Cathryn J. Dinges
Senior Corporate Counsel

Westar Energy
Taking energy to heart.

November 2, 2018

Mr. Jeff McClanahan
Kansas Corporation Commission
Director of Utilities
1500 SW Arrowhead Road
Topeka, Kansas 66604

RE: Docket No. 17-WSEE-063-STG

Dear Mr. McClanahan:

In the above captioned docket, the Commission required Westar Energy, Inc. to conduct a study of the impact of electric and magnetic fields (EMF) on the property adjacent to the ROW along the preferred route after the line is completed. Enclosed, please find the report as requested.

The attached study shows close correlation between actual field EMF readings taken with the line in operation and the calculated EMF values for the same operating conditions. It is therefore expected that actual EMF values measured at the maximum capacity of the transmission line would closely correlate with the maximum calculated values determined during transmission line design. The maximum EMF calculations completed during transmission line design resulted in an electric field of 0.94 kV/m and a magnetic field 22.7 mili-Gauss at the edge of the right of way and are expected to be very close to actual values.

If the Commission Staff would like additional information on this project, they may contact me at 575-8344.

Sincerely,

Cathryn Dinges

Cathy Dinges
Corporate Counsel

818 S Kansas Ave / PO Box 889 / Topeka, KS 66601-0889 / o: (785) 575-8344 / f: (785) 575-8136
WestarEnergy.com / cathy.dinges@WestarEnergy.com

Stranger Creek to Iatan; 345kV Line 2 - EMF Measurements

Westar Energy

Electromagnetic Field Measurement Report
Project No. 91475

Revision 1
10/22/2018

Stranger Creek to Iatan; 345kV Line 2 - EMF Measurements

prepared for

Westar Energy
Electromagnetic Field Measurement Report
Leavenworth, Kansas

Project No. 91475

Revision 1
10/22/2018

prepared by

Burns & McDonnell Engineering Company, Inc.
Houston, Texas

INDEX AND CERTIFICATION

Westar Energy
Stranger Creek to Iatan; 345kV Line 2 - EMF Measurements
Project No. 91475

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Certification

I hereby certify, as a Professional Engineer in the state of Kansas, that the information in this document was assembled under my direct personal charge. This report is not intended or represented to be suitable for reuse by the Westar Energy or others without specific verification or adaptation by the Engineer.

Date: 10/22/2018

10/22/18

RECORD OF REVISIONS

Rev. No.	Date	By	Pages	Description
A	09/14/2018	JK	35	Issued for Review
B	10/09/2018	JK	25	Westar Comments Included
0	10/12/2018	JK	25	Final Issue
1	10/22/2018	JK	25	Westar Comments Included

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LIST OF ABBREVIATIONS

Abbreviation	Term/Phrase/Name
Burns & McDonnell	Burns & McDonnell Engineering Company, Inc.
ROW	Right of Way
kV	Kilovolt
EMS	Energy Management System
IEEE	Institute of Electrical and Electronic Engineers
AC	Alternating Current
E-Field	Electric Field
ft.	feet
kcmil	Kilo-circular-mil
ACSR	Aluminum Conductor Steel Reinforced
“	Inch
‘	Foot
OD	Outer Diameter
OPGW	Optic Fiber Ground Wire
mG	mili Gauss
µT	Micro Tesla
Hz	Hertz
kb	Kilo-byte
RMS	Root Mean Squared
V	Volt
m	meter

Abbreviation	Term/Phrase/Name
kV	Kilo-volt
MVA	Mega-Volt-Ampere
A	Ampere
BPA	Bonneville Power Administration
PLS CADD	Power Line System Computer Aided Design and Drafting
NESC	National Electrical Safety Code
mA	milli-Ampere
°C	Celsius degree
°F	Fahrenheit degree
PES	Power Engineering Society
EPRI	Electric Power Research Institute
rad	Radian
s	second
F	Farad
m^2	Squared meter
ft^2	Squared foot

1.0 INTRODUCTION

Westar Energy contracted Burns and McDonnel to measure electric and magnetic field levels at the edges of the right of way and near the structures of the Stranger Creek to Iatan 345 kV Line 2 that was recently rebuilt from 161 kV to 345 kV standards and is operating at 345 kV.

The Scope of Work, the measurements of the electric and magnetic fields are as follows:

- Secure field test equipment to measure the electric field and the magnetic field for the Stranger Creek to Iatan, 345 kV Line 2. Contractor shall ensure the equipment has been calibrated in accordance with the appropriate codes/specifications. Contractor shall measure and document the height of the conductor at each testing location. This includes taking measurements at three locations shown in Figure 1-1 with measurements taken at places for each location per Table 1-1.

Table 1-1: Measurement Places

Description	Location Along the T-line Route	Perpendicular Distance from the Centerline of the T-Line
Edges of ROW at Structure (2 measurements)	At nearest structure	75 feet from centerline on each side
Edges of ROW at Conductor Low Point (2 measurements)	At nearest belly of conductor sag	75 feet from centerline on each side

- At the time of the field testing, Westar will provide Burns & McDonnell with actual current flow and voltage on the Stranger Creek to Iatan, 345 kV Line 2 from Westar's EMS.
- The Field Measurements to be performed following the IEEE Standard 644; IEEE Standard Procedures for Measurement of Power Frequency Electric and Magnetic Fields from AC Power Lines. Please note that during testing the E-Field probe is to be located one meter (3.28 feet) above ground level. In some areas, existing crops interfered with the E-Field probe requiring increasing the height of the probe to approximately 3 feet above the crops. When the probe height is not equal to one meter, the real height used will be recorded and used for comparison of the actual measurements versus the predicted values. For Magnetic Flux Density, crops do not influence the measurements, so field measurements were taken at 3.28 feet above ground.
- Field testing locations are summarized in Figure 1-1 and shown more detail in Figures 1-2 through 1-4.

