Exhibit No.:_____
Issues: Negative Impacts to Farming
And Ranching Operations
Witness: Charles E. Kruse
Sponsoring Party: Show-Me Concerned Land Owners
Type of Exhibit: Rebuttal Testimony
Case No.: EA-2014-0207
Date Testimony Prepared: September 15, 2014

BEFORE THE PUBLIC SERVICE COMMISSION
OF THE STATE OF MISSOURI

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

REBUTTAL TESTIMONY OF
CHARLES E. KRUSE
ON BEHALF OF THE
SHOW ME CONCERNED LANDOWNERS

SEPTEMBER 15, 2014

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I. INTRODUCTION AND PURPOSE OF TESTIMONY

Q 1: Please state your name, position and address.

A: My name is Charles E. Kruse. My wife Pam and I are the owner/operators of Charles Kruse Farms, Inc., started in 1976. My address is 1007 Woodland Drive, Dexter, MO 63841.

Q 2: Please describe your experience and qualifications.

A: I am a fourth generation farmer, farming land that my great-grandfather, grandfather, and father farmed before me. I received a BS in Agronomy from Arkansas State University in 1967, and an MS in Agronomy with an emphasis in plant genetics from the University of Missouri in 1974. I served as a Research Agronomist for the University of Missouri Delta Research Center, doing research on soybeans and small grains. I was a Technical Representative for BASF Ag , a world-wide company, providing product information and advice to farmers. I was elected by my peers and served on the Missouri Soybean Merchandising Council. I was appointed by Governor John Ashcroft and served as Director of Agriculture for the State of Missouri. I was recruited and served as the CEO of the North American Equipment Dealers Association, made up of agriculture and construction equipment dealers in the US and Canada. I was elected for 9 two-year terms by the membership of Missouri Farm Bureau to serve as State President, retiring in December, 2010. During that time I served on both the American Farm Bureau Board of Directors and the American Farm Bureau Executive Committee. I received the Distinguished Alumni Award from both Arkansas State University and the University of Missouri. I also received the Outstanding Service to Agriculture Award from the

Missouri Farm Bureau, and the Distinguished Service Award from the American Farm Bureau.

Q 3: On whose behalf are you appearing in this proceeding?

A: I am appearing on behalf of the Show Me Concerned Landowners.

Q 4: Please describe the scope and purpose of your testimony.

A: This proceeding addresses the application of Grain Belt Express Clean Line LLC (Grain Belt) for a certificate of convenience and necessity authorizing it to construct, own, operate, control, manage, and maintain a high voltage, direct current (DC) transmission line and an associated converter station providing an interconnection on the Maywood—Montgomery 345 kV transmission line. For purposes of this proceeding, I will rebut Grain Belt witness Anthony Galli's testimony regarding how the Grain Belt Express project could impact farming operations as well as discuss other issues regarding the negative impacts to farming and land as a result of large transmission projects like the Grain Belt project. Specifically I will address the following negative impacts: (A) Compaction of Soil; (B) Irrigation Equipment Interference; (C) Difficulty in Aerial Applications to Crops and Pastures; (D) Possible GPS Interference; (E) Problems Maneuvering Large Farm Equipment around Towers; (F) Precision Farming Problems; (G) Concerns about Storm Recovery; and (H) Eminent Domain.

II. Issues Regarding The Negative Impacts To Farming and Ranching Operations

A. Introduction

Q 5: Did you review any materials about the Grain Belt project for your testimony?

Yes. I reviewed information from Grain Belt's website at http://www.grainbeltexpresscleanline.com/site/home . Attached as Schedule CEK-1 are some

pages from the website concerning the overview of the project, the Missouri proposed route, and transmission line structures. In addition, I viewed a video of the Rock Island Clean Line Construction Simulation at http://www.cleanlineenergy.com/video/video/rock-island-clean-line-construction-simulation . Attached as Schedule CEK-2 are some screen shots of that video showing the types of construction equipment and transmission towers that will be used for the project.

Q 6: What are some of the negative impacts to farming and land as a result of the placement of transmission line structures?

