DOCKETED	
Docket Number:	23-OPT-01
Project Title:	Fountain Wind Project
TN #:	250501
Document Title:	TLSN-03_fwp_EMF_interference_risk_assessmentp
Description:	N/A
Filer:	Caitlin Barns
Organization:	Stantec Consulting Services, Inc.
Submitter Role:	Applicant Consultant
Submission Date:	6/2/2023 3:02:23 PM
Docketed Date:	6/2/2023

FOUNTAIN WIND PROJECT

Overhead Cable EMF Interference Risk Review

ConnectGen LLC

Document No.: 10435293-HOU-T-01-C
Date: 24 May 2023

IMPORTANT NOTICE AND DISCLAIMER

1. This document is intended for the sole use of the Customer as detailed on the front page of this document to whom the document is addressed and who has entered into a written agreement with the DNV entity issuing this document ("DNV"). To the extent permitted by law, neither DNV nor any group company (the "Group") assumes any responsibility whether in contract, tort including without limitation negligence, or otherwise howsoever, to third parties (being persons other than the Customer), and no company in the Group other than DNV shall be liable for any loss or damage whatsoever suffered by virtue of any act, omission, or default (whether arising by negligence or otherwise) by DNV, the Group, or any of its or their servants, subcontractors, or agents. This document must be read in its entirety and is subject to any assumptions and qualifications expressed therein as well as in any other relevant communications in connection with it. This document may contain detailed technical data which is intended for use only by persons possessing requisite expertise in its subject matter.
2. This document is protected by copyright and may only be reproduced and circulated in accordance with the Document Classification and associated conditions stipulated or referred to in this document and/or in DNV's written agreement with the Customer. No part of this document may be disclosed in any public offering memorandum, prospectus, or stock exchange listing, circular, or announcement without the express and prior written consent of DNV. A Document Classification permitting the Customer to redistribute this document shall not thereby imply that DNV has any liability to any recipient other than the Customer.
3. This document has been produced from information relating to dates and periods referred to in this document. This document does not imply that any information is not subject to change. Except and to the extent that checking or verification of information or data is expressly agreed within the written scope of its services, DNV shall not be responsible in any way in connection with erroneous information or data provided to it by the Customer or any third party, or for the effects of any such erroneous information or data whether or not contained or referred to in this document.
4. Any forecasts, estimates, or predictions made herein are as of the date of this document and are subject to change due to factors beyond the scope of work or beyond DNV's control or knowledge. Nothing in this document is a guarantee or assurance of any particular condition or energy output.

KEY TO DOCUMENT CLASSIFICATION

Strictly Confidential	:	For disclosure only to named individuals within the Customer's organization.
Private and Confidential	:	For disclosure only to individuals directly concerned with the subject matter of the document within the Customer's organization.
Commercial in Confidence	:	Not to be disclosed outside the Customer's organization.
DNV only	:	Not to be disclosed to non-DNV staff
Customer's Discretion	:	Distribution for information only at the discretion of the Customer (subject to the above Important Notice and Disclaimer and the terms of DNV's written agreement with the Customer).
Published	:	Available for information only to the general public (subject to the above Important Notice and Disclaimer).

Project name:	Fountain Wind Project	DNV - Energy
Report title:	Overhead Cable EMF Interference Risk Review	DNV Energy USA Inc.
Customer:	ConnectGen LLC	Renewables Advisory
	1001 McKinney, Suite 700	1400 Ravello Drive
	Houston, TX 77002	Katy, Texas, 77449
Contact person:	Adenike Thompson	
Date of issue:	24 May 2023	
Project No.:	10435293	
Document No.:	10435293-HOU-T-01	
Issue:	C	
Status:	Final	

Task and objective: Review of interference risk from electromagnetic fiends (EMF) produced by the overhead collector system of the Fountain Wind Project on over-the-air broadcasting TV and radio signals.

