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Witness: Robert Cleveland
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Clean Line LLC
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MISSOURI PUBLIC SERVICE COMMISSION

CASE NO. EA-2014-0207

SURREBUTTAL TESTIMONY OF

ROBERT CLEVELAND

ON BEHALF OF

GRAIN BELT EXPRESS CLEAN LINE LLC

October 14, 2014

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1 **I. INTRODUCTION**

2 **Q. Please state your name and business address.**

3 A. My name is Robert Cleveland. My business address is 9665 Chesapeake Drive, Suite
4 435, San Diego, CA 92123.

5 **Q. What is the purpose of this surrebuttal testimony?**

6 A. I am responding issues raised in the rebuttal testimonies of other parties in this
7 proceeding, including witnesses representing Commission Staff, the Missouri
8 Landowners Alliance (“MLA”), and the Eastern Missouri Landowners Alliance, d/b/a
9 Show Me Concerned Landowners (“Show Me”).

10 **Q. Do you intend to adopt the direct testimony of Gary Moland offered in this case?**

11 A. Yes, I do. Mr. Moland resigned his employment at DNV GL in order to accept a new job
12 leading the transmission consulting group at Leidos Engineering.

13 **Q. Are you familiar with the testimony filed by Mr. Moland and the underlying
14 transmission analysis supporting the results in that testimony?**

15 A. Yes. I assisted Mr. Moland in the preparation of his testimony and reviewed all of the
16 model results reported in his testimony. I was deeply involved in the design and review
17 of all model scenarios and results reported in Mr. Moland’s direct testimony.

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

19 A. I am employed by DNV GL as a Senior Project Manager. DNV GL is a leading global
20 engineering consulting company headquartered in Norway. I have been employed by
21 DNV GL since June 2011. I manage projects for DNV GL clients related to the
22 economic planning and simulation of U.S. electricity markets. In this role, I manage
23 consulting engagements including economic benefit analyses for new transmission

1 projects, locational marginal price (“LMP”) forecasting studies, congestion and
2 curtailment risk studies for wind generators, and wind integration studies. I also recently
3 led a project on behalf of an investor owned utility using adjusted production cost
4 (“APC”) analysis to determine the benefits of joining a regional transmission
5 organization (“RTO”).

6 Prior to joining DNV, GL I spent fourteen years working for Ventyx, the vendor
7 of the PROMOD software used by Grain Belt Express in this proceeding. My full
8 Curriculum Vitae is provided in Schedule RC-1 to this testimony.

9 **Q. Please describe your background in performing economic transmission analysis.**

10 A. In my work as a consultant over the last six years, I have performed numerous studies to
11 determine the economic and rate impact of new transmission lines, including projects in
12 MISO, SPP, and PJM. In these studies, I designed and created future scenarios to assess
13 the economic impact of a proposed transmission project or other changes to market
14 fundamentals across a range of market conditions.

15 **Q. Please summarize your surrebuttal testimony.**

16 A. Section II updates the production cost model results presented in Mr. Moland’s direct
17 testimony and presents an additional evaluation metric called adjusted production cost, or
18 APC. Commission Staff witness Sarah Kliethermes recommended that Grain Belt
19 Express provide this additional analysis in order to more completely understand the
20 Project’s impact on electric rates in Missouri. The APC results show that the Project
21 produces a benefit for the state, even when accounting for the potential impact of lower
22 wholesale electric prices on utility revenues.

23 Section III responds to Show Me witness Dr. Michael Proctor, who suggests that

1 locating wind elsewhere in the Midcontinent Independent System Operator (“MISO”)
2 could produce the same benefits to Missouri as the Project. I ran a PROMOD sensitivity
3 to compare the benefits of the Project’s 500 MW wind energy injection in Missouri with
4 locating an equivalent amount of wind generation elsewhere in MISO. The Project yields
5 more benefits to the Missouri than locating wind generation elsewhere.

6 Section IV then responds to other issues raised in intervenor rebuttal testimony.

7 **II. UPDATED PROMOD RESULTS INCLUDING ADJUSTED PRODUCTION**
8 **COST (APC) METRICS**

9 **Q. At page 9 of her rebuttal testimony, Staff witness Sarah Kliethermes states that**
10 **Grain Belt Express should provide additional production cost modeling to include**
11 **the effects on generators owned by Missouri utilities. Have you prepared such an**
12 **analysis?**

13 A. Yes. Using the same assumptions and scenarios described in Mr. Moland’s direct
14 testimony, I reran the model simulations to include additional reporting metrics that take
15 into account the wholesale power market revenues received by Missouri utilities.
16 Specifically, I added an APC metric, which is also the metric that Show Me witness
17 Michael Proctor suggested Grain Belt Express should use on pages 39 and 40 of his
18 rebuttal testimony. APC includes the off-system sales margins of Missouri utilities that
19 are discussed by Ms. Kliethermes in her rebuttal testimony at pages 10 and 11.

