

**PUBLIC SERVICE COMMISSION  
OF WEST VIRGINIA  
CHARLESTON**

**Case No. 07-0508-E-CN**

**TRANS-ALLEGHENY INTERSTATE LINE COMPANY**

**Application of Trans-Allegheny Interstate Line  
Company for a certificate of public convenience  
and necessity under W. Va. Code § 24-2-11a  
authorizing the construction and operation of the  
West Virginia segments of a 500 kV electric  
transmission line and related facilities in Monongalia,  
Preston, Tucker, Grant, Hardy, and Hampshire  
Counties, and for related relief**

**REBUTTAL TESTIMONY OF  
WILLIAM H. BAILEY, Ph.D.**

**January 4, 2008**

1 Q. PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.

2 A. My name is William H. Bailey. My business address is Exponent, Inc., 420  
3 Lexington Avenue, Suite 1740, New York, NY 10170.

4 Q. WHAT IS YOUR POSITION AT EXPONENT, INC.?

5 A. I am a Principal Scientist in the Health Sciences practice and Director of  
6 Exponent's New York office.

7 Q. HAVE YOU PREVIOUSLY SUBMITTED DIRECT TESTIMONY IN THIS  
8 PROCEEDING ON BEHALF OF THE TRANS-ALLEGHENY INTERSTATE  
9 LINE COMPANY ("TRAILCO")?

10 A. Yes. My direct testimony was previously submitted with TrAILCo's application  
11 in this proceeding in Appendix G, at Tab 8.

12 Q. WILL THE USE OF VARIOUS TERMS IN YOUR REBUTTAL TESTIMONY  
13 BE CONSISTENT WITH THE DEFINITIONS ASSIGNED TO THOSE TERMS  
14 IN THE TABLE OF NOMENCLATURE, ATTACHED TO TRAILCO  
15 APPLICATION AS APPENDIX H?

16 A. Yes. In addition, I may define new terms in my rebuttal testimony.

17 Q. PLEASE DESCRIBE THE PURPOSE OF YOUR REBUTTAL TESTIMONY.

18 A. The purpose of my rebuttal testimony is to respond to the direct testimonies of the  
19 Public Service Commission Staff witness James W. Ellars, P.E., witness  
20 Lieutenant Colonel Thomas M. Hildebrand, and witness Dr. Alan John Sexstone.

1 With regard to the issues raised by the witnesses listed above, my rebuttal  
2 testimony will address:

3 1. The incomplete discussion of electric and magnetic field (EMF) exposure  
4 and health studies in the direct testimony of Staff witness James W. Ellars  
5 that causes him to conclude that “the effect of EMF on human health  
6 remains controversial and without a definitive conclusion” (p. 48, lines 1-  
7 3). Although Mr. Ellars does not disagree with my overall conclusions  
8 regarding EMF and health, it is important to understand that his conclusion  
9 does not accurately characterize the state of our scientific knowledge on  
10 this topic. I firmly believe that scientific evidence does not support the  
11 conclusion that EMF at the levels encountered in our communities and  
12 under transmission lines pose a health hazard, and in this regard I am  
13 supported, *inter alia*, by the assessments of EMF research completed by  
14 national and international health agencies that I cited in my testimony. In  
15 addition, reviews performed for national and international agencies that  
16 have been published since the filing of my testimony support my  
17 conclusions, most notably a review by the World Health Organization  
18 (“WHO”).

19 2. Mr. Ellars’ proposal to require a ‘purchase buffer’ around the proposed  
20 transmission line. I explain that this proposal is not supported by any

1           analyses regarding likely costs or health benefits that would justify this  
2           action as “prudent avoidance.”

3           3.    Col. Hildebrand’s reference to a summary on an EPA website of another  
4           agency’s findings. He cites this single summary, but does not support his  
5           opinion further.

6           4.    Dr. Sexstone’s wife’s fear of EMF and cancer. Dr. Sexstone is concerned  
7           about his wife’s fears, which is understandable, but he inappropriately  
8           generalized the conclusions of the WHO (2007b) to adults and  
9           misunderstood how the WHO reached its conclusions regarding the lack of  
10          association between magnetic fields and breast cancer.

11          5.    Finally, I will address EMF issues that were raised in less detail by five  
12          additional witnesses.

13    Q.    FIRST, IS THE EXPERTISE OF WITNESSES ELLARS, HILDEBRAND AND  
14          SEXSTONE RELEVANT AND APPLICABLE TO THE EVALUATION OF  
15          EMF FROM THE PERSPECTIVE OF PUBLIC HEALTH?

16    A.    No, it is not. James Ellars and Thomas Hildebrand (both electrical engineers)  
17          have no specialized knowledge and training regarding public health and EMF. Dr.  
18          Sexstone has a Ph.D. in Microbiology, a field with little if any relevance to EMF  
19          and human health, and does not claim to be an expert on topics of magnetic fields  
20          or cancer. Dr. Sexstone’s concerns appear to stem from the fact that he is a

1 landowner and his wife's belief that her family members have a predisposition to  
2 cancer.

3

4 REBUTTAL TO STAFF WITNESS JAMES W. ELLARS

5 Q. STAFF WITNESS ELLARS SUMMARIZES HIS CONSIDERATION OF A  
6 FEW RESIDENTIAL AND OCCUPATIONAL EPIDEMIOLOGY STUDIES OF  
7 MAGNETIC FIELDS ON PAGES 33 TO 37 OF HIS DIRECT TESTIMONY.  
8 DOES MR. ELLARS' SUMMARY PROVIDE A COMPREHENSIVE PICTURE  
9 OF THE STATUS OF EPIDEMIOLOGY RESEARCH AND HOW IT FITS  
10 INTO A HEALTH RISK ASSESSMENT OF MAGNETIC FIELDS?

11 A. No, it is not. For a comprehensive picture of the status of epidemiology research  
12 on magnetic fields and how it fits into a health risk assessment, the Commission  
13 should consult the summary and evaluation of research by the Task Group of the  
14 WHO (WHO, 2007b) and the other assessments by national and international  
15 organizations that I referenced in my direct testimony.

16 Q. DID WITNESS ELLARS DISCUSS STUDIES IN WHICH ANIMALS OF  
17 SEVERAL SPECIES HAD BEEN EXPOSED TO LEVELS OF MAGNETIC  
18 FIELDS UP TO 10,000 TO 50,000 TIMES GREATER THAN THE AVERAGE  
19 MAGNETIC FIELDS IN HOMES OVER MOST OF THEIR LIFETIME?

1 A. He did not discuss any specific animal studies, but he did acknowledge their role  
2 in establishing causal relationships in human risk assessments (p. 34, lines 6-8)  
3 and quoted a fact sheet from WHO (p. 47, lines 4-6): “Additionally, animal  
4 studies have been largely negative. Thus, on balance, the evidence related to  
5 childhood leukemia is not strong enough to be considered causal” (WHO, 2007a).  
6 However, he appears to have ignored these conclusions in his testimony. Lifetime  
7 exposure studies in animals in particular are very important to the overall health  
8 risk assessment of any chemical or other exposure. The WHO Task Group  
9 concluded the following with respect to the findings from studies of lifetime  
10 magnetic field exposure in animals:

11 Several studies have looked at the effect of EMF exposure alone on  
12 tumour incidence; such studies are potentially capable of revealing  
13 whether EMFs could act as a complete carcinogen or serve to  
14 increase the incidence of spontaneous tumours.... Four large-scale,  
15 long-term studies have been performed on the effects of power-  
16 frequency magnetic field exposure for two years on the spontaneous  
17 tumour incidences in rats and mice....The overall results did not  
18 show any consistent increase in any type of cancer. (WHO, 2007b, p.  
19 308)

20  
21 Q. MR. ELLARS PRESENTED A TABLE TITLED “STATISTICAL STUDIES OF  
22 RELATIONSHIP BETWEEN POWER LINE EMF AND CHILDHOOD  
23 CANCERS” IN ATTACHMENT JWE-4. THIS TABLE SUMMARIZED THE

1           STATISTICAL ASSOCIATIONS AS ODDS RATIOS.<sup>1</sup> WHAT IS AN ODDS  
2           RATIO?

3   A.    In this example, the odds ratio (OR) expresses the odds that children with cancer  
4           are exposed to magnetic fields at a specified level relative to the odds that children  
5           without cancer are exposed to magnetic fields at that same level. In other words,  
6           the OR expresses the relative difference in the exposure of these two groups to  
7           magnetic fields and, if there is no difference in exposure between the two groups,  
8           the OR is equal to 1.0. It does not describe the risk of developing cancer if  
9           exposure occurs.