A: A study done by the Public Service Commission of Wisconsin in July, 2013, entitled, "Environmental Impacts of Transmission Lines,"[1] stated that the placement of transmission structures can cause the following agricultural and non-agricultural impacts:

- Aesthetics
- Agricultural Lands
- Airports and Airstrips
- Archeological and Historical Resources
- Cultural Concerns
- Electric and Magnetic Fields (EMF)
- Endangered/Threatened and Protected Species
- Implantable Medical Devices and Pacemakers
- Invasive Species

[1] See Schedule CEK-3, page 1.

- Noise and Light Impacts
- Property Owner issues
- Recreation Areas
- Safety
- Stray Voltage
- Water Resources
- Wetlands
- Woodlands

Under the Agricultural Lands section of the report, it lists the following negative impacts:

- Create problems for turning field machinery and maintaining efficient fieldwork patterns;
- Increase soil erosion by requiring the removal of windbreaks that were planted along field edges or between fields;
- Create opportunities for weed and other pest encroachment;
- Compact soils and damage drain tiles;
- Result in safety hazards due to pole and guy wire placement;
- Hinder or prevent aerial spraying or seeding activities by planes and helicopters;
- Interfere with moving irrigation equipment;

- Hinder future consolidation of farm fields or subdividing land for residential development.[2]

From my experience, all of the issues cited by the Wisconsin Commission report are valid, although the report does not identify all of the negative impacts associated with transmission structures. My testimony will address the issues I identified in my answer to question 4 above, many of which are referenced in the Wisconsin Commission report.

B. Compaction of Soil

Q 7: What is compaction of soil?

A: Soil compaction is the physical consolidation of the soil by an applied force that destroys structure, reduces porosity, limits water and air infiltration, increases resistance to root penetration, and often results in reduced crop yields.

Q 8: Why is soil compaction a problem for farming and land?

A: Compaction effects on crop yields can be a significant factor in today's farm economy and is a very serious problem in Agriculture today. Farmers and Ranchers spend a lot of time and money to prevent soil compaction from adversely affecting their crops and pastures. Soil compaction can result in stunted growth of plants; impede the uptake of plant nutrients, and have an adverse effect on plant growth and development.

Q 9: What causes soil compaction?

A: Heavy machines and equipment are the main cause of soil compaction. Soil compaction is made much worse by heavy equipment moving over the land, and when the equipment is used during wet conditions, the compaction issues become much worse.

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[2] See Schedule CEK-3, attached, page 8.

Q 10: Will the Grain Belt Project cause compaction of soil?

A: Yes, it will. Due to the size of the structures, Grain Belt will have to use very large and very heavy equipment to construct and maintian the towers and infrastructure. In the Rock Island Clean Line construction simulation video that I viewed on Clean Line's website, the construction equipment mentioned were Augers, Excavators, Cranes, and Material and Concrete Hauling Trucks. The video also shows smaller trucks, vehicles and wire stringing equipment. Grain Belt will have to pour tons and tons of concrete to set its transmission towers in a farmer's field. If a concrete truck is carrying 10 cubic yards, then the weight of the concrete is 40,000 pounds. The truck will weigh approximately 26,000 pounds for a total weight of 66,000 pounds.[3] It can be reasonably expected that it would take several concrete trucks per tower to supply all the concrete needed for one tower.

Without question, if this project were to move ahead, there would be very significant soil compaction, both due to the heavy equipment moving over the land, and the disregard for wet soil conditions that would make soil compaction much worse. Following is an example of damage to land during power line work during wet conditions:[4]

[3] See Schedule CEK-4, attached, page 2.
[4] See Schedule CEK-3, attached, page 9.

The Wisconsin report states the following on soil compaction:

"Soil mixing, erosion, rutting, and compaction are interrelated impacts commonly associated with transmission construction and can greatly affect future crop yields. Soils may be mixed during the excavation of pole foundations or during the undergrounding of electrical lines. The excavation depth for transmission structure foundations can vary greatly, but in some projects may be more than 50 feet deep. Excavated parent material or subsoils should not be mixed with topsoils and spread on the surface of the ROW [Right of Way]. Significant rutting can occur when soils become saturated or in areas of sensitive soils (see Figure 3). This may impact agricultural lands by increasing the mixing of soils, eroding topsoils during rain events, and compacting soils. The degree to which soils are compacted by heavy construction equipment again depends on the type of soil and its saturation level. Ineffective erosion controls may wash valuable topsoils downhill and impact wetlands and waterways.

