Exhibit No.: 118
Issues: Need, Benefits, Economic Feasibility, Financing Plan
Witness: David Berry
Sponsoring Party: Grain Belt Express
Clean Line LLC
Type of Exhibit: Direct Testimony
Case No.: EA-2014-0207
Date Testimony Prepared: Mar. 26, 2014

MISSOURI PUBLIC SERVICE COMMISSION

CASE NO. EA-2014-0207

DIRECT TESTIMONY OF

DAVID BERRY
EXECUTIVE VICE PRESIDENT – STRATEGY AND FINANCE

ON BEHALF OF

GRAIN BELT EXPRESS CLEAN LINE LLC

March 26, 2014

GBE Exhibit No. 118
Date 11-14-14 Reporter KF
File No. EA-2014-0207

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I. INTRODUCTION

Q. Please state your name and business address.

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

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

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

Q. What are your duties and responsibilities as Executive Vice President – Strategy and Finance of Clean Line?

A. I oversee and am responsible for the financing activities, transaction structuring, and market analysis for Clean Line and its subsidiaries. I am responsible for developing the transmission capacity products offered to the Company's customers and assessing the demand for the energy delivered by the Company's transmission lines. I also am responsible for raising the capital necessary to fund the development and construction of Clean Line's projects, including the Grain Belt Express Clean Line project ("Grain Belt Express Project" or "Project").

Q. Please describe your educational and professional background.

A. I received a Bachelor of Arts degree from Rice University with a major in economics and a second major in history. Prior to joining Clean Line, I was employed by Horizon Wind Energy (now EDP Renewables North America) as Finance Director. At Horizon Wind Energy, I was responsible for financing transactions, investment analysis, and

acquisitions. I worked on and led over $2 billion of project finance transactions, including a non-recourse debt financing that was named 2006 North American Renewables Deal of the Year by *Project Finance* and several structured equity transactions for projects in development, construction, and operations. In addition, I was responsible for maintaining financial models for Horizon Wind Energy's wind farm development projects and exploring expansion into other generation technologies besides wind energy.

Q. Have you previously testified before any federal or state regulatory commission?

A. Yes. In support of Clean Line and its subsidiaries, I have previously testified before the Illinois Commerce Commission, the Kansas Corporation Commission and the Indiana Utility Regulatory Commission.

Q. What is the purpose of your direct testimony?

A. My testimony supports the Company's request for a certificate of convenience and necessity ("CCN") to operate in the state of Missouri. The Grain Belt Express Project is a major infrastructure expansion that brings economic, market, policy and environmental benefits to Missouri and the surrounding region. By installing a converter station in Missouri, the Project will allow Missouri electric purchasers the opportunity to access the lowest cost renewable energy in the country without an increase in the rates paid by retail electric consumers. It is my belief the Project is strongly beneficial to the Missouri public.

I understand that this Commission has used five criteria to evaluate applications for a CCN. Those criteria are: (1) there must be a need for the service; (2) the proposed service must promote the public interest; (3) the applicant's proposal must be

economically feasible; (4) the applicant must have the financial ability to provide the service; and (5) the applicant must be qualified to provide the proposed service. In this testimony, I will explain why the Application satisfies each of those criteria.

Q. How is your testimony organized?

A. My testimony is organized into four additional sections.

- **Section II** describes the open access, point-to-point transmission service that the Project will offer to transmission shippers or users, who will pay for the costs of the line.
- **Section III** addresses why the Project serves the public interest, why the Project is needed, and why the Project is economically feasible. These three criteria are closely linked and are therefore best discussed together.
- **Section IV** describes how Grain Belt Express will finance the Project.
- **Section V** summarizes the Company's qualifications to develop, construct and operate the Project.

Q. Please summarize the conclusions of your testimony.

A. First, there is a demonstrated need for the service provided by Grain Belt Express. The open access transmission service offered by the Company is necessary to meet the requirements of the Missouri Renewable Energy Standard ("RES") and the renewable portfolio standard ("RPS") requirements of the other states served by the Midcontinent Independent System Operator, Inc. ("MISO") and PJM Interconnection, LLC ("PJM") regional transmission organizations ("RTOs"). Wind generators in western Kansas, where the Grain Belt Express Project originates, also have a clear and substantial need for transmission capacity to reach larger electricity markets in Missouri and other states in

MISO and PJM. Due to constraints of the existing grid, most of these wind generators cannot proceed with their wind generation projects in the absence of the Grain Belt Express Project.

Second, the service provided by Grain Belt Express serves the public interest of Missouri and the surrounding region for the following reasons:

- The Project will offer any customer participating in MISO and PJM access to low-cost wind energy, which today cannot be readily accessed by buyers in these power pools.
- The Project enables cost-effective compliance with RES and RPS goals in Missouri and other states in the MISO and PJM region.
- The Project reduces wholesale electricity prices in Missouri and throughout MISO and PJM.
- Lower renewable energy compliance costs and lower wholesale electric prices will both result in decreased costs to end-use electric customers.
- By delivering over 18 million megawatt-hours ("MWh") of clean energy to Missouri, Illinois, Indiana, and other MISO and PJM states, the Project will reduce the need to generate electricity from fossil-fueled power plants and therefore will reduce carbon dioxide, sulfur dioxide, nitrous oxide and mercury emissions as well as water usage.
- The Project allows Missouri to access affordable clean energy as increasing environmental regulation drives increased costs for and additional retirements of coal plants.
- By enabling new generation sources and providing a major link between three major RTOs in the Eastern Interconnection, the Project will improve electric reliability and reduce seams issues between regions. This benefit is further discussed in the direct testimony of Dr. Wayne Galli and Robert Zavadil.
- The Project will contribute to economic development in Missouri and in the broader region by providing construction, manufacturing and operations jobs and additional business for Missouri companies. This benefit is further discussed in the testimony of Dr. David Loomis.
- All of these benefits will be provided to the public without any socialization of transmission costs to ratepayers since only users of the line will be charged for the costs of the Project.

Third, the Grain Belt Express Project is economically feasible. High voltage direct current ("HVDC") technology is the most cost-effective way to move large amounts of renewable energy over a long distance. High capacity factor wind energy sourced from western Kansas is today the cheapest form of renewable energy in the Midwest and is fully competitive with the cost of generating electricity from fossil-fueled power plants. Therefore, the Project will be cheaper than alternatives for meeting RPS requirements and the general demand by consumers for clean energy, and on the basis of these economics, the Project can attract the necessary transmission customers.

Fourth, Grain Belt Express can successfully finance the Project. The Company will rely on specific revenue contracts with shippers or transmission service customers in order to support the financing of the Grain Belt Express Project. Project finance is a proven financing model commonly used for electric generation projects, natural gas pipelines, and electric transmission projects. The management of Grain Belt Express and our investors both have substantial experience in project finance and know how to develop the Project to meet the requirements of the capital markets.

Fifth, Grain Belt Express is qualified to sell the service it is offering. The Kansas Corporation Commission and the Indiana Utility Regulatory Commission have both affirmed Grain Belt Express' qualifications to construct and operate the Project. Grain Belt Express will be able to rely upon the substantial expertise of its principal strategic investor, National Grid, one of the world's largest investor-owned utilities and most experienced transmission operators.

II. NATURE OF SERVICE

Q. Please describe the service to be offered by the Grain Belt Express Project.

A. The Project will offer point-to-point transmission service from its western converter station in Ford County, Kansas to its two points of interconnection located in Missouri and Indiana. The Missouri converter station will be located near Ameren's Maywood 345 kV substation and will allow the delivery of up to 500 megawatts ("MW") of power into the MISO energy market.

The second delivery point is the Sullivan substation which is owned by Indiana Michigan Power, a subsidiary of American Electric Power Company. Located near the Illinois-Indiana border, this second delivery point will enable the delivery of up to 3,500 MW of power to the PJM energy market. The amount of power delivered to PJM is higher because the Project interconnects to a 765 kilovolt ("kV") system in Indiana, which can manage a larger injection than the 345 kV system in Missouri.

The Project will connect the abundant and low-cost wind energy resources of western Kansas to Missouri, Illinois, Indiana, and other states in the MISO and PJM footprints. In light of this purpose, the customers or "shippers" that will buy transmission service on the Project will generally fall into two categories. First, wind generators can buy transmission service on the Project and then sell their output to the MISO and PJM energy markets (or under a power purchase agreement with MISO or PJM load serving entities). Second, load serving entities can buy capacity on the Project and use this service to move low-cost wind energy purchased from western Kansas to where the energy is needed by electric customers.

Q. Who will pay for the costs of the Grain Belt Express Project?

A. Grain Belt Express will pay for the development, construction and operation of the Project, and it will recover these costs through selling transmission service to shippers, as described above. As a result, the Project will offer broad benefits to the public but will impose costs only on shippers who use the Project. None of these shippers will have an obligation to buy service and will only buy service because they find our service economically beneficial. Because the Project employs a "shipper pays" or merchant model, none of its costs will be recovered through the cost allocation process of MISO, PJM or Southwest Power Pool, Inc. ("SPP"). Accordingly, none of these costs will be passed through to Missouri ratepayers under a regional transmission tariff paid by load serving entities or retail ratepayers.

Q. How does this principle of "shipper pays" compare to other rate methods for new transmission to promote wind energy?

A. The Project imposes no costs on ratepayers in general and will charge only the shippers who use the line. This is different from most cost-allocated transmission lines, such as MISO's Multi-Value Projects ("MVP") or the Priority Projects of Southwest Power Pool, Inc. ("SPP"), which recover their costs under the FERC-approved regional transmission tariffs paid by all users of those systems according to a cost-allocation formula. The Project's "shipper pays" model provides for greater transparency in meeting RPS by assuring that parties who do not benefit from new lines do not pay for them.

The MVP and Priority Projects are alternating current ("AC") lines, and the shipper pays model used by the Project is usually not appropriate for such AC projects. Unlike HVDC lines, AC projects cannot limit the flows of electricity to those who pay

for service. In AC lines, power flows to the path of least resistance regardless of the rate recovery mechanism or the contracts in effect. In contrast, HVDC converters function like "toll booths" that control the entry and exit of cars to the turnpike. Only cars that pay for entrance and exit can use the turnpike. Similarly, only shippers that buy service on the Project will be able to use the HVDC line.

Q. How will Grain Belt Express initially allocate the transmission capacity on the Project?

A. To start this process, the Company will issue a broad solicitation to be publicized on the Project website, in industry periodicals and in RTO forums. The solicitation will request a response from interested customers and provide a form of response. Grain Belt Express will negotiate with all interested customers who meet the eligibility criteria, the most important of which is the necessary creditworthiness to purchase long-term capacity. Based on the results of these negotiations, interested customers will submit a detailed bid for transmission service to the Company. In evaluating these bids, Grain Belt Express will apply consistent and objective ranking criteria that will be published for the benefit of all bidders. Long-term transmission service will be awarded to those bids scoring highest based on the Company's ranking criteria.

Grain Belt Express will initially allocate the Project's capacity under long-term, firm transmission service agreements. This will facilitate the financing of the Project through the process I describe in **Section IV** of my direct testimony. However, as I discuss below, customers will also be able to request shorter term firm service or non-firm service under the Company's transmission service tariff.

Q. Please describe Grain Belt Express' transmission tariff.

A. Transmission service will be sold under an open access transmission tariff ("OATT"). Similar to the transmission tariffs of SPP, MISO, and PJM, the Grain Belt Express OATT will take as its starting point the *pro forma* OATT created by FERC. The tariff will be administered by an RTO, who will manage requests for new service. Grain Belt Express' intent is that PJM, who will receive 3,500 MW of the Project's injection and is experienced in administering the tariffs of HVDC lines, will administer the Project's OATT; however, MISO or SPP could also perform this function. Independent administration of the tariff assures that all eligible customers can purchase service on the Project subject to its availability.

Q. What obligations will Grain Belt Express have in offering and providing transmission service pursuant to a tariff that conforms to FERC's pro forma OATT?

A. Grain Belt Express will be obligated to provide non-discriminatory, open access transmission service to all "eligible customers," as defined by the FERC pro forma OATT. Any modifications to the Company's OATT (from the pro forma OATT) must be approved by FERC.

Q. Will entities who do not receive an initial allocation of capacity be able to request service on the Project?

A. Yes. The negotiated capacity allocation process I describe above determines only the initial allocation of the Project's capacity. Any future sale of capacity will be governed by the OATT, just as is the case for traditional, cost of service transmission providers.

After the initial allocation of capacity, the Project will function as part of the integrated transmission system, and therefore, any eligible customer can request service at any time.

Even if the Project's firm capacity is fully subscribed, any eligible customer can still request non-firm service. Under the terms of the FERC pro forma OATT, Grain Belt Express must provide non-firm service to an eligible customer so long as the same capacity is not being used by the holder of firm transmission rights. In addition, Grain Belt Express will set up a secondary market for the Project, where customers that do not receive an initial allocation of capacity can purchase capacity from customers who do receive an initial allocation. Because Grain Belt Express anticipates that a significant portion of its firm transmission service customers will be wind farms and purchasers of energy from wind farms, which do not produce at full output 100% of the time, non-firm or secondary service is likely to be available in many circumstances.

Q. Who will be able to purchase the energy delivered by the Project?

A. As the Project will deliver to both MISO and PJM, any customer in these two markets will be able to purchase the low-cost renewable energy delivered by the Project. Therefore, as I will describe more in **Section III**, the benefits of the Project accrue not just to the specific users but to the public generally, despite the fact that the general public will not have to pay for the costs of the Project via cost allocation.

III. PROJECT NEED, BENEFITS AND ECONOMIC FEASIBILITY

A. Overview of Missouri RES

Q. Is there demand in Missouri for the renewable energy to be delivered by the Grain Belt Express Project?

A. Yes. Missouri's Renewable Energy Standard ("RES") in Sections 393.1020 and 393.1030 requires the generating portfolios of investor-owned electric utilities to include renewable generation of at least 15% by 2021. A higher percentage of renewable energy in Missouri's electric mix can lower fuel price volatility, create jobs, improve air and water quality, and reduce the rate and reliability impacts of greenhouse gas and other environmental regulations. However, in order to realize these benefits, cost-effective renewable energy resources must be available for utilities to purchase. In that respect, new transmission lines like the Grain Belt Express Project play an essential role.

Q. Will the wind energy delivered by the Project be eligible to meet the Missouri RES?

A. Yes. The Missouri RES does not impose any geographic restrictions on the location of the generation facilities. The RES does provide that 2% of the renewable requirements must be met by solar, but western Kansas wind is eligible to meet the remaining 98% of the RES requirement.

Q. Why is it important that Missouri utilities have access to the lowest cost renewable energy to meet the RES?

A. The RES imposes a cost cap that compliance with the RES cannot increase rates paid by Missouri ratepayers by more than one percent. This means that renewable energy cannot be substantially more expensive than energy from other generation resources. The cost cap mandates that Missouri's utilities have access to the cheapest renewable energy

resources. If they do not have this access, the RES may not be met, and the public will be deprived of the benefits of cost-effective renewable energy compliance, which were supported by Missouri's voters in 2008 when they approved the RES by referendum.

Q. How much renewable energy will be required to meet the Missouri RES, and how does that compare to current supply?

A. Approximately 9-10 million MWh per year of renewable electricity will be needed by 2021 for Missouri's investor-owned utilities to meet their RES requirements. In contrast, the current renewable energy supply of these utilities is only about 4 million MWh per year, encompassing both facilities located in Missouri and renewable energy purchased in other states for end use in Missouri. Therefore, Missouri's investor-owned utilities will need to procure approximately 5-6 million MWh per year of additional renewable electricity to meet the RES in 2021. I am basing my estimates on information from the RES statute, utility compliance reports and the Energy Information Administration ("EIA"). Detail behind these calculations is attached as Schedule DAB-1.