Figure 1-1: Field Testing Locations

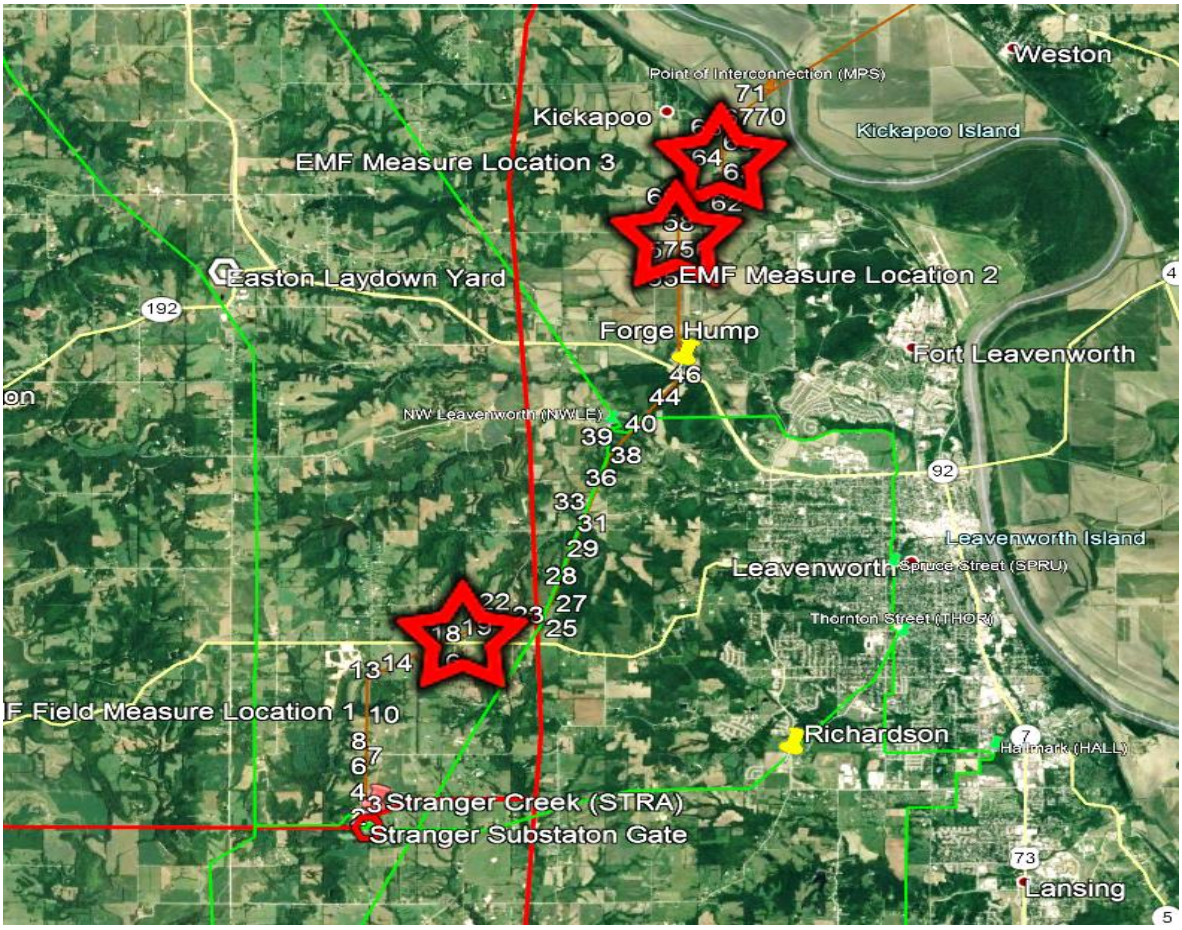
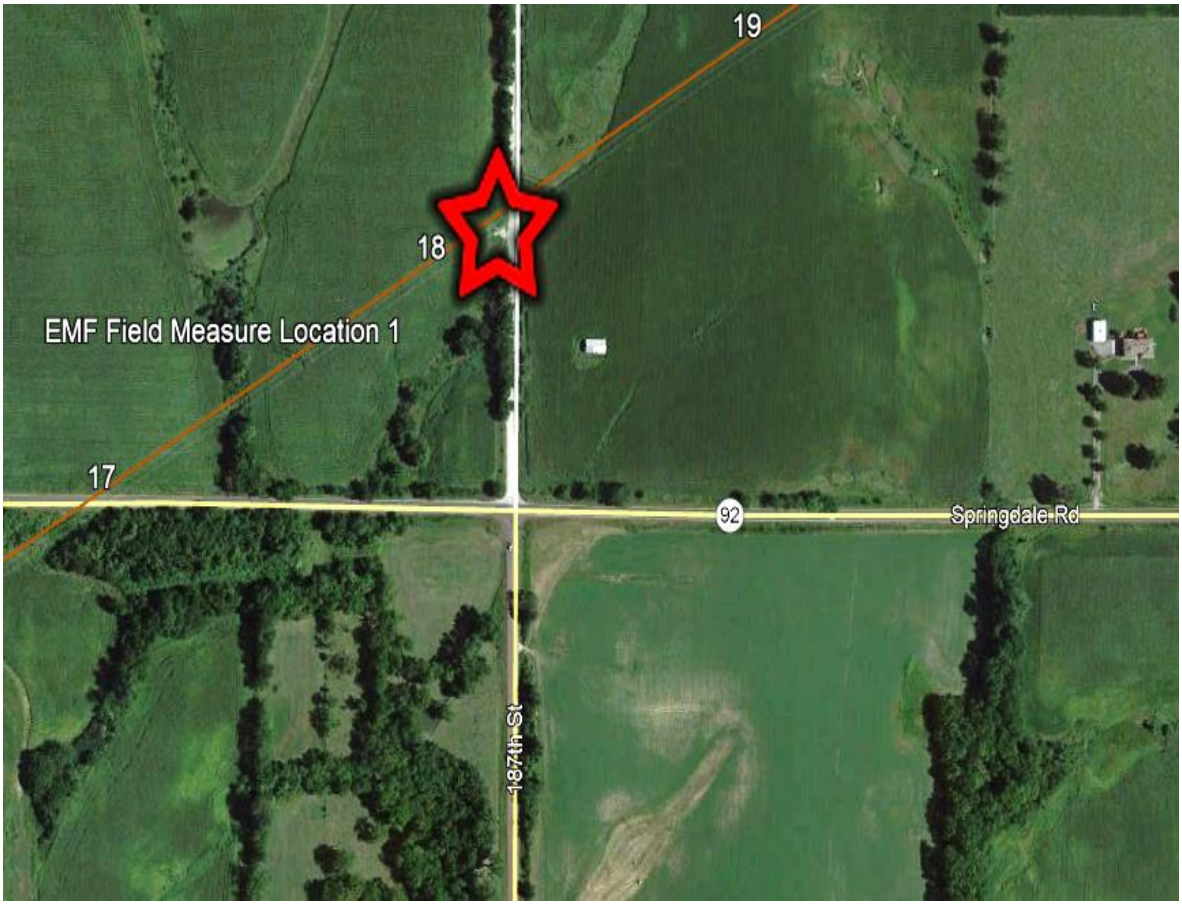


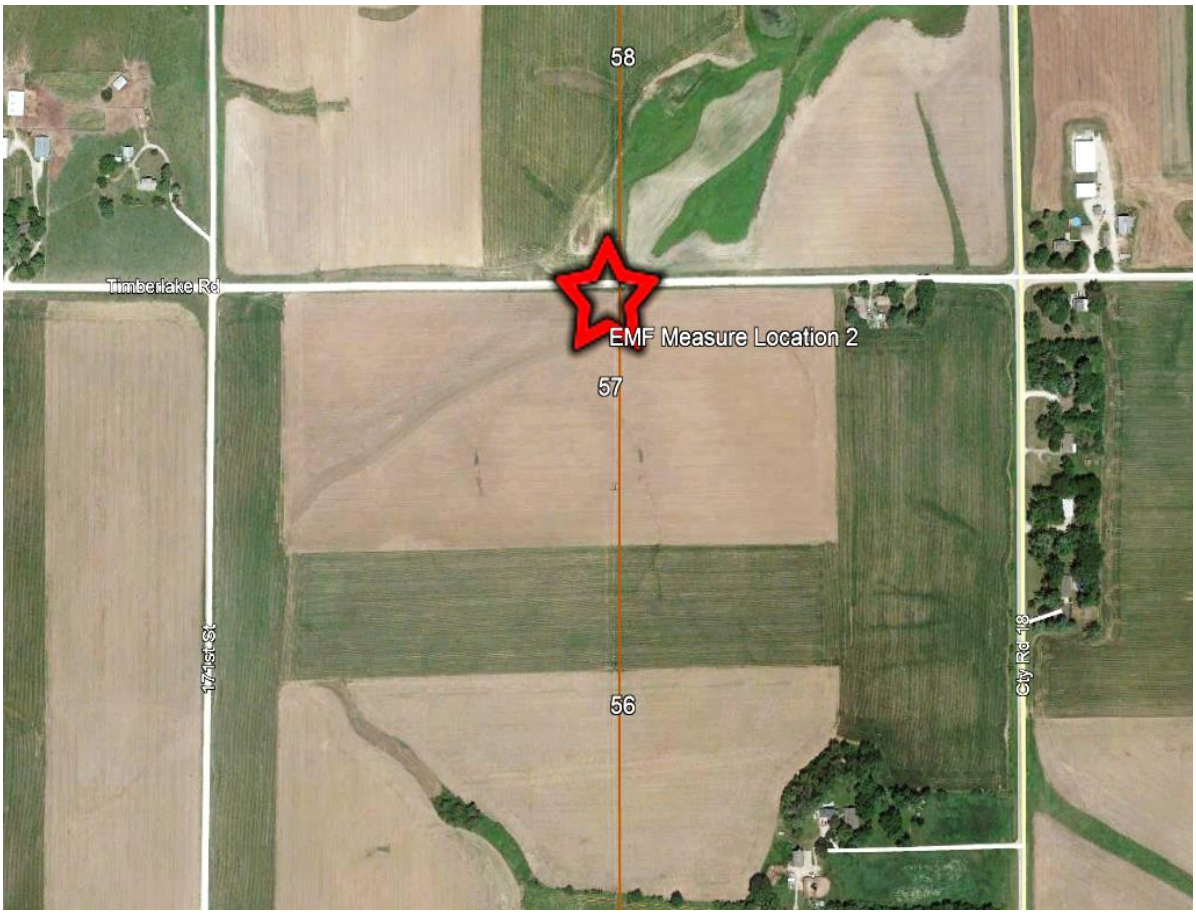
Figure 1-2: Testing Location #1; 187th. St. and Hwy. 92



