

## GENERAL

### ABOUT CLEAN LINE ENERGY

#### Who is Clean Line Energy?

- Clean Line Energy is an independent transmission company solely focused on providing transmission solutions to connect clean energy to communities and cities that have a need for low-cost renewable power. While the United States has some of the best and most cost-effective renewable resources in the world, the resources are predominately located far from population centers. The challenge lies in transporting the energy generated from these resources to the communities that need the power. Clean Line is addressing the challenge by developing the Grain Belt Express Clean Line and four other long distance transmission lines. Clean Line's leadership team has managed, built, and financed ambitious renewable and traditional energy projects around the world.

#### Who owns Clean Line Energy?

- The parent company of Grain Belt Express Clean Line LLC is Clean Line Energy Partners LLC, which is supported by investors who bring a long-term perspective, patient capital, and an understanding of the complexity of building long-distance, interstate infrastructure projects. Clean Line's investors include National Grid USA, funds associated with ZBI Ventures, and the Houston-based Zilkha family.
- National Grid is one of the largest investor-owned energy companies in the world, with extensive experience owning and operating large HVDC electricity transmission interconnectors and transmission networks in the US and the UK. National Grid shares Clean Line's vision of enabling a cleaner energy future by investing in transmission projects that facilitate the development of renewable energy sources. Clean Line is not seeking any federal or state funds or subsidies in the development of its projects.

#### What is the Clean Line team's experience with developing and constructing electric transmission infrastructure?

- Clean Line's team has extensive experience with developing, designing, and permitting transmission projects, wind farms, and other energy projects that have been built around the country.
- Clean Line is developing four other transmission lines similar to the Grain Belt Express Clean Line—each line has a similar rationale—several hundred miles long to connect the country's best renewable resources to larger markets with a demand for low-cost clean energy.
- One of our investors, National Grid, has extensive experience building, owning, and operating large HVDC transmission facilities in the US and the UK.

#### Is Clean Line also developing the wind energy that will be on the line?

- No, Clean Line Energy only develops transmission lines. Clean Line Energy is independent from existing or planned wind energy generation. This independence allows for single-minded focus on meeting the needs of the project's many stakeholders through a transparent development effort and on delivering the lowest possible cost wind to market.

#### Do Clean Line's investors include companies, investors and/or individuals who also plan to develop wind farms?

- Clean Line's investors are not currently developing wind farms, and Clean Line is not aware of any plans of its investors to do so.

## ABOUT THE GRAIN BELT EXPRESS CLEAN LINE

### What is the Grain Belt Express Clean Line?

- The Grain Belt Express Clean Line is an approximately 750-mile overhead, direct current transmission line that will deliver up to 3,500 megawatts of wind power from western Kansas to communities in Missouri, Illinois, Indiana and states farther east that have a strong demand for clean, reliable energy. HVDC transmission is the most efficient and cost effective technology to move large amounts of power over long distances due to its lower electricity losses and smaller footprint than comparable alternating current (AC) transmission lines.

### Is Grain Belt Express Clean Line a regulated or unregulated entity?

- Grain Belt Express Clean Line will be regulated by the Kansas Corporation Commission, the Missouri Public Service Commission, the Illinois Commerce Commission, and the Indiana Utility Regulatory Commission. As a transmission owner and operator, Grain Belt Express Clean Line will also be regulated by the Federal Energy Regulatory Commission. In addition, Grain Belt Express Clean Line will be required to obtain permits from a variety of state and federal agencies, including the U.S. Army Corps of Engineers and U.S. Fish & Wildlife Service.

### Will the Federal Energy Regulatory Commission be involved in the approval of this project?

- The Federal Energy Regulatory Commission (FERC) will have oversight of the terms and conditions of service and the rates charged and will have a role in ensuring that the project's transmission lines are operated fairly.

### Will the Grain Belt Express Clean Line have eminent domain?

- Grain Belt Express is committed to conducting transmission line easement negotiations in a manner that is comprehensive in its respect for the private property rights of landowners to support voluntary transmission line easement acquisition.
- Linear infrastructure projects like pipelines, water lines, telephone lines, and electric transmission and distribution lines are sited in the public interest. In order to assure that projects can be completed, the entities building them may have the right to utilize eminent domain when necessary to finalize the acquisition of certain easements.
- Grain Belt Express Clean Line may seek to acquire certain easements through eminent domain but only as a last resort after exhausting all reasonable attempts at voluntary easement negotiation.

### What is the overall project timeline?

- The Grain Belt Express Clean Line is currently under development. Construction is estimated to begin as early as 2017 and will require approximately two to three years to complete. The Grain Belt Express Clean Line may begin delivering electricity as early as 2019.

### Can only renewable energy be transported on the line?

- Clean Line's intent is to provide new wind generation facilities access to markets with a growing demand for renewable energy, which is why we are locating the resource area converter station where wind energy is most cost competitive. Legally, transmission companies are not allowed by the Federal Energy Regulatory Commission (FERC) to prohibit certain types of energy, but as a practical matter, wind energy is the resource that would be economically advantaged by a project like this. It would not make sense to build a coal or nuclear power plant a long distance from a load center when you could produce the electricity much closer to the demand.

### **In addition to Kansas, will the project also spur wind development in Missouri, Illinois, and Indiana?**

- The project will not directly spur wind development in Missouri, Illinois, and Indiana. However, these states are home to companies that produce components and equipment used in wind farms and transmission lines, and the Grain Belt Express Clean Line will likely increase demand for the products and services those companies provide.
- The project will support the integration of larger amounts of wind power into the electric grid. Generally, the wind does not always blow at any one spot, but it tends to be blowing somewhere. With a robust transmission system, we can move wind energy from where it is blowing to where it is needed. Transmission, therefore, allows more wind energy to be utilized.

