouri Agricultural Impact Mitigation Protocol as proposed by Grain Belt be incorporated as conditions of the CCN. If the Commission would like to address the risk associated with decommissioning, Staff recommends the Commission consider modifications to Grain Belt's decommissioning fund proposal.

Staff Expert/Witness: Daniel I. Beck, PE

IV. Safety Issues

a. EMF

Static EMF ("electric and magnetic fields") is a result of the physical characteristics of a DC transmission line. In alternating current transmission lines, the flow of the electric charge alternates with a frequency of sixty Hertz. In a DC or direct current line, the flow of the electric charge does not reverse direction and is therefore static.

EMF is a topic that is brought up in nearly every line certificate case. There have been studies performed that draw a correlation between negative health impacts and static EMF. Two of the latest studies showing correlation are:

- *The Influence of Static Electric Field Generated Nearby High Voltage Direct Current Transmission Lines on Hormonal Activity of Experimental Animals EHE' 07 – 2nd International Conference on Electromagnetic Fields, Health and Environment Wroclaw, Poland, September 10-12, 2007*
- *Bioinitive 2012, A Rationale for Biologically based Exposure Standards for Low-Intensity Electromagnetic Radiation*

There have also been studies performed that do not draw a correlation between negative health impacts and static EMF. Below are studies that conclude EMF does not cause long term health effects:

- *International Agency for Research on Cancer, IARC Monographs on the Evaluation of Carcinogenic Risks to Humans, Vol. 80: Static and Extremely Low-Frequency (ELF) Electric and Magnetic Fields (Lyon, France, IARC Press, 2002).*
- *National Radiological Protection Board (NRPB), Advice on Limiting Exposure to Electromagnetic Fields (0-300 GHz), Vol. 15, No. 2 (Didcot, UK, 2004).*
- *World Health Organization, Environmental Health Criteria Monograph No. 232. Static Fields (Geneva, Switzerland, World Health Organization, 2006).*
- *International Committee on Electromagnetic Safety, IEEE Standard for Safety Levels with Respect to Human Exposure to Electromagnetic Fields 0 to 3 kHz C95.6-2002 (Piscataway, NJ, IEEE, 2002) (Reaffirmed 2007).*
- *Advisory Group on Non-ionizing Radiation, Static Magnetic Fields, RCE-6, Documents of the Health Protection Agency (Chilton, UK, 2008).*
- *International Commission on Non-ionizing Radiation Protection, Guidelines on Limits of Exposure to Static Magnetic Fields, Health Physics, 96:504-514 (2009).*

The World Health Organization (WHO) and International Agency on Cancer Research (IACR) have classified radiofrequency electromagnetic field as a Group 2B carcinogen.[68] A Group 2B carcinogen is a type of agent "for which there is limited evidence of carcinogenicity in humans and less than sufficient evidence of carcinogenicity in experimental animals."[69]

[68] http://www.iarc.fr/en/media-centre/pr/2011/pdfs/pr208_E.pdf pg 1 accessed 12/27/2016.
[69] http://www.iarc.fr/en/media-centre/pr/2011/pdfs/pr208_E.pdf pg 5 accessed 12/27/2016.

The WHO did go on to state, "Despite many studies, the evidence for any effect remains highly controversial. However, it is clear that if electromagnetic fields do have an effect on cancer, then any increase in risk will be extremely small. The results to date contain many inconsistencies, but no large increases in risk have been found for any cancer in children or adults."[70]

While not precedent, the Commission has granted certificates for lines in Case Nos. EA-2015-0146, EA-2007-0319, EA-2002-0131, EA-2013-0089 and EO-2002-0351 among others. Staff does not recommend rejection of the application on the basis of public concerns about the impact of EMF on health.

Staff Expert/Witness: Shawn E. Lange

b. Potential effects on nearby utility facilities

The proposed route for the Grain Belt proposed HVDC transmission line crosses a number of existing utilities in Missouri.[71] Of the utilities that Grain Belt has identified it will cross, several are natural gas pipelines that are regulated by the Commission for safety. Additionally, several individuals expressed concerns in public comments regarding the proximity of the Grain Belt proposed HVDC transmission line to natural gas pipelines installed on or near their properties. Grain Belt's application documents and the direct testimony Grain Belt witnesses provided in support of the application do not clearly address possible harmful effects on existing utilities or explain the measures that Grain Belt will implement to protect these utilities. Staff concerns related to the potential effects on nearby utilities and recommendations to address these concerns are discussed below.

[70] http://www.who.int/peh-emf/about/WhatisEMF/en/index1.html.

[71] See Case No. EA-2016-0358, Item 98, Addendum to Application (Public) file date 10/27/2016 for listing of utilities crossed.

Grain Belt responded to a Staff data request that it does not yet have detailed location data on gas and petroleum pipelines since these are categorized as critical infrastructure and detailed location data is not made publically available. Grain Belt stated in response to a Staff data request that it anticipates that ground surveys and coordination with the utility asset owners will provide accurate and detailed location information for each crossing prior to construction. Staff recommends that if the Commission approves this Application it include a condition that Grain Belt obtain detailed location data for all underground utilities and coordinate with the utility asset owners prior to beginning construction. Recommended language for this condition is included in Section VI of this Report.

