

Exhibit No.:
Issues: Dedicated Metallic Return
Witness: Robert R. Leonberger
Sponsoring Party: MO PSC Staff
Type of Exhibit: Rebuttal Testimony
Case No. EA-2014-0207

MISSOURI PUBLIC SERVICE COMMISSION

REGULATORY REVIEW DIVISION

REBUTTAL TESTIMONY

OF

ROBERT R. LEONBERGER

GRAIN BELT EXPRESS CLEAN LINE LLC

CASE NO. EA-2014-0207

*Jefferson City, Missouri
September 2014*

1 Since July 1, 1982, I have been on the Safety/Engineering Staff of the Commission. I
2 was promoted to the position of Engineer IV in November of 1987 and assumed my present
3 position in October of 1990. I have successfully completed seven courses prescribed by the
4 U.S. Department of Transportation (DOT) at the Transportation Safety Institute regarding the
5 application and enforcement of the minimum federal safety standards for the transportation of
6 natural and other gas by pipeline (49 CFR, Part 192). Included in this training were courses
7 on the joining of pipeline materials, corrosion control, regulator stations and relief devices,
8 failure investigation, and code application and enforcement. In addition, I have attended
9 numerous other courses and seminars directly related to pipeline safety and incident
10 investigation related subjects, as well as seminars on utility regulation. In the Commission's
11 Energy Infrastructure Reliability Unit, I manage the Commission's Pipeline Safety Program
12 and supervise the Safety/Engineering Staff. My responsibilities include monitoring all phases
13 of natural gas utility plant design, installation, operation, and maintenance. Staff conducts on-
14 site plant inspections, reviews and analyzes utility records, investigates customer gas safety
15 complaints, investigates natural gas related incidents and assists in the continued development
16 of the Commission's pipeline safety rules. It is my responsibility to make recommendations
17 to each utility's management and to the Commission, if necessary, following these
18 evaluations.

19 I am a former member of the National Association of Corrosion Engineers (NACE)
20 and former member of the American Society of Mechanical Engineers-Gas Piping and
21 Technical Committee (ASME-GPTC). I represented the Commission on the ASME-GPTC
22 from 1986-1989. I currently am a member and past Chairman of the National Association of
23 Pipeline Safety Representatives (NAPSR) and I am a member of the National Association of

1 | Regulatory Utility Commissioners (NARUC) Staff Subcommittee on Pipeline Safety and
2 | represent the Commission on these organizations.

3 | Q. Have you previously testified before this Commission?

4 | A. Yes. I testified before the Commission in Case Numbers GC-90-06,
5 | GC-91-150, GR-92-165, GM-94-40, GR-96-285, GC-2006-0060, GC-2006-0318,
6 | GC-2006-0431, GC-2006-0390, GT-2009-0056 and GC-2011-0101.

7 | Q. What is the purpose of your testimony?

8 | A. The purpose of my testimony is twofold. First, I explain concerns Staff
9 | investigated regarding the potential impacts of the transmission line and converter station to
10 | be built in Missouri on existing AC transmission lines, underground metallic facilities such as
11 | gas pipelines, and telecommunications facilities. Second, I present Staff's recommendations
12 | regarding the granting of any CCN to Grain Belt Express in this case to address these
13 | particular concerns. The particular concerns I discuss here are related to the potential impacts
14 | of the project:

15 | • On existing underground metallic facilities related to corrosion or
16 | interference to cathodic protection systems caused by operation of the transmission
17 | line, the operation of the DC-to-AC converter station (to be located in Ralls County),
18 | or the operation of that portion of the AC electric transmission line exiting the
19 | converter station that is owned by Grain Belt Express.

20 | • On other existing underground metallic facilities (corrosion), AC utility lines
21 | (interference), and telecommunication facilities (interference) related to interference
22 | on these facilities caused by the operation of the transmission line, the operation of the
23 | DC-to-AC converter station (to be located in Ralls County), or the operation of the

1 that portion of AC electric transmission line exiting the converter station that is owned
2 by Grain Belt Express.

3 A comprehensive list of the conditions Staff is proposing the Commission impose on
4 any CCN the Commission issues in this case is presented in the prefiled rebuttal testimony of
5 Staff witness Daniel I. Beck.

