Transmission Line Routing information session

Electric and Magnetic Fields Summary

September 29, 2021

Overview

Puget Sound Energy (PSE) hosted an online information session on September 29, 2021. The meeting's purpose was to provide information on what electric and magnetic fields are (EMF), where frequencies are found, and how it relates to health.

The meeting was held online via Zoom due to PSE and public health requirements restricting in-person gatherings at this time. Attachment 1 contains the list of meeting participants.

Opening remarks

Karen Brubeck (PSE) welcomed the audience, shared a safety moment, provided an overview of PSE's solutions package to improve electric service on Bainbridge Island and gave a recap of PSE's progress on the Missing Link Transmission Line Project leading up to the information session on EMF.

Electric and magnetic fields overview

Andrew Thatcher, a Consulting Health Physicist, former naval nuclear engineer, certified health physicist and public health professional with over 30 years of experience in evaluating both ionizing and non-ionizing radiation exposures, gave an overview on electric and magnetic fields (EMF). EMF is a combination of electric and magnetic fields generated by electrical currents. Numerous case studies conducted by scientists have determined that EMF is not linked to causing cancer, including childhood leukemia. Based on a large body of scientific research, the World Health Organization (WHO) concluded that "the current evidence does not confirm existence of any health consequences from exposure to low level electromagnetic fields".

Question and Answer

After the presentation, Andrew answered questions from the audience regarding EMF. Andy Swayne (PSE) and Barry Lombard (PSE) answered general questions related to the Missing Link Transmission Line Project. Responses and key discussion points are noted below.

The chart [slides 15 through 17] the presenter is showing lists the field strength of a 115kV line. What is the voltage of the link line being proposed? Is it 115 kV? Higher? Lower?

- The voltage of the Missing Link Project is proposed to be a 115 kV line. The new transmission line would be same voltage as other transmission lines on the project. For reference, distribution lines are typically 12 kV.

Could electric and magnetic fields spike due to equipment failures or from lightning strikes?

- Andrew walked attendees through the overhead 115 kV transmission line scenarios on Slide 16. Scenario One details the magnetic field reading of a standard 115 kV transmission line operating normally in the right-of-way (ROW) and at various distances while Scenario Two details magnetic field readings when a 115 kV transmission line is carrying additional power. In comparison, Scenario Two's milligauss (mG) reading is modestly higher in the right-of-way, but at various distances like is 50-feet, 100-feet, and 300-feet from the right-of-way, the mG readings are only slightly higher than scenario one.

Andy Swayne also mentioned that when PSE's equipment experiences something like a malfunction, spike, or lighting stike, the safety equipment on the transmission line or distribution line will "trip" (shut off the electrical flow) and take the line out of service. When a power line goes offline, the magnetic field reading goes to 0 mG.

What is ROW?

- ROW stands for right-of-way, it refers to land or easement that is reserved for public use or public services.

How are property values impacted in association with their proximity to high voltage power lines?

- The impact to property values, in regards to proximity to high voltage power lines, varies. Some studies show property values decrease the closer you are to a transmission line, and other studies show the impact to property values to be negligible. In PSE's service territory, there hasn't been a noticeable difference between proximity to a transmission line or a distribution line. Some people will pay more for a location that is farther from a transmission line. PSE is not using property values as a factor or criteria to site the Missing Link.

Some of these lines run right by schools. Does the duration kids spend in school (8 hours/day) increase the Odds Ratio (OR) value? What about proximity and duration to schools?

- The duration of exposure time kids spend in school does not increase the OR value or measured reading of magnetic fields. Studies conducted looking for a connection between childhood leukemia and EMF assumed a child would be exposed at a given exposure level for an entire day at the exposure level. The contribution from the proposed 115 kV line would result in a minimal increase in the existing magnetic field and it should be re-iterated that the World Health Organization has not identified any association between magnetic field exposures and risks to children.

  Andrew also ran a scenario with information provided by PSE looked at the magnentic field readings from various distances (slides 16 and 17) . The strength of a magnetic field quickly dissipates the farther away you move from a transmission line. Since schools are typically set back 50-feet or more from the right-of-way where a transmission line is routed, you can assume the magnetic field readings will be very low.

I'm still confused, likely because I don't understand OR values and how they are calculated in this instance. Drew provided a bit more detail but I thought I heard him say distribution line and not transmisison line? I understood the epidemological studies linkage to less than 2 OR but it might be helpful to have visiauls of what OR is as part of the recap of the notes.