Prepared by:	Verified by:	Approved by:
A. Nercessian Project Siting Engineer Environmental and Permitting Services	F. Langelier Team Leader Environmental and Permitting Services	G. Constantin Head of Section Environmental and Permitting Services
J. Puggioni Senior Siting and Acoustic Engineer Environmental and Permitting Services	F. Gagnon Senior Scientist Environmental and Permitting Services	

☐ Strictly Confidential
☐ Private and Confidential
☐ Commercial in Confidence
☐ DNV only
☒ Customer's Discretion
☐ Published

Issue	Date	Reason for Issue	Prepared by	Verified by	Approved by
A	5 May 2023	First draft	A. Nercessian	F. Langelier	G. Constantin
B	16 May 2023	Final	J. Puggioni	F. Gagnon	G. Constantin
C	24 May 2023	Final with client-requested additional information	J. Puggioni	F. Gagnon	G. Constantin

1 INTRODUCTION

ConnectGen LLC (the “Customer”) has requested DNV Energy USA Inc. (“DNV”) to provide a technical memo to discuss the potential impact of electromagnetic fields (EMF) emitted from the overhead collection cables at the Fountain Wind Project (the “Project”) on the over-the-air TV and radio signals received at nearby dwellings.

2 PROJECT DETAILS

The Project is located in Northern California, approximately 40 miles south of Mount Shasta. It consists of 48 wind turbines, with approximately 40 miles of 34.5 kV collector cabling, of which approximately 4.5 miles are overhead [1]. The collector lines lead to an on-site Project switching station which would be located next to the Project substation and would facilitate the interconnection between the Project’s electricity and the PG&E transmission lines. The Project would tap into the existing PG&E 230 kV line via an aboveground line tap located directly adjacent to the switching station.

The nearest residences [2] are over 1.5 miles from the closest point of the Project’s overhead cabling. The majority of dwellings are concentrated in a residential development located over 2 miles to the northwest of the proposed overhead collector lines. There is existing overhead electrical cabling within the community, along the main road, as visible in aerial imagery.

Figure 1 shows the Project components and nearest residences.