Q. How much renewable energy can the Grain Belt Express Project deliver to Missouri?

A. The Project can supply Missouri with 2.2-2.6 million MWh per year of renewable energy. As I noted above, the Project's delivery point in Missouri will be capable of delivering up to 500 MW of power to the grid in Missouri at any one time. As I discuss in the next subsection, western Kansas wind energy delivered via the Project is an efficient, low-cost way to meet the RES.

B. Levelized cost analysis

Q. Have you prepared an estimate of the levelized cost of energy of the Grain Belt Express Project as delivered to Missouri?

A. Yes. I prepared a financial model calculating the levelized cost of energy for the Project. In the base case, the Project can deliver western Kansas wind energy to Missouri at a fixed, flat, and levelized cost of 4.0-4.5 cents per kilowatt-hour ("kWh") ($40-45 per MWh). This is a very compelling price and is the lowest cost way for Missouri to obtain additional renewable energy. As I discuss later in my testimony, the levelized cost of the Project's delivered energy is lower than several other alternatives.

Q. Please explain what you mean by a levelized cost of energy analysis.

A. Levelized cost of energy ("LCOE") analysis is the best financial technique to compare different generation sources. LCOE analysis takes into account all costs of generating electricity, including capital costs, operating costs, taxes, the cost of debt, the return on equity, any available subsidies, and necessary transmission additions. The analysis produces a levelized cost per unit of energy that is a proxy for a power purchase agreement that a utility would enter into, or the cost for a utility to own and operate a generation asset.

LCOE allows the comparison of different alternatives using a single analytical method. Some alternatives may have higher initial capital costs, while other alternatives may have higher ongoing operating or fuel costs. A levelized cost analysis condenses all the costs of a given alternative in a single figure, which facilitates the comparison of different alternatives. In addition, it is possible to run sensitivities on different input variables to test the conclusions of a levelized cost analysis.

Q. How is your levelized cost of energy analysis of different generation alternatives relevant to the findings the Commission must make to grant a CCN?

A. First, because the Project's delivered energy is cheaper than other ways to meet the Missouri RES and to source electricity, Missouri consumers will benefit. A lower cost of RES compliance will result in Missourians paying lower electric rates. Inexpensive generation alternatives offering clean, renewable energy promote the public interest.

Second, because the Project's delivered cost of energy is lower than alternative ways to meet demand, the Project is economically feasible. Wind generators in western Kansas or load serving entities in Missouri will be able to pay the Project's transmission charge and still deliver energy to Missouri at an attractive price.

Third, because the Project is the lowest-cost way to meet the Missouri RES and other electric demand, the Project is needed to provide the transmission service in order to meet the goals of the RES and to serve the public. Missouri citizens explicitly endorsed clean energy in passing the RES. Further, the cost cap within the RES makes it clear that *low-cost* renewable energy is required.

Q. What accounts for the low levelized cost of the Grain Belt Express Project?

A. The single most important reason is the extremely competitive cost to produce wind energy in western Kansas, which I estimate at 2.0-2.5 cents per kWh (or $20-25 per MWh) flat. Since there is no inflation factor or fuel cost for wind energy, this price will not rise over time. Based on my experience in developing and building wind farms around the United States, I can confirm that the western Kansas region produces wind-generated electricity at a cost as low as or lower than any other region of the country.

Q. Have you independently confirmed the price of generating wind energy in western Kansas?

A. Yes. In January 2014, the Company completed a Request for Information ("RFI") to wind generators that can supply energy to the Project's converter station in western Kansas. The response to the RFI included 14 wind developers developing 26 wind farms totaling more than 13,500 MW. All of these wind farms can buy service on the Grain Belt Express Project or sell power to load serving entities that purchase service on the Project. As part of their responses, generators provided indicative power purchase agreement 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.

Q. Why is it so inexpensive to generate wind power in western Kansas?

A. Western Kansas possesses an excellent wind resource that is among the country's best. Attached as Schedule DAB-2 is a wind map of the United States prepared by the National Renewable Energy Laboratory ("NREL"), a federal research laboratory that operates under the direction of the U.S. Department of Energy, and AWS Truepower, a leading meteorology firm. As is evident from the wind map, western Kansas has some of the highest wind speeds in the country—routinely between 8.5-9.0 meters per second at 80 meters above the ground, the hub height of a modern wind turbine. The map demonstrates that average wind speeds in western Kansas are substantially higher than in Missouri, Illinois, Indiana and other states to the east of Kansas that will be served by the Project. By way of confirmation, Grain Belt Express RFI respondents reported an average wind speed of 8.75 meters per second at 80 meters above the ground.

Higher wind speeds lead to a higher capacity factor, meaning that the wind generator runs at a higher average percentage of its maximum power output. For example, a wind turbine with a 2 MW capacity rating can produce a maximum of 2 MW of power under ideal circumstances. The actual power produced varies with wind speed. A wind turbine might produce at a portion of its maximum output if the wind speed at its hub height is 8.0 meters per second ("m/s"). The same turbine might produce at its full power rating with a wind speed of 15.0 m/s and might produce no power with a wind speed of 4.0 m/s.

Even small differences in wind speed have important consequences for the amount of power produced. The kinetic power potential of wind varies with the cube of the wind velocity; in other words, the power potential varies proportionally to the wind velocity raised to the third power. Consequently, an 8.8 m/s average wind speed site will have, other things being equal, 1.99 times the power potential of a 7 m/s site. This effect substantially reduces the cost of wind energy produced by facilities located in areas with higher average wind speeds. As more energy is produced by a wind turbine, the unit cost of energy decreases, since the upfront capital cost and operating costs can be recovered over a larger number of MWh.

Q. Are there any other factors responsible for the low cost to produce wind energy in western Kansas?

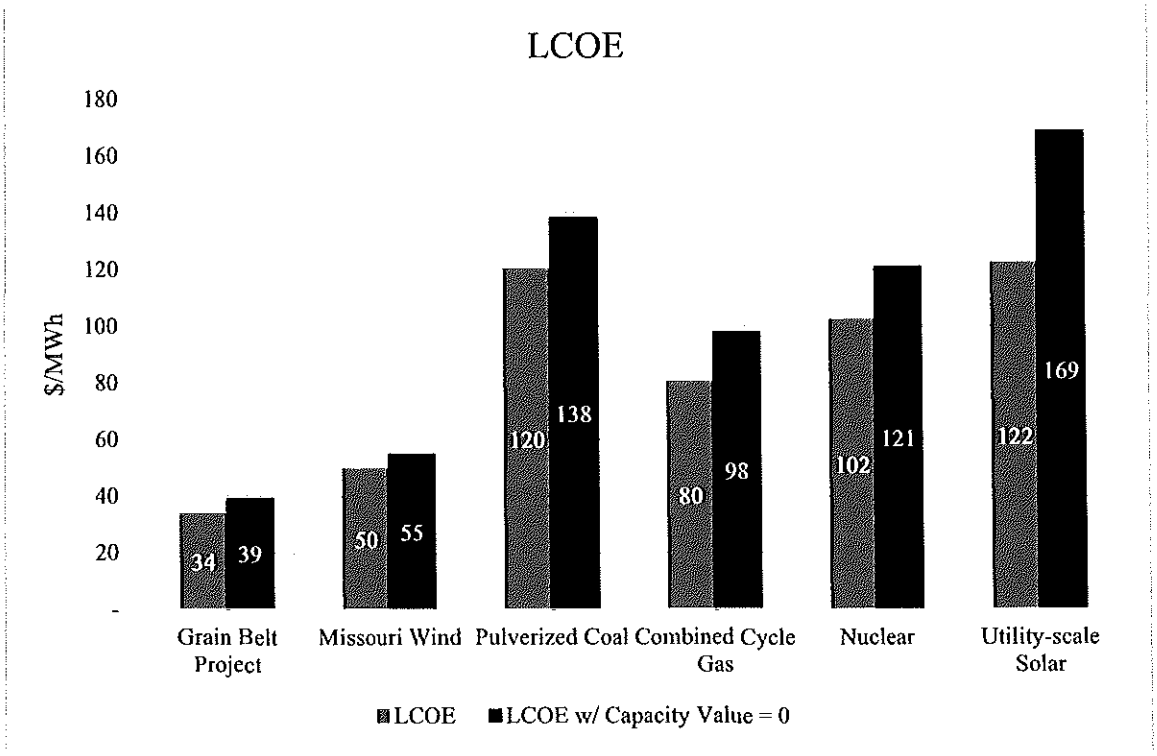
A. Yes. The State of Kansas offers two tax incentives, a property tax exemption and a sales tax exemption, that reduce the tax burden on generators in western Kansas and allow them to produce energy at lower cost. Further, construction costs in Kansas are lower than in many other regions of the country. According to a U.S. DOE study, the average

construction cost of a wind farm in the Interior region of the United States that includes western Kansas was $1,760 per kilowatt ("kW") installed, compared to a national average of $1,940 per kW.[1] This lower construction cost is consistent with my own experience and the experience of other members of the Grain Belt Express management team in constructing wind farms in many different regions in the country. Because of these advantages, western Kansas wind farms can generate electricity at a lower cost than wind farms located farther east in Missouri, Illinois, Indiana, and other target markets for the Grain Belt Express Project.

Q. What are the conclusions of your levelized cost analysis?

A. The Grain Belt Express Project is economically feasible because its total delivered cost of energy is less than other alternatives to meet state RPS or other alternatives to generate electricity generally. The cost of delivered energy is equal to the cost to generate wind energy in western Kansas (2.0-2.5 cents) plus the cost to move power on the Grain Belt Express Project, which we estimate at 1.5-2.0 cents per kWh. Based on my LCOE analysis, the Project's all-in cost of 3.5-4.5 cents per kWh is cheaper than building wind farms locally in Missouri or other less windy states east of Kansas; it is cheaper than solar, coal and nuclear power; and it is fully cost-competitive with a new natural gas power plant. These results are shown below:

[1] Lawrence Berkeley National Laboratory, 2012 Wind Technologies Market Report ("2012 Wind Report"), p. 36, http://www.windpoweringamerica.gov/pdfs/2012_annual_wind_market_report.pdf (last accessed on Feb. 26, 2014).



Two levelized cost comparisons are presented in this chart. The black bars reflect just the cost of generating energy. They do not account for the capacity value of a resource, or the ability to supply electricity with certainty during times of peak demand on the grid. The gray bars, on the other hand, show the results adjusted for each generation technology's capacity value.[2] While capacity value benefits dispatachable generation like gas and coal more than the Project's delivered wind energy, the Grain Belt Project's delivered energy remains the lowest cost option. Schedule DAB-3 contains a complete list of assumptions underlying this analysis, along with sources for these assumptions.

[2] For the wind and solar technologies, capacity value is estimated by using MISO and NREL's estimates respectively. For gas, coal and nuclear, the capacity value was assumed to be equal to one minus the forced outage rate based on national data. The value ascribed to dependable capacity is the annual cost, as estimated by the U.S. Energy Information Administration ("EIA") of operating a simple-cycle combustion turbine, which is the cheapest form of peaking generation. See Schedule DAB-3 for more detail.

Q. Does your levelized cost of energy analysis take account of the fact that wind generation does not produce all the time?

A. Yes. As noted above, my analysis includes the different capacity values attributed to wind, gas and solar resources. These different values reflect the expected contributions of the different generation technologies during times of peak demand. Further, my analysis includes an adjustment to the value of energy based on the Missouri hourly energy prices modeled by Company witness Gary Moland (Director of Power Markets & Transmission Analysis at DNV GL), as described in his direct testimony. Together, these adjustments assure that wind generation delivered by the Project is fairly evaluated against other, non-variable energy resources.

Q. Why is the Grain Belt Express Project's delivered cost of energy lower than generating wind energy in Missouri?

A. The main cost advantages are the higher wind speeds and the plentiful sites for wind development in western Kansas. As evident in Schedule DAB-2, which is a wind map of the Unites States, only the very northwest corner of Missouri has average wind speeds between 7.0-7.5 meters per second—about 1.5 meters per second less than in western Kansas. Further, building a substantial number of wind farms in this relatively unpopulated corner of the state would require a substantial expansion of Missouri's transmission infrastructure. Because this wind resource area is not located in the MISO footprint, Ameren Missouri and any other MISO participants in Illinois would have to pay an additional transmission charge to access that resource using the SPP transmission system.

Q. Does the cost advantage of the Grain Belt Express Project mean no new wind or solar generation will be built in Missouri?

A. No. I expect that Missouri's wind and solar industries will continue to grow. However, as I explain above, investor-owned utilities in Missouri cannot source 15% of their electricity from renewable energy resources by 2021 within the prescribed cost cap without new transmission to access the high capacity factor wind. Further, the scale of new generation required to meet the RPS is large, and all of the necessary generation cannot feasibly be constructed in what is a relatively small windy area within Missouri, shown in Schedule DAB-2.

Q. Did your conclusion that the Project has the ability to deliver a cost-effective resource consider the uncertainty about future fuel prices, regulations and other variables?

A. Yes. The Project remains a cost-competitive resource across a wide range of future scenarios. Using the LCOE model discussed above, I ran sensitivities around the presence of the federal production tax credit for wind energy; higher and lower natural gas prices; the future cost of carbon dioxide emissions (if any); the capacity factor of Kansas wind; and the capacity factor of Missouri wind. I varied these inputs using the ranges listed in Schedule DAB-4. The various combinations of inputs led to 162 different scenarios considered in the LCOE analysis. I found that the Grain Belt Express Project's delivered energy is always cheaper nuclear power plant generation and coal generation. The Project's delivered energy is cheaper than Missouri wind energy in the great majority of, but slightly less than 100% of the cases run. Specifically, the Project has the lower LCOE in 94% of the cases compared to Missouri wind. The Project also

has the lower LCOE in 91% of model cases compared to combined cycle gas generation. Additional detail on these results is presented in Schedule DAB-4.

Q. Is HVDC the most economically feasible technology to move western Kansas wind power to Missouri and other markets farther to the east?

A. Yes. As discussed more extensively in the direct testimony of Dr. Wayne Galli (Clean Line Executive Vice President – Transmission & Technical Services), HVDC is the lowest cost way to move large amounts of power over distances longer than 300 miles. HVDC requires a narrower right-of-way than a comparable AC system, incurs lower electric losses, and has lower capital costs per mile. As a result of these advantages, the Grain Belt Express Project is more economically feasible than an AC line or lines that would serve the same purpose.

Q. Does the scale of the Project make it more economically feasible, given that it enables over 4,000 MW[3] of new wind generation?

A. Yes. By building a single transmission project that serves the renewable energy needs of both the MISO and PJM footprints, it is possible to achieve an economy of scale that is significantly less expensive than serving the needs of Missouri alone. This is reflected in the competitive cost of transmission to deliver western Kansas wind energy to Missouri, Illinois, Indiana and other states in the region.

[3] The capacity of wind farms is likely to be slightly higher than the maximum delivery capacity of the line for two reasons. First, electric losses along the line mean less power will be delivered to MISO and PJM than is converted in Kansas. Second, because multiple wind farms rarely produce at their maximum output simultaneously, additional wind farm capacity above 4,000 MW can increase utilization of the transmission line, and therefore reduce the delivered cost of energy.