- Odds Ratios (OR) are simply a way for epidemiologists to try and determine whether a particular exposure, magnetic fields, are associated with a given outcome, childhood leukemia in this case. So if an OR is equal to 1 then the exposure does not affect the outcome. An OR less than 1 would imply a protective effect from the exposure. An OR of 2 or less is considered weak due to the large uncertainties associated with statistics in evaluating environmental outcomes. An OR greater than 5 for example, would be a strong assocaition and something not likely due to chance. That is not the case for magnetic fields and childhood leukemia. Fortunately for the study of magnetic field exposures and adverse health effects we can also rely on aminal and cellular studies that fail to support the weak OR of two or less and provides further support as to why the WHO concluded that "the current evidence does not confirm existence of any health consequences from exposure to low level electromagnetic fields".

How does EMF from transmission lines compare to EMF from cell phones? Could they cause brain cancer?

- EMF from cell phones is not equivalent to the EMF of a transmission lines. The magnetic fields of a cell phone and a transmission line don't act similar or interact in any way. Studies show EMF from 60 Hz power lines does not cause brain cancer.

What is a co-exposure scenario? What does that mean?

- In studies for EMF, a co-exposure scenaro is when scientists expose something to a known carcinogen, then add a magnetic field to see how it behaves. Co-exposure scenarios are performed in controlled environments in animal studies.

How does EMF affect people who have negative health impacts due to noise or hum these lines produce?

- Andrew stated he was not a noise expert and therefore could not address this question.

What about the high-voltage electrical power lines with their electro-magnetic fields?

- High-voltage electrical power lines are transmission lines. In the United States, it's possible to have 230 kV and higher voltage transmission lines which are higher in the air than 115 kV transmission lines. Its also possible to change the voltage of the transmission lines so there is a lower magnetic field. Engineering-wise, transmission lines use more power when they have to move power farther distances. PSE mostly uses 115 kV transmission lines to move power, though the company does operate some 230 kV transmission lines. The Missing Link is planned to be a 115 kV transmission line. There are no 230kV transmission lines on Bainbridge Island.

Would you live under large power lines for 10 to 20 years??

- Andrew responsed his home is adjacent to an overhead distribution line and he is fine with the EMF exposure. Distribution lines typically have a lower height than transmission lines and have a higher magnetic field. Transmssion lines are higher in the air which means their magnetic field will be lower as the distance from the power line is increased.

At a time when we have seen scientists, the FDA, the CDC, etc. blatantly lie to the American people about COVID data, VAERS data…why should we believe you're not the Dr. Fauci of EMF? PSE should bring in a scientist with the opposite point of view on EMF.

- Andrew agreed with the statement made by the attendee. Andrew has done approximately 1500 public meetings and it was common in larger meetings/hearings to have someone on the panel that had an opposing viewpoint on EMF so there could be a dialogue about the topic. As the dialogue continues throughout the public meeting, As a former public health expert on this subject for the Washington State Department of Health, Andrew still relies on expert reviews conducted byorganizations throughout the world to demonstrate the documented evidence on EMF research. In that manner, Andrew strives to remove all possible bias from his presentations.

Experts thought we should keep smoking and that it was OK for fire fighters to go into Chernobyl and Ground Zero. What's our recourse if the science later shows that it was right for us to be cautious?

- Andrew stated experts have known for since the 1960s that smoking was harmful to humans and that the fire fighters sent into Chernobly might not have known the impact of radiation poisoning, but the scientists certainly did. In the case of EMF, there's been extensive research over the past 45 years from around the world. The only "evidence" to date is a weak but somewhat consistent association of childhood leukemia and magnetic fields. However, that weak association is weakened by further analysis that showed that the observed association changed over time and is not supported by cellular or animal studies nor is there any mechanistic way in which exposures at these very low levels could cause harm to the human body The WHO "concluded that current evidence does not confirm the existence of any health consequences from exposure

to low-level electromagnetic fields". The WHO is a cautious and conservative organization in their statements, so for them say EMF does not have negative impact on health is a strong statement.

In regards to secondary effects; how many studies have looked for signs inside the human body?