Lat: 39.297570°

Lon: -95.011879°

Figure 1-3: Testing Location #2; Timberlake Rd. & Cty. Road 18



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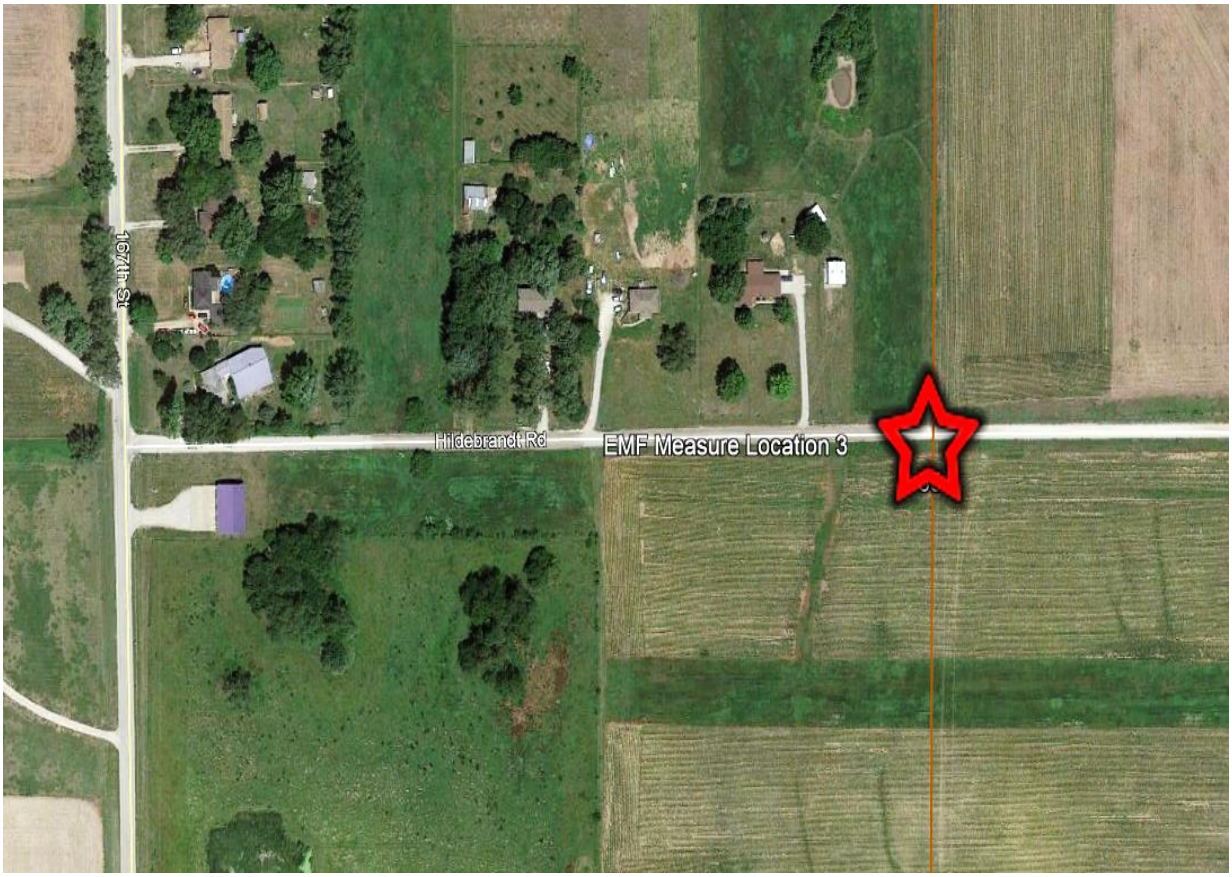
Lon: -94.968836°

Figure 1-4: Testing Location #3; 167th. & Hildebrandt Rd.