10   Q.   IS IT APPROPRIATE AND STANDARD PRACTICE FOR SUCH A  
11           SUMMARY TO ALSO DESCRIBE THE STATISTICAL UNCERTAINTY IN  
12           THE ESTIMATES OF THE ODDS RATIOS?

13   A.    Yes, but Mr. Ellars, or the source from which he copied the table, failed to include  
14           these important data, although such estimates are routinely provided in the original  
15           studies or scientific reviews. In epidemiologic studies, ORs are reported along  
16           with a statistical summary of uncertainty attributable to sampling error called the  
17           confidence interval (CI). The CI describes a range of values for the OR that has a

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<sup>1</sup>       One of the studies in the table, Verkasalo et al. (1993), is of a cohort design in which the statistical association is computed as the ratio of the number of observed cases to the number of expected cases (i.e., the standardized incidence ratio [SIR]). The SIR is a more direct estimate of risk than the odds ratio.

1 specified probability (e.g., 95%) of including the “true” estimate of effect. A 95%  
2 CI indicates that, if the study were conducted a very large number of times, 95%  
3 of the observed OR values would be expected to be between the upper and lower  
4 confidence limits. If the computed CI does not include 1.0, the OR is typically  
5 described as statistically significant. An OR can be computed as being greater or  
6 less than 1.0, but if the CI includes 1.0, the result cannot be reliably distinguished  
7 from an OR of 1.0 (indicating no statistically significant association).

8 The footnote to the table in JWE-4 also is misleading, because it glosses over the  
9 fact that studies that have ORs different from 1.0, but whose confidence intervals  
10 include 1.0, also are “neutral,” meaning they provide no evidence of increased or  
11 decreased risk.

12 Q. ARE STATISTICAL UNCERTAINTIES THE ONLY TYPE OF  
13 UNCERTAINTY IN SUCH STUDIES?

14 A. No. Statistical uncertainties are by no means the only source of uncertainty and  
15 potential error in epidemiologic studies. One major source of uncertainty in  
16 epidemiologic studies of EMF arises from the limitations in the methods used to  
17 estimate EMF exposure. For example, several of these studies used a system for  
18 classifying exposure called ‘wire coding.’ Wire code categories classify persons  
19 based on the nature of nearby power lines and/or their distance from these lines,  
20 without fully specifying the line’s characteristics or considering other sources of

1 EMF exposure. Surrogates of exposure (such as wire code categories and distance  
2 from nearby power lines) are less reliable than personal EMF measurements, and  
3 are a recognized source of uncertainty in studies of EMF and health.

4 Another common source of uncertainty arises from non-participation of possible  
5 study participants, i.e., low participation rates among the cases or controls that are  
6 identified by standard procedures as part of the source population or representative  
7 control group, respectively. When non-participation is common, researchers  
8 cannot be sure that the study populations are representative and that the  
9 comparisons of exposures and other characteristics are valid. This source of  
10 uncertainty is present in several of the studies listed in Attachment JWE-4.

11 Other sources of uncertainty in epidemiologic studies of EMF include the timing  
12 of exposure assessment with reference to an etiologically relevant time period, and  
13 the effect of other sources of EMF exposure in the home and in places other than  
14 the home, such as schools or day-care settings, on a person's overall exposure.

15 Q. WHILE MR. ELLARS CITED SOME SOURCES OF UNCERTAINTY IN  
16 STUDIES OF EMF AND HEALTH, DO YOU BELIEVE THAT HE FULLY  
17 DISCUSSED THE IMPLICATIONS OF UNCERTAINTY IN HIS  
18 EVALUATION?

19 A. No. Mr. Ellars mentions only two general sources of uncertainty and error: the  
20 size of the study sample and confounding (pp. 33-34). He fails to identify which

1 studies are compromised by small sample sizes, and which confounders may affect  
2 results; confounding factors that have been considered in these studies include  
3 residential mobility, viral contacts, and air pollution associated with traffic density.  
4 He gives no indication that he considered some of the major sources of uncertainty  
5 in his evaluation of studies of magnetic field exposures and childhood cancer, such  
6 as the method or timing of exposure assessment, or low response rates.  
7 Furthermore, he does not discuss the difficulties of controlling for confounding  
8 when the causes of a disease (such as childhood leukemia) are not well known, and  
9 may have genetic components. In a scientifically valid evaluation of  
10 epidemiologic studies, such as the one produced by the WHO Task Group, all  
11 factors in the study design that produce uncertainty and limit the ability to draw  
12 conclusions are identified and considered.

13 Q. STAFF WITNESS ELLARS FOLLOWS UP HIS DISCUSSION OF WHY  
14 SOME STUDIES HE LISTS IN ATTACHMENT JWE-4 DID NOT REPORT  
15 STATISTICALLY SIGNIFICANT ESTIMATES OF RISK BY CITING THE  
16 ANALYSIS OF DATA POOLED FROM NINE SEPARATE STUDIES (p. 35).  
17 DOES THE POOLING OF DATA ELIMINATE ALL SOURCES OF  
18 UNCERTAINTY?

19 A. No. The advantage of pooled analyses is that they have greater statistical power to  
20 detect an effect, if one is present, because of larger numbers. But even with the

1 larger number of subjects obtained by pooling data from multiple studies, there is  
2 still considerable statistical uncertainty about associations at higher exposure  
3 levels, where there are very few cases and controls. All other sources of  
4 uncertainty as described above (e.g., confounding) still need to be considered in a  
5 pooled analysis. These uncertainties were noted by the authors of both the pooled  
6 analysis cited by Mr. Ellars (Ahlbom et al., 2000) and another pooled analysis  
7 (Greenland et al., 2000). Greenland et al. wrote that they pooled studies with  
8 different magnetic field measurements, without demonstrating that all were  
9 comparable or combinable (p.632). Greenland et al. also noted that there is little  
10 scientific understanding of what is the best type of magnetic field measurement.  
11 Greenland et al. indicate that, in addition to small sample size in high exposure  
12 categories, sources of uncertainty in the pooled analysis include selection bias and  
13 large errors in field measurements.

14 Q. DO THESE SAME SOURCES OF UNCERTAINTY APPLY TO THE AHLBOM  
15 ET AL. POOLED ANALYSIS?

16 A. Yes, all of the uncertainties that I noted, and those expressed by Greenland et al.  
17 (2000) that I described above, also apply to the pooled analysis by Ahlbom et al.  
18 (2000).

1 Q. WHICH OF THE STUDIES LISTED IN ATTACHMENT JWE-4 WERE  
2 FOCUSED SOLELY ON HIGH-VOLTAGE TRANSMISSION LINES AS  
3 SOURCES OF EMF?

4 A. Only 3 of the 14 studies in Exhibit JWE-4 focused on high-voltage transmission  
5 lines. These three studies were all done in Scandinavia: Feychting and Ahlbom  
6 (1993) in Sweden, Olsen et al. (1993) in Denmark, and Verkasalo et al. (1993) in  
7 Finland. Despite the fact that all three studies compared the exposures of children  
8 across most of their respective countries over many years, the statistical  
9 associations reported were based upon a very small number of cases and controls  
10 and so the confidence intervals were wide and included 1.0 in many or all of the  
11 computations.

12 Q. WHICH OF THESE STUDIES REPORTED THAT CASES OF CHILDHOOD  
13 LEUKEMIA HAD HIGHER ESTIMATED EXPOSURES?

14 A. Only Feychting and Ahlbom (1993), and in this study the differences in the  
15 exposures of these two groups depended upon the method of estimating exposure  
16 and geographic location. Overall, a handful more cases, compared to controls, had  
17 calculated magnetic field levels  $\geq 3$  milligauss (mG) or lived within 50 meters (m)  
18 of 220 or 400 kilovolt (kV) transmission lines in the entire country of Sweden in a  
19 period of 26 years. But, differences in calculated exposure were less or not at all  
20 evident for children living in Stockholm County, those living in apartments, or

1           those living more than 50 m from the lines. When magnetic field exposure was  
2           estimated from measurements taken in the residences of cases and controls, no  
3           differences were reported.

4           Neither of the other two studies of transmission lines cited by Mr. Ellars reported  
5           that cases had higher exposures than controls. In the only study whose cohort  
6           design permitted an estimate of risk, Verkasalo et al. (1993) concluded “[t]his  
7           study found no increased risk of overall cancer, leukaemia, lymphoma or nervous  
8           system tumours in children exposed to residential magnetic fields close to  
9           transmission lines in Finland.” (p. 898). Olsen et al. (1993) reported “[t]hat no  
10          association was observed between the distance of a child’s residence from a high  
11          voltage installation and the risk of cancer” (p. 893) and that calculated magnetic  
12          field levels at the dwellings of leukemia cases were not statistically greater than  
13          those at the dwellings of controls whether exposure was defined as 1.0-2.4 mG, >  
14          2.5 mG, 1.0-3.9 mG, or  $\geq 4$  mG. This study also reported that magnetic field  
15          exposure in most of the higher-exposed dwellings comes from lines with voltages  
16          less than 150 kV, not higher voltage lines. This occurs because the lower voltage  
17          lines are more common and closer to dwellings than the higher voltage  
18          transmission lines.

