CASE: PCN 1
WITNESS: SCOTT GIBBENS

PUBLIC UTILITY COMMISSION
OF
OREGON

STAFF EXHIBIT 200

Staff Testimony

November 10, 2016

Q. Please state your name, occupation, and business address.

A. My name is Scott Gibbens. I am a Senior Economist employed in the Energy Rates, Finance and Audit Division of the Public Utility Commission of Oregon (OPUC). My business address is 201 High Street SE, Suite 100, Salem, Oregon 97301.

Q. Please describe your educational background and work experience.

A. My witness qualification statement is found in Exhibit Staff/201.

Q. What is the purpose of your testimony?

A. My testimony responds to the opening testimony in PCN 1 filed by Louis S. Toth and Robert Echenrode on behalf of Umatilla Electric Cooperative (UEC). My testimony specifically addresses Staff's analysis regarding the Safety and Justification of UEC's application for a Certificate of Public Convenience and Necessity (CPCN).

Q. Did you prepare an exhibit for this docket?

A. Yes. I prepared the following exhibits:

- Staff Exhibit 201 : Witness Qualification
- Staff Exhibit 202: UEC's response to Staff DR 2, 14, 16, 26, 30, 34, 36
- Staff Exhibit 203: UEC's Electrical Facility Inspection policy, Line Inspection policy, and Safety Manual
- Staff Exhibit 204: UEC's response to Staff DR 7, 9, & 10

Q. How is your testimony organized?

A. My testimony is organized as follows:

Q. Why are you focusing on these two topics in your testimony?

A. In relevant part, ORS 758.015(2) states:

> The commission, in addition to considering facts presented at such [a public] hearing, shall make the commission's own investigation to determine the necessity, safety, practicability, and justification in the public interest for the proposed transmission line and shall enter an order accordingly.

Staff Witness Geoffrey Ihle discusses the background of UEC's proposal as well as Staff's investigation into the necessity, practicability and conformance with land use guidelines of the proposed transmission line, while my testimony focuses on the remaining topics.

ISSUE 1, SAFETY

Q. How did Staff evaluate the safety of the proposed project?

A. Staff considered the Commission's discussion in Commission Order No. 11-366 of the term "safety." Specifically, the order states:

> "Safety" means "the condition of being safe, freedom from being exposed to danger; exemption from hurt, injury, or loss." To establish the safety of a project, petitioner must show that the project will be constructed, operated, and maintained in a manner that protects the public from danger.[1]

In its analysis, Staff utilized information provided in UEC's Petition for a Certificate of Public Convenience and Necessity (Petition), testimony in support of the Petition, data responses, general research and information provided by the Public Utility Commission's Safety Division. Staff identified two aspects to safety for the purposes of the analysis: UEC's general operation and maintenance and its proposed plans for the transmission line.

Q. Please provide Staff's analysis of UEC's general operation and maintenance.

A. UEC has been in operation since 1937.[2] It currently owns 130 miles of transmission lines.[3] Staff reviewed UEC's Electrical Facility Inspection policy, Line Inspection policy, and safety manual and found no issues or concerning items.[4]

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[1] *In re Pacific Power and Light*, OPUC Docket No. UM 1495, Order No. 11-366 at 4 (Sept. 22, 2011).
[2] Umatilla Electric Cooperative Petition for Certificate of Public Convenience and Necessity (UEC Petition) at 1.
[3] See Exhibit Staff/202, Gibbens/1.
[4] Exhibit Staff/203, Gibbens/1-182.

Q. Please provide Staff's analysis of the safety of the proposed line.

A. The current proposed transmission line will equal roughly four percent of the total network of transmission lines owned by UEC.[5] The proposal and construction process will follow the guidelines set forth by the Rural Utility Service (RUS).[6] The easement requested by UEC is 25 percent larger than that required by NESC standards (50 feet vs 40 feet) along areas where there are limited buildings or structures and will not result in a large impact to landowners.[7] In those portions where a larger easement would have a direct impact on a building, UEC is requesting an easement of 25 feet; however, those portions will have a greater than required vertical clearance.[8] The added easement space will ensure a safe operating distance, and maximize the safety of area residents and maintenance workers, and will provide UEC with a clear, unobstructed path for the line.[9]

Q. Has UEC considered the safety of the environment in its petition?

A. Yes, UEC reviewed the United States Fish and Wildlife Service (USFWS) Information for Planning and Conservation requirements.[10] None of the 17 avian species that may be present in Umatilla County are currently listed on Oregon Department of Fish and Wildlife's list of endangered species.[11] UEC will also include devices to prevent the electrocution of avian species.[12]

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[5] See Exhibit Staff/202, Gibbens/1.
[6] UEC/201, Echenrode/15.
[7] See Exhibit Staff/202, Gibbens/2.
[8] *Ibid*.
[9] *Ibid*.
[10] Exhibit Staff/202, Gibbens/3.
[11] *Ibid.*
[12] *Ibid.*

Further, as noted in UEC's response to Staff DR 16, the proposed transmission line is almost exclusively along road right-of-ways with a large portion of the path containing structures which were originally designed for 69kv transmission which will further limit the total impact to the environment.[13]

Q. Did Staff consider Clarence & Geraldine Charlo's concern in their comment letter filed on September 19, 2016, that the proposed line may have a negative health impact due to the fact that the high voltage line goes over their house?

A. Yes. Staff reviewed the concerns posited by Mr. and Mrs. Charlo in their letter provided in the record. Staff could find no evidence that the proposed line would not conform to all applicable federal, state, and local safety standards. Staff asked UEC to respond specifically to the safety concern raised by the Charlos in a data request.[14] UEC stated that the line would not in fact go over their residence, but would instead be located next to their home.[15] The minimum clearance of the proposed line from the Charlo residence is roughly 58 percent above the minimum required by NESC standards.[16] UEC reviewed and verified the estimated exposure to EMFs in order to meet the requirements shown in Institute of Electrical and Electronics Engineers (IEEE) standard C95.6: Standard for Safety Levels

[13] *Ibid*.
[14] Exhibit Staff/202, Gibbens/4.
[15] *Ibid.*
[16] *See ibid.*

with Respect to Human Exposure to Electromagnetic Fields.[17] In UEC's review, the line is shown to be a minimum of 20 percent below the allowable EMF levels declared by the IEEE along the entirety of the proposed line.[18]

Q. Does Staff find the proposed line to be safe?

A. Yes, the proposed construction and line will adhere to relevant safety standards. UEC has limited the external risks and the landowners directly affected by proximity are unlikely to be harmed.

