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IOWA UTILITIES BOARD

STATE OF IOWA
DEPARTMENT OF COMMERCE
BEFORE THE IOWA UTILITIES BOARD

IN RE:	:	
HIGH VOLTAGE TRANSMISSION PROJECTS	:	**DOCKET NO. NOI-2011-0002**

REPLY COMMENTS OF CLEAN LINE ENERGY PARTNERS LLC

COMES NOW Clean Line Energy Partners LLC ("Clean Line"), and by way of response to the Iowa Utilities Board ("Board") "Order Opening Inquiry on High-Voltage Transmission Projects and Soliciting Comments" (the "NOI"), submits its Reply Comments. Clean Line responds below to the comments and questions of the Environmental Law & Policy Center of the Midwest, Iowa Environmental Council, Iowa Association of Municipal Utilities, Interstate Power and Light, and the Sierra Club Iowa Chapter.

I. Clean Line's response to comments of the Environmental Law & Policy Center of the Midwest (ELPC) and the Iowa Environmental Council (IEC):

ELPC and IEC pose four questions in their filing that are relevant to Rock Island Clean Line. Clean Line responds to these below.

A. <u>Will any of the lines currently contemplated prolong the life of any coal plants in Iowa or beyond?</u>

Clean Line's business model is to sell capacity on the line to developers or purchasers of new renewable energy generation built in response to the transmission capacity created by our line. Clean Line has selected O'Brien County as the windward endpoint for our line because it is in the geographic center of Iowa's best wind resources, and this location will best facilitate the development of new high capacity factor wind generation. Additionally, O'Brien County has a preexisting 345 kV line that the Rock Island Clean Line will be able to tap into in order to ensure a robust conversion process. Given the location of the converter station, the expectation is that primarily wind farms will connect to the converter station, and the capacity on the Rock Island Clean Line will be purchased by such wind farms or the purchasers of the output from the wind farms. Given that all coal plants in Iowa are in utility rate-base, it is unclear how it would be prudent for a rate-based plant in Iowa to reserve firm capacity on the Rock Island Clean Line to

export energy to PJM. Thus, utilization of the Rock Island Clean Line by existing hydro, nuclear, coal, gas, and wind plants in MISO (and on the WAPA system) would likely be via secondary capacity markets (use of capacity of the line when wind farms are not using their capacity), and would likely be limited by available capacity on the existing single-circuit 345 kV line (while it is certainly possible for an existing coal plant to build a new interconnection to the Rock Island Clean Line, it is unlikely to be economic for these facilities to build a new interconnection to the Rock Island Clean Line for use of capacity in the secondary market only).

B. How many MW of non-renewable energy will be delivered by each line?

The answer to part A above is the most precise answer available.

C. Could construction of the lines be avoided by increasing energy efficiency and demand response programs at a lower cost?

The purpose of the Rock Island Clean Line project is to support high volume penetration (over 15,000 GWh per year) of location-constrained renewable resources to far away markets that lack access to cost effective, abundant supplies of renewable energy. While increased use of energy efficiency and demand response might allow some modest increase in available transfer capacity for renewable energy from Iowa to eastern markets and can certainly be studied by Iowa policymakers, there is no credible plan or method to allow the export of 15,000 GWh per year of renewables on the existing transmission grid in Iowa. The existing transmission grid in Iowa was built primarily to help local generation serve local customers, not to support export markets in large scale.

The need for new transmission to meet high renewable energy penetrations in the Eastern Interconnection was initially studied in the Joint Coordinated System Plan 2008, where HVDC lines were identified as the appropriate means to move large amounts of power. The issue was studied again in the National Renewable Energy Laboratory's ("NREL") *Eastern Wind Integration and Transmission Study*, 2010, ("EWITS").[1] The NREL study found that all wind energy penetration scenarios at 20% to 30%, as well as a reference scenario (which modeled only the state renewable energy standards at that time), required major new transmission investment.

Transmission of wind energy across long distances allows for the natural geographic variability of wind to reduce wind integration costs through the blending of distant and low-correlated wind resources. Please see Table 1 on the different correlations between the highest capacity factor wind sites in a number of different states in the Eastern Interconnection.

[1] The Joint Coordinated System Plan 2008 Executive Summary, and NREL's *Eastern Wind Integration and Transmission Study,* or "EWITS" are attached, respectively, as Exhibits A and B.