19    Q.    WHAT SOURCES OF MAGNETIC FIELDS WERE CONSIDERED IN THE  
20    REMAINING 11 STUDIES CITED BY WITNESS ELLARS?

1 A. The sources of exposure considered in the other studies were overhead power  
2 lines, which included distribution lines of unspecified voltage. If the study used  
3 measurements to estimate magnetic field exposure, then contributions from  
4 sources within the home to magnetic field exposure would have been captured.

5 Q. IS THE ATTACHMENT JWE-4 AN UP-TO-DATE LISTING OF  
6 EPIDEMIOLOGY STUDIES RELATED TO THIS TOPIC?

7 A. No, Mr. Ellars' list is not up-to-date, as is evident that the most recent study he  
8 cites is from 1993, more than 14 years ago. Additional studies were considered in  
9 the Ahlbom et al. and Greenland et al. pooled analyses, and more studies continue  
10 to be published. Mr. Ellars fails to recognize the error that can result from  
11 selecting only some studies from a broader literature. By failing to include later  
12 studies that took steps to overcome some of the recognized limitations in this field,  
13 he presents a picture that is out-of-date and incorrect.

14 Q. WHAT ARE THE LARGER AND MORE ADVANCED STUDIES OF  
15 CHILDHOOD LEUKEMIA PUBLISHED AFTER 1993?

16 A. Some more recent epidemiology studies of magnetic fields and childhood  
17 leukemia are of particular significance because of their size and advanced  
18 methodology, i.e.:

19 1. A study of childhood leukemia in five provinces of Canada (McBride et al.,  
20 1999),

1           2.     A comprehensive study in the United Kingdom of leukemia and other  
2                    childhood cancers (UKCCS, 2000), and

3           3.     The study of childhood leukemia in nine midwestern states performed by  
4                    the U.S. National Cancer Institute (Linnet et al., 1997).

5           The authors of these studies concluded that their findings provided little support  
6                    for the proposition that there was a statistically significant difference in the  
7                    magnetic field exposures of children with and without leukemia, i.e., a statistical  
8                    association between magnetic field exposure and childhood leukemia.

9    Q.    SO MAY WE CONCLUDE THAT IT IS NOT APPROPRIATE TO DRAW  
10            INFERENCES ABOUT POWERLINE EMF AND CHILDHOOD LEUKEMIA  
11            AND OTHER CANCERS FROM MR. ELLARS' TABLE IN ATTACHMENT  
12            JWE-4?

13   A.    Absolutely. The table provided by Mr. Ellars is not complete, nor does it (or Mr.  
14            Ellars in his discussions) take into consideration all of the sources of uncertainty  
15            and error in these studies. Furthermore, as I have stated in my direct testimony  
16            (pp. 11-13) and above, epidemiology studies are but one part of the evidence that  
17            must be considered in assessing potential human health risks.

18   Q.    MR. ELLARS PROVIDES ATTACHMENT JWE-5 TO CHARACTERIZE THE  
19            TYPICAL MAGNETIC FIELD LEVELS PRODUCED BY COMMON,  
20            EVERYDAY HOUSEHOLD ITEMS SUCH AS APPLIANCES. HE ALSO

1 APPEARS TO SUGGEST THAT THESE ITEMS CONTRIBUTE LITTLE TO  
2 POPULATION MAGNETIC FIELD EXPOSURES (IN CONTRAST TO  
3 TRANSMISSION LINES) BECAUSE APPLIANCES ARE TYPICALLY USED  
4 FOR A LIMITED PERIOD OF TIME (P. 43). DOES THIS MEAN THAT  
5 EXPOSURES FROM APPLIANCES AND OTHER NON-TRANSMISSION  
6 LINE SOURCES ARE NOT IMPORTANT?

7 A. No, for several reasons. While difficult to estimate, studies of exposures from  
8 different sources indicate that magnetic fields from appliances may significantly  
9 contribute to a person's overall time-averaged exposure. Although Mr. Ellars  
10 discussed the importance of duration in the assessment of "time weighted average"  
11 on p. 43 at lines 8-10, and suggested that appliance use was time limited (lines 12-  
12 13), he did not provide data on the relative contribution of appliances to time-  
13 averaged exposure.

14 In perhaps the most detailed study of lifetime exposures to magnetic fields, which  
15 was performed in Germany, Behrens et al. (2004) reported that about 1/3 of total  
16 exposure can be attributed to electrical appliances, 1/3 to flawed electrical  
17 installations in homes, and 1/3 to sources external to homes and other buildings  
18 (e.g., power lines). It is interesting to note that in this study alarm clocks and  
19 electromechanical digital alarm clocks (which barely register as an exposure  
20 source based on magnetic field intensity in Mr. Ellars' table in JWE-5) were found

1 to contribute 20-100 times more to a person's lifetime exposure than other  
2 appliances he lists, including hairdryers and microwave ovens, because of long  
3 periods of nighttime exposure.

4 Non-transmission line sources besides appliances are also significant sources of  
5 exposure to magnetic fields. In the U.S., a random survey of ~1,000 residences  
6 reported that currents flowing on water pipes and on other components of house  
7 grounding systems are twice as likely as outside power lines to be the source of the  
8 highest magnetic fields measured in homes (Zaffanella, 1993). In a study of  
9 magnetic field sources in the United Kingdom in homes where exposures were  
10 estimated to be higher than average levels, low-voltage sources inside and outside  
11 of the home were the source of magnetic field levels greater than 2 mG in 77% of  
12 the homes (Maslanyj et al., 2007). Low-voltage sources refer to the electrical  
13 wiring within the home, appliances, and the supply circuits outside the property  
14 that deliver electricity to the home (i.e., distribution lines). In homes with  
15 magnetic fields greater than 4 mG, exposure also was attributed to low voltage  
16 sources in most of the homes (57%). These studies indicate that indoor sources  
17 including appliances, building wiring and water pipes, and outdoor distribution  
18 lines may contribute the most to magnetic field exposure.

19 Q. ON PAGE 38 WITNESS ELLARS CITES THE CONCLUSIONS OF A REVIEW  
20 BY SCIENTISTS AT CALIFORNIA'S DEPARTMENT OF HEALTH

1 SERVICES (“DHS”), AND NOTES THAT THEIR CONCLUSIONS DIFFER  
2 FROM OTHER REVIEWS (P. 39), AS YOU STATED IN YOUR TESTIMONY.  
3 DO YOU THINK THAT THE REASONS HE QUOTES FROM THE DHS  
4 REPORT OUTWEIGH THE CONCLUSIONS OF THE NATIONAL  
5 INSTITUTE OF ENVIRONMENTAL HEALTH SCIENCES (“NIEHS”) AND  
6 THE INTERNATIONAL AGENCY FOR RESEARCH ON CANCER (“IARC”),  
7 AMONG OTHERS?

8 A. No. In my testimony (pp. 18-20), I explained why the NIEHS, IARC and other  
9 agencies, which used larger and more diverse panels and adhered to standard  
10 methods, have more scientific validity.

11 Q. ARE THE LIMITATIONS OF THE REVIEW BY THE DHS SCIENTISTS  
12 RECOGNIZED BY OTHER HEALTH AGENCIES?

13 A. Yes. Scientific criticism has also been expressed by the National Radiological  
14 Protection Board (“NRPB”), the Health Council of the Netherlands (“HCN”), and  
15 the Minnesota Department of Health (“MDH”) (NRPB, 2004; HCN, 2004; MDH,  
16 2002, respectively). The MDH expressly stated the following criticisms of the  
17 DHS review and I quote them in their entirety:

18 While some scientists praised the California reviewers for using a  
19 novel approach, other researchers raised substantial concerns  
20 regarding the report’s conclusions, and more fundamentally, the  
21 process used to conduct the evaluation (CDHS 2002). Based on  
22 these comments and a review of the report, MDH concluded that

1           there is no scientific consensus at this time on the report's  
2           conclusions, including the degrees of confidence that the reviewers  
3           assigned regarding a causal relationship between EMF and adverse  
4           health effects.

5           MDH also concluded that there are some significant limitations in  
6           California's EMF evaluation. For example, the California reviewers  
7           failed to adequately address the lack of supporting data from animal  
8           laboratory studies and the lack of a plausible biological mechanism  
9           of how EMF may cause harm in their evaluation. Furthermore, they  
10          failed to adequately address several well-recognized limitations  
11          (e.g., selection bias, confounding, exposure misclassification) in  
12          EMF epidemiological research. (p. 23).