[17] Exhibit Staff/205, Gibbens/1-2.
[18] *See ibid.*

ISSUE 2, JUSTIFICATION

Q. How did Staff evaluate the justification for the proposed project?

A. Staff utilized the discussion of this standard set forth in Commission Order No. 11-366:

> "Justification" means "the act of or instance of justifying." "Justify," in turn, means "to prove or show to be valid, sound, or confirming to fact or reason." Thus, to show that a project is justified, the petitioner must show sufficient reason for the project to be built. To make this determination, we consider the public benefits and costs of the project. Where possible, we rely on benefits and costs that can be quantified in economic terms.[19]

In reviewing the justification for the proposed project, Staff attempted to identify if UEC had provided an acceptable reason for constructing the line. Starting with the assumption that the line is necessary, as Staff finds in its testimony on that issue,[20] Staff examined whether UEC had reasonably demonstrated that the selected route was the optimal solution. Staff then reviewed whether UEC made every attempt to limit the impact on individual landowners and comply with the public interest.

Q. Why did Staff not perform a traditional cost/benefit study?

A. A standard measure to identify justification is to perform a cost/benefit study. However, the majority of the benefits of the line are somewhat unquantifiable. Improvements to reliability, reductions in outages, flexibility in serving load and increased load serving capabilities are benefits which are difficult to assign a monetary value, making a cost/benefit study of limited value. The traditional accounting costs, which are easily quantified in dollar terms, are not a primary

[19] Order 11-366 at 4.
[20] *See* Staff/100, Ihle/10.

concern for Staff because UEC is not a rate-regulated investor-owned utility. As a consumer-owned cooperative, UEC is assumed to be acting on the behalf of all of its customers, and any costs that it incurs are the result of actions taken in some sense by the representatives of the customers themselves. UEC follows the "Democratic Member Control" principal, so customers have a direct impact on decision-making.[21] As a cooperative, the customers are also the stakeholders, and any profits the utility makes are either returned to them or re-invested in the cooperative.[22] So while Commission Staff did consider the total costs in its assessment of the practicability of the filing, the cost, though important, does not bear the same importance as it would if UEC were an investor-owned utility.

Q. Does Staff believe that this is the best alternative which UEC examined?

A. Yes. UEC examined two alternative routes as well as an option of upgrading existing lines to serve the same purpose as the proposed line. As discussed in Staff/100, the two alternatives have a higher customer impact, higher cost, and greater length. The longer the line, the more prone it is to line loss and weather or physical impacts which cause outages.

[21] UEC Cooperative Principles; https://www.umatillaelectric.com/about/uec-cooperative-principles/; 11/9/16.
[22] UEC History; https://www.umatillaelectric.com/about/history/; 11/9/16.

Table 1.

Alternative	Cost[23]	New Customer Impact[24]	Length[25]
Proposed Route	$5.74 Million	.1 Miles	4.71 Miles
West Alternate	$ 6.1 Million	2.9 Miles	4.78 Miles
East Alternate	$7 Million	4.8 Miles	6 Miles
Upgrade Existing Lines	>$11 Million	0 Miles	11.5 Miles

Table 1, above, shows the relative costs, new customer impact and lengths for each alternative. The primary route is also the only route of the three alternatives that follows the existing transmission path for the longest duration possible. It also has the advantage of being the lowest cost and most reliable option. Further, upgrading the existing lines would not provide the added benefit of an additional layer of redundancy to reduce outages to the area.[26] This provides a benefit to 11,133 Oregon ratepayers, 7,978 of whom are served by UEC directly.[27]

Q. Did Staff examine other alternatives beyond the three presented by UEC?

A. Yes, Staff looked for other possible options; however, given the relatively short distance between starting and ending points, along with the geography of the area surrounding the termination points, no other viable alternatives were identified.

[23] Exhibit Staff/204, Gibbens/1-3.
[24] *Ibid*.
[25] *Ibid.*
[26] Exhibit Staff/202, Gibbens/5.
[27] Exhibit Staff/202, Gibbens/6.

Q. Does Staff believe this is the best option to fulfill the needs of the UEC?

A. Yes. Because an upgrade to the existing system does not achieve the same benefit, and requires substantial amounts of additional capital, along with the fact that the chosen route is the best possible alternative to limit customer impact and minimize costs, Staff finds the proposed route to be justified.

Q. If the route is justified, has UEC performed due diligence in minimizing the impact to customers, businesses, and anyone affected by the proposal?

A. The use of condemnation to place utility structures and equipment should be used as a last resort. However, any condemnation proceeding that would follow as a result of the Commission's granting of UEC's Petition would follow legal standards on compensating landowners for the value of property interests taken due to the placement of the transmission line. In reviewing UEC's attempts to obtain all of the necessary easements, Staff finds that UEC has made a reasonable effort to come to an agreement with affected landowners. UEC began the process of obtaining easements for the line in January of 2015, with an initial round of contact with every affected landowner.[28] UEC placed stakes at the proposed location of the structures for any landowner who was interested as well as adjusted structure placement when possible to accommodate the wishes of the land owner.[29] Out of 71 easements that UEC would need to secure in order to construct the line, UEC has currently obtained

[28] Staff Exhibit/202, Gibbens/7.
[29] *Ibid.*

54.[30] So at this time, roughly three-fourths of all affected landowners have agreed to the easement compensation offered. UEC continues to be in contact with the remaining landowners.

