FILE

16

Irwin, Steven

From:	Scott Cormany <scottcormany@gmail.com>
Sent:	Friday, November 15, 2013 8:29 PM
To:	PUCO ContactOPSB
Subject:	Case# P13-0429-EL-BTX Biers Run Hopetown Delano
Attachments:	UniotoElementary.pdf; ATT00001.htm

OPSB:

Please add this and the attached map to the docket. Thank you.

I am writing to express my concern regarding the information being relayed pertaining to the proposed "AEP Blue Route" which runs near the Unioto Elementary School (previously known as the Cormany Learning Center), particularly the location and perceived detrimental health effects.

Attached you will find a map that lays out where the line will be located in relation to the school based on AEP's Proposed Blue Route. Also, please note the information contained in the attached map and document.

The information about electromagnetic field exposure from power lines contained is sourced from studies around the world and from reputable national and international organizations.

On a personal note, my wife is eight and half months pregnant. When of age, I intend on sending my child to Unioto and would feel comfortable doing so, if the "Blue Route" is selected.

Sincerely,

Scott Cormany

UNIOTO ELEMENTARY SCHOOL

NORTH

1 inch = 400 feet

"At a distance of about 300 feet from a transmission line, measured magnetic fields are similar to typical ambient background levels found in most homes" *Source: National Institute of Environmental Health Sciences (NIEHS), 2002.*

Common Levels of Magnetic Fields

Any device that uses electric current creates a magnetic field. Electric appliances such as computers and refrigerators and the wiring that runs through walls and ceilings in homes produce magnetic fields when current is flowing. Table 1 lists sample ranges of magnetic fields for various appliances and tools. For comparison, Table 2 shows typical magnetic fields generated by different types of electric lines. Typical background environmental or ambient magnetic field levels are most often around 1 to 3 mG. Table 3 shows magnetic fields generated by different types of underground transmission lines.

Table 1 Common Sources of Magnetic Fields (mG)[1]

Sources*	Distance From Source	
	6 inches (mG)	24 inches (mG)
Microwave Ovens	100 – 300	1 – 30
Dishwasher	10 – 100	2
Refrigerator	Ambient – 40	Ambient – 10
Fluorescent Lights	20 – 100	Ambient – 8
Copy Machines	4 – 200	1 – 15
Drills	100 – 200	3 – 6
Power Saws	50 – 1,000	2 – 40

Table 2 Typical US Magnetic Field Levels Associated with Overhead Transmission Lines[2]

Overhead Transmission Line Voltages	Usage	Typical Magnetic Field Measurements (mG)				
		Maximum in ROW	Approximate Distance From Centerline (Feet)			
			50	100	200	300
115 kV	Average	30	7	2	0.4	0.2
	Peak	63	11	3	0.9	0.4
230 kV	Average	58	23	7	1.8	0.8
	Peak	118	40	13	3.6	1.6
500 kV	Average	87	29	13	3.2	1.4
	Peak	183	62	27	6.7	3.0

National Institute of Environmental Health Sciences (NIEHS) and National Institutes of Health, [illegible], June 2002, pp. 33-35, http://www.niehs.nih.gov/health/topics/agents/emf/, accessed on April 10, 2014.

World Health Organization (WHO), [illegible], Geneva, World Health Organization, 2007, modified from Table 6.9, p. 33.

