

MEMO

To: Julia Mancinelli, Environmental Manager, Innergex Renewable Energy, Inc.

Cc: Eddie Park, Project Developer, Innergex Renewables USA, LLC

From: Dr. Bob Pearson, Senior Project Manager, Tetra Tech

Date: Saturday, December 15, 2018

Subject: EMF and ‘Dirty Power’ in Context to the Proposed Paeahu Solar Project, Maui County, Hawaii

Innergex Renewables USA LLC (Innergex) has proposed to build the Paeahu Solar Project (the Project) located within the northwestern portion of Tax Map Key (TMK) 2-1-008:001. The solar arrays and associated infrastructure would utilize approximately 200 acres of Ulupalakua Ranch–owned land located east of the Maui Meadows neighborhood in Wailea, Maui (Figure 1). The Project would have a generating capacity of 15 megawatts (MW), an area designated for a 60 megawatt hour battery energy storage system, and an approximately 0.5-mile overhead generation-tie line that would interconnect the Project to the Maui Electric Company grid at the existing Auwahi 69-kilovolt (kV) substation.

Solar energy is the conversion of sunlight into usable energy forms. The sun’s rays transmit light energy, in the form of photons, which can be converted to electricity using certain materials that naturally release electrons when exposed to light. These materials are contained within the photovoltaic solar panels. When the sun shines on the solar panels, direct current (DC) electricity is produced. The DC electricity is then fed into a solar inverter to convert the DC electricity to 60 hertz (Hz) alternating current (AC) electricity (the form of electricity that is used by the power grid and household appliances). A transformer is also used to increase or decrease the voltage level of the AC electricity. Figure 2 provides an overview of the different components of a solar energy and battery energy storage system: 1) solar panels, 2) inverters, 3) transformers, 4) substation, 5) battery, and 6) electrical grid.

The Project will consist of solar panels on mounting racks, low voltage DC cabling, inverters to convert DC to AC electricity, transformers to step up the voltage of the AC electricity from the inverters, belowground AC collector lines, battery storage to store the produced electricity, a substation to convert the produced power to 69 kV, and overhead 69-kV power lines to deliver the power to the Maui Electric Auwahi Substation located 0.5 miles south of the Project (Figure 1).

Electric and Magnetic Fields

EMF is a term that refers to electric and magnetic fields (EMF). Electric facilities such as the Paeahu Solar Project produce EMF when they are in operation. These fields are caused by distinct aspects of the operation of the facility and can be evaluated separately.

Electric fields are produced whenever a conductor such as a power line is connected to a source of electrical voltage. An example of this is the plugging of a lamp into a wall outlet in a home. When the lamp is plugged in, a voltage is induced in the cord to the lamp that causes an electric field to be created around the cord. The electric field remains constant even when the electricity is not being used. In other words, even if the lamp is off, there is an electrical field around the lamp cord. Electric field strengths are measured in units of volts per meter (V/m) or kilovolts per meter (kV/m), where 1 kV/m = 1000 V/m.

Magnetic fields are produced whenever an electrical current flows in a conductor. In the lamp example, if the lamp is turned on allowing electricity to flow to the lamp, a magnetic field is created around the lamp cord in addition to the electric field. The magnetic field will vary with the amount of power being produced by the solar farm, highest at midday and zero at night. Magnetic fields are measured in milliGauss (mG). The strength of both electric and magnetic fields decreases rapidly with distance from the source.¹

As the Project will have both DC and AC electricity, it will produce both DC and AC EMF. The Project solar panels and underground DC collector lines will produce low levels of DC EMF while the Project's inverters, transformers, battery energy storage system, substation, AC collector lines, and 69-kV AC generation-tie line will produce low levels of AC EMF.

DC electricity is considered "static" because it does not vary in the direction of the current. Static electric fields are created by the separation of a positive and negative electric charge and are created naturally by the Earth's atmosphere during stormy conditions or by friction (e.g., "static cling" of clothes from the dryer). Static magnetic fields are created by magnets or by the flow of DC electricity. The earth has a naturally occurring static magnetic field, which is what enables a compass to be used for directional finding. The Earth's magnetic field varies between 350 and 700 mG, depending on the location.

The DC magnetic fields produced by the solar panels will be a few mG, which is significantly less than the Earth's natural magnetic field and therefore would not be detectable above the baseline levels of the Earth's natural magnetic field at the Project's western parcel boundary (adjacent to Maui Meadows). Additionally, strength of the DC magnetic field is estimated to be zero within 50 feet of the solar panels because the magnetic field decreases rapidly with distance from the source. The closest solar panel to the Maui Meadow's eastern

¹ For more information about EMF, please review the following publication: "EMF Electric and Magnetic Fields Associated with the Use of Electric Power Q&A," which is published by the National Institute of Environmental Health Sciences of the National Institutes of Health. This publication can be downloaded at: https://www.niehs.nih.gov/health/materials/electric_and_magnetic_fields_associated_with_the_use_of_electric_power_questions_and_answers_english_508.pdf

property boundaries is 290 feet. The electric fields produced by the solar panels will be zero within 50 feet of the solar panels as the electric fields will be quickly absorbed by the metal of the solar panels, which will be grounded. The low voltage DC cabling will be buried 3 to 5 feet and will have both positive and negative conductor lines located close together underground; therefore, they will have no measurable EMF aboveground because the magnetic fields from the positive and negative lines will cancel each other out, a phenomenon called phase cancellation. Therefore, the DC EMF produced by the Project's solar panels and collector lines would be unmeasurable at the property boundary.