A concern discussed in recent literature regarding the effect of overhead HVDC transmission lines on pipelines is that some HVDC systems are designed so that imbalance or return current flows through the earth. This current can be picked up and discharged as stray current by nearby metallic pipelines and may result in damage to the pipeline coating and/or corrosion of the pipeline. Literature also indicates that the use of Dedicated Metallic Return (DMR) conductors to carry return current in the HVDC system prevents this source of stray current flow through the ground under normal conditions.[72] Grain Belt stated in a data request response in its previous CCN application case that it intends to use DMR conductors, and, in this case, various exhibits indicate it still plans to use DMR conductors as the method for transferring imbalance currents, including the direct testimony of Grain Belt witness Dr. Anthony Wayne Galli, P.E., Schedule AWG-5. Staff recommends that if the Commission approves this Application it include a condition that Grain Belt be required to demonstrate to the Commission

[72] "Guide, Influence of High Voltage DC Power Lines on Metallic Pipelines", October 2014, Canadian Association of Petroleum Producers (CAPP), 2014-0034.

that the Project is built with operational DMR conductors before beginning commercial operations. Recommended language for this condition is included in Section VI of this Report.

An additional concern is what may occur in the event of a lightning strike or a natural disaster that results in current from the Project entering the ground. In response to a Staff data request in the previous Grain Belt CCN application case, Grain Belt stated that during a lighting strike, or in the extreme case that a pole conductor has fallen to the ground, there is a momentary possibility for current to be injected into the ground. Grain Belt further stated that in the case of the lightning strike on the Grain Belt proposed HVDC transmission line, the duration and magnitude of the current injection into the ground is directly proportional to the duration and magnitude of the current resulting from the lightning strike and that, in the extreme case that an energized pole conductor has fallen to the ground, the control and protection system of the Grain Belt proposed HVDC transmission line would de-energize the Project in less than a second. Grain Belt stated that it would take approximately 80-150 milliseconds before the protection system would completely shut down or de-energize the Grain Belt proposed HVDC transmission line if both of the poles (sets of conductors on each site of the tower structure) were downed. In response to a Staff data request in the current case, Grain Belt stated that its application materials do not contain a description of the HVDC control and protection system; however, such a system is designed to ensure that all reliability standards at each point of interconnection are met and that it will meet all North American Electric Reliability Corporation ("NERC"), SPP, MISO and PJM reliability standards. Staff recommends that if the Commission approves this application it include a condition that Grain Belt be required to show the Commission that it has operational protection and control safety systems that automatically de-energize the Project within approximately 150 milliseconds of when an abnormal or fault condition occurs before it begins

commercial operations. Recommended language for this condition is included in Section VI of this Report.

Through data requests Staff asked what studies Grain Belt had performed or intended to perform to evaluate the design, operation effects and interference currents on nearby utilities, and what measures Grain Belt will employ to mitigate impacts of direct current interference, the Grain Belt proposed Missouri converter station, and operating personnel safety concerns on nearby utilities in the previous Grain Belt CCN application case. Grain Belt responded that it will conduct all necessary studies to identify necessary mitigation associated with any impacts introduced by its Project to underground metallic facilities and that these studies will be conducted in coordination with the utilities that have facilities the Grain Belt proposed HVDC transmission line will cross or run next to. Grain Belt stated that since these studies are dependent on the exact pole/structure location they will be completed during the construction phase of the Project, once the exact location of all the Grain Belt poles/structures are known. Grain Belt stated that these studies take about a month to complete and there will be sufficient time to incorporate any appropriate mitigation measures during the construction phase of the Project. Staff questioned if Grain Belt was still agreeable to conducting these studies in the current case. Grain Belt responded that it intends to obtain the support of experts to properly identify and mitigate impacts, if any, to nearby utility infrastructure. Staff recommends that if the Commission approves this Application it include a condition that Grain Belt be required to perform detailed engineering studies to determine if the operation of the Grain Belt proposed HVDC transmission line, the Grain Belt proposed Missouri converter station, and the Grain Belt-owned portion of the AC electric transmission line connecting the Grain Belt proposed Missouri converter station to the AC grid will have adverse impacts on nearby utilities.

Additionally, Staff recommends that Grain Belt be required to coordinate with Staff regarding the need for additional studies and monitoring and mitigation measures and to file annual status reports with the Commission. Recommended language for these conditions is included in Section VI of this Report.

Staff Expert/Witness: Kathleen A. McNelis, PE

c. Emergency Restoration Plans

An Emergency Restoration Plan is an important Safety aspect the Commission reviews in order to help determine if the Utility can perform the actions necessary for the request. While it is not unusual to have items that cannot be determined until final design, the following are areas that Staff feels are currently lacking in specificity.

Equipment

If there was an event that would require restoration of facilities, the Grain Belt plan would utilize helicopters. First, light lift helicopters would be utilized to determine what needed to be done and if heavy duty or medium duty helicopters would be required for replacement and/or lifting of equipment due to terrain and restoration efforts.

In the event the restoration effort requires the use of a heavy lift helicopter, the lead time may be several days[73], depending on the severity of the outage. The helicopters listed in the table in Section 3.1.5.3 on page 18 in the *Grain Belt Express Project Restoration Plan* located in schedule TFS-5 of Mr. Shiflett's direct testimony, all tend to be in the Western United States. The Grain Belt project spans from western Kansas to eastern Indiana. Logistically if the helicopters come from the Western United States, the lead time to procure the use of one may be days. While Grain Belt may be able to request a contractor with regional operations, in response

[73] Grain Belt response to Staff DR 38 Part 2.

to Staff DR 38 Grain Belt witness Mr. Shiflett states, "Regional operations and response times for the required equipment will be a factor in the evaluation and selection of contractors."[74]

This equipment may be used extensively in the restoration efforts and the lack of specificity on lead times, regional operations of contractors, and the lack of a contract is concerning.

Manpower

Regional Mutual Assistance Groups (RMAGs) are traditionally groups of electric utility companies who enter into voluntary agreements to help other group utilities in the event there is/are event(s) that necessitate the use of additional manpower with skill sets, equipment, or materials in the restoration of power. These RMAGs have traditionally been regional to help minimize the time necessary for mobilization of manpower and equipment as well as lower the amount of contract labor that a utility may have emergency restoration activities.