Demand response programs generally exist to shave peak demand usage, especially during periods when the transmission system is overstressed, and to avoid the use of more expensive peaking power. The integration of clean, renewable energy resources will help diversify our country's generation fleet and also provide the opportunity to retire older, less efficient fossil plants that are currently providing the energy supply for that portion of demand that is not able to be responsive.

Energy efficiency programs have the potential of reducing energy usage. Energy efficiency programs will help meet some of the growing energy needs but the expected level of growth along with a desire to reduce environmental impacts provides for an overwhelming, continual need for more renewable energy sources. Demand response and energy efficiency programs, therefore, are not a replacement for, but are complementary to, transmission infrastructure investments that support an increase in penetrations of renewable energy sources.

	KS	IA	IL	IN	PA
KS		0.37	0.09	0.03	.00
IA	0.37		0.19	0.07	.02
IL	0.09	0.19		0.75	.15
IN	0.03	0.07	0.75		.19
PA	.00	.02	.15	.19	

Low correlation
Medium correlation
High correlation

1. "Low correlation": between 0.0 and 0.2; "Medium correlation": between 0.2 and 0.5; "High correlation": between 0.5 and 1.0
Source: EWITS; Clean Line analysis

Table 1: Correlation of Highest Capacity Factor Wind Sites in Five States

D. <u>Do transmission proponents intend to engage stakeholders in the planning, siting, and routing processes beyond the meeting and notice requirements of 199 IAC 11.4-11.5?</u>

Rock Island Clean Line's preferred route development process, including extensive public, government agency and non-governmental organizational outreach, is considerably more extensive than what is required under Iowa law. The Rock Island Clean Line process consists of four key stages of development—a project area stage, a study corridor stage, a route alternative stage, and the final selection of the preferred route — with appropriate outreach and data collection efforts at each stage.

At the initial project area stage, Clean Line reached out to state and county agencies as well as to conservation organizations and others to gather data about areas of concern and areas of opportunity related to siting the Rock Island Clean Line. The data requests related to a wide array of criteria, encompassing cultural and historical resources, locations of schools and other institutions, wildlife habitats and conservation concerns, and other types of data. Clean Line also conducted numerous community roundtable meetings to collect feedback from local planners, engineers and conservation officials, among others. With all of that input, Clean Line developed draft study corridors, which sought to exclude, to the best extent possible, key areas of concern such as large population centers and highly sensitive environmental areas (a large linear project cannot, by definition, always avoid some community and environmental concerns such as river crossings, but can attempt to select relatively lower-impact alternatives). These study corridors, typically three to ten miles wide, were then made fully public and available for review and comment by any party, including individual landowners invited to public open houses, state and local government agencies, conservation and agricultural organizations, and others. To carry out this effort, Clean Line hosted 20 open houses across Iowa to introduce the project and collect feedback, inviting tens of thousands of landowners, residents and other stakeholders that live or have an interest in the study corridor area.

Clean Line has now developed alternative routes, a series of several interrelated routes, typically each half a mile in width, and has made these much narrower alternative routes available to governmental agencies and various other organizations for their review and input.[2] Based on additional consultations and data review, Clean Line will develop a final preferred route, potentially with alternatives remaining in several shorter portions of the route, and will commence the process of sharing the route(s) with the public at the official informational meetings as required by Iowa law. Following those informational meetings and final

[2] To avoid running afoul of Iowa regulations restricting negotiations with actual route landowners until after the official informational meetings are held, these alternative routes have not been made available to the general public; this is in contrast to Clean Line's Illinois process, where the alternative routes have been made available to the general public at this stage.

adjustments to the route based on those meetings, the preferred route will be filed with the Board for approval.

While siting long-distance linear infrastructure projects will always be a difficult task and no such project is without its adverse impacts, Clean Line believes that the extensive and transparent process it has conducted is the most reasonable method to select a preferred route for the Rock Island Clean Line.

II. Clean Line's response to comments of the Iowa Association of Municipal Utilities (IAMU):

The IAMU made the following statement in relation to merchant transmission projects.

> For high-voltage DC merchant transmission proposed by Wind On Rails and by Clean Line Energy Partners, for example, we are concerned that the analyses have not included costs for the lower-voltage facilities that will also be needed. Those lower voltage facilities would not qualify for MVP treatment, so the costs could be allocated unfairly to Iowa customers. Also, the HVDC plans have not been vetted by the MISO MTEP process, and clearly should be if they in any way affect costs within the MISO footprint.