20 **Q. How is APC defined for the purpose of your analysis?**

21 A. APC is defined in the same way as Dr. Proctor defines it on page 40 of his rebuttal
22 testimony. Specifically, APC is defined as (1) the total variable cost of generation minus
23 (2) the cost of energy purchases plus (3) revenue from off-system sales. This is a
24 standard way of defining APC similar to the metric used by both MISO and Southwest

1 Power Pool (“SPP”).

2 Total variable cost of generation is equal to the total cost of consumed fuel,
3 variable operation and maintenance cost, and emissions costs (if applicable). Purchase
4 and sale volumes and accounting are calculated on an hourly basis. For each hour of the
5 year, if a Missouri utility generates more energy than it needs to serve load, the excess is
6 sold at the market price and included in the “revenue from off system sales” in the APC
7 metric. On the other hand, if a Missouri utility generates less energy than it needs to
8 serve load, the utility purchases the deficit at the market price and the payment is
9 included in the “cost of energy purchases.”

10 When defining the APC metric, I included all of the generation owned by the
11 Missouri utility in question. For example, I considered the fact that Missouri regulated
12 utilities own generation in other states that they use, in part, to serve their Kansas load.

13 **Q. Have you made any other adjustments to the production cost model used in Mr.**
14 **Moland’s direct testimony?**

15 A. No. I did not change the model year, transmission topology, or any other assumptions. I
16 did make a correction to the way the Missouri benefits were reported. The previous
17 results, presented in Mr. Moland’s testimony, did not include 29 Kansas City Power &
18 Light Company load buses that were incorrectly assumed to be located in Kansas.
19 Actually, these load buses are located in Missouri. This change does not affect the way
20 the underlying model runs or the generator dispatch.

21 **Q. What results were affected by the change described above?**

22 A. The change reported above affects the Missouri-specific benefits reporting as related to
23 LMP and demand cost changes. The production cost and emissions reductions were not

1 affected since these were reported for the entire eastern interconnection.

2 **Q. How much does including the additional KCPL load buses in the model affect the**
3 **Missouri LMP and demand cost?**

4 A. The change in LMP reduction does not materially change the results. In the Business-as-
5 Usual scenario, the original results showed reduction of Missouri Load Hub average
6 annual LMP of \$0.24, from \$33.64/MWh to \$33.40/MWh (Schedule GM-2). The revised
7 results show a reduction of \$0.22.

8 When the additional load buses are incorporated, annual demand cost savings
9 increased by about \$1 million. In the Business-as-Usual scenario, the Project's original
10 demand cost benefit was \$21.8 million in the originally filed results. The benefit
11 increases to \$22million when the additional buses are added to the reporting. A full set
12 of model results, including APC, that take account of the additional KCPL buses is
13 attached to this testimony as Schedule RC-2.

14 **Q. What do the APC metrics conclude about the benefits of the Project to the State of**
15 **Missouri?**

16 A. The additional APC results confirm that the Project provided a net benefit to Missouri,
17 even accounting for lower off system sales revenues by Missouri utilities. In the
18 Business-as-Usual scenario, the total adjusted production cost savings to Missouri is \$2.6
19 million in 2019. All four scenarios show a lower APC with the Project than without.

20 I also calculated APC results specifically for Ameren Missouri and provided the
21 results in Schedule RC-2. The results show a \$1.0 million decrease in adjusted
22 production cost in 2019 in the Business-as-Usual scenario, with the Project online. All
23 four scenarios show a lower APC with the Project than without for Ameren Missouri as

1 well.

2 **Q. What do the APC results from your model indicate about the Project's rate impacts**
3 **on Missouri?**

4 A. The APC results show that the Project will decrease cost-of-service rates for incumbent
5 utilities that own their own generation.