Q. Does Staff find the proposal justifiable?

A. Yes. Given that the line is necessary, and that the proposed route is the best alternative, along with the fact that UEC has attempted to limit the impact to all customers, Staff finds the proposed transmission line justified and is in the public interest.

Q. Does this conclude your testimony?

A. Yes.

[30] Exhibit Staff/202, Gibbens/8.

UMATILLA ELECTRIC COOPERATIVE

Oregon Public Utility Commission
Docket No. PCN-1

PUC Staff DR 35: Does UEC's proposed construction plan for the transmission line include any measures to reduce potential exposure to electric and magnetic fields (EMF) generated by the proposed line once it is in service? If so, please describe those measures in detail. If not, please explain why UEC's plan does not include any such measures and whether the Company considers EMF measures to be necessary for the proposed line.

Response

Electric fields and magnetic fields have been reviewed for the proposed project and verified to meet the requirements shown in IEEE standard "C95.6: Standard for Safety Levels with Respect to Human Exposure to Electromagnetic Fields, 0-3 kHz" which recommends the maximum general public exposure to electric and magnetic fields.

Document "Response 35 Attachment 1" details three configurations of the proposed power line; one with only transmission conductors installed, another with transmission conductors with one underbuilt distribution circuit installed, and a third with transmission conductors with two underbuilt distribution circuits installed. In each configuration, levels of the anticipated electric and magnetic fields were calculated at 15 feet above ground at the middle of a typical span on the proposed line. The calculations were done with the voltage at 105% of the nominal voltage and with maximum conductor rated current flowing on the line.

The attachment contains graphs for each configuration which display the intensity of magnetic and electric fields calculated 15 feet above the ground surface directly under the power line and up to 75 feet away from the centerline of the proposed line. The following maximum values are displayed in the graphs:

Configuration	Max Magnetic Field (milligauss)	Max Electric Field (kilovolt/meter)
Transmission Only	114.69	0.669
Transmission w/ 1 Dist.	239.02	0.517
Transmission w/ 2 Dist.	679.05	0.753

IEEE standard C95.6 recommends maximum exposure levels of electric and magnetic fields exposed to the general public to be 0.904 millitesla (9,040 milligauss) and 5000 volts/meter (5

kilovolts/meter) respectively. As shown in the table above, the proposed line will have values substantially less than the maximum allowable levels.

Mitigating measures are inherent in the above due to the height of the structures and the fact that the maximum calculated values of electric and magnetic fields below a typical span on the proposed project will be much less than the maximum levels allowed by IEEE standard C95.6.

Response Date: October 20, 2016

Witness Most Knowledgeable About Response: Louis S. Toth

Electric and Magnetic Field Graphs

Transmission Only

PLS-CADD Version 14.20x64 8:34:51 PM Wednesday, October 19, 2016
Toth & Associates
Project Name: 'm:\pls cadd\jobs (active)\tx - or14 butte-mcnary\or14 butte-mcnary.DON'

EMF Calculation Notes:
  1) All calculations based on the EPRI Red Book methods (2nd Edition, 1982 - infinite straight wire with flat earth approximation).
  2) These approximations are only valid for low frequency (50-60Hz) AC transmission lines.
  3) Bundles are modeled with an equivalent conductor as per EPRI Red Book 8.3.1.
  4) The effects of earth return currents (earth resistivity) are ignored when calculating the magnetic field.
  5) Wire position is determined by the currently displayed weather case.
  6) Wire height used is the height of the wire where the target point is projected upon it.
  7) All calculations assume ground is flat with same elevation as that of centerline.

Meter height above centerline ground: 15.00 (ft)
Cross section offset for graph +/-:   75.00 (ft)
Result interval for graph: 1.00 (ft)
Electric field limit: 0.00 (kV/m)
Magnetic field limit: 0.00 (mG)

EMF calculation includes only wires going from structure 6 to structure 7

EMF Circuit Data:

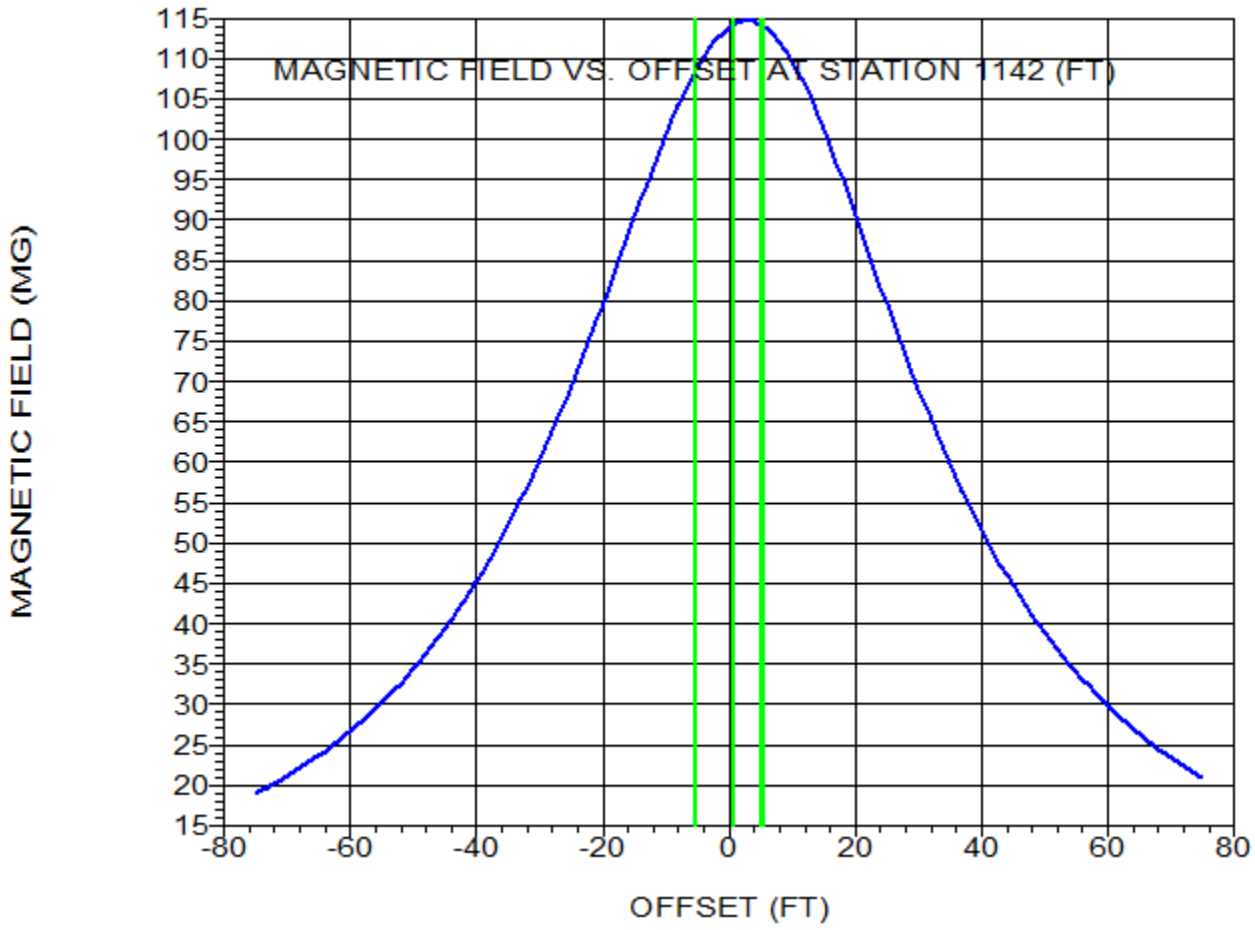
Set #	Phase #	Conductors Per Phase	Voltage Ph-Ph (kV)	Current (Amps)	Phase Angle (deg)	Bundle Diameter (in)
1	1	1	0	0.000	0	0.000
6	1	1	121	1187.000	0	0.000
6	2	1	121	1187.000	120	0.000
6	3	1	121	1187.000	-120	0.000
32	1	1	0	0.000	0	0.000
33	1	1	0	0.000	0	0.000