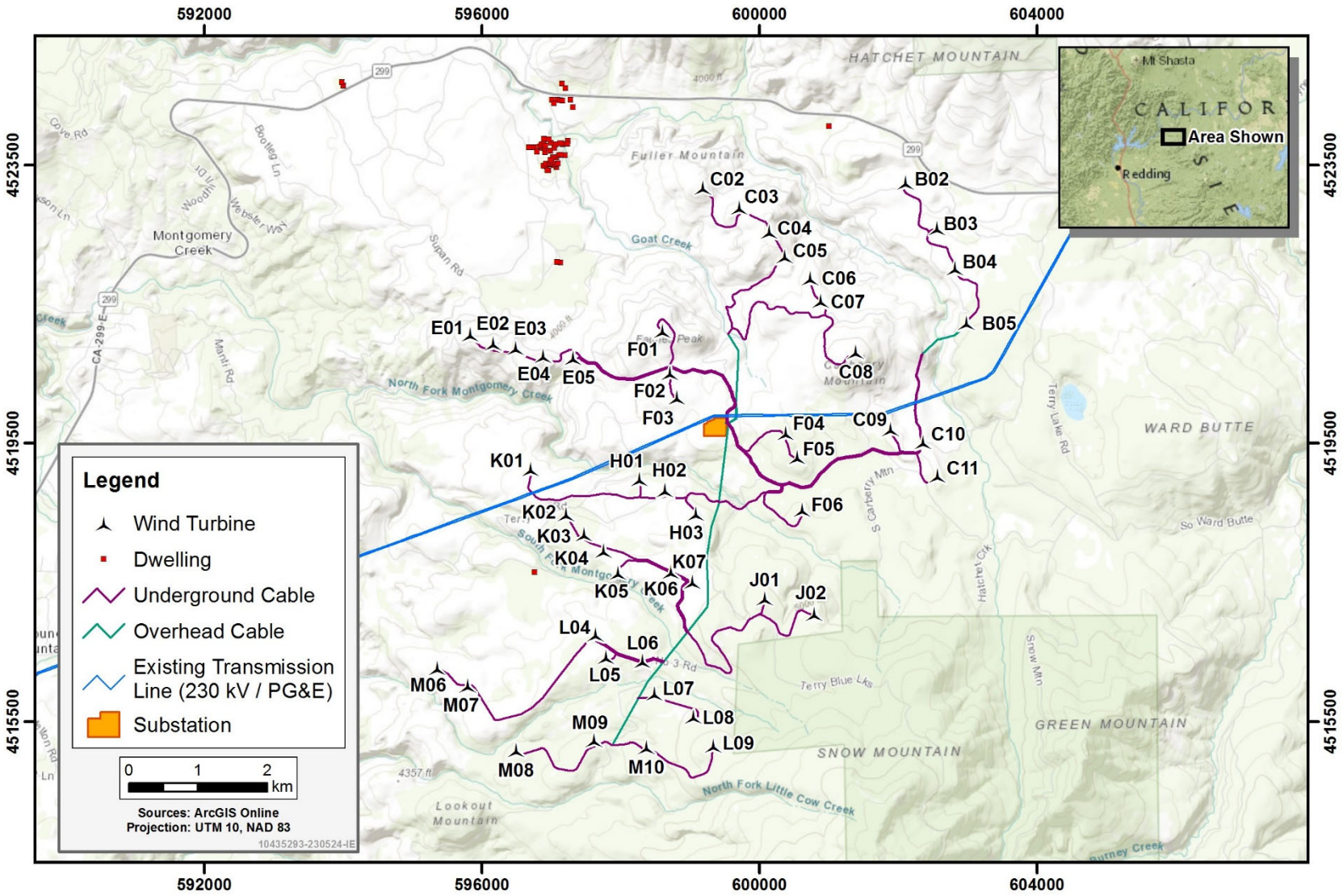

Figure 1 Project components and residences (red)

3 LITERATURE REVIEW ON INTERFERENCE RISK

According to *EMFs.info* [3] and *getstreamwise.com* [4], among other similar sources, FM and TV interference is possible due to EMFs from overhead electrical cables, but only in close proximity to the sources:

> *On rare occasions, interference with higher frequency FM radio can occur near electricity installations. This is usually as a result of faulty equipment. Occasionally properties close to overhead line towers have overlaid television images. This is a result of "ghosting" when both the main TV signal and a reflected signal from the tower are received.*
>
> *…*
>
> *Power lines – Overhead power lines leading to your home can decrease the strength of signals from broadcast towers, leading to a reduced antenna signal.*

The magnetic component of EMF is measured in milligauss (mG). According to *emfcenter.com* [5] EMF radiation from power lines reaches levels below 0.5 mG beyond 700 feet from the source:

> *Radiation from power lines is categorized as ELF (extremely low frequency). This type of radiation can travel several hundred meters. At a 700 feet (213 meters) distance, the radiation will typically be reduced to less than 0.5 mG. This is generally considered a safe distance.*

The distance to reach 0.5 mG drops to 200 feet for "neighborhood distribution power lines on wooden poles" [5].

The New York State Public Service Commission [6] conducted a study on 11 September 1990 recommending a standard of 200 mG for future transmission facilities. This standard was put forward based on a "prudent avoidance" basis. Typical right-of-way widths recommended in the study include 150 feet for 345 kV circuits, 120 feet for 230 kV circuits and 100 feet for lower voltage circuits.

According to the California Public Utilities Commission document [7] titled EMF Design Guidelines for Electrical Facilities dated 21 July 2006 the California Department of Education (CDE) has criteria to avoid high-voltage power transmission lines. For overhead power lines, the setback criteria are:

- 100 ft for 50 – 133 kW power lines (interpreted by CDE up to 200 kV)
- 150 ft for 220 – 230 kV power lines
- 350 ft for 500 – 550 kV power lines

A study submitted to California public utilities commission (CPUC) for the Lakeville-Sonoma 115 kV transmission line [8] stated:

> *For areas where no major transmission lines exist, EMF is still present due to neighborhood electrical distribution lines, household wiring, and other electrical equipment and wiring. Generally speaking, the magnetic field returns to "background" level (i.e., a level no greater than normally occurs in nature) at distances of approximately 3–4 feet from a typical household appliance. The distance required to return to "background" level is much higher with respect to electrical power lines: approximately 60–200 feet from a distribution line and 300–1,000 feet from a transmission line.*

The sources above indicate that television sets themselves, and other similar major household electronics, are likely to emit stronger EMFs than a transmission or distribution line located 1,000 feet or more from residences as it is the case for the Project collection cabling.