On the subject of the MISO MTEP process, Clean Line wishes to clarify that it is appropriately engaged in the MTEP process. Below is a portion of the answer that was submitted in Clean Line's initial filing in response to question 3A:

> Clean Line has made progress in the interconnection process for the terminals at both ends of the line. At the western end of the project, Clean Line began discussions with MISO in February of 2010 regarding necessary studies to ensure that electric reliability is maintained. We expect that the Rock Island Clean Line will be studied in MTEP 2012 under a "no harm study." Because we are not in an interconnection queue within MISO, the stages of the MISO planning process detailed above may not be applicable to this Project. Interconnection studies that have progressed within PJM will require coordination with MISO and these discussions will ultimately lead to the "no harm study" as discussed above.[3]

Clean Line currently anticipates that a 345 kV collector system will be built by either Clean Line or its customers to ensure a robust connection for wind plants trying to interconnect to its western converter station. Lower voltage lines built to route power from these wind plants to our collection points will be permitted and built exclusively for generation access to the

[3] See Rock Island Clean Line LLC's filing in response to the Notice of Inquiry, October 3, 2011, pages 14-15.

converter station. Clean Line has not sought, nor do we have a current intention to seek, cost allocation by MISO for these radial lines. Clean Line does not believe it likely that these lines would be selected by MISO for final approval as MVP lines per MISO's current rules. Under current business paradigms, Clean Line's customers would bear the costs of the lower voltage radial facilities both directly in their project costs and/or in Clean Line's tariff. If, in the future, RTO rules regarding inter-regional cost allocation change, then Clean Line reserves the right to reassess our business model.

III. Clean Line's response to comments by Interstate Power and Light (IPL)

IPL raises two basic issues in their comments, one concerning costs to MISO should MISO assume functional control of the Rock Island Clean Line project and the other relating to general cost allocation potential for the project to MISO.

A. Functional Control of the Line

On the issue of which RTO will ultimately have functional control over the Project, IPL writes:

> [T]he October 3, 2011, filing by Rock Island Clean Line suggests there is the potential to increase IPL's transmission costs to its customers and this is concerning. The October 3, 2011, filing by Rock Island Clean Line states that the line may be under the functional control of MISO. IPL does not believe that this project is being built to benefit MISO, and therefore, is opposed to any additional costs associated with MISO's functional control of the facility being spread to MISO customers, including IPL**.** The only way IPL would support MISO's functional control over the Rock Island Clean Line project would be if there was a measurable benefit to the MISO footprint. But the Rock Island Clean Line project's benefits must be demonstrated to be in excess of the additional costs associated with MISO's functional control.

The Rock Island Clean Line project is in the PJM merchant transmission queue and plans to deliver, in the normal operation of the line, exclusively to PJM (although the line would, for emergency operations or general reliability purposes, have the significant and valuable ability to reverse the direction of flow to the West, into MISO, if needed in an emergency). To avoid seams issues and for other reasons, our expectation is that PJM will be the RTO selected to operate the Rock Island Clean Line. That reasonable expectation notwithstanding, the ultimate decision as to whether the line will be operated by MISO or PJM will be the result of discussions between Clean Line, MISO and PJM that have yet to occur and cannot be fully predicted. Clean Line cannot make an assertion on the question of which RTO will operate the line at this point.

Clean Line finds it reasonable for IPL to assert that MISO's functional control over the project would only make sense if there was a measurable benefit to the MISO footprint and that the benefits of the project in that scenario should be in excess of the additional costs associated with MISO's functional control.

B. <u>Cost Allocation</u>

On the subject of cost-allocation, IPL writes:

> The October 3, 2011, filing by Rock Island Clean Line also stated that "Clean Line will file to obtain approval for negotiated rate authority and will seek to execute contracts with individual capacity customers; or, in the alternative, depending on the ongoing evolution of RTO planning and cost-allocation processes will proceed to through the regional planning mechanisms for cost allocation." The project is currently being described as having costs paid for by the users/subscribers of the line, and therefore, IPL does not believe an alternative cost allocation is appropriate for the type and design of the Rock Island Clean Line project. . . .
>
> In addition, FERC Order 1000 mandates development of cost allocation methodologies for new regional and inter-regional projects, ensuring that allocated costs are commensurate with benefits. At the current time, IPL does not believe that any such type of inter-regional allocation would align with how the Rock Island Clean Line design project is currently being portrayed.