Q. Please summarize the results of your levelized cost analysis.

A. The Grain Belt Express Project offers Missouri utilities an affordable way to meet the Missouri RES and to buy clean energy. The Project is cheaper than local wind energy, cheaper than solar energy, and very cost-competitive with new natural gas power generation. These results support the conclusion that the Project is needed, serves the public interest and is economically feasible.

C. Regional RPS demand

Q. Is the market for renewable energy a state-by-state market, or is it a regional market?

A. The market for renewable energy and renewable energy credits ("RECs") is regional in nature.[4] Markets for renewable energy and RECs are highly linked across states, similar to the manner in which markets for wholesale electricity are highly linked in different states.

Q. Does Missouri have an interest in other states having adequate resources available to meet their state RPS goals?

A. Yes, as a result of the regional nature of power and REC markets, states will be able to satisfy their renewable energy goals at a lower cost if other states also have access to adequate supplies of the lowest cost renewable energy. Shortfalls in other states in renewable energy resources to meet RPS requirements will tend to increase REC prices throughout the region and therefore increase the cost of meeting the portfolio standard mandated by Missouri's RES requirement.

[4] A REC is an allowance representing the environmental attributes of one MWh of renewable electricity. RECs can be traded and used to show compliance with RPS statutes.

It may help to consider the following scenario. Let us assume there was a REC shortfall in State X, so REC prices were higher in State X compared to prices in Missouri. The same REC is eligible to meet both states' RPSs. Owners of RECs would sell them in State X's market until Missouri REC prices rose to a level equal to State X's prices. In this example, Missouri pays more for RECs because there is a shortfall in another state and low-cost supply migrates from Missouri until prices equalize across the two states.

Q. In addition to Missouri, do other states in MISO and PJM have RPS requirements?

A. Yes. Within the PJM footprint, the District of Columbia, Delaware, Maryland, New Jersey, West Virginia, North Carolina, Ohio, Pennsylvania and Virginia all have enacted RPSs, goals, or targets, as have Indiana, Illinois, and Michigan, which have service territories in MISO, as well as PJM.[5] The Project's second delivery point in Indiana will be able to serve many of the RPS requirements in the PJM footprint. Several additional states in the MISO footprint—Iowa, Minnesota, Montana, North Dakota, Wisconsin, and of course Missouri—also have RPS requirements.

Q. Based on state renewable energy standards and goals, what is the total demand for renewable energy in the MISO and PJM regions?

A. I estimate that the demand for renewable energy from states in the MISO and PJM regions will be 111.8 million MWh in 2015, 175.0 million MWh in 2020, and 222.5 million MWh in 2025. These figures were obtained by using the statutory requirements or goals and applying them to the load forecasts from the U.S. Energy Information

[5] Indiana and Virginia have voluntary renewable energy goals.

Administration's (EIA) 2014 Annual Energy Outlook.[6] The calculations to obtain these figures are provided in Schedule DAB-5

Q. How does this total volume of renewable energy demand compare with existing supply?

A. According to data published by the Monitoring Analytics and MISO, total renewable energy generation in the MISO and PJM states during 2013 was about 80 million MWh.[7] This figure likely overestimates the RPS-eligible supply since it includes conventional hydro generation, which is not eligible to meet many state RPS requirements. Regardless, the current level of supply in the MISO and PJM states falls far short of the projected demand over the next 12 years, based on state RPS requirements and renewable energy goals. This shortfall underlines the need for new transmission infrastructure like the Project to enable low-cost wind energy.

Q. Why is the Grain Belt Express Project a beneficial way to meet the RPS requirements in MISO and PJM states?

A. First, the Project does not impose any costs on ratepayers in general, only specific users of the line. This creates greater transparency in transmission costs and eliminates the risk that specific states or users will pay more than their fair share of the costs of regional RPS compliance.

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[6] EIA, "Annual Energy Outlook 2014." Available online at http://www.eia.gov/oiaf/aeo/ (last accessed Feb. 28, 2014).

[7] For MISO, includes energy generation from hydro, wind and waste sources. MISO, "Monthly Market Assessment Reports: Fuel Mix Section." Available at https://www.misoenergy.org/MarketsOperations/MarketInformation/ (last accessed March 18, 2014). For PJM, includes energy generation from hydro, wind, biomass, landfill gas, waste and solar sources. Monitoring Analytics, "2013 State of the Market Report for PJM: Volume 2." Available at http://www.monitoringanalytics.com/reports/pjm_state_of_the_market/2013/ (last accessed March 18, 2014).

Second, unlike MISO and its MVP Projects, PJM does not have a comprehensive planning process to design transmission projects to meet RPS demand. PJM states may voluntarily elect to pay for "public policy" projects, but they are not obligated to support such projects. To date, no states have agreed to support public policy projects. PJM has not yet approved any lines for the purpose of meeting the massive RPS goals of the region. Shipper-funded transmission lines like the Grain Belt Express Project therefore have an essential role in meeting RPSs in PJM, where the Project can deliver 3,500 MW of renewable power. If shipper-funded projects like the Grain Belt Express Project fail to proceed, there will be an inevitable shortfall in PJM RPS goals. This will drive up compliance costs throughout other states, even those outside of the PJM footprint like Missouri.

Third, as I have explained above, wind is the low-cost renewable energy resource, and Kansas produces the cheapest wind energy in the country. By accessing the cheapest resource, it is possible to meet RPS in the state and region at the lowest cost. As Dr. Galli discusses in his testimony, HVDC is the low-cost way to connect Kansas wind resources to larger markets in MISO and PJM. Western Kansas wind generation connected to an HVDC transmission line offers a large-scale, low-cost, efficient solution to meeting renewable energy standards which ramp up considerably over the coming years.

Q. Will there be additional demand for renewable energy beyond that called for by the MISO and PJM state RPS requirements?

A. Yes. The RPS requirements described above are a floor, not a ceiling, on the amount of renewable energy to be procured. Given the declining cost of renewable energy and the

cost parity between the high capacity factor wind power and other sources, actual renewable energy purchases will exceed the RPS requirements. This is especially true because of the growing numbers of cooperatives, municipalities and large industrial customers that buy substantial amounts of renewable energy, even though they are not obligated to make these purchases.

For example, Associated Electric Cooperative, Inc. ("AECI") sources 600 MW, or about 10% of its electricity, from wind power.[8] City Utilities of Springfield entered into a 50 MW PPA with the Smoky Hills Wind Farm in Salina, Kansas, and offers its retail customers a voluntary green switch program to buy this power.[9] In 2004, the City of Columbia passed a local ordinance requiring increasing levels of renewable energy purchases by the municipal utility, and now purchases wind power from Next Era Energy's Crystal Lake wind farm in Iowa.[10] The Missouri Joint Municipal Electric Utility Commission also has purchased wind power on behalf of its members from the Loess Hills Wind Farm.[11] Together these purchases demonstrate that wind power is a cost-effective resource. There is no regulatory mandate for these purchases since municipal utilities and cooperatives are not bound by the Missouri RES. Demand for wind power from municipals and cooperatives is in addition to the statutory demand from the RES.

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[8] http://www.aeci.org/clean/renewables/green-power (last accessed on Feb. 26, 2014).

[9] http://www.cityutilities.net/renewable/renewable.htm (last accessed Feb. 26, 2014).

[10] https://www.gocolumbiamo.com/WaterandLight/Documents/RenewReport.pdf (last accessed Feb. 26, 2014).

[11] http://www.mpua.org/Loess_Hills_Wind_Farm.php (last accessed Feb. 26, 2014).

D. Kansas wind generation potential

Q. Has Grain Belt Express identified wind generators that desire to buy service on the Grain Belt Express Project or sell their power to utilities who buy such service?

A. Yes. As mentioned above, we ran an RFI to identify wind farms near our converter location in western Kansas. Fourteen wind developers responded, who together are advancing 26 wind projects totaling over 13,500 MW.

Q. How does this compare to the total wind potential in Kansas?

A. It is only a small fraction. NREL ranks Kansas as the state with the fourth highest wind capacity potential in the U.S. According to NREL, Kansas has the potential for more than 760,000 MW of wind generation facilities in areas with suitable land use and sufficient wind speeds to support gross capacity factors greater than 40%. The total annual generation potential of these facilities is 3,024,280 gigawatt-hours ("GWh").[12] However, according to the American Wind Energy Association, Kansas had only 2,713 MW of installed wind generation capacity as of December 31, 2013, meaning only a tiny fraction of the state's wind potential is currently utilized.[13] The rest of Kansas' wind resources can only be developed with increased access to markets and transmission infrastructure.

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[12] National Renewable Energy Laboratory, Estimates of Windy Land Area and Wind Energy Potential by State for Areas with a Gross Capacity Factor of 40% and Greater at 80 Meters (2010); available at: http://www.windpoweringamerica.gov/docs/wind_potential.xls (last accessed Feb 23, 2012) [hereinafter "NREL Estimates of Wind Energy Potential"]. The NREL Estimates of Wind Energy Potential assume turbine technology prevalent in 2009. Therefore, NREL may understate the capacity factors that could be obtained using current or future turbines. However, improved turbine technology will not change the relative capacity factors between geographies. That is to say, the Kansas will still support higher capacity factors and have more wind potential at a given capacity factor than less windy locations farther east.

[13] AWEA state profile. Available at http://www.awea.org/Resources/state.aspx?ItemNumber=5223 (last accessed Jan. 3, 2014)

Q. Why will Kansas wind generators wish to buy service on the Grain Belt Express Project?

A. There are many developers in Kansas pursuing wind generation projects, and the amount of wind resource available is practically limitless. However, Kansas and SPP are small electricity markets compared to the MISO and PJM markets served by the Grain Belt Express Project. In their responses to the RFI, 20 wind projects stated that they need additional transmission capacity from western Kansas to reach larger markets to the east.

Q. Can wind developers in western Kansas proceed with construction of their projects without the Grain Belt Express Project being approved and built?

A. Only to a very limited extent. The amount of wind power under development, to say nothing of the huge wind resource potential, far exceeds the demand within Kansas. New infrastructure like the Grain Belt Express Project is essential to allow the construction of new wind farms.

Q. Did respondents to the RFI provide you with any additional information about the development status of their projects?

A. Yes. They stated that they have over 100 meteorological towers installed and over 700,200 acres of land under lease or option. Developers are spending real time and money developing their projects in advance of the construction of the Grain Belt Express Project. But if the Project is not approved and constructed, these developers will not be able to supply their low-cost wind power to Missouri and the MISO and PJM markets.

E. Other benefits

Q. What other benefits will Grain Belt Express offer to Missouri and the surrounding region?

A. Beyond offering a low-cost source of renewable energy to meet RPS targets and the demand for clean energy generally, Grain Belt Express creates a number of other benefits:

- The Project does not broadly impose costs on ratepayers since it is paid for by specific users of the line. Consequently, the Project can reduce the need for future rate-based transmission lines that can increase electric rates for consumers.
- The Project will reduce wholesale electric power prices in Missouri and in surrounding states, which will decrease the cost of load serving entities to purchase electric power from the MISO and PJM markets, ultimately resulting in lower electric rates for consumers.
- By delivering 18 million MWh per year of clean energy, the Project will reduce carbon dioxide, sulfur dioxide, nitrous oxides, mercury and other particulate emissions that would occur if the same electricity were generated by other generation sources.
- As discussed in the direct testimony of Clean Line Executive Vice President Dr. Wayne Galli and Mr. Robert M. Zavadil of EnerNex, LLC, the Project will improve electric reliability in Missouri and regionally, both due to the installation of new generation sources and additional interregional transmission capacity.
- The Project will create jobs and tax revenue for Missouri by using Missouri equipment vendors to manufacture elements of the Project's transmission infrastructure.

Q. Are there any costs to Missouri ratepayers that detract from the benefits you describe above?

A. No. Grain Belt Express is assuming the full market risk of the Project and will not pass any costs through to Missouri ratepayers. The Company's business model provides Missouri with the opportunity to benefit from low-cost renewable power from Kansas wind turbines without the obligation to pay for this access. The only circumstance in which Missouri ratepayers would pay for capacity on the Project is if their retail utility

determines that the Project is a cost-effective means to meet their energy needs. In this case, the Project would actually decrease costs for ratepayers because its service would necessarily be cheaper than the alternative. Because of the free market nature of the Project, this conclusion is true not only for Missouri but also for states throughout the region that will benefit from the Project.

Q. If the Grain Belt Express Project is not built, will other transmission lines be needed to meet state RPS?

A. Yes, they will. Two recent examples of transmission lines approved to meet state RPS are the SPP Priority Projects and the MISO MVP Projects. Together these projects cost over $6 billion, primarily in order to enable additional wind energy to meet RPS. More projects will be needed as state RPS goals and the demand for clean energy continue to grow. In addition, if SPP and MISO wind energy is exported to PJM or other regions, more transmission projects will be needed in order to allow SPP and MISO states to meet their obligations. By allowing cost-effective compliance with regional RPS requirements without additional cost-allocated transmission, Grain Belt Express can help mitigate any future cost increases in transmission rates.

Q. How will the Grain Belt Express Project affect wholesale electricity prices?

A. The Project will enable the delivery of over 4,000 MW of new, low-cost renewable energy generation into the MISO and PJM markets. These generation resources will increase competition, displace more expensive generation, and reduce wholesale electricity prices.

Q. Why does the addition of more wind into a system reduce wholesale electricity prices?

A. In MISO and PJM, wholesale electricity prices are determined on a sub-hourly basis by aggregating supply bids. Generators bid the amount of electricity they are willing to supply at a certain price. Typically generators will bid in their cost of production, if any, plus any variable operations and maintenance cost, which together comprise their marginal cost. Because wind has a zero marginal cost, it adds zero marginal cost energy to the supply stack.

The effect of more wind turbines participating in the wholesale electric market is to increase the supply curve of generation. When wind generation is producing, the combined electric generation stack can produce a given amount of electricity with a lower market-clearing price. The decline in clearing price results in decreased wholesale market prices.

Q. Why do generators bid only their marginal cost of production into the MISO and PJM markets?

A. Because generators are paid the clearing price, not their actual bid, there is no incentive to bid above the marginal cost to produce. If a generator bids any price above its marginal cost, it risks losing out on a profit opportunity if the market price is above the generator's marginal cost and below the generator's bid

Q. Have other studies supported your claim that wind energy can reduce wholesale market power prices?

A. Yes. Several studies have confirmed this effect. One NREL-sponsored report analyzed the relationship between levels of wind penetration and market prices in ERCOT

(Electric Reliability Council of Texas) from 2007 to 2009 and found that wind penetration was negatively correlated with market price, or "when the level of wind generation [was] above its average level, the price [was] below its average level."[14] A similar report was recently published by the Illinois Power Authority documenting how wind has decreased wholesale power prices in Illinois.[15]

Q. Has Grain Belt Express performed any studies regarding the amount by which the Project will reduce wholesale electric prices?

A. Yes. Grain Belt Express engaged DNV GL, a leading energy consulting firm, to perform such a study. Company witness Gary Moland, Senior Director of Power Markets & Transmission Analysis at DNV GL, performed this analysis using PROMOD, an industry standard tool that is discussed in more detail in his direct testimony. He estimates that Missouri wholesale electric prices will decrease by an average of $0.12-$0.69/MWh in the year 2019 with the inclusion of the Grain Belt Express Project and the generation it enables. Total Missouri demand cost—the cost for load serving entities to buy electricity to serve their customers—decreases by $11-$65 million in 2019. Total production cost (the sum of fuel costs and variable operating costs) decreases by $387-$1,236 million in 2019. Mr. Moland ran four different scenarios with varying assumptions about fuel prices, load growth, environmental regulation, and coal retirements. The values I discuss above are the ranges across the four scenarios. Importantly, Mr. Moland's modeling

[14] Exeter Associates. "The Relationship Between Wind Generation and Balancing-Energy Market Prices in ERCOT:2007-2009." Available at: http://www.nrel.gov/docs/fy11osti/49415.pdf (last accessed on March 17, 2014)..