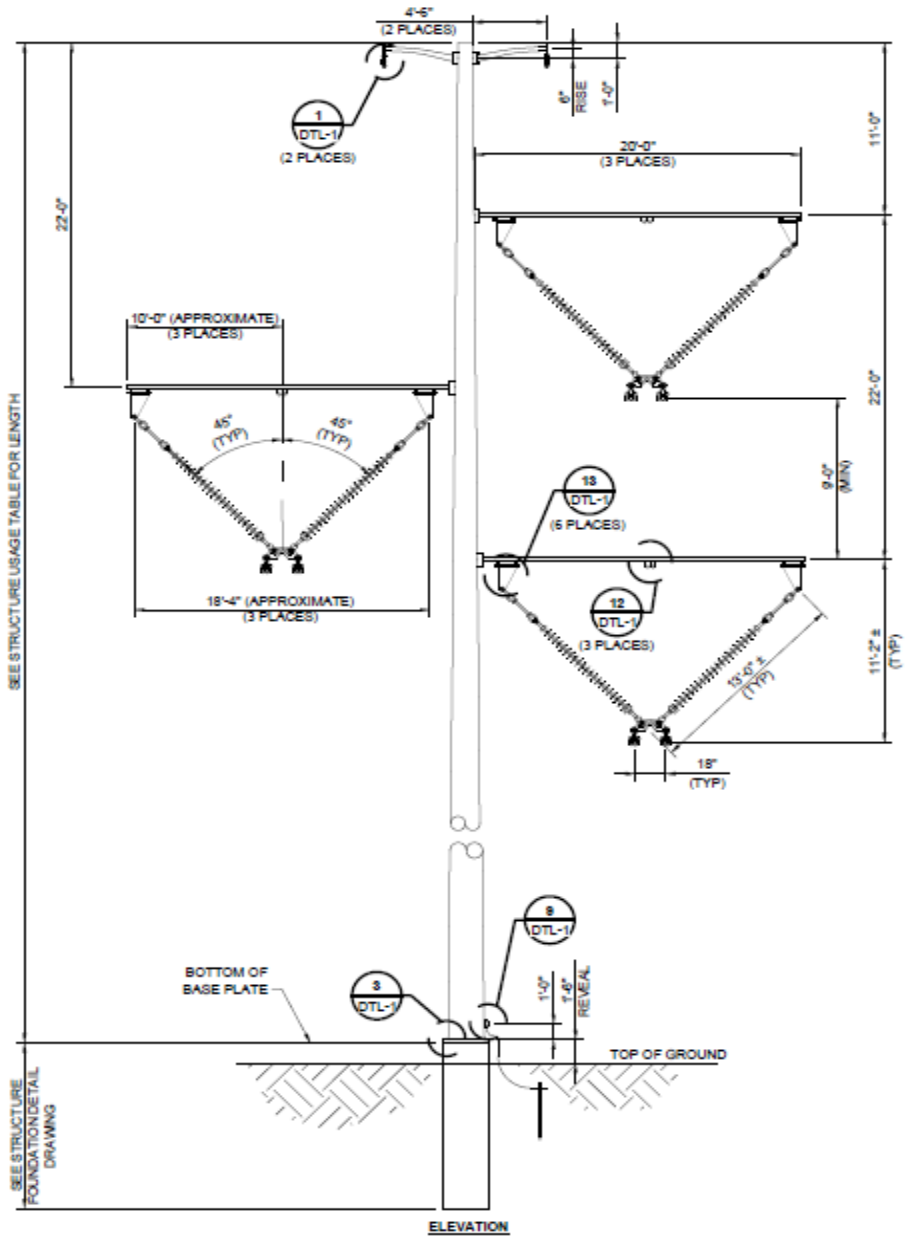
Lat: 39.390281°

Lon: -94.959957°

2.0 LINE CONFIGURATION AND CHARACTERISTICS

The line configuration at the testing locations corresponds to a single circuit delta with double bundled conductor for each phase and two static wires. The structures are tubular steel monopoles. Figure 2-1 indicates the main dimensions.

Figure 2-1: Line Configuration



3.0 TEST METER

As a test meter the EMDEX II manufactured by ENERTECH, was employed for the measurements of both E-Field and Magnetic Flux Density.

The specifications are the following:

EMDEX II Specifications

Feature	Specification
Meter Purpose	Multi-Functional Magnetic Field Measurement System
Recording	Yes
Data Collection	Actual Measurements
Range	0.1 - 3,000 mG (0.01 - 300 μT)
Resolution	0.1 mG (0.01 μT)
Typical Accuracy	ą 1 - 2%
Frequency	Broadband: 40 - 800 Hz Harmonic: 100 - 800 Hz
Max Sample Rate	1.5 Seconds
Internal Memory	512 Kb
Display (mG or mT units)	Alphanumeric 8-Character
Measurement Method	True RMS

Typical Battery Life	Alkaline: Up to 7 Days Lithium: Up to 21 Days
LINDA Wheel or Amp-Logger Use	Yes
Dimensions	6.6" x 2.6" x 1.5" (16.8 x 6.6 x 3.8 cm)
Weight	12 ounces (341 grams)

To measure the E-Field the E-Probe is required, consisting of a four-foot-long fiberglass extension rod, four feet long and a parallel plate capacitor where displacement current is induced by the field and measured using the EMDEX II instrument.

The instrument EMDEXII meter is inserted between the two plates and connected to them by a cable.

E-Probe Specifications

Feature	Specification
Purpose	Meter Electric Fields
Electric Field Ranges	5 V/m to 13 kV/m at 60 Hz 6 V/m to 13 kV/m at 50 Hz

Resolution	5 V/m at 60 Hz 6 V/m at 50 Hz
Frequency Bandwidth	40 Hz to 800 Hz
Measurement Accuracy	A 5% Typical

The meter used for the measurements was calibrated on July 17th. 2018 at the manufacturer facilities, refer to Appendix A. The calibration is valid during one-year period.

4.0 MEASUREMENT RESULTS

The measurements at the three locations were performed on August 16th,2018. The results are summarized in the Tables 4-2; 4-3 and 4-4. Refer to Appendix B for the data gathering form corresponding to each location.

The times when the measurements were performed are:

- Location #1: August 16, 2018, between 11:10 am and 12:10 pm.
- Location #2: August 16, 2018, between 10:20 am and 11:00 am.
- Location #3: August 16, 2018, between 9:30 am and 9:45 am.

Line power and voltage records were taken approximately at the same time of the measurements at each location; they are summarized in Table 4-1. The average current for each case was calculated based on the line power flow and the line voltages. Refer to Appendix C for the images obtained from the EMS.

Table 4-1: Line Voltage, Power Flow and Line Current during the Period of Measurements

Location	Time	Line Power (MVA)	Line Voltage (kV)	Avg. Phase Current (A)
#1	11:00 am	161	347.4	267.6
#2	10:26 am	162	346.7	269.9
#3	9:45 am	175	347.8	290.5

Table 4-2: Measurement Results at Location #1; Structure #18

Measurement	Left Edge of ROW at Structure #19	Right Edge of ROW at Structure #19	Left Edge of ROW Midspan #18-#19	Right Edge of ROW Midspan #18-#19
E-Field kV/m	0.562; probe 6´ height	0.492; probe 6´ height	0.761; probe 3.28´ height	0.621; probe 6´ height
Magnetic Flux Density mG	4.1	3.6	5.7	6.1

Lowest conductor height to ground at midspan: 65’

Table 4-3: Measurement Results at Location #2; Structure #58

Measurement	Left Edge of ROW at Structure #58	Right Edge of ROW at Structure #58	Left Edge of ROW Midspan #57-#58	Right Edge of ROW Midspan #57-#58
E-Field kV/m	0.498; probe 6´ height	0.450; probe 6´ height	0.632; probe 6´ height	0.589; probe 3.28´ height
Magnetic Flux Density mG	3.8	3.5	5.0	4.3

Lowest conductor height to ground at midspan: 75’

Table 4-4: Measurement Results at Location #3; Structure #66

Measurement	Left Edge of ROW at Structure #66	Right Edge of ROW at Structure #66	Left Edge of ROW Midspan #65-#66	Right Edge of ROW Midspan #65-#66
E-Field kV/m	0.444; probe 3.28´ height	0.482; probe 6´ height	0.557; probe 3.28´ height	0.643; probe 6´ height
Magnetic Flux Density mG	4.6	4.3	6.0	5.5

Lowest conductor height to ground at midspan: 56’

During line design stage, the software CORONA, developed by Bonneville Power Administration (BPA) was used to determine the expected electric field intensity levels and magnetic flux density for the transmission line. A comparison is made between the theoretical results obtained with BPA CORONA under the same conditions of line voltage, current and conductor height.

Table 4-5 presents the comparison for the E-Field and Table 4-6 for Magnetic Flux Density for the values at mid span where the highest values were obtained.

