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Witness: David Berry
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Clean Line LLC
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MISSOURI PUBLIC SERVICE COMMISSION

CASE NO. EA-2016-0358

DIRECT TESTIMONY OF

DAVID A. BERRY

CHIEF FINANCIAL OFFICER, EXECUTIVE VICE PRESIDENT

ON BEHALF OF

GRAIN BELT EXPRESS CLEAN LINE LLC

August 30, 2016

NP

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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 Chief Financial Officer and Executive Vice President for Clean Line Energy Partners LLC ("Clean Line"). 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. Please describe your education 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 as Finance Director. At Horizon Wind Energy, I was responsible for financing transactions, investment analysis, power purchase agreement pricing and acquisitions. I worked on and led over $2 billion of project finance transactions, including a non-recourse debt financing that was named North American Renewables Deal of the Year by *Project Finance*, and several equity transactions for wind generation projects in development, construction, and operations. I joined Clean Line as one of its first employees in late 2009.

Q. What are your duties and responsibilities as Chief Financial Officer and Executive Vice President of Clean Line?

A. I am responsible for developing the transmission capacity products offered to Grain Belt Express' transmission customers and furthering relationships with those customers. I lead a team responsible for ensuring that the transmission service offered by Clean Line results in a compelling value proposition for both generators, utilities and utilities' end-use

customers. I oversee and am responsible for the financing activities, accounting, transaction structuring, and market analysis for Clean Line and its subsidiaries, including Grain Belt Express. I have testified in support of Grain Belt Express' applications for certificates to construct its proposed transmission project before the Indiana Utility Regulatory Commission, the Kansas Corporation Commission, and the Illinois Commerce Commission, as well as the Missouri Public Service Commission in the Company's previous application for a certificate of convenience and necessity, No. EA-2014-0207 ("2014 Case"). On behalf of other Clean Line subsidiaries, I have testified before the Illinois Commerce Commission, the Tennessee Regulatory Authority, the Oklahoma Corporation Commission and the Georgia Public Service 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 Clean Line transmission line ("Grain Belt Express Project" or "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.

I understand that the Missouri Public Service Commission ("Commission") uses five criteria to evaluate applications for a CCN. Those criteria are: (1) there must be a need for the service; (2) the applicant's proposal must be economically feasible; (3) the applicant must have the financial ability to provide the service; (4) the applicant must be qualified to provide the proposed service, and (5) the proposed service must promote the public interest.

In this testimony, I will provide evidence that 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 through contracts with Grain Belt Express. This participant-funded business model benefits Missouri end-use electric consumers because it does not result in an increase in the transmission component of rates paid by these end-users. Further, this business model protects the Missouri public from the financial risks of the Project, which are born by Grain Belt Express and its investors.
- **Section III** addresses Grain Belt Express's financial ability to provide service on the Project. The Company will rely on specific revenue contracts with shippers or transmission service customers in order to support the financing of the Project. The proven financing model known as "project finance" is 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.
- **Section IV** addresses how the Project is economically feasible, why the Project is needed, and why it serves the public interest. These three topics are closely linked and are therefore best discussed together. The Project provides Missouri with a new source of affordable, clean energy that can reduce costs for Missouri end-users of electricity,

including the customers of the Missouri Joint Municipal Electric Utility Commission ("MJMEUC"), the municipal utility joint action agency which has agreed to purchase up to 225 megawatts ("MW") of transmission service from Grain Belt Express, with an option to purchase an additional 25 MW. The Project can help meet the need for renewable energy created by 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"). In addition to RES and RPS demand, the Project can meet the needs of large industrial and commercial users, who increasingly demand clean energy as part of corporate policies and decisions to make new investments in a state. Low-cost wind energy delivered by the Project will benefit the State of Missouri by meeting the demand for clean energy specifically and low-cost energy in general. The energy delivered by the Project is cheaper than alternative sources of power, produces wholesale electric market savings and does not affect the transmission component of rates paid by end-use customers.

- **Section V** notes Grain Belt Express' commitment to agree to a set of conditions similar to those agreed in the 2014 Case.

II. NATURE OF SERVICE

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

A. The Project will offer three types of open access transmission service.

- The Project will offer transmission service from its western converter station in Ford County, Kansas to the Project's point of interconnection along the Ameren Maywood-Montgomery 345 kilovolt ("kV") transmission line in Missouri

("Kansas-Missouri Service"). The Missouri converter station will allow the delivery of 500 MW of power to the Project's Missouri point of interconnection.

- The Project will offer transmission service from its western converter station in Ford County, Kansas to PJM ("Kansas-PJM Service"). The PJM point of interconnection for Kansas-PJM Service is the Sullivan substation, which is owned by Indiana Michigan Power Company, a subsidiary of American Electric Power Company. Located near the Illinois-Indiana border, this second point of interconnection 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 kV system in Indiana, which can manage a larger injection than the 345 kV system in Missouri.
- Finally, the Project will offer up to 500 MW of transmission service from the Missouri converter station to the Sullivan Substation in PJM ("Missouri-PJM Service.") The Missouri-PJM service provides opportunities for Missouri load-serving entities to earn additional revenue from off-system sales, which can be used to offset other costs to serve their Missouri electric customers.

Q. How will the variability be managed from the wind generation connected to the Project?

A. High voltage direct current ("HVDC") converters are fully controllable, meaning the amount of power uptake and delivery can be set to match the output of the wind generators from the Project on a near instantaneous time (four seconds or less). Therefore, one set of wind farms using Kansas-Missouri service can deliver as-generated wind output to the MISO system in Missouri. Another, much larger set of wind farms using Kansas-PJM

service can deliver as-generated wind output to the PJM system. The grid operators of MISO and PJM will be responsible for balancing the variability from the Project's wind generation. In MISO, where the Project will deliver 500 MW, the existing grid already includes over 15,000 MW of wind generation. A new addition of 500 MW is a 5% increase and will not be a major source of new variability.[1]

Q. Who will be the transmission service customers of the Project?

A. 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 three 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 ("PPA") 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 their electric customers. Third, Missouri utilities may purchase service from Missouri to PJM as a way of increasing off-system sales revenues. Grain Belt Express has received requests for transmission service from all three types of shippers, as discussed in further detail in Section IV.

[1] In its prior case before the Commission, Grain Belt Express commissioned a study by the Brattle Group to study the effects of the additional wind variability the Project brings to the MISO system. The study found (1) integrating wind from Western Kansas introduced less variability than additional wind from other MISO states due to the geographic diversity of the wind resource, (2) based on existing MISO rules, there would be no additional reserve costs from the Project's injection in MISO and (3) even if these rules were to change, the estimated impact would be only about 0.1 cent per MWh of load in MISO. See Supplemental Exhibit 14 to Grain Belt Express Response to Order for Supplemental Information in Case No. EA-2014-0207

Q. Will load serving entities in Missouri be able to contract for power delivered by the Project even if they do not purchase transmission service from Grain Belt Express?

A. Yes, Missouri utilities can choose to purchase power delivered by the Project from the MISO market, or sign a PPA with a wind generator located in western Kansas.

Q. Does the HVDC converter station provide other commercial opportunities for Missouri utilities?

A. Yes. Since the 2014 Case, Grain Belt Express has offered Missouri-PJM service to interested transmission customers. Missouri utilities will now have the ability to purchase transmission capacity from Missouri to PJM on the line and export power in order to increase off-system sales revenues. For example, in hours when locational marginal prices ("LMPs") are higher in PJM than Missouri, and Missouri utilities have excess generation, they will be able to sell power into the PJM market. They will also have the option of bidding into the PJM capacity market. The net effect of increased revenues from off-system sales reduces the overall costs for utilities to serve their Missouri electricity customers.

Q. What is your estimated price of transmission service from Kansas to Missouri?

A. In its agreement with MJMEUC, Grain Belt Express agreed to a "first-mover" rate equal to an average of $1.60 per kilowatt-month ("kW-mo") levelized for 25 years. The Kansas-Missouri rate should remain at a substantial discount to the Kansas-PJM rate based on the shorter distance to Missouri and the smaller market size. Because no generator or utility is required to purchase service from the Project, Grain Belt Express' rates are disciplined by market forces. Therefore, the total cost of wind energy delivered to Missouri by Grain Belt Express must be a better value for Missouri utilities and their customers than both other renewable resources and other sources of power generally in order to be contracted.

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 by selling transmission service to shippers. 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 participant-funded model, none of its costs will be recovered through the cost allocation process of MISO, PJM or 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 participant funding compare to other rate methods for new transmission to promote wind energy?