### **Who will benefit from the Grain Belt Express Clean Line?**

- Individuals and communities across the project area will benefit from the Grain Belt Express Clean Line. Consumers in Missouri, Illinois, Indiana, and states farther east—both residential customers and businesses—will benefit from the lower prices resulting from the increased competition that the project will bring. The project will support major new wind farm construction in Kansas, and will create jobs across Missouri, Illinois, and Indiana through the actual construction of the transmission line, through the manufacturing of the components for the transmission line, and through the construction and manufacturing of the wind turbines needed to supply the line. Kansas, Missouri, Illinois, and Indiana are home to dozens of companies that serve the wind and transmission industries.
- Additionally, local governments will benefit from increased tax revenues from the transmission line infrastructure. Citizens across the region will benefit from cleaner air and water as a result of the new wind energy enabled by the Grain Belt Express project, as that energy will displace more polluting forms of electric generation.

### **Who is considered a stakeholder of the Grain Belt Express Clean Line?**

- A stakeholder is defined as any person interested in the Grain Belt Express Clean Line, including, but not limited to: individual landowners; federal, state and local government entities and agencies; elected officials; local businesses and business organizations; non-governmental organizations; and civic and community organizations.

## **ABOUT WIND ENERGY**

### **Is wind power cost effective?**

- American wind power saves consumers money and makes the energy market more competitive. Wholesale electric power prices have reduced in areas of the country where wind power was added to the system.
- Wind power also helps stabilize consumers' electricity rates. Because there is not a fuel cost associated with it, wind energy protects consumers from volatility in the price of fossil fuels.

### **Are Clean Line's projects dependent on federal subsidies for wind energy?**

- Clean Line is not seeking any federal or state funding. Our projects depend on strong long-term fundamentals, one of which is that wind energy is cost competitive. Tax policy is one factor in the cost competitiveness of wind, just as it is with nuclear, coal and natural gas.
- There are other factors that contribute to the cost competitiveness of wind, including:

- high wind speeds in our resource areas
- wind technology advancements, such as taller towers, longer blades and other improvements that continue to drive costs even lower:

### **Does wind energy still make sense if natural gas prices remain low?**

- Yes. Natural gas will be an important part of the energy supply mix, but it should not be the only thing in the portfolio. Americans understand this intuitively. Most of us do not own just one stock in our retirement accounts, but a mix of different companies' stocks and bonds. Likewise, we buy insurance against sickness, accidents, and even death. Think of renewable energy as an insurance policy to a very real possibility that natural gas won't be consistently cheap for the next three decades.
- History suggests that it is extremely risky to rely exclusively on any one form of energy. Any consensus on long-term gas pricing and supply is a fragile one. In a world of uncertainty driven by policy, environmental concerns, macroeconomics and geology, it makes sense to develop a diverse portfolio of energy supply.
- After all, the costs of not having affordable energy are extremely high; in practice this means a portfolio of gas and renewable energy in our electric resource mix.

### **Can wind and natural gas complement each other?**

- Yes, we need a balanced energy portfolio. Wind can't supply all our electricity, and modern, natural gas-fired generation is the best complement for wind energy. Gas plants can ramp up and down quickly to deal with variability in wind generation. Natural gas is domestically produced and cleaner than most alternatives. Together, wind and gas can replace aging coal plants, creating a cleaner, more modern energy mix.

### **Does wind reduce the efficiency of fossil generation?**

- While adding new wind energy to the power supply may reduce by a very small amount the operating efficiency of a small number of fossil fuel plants, any increase in emissions from fossil fuel plants as a result of such inefficiency would be far outweighed by the decrease in emissions as a result of the displaced fossil fuel generation.

### **Does wind reduce the efficiency of fossil generation?**

- While adding new wind energy to the power supply may reduce by a very small amount the operating efficiency of a small number of fossil fuel plants, any increase in emissions from fossil fuel plants as a result of such inefficiency would be far outweighed by the decrease in emissions as a result of the displaced fossil fuel generation.

### **What happens when the wind stops blowing? Do the lights go off?**

- Utilities purchase renewable power to add diversity to their generation mix and meet state renewable portfolio requirements.
- Wind power works together with other sources of power generation that continuously respond to changes in electricity demand. When the wind blows, wind power allows grid operators to ramp down other generators and save fuel. Conversely, when the wind stops blowing, another generator—often a natural gas or hydropower facility—can increase its output to compensate.
- The nation will have a diverse stream of energy resources for many years to come, including wind, nuclear, gas, coal, and other resources.

### **What is a capacity factor?**

- Capacity factor for a power plant is a measure of how often an electric generator runs for a specific period of time. It compares how much electricity a generator actually produces with the maximum it could produce at continuous full power operation during the same period.
- A megawatt is a unit for measuring power that is equivalent to one million watts. One megawatt is equivalent to the energy produced by 10 automobile engines.
- A megawatt hour (MWh) is equal to 1,000 kilowatt hours (kWh). It is equal to 1,000 kilowatts of electricity used continuously for one hour. It is about equivalent to the amount of electricity used by about 330 homes during one hour.
- To give an example illustrating capacity factor, if a 1 MW generator produced 5,000 MWh over a year, its capacity factor would be 0.57 because 5,000 MWh equals 57% of the amount of electricity the generator could have produced if it operated the entire year (8,760 hours) at full capacity and produced 8,760 MWh of electricity.
- Generators with relatively low fuel costs are operated to supply baseload power, and typically have average annual capacity factors of 70% or more. Generators with lower capacity factors may indicate that they are operated during peak demand periods and/or have high fuel costs, or their operation depends on the availability of the energy source, such as hydro and wind energy.

### **What areas will the wind energy come from that will be transported on this line?**

- The energy transported on this line will be sourced from the area in and around Ford County, Kansas. Kansas wind speeds are among the highest in the country, translating into low-cost delivered energy.

### **Is there enough wind power being developed in Kansas to fill the capacity for the line?**

- Clean Line recently issued a Request for Information (RFI) to wind generators developing projects around western Kansas and received detailed responses on wind projects totaling over 13,600 megawatts of capacity—more than three times the total delivered capacity of the Grain Belt Express project. The RFI responses demonstrate the need for new transmission lines to provide consumers with access to abundant, low-cost, renewable energy in the western Kansas region.