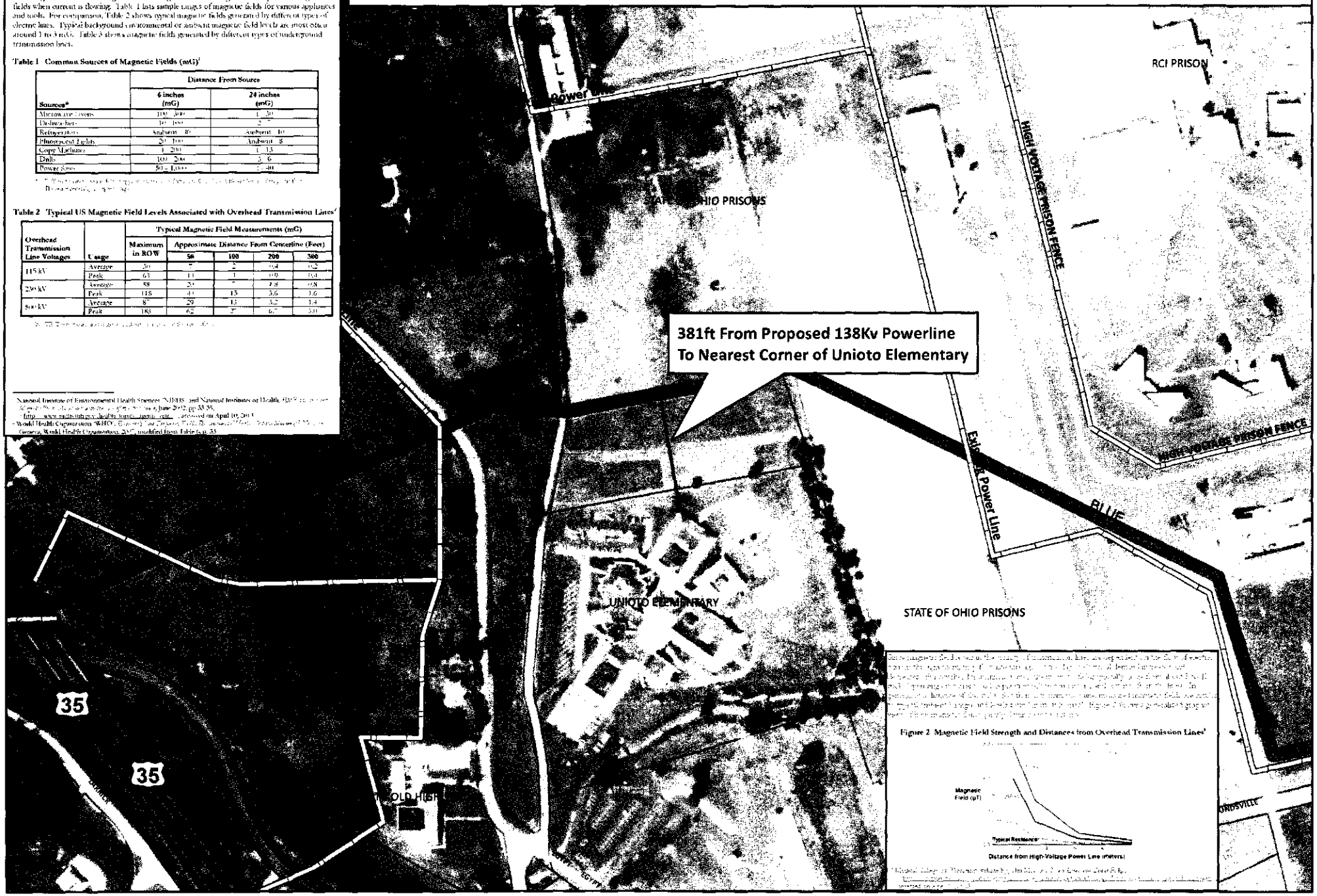


Figure 2 Magnetic Field Strength and Distances from Overhead Transmission Lines[2]

EMF
Electric & Magnetic Fields

The Electromagnetic Spectrum

Electricity produces two types of fields, electric and magnetic. These fields are often combined and referred to as electromagnetic fields or EMF. However, the two types of fields are quite different.

Recent scientific studies typically concentrate on the effects of magnetic fields and any potential association with health issues. "EMF" has become the popular short-hand term for magnetic fields.

Electric Fields

Wherever there is electricity, there are electric fields. While magnetic fields are created only when there is a current, electric fields are associated with any device or wire that is connected to a source of electricity, even when current is not flowing or the devise is not turned on.

Electric fields produced by high-voltage electric transmission lines have very little ability to penetrate buildings, or even skin. They are easily shielded by common objects such as trees, fences, and walls. Scientific studies have found no association between exposure to electric fields and human disease.

Magnetic Fields

Magnetic fields are created only when there is an electric current, the motion of electric charges (electrons) in a conductor, such as a wire. The magnitude of a magnetic field is proportional to the current flow through an electric line, not the voltage. As the current increases, so does the magnetic field.

There is no relationship between magnetic field strength and voltage. In the world of electric transmission lines, it is not uncommon for a 69 kilovolt (kV) electric line to have a higher magnetic field than a 115 kV line. High voltage 345 kV lines can carry large currents and as a result may produce relatively high magnetic fields, but primary distribution lines with voltages less than 69 kV can produce fields similar to those measured around a transmission line if they are carrying enough current.

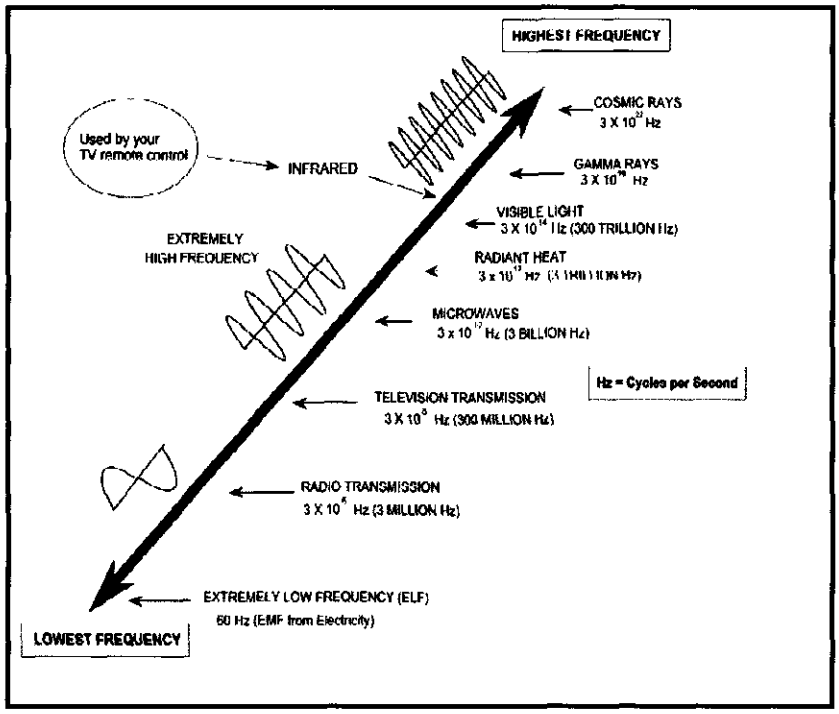
Magnetic fields become weaker rapidly with distance from the source. However, they do pass through most non-metallic materials and are therefore more difficult to shield.