The inverters, battery energy storage system, and substation transformers will act as point sources of AC EMF as they each have discrete locations within the Project area. Each of these components will produce low levels of AC EMF that will decrease with distance at a rate equal to the cube of the distance decay rate. In other words, for each doubling of the distance from the EMF source, the EMF will drop by a factor of eight. As an example, if the magnetic field level near a transformer is 10 mG at a distance of 10 feet, the field level will drop to one eighth of this or 1.25 mG at 20 feet and to 0.16 mG at 40 feet. This same decay rate would also apply to the electric fields from these same devices. Electric fields will also diminish from absorption by any vegetation (including low-growing vegetation) located in its path because the plants effectively ground the electric fields. The closest point source of AC EMF to the Maui Meadows neighborhood is an inverter located approximately 625 feet east of westernmost TMK 2-1-008:001 boundary that is adjacent to Maui Meadows. The EMF field 625 feet from this inverter would be zero. The other inverters, battery energy storage system, and substation transformers are even farther from Maui Meadows. Therefore, no EMF from the Project inverters, battery energy storage system, and substation transformers would reach the homes in Maui Meadows.

The linear AC power lines within the Project will also produce low levels of AC EMF. The 34.5-kV AC collector lines running from the inverters to the Project substation will be buried underground and will thus produce very low levels of EMF fields due to the earth absorbing the electric fields and phase cancellation of both electric and magnetic fields. The 34.5-kV AC collector line will be a minimum of 625 feet from the closest Maui Meadows property line and the EMF from the collector line will drop to zero well before the Maui Meadows subdivision boundary.

The 69-kV overhead generation-tie line extending from the Project substation to the Maui Electric Auwahi Substation south of the Project area will produce low levels of EMF. However, these EMF fields will quickly dissipate to background levels within a few hundred feet from the 69-kV line. Since the 69-kV power line will be at least 3,000 feet from the closest Maui Meadows property line, the EMF from the 69-kV power line will drop to zero well before the Maui Meadows subdivision boundary.

The net result will be that the total level of EMF from the Paeahu Solar Project will be zero at the eastern edge of the Maui Meadows Subdivision. If baseline EMF measurements were made along the Maui Meadows eastern boundary, small levels might be measured. Existing EMF would be produced from the electrical conductors and currents used in and around the homes along the east side of Kumulani Drive (e.g., household appliances, electric lights, electrical wiring, etc.) and the existing overhead electric power lines along the Kumulani Drive that provide electricity to those homes. If deemed necessary by regulatory agencies, measurements of magnetic fields could be made before construction of the Project and after the Project begins operating to assess whether

EMF from the Project's electrical infrastructure would extend into the Maui Meadows neighborhood. Prior to construction, field staff would walk the eastern boundary of the Maui Meadows neighborhood with a calibrated magnetometer (capable of measuring magnetic fields as low as two-tenths of a mG) and take magnetic field measurements along a set transect (e.g. every 25 feet walking north to south along the fence line). If a high magnetic field is encountered along the transect, measurements would be taken walking away (east) from the EMF source until the field is unmeasurable. This would provide a decay rate for the existing magnetic field. The same transects would be walked and measured during the post operational phase of the Project and the results of the pre-construction and post-operation data sets would be compared to assess any measurable differences in EMF. The pre-construction and post-operation field measurements would be conducted at the same time of day and on days with similar weather (to the extent practicable) in an attempt to limit the variability of the neighborhood's use of electrical appliances (e.g. air conditioning, electric stoves, etc.). The EMF levels at Maui Meadows are not expected to change as a result of the Project.

"Dirty" Power

Solar electric systems have been accused of producing "dirty" power from their operation. Dirty power is electricity that contains high radio frequency (RF) noise in addition to pure 60 Hz electric power. "Dirty" Power usually is not produced by utility scale power generators, as they are typically subject to national power quality standards for conducted or radiated higher frequency emissions from their systems. However, many smaller consumer electronics are exempt from these standards due to their small size. These consumer devices can produce higher frequency noise that results in "dirty" power. Such small consumer devices include: personal computers, electric razors, electric power tools, florescent light bulbs, light dimmer switches, etc.