A. The Project is different from cost-allocated transmission lines, such as MISO's Multi-Value Projects ("MVPs") or SPP's Priority Projects, which recover their costs under a regional transmission tariff approved by the Federal Energy Regulatory Commission ("FERC") where users of those systems pay according to a cost-allocation formula. The Project's participant-funded model assures that parties who do not benefit from new lines do not pay for them. The MVP and Priority Projects are alternating current ("AC"), and the participant-funded 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 over 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. Because only specific users of the line will pay Grain Belt Express' transmission charge, the Grain Belt Express Project will not cause any increase in transmission rates for entities that do not directly benefit from the line.

Q. Will Grain Belt Express commit not to seek recovery of costs for the Project from Missouri ratepayers through MISO or SPP regional cost allocation unless the Commission agrees?

A. Yes. Grain Belt Express will not seek to recover costs from Missouri ratepayers through MISO or SPP regional cost allocation without Commission authorization. As the Company agreed in the 2014 Case, such a commitment could be reflected in a condition in the Commission's Order. Absent Commission approval, Grain Belt Express will not recover costs from Missouri ratepayers through regional cost allocation, and will only construct and operate the Project under a participant-funded business model.

To be clear, Grain Belt Express is not seeking – and has no plans to seek – regional cost allocation. SPP, MISO and PJM do not currently have a process in place that would allow for the cost-allocation of an interregional project across their three footprints.

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

A. On January 20, 2015, the Company commenced the formal capacity allocation process or "open solicitation" pursuant to FERC's Order Conditionally Authorizing Proposal and Granting Waivers, issued in Grain Belt Express Clean Line LLC, No. ER14-409-000, 147 FERC ¶ 61,098 (May 8, 2014), which granted it authority to negotiate bilateral agreements for 100% of the capacity of the Project.

The respondents to the open solicitation indicated in their Transmission Service Requests the amount of capacity they wish to purchase, their preferred term of service, and their preferred rate. Respondents also provided information regarding their creditworthiness and the status of their generation projects. Most respondents proposed paying a deposit in order to reserve service on the Project. As described in further detail in Section IV, these transmission service requests indicate that demand for the Project's transmission service to Missouri and to PJM exceeds the size of the Project. The Company will rank bids in order to prioritize negotiations of commercial terms with potential capacity customers based on the information submitted, and will ultimately sign transmission service agreements with one or more of the respondents.

In addition, Grain Belt Express opened a supplemental window for transmission service requests in February 2016. MJMEUC submitted two requests, one for 200 MW for transmission from Kansas to Missouri, and the other for 50 MW from Missouri to PJM.

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 described above determines only the initial allocation of the Project's capacity. Any future sale of capacity will be governed by the Company's Open Access Transmission Tariff ("OATT"), just as is the case for traditional, cost of service transmission providers.

Q. Has Grain Belt Express updated FERC since receiving negotiated rate authority based on the fact that the delivery capacity of the line has increased?

A. Yes. Grain Belt Express' 2013 application to FERC in Docket Number ER14-409-000 contemplated a Project with a total 3,500 MW delivery capacity to both PJM and Missouri.

Based on demand for the service, Grain Belt Express revised the Project design to provide for 500 MW of delivery to Missouri and 3,500 MW of delivery to PJM, for a total of 4,000 MW of delivery capacity. In May 2016, Grain Belt Express notified FERC of this change. The Company also notified FERC that it is now offering transmission service from Missouri to PJM, as described above. This notification to FERC is attached as **Schedule DAB-01**.

Q. Please describe Grain Belt Express' transmission tariff.

A. Transmission service will be sold under an 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.

Q. What obligations will Grain Belt Express have in offering and providing transmission service pursuant to an 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. Pursuant to its negotiated rate authority from FERC, Grain Belt Express must transfer "functional control" to a third-party operator.[2] In practical terms, this means that Grain Belt Express must turn over the administration of the OATT to a third party. Grain Belt Express intends to turn over functional control of the Grain Belt Express Project, to PJM.

III. FINANCING PLAN

Q. Has the Commission previously found that Grain Belt Express is capable of financing the Project?

A. Yes. The Commission's Order in the 2014 Case states: "With regard to GBE's qualifications and financial ability to provide the service, GBE has provided competent and

[2] *Grain Belt Express Clean Line LLC*, 147 FERC ¶ 61,098 at P 29.

substantial evidence to support its claim. No party seriously disputed these two factors, so the Commission concludes that GBE has met its burden of proof demonstrating that GBE is qualified and has the financial ability to provide the service described in its application for a certificate of convenience and necessity."

Q. Have there been any significant changes to Clean Line's financing plan or financing capabilities in the 2014 Case?

A. No. The most significant change is the addition of Bluescape Resources Company LLC ("Bluescape") as an investor in Clean Line. This only strengthens the Company's financing capabilities as Bluescape can provide financing for the development, and potentially the construction, of the Project. Other than the addition of Bluescape, Clean Line's financing plan remains the same, and the capital markets remain strongly supportive of transmission lines like the Project.

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 continue funding equity to the Company. Clean Line is able to fund Grain Belt Express' development stage expenditures because of investments made by National Grid USA ("National Grid"),[3] Bluescape, ZAM Ventures, L.P. ("ZAM Ventures"), and

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

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 three largest shareholders in Clean Line are Bluescape; ZAM Ventures; and National Grid. 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 Bluescape?

A. Bluescape is a private independent oil and gas holding company primarily focused on unconventional hydrocarbon opportunities and energy-related private equity investments. Bluescape is a seasoned energy investor, making and managing investments in the energy space in a variety of geographic areas, primarily in the United States. Through its various subsidiaries, Bluescape directly holds hundreds of thousands of net acres across several U.S. oil and gas plays, including working interest and mineral acres in the Marcellus Shale and working interest acres in the Kansas portion of the Mississippi Lime. Bluescape also holds oil and gas interests in West Texas and Louisiana through two additional partnerships. Additionally, Bluescape and its subsidiaries provide bankruptcy and energy advisory services, and work with oil and gas private equity companies. The investment in

Clean Line is consistent with Bluescape's long-term strategy of developing, acquiring, and exploring energy resources vital to the world's economy, health and welfare.

Q. What is the business of ZAM Ventures?

A. ZAM Ventures 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.

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

A. No, they do not.

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

A. The initial equity investors are providing capital to enable Clean Line to undertake the development, permitting and pre-construction work for its transmission line projects, including the Grain Belt Express Project, which is to be constructed and owned by Grain Belt Express. 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. We will 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 Kansas portion of the HVDC Line from the Kansas Corporation Commission. Grain Belt Express also received certificates to operate as a public utility from the Indiana Utility Regulatory Commission and the Illinois Commerce Commission. Grain Belt Express still needs to obtain the requisite approval of this Commission. In addition to obtaining regulatory commission approvals, we will need to enter into additional contracts for a portion of the remaining 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. 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. 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 the equivalent creditworthiness, 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. 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. Other similar 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. 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 a year, depending on the time frame in which this Application is 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 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?

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 participant-funded transmission lines, like the Grain Belt Express Project. Other participant-funded transmission projects that have used 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 Cross-Sound Cable HVDC project between Connecticut and Long Island. 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-02** 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 2008 the Trans-Allegheny Interstate Line project closed a $550 million senior secured loan; in 2010 that project closed an additional $900 million of financing comprised of $450 (increased from $350) million in floating bank debt and $450 million in fixed coupon bonds; in 2012 the project was refinanced in a $1 billion revolving credit facility and in 2014 raised $550 million in fixed coupon bonds.
- The Hudson transmission line raised $691 million in 22-year bond financing in 2011.
- In 2014, Texas Nevada Transmission, a holding company of two regulated utility transmission businesses, raised $318 million in the bank market.
- In 2015, Hunt Utility Services raised $400 million in a public offering of shares in its InfraREIT, a real estate investment trust for its transmission assets, primarily in Texas.

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

A. Yes. Along with managing its current investments in oil and gas assets throughout the United States, the Bluescape management team has substantial experience investing in and managing public utility assets, including transmission infrastructure and power plants. 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 Michael Skelly, our President and CEO, and Jayshree Desai, our Chief Operating Officer, 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 Michael 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 challenges 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. Will Grain Belt Express commit not to build the Project until the necessary financing is in place?