- There have been numerous studies of research on the effects of EMF at the cellular level. Scientists and researchers do not do direct testing on humans. Conducted studies and experiments are done on the biological and cellular level of animals of which there are hundreds

How do you plan to share this information with members of the public and the City Council Members who are not in attendance? There seems to considerable concern among members of the public regarding the effects of EMFs on schools, neigborhoods, etc.

- PSE invited the entire Bainbridge Island community to join the EMF information session, including direct outreach to City Council. PSE sent letters to all island residents inviting them to the information session as well as adverstised the event on social media, print media, PSE's e-newsletter, and PSE's website. The EMF information session presentation slides and meeting summary will also be posted on the project website. PSE is always willing to answer questions from the public, email your questions to info@psebainbridge.com or leave a voice message at 888-878-8632.

Will these lines cause forest fires if high winds blows debris into them?

- There is the possibility that if an energized transmission line or distribution line comes in contact with debris, that a fire could occur. A fire could start when electricity arcs from a power line into the ground and it comes in contact with debris or vegetation that is dry. PSE's transmission lines have safety equipment designed to de-energize the power line if it senses an electrical fault along the line. PSE is fortunate that the vegetation in its service area isn't dry like California's, but is still planning for and monitoring climate change's effect on vegetation. PSE is working to minimize the possibilty of wild fires in its service territory.

While I don't think there's a risk to EMF, it is not fair to suggest that because EMF is used in medicine it is therefore harmless. We use ionizing x-rays in medicine as well. And while they're useful, they are, in fact, harmful.

- Andew agreed with the statement made by the attendee and clarified that he was not making the point that since EMF is used in medicince it is therefore harmless. Ionizing radiation is used in both diagnostic and therapeutic applications in medicine to great effect but ionizing radiaton is a weak but known carcinogen. In contrast, numerous studies have documented that low frequency magnetic fields (and static fields) could be used in constructive and therapeutic ways like improving bone health through increasing of calcium deposition in bones or promoting the absorption of chemo drugs and/or enhance inhibitory effects of regulating apoptosis and cell cycle related proteins. In these applications the magnetic field in beneficial and at signicantly higher exposure rates. Andrew was trying to change the assumption among some people that the magnetic field exposure must be harmful.

Hi Drew - as a fellow Georgia Tech grad and Nuke Submarine Officer, I appreciate your scientific, research-based, data-driven approach and reasoned answers to these questions. Although this project is meant to help reliability by adding redundancy to the supply of the Winslow substation, how many of our outages are actually caused by the lack of redundancy? I would think many of the outages are a result of trees falling on distribution lines not on the 115KV lines? Is there any data on this?

- PSE does have data on the number of outages caused by the lack of redundancy and is able to provide the data to those interested. The main purpose of the Missing Link Project is to provide transmission system redundancy to the Winslow and Murden Cove substations so large areas of the island do not go without power when a transmission line goes out of service. It is true that

there are local outages to neighborhoods when a tree falls on distribution lines, and when that happens, PSE often has the ability to reconfigure the distribution system so power can be restored to a neighborhood while the affected distribution line is repaired.

I've been impressed with the job PSE has done to trim trees in the last two years to reduce outages. There are hardly any outages anymore. Given the improvement in the last year or two, is this connection still genuinely necessary? In otherwords, it was necessary two years ago, but is it still?

- Yes, the Missing Link Project is still considered a critical project to improving reliability on Bainbridge Island. Vegetation management has helped, but it doesn't offer a long-term solution for better reliability. The goal of the Missing Link Project is to build a new transmission line connecting Murden Cove and Winslow substations so there is a transmission line loop. If one line goes out, the other can still feed the substation and provide power to customers. A majority of substations in PSE's service territory have two transmissions connected to them. PSE wants to bring the standard of having redundant transmission lines connecting substations on the island.

Closing remarks and next steps

Karen thanked the audience for attending the information session. PSE is currently working on identifying a preferred route option and announce it to the Bainbridge Island Community and Community Sounding Board later in fall 2021. The information session concluded at 6:30 p.m.

Attachment 1: Meeting staff

Electric and magnetic fields expert
Andrew Thatcher, Consulting Health Physicist

PSE Staff
Andy Swayne, PSE Municipal Liaison Manager
Barry Lombard, PSE Project Manager
Karen Brubeck, PSE Community Engagement Representative

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Kristine Danzinger, EnviroIssues, Technical support
Nyles Green, EnviroIssues, Notetaker
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Listening staff
Kerry Kriner, PSE Land Planner
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