6 Q. Please briefly summarize Staff's investigation of its concerns that you address
7 in this testimony.

8 A. Staff consulted pipeline safety counterparts in the U. S. Department of
9 Transportation – Pipeline and Hazardous Materials Safety Administration familiar with the
10 operation of HVDC electric transmission lines and reviewed case studies about the effects of
11 HVDC electric transmission lines on nearby facilities. Of particular concern to
12 Safety/Engineering Staff were the return currents on a monopolar HVDC electric transmission
13 line and fault/balancing currents on a bipolar HVDC electric transmission line operating
14 without a dedicated metallic return (“DMR”) and the effect on underground metallic
15 structures. In some situations, these current flows in the earth could cause an underground
16 metallic structure to corrode. In the case of a pipeline, corrosion could result in a pipeline
17 failure and the release of natural gas or hazardous liquid. Staff sent several data requests to
18 Grain Belt Express regarding the design of the project and ground currents.

19 Q. How did Grain Belt Express respond to those data requests?

20 A. In response to Staff Data Request No. 0089 (and numerous other Staff data
21 requests), Grain Belt Express stated that “the Grain Belt Express HVDC system is utilizing
22 dedicated metallic return (DMR) conductors to ensure any imbalance current flow is
23 completely captured by the DMR conductors and not flowing through the earth. The DMR

1 | conductors are overhead conductors that will be suspended on the same structures that the
2 | Grain Belt Express HVDC line will be on.” That DMR conductors will be included in the
3 | construction of the transmission line alleviated most of Staff’s concerns related to return
4 | current flow, imbalance current flow, and fault current flow in the earth. However, to better
5 | ensure that the project includes DMR conductors, Staff recommends that the Commission
6 | limit the authority it gives for building the HVDC transmission line in any CCN to
7 | construction of a HVDC transmission line built with DMR conductors.

8 | Q. Does using DMR conductors alleviate all of Staff’s concerns about the effects
9 | of the HVDC electric transmission line, the AC-to-DC converter station, and the Grain Belt
10 | Express-owned HVDC transmission line exiting the converter station on the underground
11 | metallic structures?

12 | A. No. During damage to the support structures or to the HVDC electric
13 | transmission line itself, the line could contact the ground allowing current to flow through the
14 | ground and causing adverse effects on underground metallic structures.

15 | Q. Did Staff inquire of Grain Belt Express regarding this concern as well?

16 | A. Yes. In response to Staff Data Request No. 0109, Grain Belt Express stated,
17 | “If either of the Grain Belt Express poles were to be downed, the protection and control
18 | scheme of the Grain Belt Express HVDC line would automatically trip (i.e., de-energize) the
19 | faulted pole(s) within 40-50 milliseconds (ms). The protection system would try to restart the
20 | faulted pole 2-3 times, depending on the final protection scheme design which is yet to be
21 | determined, before it would stop trying to restart the system. The scheme would be designed
22 | to try to restart the faulted pole(s) since most faults are of a momentary nature that clear by
23 | themselves. Thus, it would take approximately 80-150 ms before the protection system would

1 completely shut down or de-energize the line if both of the poles were downed.” As it did
2 with regard to DMR conductors, Staff recommends that the Commission limit any CCN it
3 issues in this case by explicitly requiring the installation of protection and control safety
4 systems that will automatically de-energize the system when an abnormal or fault condition
5 occurs. Staff also recommends that the Commission condition any such CCN by requiring
6 proof to the Commission that these safety systems are operational prior to commercial
7 operation of the Grain Belt Express HVDC electric transmission line.

8 Q. Does the installation of DMR conductors and safety systems to de-energize the
9 system during abnormal or fault conditions address all of Staff’s concerns that you are
10 addressing?

11 A. No, not totally. Even though the DMR conductors are part of the design and
12 safety systems are to be installed to automatically de-energize the system, it is important to
13 conduct studies to determine if the operation of the HVDC transmission line, the DC-to-AC
14 converter station in Missouri, and the Grain Belt Express-owned portion of the AC electric
15 transmission line exiting the DC-to-AC converter station have impacts on the nearby pipelines
16 (corrosion/interference with cathodic protection systems), other underground metallic
17 facilities (corrosion), AC utility lines (interference) and telecommunications facilities
18 (interference). These studies would include pipelines, other underground metallic facilities,
19 AC utility lines, and telecommunications facilities that cross or run adjacent to the Grain Belt
20 Express HVDC transmission line (and Grain Belt Express-owned AC transmission line). In
21 Staff’s opinion these engineering studies must include, but not be limited to the following:
22 the effects of tower footing groundings, if used; analysis of metallic underground facilities,
23 other AC lines, and telecommunications facilities within half a mile of the HVDC

1 transmission line; analysis of metallic underground facilities, other AC lines, and
2 telecommunications facilities within two miles of the HVDC converter station; a
3 determination whether there are locations where the HVDC line parallels a pipeline and an
4 existing AC line and, if so, whether there are any combined effects on steel pipelines (and
5 other underground metallic facilities); a determination of how the interference study will be
6 conducted (for example, continuous 24-hour recordings at a certain time of year); and the
7 effects of the HVDC transmission line exiting the converter station.