A. Yes. In the 2014 Case, Staff members Daniel Beck (in pages 18-19 of his rebuttal testimony) and David Murray (on page 10 of his rebuttal testimony, which Mr. Beck mentioned on page 22 of his rebuttal testimony) proposed conditions related to the timing of construction and financing of the Project. Grain Belt Express found the suggested conditions to be reasonable and is willing to commit not to install transmission facilities until obtaining commitments for funds sufficient to cover the total Project cost, and to file documentation necessary for the Commission to verify that Grain Belt Express has fulfilled this condition. Grain Belt is willing to work with Staff to develop a similar condition in this proceeding.

This condition recognizes that there is a necessary sequence to the development of a large transmission line following the participant-funded model, and that it is essential that Grain Belt Express obtain a CCN as a necessary precondition for obtaining financing to construct the Project. Requiring the filing of financing agreements with the Commission after a CCN is granted allows the Commission and Staff to monitor Grain Belt Express without unduly delaying the development of the Project.

IV. ECONOMIC FEASIBILITY, NEED, AND PUBLIC INTEREST

a. Description of Western Kansas Wind Resource

Q. What is the cost of the wind generation in western Kansas that the Project will unlock?

A. Wind energy can be produced in western Kansas at an extremely competitive cost. A PPA executed in 2015 for the output of the Cedar Bluff Wind Farm in western Kansas provides a data point supporting pricing in this range. Westar Energy contracted with NextEra Energy resources to procure energy from the Cedar Bluff Wind Farm at $19.15/MWh

escalating at 2% per year over 20 years.[4] Recent wind procurements have trended downward from this already low level.

Since there is no inflation factor (other than a fixed contractual escalator) or fuel cost for wind energy, the price of generation is not subject to unpredictable fluctuation. 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 in western Kansas. The response to the RFI included 14 wind developers developing 26 wind farms totaling more than 13,500 MW. As part of their responses, generators provided indicative PPA pricing, which is their own calculation of their levelized cost of energy. The lowest-priced 4,000 MW of new wind generation was an average of 2.0 cents per kWh flat for 25 years.

Q. Do you believe that there is sufficient demand from generators in western Kansas to fill the line's capacity?

A. Yes. The results of the open solicitation for capacity conducted by Grain Belt Express and launched in 2015 show strong demand for transmission service to Missouri.

Grain Belt Express has received requests for Kansas-Missouri service, Kansas-PJM service, and Missouri-PJM service in the original open solicitation window held in early

[4] Power Purchase Agreement pricing information accessed via FERC's EQR Database: http://eqrreportviewer.ferc.gov/ (last accessed August 25, 2016).

2015 and in a subsequent window held in early 2016 to allow additional requests. Fourteen of the fifteen requests submitted are from wind generators who require new transmission infrastructure to deliver low-cost wind energy from projects under development in and around western Kansas to Missouri, Illinois, and Indiana customers in MISO and PJM. Ten wind generators and one load serving entity have submitted Transmission Service Requests for Kansas-Missouri converter station. The total amount of transmission service that has been requested is 3,524 MW, representing more than six times the available Kansas-Missouri service offered by Grain Belt Express.

Fourteen wind generators submitted Transmission Service Requests for 17,301 MW of service to the Illinois converter station, or approximately 4.5 times the available Kansas-PJM capacity offered by the Project. The total capacity requested to both MISO and PJM delivery points of the Project was 20,825 MW, almost five times the total available capacity of the Project.

A summary of the responses to the open solicitation is attached as **Schedule DAB-03**.

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-04** 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 ("DOE"), and AWS Truepower, a leading meteorology firm. The wind map shows that 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, a typical hub height for wind turbines. 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.

Q. Do even small differences in wind speed have important consequences for the amount of power produced?

A. Yes. 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 exponential 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 ten-year 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 DOE study, the average construction cost of a wind farm in the "Interior Region" of the United States that includes western Kansas was $1,640 per kilowatt ("kW") installed, compared to average costs in other regions of the country of $2,290 per kW.[5] This lower construction cost is consistent with my own experience and the experience of other members of the Clean Line 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.

b. Cost Comparison of the Project's Delivered Wind Energy to Other Alternatives

Q. Have you compared the cost of wind energy delivered by Grain Belt Express with other sources of energy available to Missouri utilities?

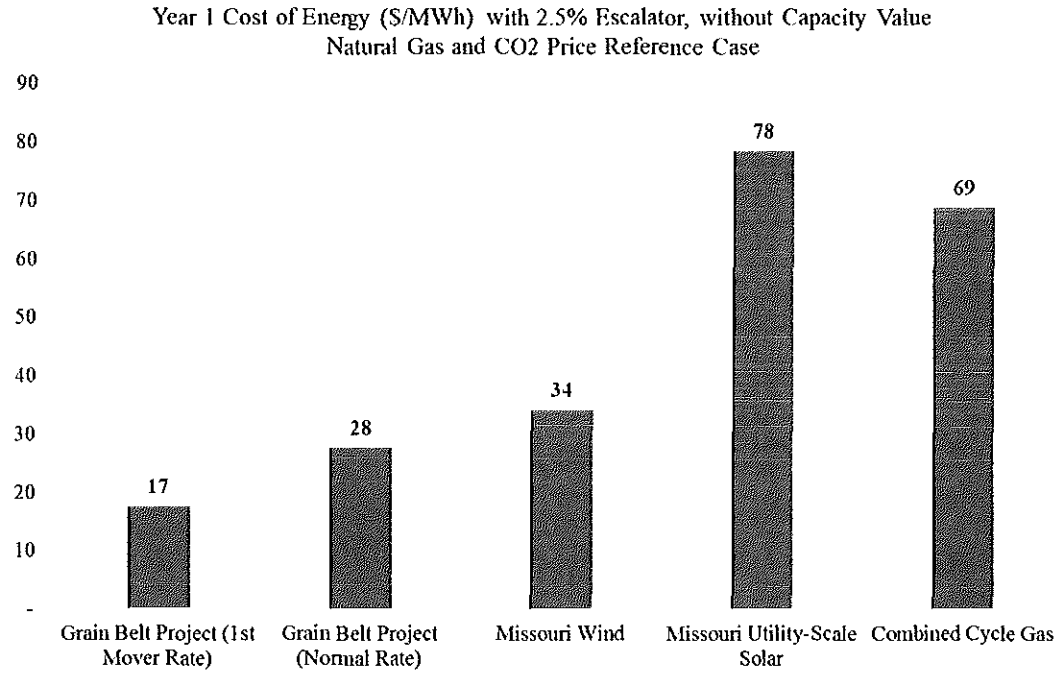
A. Yes. I performed a levelized cost of energy ("LCOE") analysis to compare the Project's delivered cost of wind energy to Missouri with other alternatives. Levelized cost of energy ("LCOE") analysis is the best financial technique to compare different generation sources. LCOE analysis takes into account 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

[5] Lawrence Berkeley National Laboratory, 2015 Wind Technologies Market Report ("2015 Wind Report"), p. 55 & 56, Report PDF and Data File XLS (Figure 43) available at https://emp.lbl.gov/publications/2015-wind-technologies-market-report (last accessed on August 25, 2016).

that is a proxy for a PPA 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. What are the results of your LCOE analysis?