In the literature, magnetic field data are presented in either units of Gauss (G) or Tesla (T). A milligauss (mG) is equal to one-thousandth of a Gauss (G). One Tesla is equal to 10,000 Gauss. A microtesla (μT) is equal to one-millionth of a Tesla or 10 mG.

Types of Radiation

Magnetic fields are part of the electromagnetic spectrum which includes cosmic rays, gamma rays, sunlight, microwaves, radio waves, and heat as illustrated in Figure 1.

Figure 1 Electromagnetic Spectrum



The electromagnetic spectrum is a name given to the range of different types of radiation from low to high frequencies. Radiation is energy that travels and spreads out as it moves away from a source. Visible light that comes from a lamp and radio waves that come from a radio station are two types of electromagnetic radiation. Only the highest frequency electromagnetic radiation, like gamma rays, can break apart DNA and lead to cancer. Low frequency radiations such as microwaves do not have enough energy to break molecular bonds, but can heat food items.

Magnetic fields generated by electric lines are in the extremely-low-frequency (ELF) range of the electromagnetic spectrum. The energy from these magnetic fields is very small. Magnetic fields from appliances and transmission lines cannot break molecular bonds.

Common Levels of Magnetic Fields

Any device that uses electric current creates a magnetic field. Electric appliances such as computers and refrigerators and the wiring that runs through walls and ceilings in homes produce magnetic fields when current is flowing. Table 1 lists sample ranges of magnetic fields for various appliances and tools. For comparison, Table 2 shows typical magnetic fields generated by different types of electric lines. Typical background environmental or ambient magnetic field levels are most often around 1 to 3 mG. Table 3 shows magnetic fields generated by different types of underground transmission lines.

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Fluorescent Lights	20 - 100	Ambient - 8
Copy Machines	4 - 200	1 - 13
Drills	100 - 200	3 - 6
Power Saws	50 – 1,000	1 - 40

* Different makes and models of appliances, tools, or fixtures will produce different levels of magnetic fields. These are generally-accepted ranges.

Table 2 Typical US Magnetic Field Levels Associated with Overhead Transmission Lines[2]

Overhead Transmission Line Voltages	Usage	Typical Magnetic Field Measurements (mG)				
		Maximum in ROW	Approximate Distance From Centerline (Feet)			
			50	100	200	300
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500 kV	Average	87	29	13	3.2	1.4
	Peak	183	62	27	6.7	3.0

NOTE: These values are for general information and not for a specific line.

[1] National Institute of Environmental Health Sciences (NIEHS) and National Institutes of Health, *EMF: Electric and Magnetic Fields Associated with the Use of Electric Power*, June 2002, pp.33-35, <http://www.niehs.nih.gov/health/topics/agents/emf/>, accessed on April 10, 2013.

[2] World Health Organization (WHO), *Extremely Low Frequency Fields, Environmental Health Criteria Monograph No. 238*, Geneva, World Health Organization, 2007, modified from Table 6, p. 33.

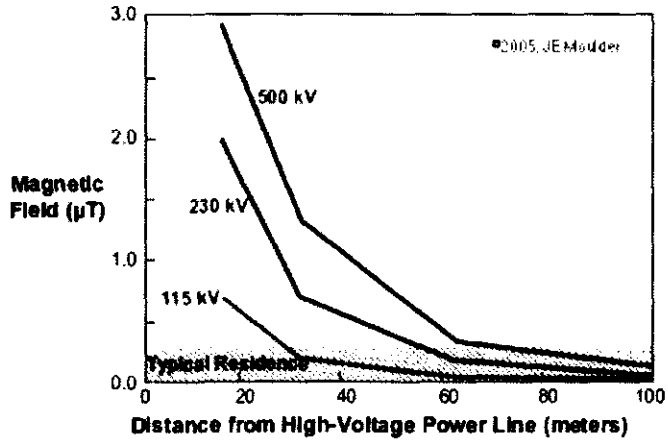
Table 3 Typical Magnetic Field Levels Associated with Underground Transmission Lines in the UK[3]

Underground Transmission Line Voltages	Details	Load	Typical Magnetic Field Measurements (mG) Approximate Distance From Centerline (Feet) 0	16	33	66
132 kV	Single cable at a depth of 1 m	Typical	50	17.8	9.4	4.7
275 kV	Direct buried with 0.5 m spacing and at 0.9 m depth	Maximum	962	131	36	9.2
		Typical	241	33	9.0	2.3

NOTE: While the standard voltages of lines in the UK differ from those used in Wisconsin, the information may be used as general background information and as a comparison with overhead transmission lines.