### **Is there a letter from ten Eastern Governors regarding Grain Belt Express Clean Line?**

- No. In 2009, ten East Coast Governors did write a letter to leaders in Congress regarding renewable energy development. This letter was sent to express the Governors' support for renewable energy in general, and their opposition to certain federal policies which might have favored Midwestern wind energy and transmission lines over their local resources. The policies referenced in their letter were not passed into law.
- This letter was sent prior to the start of development of the Grain Belt Express Clean Line and does not mention Grain Belt Express Clean Line. The Grain Belt Express Clean Line is not receiving any federal subsidies for the development of the proposed transmission line. In the letter, the Governors "support the development of wind resources for the United States wherever they exist" and seek a level playing field for renewable energy development. Grain Belt Express Clean Line's participant-funded business model is entirely consistent with such a level playing field approach.

### **How many wind farms will connect to the line? How far away from the converter station?**

- The Grain Belt Express Clean Line will be responsible for bringing online roughly 4,000 megawatts of new wind energy projects that otherwise would not be built due to limitations of the existing electric transmission grid.

Respondents to our January 2014 Request for Information submitted project information for 5,200 MW of wind projects under development within 20 miles of the proposed converter site near Dodge City, Kansas.

### **How will wind farms connect to the Grain Belt Express Clean Line?**

- A collector system will consist of alternating current transmission lines that will connect the new wind generation projects radially into the converter station.
- Clean Line believes that development of a collector system should be conducted in concert with wind developers that will build the wind farms that will connect to the Grain Belt Express Clean Line. We have begun preliminary evaluation to determine where the collector system may go and how long the lines may be, but detailed routing analysis will begin at a later date, once Clean Line determines the new wind farms that will connect to the HVDC line.

### **Can I hook a wind turbine to your transmission line?**

- The wind energy facilities that will connect to the Grain Belt Express Clean Line will be utility scale projects at the western end of the line. Each wind farm project that connects to the line will likely be in the hundreds of megawatts.

### **Will the transmission line affect my ability to get a turbine on my property?**

- Generally, it is possible to route the line through a proposed or existing wind farm, where necessary.
- Wind turbines are spaced widely, with a minimum of 1,000 – 1,400 feet between each wind turbine. The Grain Belt Express Clean Line will need about 150-200 feet of right-of-way.

## **CONSTRUCTION / OPERATION / MAINTENANCE**

### **Who will build the Grain Belt Express Clean Line and the associated wind farms?**

- Clean Line is committed to using qualified local and regional contractors to build the transmission line. We hosted Local Business Opportunity Meetings to learn about local businesses that could assist in the development, construction, and maintenance of the transmission line. Hundreds of business representatives in the project area involved in surveying, aggregate and concrete, trucking and fueling, and other related activities attended. Materials from the Local Business Opportunity Meetings are available on our website.
- Clean Line encourages local businesses interested in working on the construction and maintenance of the project to submit their business information on our website.
- Construction of new electric transmission and wind generation in close proximity to manufacturers in Kansas, Missouri, Illinois, and Indiana will increase business opportunities for companies in those states.
- The wind generation developers will select their own suppliers and construction contractors.

### **When will Grain Belt Express Clean Line begin construction?**

- Construction will take two to three years and could begin as soon as 2016.
- The timeline of the project is dependent upon the regulatory processes in each state the Grain Belt Express Clean Line will traverse. After Clean Line receives the appropriate approvals from each state utility commission, Clean Line will complete easement acquisition, signing up customers, surveying, and engineering.

### **What local business opportunities might be associated with construction?**

- We will need a wide variety of services, materials, and equipment to construct the transmission line, such as surveying, right-of-way clearing, and pouring concrete.
- We want to learn about qualified local businesses that could provide products and services for the Grain Belt Express Clean Line. If you would like to stay informed of our progress and be notified when we seek sub-contractors, please submit your business information on our website at [http://www.grainbeltexpresscleanline.com/site/page/submit\\_your\\_business\\_info](http://www.grainbeltexpresscleanline.com/site/page/submit_your_business_info).

### **During construction will there be heavy vehicles/equipment on roads?**

- Yes. The construction of a transmission line of this size generally requires the use of heavy vehicles and machinery. Clean Line is cognizant of the risks associated with heavy traffic on county and local roads and will minimize the impact of these vehicles to existing road networks and will repair any damage it causes. Clean Line will work with the state departments of transportation and county commissioners and engineers to plan road use during construction.

### **What portion of the right-of-way will need to be cleared?**

- The amount of right-of-way that will need to remain cleared for the operation of the line will depend on the type of vegetation that grows within the transmission line right-of-way. Typically, agriculture crops (with the exception of tree crops), pasture lands, and grasslands will not need to be cleared for the operation of the line; however, trees and other vertical vegetation more than 10 feet tall will need to be cleared and managed based on potential safety and reliability concerns.
- Typically, only a small portion of the right-of-way will need to be cleared. In certain circumstances during construction, there may be situations where the entire right-of-way is cleared. There will also be times when the impact to the right-of-way between structures might be closer to a two-track temporary road. At this point in time, we don't know where these scenarios might occur, but we will work with landowners to minimize impacts.

### **How will Clean Line address impacts of construction to farmland?**

- We will work to prevent and/or mitigate agricultural impacts associated with the construction process. Reclamation activities that may be implemented on impacted areas include, spoil removal, soil de-compaction, soil fertilization, erosion prevention, and repair of damaged soil.
- Our Agricultural Impact Mitigation Policy (available on the landowner information pages of our website) outlines ways we will minimize and mitigate for impacts to agricultural lands.

### **What is a multi-use construction yard or lay-down yard?**

- Multi-use construction yards, sometimes called lay-down yards, are typically located off the right-of-way (ROW) on a parcel specifically negotiated for storing equipment, components and other materials. Construction work is coordinated from these areas. Multi-use construction yards will be nearby but not necessarily adjacent to the ROW. Most multi-use construction yards will be located between 20 and 40 miles apart with dimensions typically ranging from one to ten acres. Clean Line will negotiate with landowners interested in hosting such facilities.
- Staging Areas are typically located within the ROW and are used as miniature multi-use construction yards. The components for a few structures may be arranged in a staging area immediately before they are assembled. Staging areas will not be common, due to the extra work involved in the off-load and on-load of

structure parts (double-handling). Construction crews will naturally minimize handling time and costs, usually by transporting components directly to each structure location.