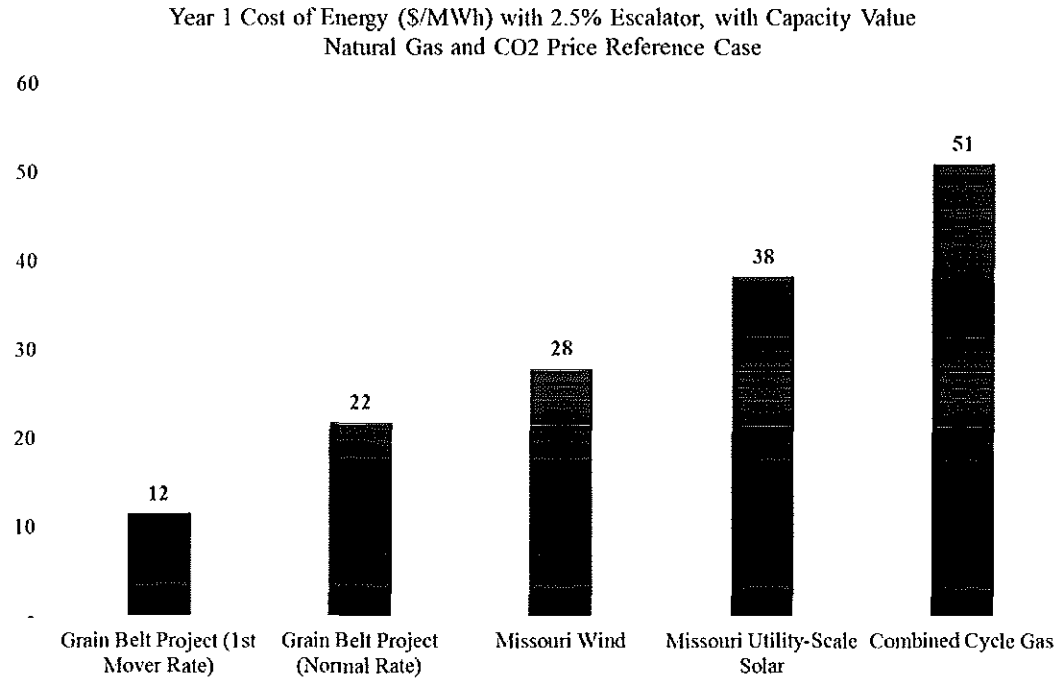
A. Across multiple assumption scenarios, the Project's total delivered cost of energy is less than other renewable or conventional energy alternatives. The cost of delivered energy is equal to the cost to generate wind energy in western Kansas plus the cost to move power on the Grain Belt Express Project. I have considered two Grain Belt Express Project scenarios. The first scenario includes the cost to generate wind plus the "first mover" transmission rate offered to MJMEUC for the first 200 MW of wind power delivered to Missouri. The second scenario is the cost to generate wind plus a transmission rate equal to two-thirds of the Project's published rate for Kansas-PJM service. The results of the LCOE analysis are summarized below:



Schedule DAB-05 contains a complete list of assumptions underlying this analysis, along with sources for these assumptions.

Q. How do your results change if you adjust different generation types for their dependable capacity value?

A. The results of the above comparison are only for the cost of energy. They do not account for resources' differing capacity value, or the ability to supply electricity with certainty during times of peak demand on the grid. The comparison below adjusts for capacity value, using the assumptions described in **Schedule DAB-05**. The value of dependable capacity (expressed as the avoided cost of a simple combustion turbine) is treated as a reduction to the cost of energy of the resource.



Q. How do your results change if you adjust your assumptions about natural gas prices and the cost of carbon dioxide emissions?

A. I have tested the results of my LCOE analysis using a range of assumptions on natural gas prices and the cost of carbon dioxide emissions (including a case with no price on carbon dioxide emissions). Since wind and solar do not use fuel or emit carbon dioxide, changing these two assumptions only affects the LCOE result for natural gas generation. The results of the sensitivity on assumptions are below.

Year 1 Cost of Energy ($/MWh) with 2.5% Escalator, with Capacity Value				
Carbon Price Scenario	Natural Gas Price Scenario	Combined Cycle Gas	Grain Belt Project (1st Mover Rate)	Grain Belt Project (Normal Rate)
No Carbon Price	Low	27	12	22
Mid	Low	37	12	22
High	Low	44	12	22
No Carbon Price	Mid	41	12	22
Mid	Mid	51	12	22
High	Mid	58	12	22
No Carbon Price	High	64	12	22
Mid	High	75	12	22
High	High	82	12	22

Year 1 Cost of Energy ($/MWh) with 2.5% Escalator, without Capacity Value				
Carbon Price Scenario	Natural Gas Price Scenario	Combined Cycle Gas	Grain Belt Project (1st Mover Rate)	Grain Belt Project (Normal Rate)
No Carbon Price	Low	44	17	28
Mid	Low	55	17	28
High	Low	62	17	28
No Carbon Price	Mid	58	17	28
Mid	Mid	69	17	28
High	Mid	76	17	28
No Carbon Price	High	84	17	28
Mid	High	92	17	28
High	High	100	17	28

While the price of natural gas generation varies, Grain Belt Express' delivered wind energy remains less expensive in all cases. Because wind generation has no variable fuel costs or emissions, its cost is much more certain over a 25-year period than natural gas generation. Reducing portfolio fuel risk is a major benefit that wind power provides utilities.

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

A. The analysis is relevant because it shows that the Project is economically feasible, that there is a need for the Project, and that it serves the public interest.

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.

Second, because the Project is the lowest-cost way to meet renewable energy and other electric demand, the Project is needed to meet the goals of the Missouri RES and to serve utilities not subject to the RES like MJMEUC. Further, the cost cap within the RES makes it clear that *low-cost* renewable energy is required.

Finally, because the Project's delivered energy is cheaper than other sources of electricity, Missouri consumers will benefit. A lower cost of energy will result in Missourians paying lower electric rates. Inexpensive generation alternatives offering clean, renewable energy promote the public interest.

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-04**, which is a wind map of the United 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. The wind speed advantage contributes greatly to the lower cost due to the power production equation explained earlier in my testimony, whereby the power potential increases with velocity raised to the third power and is therefore exponentially impacted by even a small increase in wind speed. 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. Has your levelized cost analysis changed since the similar analysis presented in the 2014 Case?

A. Yes. I have updated my analysis in several respects. First, I have updated the cost of wind energy based on recent technology and cost improvements. Second, I have updated the

value of the federal production tax credit to 80% of its full value, reflecting the fact that construction of wind farms connected to the Project is unlikely to begin until 2017. This is because wind farms that are commercially dependent on the line will not have the certainty they need to place turbine orders or take other steps to demonstrate start of construction to the Internal Revenue Service until Grain Belt Express has obtained all of the regulatory permits the Project requires, including a Missouri CCN. Third, I have specifically included a discounted transmission service price from Kansas to Missouri based on the first-mover price offered to MJMEUC and our intention to offer a discounted, though higher, price to other customers moving low-cost wind power to Missouri. Fourth, I have updated all assumptions, both those related to the Grain Belt Express Project and those based on government and other publicly available data sources.

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[6] 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.

c. Demand for Renewable Energy Delivered by Grain Belt Express

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

A. Yes. Major Missouri utilities including Ameren, Associated Electric Cooperative, Inc. ("AECI"), and MJMEUC all intend to procure a significant amount of additional renewable capacity in 2016-2020. MJMEUC has entered into a Transmission Service Agreement with Grain Belt Express, receiving firm, congestion-free access to low-cost western Kansas wind resources for 25 years. MJMEUC will procure up to 200 MW of wind power delivered to Missouri based on this contract, and will utilize 25 MW of capacity from Grain Belt Express' Missouri converter station to its Illinois converter station in order to sell excess energy and capacity into the PJM market, providing further savings for Missouri consumers. MJMEUC is also entitled to sign up for an additional 25 MW of Missouri-PJM service.

[6] The capacity of wind farms is likely to be slightly higher than the maximum delivered 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.

Ameren Missouri's latest utility Integrated Resource Plan ("IRP"), filed with this Commission on October 1, 2014, found that "wind energy resources exhibit the lowest cost on an LCOE [levelized cost of energy] basis among all candidate resource options." The IRP called for the purchase of 400 MW of new wind power beginning in 2019 based on an estimated cost for regional wind resources of 7.67 ¢/kWh, which is considerably higher than the cost of wind delivered by Grain Belt. At their estimates of the cost of renewable resources, Ameren was constrained by the 1% cost cap; in order to actually meet the RES requirement, Ameren determined that they would need to install 1,003 MW of wind by 2024.

In December 2015, Ameren Missouri issued an RFP for wind generation and is currently reviewing and evaluating responses. Ameren is seeking to source a minimum of 50 MW of wind in 2019.[7]

AECI issued an RFP in April 2016 and is seeking to procure up to 300 MW of wind power for a minimum term of 20 years.[8]

Q. Is there demand from commercial and industrial load in Missouri for renewable energy?

A. Yes. Many corporations have adopted ambitious renewable energy goals whose successful achievement depends on large-scale, off-site wind energy procurement. Forty-three percent of Fortune 500 companies and 60 percent of Fortune 100 companies have set climate and

[7] 2016 Ameren Missouri Integrated Resource Plan Annual Update Report, https://www.efis.psc.mo.gov/mpsc/commoncomponents/view_itemno_details.asp?caseno=EO-2016-0273&attach_id=2016020160, p. 4 (last accessed August 25, 2016).