6 **III. PROJECT BENEFITS COMPARED TO MISO WIND ALTERNATIVE**

7 **Q. At page 41 of his rebuttal, Dr. Proctor states that the benefits from the Project,**
8 **described in Mr. Moland's testimony, could occur if the same amount of wind**
9 **generation is built elsewhere in MISO. What is your response?**

10 A. I prepared an additional production cost model sensitivity using the Business as Usual
11 assumptions. Instead of the Project's 500 MW high capacity factor wind energy injection
12 in Missouri, I added an equivalent amount of wind energy in MISO locations with a high
13 capacity factor wind resource. To model the MISO wind alternative, I chose the five
14 highest capacity factor wind profiles from the Eastern Wind Interconnection Study
15 (EWITS) library that were located in Minnesota, Iowa or North Dakota. The five MISO
16 wind farms are located on high voltage 345 kV buses near the high wind capacity sites.
17 In other words, I assumed the appropriate interconnection upgrades were in place for
18 these wind farms to reach the MISO 345 kV system.

19 **Q. What did your additional model sensitivity show about the benefits to Missouri?**

20 A. It showed that the benefits to the State of Missouri were higher with the Grain Belt
21 Express Project for all the three benefit metrics specific to Missouri. Demand Cost
22 reduction for the state of Missouri was only \$4 million savings in the MISO wind
23 alternative, compared to \$22 million savings with Grain Belt Express Project. Locational

1 Marginal Price impact was also much lower with the MISO wind alternative, with the
2 Missouri Load Hub dropping \$0.04/MWh on annual average, compared to a \$0.22/MWh
3 drop with Grain Belt Express. The Adjusted Production Cost benefit to Missouri in the
4 MISO wind alternative was \$0.48 million, compared to \$2.6 million with Grain Belt
5 Express.

6 **IV. OTHER ISSUES**

7 **Q. At page 5 of her rebuttal testimony, Ms. Kliethermes states that Grain Belt Express**
8 **has only modeled the day-ahead power market. Is that an accurate description of**
9 **the model results presented in Mr. Moland's direct testimony and your surrebuttal**
10 **testimony?**

11 A. No, it is not. PROMOD is more sophisticated than Ms. Kliethermes describes.
12 PROMOD produces one set of LMPs that reflects day-ahead and real-time market
13 processes, the economic inefficiency due to re-dispatch between the two markets, and the
14 impact of operating reserves. The benefits presented in this study are based upon these
15 realistic LMPs, not on simple day-ahead LMPs.

16 In the first phase of its dispatch, PROMOD mimics the day-ahead market over a
17 study week with a security-constrained unit commitment process. The methodology
18 incorporates a combined linear program and mixed-integer program to mimic the
19 decisions made by each balancing area to commit generation to meet the next day's
20 energy demand and operating reserve requirements, given generator bids, generator
21 operational constraints, and transmission system constraints. The economics of the
22 commitment decision are based upon day-ahead forecast LMPs derived within the
23 process.

1 In the next phase, PROMOD applies the day-ahead commitment solution to an
2 hour-by-hour real-time security constrained economic dispatch of the system solved by a
3 linear program. Each balancing area dispatches generation against energy demand and
4 operating reserve requirements. The least-cost dispatch decision is driven by LMPs
5 within the linear program solution for the given hour. Generator re-dispatch and real-
6 time unit commitments occur during this real-time dispatch phase, and the LMPs within
7 the real-time dispatch are different than forecasted LMPs used in the day-ahead unit
8 commitment process.

9 **Q. At page 5 of her testimony, Kliethermes states that Grain Belt Express modeled the**
10 **entire Eastern Interconnection as a single market. Is that an accurate description of**
11 **the model results presented in Mr. Moland's direct testimony and your surrebuttal**
12 **testimony?**

13 A. No, this is not accurate. PROMOD models each RTO separately as its own balancing
14 area and market, similar to how the electric system operates. Electric systems that are not
15 part of an RTO are typically grouped within a regional representation of a larger
16 balancing area. There are fourteen balancing areas modeled in the simulations discussed
17 in this testimony, with each balancing area committing its own generation to meet its own
18 load and operating reserve requirements. Interchange between balancing areas occurs
19 when two neighboring regions have a price differential larger than an economic hurdle
20 rate specified in \$/MWh. The physical transmission flows supporting this interchange
21 are subject to transmission constraints in the day-ahead commitment and real-time
22 dispatch solutions.

1 **Q. Is the PROMOD simulation software used in the industry to study economic**
2 **impacts of new transmission projects?**

3 A. Yes, PROMOD is widely accepted and used as a software tool to study the economic
4 benefit of new transmission projects. MISO, SPP, PJM use the software utilize the
5 software within economic transmission planning processes to evaluate the impact of
6 candidate transmission projects in regional transmission plans. Many electric utilities use
7 the software for making similar decisions regarding new transmission projects. MISO
8 also uses PROMOD to produce some of the economic benefits in its annual Value
9 Proposition study presented to members.