- In some instances, weather, topography, other environmental factors, or construction activities such as pulling and tensioning of the conductors may require activity outside the staging areas or ROW. These specific instances will be discussed with landowners in advance and will only take place where such use is permitted.

#### **Are any access roads going to be built for the project?**

- There will be a mixture of temporary and permanent roads—though permanent roads in crop land would be highly unusual. Clean Line will negotiate the nature of access roads with landowners, and the landowners will be compensated accordingly.
- Temporary access roads and their locations will be determined on a case-by-case basis.
- Construction crews will make an effort to access the right-of-way easement from public roads that intersect or are adjacent to the right-of-way. Once an access road is established, construction will follow the right-of-way to the next access road location, which preferably will be located at the next public road crossing. In some instances, depending on topography or other environmental conditions, off-right-of-way access may be needed to facilitate construction or maintenance of the line.

#### **Will Clean Line continue to own the transmission line after it's permitted or built?**

- Clean Line intends to develop, own, and operate the Grain Belt Express Clean Line. As is often the case with large infrastructure projects, other companies may participate in the ownership or play a role in the process.

#### **Who will operate the Grain Belt Express Clean Line?**

- Like many other transmission lines, the Grain Belt Express Clean Line will be controlled by one of the regional transmission organizations (RTO). RTOs are responsible for planning and coordinating the transfer of energy over large multi-state areas. An RTO controls and monitors an electric transmission grid that is larger and uses higher voltages than a typical single power company's distribution grid.
- Grain Belt Express Clean Line will be responsible for all maintenance of the line.

#### **Who will operate the converter station?**

- Typically, converter stations of this sort are operated remotely by highly skilled operators in cooperation with the regional transmission organization (RTO) to ensure reliability and transparency in administration of the tariff.
- Operation staffing will consist of Clean Line employees or other contractors with appropriate technical expertise and certification by the North American Electric Reliability Corporation (NERC) as system operators.
- Clean Line will coordinate with RTOs or other necessary regulatory bodies in the control and operation of the converter stations.

#### **What is the maintenance plan for the line? Will you ever use helicopters?**

- There will be a regular maintenance plan for the line. The plan will involve visual inspections, and this typically involves a helicopter. This typically takes place a couple of times a year. Repairs will typically take place from land-based crew and trucks.

- Any emergency repairs would need to happen immediately, and Clean Line would let landowners know as soon as practical. Landowners will be notified prior to any scheduled maintenance work conducted on their property.

#### **How will you maintain vegetation in the right of way? Will you use chemical herbicides?**

- Rights-of-way must be maintained to ensure compliance with reliability and safety standards.
- Clean Line will work with landowners to plan maintenance responsibly, considering local farming practices. Clean Line is working with environmental agencies and conservation organizations and has asked for their input on best practices for vegetation management.
- Prior to the beginning of operations, Clean Line will issue a Transmission Vegetation Management Plan which will include standards and operating guides for how to ensure safe and low impact methods to maintain right-of-way.
- Additionally, on organic farms, no herbicides, pesticides, fertilizers, or seed would be applied unless requested and approved by the landowner.

#### **Will you be responsible for removing the transmission line?**

- Yes, Clean Line will be responsible for removing the structures if the line is no longer operational.

## **ECONOMIC**

#### **How many jobs will the Grain Belt Express Clean Line create?**

- The Grain Belt Express Clean Line will bring substantial economic benefits throughout the project region. It is estimated that the project will result in more than 5,000 direct construction jobs building the transmission line, associated facilities, and new wind farms, and more than 500 permanent jobs maintaining and operating the wind farms and transmission line. Additionally, businesses will see increased demand for their products and services, particularly those involved with materials, services, and equipment to be used in construction of the project and associated wind farms, as well as retail and hospitality industries.

#### **Who will pay for the Grain Belt Express Clean Line?**

- The development and construction of the Grain Belt Express Clean Line is estimated to cost roughly **\$2 billion**. Clean Line will finance the transmission line and will sell transmission capacity to wind energy developers that wish to transmit their energy to market and to utilities or load serving entities that choose to buy the low-cost clean energy delivered by the line.

#### **Do Clean Line's projects require or expect federal subsidies?**

- No. There are currently no federal subsidies for transmission lines, and Clean Line has not sought any.

#### **Who will finance construction for the Grain Belt Express Clean Line?**

- There is significant interest in the private sector in investing in transmission infrastructure, and there are several credible options for financing the construction of transmission lines. Clean Line's current plans are to obtain the necessary permits from state and federal entities, and sign long-term transmission capacity contracts with creditworthy customers.
- Clean Line will then obtain financing, a combination of equity and debt, to construct the entirety of the transmission line based on having obtained the requisite permits and secured customers with long-term contracts to purchase transmission service.

### **Will this project affect my electric bill?**

- If your local utility decides that it is in their customers' best interest to buy power from the line (no fuel cost, no pollution, renewable resource), they will ultimately incorporate the transmission costs into their customers' electricity bills along with generation and distribution. Transmission costs are the smallest part of a consumer's electric bill, generally less than 10%. If your local utility does not buy power on the line, you will not see costs resulting from the project.

### **Is there a demonstrated need for transmission lines like these?**

- Numerous studies by the U.S. Department of Energy (DOE) and other government and nongovernmental organizations have demonstrated a need for HVDC transmission lines. Clean Line will still have to sell the capacity on its transmission lines before they are built, and if the capacity is sold to customers then the need is assured.

## **TECHNOLOGY**

### **DC**

#### **What is DC?**

- DC stands for direct current. DC is widely considered the most efficient method to deliver large amounts of energy across long distances. DC lines can transfer significantly more power with greater efficiency than comparable AC lines.