[15] Illinois Power Authority, "Annual Report: The Cost and Benefits of Renewable Procurement in Illinois Under the Illinois Power Agency and Illinois Public Utility Acts." Available at http://www2.illinois.gov/ipa/Documents/April-2012-Renewables-Report-3-26-AAJ-Final.pdf (last accessed March 17, 2014).

found benefits across all metrics in all scenarios. The finding of benefits in terms of reduced power prices, demand cost, and production cost is therefore robust across a wide sensitivity of input values.

Q. Why are reduced wholesale electric prices relevant to end-use electricity consumers?

A. Lower wholesale electric prices reduce costs for load serving entities and therefore for consumers who pay cost-based rates, as is the case for most electric users in Missouri. When prices are affordable, utilities who serve retail load can buy from the wholesale market instead of running their own generation. Lower wholesale prices will mean incumbent utilities run their most expensive generation less often, reducing fuel costs. Finally, for certain Missouri utilities, purchasing wholesale electricity from the MISO market is always an alternative to building new generation. Market prices serve as a cap on the cost of new generation because utilities can elect this option if purchasing wholesale power is cheaper than building new generation.

Other states in the region, like Illinois and Ohio, have retail electric competition. In these areas, retail electric suppliers buy electricity from the wholesale market, so decreased wholesale electric prices reduce the costs paid by retail electric suppliers. Competitive forces require that retail electric suppliers pass the savings on to their end-use customers. If a retail provider does not pass along wholesale power price reductions to its customers, another retail provider can make a lower offer to supply retail customers and can meet this price by buying electricity from the wholesale electricity market. The ability to switch retail providers guarantees that cost reductions will reach retail customers.

Q. How will the Grain Belt Express Project create environmental benefits?

A. Generating electricity from wind resources creates environmental benefits because the process does not emit carbon dioxide or other by-products such as nitrogen oxide, sulfur dioxide, mercury, particulates, coal ash or scrubber sludge, as in the case of coal-fueled generation, or radioactive waste, as in the case of nuclear generation. This will result in cleaner air and water—and therefore better health—for Missourians and other residents in the region. Adding more renewable power to the energy supply mix will produce environmental benefits by offsetting the carbon emissions that would be produced by generating the same amount of electricity from other sources.

Q. What are the expected emission reductions if the Grain Belt Express Project is built?

A. The Grain Belt Express Project will deliver approximately 18 million MWh of clean electric energy per year into the PJM and MISO markets. As described in his direct testimony, Mr. Moland estimates that to generate this same amount of electricity, non-wind resources economically dispatched in the year 2020 would emit (a) over 9 million tons of carbon dioxide, (b) over 6,000 tons of nitrogen oxide, (c) over 16,000 tons of sulfur dioxide, and (d) over 100 pounds of mercury. These emission reductions are the average values achieved across multiple future scenarios of environmental regulation, but there are reduced emissions in all cases studied. In addition, there are water usage savings in all scenarios, averaging 4.0 billion gallons per year.

Q. Why is it important for Missouri to have low-cost options to source its electricity from clean sources?

A. In 2012, Missouri relied on coal for 79% of its electricity.[16] As the Commission is aware, EPA's regulations have increased the cost of coal-fired generation and prompted over 60 GW of coal unit retirements nationwide. Additional retirements and cost increases seem likely given the recent history of EPA regulation and the likely prospects of greenhouse gas regulation. The EPA's Mercury and Air Toxics Standards are driving a wave of new pollution equipment to be installed with a deadline of 2016. EPA is petitioning the United States Supreme Court to reinstate the Cross-State Air Pollution Rule ("CSAPR") that reduces sulfuric and other particulate emissions from coal. Even if EPA's petition is denied, EPA's attempt to reinstate CSAPR signals its clear intent to increase particulate regulation. In 2013, EPA proposed carbon dioxide limits on new power plants that effectively require carbon capture on new coal-fired power plants. EPA is currently developing carbon dioxide limits on existing coal-fired power plants, to be proposed later in 2014 under Section 111(d) of the Clean Air Act.[17] To keep electric rates stable as the regulatory landscape for coal power changes, it is critical that Missouri utilities have abundant access to affordable clean energy, like the low-cost wind energy the Project will deliver.

Q. Will the Grain Belt Express Project increase the reliability of the electric grid?

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[16] EIA Net Generation by State by Type of Producer by Energy Source. http://www.eia.gov/electricity/data/state/. (last accessed on Feb. 7, 2014).

[17] Presidential Memorandum -- Power Sector Carbon Pollution Standards (2013). Available at http://www.whitehouse.gov/the-press-office/2013/06/25/presidential-memorandum-power-sector-carbon-pollution-standards (last accessed on March 17, 2014).

A. Yes. As discussed more extensively in the direct testimony of Dr. Wayne Galli and Robert Zavadil, the Project will enable new generation resources that can improve system reliability and reduce the probability of loss of load. The Project will improve interregional transmission capacity between SPP, MISO and PJM, the three RTOs with which the Project interconnects. This inter-regional transfer capacity will allow RTOs to import power from other regions in the event of extreme weather, generation outages, or other contingency events. The stronger the ties between regions, the more robust the grid will be as it copes with reliability problems in any one region. Further, inter-regional transmission capacity can reduce the congestion and other issues that arise between the borders or "seams" of RTOs. Of note, the Commission recently opened a docket, File No. EW-2014-0156, on seams issues between Missouri's two RTOs, SPP and MISO.

Q. Will the Grain Belt Express Project create benefits for the Missouri economy?

A. Yes. The Project will create additional economic activity in Missouri. As further discussed in the direct testimony of Company witness Dr. David Loomis (Professor of Economics at Illinois State University), the Project will create 1,315 construction and manufacturing jobs in Missouri for three years, depending on Missouri's share of equipment manufacturing related to the Project. Manufacturing related to the wind farms for the Project will create 1,311 to 3,933 jobs in Missouri, depending on the percentage of equipment manufactured in the state.

Q. Has Grain Belt Express already made specific arrangements to purchase equipment from Missouri companies?

A. Yes, Grain Belt Express is committed to using local contractors to build the Project to the maximum extent practicable. As evidence of this commitment, we have entered into

agreements with ABB, Inc. ("ABB") to purchase transformers from their St. Louis facility; with Hubbell Power Systems, Inc. ("Hubbell") to purchase insulators and conductor hardware from their Centralia factory; and with General Cable Industries, Inc. ("General Cable") to purchase conductor manufactured in their Sedalia plant. Today these three facilities already employ over 1,000 Missourians. As part of its agreement with Grain Belt Express, Hubbell Power Systems will expand its Centralia facility and will employ over 50 people to work on Clean Line's order. In addition, General Cable has agreed to manufacture conductors for the Project using aluminum sourced from Noranda's New Madrid smelter. Schedule DAB-6 contains letters from ABB, Hubbell, and General Cable that outline what our supplier agreements mean for each facility. As we continue our procurement efforts, Clean Line will seek to form more supply partnerships with Missouri companies.

IV. FINANCING PLAN

Q. Please describe how Grain Belt Express will fund the development and construction of the Project.

A. Clean Line,, through a holding company, Grain Belt Express Clean Line Holding LLC, owns 100% of the membership interests in Grain Belt Express, the Applicant in this Proceeding. During the development stage of the Project, in which Grain Belt Express will seek the regulatory approvals to construct the Project and sell its transmission capacity, Clean Line will contribute funding equity to Grain Belt Express. Clean Line is able to fund Grain Belt Express' development stage expenditures because of investments made by National Grid USA, ZAM Ventures, L.P. ("ZAM Ventures"), and Clean Line's

other investors, as well as Clean Line's ability to raise more money from these or new investors.

Once the Project reaches the point of beginning construction, it will be financed at the project level against the strength of its future, contracted revenues. Clean Line's existing investors may make additional investments in Grain Belt Express or Clean Line may seek outside investment capital, which as I describe below, is widely available for transmission line projects.

Q. Does Clean Line currently have equity investors?

A. Yes. The two largest shareholders in Clean Line are ZAM Ventures, which is one of the principal investment vehicles for ZBI Ventures, L.L.C. ("ZBI Ventures"), and National Grid USA ("National Grid").[18] Michael Zilkha, an individual and experienced energy investor, and Clean Line Investment LLC, a company owned by Clean Line employees and service providers, are also investors in Clean Line.

Q. What is the business of ZAM Ventures?

A. ZAM Ventures is one of the principal investment vehicles for ZBI Ventures, which focuses on long-term investments in the energy sector. Many of ZAM Ventures' investments are in the oil and gas industry around the world. It has invested in several private conventional and unconventional oil and gas investments in the United States, Canada and elsewhere in the world. ZAM Ventures has also invested in an oilfield services company doing business in various parts of the United States and has made other investments in alternative energy companies.

[18] National Grid invests in Clean Line through its 100% owned subsidiary GridAmerica Holdings, Inc., a Delaware corporation.

Q. What is the business of National Grid and its affiliates?

A. National Grid's regulated subsidiaries deliver electricity to approximately 3.4 million customers in New York, Massachusetts, and Rhode Island. Its regulated operating subsidiaries include New England Power Company, Massachusetts Electric Company, Nantucket Electric, Narragansett Electric Company, Niagara Mohawk Power Corporation, KeySpan Gas East Corporation, Boston Gas Company, Colonial Gas Company, and The Brooklyn Union Gas Company. Through these subsidiaries, National Grid USA jointly owns and operates over 8,600 miles of high voltage transmission spanning upstate New York, Massachusetts, New Hampshire, Rhode Island, and Vermont, including nearly 100 miles of underground cable and 522 substations. National Grid is also the largest distributor of natural gas in the northeastern United States, serving approximately 3.5 million customers in New England and upstate New York. Other operating subsidiaries are involved in LNG storage. National Grid also invests and participates in the development of natural gas pipelines and other energy related projects.

National Grid is a wholly owned U.S. subsidiary of National Grid plc, a major multinational company whose principal activities are owning and operating regulated networks for the transmission and distribution of electricity and natural gas. National Grid plc is based in the United Kingdom and is one of the largest investor-owned energy companies in the world, with $75 billion in assets and over $22 billion in annual revenues. In the United Kingdom, a subsidiary of National Grid plc, National Grid Electricity Transmission plc, owns and operates the high voltage electric transmission system in England and Wales, comprising approximately 4,500 miles of overhead

transmission lines among other assets, and operates the high voltage electricity transmission system in Scotland. National Grid Electricity Transmission plc is also the operator and part owner of a 2,000 MW HVDC link to France, a 1,000 MW HVDC link to the Netherlands, and a planned HVDC facility to link Scotland with England and Wales. Another subsidiary of National Grid plc, National Grid Gas plc, owns and operates the gas transportation system, comprising approximately 4,700 miles of high pressure pipe, and a majority of the gas distribution system, in Great Britain, serving over 11 million homes and businesses.

Q. Do ZAM Ventures or National Grid have operations in Kansas, Missouri, Illinois, or Indiana?

A. No, they do not. As a result, Grain Belt Express has no potential affiliate concerns or potential conflicts of interest in pursuing the Project.

Q. Are there benefits to Clean Line and Grain Belt Express from having National Grid as an investor in Clean Line?

A. Yes. First, National Grid's equity investment provides additional equity capital that can be used in the development stages of our projects until permanent financings can be put in place through the financing plan and process that I describe later in my testimony.

Second, National Grid and its subsidiaries are major participants in the electricity and natural gas transmission and distribution sectors in the United States. National Grid USA is a financially strong company with substantial assets and revenues. Its participation as an equity investor in Clean Line provides additional credibility in the capital markets for Clean Line's projects, financing plans, and financial capabilities.

Third, National Grid and its subsidiaries are experienced in constructing and operating electric transmission facilities, particularly HVDC facilities. Clean Line can draw on this experience when necessary in connection with the planning, construction, and operation of the Grain Belt Express Project.

Q. Does Clean Line or its subsidiaries have any debt?

A. No, they do not.

Q. What is the nature of the investment in Clean Line to date?

A. The initial equity investors are providing capital to enable Clean Line to undertake the initial development and permitting work for its transmission line projects, including the Grain Belt Express Project, which is to be constructed and owned by Grain Belt Express. We estimate that of the total cost of a transmission project, such as the Grain Belt Express Project, approximately 2% is spent in development activities (obtaining siting authority, interconnection studies, routing, permitting, and public outreach), approximately 10% is spent in pre-construction activities (ordering the DC converters and acquiring rights-of-way), and the remaining approximately 88% is spent in construction and commissioning activities. The funding provided by the equity investors will enable Clean Line and its subsidiaries to bring the Project, and the other transmission line projects being developed by other subsidiaries of Clean Line, to a point of development at which long-term transmission service agreements can be signed with transmission customers and, on the basis of these agreements, project-specific financing arrangements can be entered into with lenders and with equity investors and/or other partners. The additional capital obtained through these financing arrangements will allow Grain Belt Express to construct the Project. The initial equity investors may participate

in the project financings by making debt or additional equity investments along with new lenders, investors and/or partners.

Q. At what point will Grain Belt Express put into place the financing to construct the Project?

A. When the Project has completed the majority of its permitting and licensing processes, and therefore has certainty on the route and schedule for the Project, Grain Belt Express will enter into long-term contracts with customers for transmission capacity on the Project. Grain Belt Express then intends to issue project-specific debt secured by the revenue stream from the transmission capacity contracts to raise the capital necessary to complete the remaining development activities, construct the Project, and place it into operation. Additional equity capital may also be raised to help finance construction of the Project, or Clean Line's existing investors may make additional equity investments in the Project.

Q. How does project finance differ from the general corporate finance approach that many utilities use to finance new transmission lines and other additions to their plants and equipment?

A. The key distinction between general corporate finance and project finance is the revenues and assets investors rely upon to recover (and secure, in the case of secured debt) their investment and to earn their required return. When utilities issue corporate debt or equity to fund new construction, the issued securities typically are supported by, and the buyers typically rely on, all the assets and revenues of the issuer and not just the assets and revenues of the new project that is being financed. Project finance, on the other hand, relies principally (and in some cases exclusively) on the assets and revenues of a

particular project as the source of security. Project finance typically relies less on historical operating results or the current financial condition of the company issuing securities, and more on the quality and certainty of future revenues. Compared to corporate finance, the advantage of project finance is that unrelated liabilities do not diminish the claims of investors to receive revenues from the project to be constructed and financed.

Q. Is project finance a proven model for financing the development and construction of projects such as the Grain Belt Express Project?

A. Yes. Many successful transmission projects have followed the same model in which initial equity investors fund development and the project is later refinanced at the project level to fund construction. Utilities and developers have applied this model to traditionally rate-based transmission lines, like the Path 15 project in California and the Trans Bay Cable project crossing the San Francisco Bay. This model is also common for shipper-pays transmission lines, like the Grain Belt Express Project. Other shipper-pays transmission projects that have pursued or are pursuing this financing model include the Neptune underwater HVDC project between New Jersey and Long Island, the Hudson underwater HVDC project between New Jersey and New York City, and the Wyoming Colorado Intertie. Many of the Competitive Renewable Energy Zone ("CREZ") transmission lines in Texas followed the project-specific finance model, as well.