Since magnetic field levels in the vicinity of transmission lines are dependent on the flow of electric current through them, they fluctuate throughout the day as electrical demand increases and decreases. For overhead transmission lines, the magnetic fields typically range from about 5 to 150 mG, depending on current load, separation of the conductors, and distance from the lines. In general, at a distance of about 300 feet from a transmission line, measured magnetic fields are similar to typical ambient background levels found in most homes[4]. Figure 2 shows a generalized graphic view of how magnetic fields quickly diminish with distance.

Figure 2 Magnetic Field Strength and Distances from Overhead Transmission Lines[5]



[3] WHO, 2007, modified from Table 7 on p.34.

[4] NIEHS, 2002., p. 35.

[5] Medical College of Wisconsin website by John Moulder, *Power Lines and Cancer FAQs*, <http://www.mcw.edu/radiationoncology/ourdepartment/radiationbiology/Power-Lines-and-Cancer-FAQs.htm>, accessed on April 10, 2013.

Health Concerns

After more than three decades of research, there are still concerns among members of the public regarding exposure to elevated magnetic fields and an increased risk of childhood cancers. The concern about power lines and cancer comes largely from studies of people living near power lines and people working in the electrical occupations. Some of these studies appear to show a weak association between exposure and power-frequency magnetic fields and the incidence of some cancers.

Types of Studies

Medical research is of several different types, including epidemiological studies, laboratory studies, and clinical studies.

Epidemiological studies collect data in the real world and draw inferences from the information collected. For medical research, epidemiological studies observe and compare groups of people who have had or have not had certain diseases or exposures to see if the risks to the groups differ. Usually when epidemiological studies show a consistent and strong association to a risk factor, scientists will develop a plausible theory for how such an exposure might cause the disease. This is called a biological mechanism.

Epidemiological studies alone are not sufficient to verify a theory of cause and effect because the results are statistical associations and not direct evidence. To get beyond epidemiological studies and evaluate whether exposure to magnetic fields actually causes health effects, laboratory studies of cells and animals and clinical studies with human volunteers are necessary.

Controlled laboratory studies are conducted at the cellular level and on lab animals to test the hypothesis. In medical laboratory studies, the researchers take total control over study conditions to try to determine the actual biological mechanisms of how potential agents like magnetic fields can cause disease.

Clinical studies make use of the theories of biological mechanisms, and perhaps the laboratory testing results, to try to quantify effects on persons. In clinical studies, human volunteers are tested with different treatments to measure the actual effects on them accurately. For studies of EMF effects, medical researchers use controlled exposure rates on volunteers to look for measurable changes such as brain activity and hormonal levels.

Epidemiological Studies

In 1979, an epidemiology study by Wertheimer and Leeper[6] reported a statistical association between "wire codes" and childhood cancers in certain neighborhoods of Denver, Colorado. The term, "wire code" referred to the physical size of the power line which was assumed to be related to current flow of the line and thus a good surrogate measurement for the magnetic field. No magnetic field measurements were ever conducted for this study. Because the size of a line is not related to the magnetic field, subsequent studies have been tried to determine if there is any validity to the relationship stated in the Wertheimer/Leeper study. A multitude of increasingly sophisticated laboratory and correlative studies have investigated the potential association for more than 30 years.

[6] N.W. Wertheimer and Leeper, E., "Electric Wiring Configurations and Childhood Cancer", *Am. J. Epidem.*, Vol. 109, 1979, pp. 273-284.

Epidemiological studies are field studies. Unlike laboratory research where investigators have total control over study conditions, epidemiologists observe the world as it is. They draw inferences from information observed or collected about a study population's life, habits, and exposure to environmental factors. Because of this limitation, epidemiological studies suffer from a number of inherent weaknesses which may include issues associated with sample size, sample biases, and confounding factors. It is not uncommon for published studies to be criticized for weaknesses in study design or faulty conclusions. Additionally, particularly in regard to the study of EMF impacts, there is a problem with the lack of unexposed populations (control group) that can be compared to exposed populations. Everyone is exposed to some level of magnetic fields from household appliances and existing electric lines.

Most public and scientific attention has focused on childhood leukemia with lesser attention given to adult leukemia, childhood and adult brain cancer, lymphoma, and overall childhood cancer. Some epidemiological studies used a combination of the type of wiring and the distance to a residence as means of quantifying exposure, as the Wertheimer/Leeper study did, to see if level of exposure varied with the occurrence of cancer. Other studies used distance from transmission lines or substations as measures of exposure, and some studies have used contemporary measured fields or calculated fields. In general, the different methods of exposure assessment do not agree with each other, and there is no one method of exposure assessment common to all the major studies.