With respect to potential cost-allocation to MISO, similar to the discussion above raised by the IAMU regarding the radial lines feeding the western converter station, Clean Line does not believe that the Rock Island Clean Line HVDC project itself would be selected by MISO for final approval as an MVP line per MISO's current rules. Clean Line has not sought, and nor do we have a current intention to seek, cost allocation by MISO for the project in either the MVP or the MTEP process. If, in the future, MISO's rules regarding MVP designation change, or if rules regarding inter-regional project cost allocation evolve under FERC Order 1000, then Clean Line reserves the right to reassess its business model and potentially to seek cost allocation to MISO, if some portion of the benefits of the project to MISO are found to meet or exceed appropriate benefit/cost ratios. Clean Line has no choice but to reserve this right, because if future rules do allow for such cost allocation, Clean Line would face a competitive disadvantage relative to other projects were it not to seek cost recovery for any potential benefits.

With respect to cost allocation to PJM, PJM has recently undertaken an extensive stakeholder process to consider changes to its overall transmission planning and cost allocation methodology. This stakeholder process has been convening a task force known as the PJM Regional Planning Process Task Force (RPPTF). Information and documents relating to this task

force can be found on PJM's website at: http://www.pjm.com/committees-and-groups/task-forces.aspx

In September, PJM released a white paper for the consideration of this task force. The White Paper laid out a number of potential new approaches for the Regional Transmission Expansion Plan (RTEP) process that would move beyond PJM's traditional bright-line reliability and economic tests for transmission expansion projects.[4]

In the White Paper, one potential future method for decision making and cost-allocation known as the Critical Mass Approach is raised. The Critical Mass Approach is characterized by consideration of the separate reliability, economic, state policy, and generator access benefits of any new project, and possible inclusion of projects in RTEP due to the aggregate benefit, regardless of whether the projects meet any of the individual "bright line" tests traditionally utilized by PJM in its RTEP analyses (*i.e.*, reliability and economic criteria).

Clean Line has not at this point advocated for any changes to the PJM planning process in general or to the merchant transmission process specifically. If changes such as those discussed above are seriously considered for adoption by PJM, Clean Line will work to make sure that the competitive posture of merchant projects is in no way undermined by such developments, and would potentially seek to allocate costs to PJM when consistent with appropriate identified benefits.

Similarly, in addition to the approaches already being considered by PJM, future discussions regarding the development of regional and inter-regional compliance filings with FERC pursuant to Order No. 1000 may necessitate consideration of methods to appropriately allocate costs of merchant projects like Rock Island Clean Line commensurate with the benefits engendered by the project.

IV. Clean Line's response to comments by the Sierra Club Iowa Chapter

While the issues raised by the Sierra Club Iowa Chapter are raised multiple times in its comments, Clean Line's replies to each of the following substantive issues raised by the Sierra Club Iowa Chapter:

- The need for additional renewable energy development and related transmission infrastructure;
- Preferences for renewable energy on new transmission projects;
- Cost allocation and regional planning;

[4] See PJM "RPPTF White Paper: Enhancing PJM's RTEP Protocol," September 23, 2011, attached as Exhibit C.

- Advantages of AC and DC systems; and
- Environmentally responsible siting practices.

A. <u>The need for additional renewable energy development and related transmission infrastructure</u>

The introductory section of the Sierra Club filing provides some supportive comments relevant to the purposes of the Rock Island Clean Line project, including: "Full utilization of Iowa's wind potential is critical to moving Iowa and the region beyond dirty energy, and increased transmission capacity is necessary to achieve that goal," and "[a]n integrated grid with geographically dispersed solar and wind resources will ensure reliability across the grid even when the wind slows at specific locations or the sun is not shining." Clean Line appreciates the support of renewable energy development provided by the Sierra Club as well as the recognition that additional transmission capacity in support of future renewable energy development is necessary in Iowa.

B. <u>Preferences for renewable energy on new transmission projects:</u>

At page 4 of its comments, the Sierra Club states: "It is unclear how Clean Line can emphasize wind energy transmission when it is not allowed to discriminate against non-renewable sources of energy because of FERC's Open Access Transmission Tariff."