Large commercial multi-step inverters such as those proposed for installation at the Project include adequate high frequency voltage filtering. In addition, the medium and high voltage transformers that the produced electricity will transmit through before it is delivered to the grid, effectively block high frequency noise, leaving very smooth 60 Hz sinewaves delivered to the power grid. Smaller consumer sized "square wave" or "modified sine wave" inverters used in residential home solar systems have limited filtering and can cause non sinusoidal voltage waveforms and can cause significant issues with other consumer equipment such as microwaves or power tools.

The inverters that Innergex plans to use to convert the DC electricity from the solar panels to 60 Hz AC electric power will use higher frequencies in their operation; however, the frequencies used are less than 1 megahertz and therefore do not cause interference with higher frequency communications (radio, TV, or cell phones). The inverters will meet RF radiation standards for a Class B digital device as required by part 15 of the Federal Communications Commission Rules (Code of Federal Regulations Title 47, Part 15). These limits are designed to provide reasonable protection against harmful RF interference to electronic devices in a nearby residence. Since the inverters are designed to operate without interference near a residence and the closest residence to a Project inverter is 625 feet, any low level of RF produced by the inverter will dissipate near the inverter within the Project boundaries and will not be measurable or noticeable at the Project boundary.

Note:

This memo was authored by Dr. Robert Pearson, a nationally recognized expert concerning environmental issues in the electric utility industry. Dr. Pearson has over 42 years of experience in environmental and technical engineering, regulatory review and assessment, preparation of industrial compliance policy, and environmental consulting. See Attachment A for a copy of Dr. Pearson's Curriculum Vitae (CV).