Table 4-5: Comparison Between E-Field Measured Values versus Predicted Values at Midspan

Case	Measured E-Field (kV/m)	Predicted E-Field (kV/m)
Location #1; ROW Edge Mid Span Left from #18 to #19	0.761	0.700
Location #1; ROW Edge Mid Span Right from #18 to #19	0.621	0.626
Location #2; ROW Edge Mid Span Left from #58 to #57	0.632	0.620
Location #2; ROW Edge Mid Span Right from #58 to #57	0.589	0.571
Location #3; ROW Edge Mid Span Left from #66 to #67	0.557	0.773
Location #3; ROW Edge Mid Span Right from #66 to #67	0.643	0.668

Table 4-6: Comparison Between Magnetic Flux Density Measured Values versus Predicted Values at Midspan

Case	Actual Magnetic Flux Density (mG)	Predicted Magnetic Flux Density (mG)
Location #1; ROW Edge Mid Span Left from #18 to #19	5.7	5.0
Location #1; ROW Edge Mid Span Right from #18 to #19	6.1	4.9
Location #2; ROW Edge Mid Span Left from #58 to #57	5.0	3.6
Location #2; ROW Edge Mid Span Right from #58 to #57	4.3	3.5
Location #3; ROW Edge Mid Span Left from #66 to #67	6.0	5.0
Location #3; ROW Edge Mid Span Right from #66 to #67	5.5	4.9

The comparison shows that both the actual and predicted values are very close. The differences are due to the following factors:

- The predicted values are obtained assuming flat terrain. The existing slopes affect the actual values as the distance from the line is slightly less or more than the prediction assumes
- The presence of crops and vegetation affects the actual values as they locally intensify or attenuate the readings. The predicted values do not include crop or vegetation affects in the calculations.
- The meter reading the actual values has a certified accuracy of +/- 5% resulting in some differential between the predicted and actual values.

APPENDIX A - METER CALIBRATION CERTIFICATE

Certificate of Calibration

The calibration of this instrument was controlled by documented procedures as outlined on the attached Certificate of Testing Operations and Accuracy Report using equipment traceable to N.I.S.T., ISO 17025, and ANIZ540-1 COMPLIANT.

Instrument Model: EMDEX II

Frequency: 60 Hertz

Serial Number: 3221

Date of Calibration: 07/17/2018

Re-Calibration suggested at one year from above date.

EMDEX LLC
EMDEX-LLC
1356 Beaver Creek Drive
Patterson, California 95363
(408) 866-7266

H. Christopher Hooper

Calibration Inspector

EMDEX II
(STANDARD FIELD)
CERTIFICATE OF TESTING
OPERATIONS AND ACCURACY REPORT

EMDEX LLC
1356 Beaver Creek Drive
Patterson, CA 95363
(408) 866-7266
www.emdex-llc.com

Customer Name: Burns & McDonnell

Serial #: 3221 Unit Type: STD X LIN ____ CUST ____

Basic Program Version: 3.0C Memory: 512K

Calibrated @ 60 Hz Display: mG
Temperature: 25°C +/- 5°C Relative Humidity: 20% - 60%

Magnetic Field Test:

Nominal (mG)	Actual Field (mG)	EMDEX II Readings (mG)	
3000	3000	2995.2	
2000	2000	1996.8	X AXIS
200	200	201.6	
20	20	20.4	
1	1	1.0	
3000	3000	2998.4	
2000	2000	1996.8	
200	200	201.6	Y AXIS
20	20	20.4	
1	1	1.0	
3000	3000	2998.4	
2000	2000	1996.8	
200	200	201.6	Z AXIS
20	20	20.4	
1	1	1.1	

Oblique Angle Test:

Internal Computer	LCD Display	Hand Calculated	
2000.0	2003	2002.5	RESULTANT

Near Zero Low Field Test: 0 0 RESULTANT

Electric Field Test:

Nominal	Injected Current (uA) (E-Field Sensor Current)	EMDEX II Readings (uA)
15.0 uA	15.00	14.92
1.5 uA	1.500	1.485
0.15 uA	0.150	0.150
Ambient	0	0

Tester: H. Christopher Hooper Date: 7/17/2018

Calibration due one year from date listed above.

Comment: Unit was submitted for calibration.
Pre-calibration values were within meter specifications.
Unit was serviced, calibrated, and is in good working order.

*The value of the Actual Magnetic Field is accurate to within +/-1.00% according to IEEE Standard 644-1994. The Injected Current, used for E-Field calibration, is accurate accordingly to within +/- 1.1%.

Rev: June 15, 2005

CE

EU Declaration of Conformity

Application of Council Directives: 89/336/EEC

Standards to which Conformity is declared:
EN55022, EN61000-4-2, ENV50140

Manufacturer's Name: *EMDEX-LLC*

Manufacturer's Address: 1356 Beaver Creek Drive
Patterson, CA 95363

Type of Equipment: EMDEX II

Model/Serial Number: 3221

Year of Manufacture: 2008

I, the undersigned, hereby declare that the equipment specified above conforms to the Directives and Standards listed in this document.

Signature: H. Christopher Hooper

Full Name: H. Christopher Hooper

Position: QUALITY MANAGER

Place: Patterson, CA **Date: 07/17/2018**

Statement of Compliance

EMDEX-LLC

A: EMDEX-LLC has designed the EMDEX line of meters to comply with and has passed testing of EU Directive 89/336/EEC. The standards that apply to this testing include:

1) EN55022
2) EN 61000-4-2
3) ENV 50140

While other international standards may apply, EMDEX-LLC has not tested these meters for compliance with other standards and it is not incumbent upon EMDEX-LLC to do so.

B: EMDEX-LLC's Operations and Accuracy Report written for each meter is documented according to IEEE Standard 644-1994.

C: The equipment used as a standard to generate the magnetic field that is documented on EMDEX-LLC's Certificate of Testing Operations and Accuracy Report has been calibrated and is traceable to the National Institute of Standards and Technology (NIST) and ISO 17025. The calibration facility used by EMDEX-LLC is designed to comply with IEEE Standard 644-1994.

Meter Type: EMDEX II

Serial Number: 3221

Date: 07/17/2018

Technician: H. Christopher Hooper

APPENDIX B -DATA GATHERING FORM

ELECTROMAGNETIC FIELDS MEASUREMENTS

	Line Name	Stranger Creek to Iatan 2				
	Client	Westar				
	State/County	Kansas/Near Leavenworth				
	Measurements by	JMPG				
	Witnesses	J. Kesic, C. Lange				
	Date/Time	8-16 9:30 am to 9:45 am				
	Location #	#1, Structure #66, Span 65 to 66				
	Coordinates	Lat.		Lon.		
A.1	Line Voltage kV					
	Nominal	345				
	Actual	347.4				
A.2	Line Current A					
	Rating	3000				
	Actual	267.6				
B.1	Line Conductor					
	Type, Size	2xACSR LAPWING 1590 kcmil				
B.2	Overhead Ground Wire					
	Type, Size	2xAFL AC-64/528				
B.3	Sketch, Line Configuration	Single Circuit Delta Configuration				
C	Atmospheric Conditions	Clear, Slight Clouds				
	Temperature °F	80				
	Altitude Above Sea Level ft.	1,000				
	Fair, Rain, Snow, etc.	Fair				
D	Structures					
	Metal	X				
	Wood					
	Other					
	Average Ruling Span ft.	1040				
E	Measurements	ROW Edge Str, L	ROW Edge Str, R	ROW Edge Span, L	ROW Edge Span, R	Midspan Conductor Height: 75
	E-Field kV/m	0.444	0.482 (*)	0.557	0.643 (*)	
	Harmonics kV/m					
	Magnetic Flux Density mG	4.6	4.3	6.0	5.5	
	Harmonics mG					
G	Instrument					
	Manufacturer	EMDEX LLC				
	Model	EMDEX II				
	Calibration	Jul-18				
	Frequency Bandwidth Hz	40-800				
	Holding Device Length ft.	4				

Notes: (*) Measurements in crops approx. 6' height. Crops 3 to 4 feet tall. Midspan lowest conductor height: 56´
KCC: Leo Haynos
Westar: Paul Wallen, Dave Peck, Mona Khosh
Burns and MacDonnell: Jessica Greathouse, Cole Lange, David Hancock, Jorge Kesic