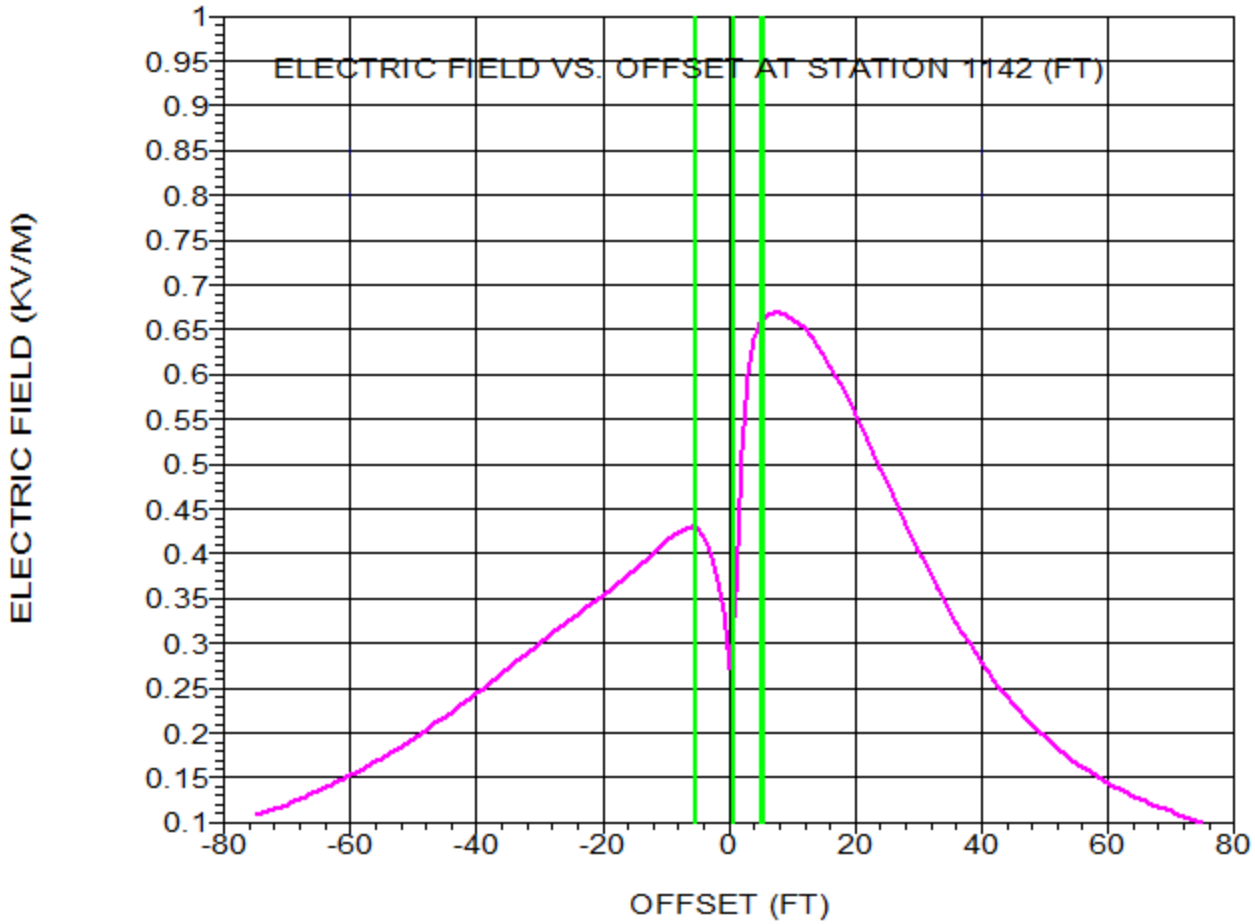
Calculated EMF Circuit Data For Last Point:

Wire station and offset are based on alignment closest to point on wire.
In the case of wires that are not parallel, this may result in different stations for the wires and centerline.