Proposed Paeahu Solar Project, Maui County

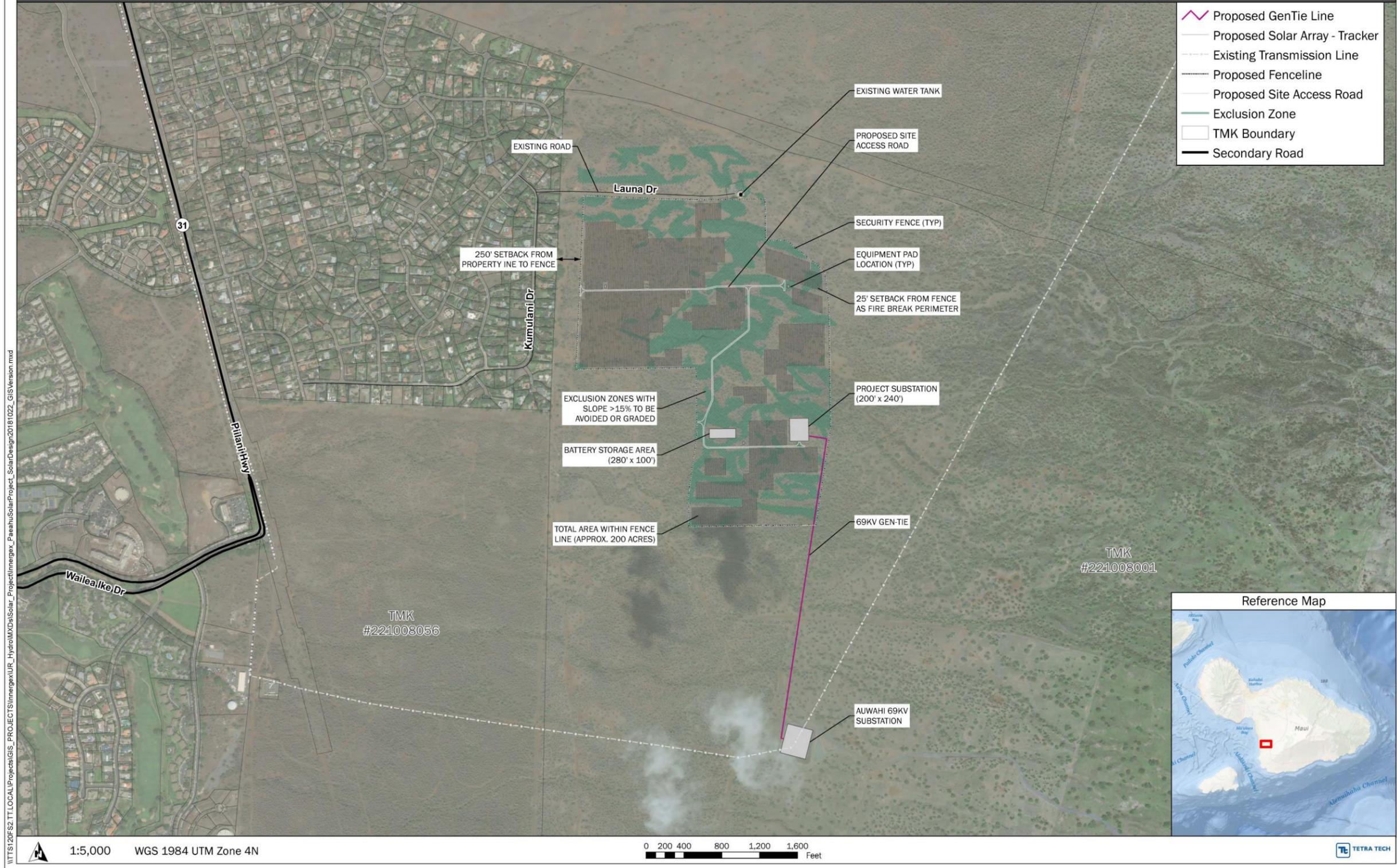


Figure 1. Paeahu Solar Project

SOLAR ENERGY AND BATTERY ENERGY STORAGE SYSTEM

HOW IT WORKS

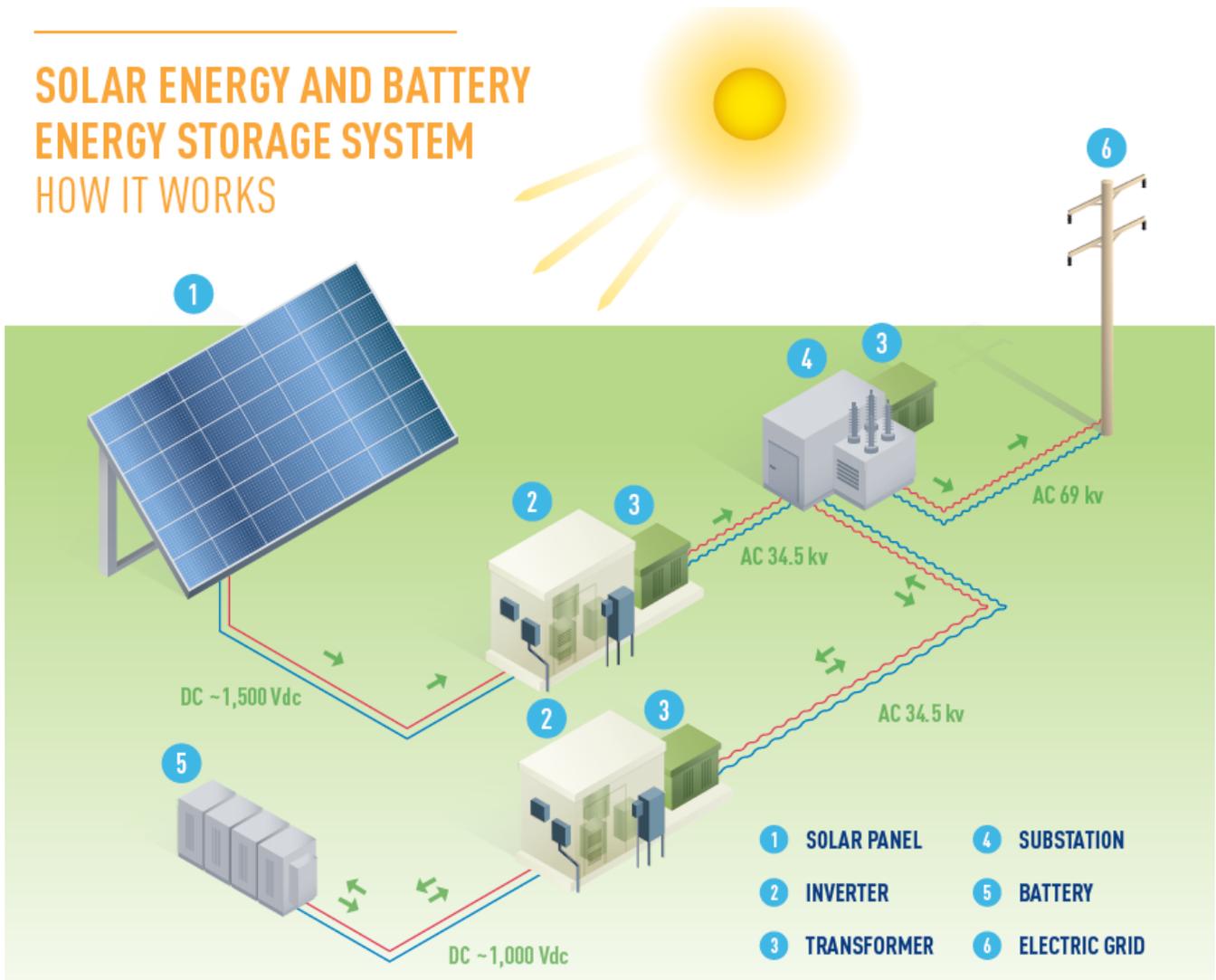


Figure 2. Flow Chart of a Solar Energy Project

Attachment A. Dr. Pearson's CV

Education

Ph.D., Remote Sensing of Natural Resources, Colorado State University, 1973.
M.Sci., Remote Sensing of Natural Resources, Colorado State University, 1971.
Professional Geophysical Engineer, Colorado School of Mines, 1968.

