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Skill. Integrity. Efficiency.

November 28, 2016

VIA FEDERAL EXPRESS

Dr. Talina R. Mathews  
Executive Director  
Public Service Commission  
211 Sower Boulevard, P.O. Box 615  
Frankfort, Kentucky 40602-0615

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NOV 28 2016

PUBLIC SERVICE  
COMMISSION

Case No. 2016-00409

Re: *In the Matter of: Application of Big Rivers Electric Corporation  
for an Order Declaring the Construction of Seven Solar Power  
Facilities to be Ordinary Extensions of Existing Systems in the  
Usual Course of Business*

Dear Dr. Mathews:

Enclosed for filing on behalf of Big Rivers Electric Corporation are an original and ten (10) copies of an application asking the Kentucky Public Service Commission to issue an order declaring that the construction of certain solar power facilities are ordinary extensions of existing systems in the usual course of business not requiring a certificate of public convenience and necessity, or alternatively, asking the Commission to grant a certificate of public convenience and necessity. Please contact me if you have any questions.

Sincerely,

Tyson Kamuf  
Counsel for Big Rivers Electric Corporation

TAK/abg

Enclosures

**ORIGINAL**



Your Touchstone Energy® Cooperative 

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NOV 28 2016

PUBLIC SERVICE  
COMMISSION

**COMMONWEALTH OF KENTUCKY**

**BEFORE THE PUBLIC SERVICE COMMISSION OF KENTUCKY**

**In the Matter of:**

**APPLICATION )  
OF BIG RIVERS ELECTRIC CORPORATION )  
FOR AN ORDER DECLARING THE )  
CONSTRUCTION OF SEVEN SOLAR POWER )  
FACILITIES TO BE ORDINARY EXTENSIONS OF )  
EXISTING SYSTEMS IN THE USUAL COURSE OF )  
BUSINESS )**

**Case No.  
2016-00409**

**APPLICATION**

**and**

**EXHIBITS**

**FILED: November 28, 2016**

**ORIGINAL**

1 COMMONWEALTH OF KENTUCKY  
2 BEFORE THE PUBLIC SERVICE COMMISSION OF KENTUCKY

RECEIVED

NOV 28 2016

PUBLIC SERVICE  
COMMISSION

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5 In the Matter of:

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7 APPLICATION OF BIG RIVERS ELECTRIC )  
8 CORPORATION FOR AN ORDER DECLARING )  
9 THE CONSTRUCTION OF SEVEN SOLAR POWER )  
10 FACILITIES TO BE ORDINARY EXTENSIONS OF )  
11 EXISTING SYSTEMS IN THE USUAL COURSE )  
12 OF BUSINESS )

CASE NO.  
2016-00 409

13  
14  
15 **VERIFIED APPLICATION**  
16

17 Comes Big Rivers Electric Corporation (“Big Rivers”), by counsel, and hereby  
18 submits this application (“Application”) pursuant to KRS 278.020 and 807 KAR 5:001 Sections  
19 15 and 19 seeking an order from the Kentucky Public Service Commission (“Commission”)  
20 declaring (i) that the solar power facilities described herein (the “Solar Power Facilities”) are  
21 ordinary extensions of existing systems in the usual course of business, and (ii) that Big Rivers  
22 may construct, own, and operate the Solar Power Facilities without first obtaining a certificate of  
23 public convenience and necessity (“CPCN”) or other authorization from the Commission.  
24 Alternatively, Big Rivers requests that the Commission grant it a CPCN authorizing it to  
25 construct the Solar Power Facilities pursuant to KRS 278.020(1). In support of this Application,  
26 Big Rivers states as follows:

27 **A. Filing Requirements**

28 2. Big Rivers Electric Corporation is a member-owned, not-for-profit, generation  
29 and transmission cooperative headquartered in Henderson, Kentucky. It was incorporated in the  
30 Commonwealth of Kentucky as an electric cooperative corporation pursuant to KRS Chapter 279  
31 on June 14, 1961, and is in good standing in the Commonwealth of Kentucky. Big Rivers’

1 mailing address is P.O. Box 24, Henderson, Kentucky, 42419-0024. Big Rivers' street address is  
2 201 Third Street, Henderson, Kentucky, 42419-0024. Its electronic mail address is  
3 regulatory@bigrivers.com. A copy of Big Rivers' articles of incorporation and all amendments  
4 thereto are attached as Exhibit 14 to the *Application of Big Rivers Electric Corporation for*  
5 *Approval to Issue Evidences of Indebtedness*, P.S.C. Case No. 2012-00492. 807 KAR 5:001  
6 Section 14(1)-(2).