Q. Are you confident that the project finance markets will support the construction of the Grain Belt Express Project?

A. Yes. Large amounts of liquidity exist in the capital markets for transmission projects that have reached an advanced stage of development. The capital markets have a substantial

history of supporting transmission projects, including merchant transmission projects, through debt and equity financings. Schedule DAB-7 contains a list of such transactions that have occurred in both the equity and debt markets. For example, in 2003 the Path 15 project, an 83-mile stretch of 500 kV lines in Southern California, closed $209 million in debt financing spread across the bank and bond markets. In 2005 the Neptune Project, a ±500 kV HVDC underwater transmission line, raised $600 million in a private placement at a competitive spread to LIBOR. In early 2008 Trans Bay Cable LLC successfully closed an approximately $500 million transaction in the project finance market to fund a 53-mile underwater HVDC project. In September 2008 the Trans-Allegheny Interstate Line project closed a $550 million senior secured loan, and in January 2010 that project closed an additional $800 million of financing, comprised of $350 million in floating bank debt and $450 million in fixed coupon bonds. Additionally, significant institutional investors such as the California Public Employees Retirement System, John Hancock Financial Services, and TIAA-CREF have made major equity investments in transmission lines, as have the private equity firms ArcLight Capital Partners, Energy Investors Fund, Energy Capital Partners, and Starwood Energy. All of these examples confirm that debt and equity financing is in plentiful supply for projects like the Grain Belt Express Project. Texas' recent experience with the CREZ lines provides further confirmation of the viability of project finance applied to transmission lines.

Q. What is the CREZ transmission program?

A. The CREZ transmission build-out program was established by the Texas legislature in 2005 to advance the construction of new wind farms in Texas. The CREZ projects are

primarily designed to transport electricity generated by renewable energy resources to larger load centers in Texas, while simultaneously providing the infrastructure necessary to meet the long-term needs of the areas with the greatest growth potential. Transmission projects have been assigned to developers, both incumbent utilities and new entrants, through an application process. In March 2009 the Texas Public Utility Commission ("PUC") issued an order approving projects comprising 2,300 miles of new 345 kV transmission lines pursuant to the CREZ legislation. At this time, all of the CREZ lines have been successfully completed.

Q. Did the Texas PUC approve any CREZ projects to be constructed by independent transmission companies?

A. Yes. The Texas PUC awarded CREZ projects to eight transmission service providers: Oncor, Lower Colorado River Authority, South Texas Electric Cooperative, Sharyland Utilities, Electric Transmission Texas, Lone Star Transmission, Wind Energy Transmission Texas, and Cross Texas Transmission. Of these entities, Electric Transmission Texas, Lone Star, Wind Energy Transmission Texas, and Cross Texas Transmission were new, independent entities established to pursue the CREZ projects. Like Grain Belt Express, these new entities had strong investor backing and had developed plans to use project financing to raise capital to construct their designated transmission lines.

Q. Were the CREZ transmission providers able to raise sufficient capital to proceed with their projects?

A. Yes. With several project finance loans oversubscribed – meaning more lenders wanted to participate than was possible based on the size of the loan or debt offerings – the

CREZ projects enjoyed strong success in raising capital. The following examples all used project finance: In June 2011, Sharyland raised over $730 million for its designated project in the bank and private debt markets. Sharyland's parent company Hunt Consolidated, Inc. announced plans for two real estate investment trusts totaling $2.1 billion that will invest in Sharyland's CREZ lines as well as other natural gas and electric transmission assets. In July 2011 Cross Texas Transmission and Wind Energy Transmission Texas raised over $700 million in bank debt. In November 2011 Lone Star raised $386.6 million in bank loans for its CREZ line.

Q. Were the CREZ loans and other financing committed for the CREZ projects prior to the transmission service providers receiving key permits for their projects, including Texas PUC approval?

A. No. The CREZ transmission service providers provided information about their parent companies and plans to finance the lines as part of the selection process. However, the transactions I described in my previous answer did not occur until the respective project sponsors had received one or more certificates of convenience and necessity from the Texas PUC.

Q. Is it typical for energy projects using project finance to obtain full financing prior to obtaining the necessary permits and other regulatory approvals?

A. No. In my experience project lenders require the necessary permits and approvals as a condition precedent to funding a project loan. Project-based equity investors typically have the same requirement. While I am aware of certain transactions in which debt and equity investors have made commitments conditioned on obtaining remaining permits and approvals, this model is not appropriate for projects such as the Grain Belt Express

Project. First, banks and other lending institutions will not make conditional commitments until they have a very high degree of certainty that the project will actually be approved by the applicable regulatory agencies. Second, the time horizon of the Grain Belt Express Project is such that construction will not begin for at least two years, depending on the time frame in which this Application and a similar application in Illinois are approved. Conditional commitments to project finance are made where there is a much shorter period of time anticipated between the commitment being made and the anticipated date of the event that will trigger the release of the funds. Third, lenders typically charge a commitment fee on future loan commitments, which can be quite costly to the project. In summary, debt providers would not make such a long-term commitment to finance the Project before key approvals are in place.

Q. How does the financing approach that Clean Line plans to employ compare to the financing methods used for other kinds of energy projects?

A. Developers of new independent power generation projects have long relied on project finance to fund their construction. For example, the U.S. wind power industry has raised tens of billions of dollars of project-level debt and equity over the last five years. Horizon Wind Energy (now EDP Renewables), one of the leading developers of wind generation facilities in the U.S., successfully used this approach to develop, finance, construct, and place into operation a number of significant wind generation projects throughout the U.S. When I worked at Horizon, I led over $2 billion of project finance transactions using this approach. In addition to electric generation, natural gas pipelines have commonly used project finance to fund the construction of new pipeline projects.

Q. At what point will Clean Line obtain financing for the construction of the Grain Belt Express Project?

A. Our current plan is to obtain construction financing once we have obtained the major regulatory approvals necessary to proceed with the Project and we have sold a majority of the capacity on the Project. Grain Belt Express has already obtained certificates to operate as a public utility in Kansas and to construct the 370-mile Kansas portion of the HVDC Line from the Kansas Corporation Commission. Grain Belt Express also received a certificate to operate as a public utility from the Indiana Utility Regulatory Commission. Grain Belt Express still needs to obtain the requisite approvals of this Commission and the Illinois Commerce Commission. In addition to obtaining regulatory commission approvals, we will need to enter into contracts for a portion of the transmission capacity on the Grain Belt Express Project prior to obtaining full financial commitments for the Project. The exact percentage of capacity that needs to be under contract prior to obtaining full financing commitments will depend on the price, counterparty creditworthiness, and term in years of the signed transmission contracts.

Q. Please describe the nature of these transmission capacity contracts and why they are necessary to support the Project's financing.

A. Grain Belt Express intends to offer long-term transmission capacity contracts to its potential customers. These contracts will provide for a reservation charge, which will require the transmission customer to pay regardless of what percentage of the time the customer uses the reserved capacity. This pricing arrangement is typical for transmission lines operated by the transmission owner members of SPP, MISO and PJM. It is also similar to the contractual arrangements for natural gas pipelines. Grain Belt Express will

impose credit requirements on its transmission customers. The credit requirements will require each transmission customer to have investment grade credit ratings, or post additional security in the form of cash, a letter of credit, or a parent guarantee from an entity with investment grade credit ratings. These credit requirements will provide revenue certainty, which will allow lenders to be comfortable that Grain Belt Express can repay its debt.

Q. How will lenders size the debt they lend to Grain Belt Express?

A. Lenders typically look at project finance borrowing capability based on debt service coverage ratios, where the numerator is contracted cash flow available to service debt, and the denominator is principal and interest owed. In my experience, typical coverage ratios for project finance are 1.25 to 1.50 times. These coverage ratios allow projects like the Grain Belt Express Project to raise substantial amounts of debt financing to fund construction costs, while maintaining a margin of safety on debt repayment in the event of unforeseen operational or commercial problems.

Q. If Grain Belt Express is able to obtain the regulatory approvals and the transmission contracts as you describe, do you foresee any difficulty in obtaining the necessary financing to build the Project?

A. No. Several precedent transactions have demonstrated that project finance for transmission lines is a viable model. Further, Clean Line has developed a database of lenders and equity investors who have either made past investments in transmission projects or have expressed an interest in investing in one of Clean Line's projects once it has secured the key permits and contracts. My Clean Line colleagues and I have worked with many of these lenders and equity investors on prior transactions.

Q. Do the equity investors in Clean Line have the commitment and experience to support this plan?

A. In my opinion, yes. Both ZAM Ventures and the Zilkha family have deep experience in the energy field, including in electric power and renewable energy, and in project finance, specifically. ZAM Ventures and its affiliates and the Zilkha family have previously made significant investments in start-up companies in the energy industry, including companies developing renewable resources projects, and are quite familiar with our development and financing model. National Grid is a very experienced investor in electric infrastructure projects and has substantial capabilities to support Grain Belt Express' financing efforts. In addition, National Grid has the financial capability to make additional investments in Clean Line and Grain Belt Express as the Project meets the necessary regulatory milestones.

Q. Does Clean Line have the management expertise to successfully execute its development and financing model?

A. Yes. Along with several other members of our management team, including Mr. Skelly, our President and CEO and Jayshree Desai, our Executive Vice President – Commercial and Operations, I was previously employed by Horizon Wind Energy, where we worked to bring a number of wind energy projects into operation using project financings. Additionally, other members of our management team, including Mario Hurtado, our Executive Vice President – Development, have many years of experience in developing independent power generation projects. Cary Kottler, our general counsel, was a corporate attorney at a large law firm where he was involved in a number of significant financial transactions encompassing many sectors of the renewable energy industry.

More complete descriptions of the qualifications and experience of the primary members of the Clean Line/Grain Belt Express management team are provided in Mr. Skelly's direct testimony.

Q. What conditions will project lenders place on Clean Line before they advance the money to build the Project?

A. Lenders will scrutinize construction contracts and will only advance money once the appropriate conditions exist. Those conditions include (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. While this due diligence creates an additional administrative burden for the transmission developer, it ensures that projects proceed prudently. Construction lenders will not release funds to begin construction unless Grain Belt Express demonstrates that it has commitments for sufficient financing to construct the entire Project. Lenders will not take the risk that additional necessary financing cannot be obtained, resulting in an incomplete project with limited collateral value. Therefore, Grain Belt Express will not begin to construct major physical facilities until it has obtained adequate funding to complete the Project.

Q. Please summarize why Clean Line's financing plan will enable Grain Belt Express to construct the Project.

A. Project finance is a time-tested and proven way to finance the construction of transmission lines. There are a significant number of precedent transactions that have set a framework for the terms, pricing, legal documentation, and interested parties. Clean Line has identified and developed relationships with a large number of potential financing parties. We are developing the Grain Belt Express Project using a business

model that will allow its successful project financing. Finally, our staff has the experience and demonstrated capability to execute large project financing transactions, and our equity investors have the commitment and the experience to support our financing plan.

V. COMPANY QUALIFICATIONS

Q. Is Grain Belt Express qualified to operate as a transmission utility?

A. Yes, I believe that we possess the necessary qualifications. As part of the development of the Grain Belt Express Project, our credentials have been reviewed by the Kansas Corporation Commission and the Indiana Utility Regulatory Commission. Both of these bodies have authorized Grain Belt Express to operate as a public utility in those states. Further, the Kansas Corporation Commission on November 7, 2013 approved the Kansas portion of the Project's route. Grain Belt Express will also request authorization to operate as a public utility in Illinois.

As to the specific aspects of the Company's business plan, these are addressed by several different witnesses in this proceeding. The construction management capability of the Company is addressed in the direct testimony of Michael Skelly. He discusses the extensive experience of our team in constructing transmission lines and other energy infrastructure projects. Mr. Skelly also discusses our ability to utilize the capabilities of National Grid USA, our principal strategic investor and one of the most experienced installers of HVDC equipment in the world. The operational capability of Grain Belt Express is discussed in the direct testimony of Dr. Galli. He describes how Grain Belt Express will manage the operations of the Project; how functional control will be turned over to either MISO or PJM; how we will manage vegetation along the Project; and how

Grain Belt Express will staff the Project on an ongoing basis. Finally, I have addressed the capability of Grain Belt Express to finance the Project in the prior section of my testimony.

Q. Does this conclude your testimony?

A. Yes, it does.

BEFORE THE PUBLIC SERVICE COMMISSION
OF THE STATE OF MISSOURI

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

AFFIDAVIT OF DAVID BERRY

STATE OF Texas)
) **ss**
COUNTY OF Harris)

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

1. My name is David Berry. I am Executive Vice President – Strategy and Finance of Clean Line Energy Partners, LLC.

2. Attached hereto and made a part hereof for all purposes is my Direct Testimony on behalf of Grain Belt Express Clean Line LLC consisting of 53 pages, having been prepared in written form for introduction into evidence in the above-captioned docket.

3. I have knowledge of the matters set forth therein. I hereby swear and affirm that my answers contained in the attached testimony to the questions therein propounded, including any attachments thereto, are true and accurate to the best of my knowledge, information and belief.

David Berry

Subscribed and sworn before me this 25 day of March 2014.

Notary Public

My commission expires: 7-22-2015

JUDY BLANKENSHIP
Notary Public, State of Texas
My Commission Expires
July 22, 2015

Calculations to estimate Missouri's need for renewables

To estimate the total amount of renewable energy needed for Missouri to meet its 2021 Renewable Energy Standard (RES) target, I first estimated the total 2021 electricity demand (A). This estimate was based on 2012 sales[1] that were increased according to the projected increase in electricity demand for the Missouri region.[2] Missouri's RES only applies to investor-own utilities, who according to the most recent EIA data, account for about 70 percent of the state's retail sales (B). The result is that 62 million MWh of 2021 electric demand is subject to the RES (C). In order for 15% of this future demand to be met with renewables, Missouri will need 9 million MWh of renewable energy supply (E)

89	A: Projected 2021 Missouri electric retail sales (million MWh)
70%	B: Percentage of Misouri electric sales that are subject to the RES
62	C = A x B: 2021 electric retails sales that are subject to the RES (million MWh)
15%	D: Renewable Electricity Standard 2021 requirement
9	E = C x D: Missouri's 2021 need for renewables (million MWh)

[1] EIA Detailed State Data. "Retail Sales of Electricity by State by Sector by Provider." Available online at http://www.eia.gov/electricity/data/state/. (Last accessed on February 7, 2014).

[2] EIA 2014 Annual Energy Outlook. "Electric Power Projections for Electricity Market Module Regions." Available online at http://www.eia.gov/forecasts/aeo/er/tables_ref.cfm. (Last accessed on February 28, 2014).

EIA Detailed State Data. "Retail Electricity Sales Statistics, 2010." Available online at http://www.eia.gov/electricity/state/missouri/index.cfm. (Last accessed on February 28, 2014).