BURNS McDONNELL

ELECTROMAGNETIC FIELDS MEASUREMENTS

	Line Name	Stranger Creek to Iatan 2				
	Client	Westar				
	State/County	Kansas/Near Leavenworth				
	Measurements by	JMPG				
	Witnesses	J. Kesic, C. Lange				
	Date/Time	8-16 10:20 am to 11:00 am				
	Location #	#2, Structure #58, Span 57 to 58				
	Coordinates	Lat.		Lon.		
A.1	Line Voltage kV					
	Nominal	345				
	Actual	346.7				
A.2	Line Current A					
	Rating	3000				
	Actual	269.9				
B.1	Line Conductor					
	Type, Size	2xACSR LAPWING 1590 kcmil				
B.2	Overhead Ground Wire					
	Type, Size	2xAFL AC-64/528				
B.3	Sketch, Line Configuration	Single Circuit Delta Configuration				
C	Atmospheric Conditions	Clear, Slight Clouds				
	Temperature °F	80				
	Altitude Above Sea Level ft.	1,000				
	Fair, Rain, Snow, etc.	Fair				
D	Structures					
	Metal	X				
	Wood					
	Other					
	Average Ruling Span ft.	982				
E	Measurements	ROW Edge Str, L	ROW Edge Str, R	ROW Edge Span, L	ROW Edge Span, R	Midspan Conductor Height: 75
	E-Field kV/m	0.498 (*)	0.450 (*)	0.632 (*)	0.589 (*)	
	Harmonics kV/m					
	Magnetic Flux Density mG	3.8	3.5	5.0	4.3	
	Harmonics mG					
G	Instrument					
	Manufacturer	EMDEX LLC				
	Model	EMDEX II				
	Calibration	Jul-18				
	Frequency Bandwidth Hz	40-800				
	Holding Device Length ft.	4				

Notes: (*) Measurements in crops approx. 6' height. Crops 3 to 4 feet tall. Midspan lowest conductor height: 75´
KCC: Leo Haynos
Westar: Paul Wallen, Dave Peck, Mona Khosh
Burns and MacDonnell: Jessica Greathouse, Cole Lange, David Hancock, Jorge Kesic

BURNS McDONNELL

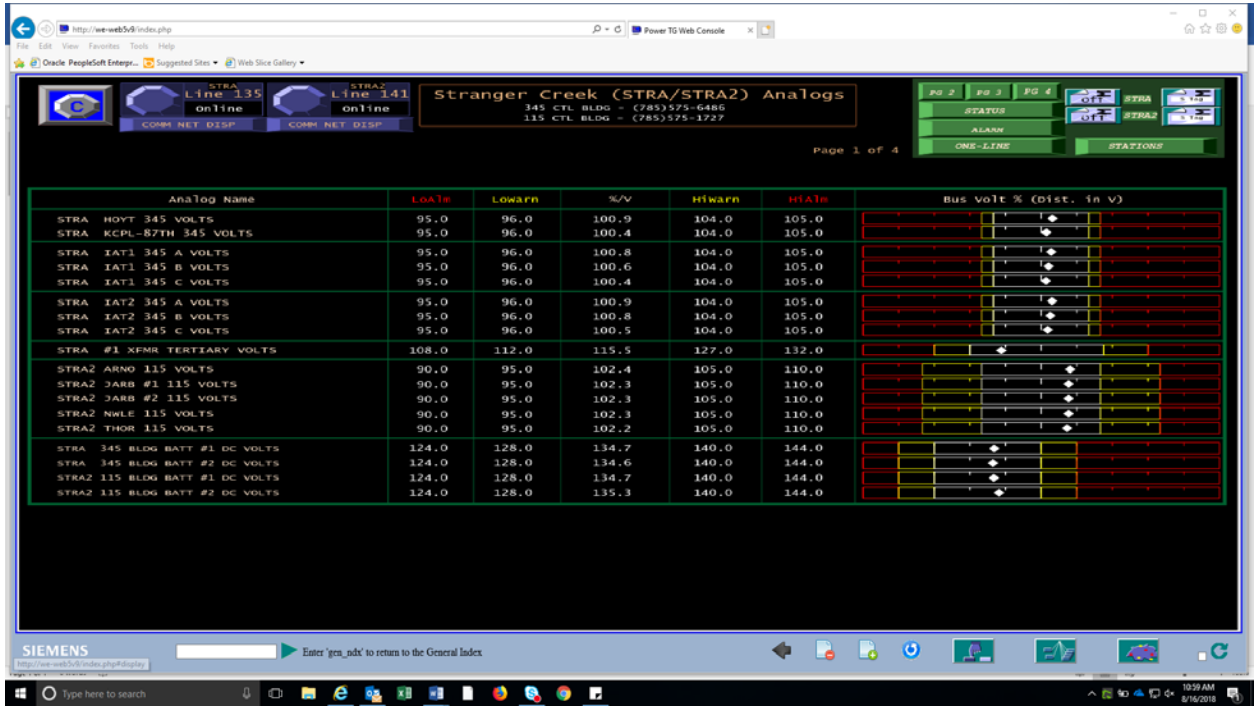
ELECTROMAGNETIC FIELDS MEASUREMENTS

	Line Name	Stranger Creek to Iatan 2				
	Client	Westar				
	State/County	Kansas/Near Leavenworth				
	Measurements by	JMPG				
	Witnesses	J. Kesic, C. Lange				
	Date/Time	8-16 11:10 am to 12:10 pm				
	Location #	#3, Structure #18, Span 18 to 19				
	Coordinates	Lat.		Lon.		
A.1	Line Voltage kV					
	Nominal	345				
	Actual	347.8				
A.2	Line Current A					
	Rating	3000				
	Actual	290.5				
B.1	Line Conductor					
	Type, Size	2xACSR LAPWING 1590 kcmil				
B.2	Overhead Ground Wire					
	Type, Size	2xAFL AC-64/528				
B.3	Sketch, Line Configuration	Single Circuit Delta Configuration				
C	Atmospheric Conditions	Partly Cloudy				
	Temperature °F	80				
	Altitude Above Sea Level ft.	1,000				
	Fair, Rain, Snow, etc.	Fair				
D	Structures					
	Metal	X				
	Wood					
	Other					
	Average Ruling Span ft.	990				
E	Measurements	ROW Edge Str, L	ROW Edge Str, R	ROW Edge Span, L	ROW Edge Span, R	Midspan Conductor Height: 75
	E-Field kV/m	0.562 (*)	0.492 (*)	0.761 (**)	0.621 (*)	
	Harmonics kV/m					
	Magnetic Flux Density mG	4.1	3.6	5.7	6.1	
	Harmonics mG					
G	Instrument					
	Manufacturer	EMDEX LLC				
	Model	EMDEX II				
	Calibration	Jul-18				
	Frequency Bandwidth Hz	40-800				
	Holding Device Length ft.	4				

Notes: (*) Measurements in crops approx. 6' height. Crops 3 to 4 feet tall. Midspan lowest conductor height: 65´.
(**) E-Field measured @ 3.2 feet from short weeds (≈ 1´tall)
KCC: Leo Haynos
Westar: Paul Wallen, Dave Peck, Mona Khosh
Burns and MacDonnell: Jessica Greathouse, Cole Lange, David Hancock, Jorge Kesic