7 3. Big Rivers owns generating assets and purchases, transmits, and sells electricity at  
8 wholesale. Its principal purpose is to provide the wholesale electricity requirements of its three  
9 distribution cooperative members: Jackson Purchase Energy Corporation ("JPEC"), Kenergy  
10 Corp. ("Kenergy"), and Meade County Rural Electric Cooperative Corporation ("Meade County  
11 RECC") (JPEC, Kenergy, and Meade County RECC are collectively referred to herein as the  
12 "Members"). The Members in turn provide retail electric service to approximately 114,000  
13 consumer/retail members located in 22 western Kentucky counties: Ballard, Breckenridge,  
14 Caldwell, Carlisle, Crittenden, Daviess, Graves, Grayson, Hancock, Hardin, Henderson,  
15 Hopkins, Livingston, Lyon, Marshall, McCracken, McLean, Meade, Muhlenberg, Ohio, Union  
16 and Webster.

17 4. A table of each regulatory requirement for this filing, cross-referenced to the  
18 location in this Application where that requirement is satisfied, is attached hereto as Exhibit A.

19 **B. Request for Declaratory Order**

20 5. KRS 278.020(1) provides an exception to the requirement that any person must  
21 obtain a CPCN prior to beginning the construction of any facility for furnishing utility services to  
22 the public. That exception applies to "ordinary extensions of existing systems in the usual  
23 course of business." KRS 278.020(1). The Commission's regulations clarify that a CPCN:

1 shall not be required for extensions that do not create wasteful duplication of  
2 plant, equipment, property, or facilities, or conflict with the existing certificates or  
3 service of other utilities operating in the same area and under the jurisdiction of  
4 the [C]ommission that are in the general or contiguous area in which the utility  
5 renders service, and that do not involve sufficient capital outlay to materially  
6 affect the existing financial condition of the utility involved, or will not result in  
7 increased charges to its customers.  
8

9 807 KAR 5:001 Section 15(3).

10 6. In the present case, the Solar Power Facilities involve the construction of seven  
11 separate photovoltaic systems with a total capacity of approximately 120 kW (direct current  
12 (“dc”). Multiple systems will be constructed in the service territory of each of Big Rivers’  
13 Members. The three systems in JPEC’s territory will have a total capacity of approximately 30  
14 kW (dc); the two systems in Kenergy’s territory will have a total capacity of approximately 60  
15 kW (dc); and the two systems in Meade County RECC’s territory will have a total capacity of  
16 approximately 30 kW (dc).

17 7. The Solar Power Facilities will consist of solar panels, inverters, all related  
18 electrical, structural, and other components, and all equipment necessary to connect the Solar  
19 Power Facilities to each Member’s existing distribution system. There will be a total of  
20 approximately 360 panels, each with a capacity of about 300 to 350 watts (dc).

21 8. Big Rivers will lease the premises on which the Solar Power Facilities will be  
22 constructed from either its Members (in the case of Kenergy and Meade County RECC) or other  
23 organizations within a Member’s service territory (in the case of JPEC). In the case of JPEC, the  
24 leased premises are those of the Livingston County Board of Education for a system to be  
25 installed at Livingston County Middle School, the McCracken County Board of Education for a  
26 system to be installed at McCracken County High School, and the Marshall County Fiscal Court  
27 for a system to be installed at Mike Miller Park (“the non-Member Organizations”).

1           9.       Big Rivers estimates that the total cost for all seven of the photovoltaic systems,  
2 prior to any grants, will be less than \$500,000. Following potential vendor site visits, Big  
3 Rivers' staff and representatives of the National Renewable Cooperative Organization  
4 ("NRCO") evaluated vendor proposals. NRCO was formed by a number of rural electric  
5 cooperatives to facilitate the development and deployment of renewable energy resources. Big  
6 Rivers has retained Harvest Energy Solutions of Almo, Galloway County, Kentucky ("Harvest  
7 Energy"), to construct the Solar Power Facilities. However, after the construction is complete,  
8 Big Rivers will own the facilities.