Professional Registration

Registered Professional Engineer in Colorado (12582)

Experience

Principal, Broomfield Environmental LLC, 2015 to present
Senior Project Manager, Tetra Tech, Denver, CO, 2014 to present
Vice President, Principal Technologist, Environment and Nuclear Division CH2M HILL,
Denver, Colorado, 2000 to 2014
Project Manager, URS-Radian, Denver, CO, 1994-2000.
Senior Staff Scientist, Radian Corporation, Denver, CO, 1992-1994.
Administrator, Environmental Affairs, Public Service Company of Colorado, Denver,
CO, 1979-1992.
Senior Environmental Engineer, Public Service Company of Colorado,
Denver, CO, 1973-1979.
Project Geophysicist, Chevron Oil Company, Geophysical Division, Los Angeles, CA
and Houston, TX, 1968-1969.

Appointments

Colorado Water Quality Control Commission, 1983. Appointed by Governor Lamm for a
three year term, confirmed by the Colorado Senate.
Colorado Plant Operator Certification Board, 1984. Appointed by Governor Lamm for a
three year term.
Colorado Water Quality Control Commission, 1986. Appointed by Governor Lamm for a
three year term, confirmed by the Colorado Senate.
Colorado Plant Operator Certification Board, 1987. Appointed by Governor Lamm for a
three year term, Chairman, 1986-89.
Colorado Water Quality Control Commission, 1989. Appointed by Governor Romer for a
three year term, confirmed by the Colorado Senate, Chairman 1988-91.
Governor's Blue Ribbon Panel on the Future of Health Care in Colorado, 1989.
Appointed by Governor Romer.
Colorado Center of Environmental Management, 1992. Appointed by Governor Romer.

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Grand Canyon Visibility Transport Commission, Public Advisory Committee, 1992.
Appointed by Governor Romer.

National Coal Council, 2006 to 2014. Appointed by US Secretary of Energy Steven Chu to this Advisory Committee for the US Secretary of Energy.

University Teaching Experience

Taught master's level course titled Air Quality Planning and Policy, URP 6686-002,
Department of Urban and Regional Planning, College of Architecture & Planning,
University of Colorado at Denver, 1995 to 2003.

Faculty Advisor, Regis University, 1996

Fields of Experience

Dr. Pearson is the Principal in the environmental consulting firm Broomfield Environmental LLC. He is also currently a senior project manager for Tetra Tech in their downtown Denver office. Previously he served as a Vice President and Principal Technologist in the Environment and Nuclear Division of CH2M HILL in their Denver office. Before that he was a Project Manager in the Denver technical staff of Radian International responsible for the technical conduct of research and analysis projects for these clients. He has over 42 years of experience in environmental and technical engineering, regulatory review and assessment, preparation of industrial compliance policy, and environmental consulting. He has proven ability to work with clients to assess regulatory programs, define needs, and develop programs to satisfy those needs. His program administrative experience includes projects in electric and magnetic fields, air pollution control and assessment, water quality control, environmental permitting, and environmental research and development. Dr. Pearson is a nationally recognized expert concerning environmental issues in the electric utility industry. He has also served as a state water quality regulatory commissioner and commission chairman appointed by the governor, as well as a member and chairman of a water quality operator certification board, also governor appointed.

Electric and Magnetic Field Health Effects

- Managed utility company participation in two state of the art epidemiological research studies on the relationship between electric power lines and the occurrence of childhood cancer. These studies were done in Denver by Wertheimer and Leeper in 1978 and Savitz et al. in 1985. Much of the data required for the studies were provided from company data files and the overall design and execution of both studies was critiqued for its correctness and appropriateness.
- Provided electric and magnetic field (EMF) analysis and testimony for a 115 kV underground electric transmission project In Denver which had been stalled by

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community opposition. As a result, the concerns of the citizens were allayed and the project was allowed to be constructed and placed into operation on schedule.