BURNS McDONNELL

APPENDIX C -POWER AND VOLTAGE RECORDS


Power TG Web Console
STRA Line 135 online
STRA2 Line 141 online
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115 CTL BLDG - (785)575-1727
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STATUS
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Analog Name
LoAlm
Lowarn
%/V
Hiwarn
HiAlm
Bus Volt % (Dist. in V)
STRA HOYT 345 VOLTS 95.0 96.0 100.9 104.0 105.0
STRA KCPL-87TH 345 VOLTS 95.0 96.0 100.4 104.0 105.0
STRA IAT1 345 A VOLTS 95.0 96.0 100.8 104.0 105.0
STRA IAT1 345 B VOLTS 95.0 96.0 100.6 104.0 105.0
STRA IAT1 345 C VOLTS 95.0 96.0 100.4 104.0 105.0
STRA IAT2 345 A VOLTS 95.0 96.0 100.9 104.0 105.0
STRA IAT2 345 B VOLTS 95.0 96.0 100.8 104.0 105.0
STRA IAT2 345 C VOLTS 95.0 96.0 100.5 104.0 105.0
STRA #1 XFMR TERTIARY VOLTS 108.0 112.0 115.5 127.0 132.0
STRA2 ARNO 115 VOLTS 90.0 95.0 102.4 105.0 110.0
STRA2 JARB #1 115 VOLTS 90.0 95.0 102.3 105.0 110.0
STRA2 JARB #2 115 VOLTS 90.0 95.0 102.3 105.0 110.0
STRA2 NWLE 115 VOLTS 90.0 95.0 102.3 105.0 110.0
STRA2 THOR 115 VOLTS 90.0 95.0 102.2 105.0 110.0
STRA 345 BLDG BATT #1 DC VOLTS 124.0 128.0 134.7 140.0 144.0
STRA 345 BLDG BATT #2 DC VOLTS 124.0 128.0 134.6 140.0 144.0
STRA2 115 BLDG BATT #1 DC VOLTS 124.0 128.0 134.7 140.0 144.0
STRA2 115 BLDG BATT #2 DC VOLTS 124.0 128.0 135.3 140.0 144.0
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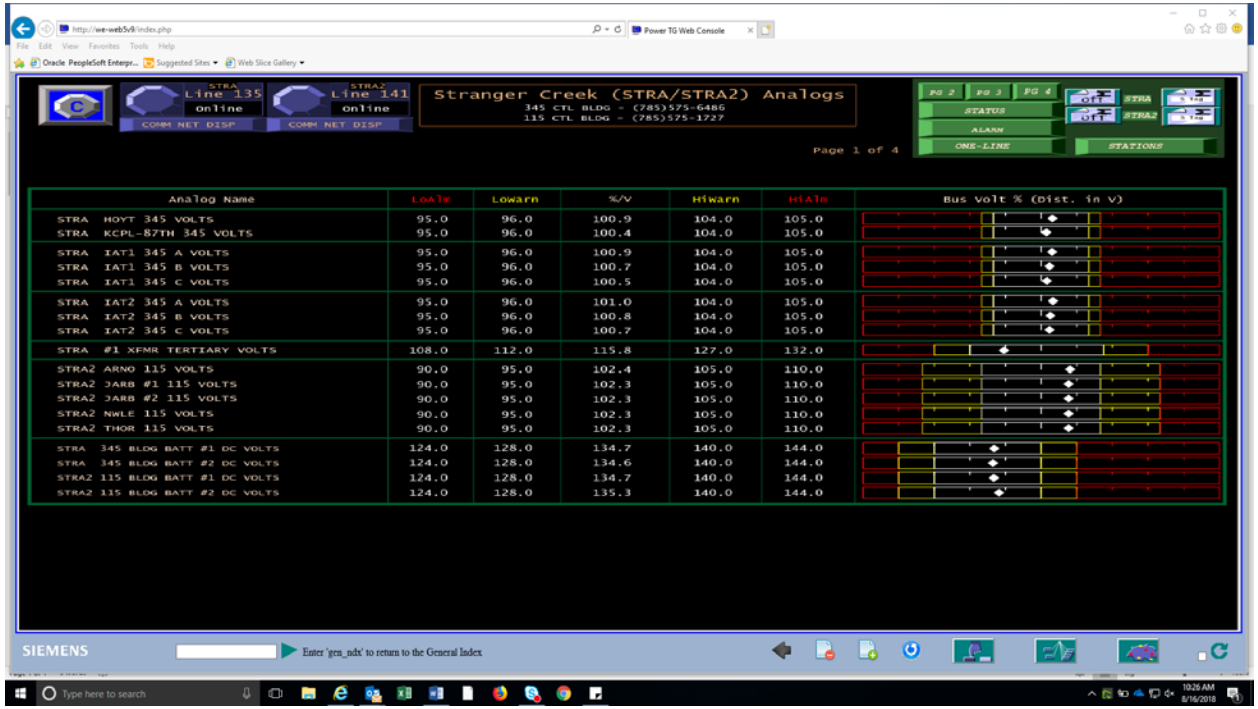
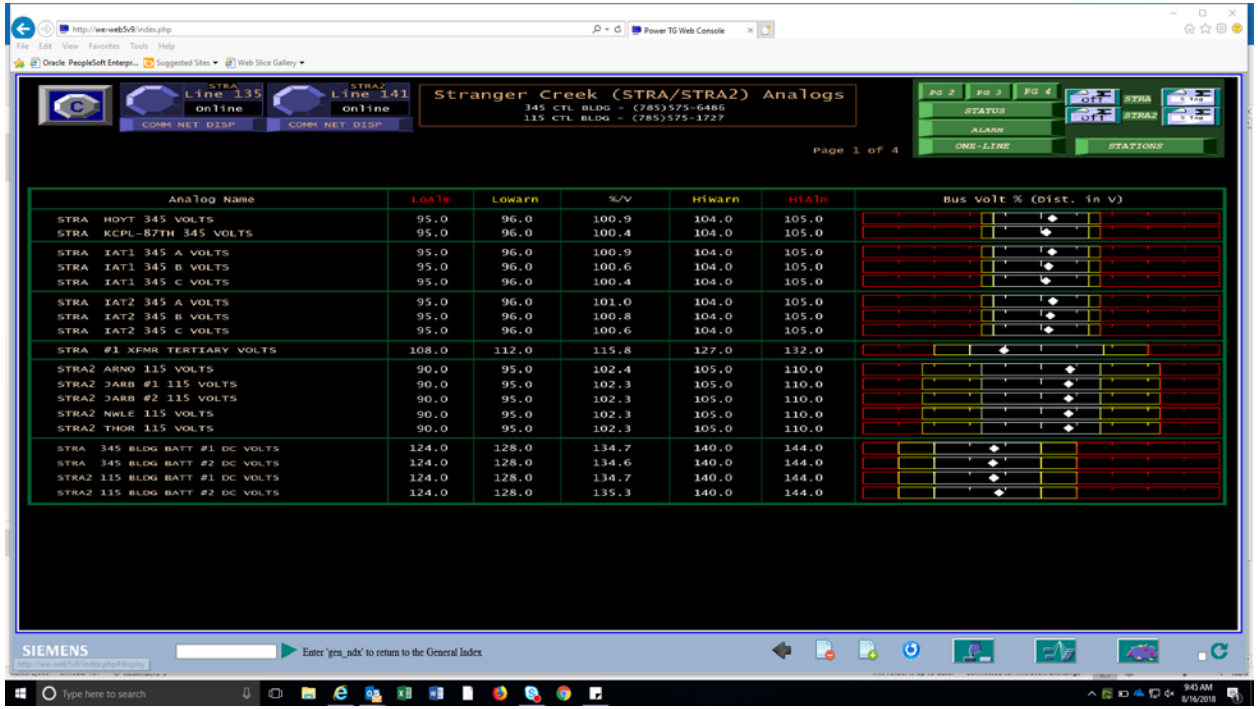