#### **What is the difference between alternating current and direct current?**

- Historically, the transfer of electricity between regions of the country has been over high-voltage alternating current (AC) transmission lines, which means that both the voltage and the current on these lines move in a wave-like pattern along the lines and continually change direction. In North America, this change in direction occurs 60 times per second (defined as 60 Hertz [Hz]). The electric power transmitted over AC transmission lines is exactly the same as the power we use every day from AC outlets, but at a much higher voltage. Over the past 40 years high voltage direct current (HVDC) transmission lines have been constructed that offer significant electrical, economic, and environmental advantages over AC transmission lines for long distances. DC transmission is especially suited for integrating and transporting power generated by various renewable energy sources. Unlike an AC transmission line, the voltage and current on a DC transmission line are not time varying, meaning they do not change direction as energy is transmitted.

#### **Is DC a new technology?**

- Direct current (DC) transmission is a proven technology that has been around since the 1930s and the birth of the modern electric industry. DC is already in use in the United States and throughout the world. Currently, there are more than 20 DC transmission facilities in the United States and more than 35 across North America.

### **What are the advantages of DC technology?**

- Direct current (DC) transmission lines have smaller structures and require less land than AC lines to deliver an equivalent amount of energy. From a power grid operator perspective, DC gives grid operators complete control of energy flow. DC lines are not a replacement for the AC grid, and the AC grid in the Midwest and across our nation also requires significant expansion. DC complements the existing AC transmission network and can be an additional source for system stability and reliability.

### **Why did Clean Line select DC for the Grain Belt Express Clean Line project?**

- Direct current (DC) is the preferred technology for moving large amounts of power over long distances. The use of a DC transmission line results in overall higher efficiency and reliability than an equivalently sized alternating current line to move the same amount of power, therefore offering significant electrical, economic and environmental advantages. These advantages include lower power losses on the line, better land use due to smaller structures, and the ability to control the power flow.

### **Will DC strengthen the grid?**

- DC lines do in fact strengthen the grid. DC lines are completely controllable, unlike AC, where the power flows on the path of least resistance. Clean Line has been working with the regional transmission operators, Southwest Power Pool (SPP), Midcontinent Independent System Operator (MISO) and PJM Interconnection, to ensure that the project can be integrated into the system without violating any reliability criteria.

### **What is the voltage rating of this line?**

- The Grain Belt Express Clean Line is a +/- 600 kilovolt high voltage direct current transmission line.

### **Can the line be placed underground?**

- Underground cable systems for power transmission are very complex and depend upon a number of factors in order to operate efficiently and reliably. To date, there have been no underground cable systems designed or installed at the proposed voltage and power ratings that will be utilized by the Grain Belt Express Clean Line, nor over the proposed distances.
- Undergrounding the Grain Belt Express Clean Line would be technically and economically infeasible.

### **What is a converter station?**

- Converter stations are required for each of Clean Line's projects to convert power from AC to DC or vice versa. The DC converter station in the wind resource area is used to convert the incoming AC power into DC power. The delivery converter station on the other end converts DC power into AC power to be delivered to customers through the existing AC grid.

### **What is the life span of the converter station and the transmission line?**

- While the design life of a DC converter station is typically 30 years, operational experience of existing DC lines reveals that they are operated safely and reliably well beyond this standard timeframe. For example, the Pacific DC Intertie, which connects wind and hydro resources of the Pacific Northwest to Los Angeles, has been functioning successfully (with the appropriate upgrades and maintenance) since 1970 and is expected to operate for many decades into the future.

### **How many converter stations will there be?**

- Clean Line is developing and studying the project with a converter station at each end of the DC transmission line, and one intermediate converter station in eastern Missouri, for a total of three. The intermediate converter station in Missouri and the eastern converter station, near the Illinois-Indiana border, will deliver clean power to the existing AC grid.

- Having two interconnection points will allow the power to be delivered to consumers in two different regional markets, coordinated by the regional transmission organizations Midcontinent Independent System Operator (MISO) and PJM Interconnection.

### **What equipment does the converter station entail?**

- Each converter station is equipped with the following components:
  - DC Switchyard: DC lines enter the converter station through the DC switchyard.
  - Converter Buildings: These buildings contain the valve halls, the control room, mechanical and electrical operations and additional operational and maintenance facilities.
  - Valve Halls: This is the heart of the conversion process. Each valve hall contains numerous valves (“electronic switches”) that switch off and on to convert DC to AC and vice versa.
  - Synchronous Condensers or STATCOMs: The function of the condenser or STATCOMs, if needed, is to assist in control of the AC voltage and to enhance the performance of the conversion process.
  - Converter Transformers: Specialized converter transformers step the AC voltage up to 600 kV and provide some cancellation of harmonics generated in the conversion process.
  - AC Switchyard: This is where the power will enter or leave the HVDC Converter Station and enter into the AC network, which will then disperse the energy into the power grid and ultimately to consumers. This part of the station looks like a typical AC substation with the addition of various filter banks.

### **How large will the converter station site be?**

- The converter station will require about 40 to 65 fenced-in acres.

### **Is there noise associated with the converter station?**

- Noise is typically limited to 55 decibels (dB) or below at the edge of the perimeter fence of the converter station and the sound will dissipate as you get farther away. An example of the 55dB noise level is a “quiet suburb conversation at home” – quieter than a central air conditioner unit from 100 ft. away.

### **What is the Dedicated Metallic Return Conductor?**

- Under normal operations a bi-pole high voltage direct current (HVDC) transmission line requires a return path for very small current imbalances. During emergency operations or certain maintenance operations when one pole is out of service, the full load current will flow through this return path. In some existing HVDC transmission lines, this return path is via ground electrodes. The Grain Belt Express Clean Line project will utilize a third set of conductors (wires) on the transmission structure referred to as the dedicated metallic return conductor. Therefore, during bi-pole or monopole operations, all current will be contained within conductors on the project.

## **STRUCTURES**

### **What type of structures will the transmission line use?**

- There are many factors that must be considered when determining the structures to be used for the transmission line, including terrain requirements, land-use constraints (for instance avoiding interference with center pivot irrigation systems), and cost (steel prices can vary widely over time).

- Several structure types are under engineering review. Clean Line is currently analyzing a variety of structures including steel monopole, steel lattice, and lattice mast structures.