13          MDH also has concluded that there are several important distinctions  
14          between California's evaluation process and the processes used by  
15          other scientific EMF review panels. The California evaluation was  
16          conducted by three reviewers, all from the same agency, and all with  
17          primary expertise in epidemiology. Other recent scientific EMF  
18          panels (listed above) have taken advantage of a broader review panel  
19          selected from leading U.S. and international health agencies and  
20          research organizations, representing expertise in a wide variety of  
21          disciplines (e.g., epidemiology, cellular biology, physics, statistics)  
22          (p. 24).

23  
24    Q.    WAS THE APPROACH USED BY THE DHS TO EVALUATE SCIENTIFIC  
25           RESEARCH DEMONSTRATED TO BE MORE VALID THAN THE  
26           METHODS USED BY IARC AND NIEHS IN THEIR EVALUATIONS OF THE  
27           LITERATURE?

28    A.    No. The review method developed and applied by the three scientists at the DHS  
29           to evaluate the EMF research had never been tried or tested either by them or any  
30           other review group. In contrast, the IARC approach has been used in the  
31           evaluation of over 900 chemicals, physical agents, and mixtures.

1 Q. HAVE EITHER THE DHS OR THE PUBLIC UTILITY COMMISSION OF  
2 CALIFORNIA CHANGED THEIR POLICIES TOWARD EMF OR CHANGED  
3 THEIR RECOMMENDATIONS AS A RESULT OF THE REPORT BY THESE  
4 THREE SCIENTISTS EMPLOYED BY THE DHS?

5 A. No. The recommendations to the public regarding EMF on the DHS website  
6 today are the same as in 1999 (DHS, 1999). Furthermore, the California Public  
7 Utility Commission, which considered the report by the DHS (2002), expresses  
8 the same view of the research as in 1993 – “The Commission is unable to  
9 determine whether there is a significant scientifically verifiable relationship  
10 between EMF exposure and negative health consequences” – and has reaffirmed  
11 the Commission’s 1993 “low-cost/no-cost, policy to mitigate EMF exposure for  
12 new utility transmission and substation projects” (CPUC, 2007).

13 Q. MR. ELLARS STATED ON P. 48, LINES 1-3 OF HIS TESTIMONY: “BASED  
14 ON MY REVIEW OF THE STUDIES AND THE LITERATURE AVAILABLE,  
15 IT IS OBVIOUS THAT THE EFFECT OF EMF ON HEALTH REMAINS  
16 CONTROVERSIAL AND WITHOUT A DEFINITIVE CONCLUSION.” DO  
17 YOU AGREE?

18 A. While this may appear to be the case when members of the general public first  
19 approach this area of research, taken alone, this statement does not accurately or  
20 fully describe the current state of the science. There has been nearly 30 years of

1 research on the possible health effects of EMF, the more recent half of which Mr.  
2 Ellars has failed to address. As with any area of scientific inquiry, no definitive  
3 conclusions can be offered that provide a *final* solution to questions about health  
4 risks; however, reliable conclusions have been provided that are based on  
5 objective and thorough reviews of hundreds of studies compiled over this 30-year  
6 period. Thus, while members of the public may observe scientific controversy or  
7 further questions being raised, they should not fail to appreciate the breadth and  
8 quality of research that has been amassed on this topic. Like anything else,  
9 scientists could identify more areas to explore and debate, but the current body of  
10 research is sufficient for a reliable consensus among health authorities today.

11 Q. DOES STAFF WITNESS ELLARS RECOMMEND THAT THE TRAILCO  
12 PROJECT NOT BE APPROVED BECAUSE OF EMF CONCERNS?

13 A. No, he does not, but he does recommend that the Commission require that  
14 “TrAILCo should be required to purchase any properties containing residences  
15 that are situated within 400 feet of the centerline whose owners desire to sell their  
16 properties” (p. 51, lines 14-16).

17 Q. WHAT IS THE STATED PURPOSE OF HIS PROPOSED REQUIREMENT?

18 A. Mr. Ellars reports “[t]he Staff believes this will create an adequate buffer zone  
19 between the line and inhabited structures. In addition to mitigating other impacts  
20 upon residences, such a buffer zone would also be consistent with a “prudent

1 avoidance” approach to transmission line siting and the potential effects of EMF.”  
2 (p. 51, line 16 to p. 52, line 2).

3 Q. DOES HE PROVIDE ANY DATA OR ANALYSES TO SUPPORT HIS  
4 RECOMMENDATION FOR A ±400-FOOT ‘PURCHASE BUFFER’ (I.E., A *DE*  
5 *FACTO* RIGHT-OF-WAY 800 FEET WIDE) AROUND THE PROPOSED  
6 LINE?

7 A. No, but on pp. 41-42 of his testimony he calls attention to the distance from the  
8 centerline of the right-of-way at which the calculated magnetic field would reach a  
9 level of 4 mG under average load conditions (365 feet) and peak load conditions  
10 (410 feet) and on p. 42 he states “[m]y intention is to establish, for the  
11 Commission’s consideration, the distances from the ROW centerline at which the  
12 magnetic field will reach this [4 mG] level.” (lines 13-15). It cannot be  
13 coincidence that he recommends a “buffer” for EMF “prudent avoidance” that  
14 corresponds to a zone where the magnetic field would be less than 4 mG.

15 Q. IN ADDRESSING EMF, DOES MR. ELLARS CONCLUDE IN HIS  
16 STATEMENT THAT THE EMF LEVELS ASSOCIATED WITH THE  
17 OPERATION OF TRAIL REPRESENT A HEALTH DANGER?

18 A. No, he does not.

19 Q. WHAT IS YOUR UNDERSTANDING OF “PRUDENT AVOIDANCE”?

1 A. Dr. Granger Morgan of Carnegie Mellon University is credited for defining this  
2 concept. He described “prudent avoidance” as “limiting exposures which can be  
3 avoided with small investments of money and effort.” He stated that:

4 ... because of our [sic] understanding of the science of the [EMF]  
5 problem is still very incomplete, there is a real chance that some or  
6 all of the expense and associated trouble that would result from  
7 “aggressive action” taken now, would ultimately turn out to have  
8 been ineffective. There are two ways this could happen. First, it  
9 could turn out that there are no health risks from fields or that there  
10 are risks but they are very small. Second, it could turn out that  
11 while there are risks, we’ve done the wrong things to control them  
12 and gotten little or no improvement for our money ...

13 In our discussion of the strategy of “prudent avoidance” we argued  
14 that today it is hard to justify spending more than a few thousand  
15 dollars per person exposed in order to reduce exposures. We said  
16 this because we believe that if fields pose health risks, only a very  
17 small fraction of all the people exposed can be expected to develop  
18 adverse health consequences (probably not more than one in many  
19 thousands). That means that spending a few thousand dollars per  
20 exposure avoided amounts to spending millions of dollars or more  
21 per possible health effect avoided (Morgan, 1989, pp. 28-29).

22  
23 Q. IS DR. MORGAN’S CONCEPT OF “PRUDENT AVOIDANCE” SIMILAR TO  
24 THE APPROACHES RECOMMENDED BY NIEHS AND WHO?

25 A. Yes.

26 Q. WHAT ARE THE RECOMMENDATIONS OF THE NIEHS?

27 A. The NIEHS (1999) report to Congress states:

28 In the case of ELF-EMF, there are several issues that complicate any  
29 regulatory action. First, there is only marginal, scientific support that  
30 exposure to ELF-EMF is a health hazard. Second, it is unclear what  
31 aspect of the exposure, if any, may be the active component of the

1 field resulting in the increased cancer risk. While the association  
2 observed is with average magnetic field measures, controls resulting in  
3 reductions in these field levels may not alleviate the risk. Third, it is  
4 impossible to remove all ELF-EMF exposure and remain a modern,  
5 technologically advanced society. Finally, considering the weak  
6 degree of evidence involved, it is critical that the potential risks from  
7 any alternatives to our current methods of using electricity be carefully  
8 evaluated...

9 The NIEHS suggests that the level and strength of evidence supporting  
10 ELF-EMF exposure as a human health hazard are insufficient to  
11 warrant aggressive regulatory actions; thus, we do not recommend  
12 actions such as stringent standards on electric appliances and a  
13 national program to bury all transmission and distribution lines.  
14 Instead, the evidence suggests passive measures such as a continued  
15 emphasis on educating both the public and the regulated community  
16 on means aimed at reducing exposures. NIEHS suggests that the  
17 power industry continue its current practice of siting power lines to  
18 reduce exposures and continue to explore ways to reduce the creation  
19 of magnetic fields around transmission and distribution lines without  
20 creating new hazards (pp. 37-38).