Set #	Phase #	Weather Case	Cable Condition	Wind From	Wire X (ft)	Wire Y (ft)	Wire Z (ft)	Wire Station (ft)	Wire Offset (ft)	Eqv. Wire Diameter (in)	Voltage To Gnd. (kV)
1	1	-20 Deg F	Initial RS	Left	8505638.09	821608.27	523.73	1142.14	0.63	0.496	0
6	1	212 Deg F	Max Sag RS	Left	8505644.05	821608.35	499.97	1142.15	-5.33	1.382	69.86
6	2	212 Deg F	Max Sag RS	Left	8505633.50	821608.21	507.96	1142.14	5.23	1.382	69.86
6	3	212 Deg F	Max Sag RS	Left	8505633.34	821608.21	491.97	1142.15	5.38	1.382	69.86
32	1	32 Deg F w/ 1/4" Ice	Max Sag RS	Left	8505637.91	821608.27	467.75	1142.14	0.82	1.195	0
33	1	32 Deg F w/ 1/4" Ice	Max Sag RS	Left	8505637.90	821608.27	466.77	1142.14	0.82	1.195	0

Maximum magnetic field of 114.69 (mG) found at station 1142.14, offset 3.00 (ft)
Maximum electric field of 0.669 (kV/m) found at station 1142.14, offset 7.00 (ft)




ELECTRIC FIELD VS. OFFSET AT STATION 1142 (FT)
ELECTRIC FIELD (KV/M)
1
0.95
0.9
0.85
0.8
0.75
0.7
0.65
0.6
0.55
0.5
0.45
0.4
0.35
0.3
0.25
0.2
0.15
0.1
-80
-60
-40
-20
0
20
40
60
80
OFFSET (FT)

Transmission with 1 Distribution Circuit Underbuild

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Toth & Associates
Project Name: 'm:\pls cadd\jobs (active)\tx - or14 butte-mcnary\or14 butte-mcnary.DON'

EMF Calculation Notes:
  1) All calculations based on the EPRI Red Book methods (2nd Edition, 1982 - infinite straight wire with flat earth
approximation).
  2) These approximations are only valid for low frequency (50-60Hz) AC transmission lines.
  3) Bundles are modeled with an equivalent conductor as per EPRI Red Book 8.3.1.
  4) The effects of earth return currents (earth resistivity) are ignored when calculating the magnetic field.
  5) Wire position is determined by the currently displayed weather case.
  6) Wire height used is the height of the wire where the target point is projected upon it.
  7) All calculations assume ground is flat with same elevation as that of centerline.

Meter height above centerline ground:  15.00 (ft)
Cross section offset for graph +/-:    75.00 (ft)
Result interval for graph:              1.00 (ft)
Electric field limit:                   0.00 (kV/m)
Magnetic field limit:                   0.00 (mG)

EMF calculation includes only wires going from structure 6 to structure 7
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EMF Circuit Data:

Set #	Phase #	Conductors Per Phase	Voltage Ph-Ph (kV)	Current (Amps)	Phase Angle (deg)	Bundle Diameter (in)
1	1	1	0	0.000	0	0.000
6	1	1	121	1187.000	0	0.000
6	2	1	121	1187.000	120	0.000
6	3	1	121	1187.000	-120	0.000
20	1	1	13.1	703.000	0	0.000
20	2	1	13.1	703.000	120	0.000
20	3	1	13.1	703.000	-120	0.000
21	1	1	0	0.000	0	0.000
32	1	1	0	0.000	0	0.000
33	1	1	0	0.000	0	0.000

Calculated EMF Circuit Data For Last Point:

Wire station and offset are based on alignment closest to point on wire.
In the case of wires that are not parallel, this may result in different stations for the wires and centerline.

