

Appendix F Electric and Magnetic Field Estimates

Electric and Magnetic Field Estimates, Pilot Knob to Burnsville 115 kV Rebuild and Upgrade Project¹

There are two scenarios of transmission and distribution line configurations associated with the project:

- Scenario 1: The segment between Pilot Knob Substation and the intersection with Deerwood Drive is double circuit (approximately 1 mile). There is no distribution underbuilt on structures. The 115 kV is modeled as bundled conductor.
- Scenario 2: A majority of the remaining alignment is single circuit with distribution underbuilt on the structures. The 115 kV is modeled as bundled conductor.

¹ Estimates provided to Commerce by GRE, July 19, 2024

Scenario 1: Double Circuit, No Distribution Underbuild

Electric Fields

Table F1 Calculated Electric Fields (kV/m) for Double Circuit Line (One meter [3.28 feet] above ground)

		Distance to Proposed Alignment – Electric Field (feet)										
Operating Voltage (kV)	Max Operating Voltage (kV)	-300	-200	-100	-50	-25	Max	25	50	100	200	300
115 kV Double Circuit	121	0.02	0.04	0.12	0.06	0.78	2.37	0.78	0.07	0.12	0.04	0.02
69 kV Double Circuit	72	0.01	0.02	0.07	0.04	0.47	1.41	0.47	0.04	0.07	0.02	0.01

Magnetic Fields

Table F2 Calculated Magnetic Fields (mG) for Proposed Alignment Design

			Distance to Proposed Alignment – Magnetic Field (feet)										
Operating Voltage	Max Operating Voltage (kV)	Line Current (Amps)	-300	-200	-100	-50	-25	Max	25	50	100	200	300
115 kV Peak Load	121	241	0.52	1.21	4.64	14.19	29.19	44.90	29.19	14.19	4.64	1.21	0.52
115 kV Average Load	121	151	0.32	0.76	2.91	8.89	18.29	28.13	18.29	8.89	2.91	0.76	0.32
69 kV Peak Load	72	402	0.86	2.02	7.74	23.66	48.69	74.90	48.69	23.66	7.74	2.02	0.86
69 kV Average Load	72	251	0.54	1.26	4.83	14.78	30.40	46.77	30.40	14.78	4.83	1.26	0.54

Scenario 2: Single Circuit, Distribution Underbuild

Electric Fields

Table F3 Calculated Electric Fields (kV/m) for Double Circuit Line (One meter [3.28 feet] above ground)

		Distance to Proposed Alignment – Electric Field (feet)										
Operating Voltage (kV)	Max Operating Voltage (kV)	-300	-200	-100	-50	-25	Max	25	50	100	200	300
115 kV Single Circuit	121	0.01	0.02	0.07	0.04	0.18	0.25	0.10	0.05	0.06	0.02	0.01
69 kV Single Circuit	72	0.01	0.01	0.04	0.03	0.08	0.15	0.09	0.02	0.03	0.01	0.01

Magnetic Fields

Table F4 Calculated Magnetic Fields (mG) for Proposed Single Circuit Alignment Design

			Distance to Proposed Alignment – Magnetic Field (feet)										
Operating Voltage	Max Operating Voltage (kV)	Line Current (Amps)	-300	-200	-100	-50	-25	Max	25	50	100	200	300
115 kV Peak Load	121	241	0.201	0.473	1.705	4.171	6.527	23.45	14.56	6.542	2.11	0.546	0.228
115 kV Average Load	121	151	0.123	0.293	1.079	2.727	4.066	12.30	8.166	3.787	1.246	0.324	0.135
69 kV Peak Load	72	402	0.322	0.778	2.928	7.665	11.56	27.51	19.47	9.348	3.143	0.822	0.342
69 kV Average Load	72	251	0.2	0.488	1.858	4.981	7.719	15.42	11.30	5.558	1.897	0.499	0.207