21  
22 Q. DO YOU BELIEVE THAT MR. ELLARS' PROPOSAL FOR AN 800-FOOT  
23 WIDE 'PURCHASE BUFFER' IS CONSISTENT WITH A "PRUDENT  
24 AVOIDANCE" APPROACH TO TRANSMISSION LINE SITING AND THE  
25 "POTENTIAL EFFECTS OF EMF" AS WITNESS ELLARS SUGGESTS ON  
26 PAGES 51-52?

27 A. No. Transmission line rights-of-way are established to meet electrical safety  
28 standards under the National Electric Safety Code, provide for access and  
29 maintenance, and restrict potentially incompatible land uses. The addition of  
30 another buffer zone beyond the right-of-way would not be consistent with the

1 recommendations of scientific and health organizations for addressing public  
2 concern about EMF because the magnitude of likely expenditures is not  
3 proportional to the weight of the available scientific evidence. Proportionality of  
4 expenditures and the weight of the scientific evidence is a key tenet of “prudent  
5 avoidance.”

6 Q. WHAT DOES THE WHO RECOMMEND REGARDING APPROPRIATE  
7 STRATEGIES TO RESPOND TO PUBLIC CONCERN ABOUT EMF?

8 A. The WHO (2007b) recently summarized its precautionary recommendations as  
9 follows:

10 For high-level short-term exposures to EMF, adverse health effects  
11 have been scientifically established (ICNIRP, 2003). International  
12 exposure guidelines designed to protect workers and the public from  
13 these effects should be adopted by policy makers. EMF protection  
14 programs should include exposure measurements from sources where  
15 exposures might be expected to exceed limit values.

16  
17 Regarding long-term effects, given the weakness of the evidence for a  
18 link between exposure to ELF magnetic fields and childhood  
19 leukaemia, the benefits of exposure reduction on health are unclear. In  
20 view of this situation, the following recommendations are given:

- 21  
22
- 23 • Government and industry should monitor science and  
24 promote research programmes to further reduce the  
25 uncertainty of the scientific evidence on the health effects of  
26 ELF field exposure. Through the ELF risk assessment  
27 process, gaps in knowledge have been identified and these  
28 form the basis of a new research agenda.
  - 29 • Member States are encouraged to establish effective and  
30 open communication programmes with all stakeholders to

1 enable informed decision-making. These may include  
2 improving coordination and consultation among industry,  
3 local government, and citizens in the planning process for  
4 ELF EMF-emitting facilities.

- 5  
6 • When constructing new facilities and designing new  
7 equipment, including appliances, low-cost ways of reducing  
8 exposures may be explored. Appropriate exposure reduction  
9 measures will vary from one country to another. However,  
10 policies based on the adoption of arbitrary low exposure  
11 limits are not warranted.

12  
13 Q. IS THIS 'PURCHASE BUFFER' PROPOSED BY MR. ELLARS FAR LARGER  
14 THAN HAS BEEN PROPOSED IN THE PAST IN WEST VIRGINIA?

15 A. Yes. I noted that Witness Byron L. Harris in his direct testimony filed on behalf  
16 of the Consumer Advocate referenced the "Order of the West Virginia  
17 Commission approving a Certificate of Convenience and Necessity for a 765 kV  
18 transmission line in Mason, Putnam and Cabell Counties (Case 9003) [Exhibit  
19 BLH-5]. In that case, the Commission ordered "[t]o mitigate possible adverse  
20 effects of the field created by the energized line, Appalachian shall construct,  
21 maintain and operate the 765 kV Culloden-Gavin line so that there will not be any  
22 inhabited dwelling within 200 feet of the centerline." (5. at p. 340). This action  
23 appears to have been largely directed towards minimizing well-known electric  
24 field effects from high voltage lines, including nuisance shocks from grounded  
25 objects.

1 Q. IS THE SCIENTIFIC EVIDENCE REGARDING ASSOCIATIONS BETWEEN  
2 MAGNETIC FIELDS AND CANCER OR OTHER HEALTH CONDITIONS AS  
3 STRONG OR CONVINCING AS HAS BEEN RELIED UPON BY  
4 COMMITTEES THAT SET ELECTRICAL SAFETY STANDARDS OR  
5 PUBLIC UTILITY COMMISSIONS THAT DEVELOP POLICIES AND  
6 STANDARDS TO ADDRESS INDIRECT EFFECTS OF ELECTRIC FIELDS?

7 A. No, it is not. The indirect effects of high electric fields are known, while the  
8 evidence in support of health effects associated with long-term exposure to low  
9 levels of magnetic fields is weak.

10 Q. SO THE RECOMMENDATION OF STAFF WITNESS ELLARS FOR A  
11 'PURCHASE BUFFER' AROUND THE PROPOSED TRANSMISSION LINE  
12 BASED ON MAGNETIC FIELD CONSIDERATIONS IS NEITHER  
13 CONSISTENT WITH THE LEVEL OF EVIDENCE APPLIED BY  
14 COMMISSIONS TO ADDRESS ELECTRIC FIELDS NOR WITH THE  
15 "PRUDENT AVOIDANCE" APPROACH OR POLICY RECOMMENDATIONS  
16 FROM THE NIEHS OR WHO?

17 A. That is correct. Mr. Ellars has not presented any estimate of the costs of his  
18 proposal that would permit the Commission to evaluate the reasonableness of the  
19 associated costs; the "prudence" part of the "prudent avoidance" approach refers  
20 to fiscal prudence, not a regulatory attitude towards potential health risks, and so

1 such information is required. Neither the NIEHS nor the WHO supports costly  
2 measures to minimize exposures to EMF. Moreover, the proposed ‘purchase  
3 buffer’ appears to be a more aggressive regulatory action than the precautionary  
4 recommendations made by the NIEHS to Congress in 1999. Mr. Ellars’ proposal  
5 also is contrary to WHO’s recommendation that “policies based on the adoption  
6 of arbitrary low exposure limits are not warranted” (WHO, 2007a), as noted  
7 above.

8  
9 REBUTTAL TO WITNESS LIEUTENANT COLONEL THOMAS M. HILDEBRAND

10 Q. ARE YOU FAMILIAR WITH THE WEB PAGE POSTED AT THE  
11 ENVIRONMENTAL PROTECTION AGENCY (“EPA”) WEBSITE REFERRED  
12 TO BY COL. HILDEBRAND AS HIS ATTACHMENT NO 20?

13 A. Yes, I am.

14 Q. IS THIS INFORMATION OF THE SAME CALIBER AS THE INFORMATION  
15 PROVIDED BY THE OTHER SCIENTIFIC ORGANIZATIONS DISCUSSED  
16 ABOVE, SUCH AS THE WHO AND THE NIEHS?

17 A. No, it is not. The EPA is not one of the federal agencies that currently has a  
18 mandate or the specialized expertise to address health issues related to EMF, nor  
19 does the agency have a published weight-of-evidence review on this topic. It  
20 appears to me that in putting up the website someone paraphrased the conclusions

1 of the NIEHS evaluation of EMF research. Accurate conclusions about a topic as  
2 complex and technical as EMF are not easily extracted from primary sources. The  
3 report of the Director of the NIEHS to Congress (NIEHS, 1999) is a far clearer  
4 and more authoritative summary of the assessment of EMF research than the  
5 material presented by Col. Hildebrand.

6 Q. DO YOU FURTHER DISAGREE WITH COL. HILDEBRAND'S BELIEF  
7 THAT HIS ATTACHMENT 20 IS AN EXAMPLE OF PROOF FOR "THE  
8 FACT THAT POWER LINES CAUSE HEALTH PROBLEMS" (PAGE 20,  
9 LINE 24)?

10 A. Yes. In addition to the noted limitations of the EPA document, it does not state or  
11 provide proof of this conclusion. This statement represents nothing more than  
12 Col. Hildebrand's opinion.

13  
14 REBUTTAL TO WITNESS DR. ALAN JOHN SEXSTONE

15 Q. WHAT IS THE BASIS FOR DR. SEXSTONE'S CONCERN SPECIFIC TO HIS  
16 FAMILY MEMBERS?

17 A. Among the concerns that Dr. Sexstone expresses in his testimony is his wife's fear  
18 that "repeated exposure to relatively high EMFs that occur directly under  
19 powerlines could induce a cancer" (p. 10, lines 14-16), which is augmented by her  
20 concerns about her family's history of cancer (p. 9, lines 15-16).

1 Q. AS PART OF THE RATIONALE FOR HIS WIFE'S FEAR, DR. SEXSTONE  
2 STATED, "AN EXPOSURE THRESHOLD OF 4 MG OFTEN IS CITED AS  
3 THE LEVEL ABOVE WHICH THE INCIDENCE OF CHILDHOOD  
4 LEUKEMIA MAY BE SIGNIFICANTLY HIGHER THAN CONTROLS" (P. 11,  
5 LINES 4-6). PLEASE COMMENT.