There are three (3) RMAGs that have utilities with overhead HVDC lines. They are the Midwest Mutual Assistance Group, the Western Regional Mutual Assistance Group and the North Atlantic Mutual Assistance Group.[75] It is not clear if the RMAG utilities with HVDC lines have HVDC lines in the region or if the utilities have them in other regions so while the utilities may have experience with them, the skilled manpower may not be accessible at all or in short order.

Grain Belt plans to enter into Regional Mutual Assistance Groups however; Grain Belt has not executed any RMAG contracts[76]. It is unclear which RMAG Grain Belt plans on entering into a contract with, whether or not that RMAG has member utilities with accessible

[74] Grain Belt response to Staff DR 38 Part 2.
[75] Grain Belt response to Staff DR 39 Part 2.
[76] Grain Belt response to Staff DR 39 Part 1.

skilled manpower in restoration of a HVDC line, and if and to what degree being a member of a RMAG with member utilities with HVDC lines factors into the selection process.

Materials

Depending on the extent of the damage, it may be necessary to have additional materials at the ready to facilitate the recovery. The major material items Grain Belt defines in the Restoration Plan are Structures, Mats, Equipment, Special Equipment and Miscellaneous Materials. [77] The amount and type of structure on hand will depend on the "location and utilization in the final design."[78] The amount and size of mats "will be determined based on the location and terrain during detailed design and construction."[79] The "[e]quipment requirements will be determined during detailed design and construction."[80] "The inventory of miscellaneous restoration materials will be defined during detailed design and construction."[81] It is also unclear what equipment will be purchased for use in maintenance, operations, and/or emergency activities.[82]

Grain Belt intends to contract with certain vendors for materials and/or services in the support of a restoration effort however; Grain Belt has not executed contracts or agreements for vendors to provide equipment if a restoration event occurs. However, Grain Belt anticipates purchasing equipment and storing that equipment; and for like equipment in multiple Clean Line projects, possibly creating a pooled equipment inventory.

The lack of specificity on amounts and locations of major material items is concerning.

[77] Grain Belt witness Shiflett Direct Schedule TFS-5 pg 6 of 28.
[78] Shiflett Direct Schedule TFS-5 pg 6 of 28.
[79] Shiflett Direct Schedule TFS-5 pg 6 of 28.
[80] Shiflett Direct Schedule TFS-5 pg 6 of 28.
[81] Shiflett Direct Schedule TFS-5 pg 6 of 28.
[82] Shiflett Direct Schedule TFS-5 pg 20 of 28.

While the NERC requires compliance on Emergency Restoration Plans, the current lack of specificity on where the manpower may come from in the event of a restoration event, the current lack of specificity on the time frame necessary and contracts for major equipment such as helicopters, as well as the amounts and location of storage of all major materials such as poles is concerning and many if not most all of these items will not be completed until after the final design. An Emergency Restoration Plan is an important Safety aspect the for the Commission,

Staff Expert/Witness: Shawn E. Lange

d. Interconnection Studies

PJM

System Impact Study Concerns

The results of the PJM System Impact Study (SIS) indicate the following about the Grain Belt Project (X3-028)[83]:

- The Grain Belt Project circuits disconnect from the system for several contingencies.
- The Grain Belt Project addition causes two wind farms to trip for several contingencies.

The PJM SIS study goes on to state: "As X3-028 is required to stay connected to the system for all faults, an updated model that exhibits this behavior is needed. The results suggest that further transmission reinforcement may also be required; the extent of this reinforcement cannot be confirmed prior to an updated X3-028 dynamic model being available."[84]

The PJM SIS study indicates it is not possible to determine the level of additional transmission upgrades until a new model of the Grain Belt converter station in PJM is created. It is unclear if additional transmission upgrades are required, or if a special protection scheme is

[83] http://www.grainbeltexpresscleanline.com/sites/grain_belt/media/x3028_imp.pdf Pg.13.
[84] http://www.grainbeltexpresscleanline.com/sites/grain_belt/media/x3028_imp.pdf Pg.13.

sufficient, or if Grain Belt will need to reduce the capacity of the transmission line into Indiana and/or the Illinois Converter Station of the Grain Belt Project.

MISO

MISO System Impact Study (November 2014) concerns

The MISO System Impact Study states, "As specified in the interconnection customer's requested scope of work, the scope of this J255 study was to be limited to identifying injection-related constraints for the Maywood interconnection based on single contingency NERC Category B events only."[85]

NERC category B events involve the loss of a single element. The element may be a generator, transmission line, transformer or a pole of a DC transmission line.

Staff is concerned that, per Grain Belt's request, the study did not include NERC category C events. NERC category C events involve the loss of two (2) or more elements. This includes the loss of two (2) elements in an N-2 scenario or the loss of one element, readjusting the system and the subsequent loss of another element in an N-1-1 scenario.

Staff is concerned that the NERC category C events have not been analyzed for the MISO region. NERC category C analysis will be performed as part of additional studies within MISO, which will not be constrained by Grain Belt's study scope limitations.

SPP

System Impact Study Concerns

Conclusions in the SPP SIS indicate[86] the addition of Grain Belt Project in AEP causes issues under certain conditions, especially if there is an outage of the Rockport-Jefferson 765 kV line.

[85] http://www.grainbeltexpresscleanline.com/sites/grain_belt/media/GI-SPA-2014-MAY-MO-J255-SIS_Report_(FINAL).pdf Pg. 5.

