

## MEMORANDUM

To: Pine Gate Renewables  
Mikala Newsom

From: Marcus Rubenstein, CPESC  
Kimley-Horn and Associates

Date: February 3, 2023

Re: Morven Solar Energy Project – Radiation

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### Commentors have expressed concerns related to radiation coming from solar panels/farms

- NC State University published a white paper in May 2017 by Tommy Cleveland called *Health and Safety Impacts of Solar Photovoltaics*. Cleveland explains the meaning of Electromagnetic fields (EMF), also referred to as radiation, and how they are generated from photovoltaic (PV) panels. EMF that are produced through PV panels are non-ionizing radiation, which means that the radiation comes off as heat (energy to move atoms in molecule). However, they do not produce enough energy to remove electrons from an atom or molecule, or damage DNA.
  - Humans are exposed to EMFs every day. Based on the World Health Organization (WHO), EMFs can be generated through natural or human-made sources. EMFs can be generated through the electricity that comes out of every power socket, x-rays, mobile devices, radio stations.
  - Cleveland states that humans are exposed to EMFs/radiation throughout our daily lives without any negative health impacts. Solely by standing outside a fenced solar facility does not expose significant EMF.
- The Committee on the Possible Effects of Electromagnetic Fields on Biologic Systems from the National Research Council published a book in 1997 titled *Possible Health Effects of Exposure to Residential Electric and Magnetic Fields*. This book researched whether routine exposures to electric and magnetic fields found in or around residential areas could cause cancer, reproductive abnormalities, or other neurological diseases.
  - The book mentions the following: “Based on a comprehensive evaluation of published studies relating to the effects of power-frequency electric and magnetic fields on cells, tissues, and organisms (including humans), the conclusion of the committee is that the current body of evidence does not show that exposure to these fields presents a human-health hazard. Specifically, no conclusive and consistent evidence shows that exposures to residential electric and magnetic fields produce cancer, adverse neurobehavioral effects, or reproductive and developmental effects.”
- Solar fields are a passive generator of electricity. They do not produce noise or odors, nor do they produce emissions as they generate electricity or emit harmful chemicals into the area.
- Exponent, Inc published a report in January 2020 called the *Report on Electric and Magnetic Fields*. They mention that majority of the electricity generated in North America are transmitted as alternating current (AC) at a frequency of 60 Hertz (hz).
  - Solar panels on the other hand, generate direct current (DC), which based on Cleveland, produce stationary 0 hz electric and magnetic fields
  - As majority of the electricity produced from solar panels are DC, inverters are located in specific areas of the solar facility to convert DC to AC electricity.
  - The invertors that deliver the power to the substation to produce extremely low frequency EMF (ELF-EMF). This power is transmitted at the average frequency of 60 hz.

- Scientists from WHO conducted a research in 2007 regarding effects on exposure to ELF-EMF
  - They stated that EMFs are composed of electric and magnetic fields.
  - Electric fields are generated by voltage and magnetic fields are generated by electric current
  - The relatively low voltages in a solar facility and the fact that electric fields are easily shielded (i.e., blocked) by common materials, such as plastic, metal, or soil means that there is no concern of negative health impacts from the electric fields generated by a solar facility.
  - In October 2005, WHO gathered a task group of scientific efforts to perform a health assessment on whether there were any risks to health that might exist from exposure to ELF electric and magnetic fields.
    - They tested to see the effects on human health from exposure to ELF in the frequency range from 0 hz to 100,000 hz
    - The task group concluded that there were no substantive health issues related to ELF electric fields at levels that were normally encountered by humans on a daily basis.
- Electricity from solar panels and transmission to the power grid emits extremely weak electromagnetic fields. Exposure to low-level electromagnetic fields has been studied extensively, and there is no evidence that it is harmful to human health, according to the WHO.

Summary – Based on the information provided above, PV panels generate electromagnetic fields, also known as radiation. Based on studies conducted, the EMFs that are generated from these panels are at extremely low frequencies and have shown no evidence of effects on human health.