8 Q. Did Staff inquire of Grain Belt Express about conducting studies to determine
9 the effects on facilities near the Grain Belt Express HVDC transmission line, the DC-to-AC
10 converter station, and the HVDC electric transmission line exiting the converter station?

11 A. Yes. In its response to Staff Data Request No. 0091, Grain Belt Express stated
12 that it will “perform all the necessary studies and identify any necessary mitigations required
13 to ensure that it is in full compliance with all applicable Code of Federal Regulations (CFR)
14 associated with pipeline safety, including sections of 49 CFR Part 192, Subpart I and 49 CFR
15 Part 195, Subpart H. These studies will be conducted in coordination with the gas and/or
16 water utilities that operate pipelines to which the Grain Belt Express line crosses or runs
17 adjacent. As these studies are dependent on the exact pole/structure location, they will be
18 completed during the construction phase of the Project, once the exact location of all the
19 Grain Belt Express poles/structures are known. As these studies take about a month to
20 complete, there will be sufficient time to incorporate any appropriate mitigation measures
21 during the construction phase of the Project.” In its response to Staff Data Request No. 0092,
22 Grain Belt Express stated that it “will perform all the necessary studies and identify any
23 necessary mitigation associated with any impacts introduced by the Project to underground

1 metallic facilities. These studies will be conducted in coordination with the gas and/or water
2 utilities which operate underground metallic facilities that the Grain Belt Express line crosses
3 or runs adjacent to. Since these studies are dependent on the exact pole/structure location,
4 they will be completed during the construction phase of the Project, once the exact location of
5 all the Grain Belt Express poles/structures are known. As these studies take about a month to
6 complete, there will be sufficient time to incorporate any appropriate mitigation measures
7 during the construction phase of the Project.” Further, in other responses to Staff data
8 requests, Grain Belt Express again stated it would conduct these studies.

9 Q. Does Staff have any recommendations to the Commission regarding these
10 studies?

11 A. Yes. Staff recommends that if the Commission issues Grain Belt Express a
12 CCN in this case it include as a condition that if any of the studies show that mitigation
13 measures are identified/needed, those measures must be in place prior to commercial
14 operation of the HVDC transmission line. The Commission should also require that these
15 studies be made available to Staff and affected facility owners at least 45 days prior to
16 commercial operation of the HVDC transmission line and that these engineering
17 studies/analyses are conducted by persons knowledgeable in (1) HVDC power lines, (2) DC-
18 to-AC converter stations, (3) pipeline cathodic protection systems, (4) corrosion of
19 underground metallic facilities, (5) interference with AC utility lines, (6) interference with
20 telecommunications facilities, and (7) the effects of DC and AC interference on the facilities
21 identified in Exhibit 3 of Grain Belt Express’ Application.

22 Q. Does Staff view these conditions sufficient to address its concerns with
23 impacts of the transmission lines and converter station on other facilities in Missouri?

1 A. No. Staff believes that Grain Belt Express should also conduct future studies
2 to ensure the impacts its facilities may have on other facilities in Missouri are known and may
3 be addressed. Grain Belt Express and Staff will need to determine the frequency of future
4 studies, based on the results of the initial studies, to ensure impacts on other facilities
5 associated with the operation of the HVDC transmission line, the converter station, or the
6 Grain Belt Express-owned HVDC transmission line have not developed subsequent to the
7 initial studies. If future studies show there are impacts on other facilities associated with the
8 operation of the HVDC transmission line, the DC-to-AC converter station or Grain Belt
9 Express' AC line associated with the converter station, Grain Belt Express must then
10 implement any additional mitigation measures these future studies indicate are needed, and it
11 should be required to do so within three (3) months of when the need for them is discovered.
12 Therefore, Staff recommends the Commission order Grain Belt Express to file annual status
13 updates on discussions with Staff regarding the need for additional studies, a summary of the
14 results of any additional studies, and any mitigation measures that have been implemented to
15 address underground metallic structures, telecommunications facilities, and AC lines.

16 Q. Does this conclude your rebuttal testimony?

17 A. Yes.