6 A. As I have stated in my testimony and as referenced in reviews by the WHO and  
7 other agencies cited therein, an association has been reported in the literature  
8 between childhood leukemia and estimates of time-averaged exposures to  
9 magnetic fields above 3-4 mG. This observation has provided the fundamental  
10 basis for the IARC and the WHO to designate magnetic fields as a possible human  
11 carcinogen. Neither of these organizations concluded that there was sufficient  
12 evidence to justify this description for any form of adult cancer.

13 Dr. Sexstone appears to be concerned about exposures to levels above 4 mG while  
14 walking over parts of his property away from his residence. While Dr. Sexstone  
15 correctly indicates that magnetic fields close to or under the transmission line  
16 could be much higher than at greater distances, and that exposure in epidemiology  
17 studies is estimated on a time-averaged metric, he then speculates that  
18 "generalizations from residential studies are inappropriate" (p. 12, line 22). His  
19 speculation does not consider that the WHO and other agencies have reviewed  
20 epidemiology studies that include populations with adults and children living

1 adjacent to high voltage transmission lines and, thus, were part of their daily  
2 exposures.

3 Moreover, the question he responds to on p. 12, lines 4-5 misstates my testimony  
4 regarding the conclusions of health and scientific agencies. The position of the  
5 WHO is that “[h]ealth effects related to short-term, high-level exposure have been  
6 established and form the basis of two international exposure limit guidelines  
7 (ICNIRP, 1998; IEEE, 2002). At present, these bodies consider the scientific  
8 evidence related to possible health effects from long-term, low-level exposure to  
9 ELF fields insufficient to justify lowering these quantitative exposure limits”  
10 (WHO, 2007a). These organizations have not concluded that exposures below  
11 their recommended limits pose any health threat. While the WHO statement may  
12 not be comforting to Dr. Sexstone’s wife or other members of the public, perhaps  
13 the conclusion of Health Canada may be clearer and, therefore, more reassuring.  
14 In providing advice to the public, Health Canada advises “You do not need to take  
15 action regarding typical daily exposures to electric and magnetic fields... . At  
16 present, there are no Canadian government guidelines for exposure to EMFs... .  
17 Health Canada does not consider guidelines necessary because the scientific  
18 evidence is not strong enough to conclude that typical exposures cause health  
19 problems” (Health Canada, 2006).

1 Q. DR. SEXSTONE DISCUSSES A STUDY BY FORSSÉN ET AL. (2005) ON  
2 PAGE 13 AND ACCUSES THE WHO EMF REPORT OF “AN  
3 INAPPROPRIATE GENERALIZATION WITH RESPECT TO RISKS” BASED  
4 ON THIS EPIDEMIOLOGY STUDY OF OCCUPATIONAL EXPOSURE TO  
5 MAGNETIC FIELDS AND BREAST CANCER. DO YOU AGREE WITH HIS  
6 OPINION?

7 A. No. It appears that he has misunderstood both this study and the WHO (2007b)  
8 report. First, his assertion that “in the Forssén study, maximum occupational  
9 exposures did not normally exceed 5 mG” (p. 13, lines 8-9) is mistaken. The main  
10 analysis of the study compared the occupational exposures of women with and  
11 without breast cancer based on the geometric *mean* of their time-weighted  
12 exposures. The highest exposure category for this analysis was  $>0.3\mu\text{T}$  (i.e., 3  
13 mG). Dr. Sexstone misunderstood the exposure metric to mean that women did  
14 not have any exposures that were greater than 5 mG. Other analyses reported in  
15 the study provide clear evidence that women had frequent exposures greater than 5  
16 mG. Forssén et al. examined the relative number of breast cancer cases and  
17 controls among 43,404 women whose jobs led to peak exposures between 15 and  
18 19.9 mG; 52,360 women whose jobs led to peak exposures between 20 and 34.9  
19 mG; and 10,347 women whose jobs led to peak exposures over 35 mG. Forssén et  
20 al. did not find an association between magnetic fields and breast cancer in any of

1 the analyses; “[a]ll risk estimates were close to unity regardless of exposure  
2 cutpoint or choice of exposure parameter” (Forssén et al., 2005, p. 250).

3 Dr. Sexstone also mischaracterized the basis for the conclusion in the WHO report  
4 regarding EMFs and breast cancer in lines 6-8 of p. 13 of his testimony. Nowhere  
5 does the WHO report state that its conclusions about the lack of a relationship  
6 between magnetic fields and breast cancer are just “[b]ased on this study,” as  
7 claimed by Dr. Sexstone. As discussed above and in my direct testimony, weight  
8 is given to studies of higher quality, and, as noted by the WHO, the study of breast  
9 cancer by Forssén et al. was of relatively high quality, and, therefore, assigned  
10 greater weight in the overall evaluation. However, the WHO report still  
11 considered the impact of *all* 19 new epidemiology studies, including the Forssén et  
12 al. (2005) study, on the existing body of epidemiology studies previously  
13 considered in the review by IARC. Based upon all the studies, the WHO Task  
14 Group (WHO, 2007b) concluded:

15 The scientific evidence supporting a linkage between ELF magnetic  
16 fields and any of these diseases is much weaker than for childhood  
17 leukaemia and in some cases (for example, for cardiovascular disease  
18 or breast cancer) the evidence is sufficient to give confidence that  
19 magnetic fields do not cause the disease. (p. 12)

20 For adult breast cancer more recent studies have convincingly shown  
21 no association with exposure to ELF magnetic fields. Therefore further  
22 research into this association should be given very low priority. (p. 18)

23

1 Q. DR. SEXSTONE ALSO CRITICIZED THE FORSSÉN ET AL. (2005) STUDY  
2 FOR NOT ADDRESSING “THIS RARE INDIVIDUAL” WITH “KNOWN RISK  
3 FACTORS OR A FAMILY PEDIGREE OF HIGH CANCER INCIDENCE”  
4 (PAGE 13). WHILE SUCH INDIVIDUAL CHARACTERISTICS WERE NOT  
5 COLLECTED OR REPORTED IN THIS STUDY, IS IT TRUE THAT  
6 SCIENTISTS HAVE NEGLECTED TO CONSIDER THE POSSIBILITY THAT  
7 POTENTIAL RISKS OF MAGNETIC FIELDS MIGHT BE HIGHER FOR  
8 PERSONS WITH A GENETIC PREDISPOSITION?

9 A. No. Scientists have considered this possibility and explored it in both human  
10 epidemiology studies, and in laboratory research studies of animals and human  
11 cells.

12 Q. ON PAGE 13, DR. SEXSTONE ARGUES THAT “PRUDENT AVOIDANCE”  
13 IS POSSIBLE FOR APPLIANCES, BUT IS NOT ACCEPTABLE FOR THE  
14 PROPOSED POWERLINE. WHAT IS YOUR RESPONSE?

15 A. Sources of magnetic fields are common and in some cases encountered for a  
16 considerable amount of time, as I discussed earlier in this testimony. Thus, short  
17 of forsaking the use of electricity in one’s home, it is difficult to totally avoid  
18 exposure from appliances and other non-transmission line sources, but people can  
19 take steps to reduce exposures. Given that there is information about the  
20 distribution of fields for the proposed line that is available to the Sexstones, they

1 can practice “prudent avoidance” by choosing to minimize the time spent in the  
2 areas where the field intensity is greatest, i.e., underneath the line. While I  
3 understand this is not their preferred solution, the acceptability of all the factors  
4 associated with the provision of essential infrastructure to the entire population,  
5 and any attendant risks (if any), is the province of governmental agencies, not the  
6 utility or the individual.

7 COMMENTARY ON THE TESTIMONY OF OTHER WITNESSES

8 Q. WOULD YOU PLEASE BRIEFLY COMMENT ON THE FOLLOWING  
9 STATEMENTS ON EMF ISSUES THAT ARE PRESENTED IN THE NON-  
10 EXPERT TESTIMONY OF LANDOWNERS ROBIN DALLAS, STEVEN  
11 GIESSLER, DUANE G. NICHOLS, LEW MCDANIEL, AND BHANTE  
12 YOGAVACARA RAHULA?

13 A. Yes. The following landowners provided statements on EMF in their testimony:

- 14 • **Robin Dallas** expressed health concerns about EMF and her family,  
15 particularly her children (Dallas testimony, pp. 9-10).
- 16 • **Duane G. Nichols** presented his opinion as to choices that the public makes  
17 in selecting locations for homes and recreation, and cites the potential effect  
18 of the transmission line on property values because of evidence cited in a  
19 1992 survey of real estate appraisers (Nichols, p. 9) and an additional  
20 attachment regarding property values (Delaney and Simmons, 1992).