[8] http://www.aeci.org/docs/default-source/RFPs/2016-renewables-rfp.pdf?sfvrsn=0 (last accessed August 25, 2016).

clean energy targets.[9] In 2015, non-utility purchases (corporate buyers, universities and the military) accounted for 52 percent of the megawatts contracted under wind power PPAs.[10] In recent years, Illinois has seen a substantial increase in the purchases of wind energy by such customers. IKEA owns and sources 98 MW of wind power from the Hoopeston Wind Project in Hoopeston, Illinois. Microsoft purchases 175 MW of wind power from the Pilot Hill wind farm, located near Chicago, where one of the company's data centers is sited.

Because major corporations have a strong manufacturing presence in Missouri but limited options for low-cost renewable energy, they require expanded options such as wind power delivered by Grain Belt Express. A number of firms have expressed their support for the delivery to Missouri of low-cost wind energy through Grain Belt Express. Michael Skelly further describes this support in his direct testimony.

Q. What existing and possible future regulatory requirements drive demand for renewable energy in Missouri?

A. 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

[9] WWF, Ceres, Calvert Investments, David Gardiner & Associates, "Power Forward 2.0: How American Companies Are Setting Clean Energy Targets and Capturing Greater Business Value," http://www.dgardiner.com/wp-content/uploads/2014/06/power_forward_2-0_FINAL.pdf (last accessed August 25, 2016).

[10] Greg Alvarez, American Wind Energy Association, "Making a deal: wind energy power purchase agreements," March 14, 2016, http://www.aweablog.org/making-a-deal-wind-energy-power-purchase-agreements/ (last accessed August 25, 2016.)

resources must be available for utilities to purchase. In that respect, new transmission lines like the Grain Belt Express Project play an essential role.

In addition, should the Clean Power Plan withstand judicial review and come into effect, Missouri will require a substantial amount of renewable energy in order to comply cost effectively. Under the Final Plan that the Environmental Protection Agency issued in August 2015, Missouri is required to reduce its carbon emissions by 22.6 million tons per year by 2030 from 2012 levels.[11] Grain Belt Express will provide approximately 3 million tons of reductions if it displaces coal generation.[12]

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.

In addition to the state-level RES, some municipalities have enacted renewable energy standards. A resolution adopted by the City Council of Columbia, Missouri on October 6, 2014 expresses the Council's support for the Project as an economically feasible renewable energy option to serve the City's customers and to help the City fulfill its Renewable Energy Ordinance. The ordinance also increased the percentages of required renewable energy increased from 10% to 15% by 2018 and from 15% to 25% by 2023, and

[11] https://www3.epa.gov/airquality/cpptoolbox/missouri.pdf (last accessed August 25, 2016)

[12] The Project's carbon emissions displacement is calculated based on 2.6 million MWh of delivered energy displacing coal generated at the 2012 Missouri baseline coal emissions rate published in EPA Technical Support Document "CO2 Emission Performance Rate and Goal Computation Technical Support Document for CPP Final Rule" *Appendix 1* https://www.epa.gov/cleanpowerplan/clean-power-plan-final-rule-technical-documents (last accessed August 25, 2016).

set a new goal of 30% by 2029. The City Council approved the resolution upon the recommendation of the city's municipal utility, Columbia Water & Light Department. See **Schedule DAB-06.**

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 million MWh per year of renewable electricity will be needed by 2021 for Missouri's investor-owned utilities to meet their RES requirements. I am basing my estimates on information from the RES statute, utility compliance reports and the U.S. EIA. Detail supporting these calculations is attached as **Schedule DAB-07**. While other Missouri utilities are further along in meeting their RPS goals, Ameren still has a significant need, as discussed in their most recent IRP described above.

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.

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

A. The market for renewable energy and renewable energy credits ("RECs") is regional in nature,[13] with active trade of RECs occurring among states in each region.

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 requirement.

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 each state's RPS. 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. As a result, Missouri would pay more for RECs because there is a shortfall in another state and low-cost supply migrates from Missouri to higher-priced State X until prices equalize across the two states.

[13] 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.

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.[14] 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 115.23 million MWh in 2016, 159.08 million MWh in 2020, and 200.04 million MWh in 2025. These figures were obtained by using the statutory requirements or goals, and applying them to the load forecasts from the EIA's 2015 Annual Energy Outlook.[15] The calculations to obtain these figures are provided in **Schedule DAB-08**.

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

A. According to data published by Monitoring Analytics (PJM's market monitor) and by MISO, total renewable energy generation in the MISO and PJM states during 2015 was

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

[15] EIA, "Annual Energy Outlook 2016." Available online at https://www.eia.gov/forecasts/aeo/index.cfm (last accessed August 25, 2016).

about 90 million MWh.[16] 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 MISO and PJM states falls far short of the projected demand over the next ten 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. The Project does not impose any costs on ratepayers in general. Only the specific users of the line would pay for the service offered by the Project. 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. Wind is the lowest-cost renewable energy resource, and Kansas produces the cheapest wind energy in the country. By accessing the cheapest resource, it is possible to meet demand driven by RPS's at the lowest cost. 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?

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[16] 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 August 25, 2016). For PJM, includes energy generation from hydro, wind, biomass, landfill gas, waste and solar sources. Monitoring Analytics, "2015 State of the Market Report for PJM: Volume 2." Available at http://www.monitoringanalytics.com/reports/PJM_State_of_the_Market/2015.shtml (last accessed August 25, 2016).

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, AECI sources 750 MW, or about 12% of its electricity, from wind power.[17]

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.[18] In 2004, the City of Columbia passed a local ordinance requiring increased levels of renewable energy purchases by is municipal utility, which now purchases wind power from Next Era Energy's Crystal Lake wind farm in Iowa.[19] MJMEUC, in addition to its Transmission Service Agreement with Grain Belt Express, also has purchased wind power on behalf of its members from the Loess Hills Wind Farm.[20] Together these purchases demonstrate that wind power is a cost-effective resource. There is no state 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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[17] http://www.aeci.org/docs/default-source/documents/2015-annual-report-with-fact-book-2.pdf?sfvrsn=0 (last accessed on August 25, 2016).

[18] https://www.cityutilities.net/corporate/aboutcu/annual-report/ (last accessed August 25, 2016).

[19] https://www.como.gov/WaterandLight/Documents/RenewReport.pdf (last accessed August 25, 2016).

[20] http://www.mpua.org/Loess_Hills_Wind_Farm.php (last accessed August 25, 2016).

Q. Can the wind energy delivered by the Project be used to comply with Clean Power Plan requirements should they come into effect?

A. Yes. The EPA clarified in the Final Rule that the state that drives the investment in a renewable resource can take credit for the associated carbon emission reductions, regardless of the location of the renewable energy facilities.[21] The Missouri utilities that contract to purchase power from the Grain Belt Express Project will drive the investment for the new Kansas wind farms. As a result, credit for the reduced carbon emissions reductions will accrue to Missouri.

Q. Are fossil fuel generation assets subject to any other major environmental regulations?

A. Yes. The EPA has issued multiple environmental regulations pertaining to waste and pollution that fossil fuel generators must comply with over the next several years. There will be costs associated with installing pollution control equipment and waste disposal that will increase the cost of fossil fuel generation for utilities and ratepayers. The Effluent Limitations Guidelines and Standards for the Steam Electric Power Generating Units are designed to reduce toxic metals and other harmful pollutants discharged in the wastewater from steam electric power plants.[22] The final rule became effective January 4, 2016, and compliance with this rule begins on November 1, 2018. The Coal Combustion Residual Rule regulates the disposal of coal ash materials generated from foal fired power plants

[21] Clean Power Plan Final Rule, Federal Register Vol. 80 No. 205, at pages 227, 235, and 252. https://www.gpo.gov/fdsys/pkg/FR-2015-10-23/pdf/2015-22842.pdf (last accessed August 25, 2016).

[22] Federal Register Vol. 80 No. 212, https://www.gpo.gov/fdsys/pkg/FR-2015-11-03/pdf/2015-25663.pdf (last accessed August 25, 2016).

and took effect on October 19. 2015.[23] The Mercury and Air Toxics Standards (MATS) Rule regulates toxic air emissions from coal and oil-fired power plants, and was finalized on March 17, 2016. EPA has continued to enforce MATS despite several legal challenges.[24]

d. Other Benefits of Grain Belt Express

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's participant-funded business model protects Missouri electric customers from costs and risks inherent in traditional, rate-based transmission (see direct testimony of Grain Belt Express witness Suedeen Kelly);
- The Project meets the clear need for interregional transmission while avoiding the contentious and problematic cost allocation processes across multiple RTOs (see direct testimony of Grain Belt Express witness Suedeen Kelly);
- The Project will reduce wholesale electricity prices and the cost for Missouri utilities to serve their electric load, savings which will ultimately passed along to Missouri customers through rate cases (see direct testimony of Company witness J. Neil Copeland);
- The Project provides Missouri utilities access to lower cost power supply than would otherwise be available, with an estimated savings to MJMEUC of $10 million per year and

[23] https://www.gpo.gov/fdsys/pkg/FR-2015-07-02/pdf/2015-15913.pdf (last accessed August 25, 2016).