Set #	Phase #	Weather Case	Cable Condition	Wind From	Wire X (ft)	Wire Y (ft)	Wire Z (ft)	Wire Station (ft)	Wire Offset (ft)	Eqv. Wire Diameter (in)	Voltage To Gnd. (kV)
1	1	-20 Deg F	Initial RS	Left	8505638.09	821608.27	523.73	1142.14	0.63	0.496	0
6	1	212 Deg F	Max Sag RS	Left	8505644.05	821608.35	499.97	1142.15	-5.33	1.382	69.86
6	2	212 Deg F	Max Sag RS	Left	8505633.50	821608.21	507.96	1142.14	5.23	1.382	69.86
6	3	212 Deg F	Max Sag RS	Left	8505633.34	821608.21	491.97	1142.15	5.38	1.382	69.86
20	1	167 Deg F	Max Sag RS	Left	8505643.39	821608.34	479.77	1142.14	-4.67	0.856	7.563
20	2	167 Deg F	Max Sag RS	Left	8505640.31	821608.30	479.77	1142.14	-1.58	0.856	7.563
20	3	167 Deg F	Max Sag RS	Left	8505634.06	821608.22	479.77	1142.14	4.67	0.856	7.563
21	1	167 Deg F	Max Sag RS	Left	8505637.14	821608.26	479.77	1142.14	1.58	0.856	0
32	1	32 Deg F w/ 1/4" Ice	Max Sag RS	Left	8505637.91	821608.27	467.75	1142.14	0.82	1.195	0
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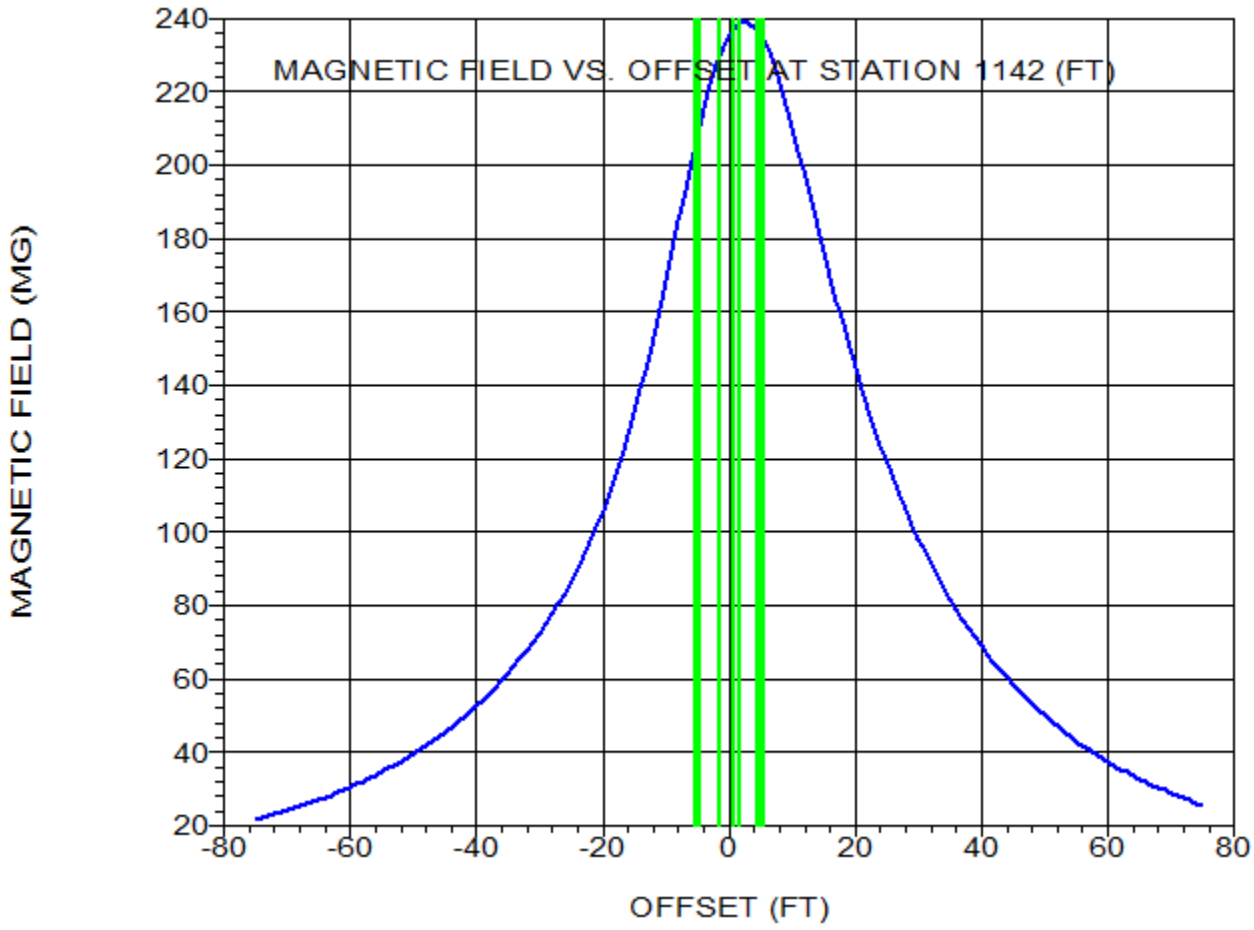
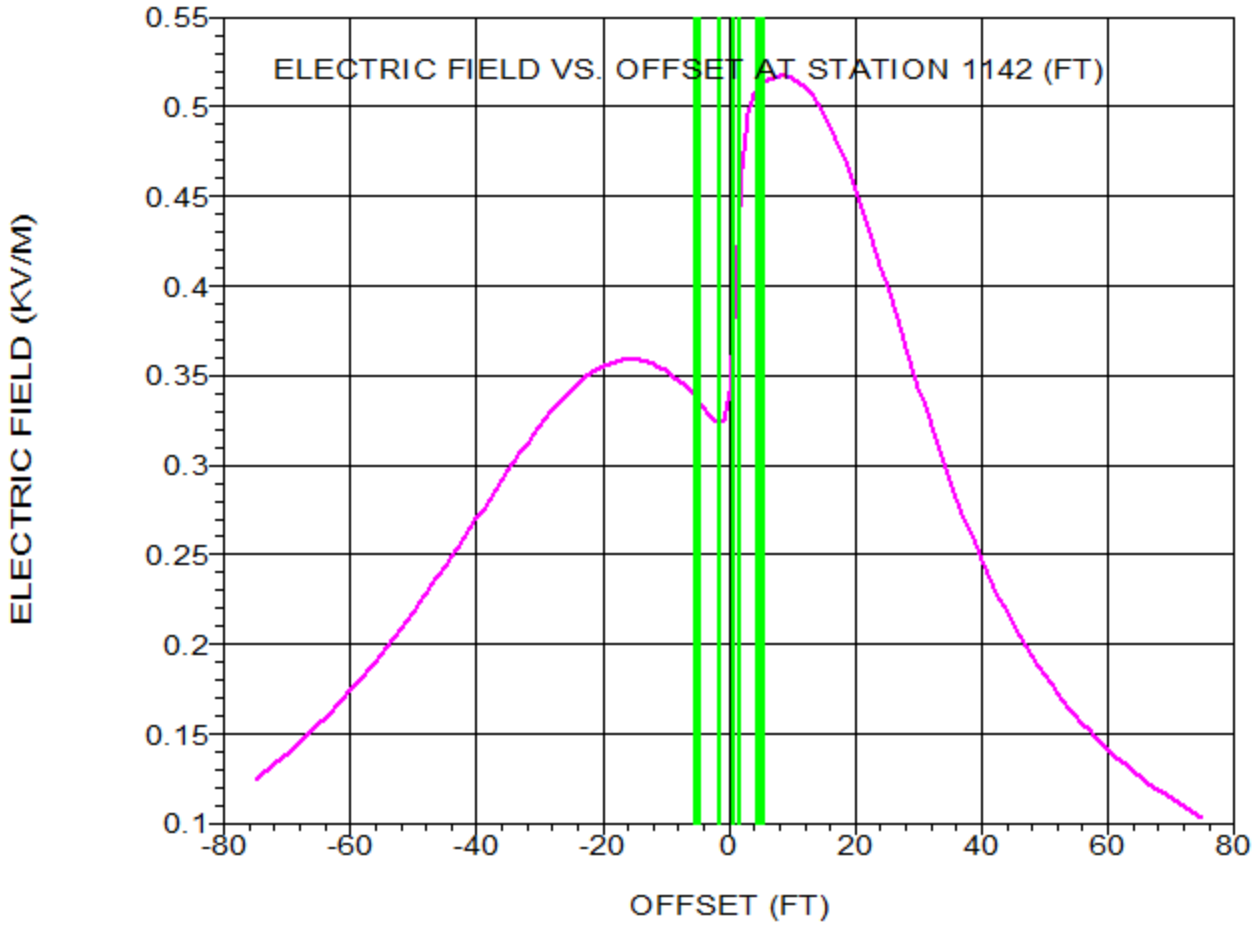
Maximum magnetic field of 239.02 (mG) found at station 1142.14, offset 2.00 (ft)
Maximum electric field of 0.517 (kV/m) found at station 1142.14, offset 8.00 (ft)