[86] http://www.grainbeltexpresscleanline.com/sites/grain_belt/media/docs/SPP_GBX_HVDC_Study_Final_Report_09-06-2013.pdf Pg. 39.

A solution is implementing a Special Protection Scheme (SPS) to reduce the power on the Grain Belt HVDC line in the event of an outage on the Rockport-Jefferson 765 kV line.

The SIS study goes on to state, "If the post-fault HVDC reduction SPS is not an acceptable solution, then a major transmission upgrade or reduction in the size of the GBX project will have to be considered."[87]

Based on the PJM SIS study it is not possible to determine the level of additional transmission upgrades until a new model of the Grain Belt Illinois converter station is complete. It is unclear if the proposed SPS is sufficient, or if additional transmission upgrades or a reduction in the capacity of the transmission line into Indiana and/or the Illinois converter station of the Grain Belt Project is needed.

Additional concerns

Mark Twain

The location of Grain Belt's requested Missouri converter station has had congestion issues. Ameren Missouri's Audrain CT plant has had a SPS[88] such that upon high thermal level experienced by the Palmyra substation, the plant's total output would be reduced by approximately thirty (30) MWs[89]. MISO has studied and developed a series of projects to relieve existing transmission constraints and relieve congestion known as the Multi-Value Projects (MVP) Portfolio. MVPs are planned for northeastern Missouri that should address the existing congestion issue as well as other issues. This MISO MVP will[90]:

- Provide benefits in excess of its costs under all scenarios studied, with its benefit to cost ratio ranging from 1.8 to 3.0

[87] http://www.grainbeltexpresscleanline.com/sites/grain_belt/media/docs/SPP_GBX_HVDC_Study_Final_Report_09-06-2013.pdf Pg. 7.
[88] Ameren's Transmission Planning, Criteria and Guidelines; Revised March 14, 2014 pg. 7.
[89] Ameren 2011 Integrated Resource Plan (IRP) Chapter 4 pg 5.
[90] MISO Multi Value Project Portfolio Results and Analyses January 10, 2012 pg. 1.

- Maintain system reliability by resolving reliability violations on approximately 650 elements for more than 6,700 system conditions and mitigating 31 system instability conditions
- Enable 41 million MWh of wind energy per year to meet renewable energy mandates and goals
- Provide an average annual value of $1,279 million over the first 40 years of service, at an average annual revenue requirement of $624 million
- Support a variety of generation policies by using a set of energy zones which support wind, natural gas and other fuel sources

As studied, Grain Belt's Project induced thermal overloads in MISO. Upon including certain MISO MVPs in the modeling, all overloads were eliminated. These MVPs consisted of[91]:

- Ottumwa-Adair 345kV line
- Adair 345/161kV transformer
- Palmyra Tap-Palmyra 345kV line
- Quincy-Sugar Creek 345kV line
- 345/138kV transformers at Quincy, Pawnee, Pana, and Mt Zion

The Commission order in Case No. EA-2015-0146 granted Ameren Transmission Company of Illinois (ATXI) a conditional CCN for the Mark Twain Project. The Mark Twain Project includes:

- Ottumwa- Adair 345kV line from the Missouri border to Adair
- Adair 345/161kV transformer
- Palmyra Tap-Palmyra 345kV line

One of the conditions to that CCN is that ATXI must get county assents prior to construction.[92] ATXI has not been able to obtain the county assents and has filed lawsuits against the Shelby, Schuyler, Adair, Knox and Marion County Commissions over each county assent. It is currently unclear if ATXI will obtain county assents or a favorable ruling allowing them to construct.

[91] http://www.grainbeltexpresscleanline.com/sites/grain_belt/media/docs/Webinar-GBX_Steady_State_Results-February_2013_web.pdf Pg. 32.
[92] EA-2015-0146 Report and Order Pg. 35 Paragraph 22.

Without the Mark Twain Project or something comparable, Grain Belt will induce thermal overloads in the MISO system without additional upgrades or changes to the Grain Belt Project.

Short Circuit Ratio

The Dynamic Stability assessment of the Grain Belt Project includes the following table of short circuit ratio (SCR) in Kansas. The short circuit ratio is shown in the table [93] below.

	Without SC		With SC	
ClarkCo - 539800	Fault MVA	SCR'	Fault MVA	SCR'
2017 LL	4844.48	1.21	8406.06	2.10
2017 SP	5471.96	1.37	9034.25	2.26
2022 SP	5950.93	1.49	9514.52	2.38

1. SCR calculated for a wind capacity of 4,000 MW

The short circuit ratio is the ratio of the system short circuit level Mega Volt-Amperes to the DC power MW. In a Competitive Renewable Energy Zones reactive study of a project that would include a HVDC transmission line that would transmit power generated from wind farms in western Texas to the load centers of Dallas, San Antonio, and Austin. In that study, it was observed that a SCR of less than 2 indicated a weak interconnection point.[94]

IEEE and Cigre[95] have studied this issue and have guides on planning DC connections to weak AC grids[96].

It is currently unclear what the short circuit ratio will be at the interconnection of the Missouri converter station and the MISO AC system.

[93] Dynamic Stability assessment of Grain Belt Express Clean Line HVDC project Pg. 2-8.

[94] Dynamic Stability assessment of Grain Belt Express Clean Line HVDC project Pg. 2-8.

[95] 'IEEE guide for planning DC links terminating at AC locations having Low Short-Circuit capacities', IEEE Std 1204-1997; Guide for planning DC links terminating at AC locations having Low Short-Circuit capacities – Part I: AC/DC interaction phenomena', CIGRÉ working group 14.07, Report 68, June 1992.

[96] "Problems associated with Very Low SCR ac systems can be resolved either by strengthening the system by addition of synchronous compensators or by stabilizing the ac system voltage by fast control" CIGRÉ working group 14.07, Report 68 I-1.