On November 9, 2011, Rock Island Clean Line filed a request with Federal Energy Regulatory Commission for authorization to sell transmission services at negotiated rates and to sell up to 75% of its capacity to anchor tenants, with the remainder being sold through an open season.[5] Consistent with the purpose of the project to move location-constrained renewable energy resources to customers that need the power, Clean Line also sought authority to provide a preference for renewable energy during the Open Season for the project. In this context, Clean Line does not believe the preference for renewable energy to be unduly discriminatory.

Additionally, as a practical matter, Clean Line notes that it has selected O'Brien County as the windward endpoint for our line because it is in the geographic center of Iowa's best wind resources, and this location will best facilitate the development of new high capacity factor wind generation, and thus effectively preference that energy resource.

C. <u>Cost Allocation and Regional Planning:</u>

On page 8, the Sierra Club states: "It does not appear that Clean Line . . . [has] engaged in any regional planning at all with MISO." Later on page 8, the Sierra Club continues –

[5] See Rock Island Clean Line LLC, Docket No. ER12-365-000.

"Recommendation: The Board should not approve transmission projects in Iowa that have not engaged in the MISO regional planning process."

Further, on page 13, the Sierra Club states:

> With respect to Clean Line, because there will only be an on-ramp in western Iowa, with the wind farms radially and exclusively connected to the Clean Line converter station, and no off-ramps in the state, **all** [emphasis supplied] of the electricity will be shipped out of state. In that case, we do not support any cost allocation for the Clean Line transmission lines to be allocated to Iowans, other than to those electricity generators who have access to the dedicated transmission lines. At this point Clean Line has not participated in the MISO planning process and should not be subject to the MISO cost allocations which might allocate costs throughout the region irrespective of who is receiving the benefit of the transmission. DC transmission, because of its limited access to all generators and consumers, must be treated differently in terms of cost allocation.

The twice-stated assertion that Clean Line has not participated in the MISO planning process is simply incorrect. Clean Line's participation in the MISO process was made clear in its initial filing and is also detailed in the response to the IAMU's response above. The recommendation on page 8 is therefore not relevant to the Rock Island Clean Line. Further, FERC Order No. 1000 continues to provide the "option" for merchant transmission developers to participate in regional transmission plans.[6] Merchants are, however, required to provide data and project detail sufficient to determine that subject projects meet reliability criteria specified pursuant to Section 215 of the FPA. For more general discussion of the potential for cost allocation to MISO or PJM, please see Clean Line's response to IPL, above.

The Sierra Club also notes that DC projects should be treated differently than AC projects because of what they characterize as the "more limited nature of interconnections." Clean Line agrees with this last statement; the limited nature of interconnections to a DC line, in the context of FERC open-access rules, is also what makes possible the merchant business model of the Rock Island Clean Line (the limiting of free riders on the line allows the discreet capacity customer model to function). The Rock Island Clean Line project, if proposed as an AC project, would be open to interconnections across Iowa as the Sierra Club suggests. But in that instance, costs would most definitely need to be assigned broadly to Iowans, since a transmission "network" cannot exclude uses or users.

[6] See FERC Order No. 1000, Transmission Planning and Cost Allocation by Transmission Owning and Operating Public Utilities, 136 FERC § 61,051 (2011), ¶ 163-165.

D. <u>Advantages of AC and DC systems:</u>

On page 3 of its comments, the Sierra Club contends that: "The proposed projects cannot adequately serve the interests of Iowans unless . . . lines are AC so they can serve multiple uses going forward." The Sierra Club further contends that "projects that prevent consumption of the renewable energy resource in Iowa should not be seen as in the public interest." Sierra Club Comments, p 4.

Beginning on page 5, the Sierra Club submits the comments of Michael Heyek, Senior Vice President for Transmission, and Evan Wilcox, Transmission Planning Engineer, for American Electric Power. The comments are extensive but conclude that: "In general, HVDC lines are complimentary to, but not a replacement for, a robust AC system." On page 6, the Sierra Club writes:

> Further, line loss on AC lines is becoming less of an issue. There are two recent technologies that reduce the line loss on AC transmission lines. Those technologies are phase angle regulating transformers and a flexible alternating current transmission system. As these technologies enter into the planning and construction of transmission lines, any arguable advantage of DC lines is significantly diminished.