#### **How tall will the structures be?**

- Typical structures will be between 110 and 150 feet tall. However, the exact height of the structure depends on several variables, including: engineering requirements, topography, structure type, and span length. Generally, the taller the structures, the greater the span between structures; and the shorter the structures, the shorter the span between structures. This means if structures are at the taller end of the 110 to 150 foot range, there typically will be fewer of them. Instances when the structures could exceed 150 feet in height include river crossings or terrain that would require longer span length.

#### **How large will the foundation footprints be?**

- The typical foundation footprints will be between 6 feet and 8 feet in diameter for tubular monopole or lattice mast type structures with a single pier foundation. Typical lattice structures with four pier foundations will have a footprint of about 27 feet x 27 feet. More robust “dead-end structures” every few miles or at sharp angles will be needed periodically and could be 12 feet in diameter for monopole or lattice mast type structures, or 46 feet x 46 feet for four pier lattice structures.

#### **What is the minimum clearance below your transmission line?**

- Minimum clearances are designated by the National Electrical Safety Code (NESC) and vary depending on several factors, such as vehicular traffic or pedestrian usage. The design of our transmission line must meet or exceed NESC requirements.
- For a line of this type and voltage, minimum ground clearances according to NESC is 31 feet. Clean Line intends to use an additional 3-foot buffer for a total clearance of 34 feet at the lowest sag in the line. This is an absolute minimum at the lowest point on the conductor, at lowest possible sag. The majority of the time, the actual clearance will be higher.

#### **What is the span length between structures?**

- Clean Line anticipates that there will be between 4 and 7 structures per mile, with span lengths from 750 feet to 1,320 feet between structures. As with structure height, there are several variables that factor into the exact span between structures, such as structure type, soil conditions, and topography.
- These ranges will encompass the large majority of span lengths along the line, but there may be longer or shorter spans due to engineering and environmental considerations, such as river crossings.

## **ELECTRONIC INTERFERENCE**

#### **Are there any impacts to radio signal? If so, what are they?**

- FM radio receivers typically do not pick up interference from transmission lines. If there is AM radio frequency interference, it typically occurs immediately under a transmission line and dissipates rapidly away from the line.

#### **Are there any impacts to television signal? If so, what are they?**

- Digital television signals are not impacted; therefore, television interference is highly unlikely.

#### **Will the line interfere with GPS signals?**

- GPS units associated with farm equipment will operate with their traditional degree of accuracy near and under high voltage transmission lines.

- Information about television and radio reception, cell phones, wireless internet, and global positioning system (GPS) satellite receivers is discussed in the section on electric fields in a whitepaper that Clean Line commissioned to summarize research conducted on these topics. The section on magnetic fields discusses standards throughout the world and research regarding potential effects on implanted medical devices. At the end of the whitepaper is bibliographical information for all the studies referenced or summarized. The whitepaper is available on Clean Line's website.

#### **Will the transmission line impact or induce currents on natural gas pipelines?**

- Since the transmission line is DC, there is no varying magnetic field that can induce a current into the adjacent pipeline structures.
- Under normal operations a bi-pole HVDC line requires a return path for very small current imbalances. During emergency operations or certain maintenance operations when one pole is out of service, the full load current will flow through this return path. This return path can be another set of wires on the transmission structure (sometimes referred to as a dedicated metallic return or dedicated metallic neutral). At this time, Clean Line intends to utilize a dedicated metallic return.

#### **Is there sound associated with the line? How much and what will it sound like?**

- At the edge of the right-of-way, the sound associated with the line should be in the same range as a whisper. Audible noise is produced by corona on transmission line conductors. Corona is an electric discharge from the conductor caused by ionization of the air. This sizzling or crackling sound is called random noise. Random noise results from a multitude of small snapping sounds at corona points on the conductor.

## **HEALTH AND SAFETY**

#### **What is EMF?**

- EMF stands for electric and magnetic fields. Electric fields are produced by voltage, and voltage is the electrical pressure that drives an electric current through a circuit. Magnetic fields are produced by current, and current is the movement or flow of electrons. EMFs are naturally present in the environment and are present wherever electricity is used, for example a toaster, cell phone, a battery operated device, a lamp, a computer, etc. The earth has both magnetic fields produced by currents in the molten core of the planet and an electric field produced by electrical activity in the atmosphere, such as thunderstorms.

#### **What health effects are associated with electric and magnetic fields (EMF)?**

- There are no known long-term health impacts from the EMF associated with a transmission line. The magnetic field of a DC line is similar in nature to the natural magnetic field of the Earth (the same field that allows a compass to work), and the strength of the magnetic field while standing beneath the conductors is comparable to the strength of the Earth's field. The static electric field of a DC line when standing beneath the conductors is ten times weaker than the static electric charge you may get from walking across a carpet on a dry winter day.
- For more information on electric and magnetic fields and HVDC transmission, please contact us to request a fact sheet or visit our website.

#### **What is stray voltage?**

- The term "stray voltage" can refer to several phenomena involving the creation of an unintended electric potential difference (voltage) between two conductive surfaces. In areas where power lines traverse agricultural land, the term often refers to the development of a potential difference between the grounded

neutral conductor of a power line (a wire that usually carries minimal current) and the ground to which it is connected, causing current to flow on the grounded neutral. This current, in turn, can develop a potential difference with nearby conductive material present in agricultural operations.

- Under normal operation and with proper safety measures in effect, stray voltage remains below levels that affect the health or behavior of persons or animals. Under non-standard operating conditions, or when safety measures are not in place, voltage may increase such that persons or animals may be affected if they contact conductive material and an elevated current is induced.
- There is also no stray voltage from a DC line. DC transmission lines do not induce voltages on neighboring vehicles, structures, fences, or other conductive materials or nearby surfaces.