Grain Belt and ITC Great Plains, LLC interconnection agreement

On October 17, 2016, ITC Great Plains, LLC and Grain Belt entered into an interconnection agreement. This agreement does help to resolve issues at the Kansas converter station point of the Grain Belt Project. Included in the agreement was the condition that Grain Belt performs or have performed certain studies.

Included in the studies required of Grain Belt in Appendix B of the interconnection agreement between Grain Belt and ITC Grain Plains is the study of the impacts of the proposed line on other HVDC lines and DC ties[97]. It is currently unclear what effect the Grain Belt Project will have on any or all of the HVDC lines and DC ties in the MISO region. It is also unclear what effects the Grain Belt project will have on the proposed Rock Island Project converter stations and the Plains and Eastern Project Arkansas converter stations.

Also included in the studies required of Grain Belt in Appendix B of the interconnection agreement between Grain Belt and ITC Grain Plains is either the conduct of or support for the torsional studies in the Sunflower Electric Power Corporation.[98] If there are turbine generators in proximity to a converter station, variations in the DC voltage and currents could change the turbine generator's electrical torque. This change in electrical torque could damage the turbine generator. Staff is not aware of any screening studies or actual studies that Grain Belt has performed to determine if there is risk to turbine generators in the immediate proximity of the Missouri converter station, such as the Thomas Hill coal-fired steam turbine power plant or the Audrain combustion turbine that may be impacted by the Grain Belt Project. Staff is further not

[97] https://www.spp.org/documents/44012/2016-11-03_3221%20grain%20belt%20express%20clean%20line%20and%20itc%20great%20plains%20interconnection%20agr_er17-296.pdf Appendix B.

[98] https://www.spp.org/documents/44012/2016-11-03_3221%20grain%20belt%20express%20clean%20line%20and%20itc%20great%20plains%20interconnection%20agr_er17-296.pdf Appendix B.

aware that Grain Belt has made any effort to identify all plants that may be in the electrical proximity of the Missouri converter station though of a greater geographical distance. For example, it is not clear whether the Project could have an impact on the multiple large Ameren Missouri power plants in the St. Louis metro area.

A third study required of Grain Belt in Appendix B of the interconnection agreement between Grain Belt and ITC Grain Plains is a Harmonic interaction study.[99] This study is to assess whether the addition of the HVDC interconnection would induce unacceptable Harmonics on the SPP AC system. Staff is not aware of any study performed that would or has analyzed if there would be unacceptable harmonics induced by the Missouri converter station on the MISO AC system.

These three studies are also required in the PJM interconnection process for a HVDC line[100].

The results of the PJM SIS and the SPP SIS indicate additional action on the PJM converter end may be necessary. This action may be utilization of a SPS, additional transmission upgrades, and/or reducing the size of the Grain Belt Project. Further, additional upgrades or a change in the capacity of the transmission line into Indiana and/or the Illinois converter station of the Grain Belt Project may change the economics of the Grain Belt Project or the Project definitions used in the studies already performed.

The MISO SIS does not include NERC Category C analysis, it is unclear any effect that the Grain Belt Project may have on other DC lines in MISO, other generators in electrical

[99] https://www.spp.org/documents/44012/2016-11-03_3221%20grain%20belt%20express%20clean%20line%20and%20itc%20great%20plains%20interconnection%20agr_er17-296.pdf Appendix B.
[100] https://www.pjm.com/~/media/documents/manuals/m14e.ashx Attachment A.

proximity to the Missouri converter station and any unacceptable Harmonic activity that the Grain Belt Project may induce on the MISO AC system.

Staff Expert/Witness: Shawn E. Lange

V. Summary of public comments

Public Comments addressed in this section are comments the Commission receives from the public and are entered into the Commission's Electronic Filing and Information System ("EFIS") as public comments. This section of the Staff's Report addresses only the comments submitted in EFIS and assigned a public comment ("P") number. The multiple comments that were filed as exhibits to this docket are not discussed in this section, but can be found in bulk as items 152 and 155 on the docket sheet. The docket sheet also reflects several individual comments that were submitted as local public hearing exhibits and are not addressed in this section.

A large number of public comments have been submitted in this case, and that number continues to grow. As of January 20, 2017 (1:15 PM), there have been 3,059 public comments submitted in EFIS related to this case. A significant number were entered as signatures to a petition in opposition to the Project; therefore, Staff estimates approximately 6,300 comments have been submitted as EFIS public comments. Approximately 60 percent of the comments express opposition to the Project.

In comparison, EFIS indicates that 4,460 public comments were submitted in Grain Belt's prior application case (Case No. EA-2014-0207); when considering the multiple signatures on petitions submitted in EFIS in that case, the 4,460 number grows to over 7,000 public comments submitted in the Grain Belt Express' prior application case.

Public comments are still being entered into EFIS on a daily basis for this case. Currently petitions and schedules are being entered into EFIS and assigned a public comment number that contain comments attributed to several individuals. The public comments in this case have been attributed to a range of individuals, from throughout Missouri as well as to individuals residing in other states. The number of out-of-state public comments is not currently available but could be produced, if desired. Some public comments were made prior to the application being filed in this case.

Staff has not examined all the public comments that have been received by the Commission to the level necessary to provide the specific number of public comments supporting and opposing the application in this case. The data is being collected to provide these numbers. However the determination of these numbers requires time after the public comment is entered into EFIS. Acknowledgements to the public comment have produced responses from individuals that assert they did not submit or authorize the submittal of the public comment submitted in their name; thus, changing the supporting or opposing numbers. In addition, public comment processing time is extended to answer and reply to the designated commenters regarding the comment submitted under their name. Time is also consumed dealing with returned email and letter acknowledgements for public comments submitted in this case.