9           10.      Big Rivers will apply for a Rural Energy for America Program ("REAP") grant  
10 from the United States Department of Agriculture in the amount of \$125,000 for the projects.  
11 After application of the REAP grant, Big Rivers' total cost for the construction of the Solar  
12 Power Facilities could well be less than \$375,000. Thus, the proposed construction does not  
13 involve sufficient capital outlay to materially affect the existing financial condition of Big  
14 Rivers, and it will not result in any increased charges to Big Rivers' Members.

15          11.      The need for the proposed construction is primarily to respond to Member  
16 demand. In response to inquiries from their end-use customers, Big Rivers' Members  
17 approached Big Rivers about developing one or more solar projects. Big Rivers developed the  
18 proposed projects in conjunction with its Members primarily to serve as education and  
19 demonstration projects for Big Rivers, its Members, and the retail customers to gain knowledge  
20 and understanding of solar power facilities. For example, the siting of the projects will allow  
21 retail customers and other members of the public to view the projects and access educational  
22 information about the Solar Power Facilities, and in particular, siting projects at Livingston  
23 County Middle School and McCracken County High School will facilitate inclusion of solar

1 power within science curricula. Additional information about the projects, including real-time  
2 information relating to output, will be available over the internet.

3 12. Given the amount of Big Rivers' existing available capacity, the solar projects  
4 were designed necessarily to be low-capacity projects, but the projects still needed to be large  
5 enough to achieve some economy-of-scale benefits. Although the capacity of the proposed  
6 projects is minimal, they allow Big Rivers to add renewable resources to its generation portfolio  
7 and to begin to diversify its fuel sources, while taking advantage of the current low price of solar  
8 panels and the REAP grant. The proposed projects also allow Big Rivers to gain valuable  
9 experience with owning renewable resources, designing and developing those projects, working  
10 with third parties in the field, and investigating issues and opportunities that arise with such  
11 resources, including their integration into the power grid.

12 13. Big Rivers will meter the power at each project location and bill that power to its  
13 Members under Big Rivers' Standard Rate Schedule for Rural Delivery Service. The metered  
14 power will not appear as a separate line item on Members' monthly billing statement. There will  
15 be no changes to Big Rivers' billing processes. The Members will each decide how to offer the  
16 power to their retail customers.

17 14. Based on the foregoing, Big Rivers believes that the proposed Solar Power  
18 Facilities are reasonable and prudent, and that the proposed Solar Power Facilities are ordinary  
19 extensions of existing systems in the usual course of business. The Commission should therefore  
20 issue an order declaring that Big Rivers may construct, own, and operate the Solar Power  
21 Facilities without first obtaining a CPCN or other authorization from the Commission.

22 15. Due to the size of the Solar Power Facilities, no site compatibility certificate is  
23 required for the proposed construction. KRS 278.216(1).

1           16. Each of the premises that Big Rivers is leasing for the proposed projects has an  
2 original book value of less than \$1,000,000. As such, the leases do not require any approval  
3 under KRS 278.218(1) as a transfer of ownership or control of utility assets.

4                                   **C. Alternative Request for a CPCN**

5           17. In the event the Commission determines that the construction of the Solar Power  
6 Facilities requires a CPCN, then Big Rivers requests, in the alternative, that the Commission  
7 issue a CPCN authorizing Big Rivers to construct the Solar Power Facilities.

8           18. As explained in Paragraphs 11-12, above, construction of the Solar Power  
9 Facilities is required by public convenience and necessity. 807 KAR 5:001 Section 15(2)(a).

10          19. Big Rivers is not required to obtain any franchises or permits from any other  
11 public authorities for the proposed construction, and as such, none are submitted herewith. 807  
12 KAR 5:001 Section 15(2)(b).