Analog Name	LoAlm	Lowarn	%/V	Hiwarn	HiAlm	Bus Volt % (Dist. in V)
STRA HOYT 345 VOLTS	95.0	96.0	100.9	104.0	105.0	
STRA KCPL-87TH 345 VOLTS	95.0	96.0	100.4	104.0	105.0	
STRA IAT1 345 A VOLTS	95.0	96.0	100.9	104.0	105.0	
STRA IAT1 345 B VOLTS	95.0	96.0	100.7	104.0	105.0	
STRA IAT1 345 C VOLTS	95.0	96.0	100.5	104.0	105.0	
STRA IAT2 345 A VOLTS	95.0	96.0	101.0	104.0	105.0	
STRA IAT2 345 B VOLTS	95.0	96.0	100.8	104.0	105.0	
STRA IAT2 345 C VOLTS	95.0	96.0	100.7	104.0	105.0	
STRA #1 XFMR TERTIARY VOLTS	108.0	112.0	115.8	127.0	132.0	
STRA2 ARNO 115 VOLTS	90.0	95.0	102.4	105.0	110.0	
STRA2 JARB #1 115 VOLTS	90.0	95.0	102.3	105.0	110.0	
STRA2 JARB #2 115 VOLTS	90.0	95.0	102.3	105.0	110.0	
STRA2 NWLE 115 VOLTS	90.0	95.0	102.3	105.0	110.0	
STRA2 THOR 115 VOLTS	90.0	95.0	102.3	105.0	110.0	
STRA 345 BLDG BATT #1 DC VOLTS	124.0	128.0	134.7	140.0	144.0	
STRA 345 BLDG BATT #2 DC VOLTS	124.0	128.0	134.6	140.0	144.0	
STRA2 115 BLDG BATT #1 DC VOLTS	124.0	128.0	134.7	140.0	144.0	
STRA2 115 BLDG BATT #2 DC VOLTS	124.0	128.0	135.3	140.0	144.0	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STATUS
ALARM
ONE-LINE
STATIONS
STRA
STRA2
Analog Name
LoAlm
Lowarn
%/V
Hiwarn
HiAlm
Bus Volt % (Dist. in V)
STRA HOYT 345 VOLTS 95.0 96.0 100.9 104.0 105.0
STRA KCPL-87TH 345 VOLTS 95.0 96.0 100.4 104.0 105.0
STRA IAT1 345 A VOLTS 95.0 96.0 100.9 104.0 105.0
STRA IAT1 345 B VOLTS 95.0 96.0 100.6 104.0 105.0
STRA IAT1 345 C VOLTS 95.0 96.0 100.4 104.0 105.0
STRA IAT2 345 A VOLTS 95.0 96.0 101.0 104.0 105.0
STRA IAT2 345 B VOLTS 95.0 96.0 100.8 104.0 105.0
STRA IAT2 345 C VOLTS 95.0 96.0 100.6 104.0 105.0
STRA #1 XFMR TERTIARY VOLTS 108.0 112.0 115.8 127.0 132.0
STRA2 ARNO 115 VOLTS 90.0 95.0 102.4 105.0 110.0
STRA2 JARB #1 115 VOLTS 90.0 95.0 102.3 105.0 110.0
STRA2 JARB #2 115 VOLTS 90.0 95.0 102.3 105.0 110.0
STRA2 NWLE 115 VOLTS 90.0 95.0 102.3 105.0 110.0
STRA2 THOR 115 VOLTS 90.0 95.0 102.3 105.0 110.0
STRA 345 BLDG BATT #1 DC VOLTS 124.0 128.0 134.7 140.0 144.0
STRA 345 BLDG BATT #2 DC VOLTS 124.0 128.0 134.6 140.0 144.0
STRA2 115 BLDG BATT #1 DC VOLTS 124.0 128.0 134.7 140.0 144.0
STRA2 115 BLDG BATT #2 DC VOLTS 124.0 128.0 135.3 140.0 144.0
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STATUS
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Analog Name
Mw
MVar
MVA
Warn
Alarm
MVA
STRA HOYT 345 MVA -395 55 399 1036 1195
STRA IAT2 345 MVA -148 -65 161 1076 1195
STRA KCPL-IATAN 345 MVA -168 -63 180 1076 1195
STRA KCPL-87TH 345 MVA 475 -21 476 1076 1195
STRA KCPL-IATAN 345 BACKUP MVA -168 -63 180 1076 1195
STRA KCPL-87TH 345 BACKUP MVA 475 -21 476 1076 1195
STRA #1 XFMR 345/115 HI MVA 129 61 143 560 615
STRA #1 XFMR 345/115 LOW MVA -121 0 121 439 488
STRA #3 XFMR 345/115 LOW MVA -111 -40 118 511 598
STRA2 ARNO 115 MVA 44 15 46 161 179
STRA2 JARB #1 115 MVA 30 1 30 215 239
STRA2 JARB #2 115 MVA 44 3 44 358 398
STRA2 NWLE 115 MVA 64 18 66 215 239
STRA2 THOR 115 MVA 51 8 51 187 223
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STATUS
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STRA
OFF
STRA2
Analog Name
Mw
MVar
MVA
Warn
Alarm
MVA
STRA HOYT 345 MVA -389 55 393 1036 1195
STRA IAT2 345 MVA -150 -61 162 1076 1195
STRA KCPL-IATAN 345 MVA -166 -61 177 1076 1195
STRA KCPL-87TH 345 MVA 477 -23 478 1076 1195
STRA KCPL-IATAN 345 BACKUP MVA -166 -61 177 1076 1195
STRA KCPL-87TH 345 BACKUP MVA 479 -23 480 1076 1195
STRA #1 XFMR 345/115 HI MVA 123 60 137 560 615
STRA #1 XFMR 345/115 LOW MVA -114 1 114 439 488
STRA #3 XFMR 345/115 LOW MVA -106 -39 113 511 598
STRA2 ARNO 115 MVA 40 14 43 161 179
STRA2 JARB #1 115 MVA 30 1 30 215 239
STRA2 JARB #2 115 MVA 44 3 44 358 398
STRA2 NWLE 115 MVA 60 16 62 215 239
STRA2 THOR 115 MVA 48 7 49 187 223
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STATUS
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Analog Name
Mw
MVar
MVA
Warn
Alarm
MVA
STRA HOYT 345 MVA -353 53 357 1036 1195
STRA IAT2 345 MVA -163 -65 175 1076 1195
STRA KCPL-IATAN 345 MVA -179 -63 190 1076 1195
STRA KCPL-87TH 345 MVA 473 -18 474 1076 1195
STRA KCPL-IATAN 345 BACKUP MVA -179 -63 190 1076 1195
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STRA #1 XFMR 345/115 HI MVA 121 60 135 560 615
STRA #1 XFMR 345/115 LOW MVA -112 1 112 439 488
STRA #3 XFMR 345/115 LOW MVA -104 -39 111 511 598
STRA2 ARNO 115 MVA 41 14 44 161 179
STRA2 JARB #1 115 MVA 29 1 29 215 239
STRA2 JARB #2 115 MVA 43 3 43 358 398
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STRA2 THOR 115 MVA 45 6 46 187 223
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