Agricultural soils that have been improperly protected or mitigated may suffer decreased yields for several years after the construction of the transmission line is completed."[5] (emphasis added).

In some areas, the compaction problems for landowners could last for years, and in some areas, the damage may be permanent.

C. Irrigation Equipment Interference

Q 11: What is irrigation?

A: Irrigation is the artificial application of water to the land or soil. It is used to assist in the growing of agricultural crops, maintenance of landscapes, and revegetation of disturbed soils in dry areas and during periods of inadequate rainfall.

Q 12: Is irrigation of farm land used extensively in Missouri?

A: Irrigation, out of necessity, has become much more prevalent over the past several years. In Missouri, the two most prevalent types of irrigation are flood irrigation and center pivot irrigation. With flood irrigation, the land is shaped so there is a slight grade, and the irrigation water is then run between the rows of crop. With center pivot irrigation, a large structure moves in a circle around the field, distributing water on the crop as it moves.

Q 13: What kind of irrigation is used for the land along the proposed transmission route?

A: The proposed route for Grain Belt has land that, because of topography, is much more conducive to center pivot irrigation. The structures that are being proposed by Grain Belt

[5] *Id.* at page 8.

would make it an impossibility to irrigate the fields impacted by Grain Belt structures. In my opinion, timely moisture is the greatest variable to maximizing crop production. The inability to irrigate as a result of the Grain Belt structures would dramatically reduce the potential for this land, thereby reducing the land value significantly, as a result of the diminished productivity potential.

D. Difficulty In Aerial Applications To Crops And Pastures

Q 14: What are aerial applications?

A: Aerial application is often the most efficient and most economical way to apply crop protection products, fertilizer and even seed to grow and protect crops such as corn, soybeans and wheat. Aerial applications in agriculture are increasing every year. Herbicides, fungicides, insecticides, and other materials are applied aerially to a greater extent than ever before.

Q 15: What effects to aerial application can be expected from Grain Belt's structures?

A: While the Grain Belt structures would create obvious hazards for low-level flying, the structures would also create serious impediments to being able to uniformly apply the product, and some areas of the field simply would not be treated. This would adversely impact the potential profit picture for these fields. In the case of severe insect infestations, the untreated areas would allow the insects to thrive, creating the necessity for repeated applications of insecticides as the insects spread over large areas of the fields. As a result, costs would be greater and at the same time, profit potential would be diminished.

E. Possible GPS Interference

Q 16: What is GPS?

A: The Global Positioning System (GPS) is a space-based satellite navigation system that provides location and time information in all weather conditions, anywhere on or near the Earth where there is an unobstructed line of sight to four or more GPS satellites.

Q 17: How is GPS used in farming?

A: Farmers use GPS receivers to record location. This information helps determine how much fertilizer, weed control, and water is needed in various locations of the field. Additional soil analysis combined with market information about predicted crop prices helps farmers decide what is the best crop rotation.

Q 18: How prevalent is the use of GPS in farming operations?

A: Farmers and Ranchers are utilizing GPS at a greater level than ever. GPS is used to guide equipment so that rows are straight and uniform, herbicides are not overlapped, fertilizer applications are uniform with no double-applications or skipped spots. GPS is very important for both row–crop and pasture land.

Q 19: Can there be negative impacts to using GPS for farm operations from structures like Grain Belt will be building on farm and pasture land?

A: Yes it is possible. Whether or not transmission lines interfere with GPS is not completely settled. In 2009, the Wisconsin Department of Agriculture, Trade and Consumer Protection prepared an Agricultural Impact Statement on American Transmission Company, LLC's proposed Rockdale to West Middleton 345 kV transmission line project. GPS was one on the issues studied. On page 54, the report stated:

"The question of whether transmission lines may have an effect on increasingly sophisticated agriculture equipment, including the GPS component of precision agriculture systems, has come up frequently in recent years. Some experts in the field have indicated that they believe that there were no effects of transmission lines on GPS,

but that the issue deserves further investigation. A technician at John Deere stated that his experience suggested that transmission lines do interfere with the GPS signal, as well as stating that this issue should be formally studied and that he would support such a study."[6] (emphasis added).