Staff Expert/Witness: Robert E. Schallenberg

VI. Recommended conditions

Unless otherwise noted, Staff recommends the Commission order that Grain Belt must comply with the conditions prior to acquiring involuntary easements or starting construction of the transmission line. Staff further recommends the conditions be subject to a demonstration to the Commission the outstanding studies do not raise any new issues, and if they do, that the

Commission is satisfied with Grain Belt's solution to address those issues. Finally, Staff recommends the Commission condition the CCN such that if the design and engineering of the Project materially changes from what is presented in its Application, Grain Belt is required to file an updated application subject to further review and determination by the Commission.

Conditions related Section II – requirements of Commission rule 4 CSR 240-3.105

It is Staff Counsel's position that the Commission cannot grant a CCN absent Grain Belt receiving all county consents. Staff notes the requirements of 4 CSR 240-3.105(1)(D) includes other government approvals, that is approvals other than the county consents, and Grain Belt has made no filings to satisfy 4 CSR 240-3.105(1)(D)2 to date.

Conditions related to Section III. c. – financial ability

That Grain Belt not construct any electric transmission facilities on easements in Missouri until after it has obtained commitments for funds in a total amount equal to or greater than the total cost to build the entirety of this multi-state transmission project. To allow the Commission to verify its compliance with this condition, Grain Belt shall file the following documents with the Commission at such time as Grain Belt is prepared to begin to construct electric transmission facilities in Missouri:

a. On a confidential basis, equity and loan or other debt financing agreements and commitments entered into or obtained by Grain Belt or its parent company for the purpose of funding Grain Belt's multi-state transmission project that, in the aggregate, provide commitments for funds for the total project cost;

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

c. A statement of the total multi-state transmission project cost, broken out by the categories of engineering, manufacturing and installation of converter stations; transmission line engineering; transmission towers; conductor; construction labor necessary to complete the project; right of way acquisition costs; and other costs necessary to complete the project., and certified by an officer of Grain Belt, along with a reconciliation of the total project cost in the statement to the total project cost as of the Application of $2.2 billion; and property owned in fee by Grain Belt including the converter station sites;

d. A reconciliation statement, certified by an officer of Grain Belt, showing that (1) the agreements and commitments for funds provided in (a) are equal to or greater than the total project cost provided in (c) 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).

Staff Expert/Witness: David Murray

Condition related to Section III.d. – economic feasibility

Grain Belt provides Staff completed RTO Interconnection Agreements and any associated studies. Should the studies raise new issues, Grain Belt will also provide its plan to address those issues.

Conditions related to Section IV. b. – potential effect on nearby utility facilities

1. Grain Belt obtains detailed location information on each existing underground utility plant either crossed by or in close proximity to its proposed route, and that Grain Belt contact and coordinate with the owners of each prior to construction.
2. Grain Belt show the Commission, before it begins commercial operation of any part of the multi-state Project, that it built the entire multi-state Grain Belt proposed HVDC transmission line with dedicated metallic return conductors which are operational and

that the entire multi-state Project has operational protection and control safety systems that automatically de- energize the Project within approximately 150 milliseconds of when an abnormal or fault condition occurs.

3. Grain Belt performs engineering studies to determine if the operation of the Grain Belt proposed HVDC transmission line, the Grain Belt proposed Missouri converter station, and the Grain Belt-owned portion of the AC electric transmission line connecting the Grain Belt proposed Missouri converter station to the AC grid have adverse impacts on nearby facilities. These engineering studies must include, but not be limited to, the following:
    a. the effects of tower footing groundings, if used;
    b. analysis of metallic underground facilities;
    c. other AC power lines and telecommunications facilities that are located within a distance from the Grain Belt proposed HVDC transmission line, as determined by an appropriately qualified expert, where there may be adverse effects on the facilities;
    d. a determination whether there are locations where the Grain Belt proposed HVDC transmission line parallels a pipeline and an existing AC power line and, if so, whether there are any combined effects on steel pipelines (and other underground metallic facilities); and
    e. the effects of Grain Belt proposed transmission line(s) connecting the Grain Belt proposed Missouri converter station to the AC grid.

    If any of these studies show that mitigation measures are identified/needed, those measures must be in place prior to commercial operation of the Grain Belt proposed

HVDC transmission line. Staff recommends the Commission also require that these studies be made available to Staff and affected facility owners at least 45 days prior to commercial operation of the Grain Belt proposed HVDC transmission line, disclose how the parameters for conducting them were determined (e.g., continuous 24-hour recordings at a certain time of year), and be conducted by persons knowledgeable in (1) HVDC power lines, (2) DC-to-AC converter stations, (3) pipeline cathodic protection systems, (4) corrosion of underground metallic facilities, (5) interference with AC utility lines, (6) interference with telecommunications facilities, and (7) the effects of DC and AC interference on the facilities identified in Exhibit 3 as amended by Grain Belt's Addendum to Application (Item 99, file date 10/27/2016) and all additional facilities subsequently identified.

4. Grain Belt file annual status updates on discussions with Staff regarding the need for additional studies of the impacts of its facilities on other facilities in Missouri, a summary of the results of any additional studies, and any mitigation measures that have been implemented to address underground metallic structures, telecommunications facilities, and AC lines. Mitigation measures indicated by future studies must be implemented within three (3) months of discovery that additional mitigation measures are needed.

Staff Expert/Witness: Kathleen A. McNelis, PE

Conditions related to Section IV c. – Emergency Restoration Plans

Grain Belt provides a copy of the final Grain Belt Emergency Restoration Plan prior to the commercially operational date for the Grain Belt Project.