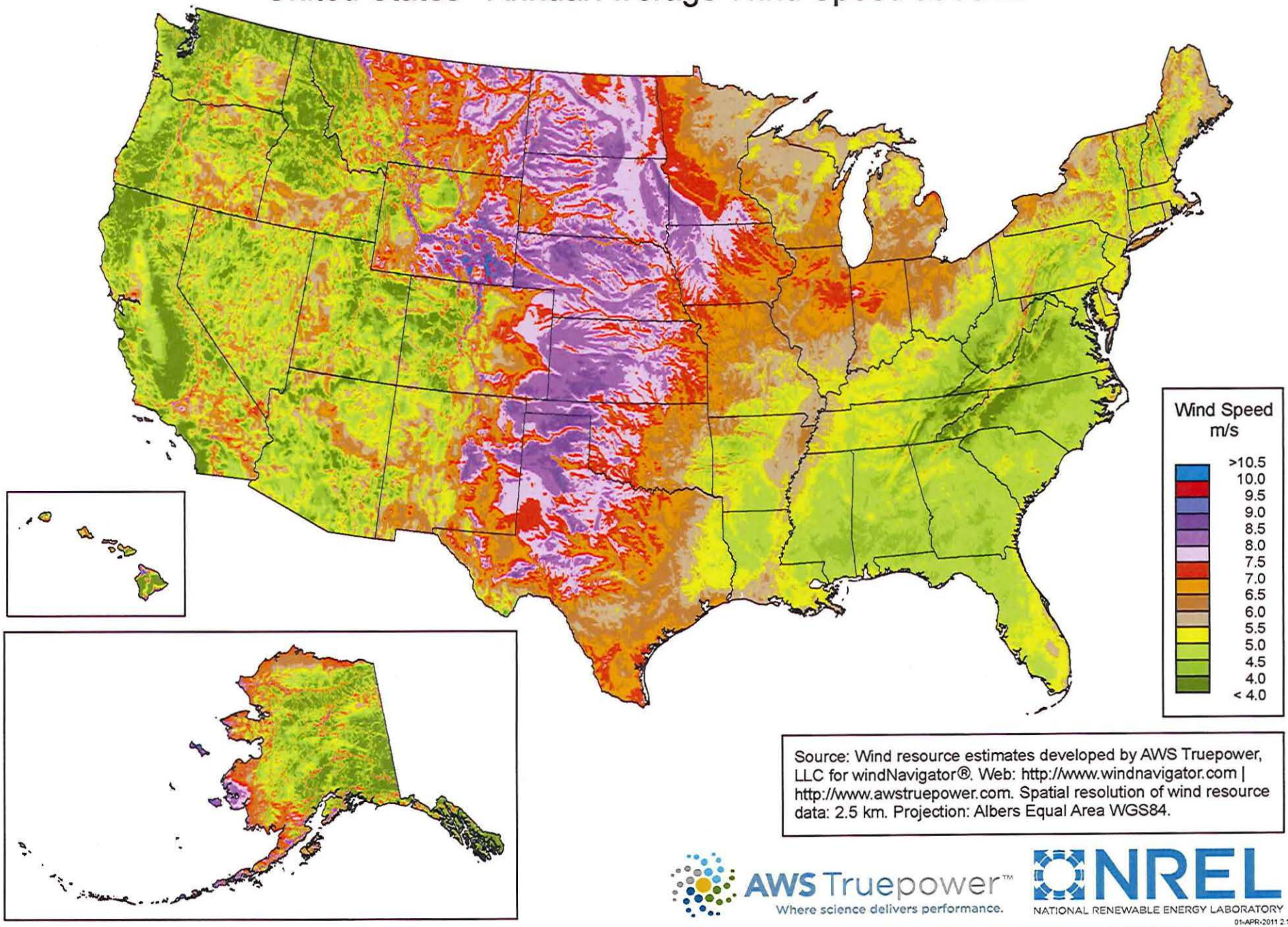
Calculations to estimate Missouri's current renewables supply

To determine Missouri's current renewables supply for RES compliance, I reviewed the 2012 RES Compliance Reports for Ameren Missouri, Empire District Electric Company, Kansas City Power & Light and KCP&L Greater Missouri Operations Company.[3] For the hydroelectric, solar and landfill methane sources, I used the reported amounts of generation. For the wind sources, since some of the generation totals were excluded or redacted, I multiplied the wind farm's nameplate capacity by an estimated capacity factor (38% for Iowa wind farms and 40% for Kansas wind farms). I then summed the generation from each of these existing sources to find a total of 4.17 million MWh of current renewables supply.

Utility	Plant	Type	Generation (MWh)
Ameren Missouri	Keokuk Hydro-electric Generation Station	Hydro	754,125
Ameren Missouri	Pioneer Prairie Wind Farm I	Wind	340,769
Ameren Missouri	Ameren Missouri Headquarters	Solar	104
Ameren Missouri	Maryland Heights Renewable Energy Center	Landfill	37,450
Ameren Missouri	S-REC Purchase from Customers	Solar	2,851
Empire District Electric Company	Elk River Wind Farm	Wind	525,960
Empire District Electric Company	Meridian Way	Wind	368,172
Empire District Electric Company	Ozark Beach Hydroelectric Project	Hydro	57,806
KCP&L Greater Missouri Operations Company	Gray County Wind Farm	Wind	393,418
KCP&L Greater Missouri Operations Company	Ensign Wind	Wind	346,783
KCP&L Greater Missouri Operations Company	St. Joseph Landfill Gas	Landfill	3,000
KCP&L Greater Missouri Operations Company	S-REC Purchase from 3Degrees Group	Solar	3,600
Kansas City Power & Light Company	Spearville I Wind Farm	Wind	352,393
Kansas City Power & Light Company	Spearville II Wind Farm	Wind	168,307
Kansas City Power & Light Company	Paseo Solar	Solar	95
Kansas City Power & Light Company	Spearville 3	Wind	353,445
Kansas City Power & Light Company	Cimarron	Wind	459,338
Kansas City Power & Light Company	S-REC Purchase from 3Degrees Group	Solar	3,900
		Total	**4,171,517**

[3]Missouri Public Service Commission. "Renewable Energy Standard Compliance Reports." Available online at http://psc.mo.gov/electric/Renewable_Energy_Standard_Compliance_Reports. (Last accessed February 28, 2014).

United States - Annual Average Wind Speed at 80 m



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

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NATIONAL RENEWABLE ENERGY LABORATORY

01-APR-2011 2.1.1

General inputs and assumptions

- Shared Inputs
  - Annual Inflation – 2.5%
  - Corporate tax rate – 35%
  - Debt – 50%
  - Cost of debt – 5.5%
  - Equity – 50%
  - Cost of equity – 12%
  - Capacity value – 95,659 $/MW-yr (Projected annual revenue requirement for combustion turbines in $/MW-yr, EIA AEO2013 forecast)
  - Regional capital cost adjustments for non-wind generation
    - KS in SPP North (SPNO) (EIA AEO2013)
    - MO in SERC Gateway (SRGW) and SPP North (SPNO) (EIA AEO2013)
  - Property tax rate
    - MO – 4%
  - Assessment on commercial property
    - MO – 32%
- Input Sensitivities (reference case)
  - 2014 PTC value – 23 $/MWh (IRS Section 45)
  - Carbon dioxide price – Synapse forecast mid case: 15 $/ton in 2020 to 60 $/ton in 2040 (Synapse Report)
  - Natural gas price – EIA AEO2014 electric power forecast: 5.68 $/Mcf in 2018 to 13.82 $/Mcf in 2040 (EIA AEO2014)
  - KS wind capacity factor – 55%
  - MO wind capacity factor – 30% (Estimated from http://www.windpoweringamerica.gov/wind_resource_maps.asp?stateab=mo)

Assumptions on alternatives

- Grain Belt line
  - Electric losses – 5%
- Kansas wind
  - Utilization rate – see KS wind capacity factor above
  - Capital cost – 1.75 $mm/MW (includes regional cost adjustments according to LBL Wind Report)
  - O&M – 7.5 $/MWh (LBL Wind Report) with 1% escalation
  - Tax depreciation – 5-years MACRS
  - Useful life – 25 years
  - Property tax – exempt (Renewable Energy Property Tax Exemption: http://www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=KS02F&re=0&ee=0)
  - Capacity credit – 17.1% of nameplate capacity (Capacity credit of MO wind scaled by capacity factor ratio between KS and MO)

- Missouri wind
  - Utilization rate – see MO wind capacity factor above
  - Capital cost – 1.75 $mm/MW (includes regional cost adjustments according to LBL Wind Report)
  - O&M – 7.5 $/MWh (LBL Wind Report) with 1% escalation
  - Tax depreciation – 5-years MACRS
  - Useful life – 25 years
  - Property depreciation – straight line over lifetime to 20% residual value
  - Property assessment – 40% for first two years, 37% for following two years, then 35% for all following years (http://stc.mo.gov/files/077_CHAPTER7.7WINDENERGYREV.pdf)
  - Property tax incentive – 50% abatement for 10 years (http://www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=MO117F&re=0&ee=0)
  - Capacity credit – 9.3% of nameplate capacity (https://www.misoenergy.org/Library/Repository/Study/LOLE/2014%20Wind%20Capacity%20Report.pdf)
  - TOD adjustment – 98% (Missouri EWITS data compared with KS wind, calculated from simulated hourly LMPs at GBX Palmyra Tap drop-off point and wind profile provided by DNV GL)
- Pulverized Coal
  - Utilization rate – 85% (EIA AEO2013)
  - Capital cost – 2.934 $mm/MW (EIA AEO2013)
  - Fixed O&M – 31.18 $/kW (EIA AEO2013)
  - Variable O&M – 4.47 $/MWh (EIA AEO2013)
  - Heat rate – 8,800 Btu/kWh (EIA AEO2013)
  - Carbon intensity – 0.093 tons/mmBtu (Bituminous coal)
  - Tax depreciation – 15-years MACRS
  - Useful life – 30 years
  - Property depreciation – straight line over lifetime to 20% residual value
  - Capacity credit – 88% [0-100 MW], 93% [100-200 MW], 93% [200-300 MW], 93% [300-400 MW], 92% [400-600 MW] of nameplate capacity (1-EFOR, or Equivalent Forced Outage Rate: Generating Availability Data System)
  - TOD adjustment – 104% (Assumed constant generation compared with KS wind, calculated from simulated hourly LMPs at GBX Palmyra Tap drop-off point and wind profile provided by DNV GL)
  - Coal price – EIA AEO2014 forecast: 2.80 $/mmBtu in 2018 to 5.29 $/mmBtu in 2040 (EIA AEO2014)
- Combined Cycle Gas
  - Utilization rate – 87% (EIA AEO2013)
  - Capital cost – 1.006 $mm/MW (EIA AEO2013)
  - Fixed O&M – 15.1 $/kW (EIA AEO2013)
  - Variable O&M – 3.21 $/MWh (EIA AEO2013)

- Heat rate – 6,333 Btu/kWh (EIA AEO2013)
- Carbon intensity – 0.053 tons/mmBtu
- Tax depreciation – 15-years MACRS
- Useful life – 30 years
- Property depreciation – straight line over lifetime to 20% residual value
- Capacity credit – 76% [0-100 MW], 87% [100-200 MW], 91% [200-300 MW], 93% [300-400 MW] of nameplate capacity (1-EFOR, or Equivalent Forced Outage Rate: Generating Availability Data System)
- TOD adjustment – 104% (Assumed constant generation compared with KS wind, calculated from simulated hourly LMPs at GBX Palmyra Tap drop-off point and wind profile provided by DNV GL)

- Nuclear
  - Utilization rate – 90% (EIA AEO2013)
  - Capital cost – 5.429 $mm/MW (EIA AEO2013)
  - Fixed O&M – 91.65 $/kW (EIA AEO2013)
  - Variable O&M – 2.1 $/MWh (EIA AEO2013)
  - Average fuel cost (including waste management) – 7.5 $/MWh (NEI: http://www.nei.org/Knowledge-Center/Nuclear-Statistics/Costs-Fuel,-Operation,-Waste-Disposal-Life-Cycle)
  - Tax depreciation – 15-years MACRS
  - Useful life – 40 years
  - Property depreciation – straight line over lifetime to 20% residual value
  - Capacity credit – 98% [<800 MW] of nameplate capacity (1-EFOR, or Equivalent Forced Outage Rate: Generating Availability Data System)
  - TOD adjustment – 104% (Assumed constant generation compared with KS wind, calculated from simulated hourly LMPs at GBX Palmyra Tap drop-off point and wind profile provided by DNV GL)
- Utility-scale Solar
  - Utilization rate – 19.2% (PV generation obtained using NREL PV-Watts for Columbia, MO http://rredc.nrel.gov/solar/calculators/pvwatts/version1/)
  - Capital cost – 3.805 $mm/MW (EIA AEO2013)
  - Fixed O&M – 21.37 $/kW (EIA AEO2013)
  - Variable O&M – 0 $/MWh (EIA AEO2013)
  - Investment tax credit – 30% of capital costs
  - Tax depreciation – 5-years MACRS
  - Useful life – 25 years
  - Property tax – exempt (Solar Property Tax Exemption: http://www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=MO122F&re=0&ee=0)
  - Capacity credit – 62% of nameplate capacity (Assumed 2-axis tracking and 10% penetration levels in MO, NREL: http://www.nrel.gov/docs/fy06osti/40068.pdf)
  - TOD adjustment – 116% (PV generation obtained using NREL PV-Watts for Columbia, MO http://rredc.nrel.gov/solar/calculators/pvwatts/version1/ and is

compared with KS wind, calculated from simulated hourly LMPs at GBX Palmyra Tap drop-off point and wind profile provided by DNV GL)

References

EIA AEO2013 – *Annual Energy Outlook 2013: Electricity Market Module.* (EIA) http://www.eia.gov/forecasts/aeo/assumptions/pdf/electricity.pdf

EIA AEO2013 forecast – *Levelized Cost of New Generation Resources in the Annual Energy Outlook 2013.* (EIA) http://www.eia.gov/forecasts/aeo/pdf/electricity_generation.pdf.

EIA AEO2014 – *Annual Energy Outlook 2014 Early Release.* (EIA) http://www.eia.gov/forecasts/aeo/er/pdf/0383er(2014).pdf

LBL Wind Report – *Wind Technologies Market Report 2012.* (LBL) http://emp.lbl.gov/sites/all/files/lbnl-6356e.pdf

Synapse Report – *2013 Carbon Dioxide Price Forecast.* (Synapse) http://www.synapse-energy.com/Downloads/SynapseReport.2013-11.0.2013-Carbon-Forecast.13-098.pdf

Input sensitivities and assumptions

- Input Sensitivities
  - PTC: [0, 23] $/MWh
  - Carbon dioxide price: [none, base, high]
    - None – no carbon costs in the future
    - Base – 15 $/ton in 2020 to 60 $/ton in 2040 and continued growth
    - High – 25 $/ton in 2020 to 90 $/ton in 2040 and continued growth
  - Natural gas price: [80, 100, 120]% of EIA AEO2014 projections
  - KS wind capacity factor: [50, 55, 60]%
  - MO wind capacity factor: [25, 30, 35]%

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

$2*3^4=162$ scenarios considered

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

The levelized cost of Grain Belt Express' delivered energy is the cheapest alternative in 87% of all cases. It is lower than Coal, Nuclear, and Solar in every scenario, and is cheaper than Missouri wind in 94% and Gas in 91% of all scenarios.