Later on the study quotes the expert witness testimony by J. Michael Silva for Montana Alberta Tie Ltd., who had done both extensive measurement and theoretical analysis to determine the possibility of transmission line impacts on GPS signals:

"Silva's testimony does leave room for two possible remaining ways that transmission lines could conceivably act to affect GPS-guided equipment. The first case would be if the power line tower physically blocked the line-of-sight between a fixed base station used to provide differential correction to satellite information and a mobile piece of farm equipment, just as a building or a tree might similarly block a satellite signal "depending on the relative instantaneous satellite and user positions." (Silva, 2007, 12) He sees this as highly unlikely.[7] (emphasis added).

And:

"The other method by which GPS might be affected, while speculative, remains worthy of further investigation. This would be through the transmission line being a media for conveyance of higher frequency harmonics of electromagnetic energy that are near to GPS frequencies. 'Performance of GPS can be degraded due to unintentional electromagnetic energy from a variety of sources, especially those that produce higher frequency harmonics near to the GPS frequencies.' (Silva, 2007, 13). Silva sees it as unlikely that harmonics of the

[6] See Schedule CEK-5, attached, page 54.
[7] *Id.* at page 55.

60 Hz. frequency of power lines would be a source of GPS interference. 'A harmonic is an integer multiple of the basic frequency at which a device is designed to operate and it is usually much lower in intensity than the primary frequency. High voltage transmission lines have very little harmonics and would not be a source of interference to GPS.' (Silva, 2007, 13)."[8] (emphasis added).

The report concludes on this issue:

"However, it is documented that radio frequency electric currents are present on transmission lines. These are used for communications and remote control by electric utilities. In addition, there are many high frequency transients present on power lines originating due to switching derived from sources along the line that affect power quality. Where power line carrier (PLC) techniques are used on power lines for telemetry, protective relaying or supervisory control, some studies demonstrate the potential for the field generated 'to degrade navigation signal receiver performance.' (Silva and Whitney, 2002)."[9] (emphasis added).

To be fair, the study did indicate that major interference was unlikely, but importantly that further study was warranted.[10] The fact that fact that some experts indicate that further studies are necessary on the impacts to GPS on large transmission lines demonstrates that Grain Belt cannot conclusively confirm that their structures and DC high voltage line will not interfere with GPS. Given that Grain Belt is asking for eminent domain powers to force landowners against their will to have these structures placed on their land, Grain Belt should be held to a very high standard in demonstrating

[8] *Id.* at page 56.
[9] *Id.*
[10] *Id.*

conclusively that GPS for farming operations will not be adversely affected by their project.

Q 20: On page 25, line 4 of Grain Belt witness Anthony Galli's testimony, he states that "It is extremely unlikely" that the Grain Belt project will interfere with GPS signals. Do you agree?

A: Not necessarily. First, Dr. Galli did not say unequivocally that that Grain Belt's structures would not interfere with GPS signals used by farmers. Second, the fact that there is anecdotal evidence of interference (the John Deere representative cited in the Wisconsin Department of Agriculture, Trade and Consumer Protection report) and that report's conclusion that further studies are warranted show that the science is not settled on this issue. If the studies showing GPS interference is "highly unlikely" are flawed in any way, it can translate into major problems for farmers who actually have to use GPS to make a living. I believe that is why the Wisconsin Department of Agriculture, Trade and Consumer Protection report concluded that more studies are needed on this important topic for farmers.

F. Problems Maneuvering Large Farm Equipment Around Transmission Towers

Q 21: Why is it a problem to maneuver large farm equipment around transmission towers?

A: By necessity, farm equipment continues to get larger. Fifty years ago, a four-row planter was considered large. Today, it is not uncommon for farmers to have 24-row planters or larger. Spray booms can be 120 feet wide. It is not unusual for tillage equipment to be 25-40 feet wide. Combine grain headers can be 45 feet wide. With all the large farming equipment used today, it is a nightmare to try to maneuver around obstacles such as the

ones that Grain Belt is proposing. Looking at the proposed route,[11] a very high percentage of these obstacles would traverse farmland at an angle, which makes the maneuverability problem even worse.

Q 22: What are the effects of the maneuverability problems associated with transmission towers?

A: Farmers will have to take more time and use more fuel to maneuver around these obstacles. This means more expenses, which cuts into the amount of income a farmer can earn.

G. Precision Farming Problems

Q 23: What is precision farming?

A: Precision farming is simply utilizing technology, especially GPS, to apply optimum amounts of fertilizer to small areas of fields based on intensive soil testing instead of applying the same rate of fertilizer to the entire field. Precision farming has become very popular in recent years.