[24] https://www.epa.gov/mats/regulatory-actions-final-mercury-and-air-toxics-standards-mats-power-plants (last accessed August 25, 2016).

additional savings possible for other Missouri utilities (see direct testimony of Grain Belt Express witness Mark Lawlor);

- The Project will reduce the emissions of carbon dioxide, nitric oxides, and sulfur dioxides (see direct testimony of Grain Belt Express witness J. Neil Copeland);
- The Project will enable Missouri utilities to diversify their fuel portfolios, and hedge their exposure to possible future increases in the cost of fuel since wind has zero fuel cost
- The Project allows Missouri and other states to cost-effectively meet their state renewable energy standards or goals;
- The Project provides a major new source of electric generation and links three major RTOs, which increases reliability during times of peak load or generator outages (see direct testimony of Grain Belt Express witness Edward Pfeiffer);
- The Project will be a source of economic development to Missouri through increased property taxes (see direct testimony Grain Belt Express of Richard Trenago); construction jobs (see direct testimony of Grain Belt Express witness Thomas Shifflett); and manufacturing jobs (see direct testimony of Grain Belt Express witness Wayne Galli).

V. CONDITIONS ON CERTIFICATE

Q. Is Grain Belt Express willing to agree to the conditions similar to those negotiated in the 2014 Case?

A. Yes. Grain Belt Express will agree to a set of conditions similar to those negotiated in the 2014 case, with appropriate updates given the advancements in the Project.

Q. Does this conclude your direct testimony?

A. Yes.

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

AFFIDAVIT OF DAVID A. BERRY

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

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

1. My name is David A. Berry. I am Chief Financial Officer and Executive Vice President for 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 47 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 A. Berry

Subscribed and sworn before me this 30th day of August, 2016.

DORCAS RUTH O'QUINN
Notary Public, State of Texas
Comm. Expires 01-06-2018
Notary ID 12966547-8

Dorcas Ruth O'Quinn
Notary Public

My commission expires: 1-6-2018

VanNess Feldman LLP

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Seventh Floor
Washington, DC 20007
(202) 298-1800 Phone
(202) 338-2416 Fax

Jessica C. Friedman
(202) 298-1895
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May 6, 2016

Kimberly D. Bose
Secretary
Federal Energy Regulatory Commission
888 First Street, N.E.
Washington, D.C. 20426

RE: Grain Belt Express Clean Line LLC
Docket No. ER14-409-___
Informational Report

Dear Secretary Bose:

On May 8, 2014, the Federal Energy Regulatory Commission (FERC or Commission) issued an order (Order) conditionally granting authorization to Grain Belt Express Clean Line LLC (Grain Belt Express) to sell transmission service rights on its Grain Belt Express transmission project (Project) at negotiated rates.[1] The Order and the underlying petition (Petition) describe the Project as being capable of delivering up to 3,500 MW of power from western Kansas to southwestern Indiana, with a connection point in Missouri. Grain Belt Express hereby informs the Commission that the Project will be capable of delivering a total of 4,000 MW of power (Project Capacity), with 500 MW of power to be delivered to Missouri and 3,500 MW to be delivered to southwestern Indiana. As explained below, the Project Capacity has been publicized since the inception of Grain Belt Express' open solicitation process and does not materially change the facts and circumstances that the Commission relied on in granting negotiated rate authority to Grain Belt Express.

As indicated in the Petition, the Project includes an intermediate converter station near the Maywood 345 kV substation in Missouri, which is located within the

[1] Grain Belt Express Clean Line LLC, 147 FERC ¶ 61,098 (2014). The authorization was made conditional to the Commission's acceptance of Grain Belt Express' rate schedule, as well as a filing disclosing the results of Grain Belt Express' capacity allocation process after the open solicitation process has concluded.

Midcontinent Independent System Operator, Inc. footprint. Prior to the commencement of the open solicitation process for the Project, Grain Belt Express determined that it was feasible to deliver up to 500 MW of power to the Missouri converter station and 3,500 of power to Sullivan County, Indiana. Accordingly, in its Notice of Open Solicitation for Transmission Service (Initial Notice) publicly announcing the commencement of the Project's open solicitation process on January 21, 2015, Grain Belt Express described the Project as capable of delivering 3,500 MW of power to Sullivan County, Indiana, and up to 500 MW of power to an intermediate converter station located in Missouri.[2] The Initial Notice was widely distributed through energy trade magazines and websites, regional energy publications, energy trade associations, regional transmission planning groups, and regional reliability entity stakeholder e-mail distribution lists. Grain Belt Express also prominently posted the availability of the Project Capacity on the Project's website. In a subsequent open solicitation notice publicly announcing a new open solicitation window for new and updated transmission service requests on February 8, 2016 (Second Notice), Grain Belt Express again notified interested parties that the Kansas-to-Missouri portion of Project Capacity is available for subscription.[3] Thus, throughout the entire open solicitation process for the Project, potential customers have been on notice that the Project will be capable of delivering 4,000 MW, with 500 MW to Missouri and 3,500 MW to southwestern Indiana.

Grain Belt Express also hereby wishes to make clear to the Commission that the Project will offer service from the Missouri converter station to southwestern Indiana if customer interest supports doing so. This potential service was clearly stated in the Second Notice, and does not impact the Project's capability of delivering 4,000 MW, with 500 MW to Missouri and 3,500 MW to southwestern Indiana.

Further, Grain Belt Express commits to continue to publicize the Project Capacity as appropriate in an effort to access all potential customers during the open solicitation process.[4] Therefore, no potential customers have been or will be disadvantaged or harmed by the updated Project information reported herein.

Grain Belt Express respectfully submits that the information above does not alter the facts and circumstances that the Commission relied on in granting negotiated rate authority to Grain Belt Express. However, to the extent that the Commission believes that any new authorization is required in light of the information reported herein, Grain

[2] See Grain Belt Express Clean Line Transmission Project Notice of Open Solicitation for Transmission Service at http://www.grainbeltexpresscleanline.com/sites/grain_belt/media/docs/Grain_Belt_Express_Open_Solicitation_Notice.pdf.

[3] See Grain Belt Express Clean Line Transmission Project Notice of Window for New & Updated Transmission Service Requests at http://www.grainbeltexpresscleanline.com/sites/grain_belt/media/docs/Notice_of_Second_Open_Solicitation_Window-Feb_2016.pdf.

[4] The open solicitation process for the Project is ongoing and Grain Belt Express has not finalized any capacity allocation arrangements with customers.

Belt Express requests that the Commission promptly notify it of the need to seek such authorization.

Please direct any questions regarding this notice to the undersigned.

Respectfully submitted,

/s/ Jessica C. Friedman
Jessica C. Friedman

Grain Belt Express Clean Line LLC

cc: Official Service List

Selected 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	Participant Funded	Equity	Energy Investors Funds and Starwood Capital Group	$	97,000,000
Jul-05	Neptune	Participant Funded	Debt	Societe General	$	600,000,000
Feb-06	Cross-Sound Cable	Participant Funded	Equity	Babcock & Brown Infrastructure	$	25,700,000
Feb-06	Cross-Sound Cable	Participant Funded	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	Participant Funded	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

Selected 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	Participant Funded	Equity	California Public Employees Retirement System (Calpers)		Undisclosed
May-11	Hudson Transmission	Participant Funded	Equity	EIF, Starwood	$	178,000,000
May-11	Hudson Transmission	Participant Funded	Debt	Societe General	$	691,000,000
Jun-11	Sharyland CREZ	Rate Recovery	Debt	SMBC, Societe General, Scotia, Mizuho, et al		
Apr-12	Electric Transmission Texas	Rate Recovery	Debt	RBS, Citi, Suntrust, SMBC	$	350,000,000
Mar-13	PATH 15	Rate Recovery	Equity	Duke-ATC	$	56,000,000
Jan-14	TransSource Missouri	Rate Recovery	Debt	AEP, Great Plains Energy	$	300,000,000
Aug-15	Cross-Sound Cable	Participant Funded	Debt	Mitsubishi UFJ	$	120,000,000
				Total	**$**	**8,042,400,000**