Staff Expert/Witness: Shawn E. Lange

Conditions related to Section IV. d. – Interconnection studies

1. Grain Belt provides the results of the forthcoming studies in SPP, MISO and PJM to the Commission. Should the studies raise new issues, Grain Belt will also provide its plan to address those issues.
2. Staff also recommends that the Commission order Grain Belt to provide to the Commission, completed documentation of the Grain Belt plan, equipment, and engineering drawings to achieve compliance with NERC standards for a project of this scope and size, National Electric Safety Code for a project of this scope and size, 4 CSR 240-18.010, the Overhead Power Line Safety Act section 319.075 et al., and any other applicable Missouri State law for a project of this scope and size; prior to the commercially operational date of the Grain Belt Project.

Staff Expert/Witness: Shawn E. Lange

Conditions related to Section III. e. – public interest – landowner interactions

Construction and Clearing

1. Prior to construction, Grain Belt will notify all landowners in writing of the name and telephone number of Grain Belt's Construction Supervisor so that they may contact the Construction Supervisor with questions or concerns before, during, or after construction. Such notice will also advise the landowners of the expected start and end dates of construction on their properties.

2. Prior to construction, Grain Belt's Construction Supervisor will personally contact each landowner (or at least one owner of any parcel with multiple owners) to discuss access to the right-of-way on their parcel and any special concerns or requests about which the landowner desires to make Grain Belt Express aware.

3. From the beginning of construction until end of construction and clean-up of the right-of-way is complete, Grain Belt's Construction Supervisor will be on-site, meaning at or in the vicinity of the route, or on-call, to respond to landowner questions or concerns.

4. If requested by the landowner, Grain Belt will cut logs 12" in diameter or more into 10 to 20 foot lengths and stack them just outside the right-of-way for handling by the landowner.

5. Stumps will be cut as close to the ground as practical, but in any event will be left no more than 4" above grade.

6. Unless otherwise directed by the landowner, stumps will be treated to prevent regrowth.

7. Unless the landowner does not want the area seeded, disturbed areas will be reseeded with a blend of K31 fescue, perennial rye, and wheat grasses, fertilized, and mulched with straw.

8. Best management practices will be followed to minimize erosion, with the particular practice employed at a given location depending upon terrain, soil, and other relevant factors.

9. Gates will be securely closed after use.

10. Should Grain Belt damage a gate, Grain Belt will repair that damage.

11. If Grain Belt installs a new gate, Grain Belt Express will either remove it after construction and repair the fence to its pre-construction condition, or will maintain the gate so that it is secure against the escape of livestock.

12. Grain Belt will utilize design techniques intended to minimize corona.

13. Should a landowner experience radio or television interference issues believed by the landowner to be attributed to Grain Belt's line, Grain Belt will work with the landowner in good faith to attempt to solve the problem.

14. Grain Belt will clearly mark guy wires.

Maintenance and Repair

1. With regard to future maintenance or repair and right-of-way maintenance after construction is completed, Grain Belt will make reasonable efforts to contact landowners prior to entry onto the right-of-way on their property to advise the landowners of Grain Belt's presence, particularly if access is near their residence.

2. All Grain Belt contractors will be required to carry and maintain a minimum of one million dollars of liability insurance available to respond to damage

claims of landowners. All contractors will be required to respond to any landowner damage claims within 24 hours. All contractors will be required to have all licenses required by state, federal, or local law.

3. All right-of-way maintenance contractors will employ foremen that are certified arborists.

4. If herbicides are used, only herbicides approved by the EPA and any applicable state authorities will be used, and herbicides will be used in strict compliance with all labeling directions.

5. Routine maintenance will not occur during wet conditions so as to prevent rutting.

6. Existing access roads will be used to access the right-of-way wherever available.

7. Prior to commencing any vegetation management on the right-of-way, Grain Belt will meet personally with all landowners to discuss Grain Belt's vegetation management program and plans for their prope1ty, and to determine if the landowner does or does not want herbicides used on their property. If the landowner does not want herbicides used, they will not be used.

Right-of-Way Acquisition

1. Every landowner from whom Grain Belt requires an easement will be contacted personally, and Grain Belt will negotiate with each such landowner in good faith on the terms and conditions of the easement, its location, and compensation therefor. They will be shown a specific, surveyed location for the easement and be given specific easement terms.
2. After construction is completed, every landowner will be contacted personally to ensure construction and clean-up was done properly, to discuss any concerns, and to settle any damages that may have occurred.
3. If a landowner so desires, Grain Belt will give the landowner a reasonable period of time in advance of construction to harvest any timber the landowner desires to harvest and sell.
4. Grain Belt’s right-of-way acquisition policies and practices will not change regardless of whether Grain Belt does or does not yet possess a Certificate of Convenience or Necessity from the Commission.

Staff Expert/Witness: Daniel I. Beck, PE

Appendix 1 - Staff Credentials

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 345kV Transmission Line	)	Case No. EA-2016-0358

AFFIDAVIT OF DANIEL I. BECK, PE

STATE OF MISSOURI)
) ss.
COUNTY OF COLE)

COMES NOW DANIEL I. BECK, PE and on his oath declares that he is of sound mind and lawful age; that he contributed to the foregoing **STAFF REBUTTAL REPORT**; and that the same is true and correct according to his best knowledge and belief.

Further the Affiant sayeth not.

Daniel I Beck PE
DANIEL I. BECK, PE

JURAT

Subscribed and sworn before me, a duly constituted and authorized Notary Public, in and for the County of Cole, State of Missouri, at my office in Jefferson City, on this 23rd day of January, 2017.