13          20. Two (2) of the Solar Power Facilities will be located at the Brandenburg,  
14 Kentucky, and Hardinsburg, Kentucky, offices of Meade County RECC. The Brandenburg  
15 location is about 50 yards east of the Meade County RECC office; the Hardinsburg location is in  
16 the parking lot of the Meade County RECC office, about 50 yards north of the that office. Two  
17 (2) more of the Solar Power Facilities will be located at the Henderson, Kentucky, and  
18 Owensboro, Kentucky, offices of Kenergy. The Henderson location is just outside Kenergy's  
19 Henderson office building; the Owensboro location is about 50 yards from Kenergy's  
20 Owensboro office. The remaining three (3) Solar Power Facilities will be located at the  
21 Livingston County Middle School, the McCracken County High School, and at Mike Miller Park  
22 in Marshall County. Additional information about each of the above locations is provided with



1 the aerial photos in Exhibit B. The Direct Testimony of Russell L. Pogue, provided as Exhibit C,  
2 also provides additional information about the locations. 807 KAR 5:001 Section 15(2)(c).

3 21. If the Commission issues an order either granting Big Rivers' request for a  
4 declaratory or granting Big Rivers' alternative request for a CPCN, Harvest Energy should begin  
5 construction within two (2) months of that order. The aerial photos provided in Exhibit B  
6 provide additional information about the size of each project, the number of arrays, *etc.* Once  
7 construction has commenced, Big Rivers and Harvest Energy anticipate, depending on weather  
8 conditions during construction, that construction will be complete, all testing completed, and  
9 power will begin to flow within four (4) to six (6) months. As outlined in Mr. Pogue's Direct  
10 Testimony in Exhibit C, Harvest Energy will provide all labor and materials. 807 KAR 5:001  
11 Section 15(2)(c).

12 22. There are no like facilities in the vicinity of the proposed construction, and the  
13 proposed construction is not likely to compete with any public utilities, corporations, or other  
14 persons. 807 KAR 5:001 Section 15(2)(c)

15 23. The technical specifications for each location are provided in the one-line  
16 diagrams provided in Exhibit D of this Application. The anticipated locations of the sites where  
17 the projects will be constructed and the interconnections of the Solar Power Facilities with each  
18 of Big Rivers' Members are shown in the aerial photos provided in Exhibit B of this Application.  
19 807 KAR 5:001 Section 15(2)(d). However, because of the small scale and the nature of these  
20 Solar Power Facilities, the exact siting and orientation of each array at each location will be  
21 determined closer to the beginning of construction and will depend on the relative elevation of  
22 the terrain, a geotech survey of the location, and the latitude/longitude at each location. Also,  
23 since these arrays are education and demonstration projects, consideration of the location will be

1 given to walkway access and drive-by viewing of the arrays. To the extent the maps in Exhibit B  
2 or the diagrams in Exhibit D do not comply with the requirements of 807 KAR 5:001 Section  
3 15(2)(d), Big Rivers hereby requests a deviation from those requirements pursuant to 807 KAR  
4 5:001 Section 22.

5 24. Big Rivers will self-finance the construction of the Solar Power Facilities.  
6 Excluding any REAP grant, the Solar Power Facilities will collectively cost less than \$500,000.  
7 Any REAP grant may decrease that cost to less than \$375,000. 807 KAR 5:001 Section  
8 15(2)(e).

9 25. After the Solar Power Facilities are placed into service, the annual cost of  
10 operation of those facilities is estimated to be about \$500 for each array, for a combined annual  
11 operational costs of less than \$4,000. 807 KAR 5:001 Section 15(2)(f).

#### 12 **D. Conclusion**

13 WHEREFORE, Big Rivers respectfully requests that (i) the Commission issue a  
14 declaratory order declaring that the Solar Power Facilities are ordinary extensions of existing  
15 systems in the usual course of business and that Big Rivers may construct, own, and operate the  
16 Solar Power Facilities without first obtaining a CPCN or other authorization from the  
17 Commission; and (ii) the Commission grant Big Rivers any and all other relief to which it may  
18 appear entitled. In the event the Commission determines that Big Rivers must obtain a CPCN to  
19 construct the Solar Power Facilities, then Big Rivers requests, in the alternative, that the  
20 Commission issue a CPCN authorizing the construction of the Solar Power Facilities.