Grain Belt Express Open Solicitation: Summary of Responses
REDACTED

Grain Belt Express Open Solicitation: Summary of Responses
REDACTED

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REDACTED

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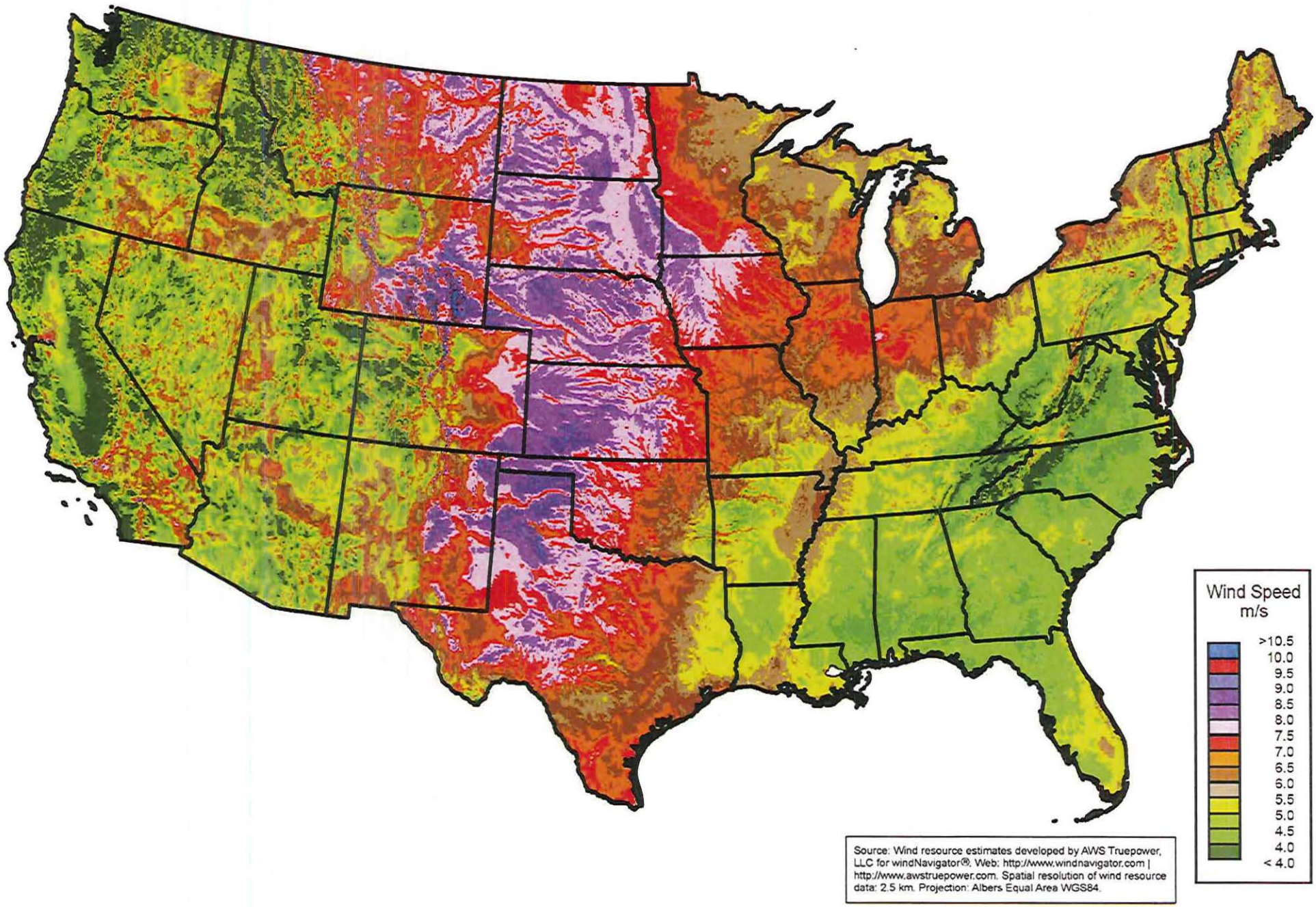
REDACTED

Grain Belt Express Open Solicitation: Summary of Responses
REDACTED

United States - Annual Average Wind Speed at 80 m



Assumptions for levelized cost analysis

General inputs and assumptions

- Shared Inputs
  - Annual Inflation – 2.5%
  - Federal and state blend corporate tax rate – 38%
  - Debt – 50%
  - Cost of debt – 4.5%
  - Equity – 50%
  - Cost of equity – 11%
  - Capacity value – 123,338 $/MW-yr (Projected annual revenue requirement for combustion turbines in $/MW-yr, EIA AEO2015 LCOE)
  - Regional capital cost adjustments for non-wind generation
    - MO in SERC Gateway (SRGW) and SPP North (SPNO) (EIA AEO2015)
  - Property tax rate
    - MO – 4%
  - Assessment on commercial property
    - MO – 32%
  - 2016 PTC at 80% value – 19 $/MWh (IRS Section 45)
  - KS wind capacity factor – 55%
  - MO wind capacity factor – 35% (Based off of wind speed difference between western Kansas resource area and northwest Missouri)
- Input Sensitivities
  - Carbon dioxide price
    - No Carbon Price (low case)
    - Mid – Synapse forecast low case: 15 nominal $/ton in 2022 to 36 $/ton in 2050 (2016 Synapse Report, extended through end of plant life in 2051)
    - High – Synapse forecast low case: 20 nominal $/ton in 2022 to 81 $/ton in 2050 (2016 Synapse Report, extended through end of plant life in 2051)
  - Natural gas price
    - Low Case – EIA AEO2016 Early Release "High Oil and Gas Resource and Technology" Case electric power delivered forecast: 4.01 $/Mcf in 2022 to 5.40 $/Mcf in 2040 (EIA AEO2016 Early Release)
    - Mid – EIA AEO2016 Early Release Reference Case electric power delivered forecast: 5.63 $/Mcf in 2022 to 9.23 $/Mcf in 2040 (EIA AEO2016 Early Release)
    - High – EIA AEO2016 Early Release "Low Oil and Gas Resource and Technology" Case electric power delivered forecast: 8.07 $/Mcf in 2022 to 16.77 $/Mcf in 2040 (EIA AEO2016 Early Release)

Assumptions on alternatives

- Grain Belt line
  - Electric losses – 6%
  - Overbuild – 105%

  - Curtailment – 0.1%
- Kansas wind
  - Capital cost – 1.64 $mm/MW (LBL Wind Report)
  - O&M – 26 $/kW-year (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 tax rate – 15% (Based on Ford County, KS 2015 rates https://www.admin.ks.gov/offices/chief-financial-officer/municipal-services/county-tax-levy-sheets/)
  - Property tax assessment percentage – 25% (https://www.admin.ks.gov/offices/chief-financial-officer/municipal-services/county-tax-levy-sheets/)
  - Property tax – 10-year exemption (Renewable Energy Property Tax Exemption: http://kslegislature.org/li/b2015_16/measures/documents/summary_sb_91_2015.pdf)
  - Capacity credit – 19% of nameplate capacity (Capacity credit of MO wind scaled by capacity factor ratio between KS and MO)
- Missouri wind
  - Capital cost – 1.64 $mm/MW (LBL Wind Report)
  - O&M – 26 $/kW-year (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)
  - Capacity credit – 12.4% of nameplate capacity (https://www.misoenergy.org/Library/Repository/Report/2016%20Wind%20Capacity%20Report.pdf)
- Combined Cycle Gas
  - Utilization rate – 87% (EIA AEO2015)
  - Capital cost – 1.017 $mm/MW (EIA AEO2015)
  - Fixed O&M – 15.36 $/kW (EIA AEO2015)
  - Variable O&M – 3.27 $/MWh (EIA AEO2015)
  - Heat rate – 6,333 Btu/kWh (EIA AEO2015)
  - 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)

- Utility-scale Solar
  - Utilization rate – 21% (LBL Solar Report)
  - Capital cost – 2.81 $mm/MW (LBL Solar Report)
  - Fixed O&M – 16 $/kW (LBL Solar Report)
  - Variable O&M – 0 $/MWh (LBL Solar Report)
  - Investment tax credit – 30% of capital costs
  - Tax depreciation – 5-years MACRS
  - Useful life – 25 years
  - Property tax – exempt (Solar Property Tax Exemption: http://programs.dsireusa.org/system/program/detail/5431)
  - Capacity credit – 48% of nameplate capacity (Assumed 1-axis tracking and 10% penetration levels in MO, NREL: http://www.nrel.gov/docs/fy06osti/40068.pdf)