- 1           •     **Lew McDaniel** is concerned that the proposed line would have diverse  
2                   adverse effects and diminish enjoyment of the watershed in areas  
3                   surrounding the lines “for those who fear EMF health risks.” (McDaniel, p.  
4                   10, lines 3-9).
- 5           •     **Steven Giessler** stated, “my family will be exposed to a potential health  
6                   hazard” (Giessler, p. 3, line 14) in his testimony and appended three  
7                   documents with relevance to the topic of EMF and health. The first  
8                   document is an epidemiology study that compared distance from home  
9                   address at birth to transmission lines of children with cancer in the United  
10                  Kingdom to selected controls (Draper et al., 2005). The second document  
11                  is a review of childhood epidemiology studies excerpted from a  
12                  comprehensive assessment of EMF research published by scientists at the  
13                  NRPB in 2001 (NRPB, 2001) whose conclusions were put into perspective  
14                  by the full Board of the NRPB.<sup>2</sup> A more recent assessment by this

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<sup>2</sup> The following overall conclusions were provided by the NRPB ([http://www.hpa.org.uk/hpa/news/nrpb\\_archive/response\\_statements/2001/response\\_statement\\_3\\_01.htm](http://www.hpa.org.uk/hpa/news/nrpb_archive/response_statements/2001/response_statement_3_01.htm)):

The Board notes the conclusions of the report. In particular, that the question of whether exposure to electromagnetic fields can influence the development of cancer cannot at present be completely resolved. This is despite the results from extensive epidemiological studies carried out in recent years with greatly improved methodology. Included in these are the findings of the UK Childhood Cancer Study (UKCCS), which is the world's largest case control study on the causes of childhood cancer.

1 organization, now part of the Health Protection Agency, was referenced in  
2 my original testimony (NRPB, 2004). The WHO Task Group has  
3 evaluated the Draper et al. study and the 2001 and other reviews prepared  
4 by the Advisory Group on Nonionising Radiation (AGNIR) for the NRPB.  
5 The third document is a review of the epidemiology literature on EMF and  
6 health prepared by Ahlbom et al. (2003) for the International Commission  
7 on Nonionizing Radiation (ICNIRP), which concludes that the association

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The annual birth rate in the UK is about 700,000. There are around 500 cases of leukaemia and about 1000 cases of other cancers reported in children (under 15 years) in the UK each year. The report by AGNIR concludes that any risk relates to leukaemia in children and young persons and in particular to those exposed at relatively high levels of average domestic exposure to magnetic fields at or above 0.4 microtesla ( $\mu\text{T}$ ) (400 nanotesla (nT)). For the UK population this relates to about 0.5% of the total population.

In the absence of any special effect of magnetic fields 2 of the 500 cases of childhood leukaemia a year would be associated with exposures of 0.4  $\mu\text{T}$  or more; if there were an effect of magnetic fields a further 2 cases might be produced, 1 case every 2 years being possibly due to proximity to power lines. This would imply an increase in the annual risk of leukaemia in childhood from about 1 in 20,000 to 1 in 10,000 and would correspond to an increase in the overall risk of leukaemia to age 15 years from 1 in 1400 to 1 in 700 for the 0.5% of children who were highly exposed. As has already been demonstrated in the UKCCS it has not been possible to detect this increase in the UK. At this low level of risk some of the increase may be due to biases in the way the data have been collected. There is no evidence that residential exposure to EMF is involved in the development of cancer in adults, and in particular of leukaemia or brain cancer.

The review of experimental studies by AGNIR gives no clear support for a causal relationship between exposure to ELF EMF and cancer.

1 of magnetic fields with childhood leukemia “is difficult to interpret in the  
2 absence of a known mechanism or reproducible experimental support” (p.  
3 911).

- 4 • **Bhante Yogavacara Rahula**, vice-Abbot for the Bhavana Society Forest  
5 Monastery, raises concerns in direct testimony that “presumed fear of  
6 health dangers from being exposed to the EMF of big power lines, real or  
7 imagined is enough to keep some people from coming to spend longer  
8 periods of time at the Bhavana Forest Monastery” (Rahula, p. 10, lines 21-  
9 23). The vice-Abbott makes the case for the uniqueness of the location, the  
10 mission of the monastery, and its meditative seclusion that are feared to be  
11 disrupted by visual impacts and noise, wholly apart from EMF issues. The  
12 vice-Abbott requests that studies be performed to evaluate alternate  
13 configurations of the proposed line to reduce magnetic fields, as  
14 exemplified in pilot calculations by engineer Kirby C. Holte (Rahula,  
15 Exhibit No. 8).

- 16 • While not representing landowners directly, Witness **Byron L. Harris**,  
17 Director of the Consumer Advocate Division of the Public Service  
18 Commission of West Virginia, alludes to health concerns raised by  
19 landowners at hearings in Morgantown and Grafton (Harris, p. 5, line 5;  
20 Appendix A).

1 Q. IS EMF A COMMON THEME OF THESE TESTIMONIES?

2 A. Yes, while the landowners typically expressed concerns about multiple aspects of  
3 the proposed project, all have expressed concern about real or perceived effects of  
4 EMF on human health. While this topic may not be of the utmost concern to all  
5 (other factors having greater priority), they all appear to have made efforts to learn  
6 more about this topic.

7 Q. DOES IT APPEAR THAT THE AVAILABILITY OF INFORMATION ABOUT  
8 RESEARCH STUDIES AND REVIEWS OF RESEARCH STUDIES ON THE  
9 INTERNET AND FROM OTHER SOURCES HAS BEEN PARTICULARLY  
10 HELPFUL TO THEM?

11 A. To a limited extent. The number of studies on this topic is very large and highly  
12 technical; therefore, it is difficult for them, regardless of their background and  
13 training, to take the individual studies they have read or descriptions of studies on  
14 Internet websites and “put them all together.” This is the reason that both the  
15 public and policymakers should give great weight to the assessments provided by  
16 national and international health agencies. Nevertheless, these health agencies and  
17 researchers in general could do more to help non-experts understand this body of  
18 research in a larger context.

19 Q. WHAT DO YOU MEAN BY “LARGER CONTEXT”?

1 A. Because the research on EMF and the reviews of that research are appropriately  
2 focused on the technical aspects of this topic, it is sometimes difficult for the  
3 public to appreciate how much we know about EMF, its fundamental properties, at  
4 what intensities it can interact with biological systems, and its potential for  
5 affecting human health. Scientists have been conducting research for many years  
6 and have significantly narrowed the degree of uncertainty about the potential for  
7 adverse health effects of EMF. In fact, we know more about EMF than all but a  
8 small fraction of the more than 70,000 toxic substances in commercial use that  
9 have been registered with the EPA. But, despite the large amount of research  
10 conducted, additional research continues. Research continues not because we  
11 have found a problem, but because everyone in modern society has exposures to  
12 EMF, whether they live near a transmission line or not. Therefore, we want to  
13 make sure that even the slightest possibility of a risk has not been overlooked.

14  
15 CONCLUSIONS

16 Q. HAVE ANY WITNESSES PROVIDED COGENT, SCIENTIFICALLY  
17 SUPPORTED ARGUMENTS TO DEMONSTRATE THAT THE REVIEWS OF  
18 SCIENTIFIC RESEARCH PUBLISHED BY NATIONAL AND  
19 INTERNATIONAL HEALTH AGENCIES THAT YOU SUMMARIZED IN  
20 YOUR TESTIMONY SHOULD BE DISREGARDED?

1 A. No. The information they have submitted in support of their arguments is  
2 incomplete and does not represent the application of appropriate scientific  
3 methods.

4 Q. HAS THE PROPOSAL FOR A 'PURCHASE BUFFER' AROUND THE  
5 TRANSMISSION LINE BEEN SUPPORTED BY ANY ANALYSES TO  
6 JUSTIFY THIS PROPOSAL AS AN APPROPRIATE "PRUDENT  
7 AVOIDANCE" ACTION?

8 A. No.

9 Q. WHAT ABOUT THE COMMENTS AND SUBMISSIONS OF MEMBERS OF  
10 THE PUBLIC?

11 A. Those who submitted testimony and those who participated in public meetings  
12 should be commended for making the effort to become acquainted with EMF, as  
13 well as other topics. The problem for them, however, is that the number of studies  
14 on this topic is very large and highly technical. I believe this is the reason that  
15 both the public and policymakers should give great weight to the assessments  
16 provided by national and international health agencies. Given the degree of public  
17 concern about EMF in relation to this project, it is absolutely critical that all  
18 parties recognize how important it is for the basis of any decision regarding EMF,  
19 whatever the source, be grounded on the highest level of scientific rigor and

1 evidence. Reliance on lesser evidence is unacceptable, where matters of broad  
2 public health and welfare are concerned.