One set of epidemiological studies has involved research of potential links between the occurrence of adult cancers and EMF exposure in electrical workers. The assumption is that electrical workers present a larger population than children with leukemia and they may be routinely exposed to higher levels of magnetic fields for longer periods of time. However in some of these studies, there were no consistent dose-response relationships. They were studies based on job titles and not on measured exposures.

Laboratory Studies

Laboratory studies have been conducted to look at the possibility of genetic mutations from magnetic fields because genetic mutations are at the root of the development of cancers like leukemia.

Cellular genotoxicity studies look at the properties of an agent that might damage the genetic information within a cell and cause mutations, which may lead to cancer. There have been many published cellular studies, examining many types of cells from plasmids and bacteria to human cells. A wide range of exposure conditions and field intensities have been assessed looking for a plausible biological mechanism to explain how EMF might cause disease in the human body.

Whole-animal laboratory studies are used to determine whether or not exposure does indeed lead to disease. Animals can be exposed to elevated levels of an agent under strictly controlled conditions for long periods of time and then carefully examined for an increase in tumors, pre-cancerous effects, and cancer. The usefulness of laboratory animal work for assessing toxicity depends on how well the work is done, what care is given to the animals, and whether the results are reproducible.

Clinical Studies

Clinical studies with human individuals rely on volunteers in a last step toward determining the degree of an agent's ability to cause disease. Clinical studies have varying degrees of rigor and can depend in part of how the volunteer study participants cooperate with the researchers as well as the researchers' control over the volunteer participants.

Participating Organizations

More than 25,000 scientific epidemiological, occupational safety, laboratory animal and cellular studies have been published. In addition there have been numerous reviews of the available research from various respected national and international organizations. A short list of the countries and organizations that have participated include:

American Cancer Society (ACS)
American Industrial Hygiene Association (AHA)
American Medical Association (AMA)
British Columbia Center for Disease Control
European Union
Health Canada
Institute of Electrical and Electronics Engineers (IEEE)
International Agency for Research on Cancer (IARC)
International Commission on Non Ionizing Radiation Protection (ICNIRP)
National Cancer Institute (NCI)
National Institute of Environmental Health Sciences (NIEHS)
Netherlands Health Council (NHC)
World Health Organization (WHO)

A list of all EMF studies to-date would be too numerous for our purposes, but a list of useful links to studies and organizations can be found at the end of this publication. There is also a summary of the findings from scientific organizations on EMF and its potential health effects.

The Results

Childhood leukemia is a relatively rare disease and its causes are not well understood despite decades of research. On average, 1 to 2 children develop the disease each year for every 10,000 children in the United States.[7] Overall though, it is still the most common type of childhood cancer, amounting to 30 percent of all cancers diagnosed in children younger than 15 years. Because the disease is very serious, researchers continue to study a wide range of subjects looking for causes and for the most effective treatments.

In order to have confidence that an exposure agent is actually linked to human disease, scientists look for strong and consistent associations from epidemiological research. In the cases of electric and magnetic fields, the studies have found only weak association, or no association, between exposure and the incidence of some cancers. In addition, study outcomes are not consistent. A large number of studies show no association between transmission lines and cancers. In contrast, the vast majority of epidemiological studies on cigarette smoking have showed a strong positive association between cigarette smoking and lung, neck, and throat cancer.

Science cannot prove a negative, so magnetic fields cannot be proven to have no effect and be safe. However, so far, science has not been able to prove the positive either, that magnetic fields do have an effect -- no published power-frequency exposure study has shown a statistically-significant dose-response relationship between measured magnetic fields and cancer rates, or between distances from transmission lines and cancer rates.

[7] National Cancer Institute at the National Institutes of Health, National Cancer Institute Factsheet, Childhood Cancers, <http://www.cancer.gov/cancertopics/factsheet/Sites-Types/childhood>, accessed April 10, 2013.

Overall, most scientists are convinced that the evidence that power line fields cause or contribute to cancer is weak to nonexistent. The biological studies conducted to-date has not been able to establish a cause-and-effect relationship between exposure to magnetic fields and human disease. Scientists have been unable to identify any plausible biological mechanism by which EMF exposure might cause human disease. There is a general consensus within the scientific community that exposure to EMF is not responsible for human disease. In summary:

- There is no documented cancer linked to EMF exposure.[8]
- There is little evidence that magnetic fields cause childhood leukemia, and there is inadequate evidence that magnetic fields cause other cancers in children.[9]
- Studies of adults' magnetic field exposure from power lines show little evidence of an association with leukemia, brain tumors, or breast cancer.[10]
- Whole animal exposure studies have not shown evidence that long-term exposure to EMF causes cancer, and no link has been found to leukemia, brain cancer, and breast cancer.[11]
- For power line magnetic fields below 500 mG, no plausible mechanisms have been identified by which biological effects can be caused in living systems. [12]

Regulation of Magnetic Fields

Public Service Commission of Wisconsin

The Public Service Commission of Wisconsin (PSCW or Commission) actively monitors research on EMF and its potential for causing human health effects. Consideration of magnetic field exposures is a regular part of the review process for electric utility construction cases. Transmission and substation construction applications must contain several types of information that relate to magnetic fields.