- Provided EMF analysis and expert testimony to governmental bodies for an overhead electric transmission project being relocated due to construction of the new Denver International Airport. The EMF concerns raised by the governmental bodies were reduced to a level allowing them to approve the project to be built on schedule.
- Chaired the EMF Health Studies Task Force of the Electric Power Research Institute. This industry advisory committee directs the EMF health studies research program of the Institute which is the largest such basic EMF research program in the world.
- Served as Vice Chairman of the Electric and Magnetic Fields Task Force of the Edison Electric Institute. This trade association industry committee of the investor-owned electric utilities in the United States provided policy preparation and issue management for this largest sector of the American electric utility industry.
- Participated in the organization and conduct of annual EMF scientific meetings for the Electric Power Research Institute (EPRI). These annual meetings are the principle informational meetings for representatives of the electric utility industry.
- Provided analysis and expert opinion on the EMF effects of a proposed Regional Transportation District light rail transportation system. This system, which is electrically powered, runs through several residential neighborhoods as well as commercial and industrial districts in the Denver area.
- Analyzed and provided expert opinion on a proposed university high energy physics facility. This facility proposed to be constructed on the campus of the University of California at Los Angeles (UCLA), will house state of the art high energy particle accelerators. The analysis provided information regarding the exposure to the surrounding neighborhood of magnetic fields from the facility as well as within the facility laboratories.
- Analyzed and provided expert opinion on a proposed electric cogeneration facility. This facility, also to be constructed on the campus of the UCLA, will provide electric power to the University. The analysis provided information regarding the potential interference with adjoining telephone switching equipment, as well as exposure to workers in nearby offices.
- Served as co-principal investigator and Project Manager of a study to investigate the "wire code paradox", sponsored by the Electric Power Research Institute. The apparent paradox was revealed when earlier EMF epidemiological studies done in Denver and elsewhere demonstrated a relationship between a surrogate measure of magnetic fields exposure, the wire code, and the occurrence of childhood cancer. Actual measures of magnetic fields showed no such relationship. The study investigated the nature of the

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wire code paradox and to determine if the wire code is related to other parameters of the neighborhood such as its layout or of the house such as its age where the child lived. Several papers on the design and status of this project were presented to the Annual DOE/EPRI Contractor's Review Meetings and Annual Meetings of the Bioelectromagnetics Society.

- Served as co-principal investigator and Project Manager of a study to investigate the feasibility of conducting an epidemiological investigation of children living in very high current configuration residences, sponsored by the Electric Power Research Institute. This study explored the feasibility of identifying children who live near larger power lines who could be surveyed for their incidence of contracting various forms of cancer including leukemia.
- Served on the study team evaluating the environmental impacts of the proposed Seattle East Link Light Rail System segment from Seattle to Bellevue WA, the Federal Way segment from the SeaTac Airport to Federal Way and the downtown Tacoma circulator. My role was to evaluate the exposure to EMF for both passengers on the train as well as members of the public long the right of way. I also reviewed the potential for interference with sensitive electronic equipment in buildings near the ROW as well as pipelines corrosion in underground utilities along the ROW.
- Served on the study team evaluating the environmental impacts of the proposed Minneapolis Metro Southwest Light Rail Train extension segment from downtown Minneapolis to Eden Prairie, MN. My role was to evaluate the exposure to EMF for both passengers on the train as well as members of the public long the right of way. I also reviewed the potential for interference with sensitive electronic equipment in buildings near the ROW as well as pipelines corrosion in underground utilities along the ROW.
- Served on the study team evaluating the environmental impacts of the proposed California High Speed Train System segment from Modesto to Fresno CA, the segment from Modesto to Sacramento and from Fresno to Bakersfield. My role was to evaluate the exposure to EMF and electromagnetic interference for both passengers on the train as well as members of the public and communications systems along the right of way.
- Served as Project Director of an assessment of the magnetic fields to be generated by the proposed high speed electric rail system to be built in Texas. This project determined the background levels of magnetic fields and the field levels which will be generated by the transit system when it is placed into service. Areas which will be exposed to an elevated magnetic field as a result of the operation of the transit system were determined. These magnetic field levels were then screened to determine if existing occupational or environmental guidelines or standards will be exceeded and if so what health implications there may be given the current scientific knowledge on the subject. As a portion of this project, measurements were made of the magnetic fields produced by the Spanish high speed rail train, the AVE, which operates between Madrid and Seville. This rail system is identical to the system proposed to be constructed in Texas. Measurements were made

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both on the train as well as along side the tracks and at a power substation which supplies electricity for the AVE rail system.

- Conducted two surveys of magnetic fields produced by 25 kV distribution power lines for an electric utility in Granada, Spain. The utility had received two requests to relocate two primary voltage distribution power lines, one from the local government and one from a group of concerned neighbors. Measurements were made of the magnetic fields produced by each of these lines which demonstrated the magnetic fields to be very low. Reports were produced for the utility for presentation to the city government and the group of concerned neighbors.
- Representing two electric utilities in Colorado at public meetings on the construction of new 115 and 230 kV electric transmission lines to be built to serve eight separate areas in Colorado and New Mexico. Presented information on the expected magnetic field levels to be produced by the transmission lines and the broader issue of the status of scientific knowledge on human health effects of electric and magnetic fields. That information was specifically requested by the public to be presented by a recognized expert in the field other than an employee of the utilities.
- Modeled the magnetic fields in the transmission switchyard and in an underground power transmission cable at the Protrero Power plant in the Bay Area of California. The project is to add a seventh unit to the power plant. The California Energy Commission requested that the modeling be done as part of the environmental impact analysis for the plant.
- Served as Principle Investigator of an EMF research project on the Denver area for the Electric Power Research Institute. The project measured the voltages induced in grounded water pipes and electric neutrals along with magnetic fields in the homes and wire codes from nearby power lines in 191 homes selected from the Denver metropolitan area.
- Testified as an expert EMF witness for Tri State Generation and Transmission in the Eighth District Court in Raton, New Mexico, January 2006. The issue was a condemnation proceeding: Tri-State Generation and Transmission Association, Inc. v. Faver, King, Sierra Grande, and Spanish Trail Ranches, [consolidated] and the damages to the ranches from the construction and operation of the new power line.
- Testified as an EMF and corona noise expert in the Colorado Public Utility Commission hearings on the Xcel Energy Midway to Daniels Park transmission line.
- Testifying as an EMF and corona noise expert in the Colorado PUC hearings on the San Luis Valley to Calumet to Comanche transmission line project in Southern Colorado and several transmission line projects in Eastern Colorado.