ELECTRIC FIELD VS. OFFSET AT STATION 1142 (FT)
ELECTRIC FIELD (KV/M)
0.55
0.5
0.45
0.4
0.35
0.3
0.25
0.2
0.15
0.1
-80
-60
-40
-20
0
20
40
60
80
OFFSET (FT)

Transmission with 2 Distribution Circuit Underbuild

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Toth & Associates
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EMF Calculation Notes:
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approximation).
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Meter height above centerline ground:  15.00 (ft)
Cross section offset for graph +/-:    75.00 (ft)
Result interval for graph:              1.00 (ft)
Electric field limit:                   0.00 (kV/m)
Magnetic field limit:                   0.00 (mG)

EMF calculation includes only wires going from structure 6 to structure 7
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EMF Circuit Data:

Set #	Phase #	Conductors Per Phase	Voltage Ph-Ph (kV)	Current (Amps)	Phase Angle (deg)	Bundle Diameter (in)
1	1	1	0	0.000	0	0.000
6	1	1	121	1187.000	0	0.000
6	2	1	121	1187.000	120	0.000
6	3	1	121	1187.000	-120	0.000
20	1	1	13.1	703.000	0	0.000
20	2	1	13.1	703.000	120	0.000
20	3	1	13.1	703.000	-120	0.000
21	1	1	0	0.000	0	0.000
22	1	1	13.1	703.000	0	0.000
22	2	1	13.1	703.000	120	0.000
22	3	1	13.1	703.000	-120	0.000
23	1	1	0	0.000	0	0.000
32	1	1	0	0.000	0	0.000
33	1	1	0	0.000	0	0.000

Calculated EMF Circuit Data For Last Point:

Wire station and offset are based on alignment closest to point on wire.
In the case of wires that are not parallel, this may result in different stations for the wires and centerline.