A utility must provide estimates of magnetic fields that would be generated by a proposed transmission line. The estimates are specific to the proposed voltage, line configuration and peak power flows during the first year of operation and after ten years of operation. In its application, a utility must report the number and type of buildings within 300 feet of a proposed centerline, including schools, hospitals, and daycare centers.

Commission staff checks and verifies the utility's calculations of the estimated magnetic fields. This information is then available to the public and considered by the Commission in its route selection decisions.

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[8] Michael P. Halpin, P.E., Florida Department of Environmental Protection, *Transmission Lines – Electric and Magnetic Fields (EMF)*, presentation, <http://www.dep.state.fl.us/siting/files/application/ppsa/turkey_pt/emf_presentation.pdf>, website accessed April, 10, 2013.

[9] National Cancer Institute Factsheet, <http://www.cancer.gov/cancertopics/factsheet/Risk/magnetic-fields>, accessed April, 10, 2013.

[10] Ibid.

[11] Medical College of Wisconsin, 2006.

[12] Robert K. Adair, "Constraints on Biological Effects of Weak Extremely-Low-Frequency Electromagnetic Fields," *Phys Rev A*, January 1991, Vol. 43, Issue 2, pp. 1039-1048.

Other Regulations and Guidelines

Limits established by national and international professional organizations are well beyond the range of magnetic fields typically generated by transmission lines. In 2002, the Institute of Electrical and Electronics Engineers (IEEE), a professional group, published a public exposure guideline of 9,040 mG.[13] In 2010, the International Commission on Non-Ionizing Radiation Protection (ICNIRP) revised its reference levels for public exposure for magnetic fields in the 60 Hz range, and recommended that magnetic fields to not exceed 2,000 mG[14]. In the US, there are no federal standards at all limiting occupational or residential exposure to power line EMF.

Some other states, particularly Florida and New York, have standards or guidance documents related to magnetic fields produced by transmission power lines. Florida limits magnetic fields at the edge of the ROW to 150 mG for transmission lines with voltages of 69 kV through 230 kV. For lines greater than 250 kV, the limit is 200 mG. Double-circuited 500 kV lines and lines greater than 500 kV may not exceed 250 mG, also at the edge of the ROW.[15] New York has a policy that requires transmission lines to be designed, constructed and operated so that magnetic fields at the edges of the ROW will not exceed 200 mG.[16]

The California Public Utility Commission requires utilities to apply no- or low-cost EMF reduction techniques to new or upgraded transmission facilities.[17]

Mitigation of Magnetic Fields

One method to lower the public's exposure to the magnetic fields generated by transmission lines is to increase the distance of the conductors from the public. The fields decrease drastically with distance. The magnetic field level at 300 feet or more from a transmission line centerline should be similar to local ambient, or background, levels. Increasing the height of any transmission structure thus lowers any resulting exposure levels.

Another common method to reduce magnetic field exposure to the public is to bring the lines (conductors) closer together. The magnetic fields interfere with one another, producing a lower overall magnetic field level. The conductors can be brought closer together by using different types of structures or double-circuiting two lines on the same structures (see Figure 3). However, there are electrical safety limits to how close together conductors can be placed. Conductors must be far enough apart so that arcing cannot occur and so that utility employees can safely work around them. Additionally, the closer conductors are to one another, the closer together poles must be constructed. Increasing the number of poles per mile increases private property land impacts and costs.

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[13] Institute of Electrical and Electronics Engineers (IEEE), *C95.6-2002 IEEE Standard for Safety Levels with Respect to Human Exposure to Electromagnetic Fields 0 to 3 kHz*. New York, IEEE, 2002 <http://standards.ieee.org/findstds/standard/C95.6-2002.html>, accessed on April 10, 2013.

[14] International Commission on Non-Ionizing Radiation Protection (ICNIRP), *Guidelines for Limiting Exposure to Time-Varying Electric and Magnetic Fields (1 Hz - 100 kHz)*. Health Physics, Vol. 99, No. 6, November 2010, p. 3, <http://www.icnirp.de/documents/FactSheetLF.pdf>, accessed on April 10, 2013.