References

EIA AEO2015 – *Annual Energy Outlook 2015: Electricity Market Module.* (EIA) http://www.eia.gov/forecasts/aeo/assumptions/pdf/electricity.pdf

EIA AEO2015 LCOE – *Levelized Cost and Levelized Avoided Cost of New Generation Resources in the Annual Energy Outlook.* (EIA) https://www.eia.gov/forecasts/aeo/pdf/electricity_generation.pdf

EIA AEO2016 – *Annual Energy Outlook 2016 Early Release.* (EIA) http://www.eia.gov/forecasts/aeo/index.cfm

LBL Solar Report – *Utility Scale Solar 2015.* (LBL) https://emp.lbl.gov/sites/all/files/lbnl-1006037_report.pdf

LBL Wind Report – *Wind Technologies Market Report 2015.* (LBL) https://emp.lbl.gov/sites/all/files/2015-windtechreport.final_.pdf

Synapse Report – *2016 Carbon Dioxide Price Forecast.* (Synapse) http://www.synapse-energy.com/project/synapse-carbon-dioxide-price-forecast

Introduced by McDavid Council Bill No. R 191-14

A RESOLUTION

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

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

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

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

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

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

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

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

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

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

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

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

ADOPTED this 6th day of October, 2014.

ATTEST:

City Clerk

Mayor and Presiding Officer

APPROVED AS TO FORM:

City Counselor

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 2015 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 69 percent of the state's retail sales (B). The result is that 57 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).

83	A: Projected 2021 Missouri electric retail sales (million MWh)
69%	B: Percentage of Missouri electric sales that are subject to the RES
57	C = A x B: 2021 electric retail 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 May 10, 2016).

[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 May 10, 2016).

EIA Detailed State Data. "Retail Electricity Sales Statistics, 2010." Available online at http://www.eia.gov/electricity/state/missouri/index.cfm. (Last accessed on May 10, 2016).

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. Shown below are the state-by-state annual renewables percentage requirements as a percentage of state electricity sales, adjusted for how much of the total retail sales is eligible load. We used 2016 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 % (RPS percentage of total electric sales)										
	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
DC	13.50%	15.00%	16.50%	18.00%	20.00%	20.00%	20.00%	20.00%	20.00%	20.00%
Delaware	14.50%	16.00%	17.50%	19.00%	20.00%	21.00%	22.00%	23.00%	24.00%	25.00%
Illinois	10.40%	11.76%	13.11%	14.47%	15.83%	17.18%	18.54%	19.90%	21.25%	22.61%
Indiana	3.19%	3.19%	3.19%	5.58%	5.58%	5.58%	5.58%	5.58%	5.58%	7.98%
Iowa	0.58%	0.58%	0.59%	0.58%	0.58%	0.57%	0.57%	0.56%	0.56%	0.55%
Maryland	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%
Minnesota	20.68%	20.68%	20.68%	20.68%	26.10%	26.10%	26.10%	26.10%	26.10%	28.80%
Missouri	3.45%	3.45%	6.91%	6.91%	6.91%	10.36%	10.36%	10.36%	10.36%	10.36%
Montana	10.36%	10.36%	10.36%	10.36%	10.36%	10.36%	10.36%	10.36%	10.36%	10.36%
New Jersey	14.81%	16.95%	19.14%	21.39%	23.72%	24.27%	24.94%	25.66%	26.46%	27.38%
North Carolina	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%
Ohio	2.20%	3.08%	3.96%	4.84%	5.72%	6.60%	7.48%	8.36%	9.24%	10.12%
Pennsylvania	13.77%	14.26%	14.74%	15.23%	17.46%	17.46%	17.46%	17.46%	17.46%	17.46%
South Dakota	10.00%	10.00%	10.00%	10.00%	10.00%	10.00%	10.00%	10.00%	10.00%	10.00%
Virginia	5.77%	5.77%	5.77%	5.77%	5.77%	5.77%	9.89%	9.89%	9.89%	12.36%
Wisconsin	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 based on 2015 retail sales for each state and future power projections from the EIA.

Total load GWh	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
DC	11,226	11,301	11,380	11,411	11,345	11,334	11,348	11,388	11,425	11,447
Delaware	11,332	11,407	11,487	11,518	11,452	11,440	11,454	11,495	11,533	11,554
Illinois	139,960	139,402	139,524	140,545	140,463	141,021	141,783	142,871	143,919	144,736
Indiana	102,059	101,967	103,195	104,155	104,207	104,685	105,275	106,155	106,893	107,459
Iowa	47,544	47,378	47,078	47,627	47,838	48,218	48,616	49,109	49,544	49,914
Maryland	61,264	61,671	62,104	62,269	61,912	61,850	61,927	62,147	62,350	62,465
Michigan	102,883	102,514	103,413	104,137	104,006	104,332	104,816	105,585	106,267	106,781
Minnesota	66,253	66,021	65,603	66,368	66,662	67,191	67,746	68,432	69,040	69,555
Missouri	81,962	81,636	81,707	82,305	82,257	82,584	83,030	83,668	84,281	84,759
Montana	14,019	14,207	14,396	14,583	14,654	14,762	14,878	15,054	15,211	15,322
New Jersey	74,493	74,987	75,514	75,715	75,281	75,206	75,299	75,566	75,814	75,953
North Carolina	131,952	133,021	134,415	135,720	136,020	136,833	137,825	139,229	140,543	141,656
North Dakota	17,897	17,834	17,721	17,928	18,007	18,150	18,300	18,485	18,649	18,789
Ohio	148,023	147,891	149,672	151,063	151,139	151,833	152,688	153,964	155,035	155,855
Pennsylvania	145,111	146,074	147,100	147,491	146,647	146,499	146,681	147,202	147,684	147,956
South Dakota	12,213	12,170	12,093	12,234	12,289	12,386	12,488	12,615	12,727	12,822
Virginia	74,380	74,380	74,380	74,380	74,380	74,380	74,380	74,380	74,380	74,380
Wisconsin	69,077	68,849	69,619	70,252	70,332	70,679	71,099	71,701	72,219	72,626

Next, we multiplied the adjusted renewable energy percentage requirement by the total 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	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
DC	1,516	1,695	1,878	2,054	2,269	2,267	2,270	2,278	2,285	2,289
Delaware	1,643	1,825	2,010	2,188	2,290	2,402	2,520	2,644	2,768	2,888
Illinois	14,557	16,390	18,297	20,337	22,231	24,232	26,287	28,427	30,588	32,725
Indiana	3,256	3,253	3,292	5,815	5,818	5,845	5,878	5,927	5,968	8,571
Iowa	276	276	276	276	276	276	276	276	276	276
Maryland	9,312	9,621	11,365	10,835	11,144	11,566	12,385	12,429	12,470	12,493
Michigan	10,288	10,251	10,341	10,414	10,401	10,433	10,482	10,558	10,627	10,678
Minnesota	13,701	13,653	13,566	13,725	17,398	17,536	17,681	17,860	18,019	20,032
Missouri	2,830	2,818	5,642	5,683	5,680	8,554	8,600	8,666	8,729	8,779
Montana	1,452	1,471	1,491	1,510	1,518	1,529	1,541	1,559	1,575	1,587
New Jersey	11,030	12,708	14,450	16,193	17,860	18,255	18,779	19,389	20,061	20,795
North Carolina	7,917	7,981	13,442	13,572	13,602	17,104	17,228	17,404	17,568	17,707
North Dakota	1,790	1,783	1,772	1,793	1,801	1,815	1,830	1,849	1,865	1,879
Ohio	3,256	4,555	5,926	7,311	8,644	10,020	11,420	12,870	14,324	15,771
Pennsylvania	19,983	20,824	21,684	22,457	25,599	25,574	25,605	25,696	25,780	25,828
South Dakota	1,221	1,217	1,209	1,223	1,229	1,239	1,249	1,261	1,273	1,282
Virginia	4,290	4,290	4,290	4,290	4,290	4,290	7,354	7,354	7,354	9,192
Wisconsin	6,908	6,885	6,962	7,025	7,033	7,068	7,110	7,170	7,222	7,263
Total	**115,225**	**121,497**	**137,894**	**146,701**	**159,083**	**170,004**	**178,494**	**183,617**	**188,751**	**200,035**