D Guzellambien
Notary Public

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 345kV Transmission Line	)	Case No. EA-2016-0358

AFFIDAVIT OF NATELLE DIETRICH

STATE OF MISSOURI)
) ss.
COUNTY OF COLE)

COMES NOW NATELLE DIETRICH and on her oath declares that she is of sound mind and lawful age; that she contributed to the foregoing **STAFF REBUTTAL REPORT**; and that the same is true and correct according to her best knowledge and belief.

Further the Affiant sayeth not.

Natelle Dietrich
NATELLE DIETRICH

JURAT

Subscribed and sworn before me, a duly constituted and authorized Notary Public, in and for the County of Cole, State of Missouri, at my office in Jefferson City, on this 23rd day of January, 2017.

D. Greuel Hankins
Notary Public

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 345kV Transmission Line	)	Case No. EA-2016-0358

AFFIDAVIT OF SARAH L. KLIETHERMES

STATE OF MISSOURI)
) ss.
COUNTY OF COLE)

COMES NOW SARAH L. KLIETHERMES and on her oath declares that she is of sound mind and lawful age; that she contributed to the foregoing **STAFF REBUTTAL REPORT**; and that the same is true and correct according to her best knowledge and belief.

Further the Affiant sayeth not.

Sarah L Kliet
SARAH L. KLIETHERMES

JURAT

Subscribed and sworn before me, a duly constituted and authorized Notary Public, in and for the County of Cole, State of Missouri, at my office in Jefferson City, on this 23rd day of January, 2017.

D Guzillankin
Notary Public

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 345kV Transmission Line	)	Case No. EA-2016-0358

AFFIDAVIT OF SHAWN E. LANGE

STATE OF MISSOURI)
) ss.
COUNTY OF COLE)

COMES NOW SHAWN E. LANGE and on his oath declares that he is of sound mind and lawful age; that he contributed to the foregoing **STAFF REBUTTAL REPORT**; and that the same is true and correct according to his best knowledge and belief.

Further the Affiant sayeth not.

Shawn E. Lange
SHAWN E. LANGE

JURAT

Subscribed and sworn before me, a duly constituted and authorized Notary Public, in and for the County of Cole, State of Missouri, at my office in Jefferson City, on this 23rd day of January, 2017.

Notary Public

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 345kV Transmission Line	)	Case No. EA-2016-0358

AFFIDAVIT OF KATHLEEN A. McNELIS, PE

STATE OF MISSOURI)
) ss.
COUNTY OF COLE)

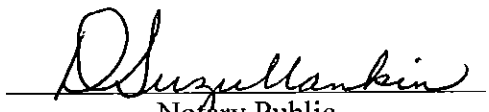
COMES NOW KATHLEEN A. McNELIS, PE and on her oath declares that she is of sound mind and lawful age; that she contributed to the foregoing **STAFF REBUTTAL REPORT**; and that the same is true and correct according to her best knowledge and belief.

Further the Affiant sayeth not.

KATHLEEN A. McNELIS, PE

JURAT

Subscribed and sworn before me, a duly constituted and authorized Notary Public, in and for the County of Cole, State of Missouri, at my office in Jefferson City, on this 23rd day of January, 2017.



Notary Public

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 345kV Transmission Line	)	Case No. EA-2016-0358

AFFIDAVIT OF DAVID MURRAY

STATE OF MISSOURI)
) ss.
COUNTY OF COLE)

COMES NOW DAVID MURRAY and on his oath declares that he is of sound mind and lawful age; that he contributed to the foregoing **STAFF REBUTTAL REPORT**; and that the same is true and correct according to his best knowledge and belief.

Further the Affiant sayeth not.

DAVID MURRAY

JURAT

Subscribed and sworn before me, a duly constituted and authorized Notary Public, in and for the County of Cole, State of Missouri, at my office in Jefferson City, on this 24th day of January, 2017.

D. SUZIE MANKIN
Notary Public - Notary Seal
State of Missouri
Commissioned for Cole County
My Commission Expires: December 12, 2020
Commission Number: 12412070

Notary Public

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 345kV Transmission Line	)	Case No. EA-2016-0358

AFFIDAVIT OF ROBERT E. SCHALLENBERG

STATE OF MISSOURI)
) ss.
COUNTY OF COLE)

COMES NOW ROBERT E. SCHALLENBERG and on his oath declares that he is of sound mind and lawful age; that he contributed to the foregoing **STAFF REBUTTAL REPORT**; and that the same is true and correct according to his best knowledge and belief.

Further the Affiant sayeth not.

Robert E. Schallenberg
ROBERT E. SCHALLENBERG

JURAT

Subscribed and sworn before me, a duly constituted and authorized Notary Public, in and for the County of Cole, State of Missouri, at my office in Jefferson City, on this 23rd day of January, 2017.

D. SUZIE MANKIN
Notary Public - Notary Seal
State of Missouri
Commissioned for Cole County
My Commission Expires: December 12, 2020
Commission Number: 12412070

D. Suzie Mankin
Notary Public

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 345kV Transmission Line	)	Case No. EA-2016-0358

AFFIDAVIT OF MICHAEL L. STAHLMAN

STATE OF MISSOURI)
) ss.
COUNTY OF COLE)

COMES NOW MICHAEL L. STAHLMAN and on his oath declares that he is of sound mind and lawful age; that he contributed to the foregoing **STAFF REBUTTAL REPORT**; and that the same is true and correct according to his best knowledge and belief.

Further the Affiant sayeth not.

MICHAEL L. STAHLMAN

JURAT

Subscribed and sworn before me, a duly constituted and authorized Notary Public, in and for the County of Cole, State of Missouri, at my office in Jefferson City, on this 23rd day of January, 2017.

Notary Public