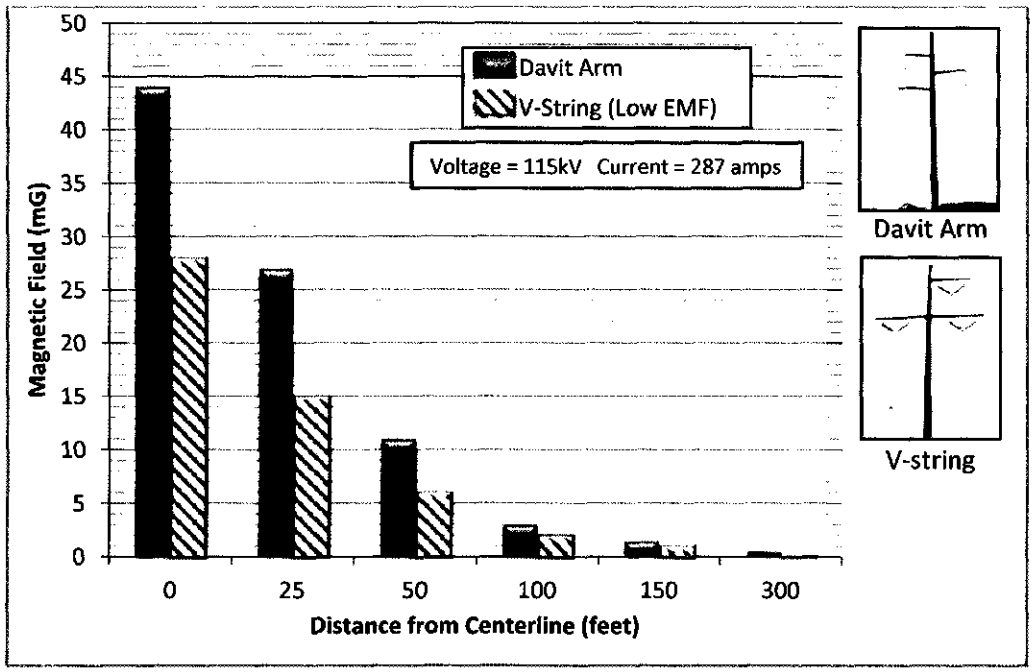
[15] Florida Administrative Code 62-814.450.

[16] State of New York Public Service Commission, *Statement of Interim Policy on Magnetic Fields of Major Electric Transmission Facilities, Cases 26529 and 26559*, Issued and Effective September 11, 1990.

[17] California Public Utility Commission, CPUC Decision D.93-11-013.

Burying transmission lines can also reduce magnetic fields because the underground lines can be installed closer together than overhead lines. Overhead lines need to be further apart because air is used as an insulator, but underground cables be insulated with rubber, plastic, or oil. Underground transmission lines are typically three to five feet below ground. While magnetic fields can be quite high directly over the line, magnetic fields on either side of an underground line decrease more drastically with increased distance than magnetic fields from an overhead line.

Figure 3 Sample EMF for Two Types of Transmission Structures



Sources of Information

The following organizations and websites contain detailed information about EMF and transmission lines along with links to published research.

International Commission on Non Ionizing Radiation Protection
http://www.icnirp.de/PubEMF.htm

Medical College of Wisconsin
http://www.mcw.edu/radiationoncology/ourdepartment/radiationbiology/Power-Lines-and-Cancer-FAQs.htm

National Cancer Institute (NCI)
http://www.cancer.gov/cancertopics/factsheet/Risk/magnetic-fields

National Institute of Environmental Health Sciences (NIEHS)
http://www.niehs.nih.gov/health/topics/agents/emf/

US EPA
http://www.epa.gov/radtown/power-lines.html

World Health Organization (WHO)
http://www.who.int/peh-emf/en/

Summaries of Scientific Consensus Group Assessments of EMF and Health Effects[18]