Q 24: Why is precision farming becoming so popular?

A: Precision farming is not only more cost-effective, it also eliminates the practice of over-fertilizing some areas of fields.

Q 25: What effects could the Grain Belt project have on precision farming?

A: A transmission project like the Grain Belt project could make it much more difficult to utilize precision farming practices, due maneuverability problems around the large Grain Belt structures and due to potential interference with GPS.[12] Again, the fact that the

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[11] See Schedule CEK-1, attached, page 3.
[12] See Schedule CEK-5, attached, pages 53-56, and my testimony under II. E. above.

Grain Belt structures would traverse fields at an angle would make precision farming extremely difficult.

H. Storm Recovery Concerns

Q 26: Do you have concerns about how Grain Belt's storm recovery efforts may affect the land?

A: Yes, I do. As much as we would hope that our state never has storms that damage property, that has not, and will not be the case. In the event of a storm that topples some of the Grain Belt structures, agriculture would experience substantial damage. Whether livestock or crops, the potential for significant losses would be high. The immediate loss of crops and livestock would be bad enough, but the moving of large equipment across fields and pastures to recover the structures and lines would cause much greater damage. There is a very high probability that the ground will be very wet and that will, of course, cause many problems—great damage to crops and pastures, severe rutting and soil compaction.

III. Final Comments and Conclusion

Q 27: The studies and documents you have attached as schedules to your testimony indicate that mitigation, remediation, and payments to landowners for damages can compensate the landowner for negative impacts to the land. Do you agree?

A: Yes, but only to a certain extent. Even if Grain Belt will be required to compensate landowners for negative impacts to the land, it has been my experience as a farmer, and as Missouri Farm Bureau President, that in practice such compensation can never be completely adequate. This project will have a permanent negative impact on farming and ranching operations in Missouri for which Grain Belt can never adequately mitigate, remediate, or compensate affected landowners. Furthermore, my understanding is that the Grain Belt project will be so much larger than traditional alternate current (AC)

transmission projects like we have currently in Missouri, both in the size of the structures and the amount of power flowing on the lines. Accordingly, the impacts could be more severe than those that have ever been experienced before in Missouri.

Q 28: Do you have any other comments?

A: Yes. During the time I served as Missouri Farm Bureau President, we saw a lot of abuses of eminent domain. We, as an organization, decided to try to pass stronger eminent domain legislation, which we were successful in doing. One of the aspects of this legislation was that eminent domain could not be used solely for economic development purposes. That part of the law, in my opinion, makes the Grain Belt effort a non-starter. Additionally, eminent domain is supposed to be used in Missouri to further the public good of our citizens. In my opinion, Grain Belt's plan provides at best only a minimal public good that is far outweighed by the negative impacts of this project on the citizens of Missouri. Furthermore, as I understand the project, there are so many unknowns, uncertainties and blanks to be filled in. In the best interests of the people of the State of Missouri, the PSC should deny this permit request. To approve this massive amount of eminent domain for a project like this is unwarranted and unjust.

Q 29: Does this conclude your testimony?

A: Yes, it does.

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AFFIDAVIT OF CHARLES E. KRUSE

STATE OF MISSOURI)
) ss
COUNTY OF Stoddard)

Charles E. Kruse, being first duly sworn on his oath, states:

1. My name is Charles E. Kruse. My wife Pam and I are the owners/operators of Charles Kruse Farms, Inc. My address is 1007 Woodland Drive, Dexter, MO 63841.

2. Attached hereto and made a part hereof for all purposes is my Rebuttal Testimony on behalf of Show Me Concerned Landowners, consisting of 16 pages, all of which have been prepared in written form for introduction into evidence in the above-referenced docket.

3. I hereby swear and affirm that my answers contained in the attached testimony to the questions therein propounded are true and accurate to the best of my knowledge, information and belief.

Charles E. Kruse
Charles E. Kruse

Subscribed and sworn to before me this 8 day of September, 2014.

Robyn M. Shaffer
Notary Public

My commission expires: 1-5-2018

NOTARY PUBLIC NOTARY SEAL STATE OF MISSOURI

ROBYN M. SHAFFER
My Commission Expires
January 5, 2018
Stoddard County
Commission #14440084