On page 17, the Sierra Club writes:

> The HVDC projects proposed by Clean Line . . . do not appear to offer the affordable and available access to the transmission grid that should be required. Because they are DC lines there are no planned on ramps or off ramps between western Iowa and the Chicago area. When the Sierra Club discussed this issue with a representative of Clean Line, we suggested that their planned line be AC so it could be accessed more easily. Or as another alternative we suggested that another converter station be located in eastern Iowa. Both of those suggestions were rejected.

On page 18, the Sierra Club writes: "A recent analysis considered the efficiency of using DC lines to integrate renewable electricity into the grid," and then includes an excerpt from Crabtree *et al.,* Integrating Renewable Electricity on the Grid, and then concludes "It is not apparent that Clean Line . . . will be superconducting DC lines."

Finally, in the Sierra Club's recommendation on this point on page 19, the Sierra Club concludes: "<u>Recommendation:</u> The Board should ensure that transmission lines constructed in Iowa are part of a well-integrated electric grid that benefits renewable energy producers and consumers in Iowa."

Clean Line agrees with the sentiment of Sierra Club's final recommendation in this section – the Board should ensure that transmission lines constructed in Iowa are part of a well-designed and reliable electric grid that benefits renewable energy producers and consumers in Iowa. The "grid" is the key word here; the Board should make sure that the grid accomplishes both the mission of providing service to renewable energy producers and the mission of providing reliable and cost effective service to consumers in Iowa. But while that is the standard for the grid in Iowa, it should not necessarily be the standard for every individual transmission project in Iowa. Individual projects may serve only one or the other of those purposes and still strongly support the public interest and need. Clean Line additionally contends that neither MISO or PJM nor the interconnecting utilities would ever enter into a transmission interconnection agreement that did not ensure a reliable grid.

Furthermore, in reference to the comments of Heyek and Wilcox, Clean Line strongly agrees that HVDC lines are complementary to, but not a replacement for, a robust AC system. This sentiment is further echoed in a more recent paper attached as Exhibit D (Fleeman, Gutman, Heyek, Bahrman, Normark, "EHV AC and HVDC Transmission Working Together to Integrate Renewable Power," Cigre/IEEE Power & Energy Society, Calgary 2009). This reference also further echoes Clean Lines stance that the most economic means for moving large amounts of power long distances is most efficiently and reliably achieved with HVDC installations.

The question for any individual DC project is whether it is an appropriate complement to the AC system. Worldwide evidence is contrary to the Sierra Club assertions. In China, for example, more than 35,000 MW of HVDC transfer capability exists with another 73,000 MW planned by 2018. The majority of this transfer capability is from very remote yet substantial resource areas, directly to large load centers. In essence, the Chinese example addresses the exact problem Clean Line is working to solve.

Making the determination of whether a DC project is an appropriate compliment to the AC grid requires that the proposed solution be fully vetted and should not be dependent upon generalized comments such as those utilized by the Sierra Club from Mssrs. Heyek and Wilcox. In the quotes submitted by the Sierra Club it is evident that the context of Heyek and Wilcox's comments does not necessarily apply. Clean Line addresses several of these comments below:

On Page 6, Sierra Club quotes Heyek and Wilcox as stating:

> In the case of large-scale renewable integration, generation in one particular location could essentially be connected to one load center through an HVDC line. To fully develop these resources, however, multiple individual lines in multiple directions would be required, with expensive converter stations for each line.

This statement makes the assumption that you cannot integrate large amounts of renewable resources through some sort of AC collector system within a geographically diverse resource. Clean Line's model is such that we can capture a very valuable and diverse resource in the lowest cost production areas through an AC collection system that gathers the resource at the converter station, thus eliminating the need for "expensive converter stations for each line"

On page 6, Sierra Club quotes Heyek and Wilcox as stating:

> [T]here would be little interconnection ability and little benefit to the existing transmission system in between.

It is true that "interconnecting ability" along a DC line is costly, but it is not technically infeasible. The argument that there is "little benefit to the existing system in between" depends on the definition of what one defines as a *benefit*. In fact, due to the complementary nature of HVDC to the AC grid, a DC line does in fact help to protect the intermediate system from undue congestion, can provide stability benefits, and provides a controllable path for the resource to reach load.

Sierra Club, again on page 6, quotes Heyek and Wilcox as stating:

> On-going needs such as maintenance and replacements are much more specialized and thus require a higher level of skill and higher cost than typical AC facilities.