### **Are there any studies that would suggest harm to people or animals either short-term or long-term from the transmission line?**

- Several studies have assessed the impacts on agricultural operations of stray voltage, along with electric and magnetic fields, corona and air ions. According to an epidemiologic study of 500 herds of Holstein dairy cattle, herd health, measured using multiple indicators, did not differ between periods before and after a nearby +/- 400 kV direct current line was energized. These results did not vary based on the herd's distance from the high voltage direct current power line. Another study conducted by Oregon State University titled "Joint HVDC Agricultural Study" determined that no differences were found between cattle and crops raised under +/-500 kV direct current lines and those raised away from the lines. A report by the Western Interstate Commission for Higher Education also determined that a +/- 400 kV direct current transmission line did not affect crops, vegetation, or nearby wildlife, nor were the electric and magnetic fields from the line felt by persons walking in the right-of-way.

### **Who did your health testing to determine there are no known health effects on humans or animals?**

- Clean Line worked with Exponent to review existing independent studies and compile materials pertaining to health effects from direct current transmission lines for Clean Line's use. Exponent is an engineering and scientific consulting firm providing solutions to complex problems. Exponent's multidisciplinary organization of scientists, physicians, engineers, and business consultants brings together more than 90 technical disciplines to address complicated issues facing industry and government today. The firm has been best known for analyzing accidents and failures to determine their causes, but in recent years it has become more active in assisting clients with human health, environmental and engineering issues associated with new products to help prevent problems in the future.

### **Is it safe to park vehicles underneath the line? Can a vehicle shock you?**

- It is safe to park beneath the line, though if the vehicle is strongly insulated from the ground, you could get a static electric shock from touching the vehicle in the same way that shuffling your feet on a carpet could give you a static electric shock when touching a doorknob due to an accumulation of charge.

### **Can my livestock graze under or around the transmission line?**

- Yes. Extensive studies indicate that exposure to transmission lines pose no harmful effect to farm animals.

### **Does Clean Line have an Avian Program?**

- Yes. The goal of Clean Line's Avian Program is to advance progress towards electric transmission systems that are safer for all avian species. The Avian Program establishes a framework for reducing risks to birds and describes Clean Line's policy to develop and implement Avian Protection Plans specific to each transmission system. To read and download Clean Line Energy Partners' Avian Program, please visit the Clean Line website.

### **What is an Avian Protection Plan?**

- An Avian Protection Plan, or APP, describes specific ways to reduce the operational and avian risks that result from avian interactions with electric utility facilities. Clean Line's Avian Protection Plans will consider specific habitat types, species, and system components when evaluating potential risks. Each APP will also identify avoidance, minimization, and mitigation measures to address avian risk for each transmission system. To learn more about Avian Protection Plan guidance, please see the Avian Powerline Interaction Committee's website at [www.aplic.org/APPs.php](http://www.aplic.org/APPs.php).

### **What is the Avian Power Line Interaction Committee?**

- The Avian Power Line Interaction Committee (APLIC) leads the electric utility industry in protecting avian resources while enhancing reliable energy delivery. The members consist of over 50 utility companies, wildlife resource agencies, conservation groups, and manufacturers of avian protection products that work together to understand the causes of bird/power line electrocutions and collisions and to develop ways of preventing bird mortalities and associated power outages. To learn more about APLIC, see [www.aplic.org](http://www.aplic.org).

## **LAND USE**

### **How wide will the right-of-way (ROW) need to be?**

- Right-of-way refers to the actual land area needed for a specific purpose, such as the easement for a transmission line. Together all the easements will make up the right-of-way for the project.
- Clean Line estimates that the right-of-way for its projects typically will be between 150 to 200 feet wide; though the line will directly impact much less land than that. Less than 1% of the easement property would be taken out of production if the structures are placed in farmland.
- The right-of-way width requirement is largely determined by how close structures are placed to each other, terrain, and clearance requirements. It is necessary to understand the amount of space needed for appropriate safety clearances to the ground and for the side-to-side movement of wires due to wind.
- Some additional areas may be necessary for lay-down or access during construction; Clean Line will provide additional compensation for these areas through separate agreements with landowners.

### **How much room is needed for structures within the easement?**

- With either lattice or monopole structures, less than 1% of the easement area will be occupied by the structure footprints.

### **Can farming / ranching continue in the easement and under the lines?**

- Yes. Clean Line will acquire easements, but the land will still belong to the landowners and can be utilized for activities such as farming, grazing cattle, and other activities that do not interfere with the operation of the line.
- Farming of row crops (e.g., wheat, corn, soybeans, etc.) can continue under the lines. There will be sufficient clearance under the transmission line to grow full-height crops (up to about 10 feet tall), not including tree crops, and to operate standard farm equipment.
- Ranching and grazing are totally compatible and will not be restricted.

### **What can be planted in the easement area?**

- Crops less than ten feet tall may be grown safely under power lines. The easement area can also be used for pasture and grazing lands. Clean Line must comply with the National Electrical Safety Code to ensure the

safety of the general public and North American Electric Reliability Corporation Standards to ensure the reliable operation of the transmission line. As a result, there are restrictions on the planting of trees that are at, or will grow to, a certain height underneath the transmission line.

#### **How close can one get to the structures/poles for farming operation?**

- Landowners will be able to farm right up to the structures.

#### **Can hunting occur near the transmission line or within the right-of-way?**

- Hunting is one of many compatible outdoor recreational activities that can occur within and adjacent to the transmission line right-of-way.

#### **How will Clean Line acquire right-of-way for this project?**

- Clean Line will acquire an easement from landowners. The easement grants Clean Line certain surface rights over a specific portion of the property. Landowners are not selling their land. Easement agreements will be negotiated individually with each landowner and will consider many factors including, but not limited to:
  - Existing uses of the land (e.g., crops vs. grazing vs. residential)
  - Type and number of structures that will be placed on the land
  - The requirement for future access rights to the land
  - Environmental conditions
- Clean Line requires that its representatives follow a Code of Conduct, which provides that all representatives treat every landowner with consideration and respect. Please visit our website or contact us for a copy of the Code of Conduct. In addition, Clean Line strives to build and maintain long-lasting relationships with landowners by working in a respectful and collaborative manner for the life of the project.