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- Participated as an expert in the Xcel Energy hearings for the Silverthorne Substation in central Colorado, the Chambers Transmission Line rebuild project in Aurora Colorado and the Brantner/Thornton Substation in Adams County, Colorado.

EMF Publications

Pearson, R.L., and H. Wachtel. An Examination of the Residential and Lifestyle Factors Which May Underlie the Wire Code Paradox. RP2964-22, Electric Power Research Institute, January, 1994.

Pearson, R.L., and H. Wachtel. "An Examination of the Residential and Lifestyle Factors Which May Underlie the Wire Code Paradox." Presented at The Annual Review of Research on Biological Effects of Electric and Magnetic Fields From the Generation, Delivery and Use of Electricity, Savannah, Georgia, November, 1993.

Wachtel, H., and R.L. Pearson. "An Approach to Unraveling the Wire Code Paradox." Presented at The Annual Review of Research on Biological Effects of Electric and Magnetic Fields From the Generation, Delivery and Use of Electricity, Savannah, Georgia, November, 1993.

Pearson, R.L. and H. Wachtel, "An Approach to Automatically Computing Wiring Code Patterns for a City." Presented to the Annual Meeting of the Bioelectromagnetics Society, Copenhagen, Denmark, June 1994.

Wachtel, H and R.L. Pearson. "Associative Residential and Lifestyle Factors Which Appear to Underlie the Wiring Code Paradox." Presented to the Annual Meeting of the Bioelectromagnetics Society, Copenhagen, Denmark, June 1994.

Pearson, R.L. and H. Wachtel, "An Automatic Wire Coding System for Exploring Possible Control Selection Bias and Identifying Large Exposed Populations for Cohort Studies." Presented at The Annual Review of Research on Biological Effects of Electric and Magnetic Fields From the Generation, Delivery and Use of Electricity, Albuquerque, New Mexico, November, 1994.

Wachtel, H., R.L. Pearson and D.A. Savitz. "A Determination of Childhood Cancer Risk in Relation to Residential Environment and Lifestyle Factors Associated With Wire Codes." Presented at The Annual Review of Research on Biological Effects of Electric and Magnetic Fields From the Generation, Delivery and Use of Electricity, Albuquerque, New Mexico, November, 1994.

Pearson, R.L., H. Wachtel and K.L. Ebi, Childhood Cancer Risk in Relation to Residential Environment and Lifestyle Factors that are Associated with Wire Codes. Presented to the Annual Meeting of the Bioelectromagnetics Society, Boston Massachusetts, June 1995.

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Wachtel, H., R.L. Pearson and K.L. Ebi, Could Air Pollution Be an Alternative to or a Cofactor With Magnetic Fields as a Link Between Wire Codes and Childhood Cancer? Presented to the Annual Meeting of the Bioelectromagnetics Society, Boston Massachusetts, June 1995.

Pearson, R.L., H. Wachtel and K.L. Ebi, Automatic Wire Coding, A Method for Mapping Electric Power Lines and Identifying Potentially Exposed Populations for Epidemiologic Studies. Presented at The Annual Review of Research on Biological Effects of Electric and Magnetic Fields From the Generation, Delivery and Use of Electricity, Palm Springs, California, November, 1995.

Wachtel, H., R.L. Pearson and K.L. Ebi. Childhood cancer Risk in Relation to Wire Code Associated REL factors and Causal Links that are Implicated. Presented at The Annual Review of Research on Biological Effects of Electric and Magnetic Fields From the Generation, Delivery and Use of Electricity, Palm Springs, California, November, 1995.

Pearson, R.L., H. Wachtel and K.L. Ebi. Assessing Possible Control Selection Bias Using a Method for Automatic Wire Coding. Presented to the Annual Meeting of the Bioelectromagnetics Society, Victoria, B.C. Canada, June, 1996.

Wachtel, H., R.L. Pearson and K.L. Ebi. Rental Status and Wire Code Are Risk Factors for Childhood Cancer. Presented to the Annual Meeting of the Bioelectromagnetics Society, Victoria, B.C. Canada, June, 1996.