3 Q. DOES THIS CONCLUDE YOUR REBUTTAL TESTIMONY?

4 A. Yes. However, I reserve the right to file such additional testimony as may be  
5 necessary or appropriate.

1 REFERENCES CITED

2 Ahlbom A, Day N, Feychting M, Roman E, Skinner J, Dockerty J, Linet M, Michealis J, Olsen  
3 JH, Tynes T, Verkasalo PK. A pooled analysis of magnetic fields and childhood leukemia. *Br J*  
4 *Cancer* 83:692-698, 2000.

5 Behrens T, Terschüren C, Kaune WT, Hoffmann W. Quantification of lifetime accumulated  
6 ELF-EMF exposure from household appliances in the context of a retrospective epidemiological  
7 case-control study. *J Expo Anal Environ Epidemiol.* 14:144-53, 2004.

8 California Public Utilities Commission (CPUC). PUC Actions Regarding EMF. November 3,  
9 2007. Accessed at  
10 <http://www.cpuc.ca.gov/PUC/energy/electric/Environment/ElectroMagnetic+Fields/action.htm>.

11 Department of Health Services (DHS). Short Factsheet on EMF, 1999. Accessed at  
12 <http://www.dhs.ca.gov/ps/deodc/ehib/emf/shortfactsheet.PDF>.

13 Department of Health Services (DHS). Neutra RR, Delpizzo V, Lee GM. An Evaluation Of The  
14 Possible Risks From Electric And Magnetic Fields (EMFs) from Power Lines, Internal Wiring,  
15 Electrical Occupations And Appliances. California EMF Program, Oakland, California, 2002.

16 Draper G, Vincent T, Kroll ME, Swanson J. Childhood cancer in relation to distance from high  
17 voltage power lines in England and Wales: a case-control study. *British Medical Journal*  
18 330:1290-1293, 2005.

19 Feychting M, Ahlbom A. Magnetic fields and cancer in children residing near Swedish high-  
20 voltage power lines. *Am J Epidemiol.* 13:467-481,1993.

21 Forssén UM, Rutqvist LE, Ahlbom A, Feychting M. Occupational magnetic fields and female  
22 breast cancer: a case-control study using Swedish population registers and new exposure data.  
23 *Am J Epidemiol*, 161:250-259, 2005.

24 Greenland S, Sheppard AR, Kelsh MA, Kaune WT. A pooled analysis of magnetic fields, wire  
25 codes, and childhood leukemia. *Epidemiology* 11:624-634, 2000.

26 Health Canada. It's your health: Electric and magnetic fields at extremely low frequencies. 2006.  
27 [http://www.hc-sc.gc.ca/iyh-vsv/environ/magnet\\_e.html](http://www.hc-sc.gc.ca/iyh-vsv/environ/magnet_e.html)

28 Health Council of the Netherlands (HCN) Electromagnetic Fields: Annual Update 2003. The  
29 Hague, Health Council of the Netherlands, 2004. (Publication no. 2004/01).

- 1 Health Council of the Netherlands (HCN). Proposals for Research into Health Effects of  
2 Electromagnetic Fields (0 Hz - 300 GHz). The Hague: Health Council of the Netherlands, 2006.  
3 (Publication no. 2006/11E.).
- 4 International Agency for Research on Cancer (IARC). IARC Monographs on the Evaluation of  
5 Carcinogenic Risks to Humans. Volume 80: Static and extremely low-frequency (ELF) electric  
6 and magnetic fields. IARC Press, Lyon, France, 2002.
- 7 International Commission on Non-Ionizing Radiation Protection (ICNIRP). Exposure to Static  
8 And Low Frequency Electromagnetic Fields, Biological Effects And Health Consequences (0-  
9 100 kHz) – Review Of The Scientific Evidence On Dosimetry, Biological Effects,  
10 Epidemiological Observations, And Health Consequences Concerning Exposure To Static And  
11 Low Frequency Electromagnetic Fields (0-100 kHz). Matthes R, McKinlay AF, Bernhardt JH,  
12 Vecchia P, Beyret B (eds.). International Commission on Non-Ionizing Radiation Protection,  
13 2003.
- 14 International Commission on Non-Ionizing Radiation Protection (ICNIRP). Guidelines for  
15 limiting exposure to time-varying electric, magnetic, and electromagnetic fields (up to 300 GHz).  
16 Health Phys 74:494-522, 1998.
- 17 International Committee on Electromagnetic Safety (ICES). IEEE Standard for Safety Levels  
18 with Respect to Human Exposure to Electromagnetic Fields 0 to 3 kHz C95. 6-2002.  
19 Piscataway, NJ: IEEE, 2002.
- 20 Linet MS, Hatch EH, Kleinerman A, Robinson LL, Kaune WT, Friedman DR, Severson RK,  
21 Haines CM, Hartsock CT, Niwa S, Wachholder S, and Tarone RE. Residential exposure to  
22 magnetic fields and acute lymphoblastic leukemia in children. N Engl J Med 337:1-7, 1997.
- 23 Maslanyj, TJ Mee, DC Renew, J Simpson, P Ansell SG Allen and E Roman. 2007. Investigation  
24 of the sources of residential power frequency magnetic field exposure in the UK Childhood  
25 Cancer Study. J. Radiol. Prol 27: 41-58.
- 26 McBride ML, Gallagher RP, Thériault G, Armstrong BG, Tamaro S, Spinelli JJ, Deadman JE,  
27 Fincham S, Robson D, Choi W. Power-frequency electric and magnetic fields and risk of  
28 childhood leukemia in Canada. Am J Epidemiol 149:831-842, 1999.
- 29 Minnesota Department of Health (MDH). EMF White Paper on Electric and Magnetic Field  
30 (EMF) Policy and Mitigation Options. 2002.
- 31 Morgan G. Electric and Magnetic Fields from 60 Hertz Electric Power: What do we know about  
32 possible health risks? Pittsburgh, PA: Carnegie Mellon University, 1989.

- 1 National Radiological Protection Board (NRPB). ELF electromagnetic fields and the risk of  
2 cancer: Report of an advisory group on non-ionizing radiation. Documents of the NRPB. 15:1-  
3 184, 2001.
- 4 National Radiological Protection Board (NRPB). Review of the scientific evidence for limiting  
5 exposure to electromagnetic fields (0-300 GHz). National Radiological Protection Board.  
6 Volume 15, No. 3, 2004.
- 7 National Institute of Environmental Health Sciences (NIEHS). Assessment of health effects  
8 from exposure to power-line frequency electric and magnetic fields: working group report. NIH  
9 Publication No. 98-3981. Research Triangle Park, NC: National Institute of Environmental  
10 Health Sciences of the U.S. National Institutes of Health, 1998.
- 11 National Institute of Environmental Health Sciences (NIEHS). NIEHS REPORT on Health  
12 Effects from Exposure to Power-Line Frequency Electric and Magnetic Fields. NIH Publication  
13 No. 99-4493 Research Triangle Park, NC: National Institute of Environmental Health Sciences  
14 of the U.S. National Institutes of Health, 1999.
- 15 Olsen JH, Nielsen A, Schulgen G. Residence near high-voltage facilities and risk of cancer in  
16 children. Br Med J, 307:891-895, 1993.
- 17 Swedish Radiation Protection Authority (SSI). Fourth annual report from SSI's Independent  
18 Expert Group on Electromagnetic Fields, 2006: Recent Research on EMF and Health Risks. SSI  
19 Rapport 2007:04.
- 20 UK Childhood Cancer Study Investigators (UKCCSI). Childhood cancer and residential  
21 proximity to power lines. Br J Cancer, 83:1573-1580, 2000.
- 22 Verkasalo PK, Pukkala E, Hongisto, MY, Valjus JE, Järvinen PJ, Heikkilä KV, Koskenvuo, M.  
23 Risk of cancer in Finnish children living close to power lines. Br Med J. 307:895-899, 1993.
- 24 World Health Organization (WHO). Electromagnetic Fields And Public Health. Fact sheet  
25 N°322, June 2007a.
- 26 World Health Organization (WHO). Extremely Low Frequency Fields. Environmental Health  
27 Criteria, Vol. 238, Geneva, WHO, June 2007b.
- 28 Zaffanella L. Survey of residential magnetic field source. Volume 1: Goals, results and  
29 conclusions. Volume 2: Protocol, data analysis and management. Palo Alto, CA, Electric Power  
30 Research Institute, 1993 (EPRI TR-102759-V1 and TR-102759-V2).