HVDC facilities can clearly be considered to be part of the "Smart Grid" of the future. Clean Line contends that such an application of technology is one that creates more advanced, higher paying jobs in the industry. Additionally, it should be noted that the existing HVDC facilities in the United States have been operating for multiple decades and have, in many cases, received upgrades that have further improved their performance and value to the system as newer technology in monitoring and controls became available; this is unlikely in AC without the addition of new lines. Also, in reality, the primary difference between an AC substation and an HVDC converter station is the addition of the valve hall. The converter valves are simple power electronic devices that require relatively minimal maintenance, and it can be argued that this is a very small incremental amount of maintenance when compared to the amount of power that can be transferred on a single HVDC facility versus multiple AC facilities.

On page 6, again, Sierra Club quotes Heyek and Wilcox as stating:

> A system based on HVDC lines would lack the benefits of generation resource sharing, geographic diversification, and the ability to easily and economically connect future generators along the way.

Again, Clean Line argues that the determination of a "complementary" project needs to look at that particular project and not assume generalizations based upon certain aspects of the technology. This approach is evident in the Freeman, *et. al.,* paper attached as Exhibit D. The fact that Clean Line's plan is to have a collector system that gathers the absolute best wind resources, the fact that those resources have a geographic diversity from other resources in the Rock Island Clean Line delivery region, and the fact that HVDC is completely controllable in essence negates this statement. Clean Line agrees that a bulk electric grid based solely on multiple HVDC lines from resource to load would have some of these issues; however, the project that is being proposed by Clean Line is, in fact, an integrated project.

Generally, with reference to the strong statements of support for renewable energy development and the need for new transmission in the introductory section, and to the points made earlier in this section, Clean Line finds some of the Sierra Club comments related to technology choice to be mutually inconsistent. In particular the statement on page 3 that all projects should be AC is clearly inconsistent with the desire for a balanced and complementary grid system serving multiple purposes. As shown in Table 1 above, wind power curve correlations tend to be lower between sites that are separated by great distances, and because of the higher efficiency advantages of HVDC technology, HVDC is the technology of choice for long distance power integration. This has been shown clearly in studies such as the JCSP and EWITS (Exhibits A and B). HVDC thus complements the cost-effectiveness of voltage transformations in the underlying AC system. With respect to the Sierra Club's comment on page 4 regarding projects that "prevent" consumption of the renewable energy resources in Iowa, Clean Line notes there is nothing about the proposed Rock Island project that prevents the consumption of renewable energy via any other projects and the rest of the electric grid in the state. The question again is one of whether the same tests should be applied to each individual project as are applied to an entire optimized grid system.

As noted in Figure 3 in our initial comments ("Iowa high capacity wind potential vs. electric demand"), Iowa's wind resource is many multiples larger than Iowa's demand could possibly require. As a practical matter, it is the lack of high-capacity export lines that prevent the utilization of Iowa's wind resource, not their potential presence. Just as Iowa's corn, soy, and hog production are many multiples larger than Iowa's consumption, and their economic value to the state is therefore dependent on the availability of export markets, so too is the economic value of Iowa's wind resource dependent on export market availability. Additionally, in relation to the Sierra Club comments on page 3, improving access to export markets for wind is in the public interest.

On page 6, the Sierra Club writes that with pending technology change, losses on the AC system are becoming less of an issue, and on page 17, the Sierra Club notes that Clean Line's

representative rejected the proposal to switch to AC technology. In contrast, however, to Clean Line's initial filing, which provided numeric estimates of the higher efficiency potential of DC lines relative to AC lines, the Sierra Club provides no empirical evidence to support the assertion that "any arguable advantage of DC lines is significantly diminished." The high efficiency of HVDC is a key foundation to the overall economics of the Rock Island Clean Line project and cannot simply be disregarded without evidence. Furthermore, the technologies for AC transmission (Phase Angle Regulators and Flexible AC Transmission Systems or "FACTS") that are mentioned by the Sierra Club do not, in fact, change the real power loss profile for AC transmission lines but rather perform functions to allow a more controllable flow of power and/or provide solutions to reactive power limitations. These AC solutions are very important to maintain reliability in certain scenarios; however, the addition of these devices will not allow for an AC transmission line over 400 miles in length to transmit a similar amount of power as an HVDC line.