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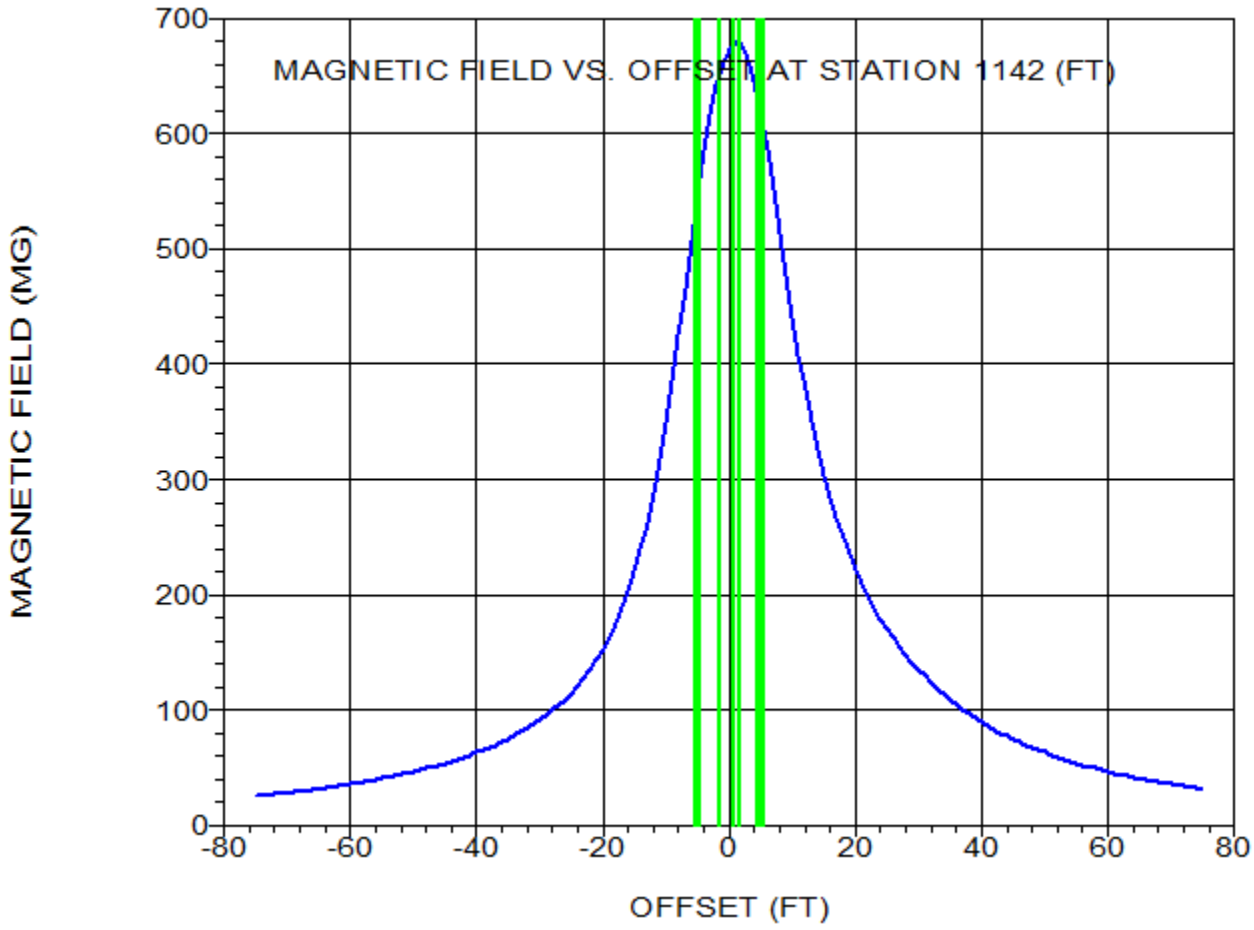
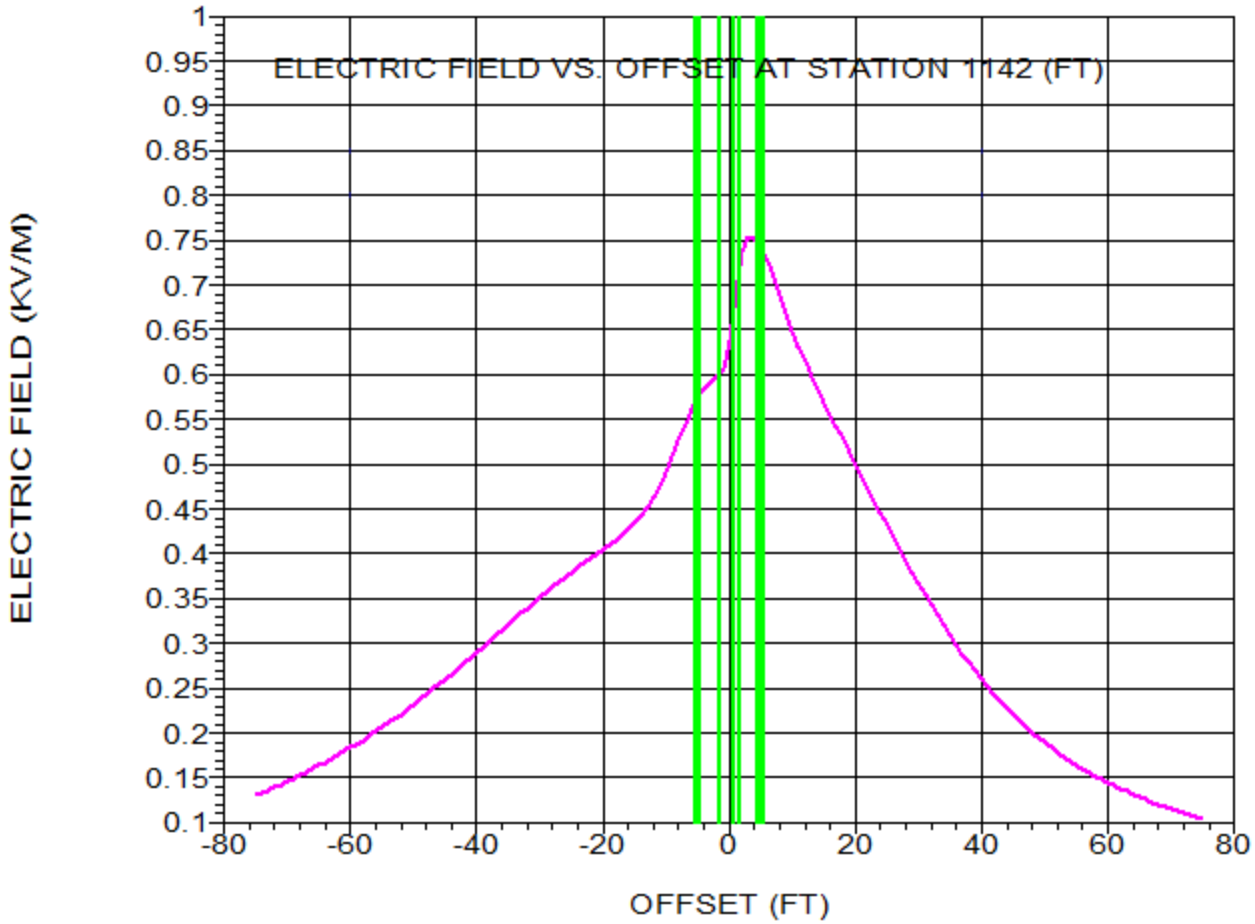
21	1	167 Deg F	Max Sag RS	Left	8505637.14	821608.26	479.77	1142.14	1.58	0.856	0
22	1	167 Deg F	Max Sag RS	Left	8505643.39	821608.34	472.73	1142.14	-4.67	0.856	7.563
22	2	167 Deg F	Max Sag RS	Left	8505640.31	821608.30	472.73	1142.14	-1.58	0.856	7.563
22	3	167 Deg F	Max Sag RS	Left	8505634.06	821608.22	472.73	1142.14	4.67	0.856	7.563
23	1	167 Deg F	Max Sag RS	Left	8505637.14	821608.26	472.79	1142.14	1.58	0.856	0
32	1	32 Deg F w/ 1/4" Ice	Max Sag RS	Left	8505637.91	821608.27	467.75	1142.14	0.82	1.195	0
33	1	32 Deg F w/ 1/4" Ice	Max Sag RS	Left	8505637.90	821608.27	466.77	1142.14	0.82	1.195	0

Maximum magnetic field of 679.05 (mG) found at station 1142.14, offset 1.00 (ft)
Maximum electric field of 0.753 (kV/m) found at station 1142.14, offset 3.00 (ft)




ELECTRIC FIELD VS. OFFSET AT STATION 1142 (FT)
ELECTRIC FIELD (KV/M)
1
0.95
0.9
0.85
0.8
0.75
0.7
0.65
0.6
0.55
0.5
0.45
0.4
0.35
0.3
0.25
0.2
0.15
0.1
-80
-60
-40
-20
0
20
40
60
80
OFFSET (FT)