#### **How much will you pay for right-of-way?**

- Clean Line Energy is committed to compensating landowners fairly and seeks to reach voluntarily negotiated agreements with 100% of the landowners along the line's route. The landowner compensation package will include an easement payment, based on the size of the easement required and market value of the land, and an additional payment for each structure placed on the landowner's property.
- Other payments may be made in certain circumstances, including for:
  - Crop damage
  - Commercially marketable timber
  - Irrigation interference
  - Damage to drainage tile

#### **How will the market value of the land be determined?**

- Clean Line will engage a certified independent appraisal firm to determine the fair market value per acre based on a market data study, which analyzes recent arms-length sales in a given county, across similar types of land-use, such as dry cropland, irrigated cropland, or pasture.

#### **Will structure payments be annual or one-time?**

- Historically, utilities have made one-time payments for transmission line easements and structures.

- During its extensive outreach efforts, Clean Line learned that landowners have a strong interest in annual payments as compensation for structures on their properties. Clean Line then decided to offer landowners the option of receiving a one-time payment or annual payments for each structure. Commencing the year after the initial structure payment, annual payments for structures will increase by two percent each year and will continue as long as the structure is on the easement.
- The easement payment will be made up-front.

#### **When will landowners receive easement payments?**

- Representatives are available to begin discussion of compensation for easements with affected landowners. A portion of the compensation for easements will begin as soon as landowners sign an easement agreement, and remaining payments will have been paid by the time construction has commenced, with the exception of any annual structure payments or damages payments, which may be paid thereafter.

#### **Will Clean Line compensate for crop damage or soil compaction during construction?**

- Clean Line is committed to minimizing impacts of the project on current land use.
- Clean Line will repair damage to soil resulting from construction and maintenance of the transmission line and will compensate for crop damage that occurs during construction.

#### **Will the line impact aerial spraying practices?**

- The project team has and will continue to collaborate with owners and operators of local airstrips as well as appropriate state associations to better understand the impacts that a transmission line might have to aerial spraying.
- In order to minimize impacts to runways, Clean Line has asked for information on private runways during its outreach efforts and has utilized the additional information as criteria in identifying potential routes.
- Clean Line will work with landowners concerned about potential interference with aerial application. To minimize potential interference, potential routes for the Grain Belt Express Clean Line may be identified along existing divisions of land and/or located in parallel to existing aerial obstructions (such as other transmission lines) to the extent practicable.
- Clean Line plans to supply the applicable state associations with GPS coordinates for the transmission structures in all states the project will traverse.

#### **What will Clean Line pay if trees must be removed?**

- Although forested areas comprise a small percentage of the project study area, the route is likely to encounter some forested areas, and Clean Line will compensate for commercially marketable timber that is taken down as a result of construction and maintenance of the line.

#### **Will even the small trees have to be removed? Can landowners keep the wood?**

- Trees and other vertical vegetation over 10 feet will need to be cleared and managed based on potential safety and reliability concerns. Landowners will be given the option to keep the wood.

#### **Will you be on public land or private land?**

- Land acquisition for a project of this size in this part of the country may involve both private and public land; however, our project will pass through primarily private ROW, as most of the land along our potential routes is private.

### **What if damages occur to fencing or other property during construction or maintenance?**

- Clean Line will either repair or compensate landowners for any damages to improvements, such as fences, incurred as a result of construction or maintenance on their property.

### **Will homes be located within the easement?**

- No. In order to comply with National Electrical Safety Code requirements and good utility practice, structures may not be located within transmission line easements.

### **How close can you be to a home? Can any structure be within your ROW?**

- Clean Line will attempt to identify potential routes as far from homes as possible, while also taking into account our other routing criteria.
- Safety and reliability requirements establish minimum clearance distances between the conductors and any structures. Habitable structures are not allowed within the right-of-way.

## **ROUTING**

### **Where will the Grain Belt Express be located?**

- The Grain Belt Express transmission project will originate in western Kansas and end near Sullivan, Indiana.
- An intermediate converter station will be located in eastern Missouri, and will interconnect with the existing AC grid to deliver power to customers in Missouri and Illinois.

### **How do you decide the specific route your line will follow?**

- Clean Line is committed to siting the Grain Belt Express Clean Line in a way that minimizes the overall effect of the transmission line on the natural and human environment while avoiding unreasonable and circuitous routes, unreasonable costs, and special design requirements.
- Clean Line works with a wide range of interested parties to develop potential routes and select a proposed route for the Grain Belt Express Clean Line.
- We conduct extensive public outreach involving local residents and agency representatives, and we believe that such a process, seeking input from those affected by the project, is critical to the ultimate success of the Grain Belt Express Clean Line.

### **Will you route the line along existing transmission lines, roads, section lines, or other property lines?**

- Routing along existing linear infrastructure (such as other transmission lines, roads, and pipelines) or property lines is widely accepted as a best practice because it helps to minimize new fragmentation of existing land use and habitats; however, we must balance that with the potential impacts on land use in the area and other considerations.

### **Will you build within other transmission lines or utility rights-of-way?**

- When paralleling existing transmission lines, our right-of-way would typically be adjacent to (but not overlapping) the existing rights-of-way. When doing so, Clean Line will maintain safety clearances as dictated by the National Electrical Safety Code and applicable state and local codes.

### **Are there any issues with crossing existing transmission lines?**

- No. While engineering is needed, there are no prohibitive issues with crossing existing transmission lines.

- Generally, our conductors will be higher voltage and cross above existing lines (higher voltage lines are on top, generally). Crossing locations will be determined in coordination with the owners of the existing infrastructure and applicable regulations.

**What impacts do you anticipate to birds/other species?**

- We will seek to avoid and minimize impacts to wildlife habitat; our routing and siting process takes into account sensitive environmental areas and habitats. Clean Line will develop an Avian Protection Plan for each project that describes measures to reduce adverse impacts to birds.

**Do landowners have any say where the structures are placed within their easements?**

- Clean Line will take landowner feedback into consideration when determining structure placements. Easement agreements will be negotiated individually with each landowner and will consider many factors including, but not limited to:
  - Existing uses of the land (e.g., crops vs. grazing vs. forested),
  - Type and number of structures that will be placed on the land,
  - The requirement for future access rights to the land, and
  - Environmental conditions