Scientific Group	Endpoints Considered	Overall Conclusions	Level of Concern
American Cancer Society (ACS)	cancer	[EMF] not proven to cause cancer	low
American Conference of Governmental Industrial Hygienists (ACGIH)	health	insufficient information on human responses and possible health effects of magnetic fields in the frequency range of 1 Hz to 30 kHz to permit the establishment of a threshold limit value for time-weighted exposures	low
American Industrial Hygiene Association (AIHA)	health	insufficient evidence of human health risk at EMF levels below ICNIRP guidelines	low
American Medical Association (AMA)	cancer/health	no scientifically documented health risk associated with the usually occurring levels of electromagnetic fields	low
American Physical Society (APS)	cancer/health	conjecture relating cancer to power line fields has not been scientifically substantiated	low
Australian Radiation Protection and Nuclear Safety Agency (ARPNSA)	health	no evidence that prolonged exposures to weak EMF result in adverse health effects	low
British Columbia Center for Disease Control (BCCDC)	health	no evidence yet to support the assumption that adverse health effects from exposure to current residential and occupational levels pose a risk to human health	low
British National Radiation Protection Board (NRPB), now health Protection Agency (HPA)	health	recommend ICNIRP EMF limits; apparent increased incidence of childhood leukemia at >4 mG, but weak evidence does not justify causality; no evidence of other health effects	low
Committee on Man and Radiation	health	balance of evidence is against the fields encountered by the public being a cause of cancer or any other disease	low
European Union (EU)	cancer/health	overall evidence for EMF to produce childhood leukemia is limited; no suggestions of any other cancer effects	low
Health Canada (HC)	health	no conclusive evidence of any harm caused by exposures at levels normally found in residential and work environments	low
Institution of Electrical Engineers (IEE)	health	not enough scientific evidence to indicate that harmful effects occur in humans due to low-level electromagnetic field exposure	low
Institute of Electrical and Electronics Engineers (IEEE)	health	the low-frequency standard IEEE C95.6 is leading standard worldwide on protection against ELF exposure to human beings; basic restrictions based on current biological knowledge; IEEE standards also adopted by the International Committee on Electromagnetic Safety (ICES)	low
International Agency for Research on Cancer (IARC)	cancer	limited convincing evidence in humans for childhood leukemia; inadequate evidence in humans for all cancers	low / med
International Commission on Non Ionizing Radiation Protection (ICNIRP)	health	no convincing evidence for carcinogenic effects of EMF; data cannot be used to set guidelines; ICNIRP guidelines are not based on cancer risks	low
Medical College of Wisconsin (MCW)	health	evidence that power line fields cause or contribute to cancer seen by most scientists as weak to nonexistent	low
National Academy of Sciences / National Research Council (NRC)	cancer/health	body of evidence has not demonstrated that exposures to EMF are a human-health hazard	low
National Cancer Institute (NCI)	cancer (breast)	no association between exposure to EMF and breast cancer in Long Island	low
National Cancer Institute (NCI)	cancer (leukemia)	little support for hypothesis that EMF is related to risk of childhood leukemia	low
National Institute of Environmental Health Sciences (NIEHS)	health	weak evidence for possible health effects from EMF; but they cannot be ruled out, especially epidemiological associations with childhood leukemia	low

[18] State of Connecticut, Connecticut Siting Council, "*Current Status of Scientific Research, Consensus, and Regulation Regarding Potential Health Effects of Power-Line Electric and Magnetic Fields (EMF)*", January 2006, modified from Appendix A.

Summaries of Scientific Consensus Group Assessments cont'd

Scientific Group	Health Endpoints Considered	Overall Conclusions	Level of Concern
National Toxicology Program (NTP)	cancer	no increased neoplasm incidences at sites in highly exposed rats and mice for which epidemiology studies have suggested an association with EMF	low
Netherlands Health Council (NHC)	cancer	adheres to its previously expressed view that, on the basis of the current level of knowledge, there is no reason to take action to reduce EMF levels	low
Occupational Safety and Health Administration (OSHA)	health	no specific OSHA standards address ELF fields; however, there are national consensus standards which OSHA could consider (ACGIH and ICNIRP)	low
World Health Organization(WHO)	health	cause-and-effect link between ELF field exposure and cancer has not been confirmed	low
California Department of Health Services	health	concern about possible health hazards - childhood leukemia, adult brain cancer, Lou Gehrig's disease and miscarriage, but evidence is incomplete, inconclusive and often contradictory	low
California Public Utilities Commission (CPUC)	health	interim measures adopted because of the lack of scientific or medical conclusions about potential health effects from utility electric facilities and power lines	low / med
Connecticut Department of Public Health	health/cancer	health risk caused by EMF exposure remains an open question; some studies show a weak link between EMF exposure and a small increased risk of childhood leukemia at average exposures above 3 mG; for cancers other than childhood leukemia, none of the studies provide evidence of an association	low
Florida Department of Environmental Protection	health	no convincing evidence for carcinogenic effects of ELF fields	low
Maryland Department of Natural Resources	health	EMF exposures remain suspect, but remaining unknowns are the reason for continued lack of firm affirmation of health risks from EMF exposures	low
Massachusetts - Energy Facilities Siting Board	health	informally adopt edge of ROW permissible levels of 85 mG for magnetic fields	
Minnesota Department of Health	health	body of evidence insufficient to establish a cause and effect relationship between EMF and adverse health effects	low
New Jersey Department of Environmental Protection	health	not known at this point whether exposure to magnetic fields from power frequency sources constitutes a health hazard	low
New York Department of Environmental Protection	health	interim policy requires transmission lines to be designed, constructed and operated such that magnetic fields at the edges of their ROWs will not exceed 200 mG	
Utah Department of Environmental Quality	health	no convincing evidence in the published literature to support the contention that exposures to extremely low frequency electric and magnetic fields (ELF-EMF) generated by sources such as household appliances, video display terminals, and local power lines are demonstrable health hazards	
Vermont Department of Health	health	data insufficient to establish a direct cause and effect between EMF exposure and adverse health effects	low
Virginia Department of Health	health	scientific proof of a causal association has not been satisfied for the implicit adverse effects of power-line frequency EMF	low

The Public Service Commission of Wisconsin is an independent state agency that oversees more than 1,100 Wisconsin public utilities that provide natural gas, electricity, heat, steam, water and telecommunication services.

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