21

1 On this the 28<sup>th</sup> day of November, 2016.

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Respectfully submitted,

  
James M. Miller  
Tyson Kamuf  
SULLIVAN, MOUNTJOY, STAINBACK  
& MILLER, P.S.C.  
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P. O. Box 727  
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Phone: (270) 926-4000  
Facsimile: (270) 683-6694  
jmiller@smsmlaw.com  
tkamuf@smsmlaw.com

Counsel for Big Rivers Electric Corporation

**Verification**


I, Russell L. (Russ) Pogue, Manager of Member Relations for Big Rivers Electric Corporation, hereby state that I have read the foregoing Application and that the statements contained therein are true and correct to the best of my knowledge and belief, on this the 28<sup>th</sup> day of November, 2016.

  
Russell L. (Russ) Pogue  
Manager of Member Relations  
Big Rivers Electric Corporation

COMMONWEALTH OF KENTUCKY )  
COUNTY OF HENDERSON )

SUBSCRIBED AND SWORN to before me by Russell L. Pogue, as Manager of Member Relations for Big Rivers Electric Corporation, on this the 28<sup>th</sup> day of November, 2016.



  
Katherine Risley  
Notary Public, State at Large Kentucky  
My commission expires: 10-31-2020  
Notary ID: 566717

**Exhibit A**

**Case No. 2016-00\_\_\_\_\_**

**BIG RIVERS ELECTRIC CORPORATION**  
**REFERENCES FOR COMPLIANCE WITH REGULATORY REQUIREMENTS**  
**Case No. 2016-00\_\_\_\_\_**

<u>Regulation</u>	<u>Filing Requirement</u>	<u>Location in Application</u>
807 KAR 5:001 Section 14(1)	The full name, mailing address, and electronic mail address of the applicant,	Application ¶ 2
807 KAR 5:001 Section 14(1)	Fully the facts on which the application is based, with a request for the order, authorization, permission, or certificate desired and a reference to the particular law requiring or providing for the information.	Application ¶¶ 1, 5-25
807 KAR 5:001 Section 14(2)	If a corporation, the applicant shall identify in the application the state in which it is incorporated and the date of its incorporation, attest that it is currently in good standing in the state in which it is incorporated, and, if it is not a Kentucky corporation, state if it is authorized to <del>transact business in Kentucky</del>	Application ¶ 2
807 KAR 5:001 Section 15(2)(a)	The facts relied upon to show that the proposed construction or extension is or will be required by public convenience or necessity.	Application ¶¶ 6-14, 20
807 KAR 5:001 Section 15(2)(b)	Copies of franchises or permits, if any, from the proper public authority for the proposed construction or extension, if not previously filed with the commission.	Application ¶ 19
807 KAR 5:001 Section 15(2)(c)	A full description of the proposed location, route, or routes of the proposed construction or extension, including a description of the manner of the construction and the names of all public utilities, corporations, or persons with whom the proposed construction or extension is likely to compete.	Application ¶¶ 8, 20; see also the maps of the proposed location filed with the Application
807 KAR 5:001 Section 15(2)(d)	One (1) copy in portable document format on electronic storage medium and two (2) copies in paper medium of: 1. Maps to suitable scale showing the location or route of the proposed construction or extension, as well as the location to scale of like facilities owned by others located anywhere within the map area with adequate identification as to the ownership of the other facilities; and 2. Plans and specifications and drawings of the proposed plant, equipment, and	See Application ¶ 23; Exhibit B and Exhibit D
807 KAR 5:001 Section 15(2)(e)	The manner in detail in which the applicant proposes to finance the proposed construction or extension.	Application ¶ 24

