Dr Ginsberg Exhibit 6

STATE OF CONNECTICUT

DEPARTMENT OF PUBLIC HEALTH

Supplemental Testimony Regarding Potential Health Effects of EMF
Submitted to the Connecticut Siting Council, June 17, 2004
Submitted by Gary Ginsberg, Ph.D. Toxicologist

The purpose of this supplemental testimony is to provide the record with additional information in three areas that have come up repeatedly since DPH's initial testimony in May. The three areas are: 1) The weight of evidence provided by the UK study; 2) The relative importance of residential EMF exposure from local sources, such as household appliances vs. exposure from fields emanating from power lines; and 3) Possible concern over transients or harmonics that might not be removed if a split phasing approach were used to control EMF levels.

1) The United Kingdom study is a large, well-conducted examination of the potential link between EMF and childhood leukemia (1999, 2000). It found no association between EMF exposures and childhood leukemia. This finding is not very different from other studies which did find an association because in those studies, whether original study or meta-analysis, the lower ranges of exposure were not associated with increased disease, while only in the highest exposure category was there a possible link. The UK study's negative findings are most robust for the low exposure categories in which there are 66 or more children per category when combining cases and controls. In contrast, the high end exposure group ($\geq$ 4 mG) had only 17 children. This is out of a total of 4535 children in the study, with the vast majority (over 4100) in the lowest exposure category of $\leq$ 1 mG. Thus, this study has very little statistical power to test whether exposures over 4 mG are associated with an increased risk of childhood leukemia. It is noteworthy that the meta-analyses of Greenland and Ahlboom have found a leukemia – EMF association when pooling data across numerous studies, an approach which provides sufficient power to begin to assess this relationship. The lack of power of the UK study is further indicated by its small influence in the meta-analyses of Ahlboom, et al., 2000, and Wartenberg, 2001. When these authors excluded the UK study from their dataset, the overall odds ratio went up only slightly in both cases. The authors of the UK study acknowledge its limited power by stating: "Those studies, as well as this study, are consistent with the idea that exposures higher than 0.2 uT (2 mG) do not increase the risk of childhood leukemia, but there is uncertainty from the other studies as to whether exposures higher than 0.4 uT (4 mG) increase the risk, and our study contributes little evidence."(UK 1999 publication, pg 1931) The final paragraph of this paper (also page 1931) indicates that the primary concern of the study is with the safety of EMF exposures specifically in the UK as opposed to testing whether EMF at high levels could cause childhood leukemia. The paper acknowledges that: "A scientific question may still remain about the effect of exposures higher than 0.4 uT (4 mG). For the vast majority of children in the UK, however, there is now a

Phone:
Telephone Device for the Deaf (860) 509-7191
410 Capitol Avenue - MS # _____
P.O. Box 340308 Hartford, CT 06134

large body of evidence that the EMF levels to which they are exposed do not increase the risk of leukemia or other malignant disease." A similar set of conclusions was reached in the UK study 2000 publication which focused more upon distance of residence from the power line rather than EMF measurements. Again it acknowldeged that "We have only a few subjects living close to 132 kV or higher voltage lines, less than 120 meters say, so that our study has little power to detect small effects associated with close proximity." (UK 2000 study, page 1579). This problem of low statistical power to detect EMF effects seems to be common to a number of European as opposed to North American studies due to generally lower EMF exposures in Europe. The Greenland, et al. (2000) meta-analysis points out: "Distributions in North American studies tend to be much higher than those in European studies, probably reflecting differences in power systems (for example, more overhead wires and lower household voltage in North America), per capita electricity consumption, and grounding practices." (Greenland, et al., pp 626-627).

The perspective put on the UK study by these considerations is that while it is overall an excellent study, it lacked the power to test whether childhood leukemia could be associated with EMF exposures that occur when living close to a power line (e.g., 4 mG and over). However, this is exactly the question we are confronted with in the current application. Therefore, the UK study, while valuable in a general sense, is not as useful as the larger pooled meta-analysis datasets. Given the suggestive positive findings for exposures above 3 or 4 mG in the Greenland et al. (2000) and Ahlboom et al. (2000) meta-analyses, DPH finds that prudent avoidance is warranted in this uncertain zone above 3 mG.

2) Local sources of EMF within the home vs fields from power lines. There is much uncertainty as to which type of EMF exposure might be most relevant to leukemia – acute, high dose exposure vs. time weight average exposure. Short-term peak exposures may be of greatest concern if the cancer mechanism involves a threshold. The recent study evaluating DNA damage and EMF exposure in rats (Lai and Singh, 2004) suggests that the mechanism may involve free radicals. This mechanism would be consistent with a threshold since there are cellular defenses against free radicals and these defenses would need to be overcome for DNA damage to occur. Peak exposures around the home may occur when a child sits and plays near a refrigerator, washing machine, computer or other home appliance. These peaks may not, on their own be sufficient to overcome cellular defenses. However, a possibility is that if one begins with a high baseline exposure due to nearby power lines and then adds to this exposure that which comes from appliances in the home, the additive EMF levels may be more likely to exceed cellular thresholds and lead to genetic effects. Given that the toxicological effects of EMF are still under investigation, this hypothesis is speculative. However, it is based upon the very plausible and rather obvious assumption that adverse effects from EMF would be increased by the additive effect of EMF from power lines together with EMF from in-home appliances.

Decreasing children'sEMF exposures from in-home appliances would be a complex and difficult public education/risk communication task with no guarantee of success in changing personal behaviors. Therefore, controlling the external fields entering homes may be the best approach to minimizing children's EMF exposures.

3) Mitigation of EMF via split phasing vs. distance. Increasing the buffer zone to potential receptors is a guaranteed way to lower EMF exposure. However, technological approaches such as split phasing may also have a benefit, and in certain cases may be more practical. The concern has been raised that split phasing may succeed in lowering mG readings on average but may not avoid peak exposures due to transient or harmonic currents. DPH does not have the expertise to judge the likelihood that this could occur. During the course of these hearings there has been a lack of actual measurement data documenting the effectiveness of split phasing in lowering EMF. Therefore, it may be prudent for the Siting Council to request a limited field trial of split phasing that would take place over the course of days to weeks of power transmission. This may determine whether split phasing is a consistent and reliable EMF reduction method or whether there are transient episodes of higher fields. Such a study may provide a greater comfort level to all parties.