The Lakeville-Sonoma study also provided information regarding radio, television and electronic equipment interference. The document states that overhead transmission lines do not generally interfere with normal radio or TV reception. However, it is possible to occur by either corona discharge or gap discharges. Both of these effects are mitigated with proper design and maintenance of powerlines. The study also states that any levels of TV or radio interference are extremely low at the typical right-of-way edge.

4 CONCLUSION

The Project consists of 48 wind turbines, 40 miles of 34.5 kV collector cabling, of which approximately 4.5 miles are overhead, and a Project switching station located next to the Project substation. The Project would tap into the existing PG&E 230 kV line via an aboveground line tap located directly adjacent to the switching station.

The nearest residences [2] are over 1.5 miles from the closest point of the Project's overhead cabling. The majority of dwellings are concentrated in a residential development located over 2 miles to the northwest of the proposed overhead collector lines. There is existing overhead electrical cabling within the community, along the main road, as visible in aerial imagery.

EMF radiation produced by 34.5 kV electrical lines at >1,000 feet will be lower than the EMF radiation caused by household electronics, such as TVs. As the Project's collector lines are located over 1.5 miles (7,920 feet), from the nearest residence, the risk of interference with over the air radio or TV signals from the Project's collector lines is expected to be negligible. Additionally, there is existing overhead electrical distribution infrastructure in the residential development located 2.0 miles northwest of the Project, as well as an existing 230 kV transmission line intersecting the Project, which are likely to produce higher EMFs in their surroundings than the Project's 34.5 kV collector cabling.

5 REFERENCES

[1] ConnectGen, Turbine and collector cabling layout: "*FTW_Site_Layout_20210901.kmz*".

[2] ConnectGen, Nearest residences. "Fountain_Wind_Receptors_20200210.kmz".

[3] Electric and Magnetic Fields and Health, Finding out more: Radio and TV interference, Access online in May 2023: https://www.emfs.info/more/more-issues/interference/

[4] StreamWise Solutions, What causes TV Antenna Interference or Loss of Signal?, Access online in May 2023: https://getstreamwise.com/tv-antenna-signal-reception-interference/

[5] EMF Center, What Distance is Safe? Access online in May 2023: https://emfcenter.com/what-distance-is-safe/

[6] State of New York Public Service Commission, Statement of Interim Policy on Magnetic Fields of Major Electric Transmission Facilities, 11 September 1990. Online: file:///C:/Users/fregag/Downloads/%7B80429BD2-E24B-4C94-9B52-FD7817516297%7D.pdf

[7] California Public Utilities Commission, EMF Guidelines for Electrical Facilities, 21 July 2006. https://www.cpuc.ca.gov/-/media/cpuc-website/divisions/energy-division/documents/infrastructure/emfs/ca_emf_design_guidelines.pdf

[8] PG&E's Lakeville-Sonoma 115 kV Transmission Line Project, Electric and Magnetic Fields (EMF) and Other Field-Related Concerns. https://ia.cpuc.ca.gov/Environment/info/esa/lakeville/fmnd/6b-AppendixB-EMF.pdf

About DNV

Driven by our purpose of safeguarding life, property and the environment, DNV enables organizations to advance the safety and sustainability of their business. We provide classification, technical assurance, software and independent expert advisory services to the maritime, oil & gas and energy industries. We also provide certification services to customers across a wide range of industries. Combining leading technical and operational expertise, risk methodology and in-depth industry knowledge, we empower our customers' decisions and actions with trust and confidence. We continuously invest in research and collaborative innovation to provide customers and society with operational and technological foresight.