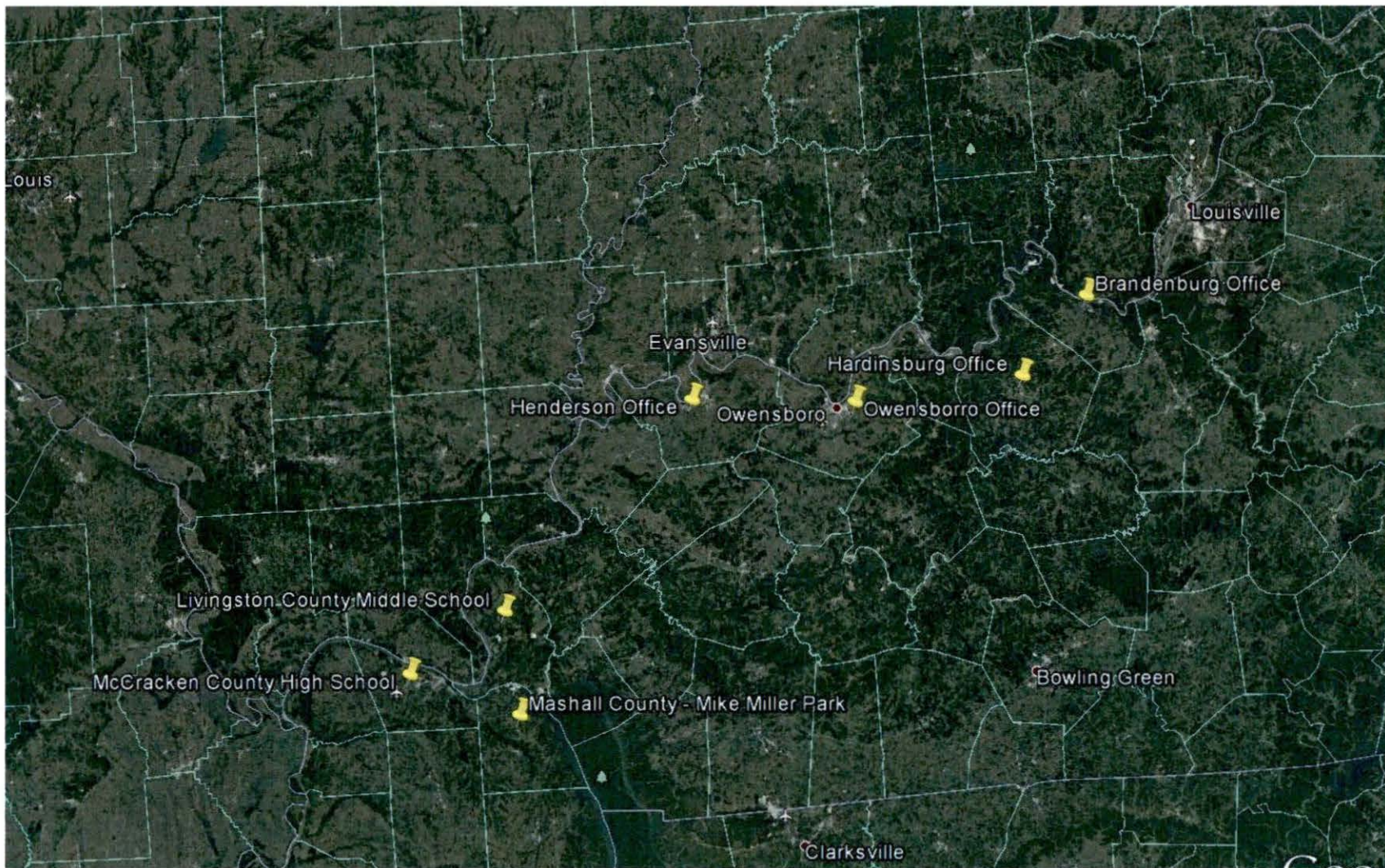
**BIG RIVERS ELECTRIC CORPORATION**  
**REFERENCES FOR COMPLIANCE WITH REGULATORY REQUIREMENTS**  
Case No. 2016-00\_\_\_\_\_

<u>Regulation</u>	<u>Filing Requirement</u>	<u>Location in Application</u>
807 KAR 5:001 Section 15(2)(f)	An estimated annual cost of operation after the proposed facilities are placed into service.	Application ¶ 25
807 KAR 5:001 Section 19(2)(a)	An application for a declaratory order shall be in writing.	The Application is in writing.
807 KAR 5:001 Section 19(2)(b)	An application for a declaratory order shall contain a complete, accurate, and concise statement of the facts upon which the application is based.	Application ¶¶ 5-16
807 KAR 5:001 Section 19(2)(c)	An application for a declaratory order shall fully disclose the applicant's interest.	Application ¶¶ 1-25
807 KAR 5:001 Section 19(2)(d)	An application for a declaratory order shall identify all statutes, administrative regulations, and orders to which the application relates.	Application ¶ 5
807 KAR 5:001 Section 19(2)(e)	An application for a declaratory order shall state the applicant's proposed resolution or conclusion.	Application ¶¶ 1, 14; Application Section D
807 KAR 5:001 Section 19(6)	An application for a declaratory order shall be supported by affidavit or shall be verified.	The Application is verified.