10 **Q. At page 18 of her rebuttal testimony, Ms. Kliethermes states that Grain Belt**
11 **Express has not provided any information regarding the cost efficiency and fuel**
12 **efficiency of the Eastern Interconnection with and without the Project. What is**
13 **your response?**

14 A. The cost efficiency and fuel efficiency of generation across the Eastern Interconnection
15 change very little when Grain Belt Express is included. The average annual variable cost
16 of thermal generation in \$/MWh is a standard measure of cost efficiency. This metric
17 changes from \$23.31/MWh to \$23.28/MWh when including Grain Belt Express in the
18 Business-as-Usual scenario, a reduction of \$0.03/MWh. This trend continues across the
19 other three scenarios when adding the Project, dropping \$0.30/MWh in the Green
20 Economy scenario, \$0.11/MWh in the Robust Economy scenario, and \$0.04/MWh in the
21 Slow Growth scenario.

22 Fuel efficiency is measured by average heat rate in MMBtu/MWh. Across the
23 four scenarios, the change to average heat rate due to the Project is very small, from a

1 0.008 decrease to a 0.001 increase. These very small differences in fuel efficiency across
2 a very large area would not appreciably impact Missouri rates, especially when compared
3 against the larger impact of the Project reducing wholesale prices and Adjusted
4 Production Cost.

5 **Q. In discussing Grain Belt Express response to Staff Data Request 37 on page 20 of**
6 **her rebuttal, Ms. Kliethermes states that the Callaway and Iatan plants were**
7 **excluded from Grain Belt Express' reporting. Why is that the case?**

8 A. Staff Data Request 37 asked for the change in generator output as a result of the addition
9 of the Project. Neither the Callaway and Iatan plants experienced any change in output
10 when the Project was added to the simulation, and therefore were not included in the
11 information provided. The exclusion of these plants does not affect Ms. Kliethermes'
12 calculations about the decrease in Missouri utilities' generation since there was no
13 decrease at these plants.

14 **Q. On page 17 of her rebuttal, Ms. Kliethermes states that Grain Belt Express' model**
15 **results indicate that increased congestion will occur in Missouri. Is this correct?**

16 A. No. Congestion costs, measured at the location of Missouri load, decrease with the
17 addition of the Project. It is inaccurate to interpret decreased congestion costs to load as
18 an increase in overall system congestion.

19 For a utility that is a member of MISO or SPP, net congestion cost is a function of
20 the congestion cost paid to the RTO for demand and congestion revenue paid to the
21 utility for generation. Congestion cost is measured directly as the portion of demand cost
22 attributable to the congestion component of the LMP. Congestion revenue is measured as
23 the portion of generator revenues attributable to the congestion component of the LMP.

1 The congestion cost minus congestion revenue represents a utility's net congestion cost.
2 In the Business-as-Usual scenario results, Ameren Missouri has a net congestion cost of
3 \$224,065 without the Project and a net congestion cost of -\$149,510 with the Project, a
4 reduction of \$373,575 specific to congestion. For KCP&L and KCP&L Greater Missouri
5 Operations, the net congestion cost reduction is \$185,166 with the Project.

6 **Q. At pages 25-26 of her rebuttal, Ms. Kliethermes points out that a number of fossil**
7 **generation plants did not produce at all when the Project is added to the PROMOD**
8 **simulation. What can be concluded from this observation?**

9 A. All of the plants Ms. Kliethermes lists are simple cycle oil or gas plants that, even
10 without the Project, generate less than 400 MWh per year. The fact that the Grain Belt
11 Express Project displaces some of these plants shows that the Project delivers a
12 substantial amount energy during peak hours when the most inefficient plants (i.e., those
13 with the highest fuel cost) are called on to generate power. Just because the plants do not
14 run in one simulated model year does not mean they are unneeded or would be retired.

15 **Q. At page 13 and 14 of his rebuttal testimony, MLA witness Jeffery Gray states that it**
16 **is unreasonable to assume that the PATH transmission line is constructed in the**
17 **PROMOD scenario with higher than forecasted load growth. What is your**
18 **response?**

19 A. As Show Me witness Dr. Michael Proctor correctly states at page 39 of his rebuttal
20 testimony, "the addition of the PATH transmission project ... in the robust economy
21 future appears to make sense as it was cancelled because of low load growth." If load
22 growth in the PJM is higher than expected, it is reasonable to assume the PATH line is
23 included in future PJM transmission plans and approved for construction.

1 Q. **Does this conclude your prepared surrebuttal testimony?**

2 A. Yes, it does.