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1 Q. How is EMF measured?

2 A. Electric fields are measured in units of kilovolts per meter ("kV/m"). The International  
3 System of Units ("SI") measures magnetic fields with the SI-derived unit of Tesla ("T"),  
4 which is widely applied in Europe; however, in North America magnetic fields are most  
5 commonly reported in units of gauss ("G"). As an example, a typical refrigerator magnet  
6 produces a magnetic field around 0.005 T (5 millitesla ["mT"]) which translates to 50 G  
7 (50,000 milligauss ["mG"]).

8 Q. Is EMF something people encounter every day?

9 A. Yes. Electric charges and the fields associated with them are found everywhere. We  
10 routinely encounter static electricity from rubbing our feet across the carpet on a dry  
11 winter day, from brushing our hair when the humidity is low, or from weather conditions,  
12 such as storms, snow, and blowing dust. The friction from walking across the carpet can  
13 create a static electric field at the surface of the body as high as 500 kV/m. This static  
14 charge is easily dissipated by touching another surface (such as a doorknob) and  
15 transferring the charge. Electric fields are easily blocked by most objects such as walls,  
16 trees, and fences. Few man-made devices produce static electric fields as frequently as  
17 does nature, but standing near a DC electrified railway, or sitting in front of a computer  
18 screen or television with a cathode ray tube ("CRT") are examples. In the case of sitting  
19 in front of a CRT television or computer screen, one may be exposed to a static electric  
20 field of about 10 – 20 kV/m at a distance of approximately one foot.

21 Likewise, magnetic fields are very commonplace. The primary natural source of  
22 static magnetic fields is the earth itself; its geomagnetic field covers the entire earth.  
23 Man-made sources include permanent magnets (e.g., the magnets contained in a set of  
24 headphones), battery-powered appliances, magnetic resonance imaging ("MRI")

Witness Exhibit No. 16

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1 scanners, and, as stated above regarding static electric fields, DC electric railways. The  
2 earth's magnetic field ranges from 300 mG at the equator to 700 mG at the magnetic  
3 north and south poles. An MRI machine produces magnetic fields between 15,000,000 -  
4 40,000,000 mG. Battery powered appliances may produce magnetic fields between  
5 3,000 – 10,000 mG.

6 **Q. What are the expected electric field levels associated with the Project's operation?**

7 A. Based on applicable EMF calculations from similarly rated HVDC lines, the highest  
8 electric field level calculated on the right-of-way is expected to be approximately 40  
9 kV/m. This includes the contribution of both the nominal field (i.e., the field that is  
10 derived from the voltage on the conductor) as well as the charges on air molecules ("air  
11 ions"). The contribution of air ions to the electric field is affected by weather conditions  
12 and the number presented above is expected to be a worst case condition with the  
13 likelihood that lower values would be typical.

14 **Q. How does the Project's EMF compare to typical EMF exposure in day-to-day life?**

15 A. As noted above, for electric fields, one can easily experience exposure up to 500 kV/m  
16 just by walking across a carpeted floor on a dry winter day, which is more than ten times  
17 the highest value expected from the Project's operation. As also noted previously, the  
18 magnetic field exposure experienced on a daily basis or in the course of one's life can  
19 range from strengths that are similar to what would be experienced within the right-of-  
20 way of the Grain Belt Express Project to levels that are orders of magnitude higher.

1 Q. When major transmission projects are undertaken, concerns regarding EMFs are  
2 sometimes raised. Does Grain Belt Express believe EMFs present a health threat to  
3 people, plants, or animals?

4 A. No. There is no conclusive evidence to support the contention that EMFs from  
5 transmission lines are linked to health related risks to humans, plants or animals. This  
6 conclusion is based primarily on the 2006 report produced by the Oak Ridge National  
7 Laboratory attached as **Schedule AWG-7**. Furthermore, the IARC, the WHO, the ICES  
8 and the ICNIRP (cited above) have all concluded that the current body of research does  
9 not indicate that strong static electric or magnetic fields cause long-term health effects.  
10 Clean Line has also retained Exponent, an expert consultant in the area of EMF health  
11 risks, to prepare a brochure for use in our public outreach and communication efforts.  
12 The brochure explains the nature of EMFs created by DC transmission lines, summarizes  
13 the scientific study of their effects, and provides references to documents produced by the  
14 scientific community. A copy of the brochure is attached as **Schedule AWG-8**.

15 Q. Does this conclude your testimony?

16 A. Yes, it does.