Scenario	PTC Value	Carbon Dioxide	Natural Gas	KS Wind CF	MO Wind CF	Grain Belt Project	Missouri Wind	Pulverized Coal	Combined Cycle Gas	Nuclear	Utility-scale Solar
1	0	0	0	0	0	66.95	90.39	79.70	51.71	102.23	122.20
2	0	0	0	0	1	68.03	77.32	79.70	51.71	102.23	122.20
3	0	0	0	0	2	68.80	67.99	79.70	51.71	102.23	122.20
4	0	0	0	1	0	61.41	90.39	79.70	51.45	102.23	122.20
5	0	0	0	1	1	62.49	77.32	79.70	51.45	102.23	122.20
6	0	0	0	1	2	63.26	67.99	79.70	51.45	102.23	122.20
7	0	0	0	2	0	56.80	90.39	79.70	51.45	102.23	122.20
8	0	0	0	2	1	57.88	77.32	79.70	51.45	102.23	122.20
9	0	0	0	2	2	58.65	67.99	79.70	51.45	102.23	122.20
10	0	0	1	0	0	66.95	90.39	79.70	62.56	102.23	122.20
11	0	0	1	0	1	68.03	77.32	79.70	62.56	102.23	122.20
12	0	0	1	0	2	68.80	67.99	79.70	62.56	102.23	122.20
13	0	0	1	1	0	61.41	90.39	79.70	62.30	102.23	122.20
14	0	0	1	1	1	62.49	77.32	79.70	62.30	102.23	122.20
15	0	0	1	1	2	63.26	67.99	79.70	62.30	102.23	122.20
16	0	0	1	2	0	56.80	90.39	79.70	62.30	102.23	122.20
17	0	0	1	2	1	57.88	77.32	79.70	62.30	102.23	122.20
18	0	0	1	2	2	58.65	67.99	79.70	62.30	102.23	122.20
19	0	0	2	0	0	66.95	90.39	79.70	73.41	102.23	122.20
20	0	0	2	0	1	68.03	77.32	79.70	73.41	102.23	122.20
21	0	0	2	0	2	68.80	67.99	79.70	73.41	102.23	122.20
22	0	0	2	1	0	61.41	90.39	79.70	73.15	102.23	122.20
23	0	0	2	1	1	62.49	77.32	79.70	73.15	102.23	122.20
24	0	0	2	1	2	63.26	67.99	79.70	73.15	102.23	122.20
25	0	0	2	2	0	56.80	90.39	79.70	73.15	102.23	122.20
26	0	0	2	2	1	57.88	77.32	79.70	73.15	102.23	122.20
27	0	0	2	2	2	58.65	67.99	79.70	73.15	102.23	122.20
28	0	1	0	0	0	66.95	90.39	120.05	69.67	102.23	122.20
29	0	1	0	0	1	68.03	77.32	120.05	69.67	102.23	122.20
30	0	1	0	0	2	68.80	67.99	120.05	69.67	102.23	122.20
31	0	1	0	1	0	61.41	90.39	120.05	69.42	102.23	122.20
32	0	1	0	1	1	62.49	77.32	120.05	69.42	102.23	122.20
33	0	1	0	1	2	63.26	67.99	120.05	69.42	102.23	122.20
34	0	1	0	2	0	56.80	90.39	120.05	69.42	102.23	122.20
35	0	1	0	2	1	57.88	77.32	120.05	69.42	102.23	122.20
36	0	1	0	2	2	58.65	67.99	120.05	69.42	102.23	122.20
37	0	1	1	0	0	66.95	90.39	120.05	80.52	102.23	122.20
38	0	1	1	0	1	68.03	77.32	120.05	80.52	102.23	122.20
39	0	1	1	0	2	68.80	67.99	120.05	80.52	102.23	122.20
40	0	1	1	1	0	61.41	90.39	120.05	80.26	102.23	122.20
41	0	1	1	1	1	62.49	77.32	120.05	80.26	102.23	122.20
42	0	1	1	1	2	63.26	67.99	120.05	80.26	102.23	122.20
43	0	1	1	2	0	56.80	90.39	120.05	80.26	102.23	122.20
Scenario	PTC Value	Carbon Dioxide	Natural Gas	KS Wind CF	MO Wind CF	Grain Belt Project	Missouri Wind	Pulverized Coal	Combined Cycle Gas	Nuclear	Utility-scale Solar

Scenario	PTC Value	Carbon Dioxide	Natural Gas	KS Wind CF	MO Wind CF	Grain Belt Project	Missouri Wind	Pulverized Coal	Combined Cycle Gas	Nuclear	Utility-scale Solar
44	0	1	1	2	1	57.88	77.32	120.05	80.26	102.23	122.20
45	0	1	1	2	2	58.65	67.99	120.05	80.26	102.23	122.20
46	0	1	2	0	0	66.95	90.39	120.05	91.37	102.23	122.20
47	0	1	2	0	1	68.03	77.32	120.05	91.37	102.23	122.20
48	0	1	2	0	2	68.80	67.99	120.05	91.37	102.23	122.20
49	0	1	2	1	0	61.41	90.39	120.05	91.11	102.23	122.20
50	0	1	2	1	1	62.49	77.32	120.05	91.11	102.23	122.20
51	0	1	2	1	2	63.26	67.99	120.05	91.11	102.23	122.20
52	0	1	2	2	0	56.80	90.39	120.05	91.11	102.23	122.20
53	0	1	2	2	1	57.88	77.32	120.05	91.11	102.23	122.20
54	0	1	2	2	2	58.65	67.99	120.05	91.11	102.23	122.20
55	0	2	0	0	0	66.95	90.39	141.50	79.20	102.23	122.20
56	0	2	0	0	1	68.03	77.32	141.50	79.20	102.23	122.20
57	0	2	0	0	2	68.80	67.99	141.50	79.20	102.23	122.20
58	0	2	0	1	0	61.41	90.39	141.50	78.94	102.23	122.20
59	0	2	0	1	1	62.49	77.32	141.50	78.94	102.23	122.20
60	0	2	0	1	2	63.26	67.99	141.50	78.94	102.23	122.20
61	0	2	0	2	0	56.80	90.39	141.50	78.94	102.23	122.20
62	0	2	0	2	1	57.88	77.32	141.50	78.94	102.23	122.20
63	0	2	0	2	2	58.65	67.99	141.50	78.94	102.23	122.20
64	0	2	1	0	0	66.95	90.39	141.50	90.05	102.23	122.20
65	0	2	1	0	1	68.03	77.32	141.50	90.05	102.23	122.20
66	0	2	1	0	2	68.80	67.99	141.50	90.05	102.23	122.20
67	0	2	1	1	0	61.41	90.39	141.50	89.79	102.23	122.20
68	0	2	1	1	1	62.49	77.32	141.50	89.79	102.23	122.20
69	0	2	1	1	2	63.26	67.99	141.50	89.79	102.23	122.20
70	0	2	1	2	0	56.80	90.39	141.50	89.79	102.23	122.20
71	0	2	1	2	1	57.88	77.32	141.50	89.79	102.23	122.20
72	0	2	1	2	2	58.65	67.99	141.50	89.79	102.23	122.20
73	0	2	2	0	0	66.95	90.39	141.50	100.90	102.23	122.20
74	0	2	2	0	1	68.03	77.32	141.50	100.90	102.23	122.20
75	0	2	2	0	2	68.80	67.99	141.50	100.90	102.23	122.20
76	0	2	2	1	0	61.41	90.39	141.50	100.64	102.23	122.20
77	0	2	2	1	1	62.49	77.32	141.50	100.64	102.23	122.20
78	0	2	2	1	2	63.26	67.99	141.50	100.64	102.23	122.20
79	0	2	2	2	0	56.80	90.39	141.50	100.64	102.23	122.20
80	0	2	2	2	1	57.88	77.32	141.50	100.64	102.23	122.20
81	0	2	2	2	2	58.65	67.99	141.50	100.64	102.23	122.20
82	1	0	0	0	0	38.01	62.61	79.70	51.71	102.23	122.20
83	1	0	0	0	1	39.09	49.55	79.70	51.71	102.23	122.20
84	1	0	0	0	2	39.86	40.22	79.70	51.71	102.23	122.20
85	1	0	0	1	0	32.47	62.61	79.70	51.45	102.23	122.20
86	1	0	0	1	1	33.55	49.55	79.70	51.45	102.23	122.20
Scenario	PTC Value	Carbon Dioxide	Natural Gas	KS Wind CF	MO Wind CF	Grain Belt Project	Missouri Wind	Pulverized Coal	Combined Cycle Gas	Nuclear	Utility-scale Solar

Scenario	PTC Value	Carbon Dioxide	Natural Gas	KS Wind CF	MO Wind CF	Grain Belt Project	Missouri Wind	Pulverized Coal	Combined Cycle Gas	Nuclear	Utility-scale Solar
87	1	0	0	1	2	34.33	40.22	79.70	51.45	102.23	122.20
88	1	0	0	2	0	27.86	62.61	79.70	51.45	102.23	122.20
89	1	0	0	2	1	28.94	49.55	79.70	51.45	102.23	122.20
90	1	0	0	2	2	29.71	40.22	79.70	51.45	102.23	122.20
91	1	0	1	0	0	38.01	62.61	79.70	62.56	102.23	122.20
92	1	0	1	0	1	39.09	49.55	79.70	62.56	102.23	122.20
93	1	0	1	0	2	39.86	40.22	79.70	62.56	102.23	122.20
94	1	0	1	1	0	32.47	62.61	79.70	62.30	102.23	122.20
95	1	0	1	1	1	33.55	49.55	79.70	62.30	102.23	122.20
96	1	0	1	1	2	34.33	40.22	79.70	62.30	102.23	122.20
97	1	0	1	2	0	27.86	62.61	79.70	62.30	102.23	122.20
98	1	0	1	2	1	28.94	49.55	79.70	62.30	102.23	122.20
99	1	0	1	2	2	29.71	40.22	79.70	62.30	102.23	122.20
100	1	0	2	0	0	38.01	62.61	79.70	73.41	102.23	122.20
101	1	0	2	0	1	39.09	49.55	79.70	73.41	102.23	122.20
102	1	0	2	0	2	39.86	40.22	79.70	73.41	102.23	122.20
103	1	0	2	1	0	32.47	62.61	79.70	73.15	102.23	122.20
104	1	0	2	1	1	33.55	49.55	79.70	73.15	102.23	122.20
105	1	0	2	1	2	34.33	40.22	79.70	73.15	102.23	122.20
106	1	0	2	2	0	27.86	62.61	79.70	73.15	102.23	122.20
107	1	0	2	2	1	28.94	49.55	79.70	73.15	102.23	122.20
108	1	0	2	2	2	29.71	40.22	79.70	73.15	102.23	122.20
109	1	1	0	0	0	38.01	62.61	120.05	69.67	102.23	122.20
110	1	1	0	0	1	39.09	49.55	120.05	69.67	102.23	122.20
111	1	1	0	0	2	39.86	40.22	120.05	69.67	102.23	122.20
112	1	1	0	1	0	32.47	62.61	120.05	69.42	102.23	122.20
113	1	1	0	1	1	33.55	49.55	120.05	69.42	102.23	122.20
114	1	1	0	1	2	34.33	40.22	120.05	69.42	102.23	122.20
115	1	1	0	2	0	27.86	62.61	120.05	69.42	102.23	122.20
116	1	1	0	2	1	28.94	49.55	120.05	69.42	102.23	122.20
117	1	1	0	2	2	29.71	40.22	120.05	69.42	102.23	122.20
118	1	1	1	0	0	38.01	62.61	120.05	80.52	102.23	122.20
119	1	1	1	0	1	39.09	49.55	120.05	80.52	102.23	122.20
120	1	1	1	0	2	39.86	40.22	120.05	80.52	102.23	122.20
121	1	1	1	1	0	32.47	62.61	120.05	80.26	102.23	122.20
122	1	1	1	1	1	33.55	49.55	120.05	80.26	102.23	122.20
123	1	1	1	1	2	34.33	40.22	120.05	80.26	102.23	122.20
124	1	1	1	2	0	27.86	62.61	120.05	80.26	102.23	122.20
125	1	1	1	2	1	28.94	49.55	120.05	80.26	102.23	122.20
126	1	1	1	2	2	29.71	40.22	120.05	80.26	102.23	122.20
127	1	1	2	0	0	38.01	62.61	120.05	91.37	102.23	122.20
128	1	1	2	0	1	39.09	49.55	120.05	91.37	102.23	122.20
129	1	1	2	0	2	39.86	40.22	120.05	91.37	102.23	122.20
Scenario	PTC Value	Carbon Dioxide	Natural Gas	KS Wind CF	MO Wind CF	Grain Belt Project	Missouri Wind	Pulverized Coal	Combined Cycle Gas	Nuclear	Utility-scale Solar

Scenario	PTC Value	Carbon Dioxide	Natural Gas	KS Wind CF	MO Wind CF	Grain Belt Project	Missouri Wind	Pulverized Coal	Combined Cycle Gas	Nuclear	Utility-scale Solar
130	1	1	2	1	0	32.47	62.61	120.05	91.11	102.23	122.20
131	1	1	2	1	1	33.55	49.55	120.05	91.11	102.23	122.20
132	1	1	2	1	2	34.33	40.22	120.05	91.11	102.23	122.20
133	1	1	2	2	0	27.86	62.61	120.05	91.11	102.23	122.20
134	1	1	2	2	1	28.94	49.55	120.05	91.11	102.23	122.20
135	1	1	2	2	2	29.71	40.22	120.05	91.11	102.23	122.20
136	1	2	0	0	0	38.01	62.61	141.50	79.20	102.23	122.20
137	1	2	0	0	1	39.09	49.55	141.50	79.20	102.23	122.20
138	1	2	0	0	2	39.86	40.22	141.50	79.20	102.23	122.20
139	1	2	0	1	0	32.47	62.61	141.50	78.94	102.23	122.20
140	1	2	0	1	1	33.55	49.55	141.50	78.94	102.23	122.20
141	1	2	0	1	2	34.33	40.22	141.50	78.94	102.23	122.20
142	1	2	0	2	0	27.86	62.61	141.50	78.94	102.23	122.20
143	1	2	0	2	1	28.94	49.55	141.50	78.94	102.23	122.20
144	1	2	0	2	2	29.71	40.22	141.50	78.94	102.23	122.20
145	1	2	1	0	0	38.01	62.61	141.50	90.05	102.23	122.20
146	1	2	1	0	1	39.09	49.55	141.50	90.05	102.23	122.20
147	1	2	1	0	2	39.86	40.22	141.50	90.05	102.23	122.20
148	1	2	1	1	0	32.47	62.61	141.50	89.79	102.23	122.20
149	1	2	1	1	1	33.55	49.55	141.50	89.79	102.23	122.20
150	1	2	1	1	2	34.33	40.22	141.50	89.79	102.23	122.20
151	1	2	1	2	0	27.86	62.61	141.50	89.79	102.23	122.20
152	1	2	1	2	1	28.94	49.55	141.50	89.79	102.23	122.20
153	1	2	1	2	2	29.71	40.22	141.50	89.79	102.23	122.20
154	1	2	2	0	0	38.01	62.61	141.50	100.90	102.23	122.20
155	1	2	2	0	1	39.09	49.55	141.50	100.90	102.23	122.20
156	1	2	2	0	2	39.86	40.22	141.50	100.90	102.23	122.20
157	1	2	2	1	0	32.47	62.61	141.50	100.64	102.23	122.20
158	1	2	2	1	1	33.55	49.55	141.50	100.64	102.23	122.20
159	1	2	2	1	2	34.33	40.22	141.50	100.64	102.23	122.20
160	1	2	2	2	0	27.86	62.61	141.50	100.64	102.23	122.20
161	1	2	2	2	1	28.94	49.55	141.50	100.64	102.23	122.20
162	1	2	2	2	2	29.71	40.22	141.50	100.64	102.23	122.20
Scenario	PTC Value	Carbon Dioxide	Natural Gas	KS Wind CF	MO Wind CF	Grain Belt Project	Missouri Wind	Pulverized Coal	Combined Cycle Gas	Nuclear	Utility-scale Solar

Calculating the Total Demand for Renewable Energy in the PJM and MISO Footprints

In order to estimate the demand for renewable energy in PJM and MISO, we first researched the statutory renewable energy requirements for states in the PJM and MISO footprints. The state-by-state annual renewables percentage requirements as a percentage of total state electricity sales are shown below. We used 2010 Energy Information Agency (EIA) data on the split of electric sales between investor-owned utilities, cooperatives, etc. to determine how much of future load will be subject to RPS requirements.