Pearson, R.L. "Transmission Lines, Electric and Magnetic Fields." Encyclopedia of Chemical Processing and Design, Volume 47, Marcel Decker, Inc., New York, July, 1996

Wachtel, H., R.L. Pearson and K.L. Ebi Distance Weighted Traffic Density Is Associated With Wire Code And Is A Risk Factor For Childhood Cancer. Presented at The Annual Review of Research on Biological Effects of Electric and Magnetic Fields From the Generation, Delivery and Use of Electricity, San Antonio, Texas, November, 1996.

Pearson, R.L., H. Wachtel and K.L. Ebi. A Retrospective Test Of Control Selection Bias Using Census Data And City Wide Automatic Wire Coding. Presented at The Annual Review of Research on Biological Effects of Electric and Magnetic Fields From the Generation, Delivery and Use of Electricity, San Antonio, Texas, November, 1996

Zaffanella, L.E., S. Greenland, D.A. Savitz, R.L. Pearson, and R. Iryie. Application of the Case Specular Method to the Savitz Denver Study Residences. Technical Report 107751, Electric Power Research Institute, Palo Alto, California, 1997

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Pearson, R.L., H. Wachtel, K.L. Ebi. Feasibility of a Study of VHCC Wire Code as a Risk Factor For Childhood Leukemia. Technical Report 107745, Electric Power Research Institute, Palo Alto, California, March, 1997 (in press).

Pearson, R.L., H. Wachtel, K.L. Ebi. The Use of Automatic Wire Coding to Evaluate Control Selection Bias in the Savitz et. al. Study. Technical Report TR-108044, Electric Power Research Institute, Palo Alto, California, August, 1998.

Pearson, R.L., H. Wachtel, K.L. Ebi. Feasibility of a Study of VHCC Wire Code as a Risk Factor for Childhood Leukemia. Technical Report TR-107745, Electric Power Research Institute, Palo Alto, California, December, 1997.

Pearson, R.L., H. Wachtel and K.L. Ebi. Residence Specific Air Pollution As A Possible Childhood Cancer Risk Factor And A Potential Link Between Wire Codes, Traffic Density And Childhood Cancer. Presented at the Second World Congress for Electricity and Magnetism in Biology and Medicine, Bologna, Italy, June, 1997.

Wachtel, H., R.L. Pearson and K.L. Ebi. Study Design For Evaluating VHCC Wire Code As A Risk Factor For Childhood Cancer. Presented at the Second World Congress for Electricity and Magnetism in Biology and Medicine, Bologna, Italy, June, 1997.

K. L. Ebi , H. Wachtel , R. L. Pearson and L. Kheifets. Assessment Of Control Selection Bias As A Possible Explanation Of The Association Between Wire Code And Childhood Cancer. Presented at the Second World Congress for Electricity and Magnetism in Biology and Medicine, Bologna, Italy, June, 1997.

R.L. Pearson. Residence Specific Air Pollution As A Possible Childhood Cancer Risk Factor And A Potential Link Between Wire Codes, Traffic Density And Childhood Cancer. Presented at the Second World Congress for Electricity and Magnetism in Biology and Medicine, Bologna, Italy, June, 1997.

Wachtel, H., R.L. Pearson and K.L. Ebi. Why Is Wire Code Associated With Childhood Leukemia Risk In Some Cities But Not In Others? Presented at the Annual Review of Research on Biological Effects of Electric and Magnetic Fields From the Generation, Delivery and Use of Electricity, San Diego California, November, 1997

Pearson, R.L., H. Wachtel and K.L. Ebi. Determining The Historical Stability Of Associations Between Traffic Density, Wire Codes And Cancer Risk. Presented at the Annual Review of Research on Biological Effects of Electric and Magnetic Fields From the Generation, Delivery and Use of Electricity, San Diego California, November, 1997

Wachtel, H., R.L. Pearson and K.L. Ebi. Control Selection Bias as A Possible Explanation For The Observed Associations Between Wire Codes And Childhood Cancer. Presented to the Annual Meeting of the Bioelectromagnetics Society, St Petersburg, Florida, June, 1998.

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Pearson, R.L., H. Wachtel and K.L. Ebi. Wire Codes, Traffic, And Air Pollution, Citywide Associations. Presented to the Annual Meeting of the Bioelectromagnetics Society, St Petersburg, Florida, June, 1998.

Wachtel, H., R.L. Pearson and K.L. Ebi. What Might We Learn About Childhood Cancer Etiology From 20 Years Of “EMF Inspired” Research? Annual Review of Research on Biological Effects of Electric and Magnetic Fields From the Generation, Delivery and Use of Electricity, Tucson, Arizona, November, 1998

Wachtel, H., R.L. Pearson and K.L. Ebi. Traffic Density And Wire Codes May Be Risk Cofactors For Childhood Cancer. Presented to the Annual Meeting of the Bioelectromagnetics Society, Long Beach California, June, 1999.

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