Similarly, due to the high cost of additional converter stations, and because Iowa's most cost-effective wind energy resource is found in the northwest portion of the state, Clean Line finds no evidence to economically justify the addition of another converter station to the project.

On page 18, the Sierra Club cites the work of Crabtree, *et al.,* Integrating Renewable Electricity on the Grid, 2010, and attaches the study as Exhibit 6. The Sierra Club's purpose is not entirely clear, but they appear to be encouraging Clean Line to make use of superconducting technology. Careful review of the article as provided in the Sierra Club's Exhibit 6, however, reveals that the recommendation of Crabtree in this paper is actually for a 10 year U.S. Department of Energy research program, not for any requirements for immediate deployment for projects well into their development cycle. As found in page 6:

> Recommendations on Long Distance Transmission
>
> DOE should:
>
> - Extend or replace the Office of Electricity program on High Temperature Superconductivity for a period of 10 years, with a focus on DC superconducting cables for long distance transmission of renewable electricity from source to market; and
> - Accelerate R&D on wide band gap power electronics for controlling power flow on the grid, including alternating to direct current conversion options and development of semiconductor-based circuit breakers operating at 200 kV and 50 kA with microsecond response time.

Furthermore, on page 16, in the full discussion of the "Direct Current Transmission Options" section, Crabtree discusses the siting difficulties of overhead transmission and load losses and continues:

> Despite these drawbacks, conventional high voltage DC transmission is a mature technology that can be implemented to meet renewable electricity transmission needs over moderate distances. Additional high voltage DC transmission within one- or two-state regions is needed to link regional renewable electricity sources to population centers.

Clean Line concurs regarding this need, which summarizes the Rock Island Clean Line project purpose succinctly. Clean Line also notes that the article provides no information about the potential costs of such superconducting systems, or the likely commercialization of the technology at scale sufficient to replace existing conductor technology utilized in a mature, commercial HVDC application as proposed by Rock Island Clean Line.

Finally, Sierra Club's extensive discussion of technology choice does not reference the clear land conservation benefits of HVDC technology, which allow for the utilization of a much narrower right of way than HVAC technology of similar voltage and transfer capability. Constructing HVDC transmission lines to complement the existing AC system can substantially minimize land impacts in the course of modernizing the electric grid in Iowa and the nation.

E. <u>Environmentally Responsible Siting Practices:</u>

The Sierra Club argues that transmission siting should avoid or mitigate impacts to natural areas and wildlife corridors, and notes that Clean Line is making a "valid attempt" to avoid or mitigate environmental impact in the routing of our line.

Clean Line appreciates the expression of confidence by the Sierra Club that our company is engaged in serious effort to minimize environmental impacts of the project. A more extensive discussion of the routing process in use by the Rock Island Clean Line is provided in the response to the comments of ELPC and IEC above.

V. Conclusion

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Clean Line Energy Partners LLC appreciates the opportunity to respond to comments and questions made by other parties to this proceeding and will be pleased to respond to additional questions the Board might have.

Respectfully submitted,

CLEAN LINE ENERGY PARTNERS LLC.

By: /s/ Kathryn L. Patton
Kathryn L. Patton
Vice President & General Counsel
Clean Line Energy Partners LLC
1001 McKinney, Suite 700
Houston, Texas 77052
Telephone: (832) 319-6330
Telefax: (832) 310-6311
E-mail: kpatton@cleanlineenergy.com

BELIN MCCORMICK, P.C.

By: /s/ Sheila K. Tipton
Sheila K. Tipton
666 Walnut Street, Suite 2000
Des Moines, Iowa 50309
Telephone: (515) 283-4635
Telefax: (515) 558-0635
E-mail: sktipton@belinmccormick.com

ATTORNEYS FOR CLEAN LINE ENERGY PARTNERS LLC

List of Exhibits

Exhibit A: Joint Combined System Plan 2008, Executive Summary.

Exhibit B: National Renewable Energy Laboratory's ("NREL") *Eastern Wind Integration and Transmission Study*, 2010.

Exhibit C: PJM "RPPTF White Paper: Enhancing PJM's RTEP Protocol," September 23, 2011.

Exhibit D: Fleeman, Gutman, Heyek, Bahrman, Normark, "EHV AC and HVDC Transmission Working Together to Integrate Renewable Power", Cigre/IEEE Power & Energy Society, Calgary 2009.