RPS requirement %	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
DC	12.00%	13.50%	15.00%	16.50%	18.00%	20.00%	20.00%	20.00%	20.00%	20.00%	20.00%
Delaware	13.00%	14.50%	16.00%	17.50%	19.00%	20.00%	21.00%	22.00%	23.00%	24.00%	25.00%
Illinois	9.09%	10.45%	11.82%	13.18%	14.54%	15.91%	17.27%	18.63%	20.00%	21.36%	22.72%
Iowa	0.58%	0.57%	0.56%	0.56%	0.56%	0.56%	0.55%	0.55%	0.54%	0.54%	0.54%
Indiana	3.22%	3.22%	3.22%	3.22%	5.63%	5.63%	5.63%	5.63%	5.63%	5.63%	8.05%
Kentucky	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Maryland	13.00%	15.20%	15.60%	18.30%	17.40%	18.00%	18.70%	20.00%	20.00%	20.00%	20.00%
Michigan	10.00%	10.00%	10.00%	10.00%	10.00%	10.00%	10.00%	10.00%	10.00%	10.00%	10.00%
Minnesota	14.80%	20.74%	20.74%	20.74%	20.74%	24.67%	24.67%	24.67%	24.67%	24.67%	27.33%
Missouri	3.48%	3.48%	3.48%	6.96%	6.96%	6.96%	10.44%	10.44%	10.44%	10.44%	10.44%
Montana	10.19%	10.19%	10.19%	10.19%	10.19%	10.19%	10.19%	10.19%	10.19%	10.19%	10.19%
New Jersey	13.67%	14.76%	16.89%	19.06%	21.30%	23.60%	24.11%	24.71%	25.38%	26.12%	26.97%
North Carolina	6.00%	6.00%	6.00%	10.00%	10.00%	10.00%	12.50%	12.50%	12.50%	12.50%	12.50%
North Dakota	10.00%	10.00%	10.00%	10.00%	10.00%	10.00%	10.00%	10.00%	10.00%	10.00%	10.00%
Ohio	3.10%	3.98%	4.86%	5.75%	6.63%	7.52%	8.40%	9.29%	10.17%	11.05%	11.05%
Pennsylvania	13.31%	13.80%	14.28%	14.77%	15.26%	17.49%	17.49%	17.49%	17.49%	17.49%	17.49%
South Dakota	10.00%	10.00%	10.00%	10.00%	10.00%	10.00%	10.00%	10.00%	10.00%	10.00%	10.00%
Tennessee	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Virginia	3.37%	5.89%	5.89%	5.89%	5.89%	5.89%	5.89%	10.10%	10.10%	10.10%	12.62%
West Virginia	9.94%	9.94%	9.94%	9.94%	9.94%	14.91%	14.91%	14.91%	14.91%	14.91%	24.85%
Wisconsin	10.00%	10.00%	10.00%	10.00%	10.00%	10.00%	10.00%	10.00%	10.00%	10.00%	10.00%

Next, we compiled the projected electric load for each state from the Energy Information Agency's (EIA). These RPS-eligible load projections are shown below.

Total load GWh	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
DC	11,355	11,464	11,585	11,672	11,719	11,727	11,788	11,882	11,977	12,046	12,093
Delaware	11,617	11,729	11,852	11,942	11,990	11,998	12,060	12,156	12,254	12,324	12,372
Illinois	146,513	148,200	149,858	151,130	151,830	152,145	152,960	154,060	155,147	156,133	157,162
Iowa	47,913	48,598	49,074	49,269	49,390	49,689	50,093	50,481	50,800	51,115	51,407
Indiana	107,617	109,289	110,850	111,936	112,382	112,658	113,338	114,261	115,146	115,872	116,592
Kentucky	94,224	96,249	98,156	99,632	100,697	101,534	102,600	103,754	104,950	106,076	107,084
Maryland	62,341	62,940	63,602	64,083	64,342	64,385	64,719	65,233	65,758	66,135	66,391
Michigan	106,164	107,375	108,541	109,393	109,707	109,830	110,368	111,176	111,949	112,611	113,250
Minnesota	71,268	72,286	72,994	73,285	73,465	73,908	74,510	75,087	75,561	76,030	76,464
Missouri	85,726	86,685	87,421	87,826	88,008	88,479	89,116	89,744	90,315	90,910	91,472
Montana	14,413	14,742	14,984	15,162	15,279	15,459	15,657	15,861	16,056	16,221	16,385
New Jersey	75,693	76,420	77,224	77,808	78,122	78,175	78,580	79,205	79,841	80,299	80,610
North Carolina	131,698	133,755	135,944	137,715	139,148	140,185	141,697	143,437	145,213	146,910	148,435
North Dakota	15,427	15,647	15,800	15,863	15,902	15,998	16,129	16,254	16,356	16,458	16,552
Ohio	156,000	158,424	160,686	162,261	162,907	163,307	164,293	165,631	166,914	167,966	169,010
Pennsylvania	145,943	147,346	148,896	150,022	150,627	150,729	151,510	152,715	153,942	154,825	155,424
South Dakota	12,300	12,476	12,598	12,648	12,679	12,756	12,859	12,959	13,041	13,122	13,197
Tennessee	101,983	104,175	106,239	107,836	108,989	109,896	111,049	112,299	113,592	114,811	115,903
Virginia	74,380	74,380	74,380	74,380	74,380	74,380	74,380	74,380	74,380	74,380	74,380
West Virginia	31,533	32,023	32,480	32,799	32,929	33,010	33,209	33,480	33,739	33,952	34,163
Wisconsin	72,709	73,772	74,562	74,984	75,325	75,839	76,442	77,032	77,546	78,129	78,639

Next, we multiplied the renewable energy percentage requirement by the total eligible load for a given state in a given year to form the table below. We summed the renewable generation requirements to determine the total demand in PJM and in MISO.

Renewables requirement GWh	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
DC	1,363	1,548	1,738	1,926	2,109	2,345	2,358	2,376	2,395	2,409	2,419
Delaware	1,510	1,701	1,896	2,090	2,278	2,400	2,533	2,674	2,818	2,958	3,093
Illinois	13,317	15,490	17,707	19,918	22,080	24,200	26,415	28,705	31,023	33,349	35,711
Iowa	276	276	276	276	276	276	276	276	276	276	276
Indiana	3,463	3,517	3,567	3,602	6,329	6,344	6,383	6,435	6,484	6,525	9,380
Kentucky	0	0	0	0	0	0	0	0	0	0	0
Maryland	8,104	9,567	9,922	11,727	11,195	11,589	12,102	13,047	13,152	13,227	13,278
Michigan	10,616	10,737	10,854	10,939	10,971	10,983	11,037	11,118	11,195	11,261	11,325
Minnesota	10,549	14,989	15,136	15,196	15,234	18,233	18,382	18,524	18,641	18,757	20,901
Missouri	2,983	3,017	3,042	6,113	6,125	6,158	9,304	9,369	9,429	9,491	9,550
Montana	1,468	1,501	1,526	1,544	1,556	1,575	1,595	1,615	1,635	1,652	1,669
New Jersey	10,346	11,280	13,039	14,832	16,639	18,450	18,943	19,575	20,261	20,975	21,744
North Carolina	7,902	8,025	8,157	13,771	13,915	14,018	17,712	17,930	18,152	18,364	18,554
North Dakota	1,543	1,565	1,580	1,586	1,590	1,600	1,613	1,625	1,636	1,646	1,655
Ohio	4,828	6,304	7,815	9,327	10,804	12,275	13,802	15,379	16,974	18,567	18,682
Pennsylvania	19,428	20,331	21,268	22,158	22,979	26,363	26,500	26,711	26,925	27,080	27,185
South Dakota	1,230	1,248	1,260	1,265	1,268	1,276	1,286	1,296	1,304	1,312	1,320
Tennessee	0	0	0	0	0	0	0	0	0	0	0
Virginia	2,503	4,380	4,380	4,380	4,380	4,380	4,380	7,509	7,509	7,509	9,386
West Virginia	3,134	3,183	3,228	3,260	3,273	4,921	4,951	4,991	5,030	5,062	8,489
Wisconsin	7,271	7,377	7,456	7,498	7,533	7,584	7,644	7,703	7,755	7,813	7,864
Total	**111,835**	**126,036**	**133,849**	**151,409**	**160,535**	**174,971**	**187,214**	**196,859**	**202,594**	**208,231**	**222,481**

General Cable

March 12, 2014

Roger Roundhouse
4 Tesseneer Drive
Highland Heights, KY 41076

Re: Grain Belt Express Clean Line Preferred Supplier Agreement with General Cable

Michael Skelly
President, Grain Belt Express Clean Line
1001 McKinney St. Suite 700
Houston, TX 77002

Dear Mr. Skelly:

Thank you for selecting General Cable as a preferred supplier of transmission conductor for the Grain Belt Express Clean Line. General Cable estimates the conductor material requirement for the 750-mile, direct current transmission line will exceed 23 million feet of conductor, made of aluminum rod and steel core.

Pursuant to our agreement, General Cable will manufacture all steel core contained in the Grain Belt Express conductor at our Sedalia, Missouri facility. The project will support a steady stream of work at our plant for two years.

General Cable will also establish an agreed-upon inventory stocking program at our Sedalia, Missouri distribution center after construction of the Grain Belt Express Clean Line is completed.

To support our agreement with Grain Belt Express, General Cable will invest in our Sedalia plant, expanding our manufacturing capabilities at a facility that employs roughly 185 associates in Missouri.

To support Grain Belt Express Clean Line's efforts to establish a local supply chain, General Cable has also committed to sourcing raw material from local companies.

Noranda Aluminum will supply aluminum rod used in the Grain Belt Express conductor from their smelter near New Madrid, Missouri.

General Cable employees are pleased to support the Grain Belt Express Clean Line, which will not only create jobs in Missouri but also deliver low-cost power to manufacturers and residents in the state.

Sincerely,

Roger Roundhouse
Senior Vice President and General Manager of the Electric Utility Products
General Cable

March 18, 2014

Re: Grain Belt Express Clean Line Preferred Supplier Agreement with ABB

Michael Skelly
President, Grain Belt Express Clean Line
1001 McKinney St. Suite 700
Houston, TX 77002

Dear Mr. Skelly:

ABB is pleased to be selected as the preferred supplier of medium power transformers for the Grain Belt Express Clean Line. The ABB transformers will be installed in western Kansas, where new wind farms will connect to the Grain Belt Express project for delivery to Missouri and states farther east.

Pursuant to our agreement, ABB will manufacture and test the transformers for Grain Belt Express at our St. Louis, Missouri manufacturing facility. ABB engineers will work with your team to develop appropriate specifications and testing requirements for the transformers.

The Grain Belt Express project will support new jobs at our St. Louis operation, which employs roughly 175 people. We further estimate the Grain Belt Express purchase order will result in expected revenue of approximately $10 million in new revenues for ABB in Missouri.

ABB, led by our transformer businesses in St. Louis and Jefferson City, Missouri, is pleased to partner with Grain Belt Express Clean Line as the preferred supplier of medium power transformers. We look forward to working with you.

Sincerely,

Emily Heitman
GM, Medium & Large Power Transformers

ABB Inc.

ISO 9001 Power Transmission 4350 Semple Avenue Telephone (314) 679-4589
St. Louis, Missouri 63120-2241 Fax (314) 679-4570

Ken Carlson
Vice President
Sales and Marketing Services

Hubbell Power Systems, Inc.
200 Center Point Circle, Ste 200
Columbia, SC 29210

March 24, 2014

Mr. Michael Skelly
President, Grain Belt Express Clean Line
1001 McKinney St. Suite 700
Houston, TX 77002

Dear Mr. Skelly:

Thank you for selecting Hubbell Power Systems, Inc. as the preferred supplier of polymer insulators and hardware assemblies for the Grain Belt Express Clean Line.

Pursuant to our agreement, Hubbell will manufacture conductor hardware and the core of the insulators for the Grain Belt Express Clean Line in Centralia, MO, creating manufacturing jobs in the state. Hubbell will coordinate delivery of hardware, dropping Tower Pak® transmission kits at designated locations along the transmission line and establish an agreed-upon stocking program of components and/or assemblies at our Centralia distribution center.

In order to support Clean Line Energy's transmission projects, Hubbell is investing over $9 million in our Centralia facilities, where the company employs approximately 600 people. New energy infrastructure projects like the Gain Belt Express are critical to our investment decisions.

The Grain Belt Express project will create good jobs in Centralia and support new investment in a community where Hubbell has a long-standing presence.

We appreciate your team's commitment to working with qualified, local businesses to build infrastructure in Missouri and bring low-cost renewable energy to the state. We look forward to working with Clean Line Energy on this transmission project.

Sincerely,

Ken Carlson
VP, Global Sales & Marketing Services

Precedent Capital Markets Transactions for U.S. Transmission Projects

Date	Project	Revenue Model	Type of Investment	Lead Investor/Arranger		Amount (approximate)
Sep-03	PATH 15	Rate Recovery	Equity	ArcLight, Energy Investors Fund	$	38,300,000
Sep-03	PATH 15	Rate Recovery	Debt	Citigroup and Macquarie Securities	$	181,700,000
Jul-05	Neptune	Capacity Sales	Equity	Energy Investors Funds and Starwood Capital Group	$	97,000,000
Jul-05	Neptune	Capacity Sales	Debt	Societe General	$	600,000,000
Feb-06	Cross-Sound Cable	Capacity Sales	Equity	Babcock & Brown Infrastructure	$	25,700,000
Feb-06	Cross-Sound Cable	Capacity Sales	Debt	Commonwealth Bank of Australia	$	193,100,000
Oct-07	Trans-Bay Cable	Rate Recovery	Debt	Bayerische Landesbank	$	465,000,000
Oct-07	Trans-Bay Cable	Rate Recovery	Equity	Steel River Infrastructure Partners	$	50,000,000
Aug-08	Trans-Allegheny Interstate Line Company	Rate Recovery	Debt	BNP Paribas and Citigroup	$	550,000,000
Aug-09	Linden Variable Frequency Transformer	Capacity Sales	Equity	GE Financial Services		Undisclosed
Nov-10	Electric Infrastructure Alliance of America REIT (various assets)	Rate Recovery	Equity	Hunt, TIAA-CREF, Marubeni, John Hancock	$	2,100,000,000
Jun-11	Sharyland CREZ	Rate Recovery	Debt	Royal Bank of Canada (RBC), Royal Bank of Scotland (RBS), and Societe Generale	$	730,000,000
Jul-11	Cross-Texas Transmission CREZ	Rate Recovery	Debt	Mitsubishi UFJ, BNP Paribas, Dexia, Citigroup	$	430,000,000

Precedent Capital Markets Transactions for U.S. Transmission Projects

Date	Project	Revenue Model	Type of Investment	Lead Investor/Arranger		Amount (approximate)
Aug-11	Wind Energy Transmission Texas CREZ	Rate Recovery	Debt	Mitsubishi UFJ, Deutsche Bank	$	500,000,000
Nov-11	Lone Star CREZ	Rate Recovery	Debt	Mitsubishi UFJ, Mizuho, Credit Agricole, RBC	$	386,600,000
Dec-11	Neptune	Capacity Sales	Equity	California Public Employees Retirement System (Calpers)		Undisclosed
May-11	Hudson Transmission	Capacity Sales	Equity	EIF, Starwood	$	178,000,000
May-11	Hudson Transmission	Capacity Sales	Debt	Societe General	$	691,000,000
Mar-13	PATH 15	Rate Recovery	Equity	Duke-ATC	$	56,000,000
				Total	**$**	**7,272,400,000**