**Exhibit B**

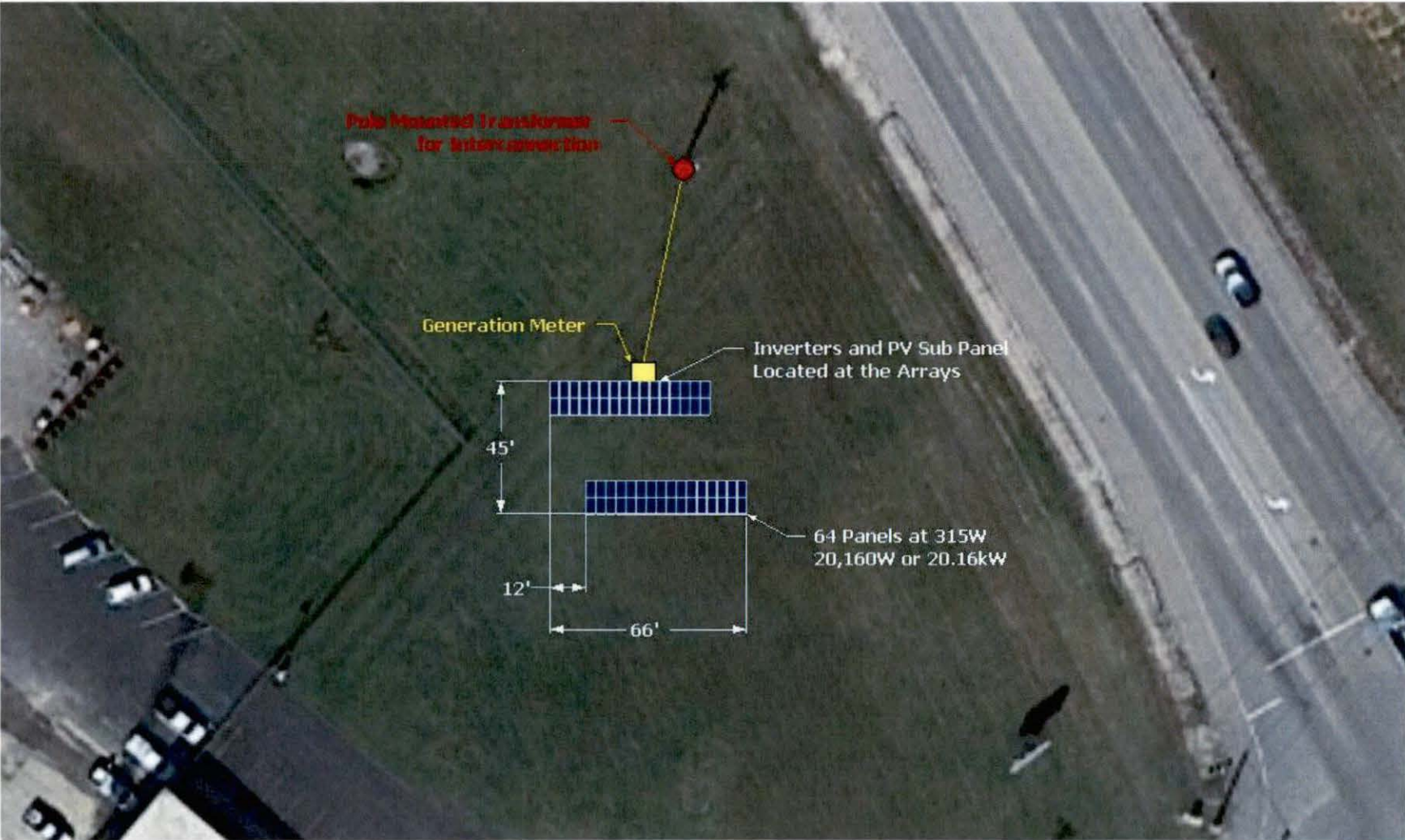
**Case No. 2016-00\_\_\_\_\_**

**Big Rivers Electric Corporation  
Proposed Locations for Solar Array Education and Demonstration Projects  
November 2016**

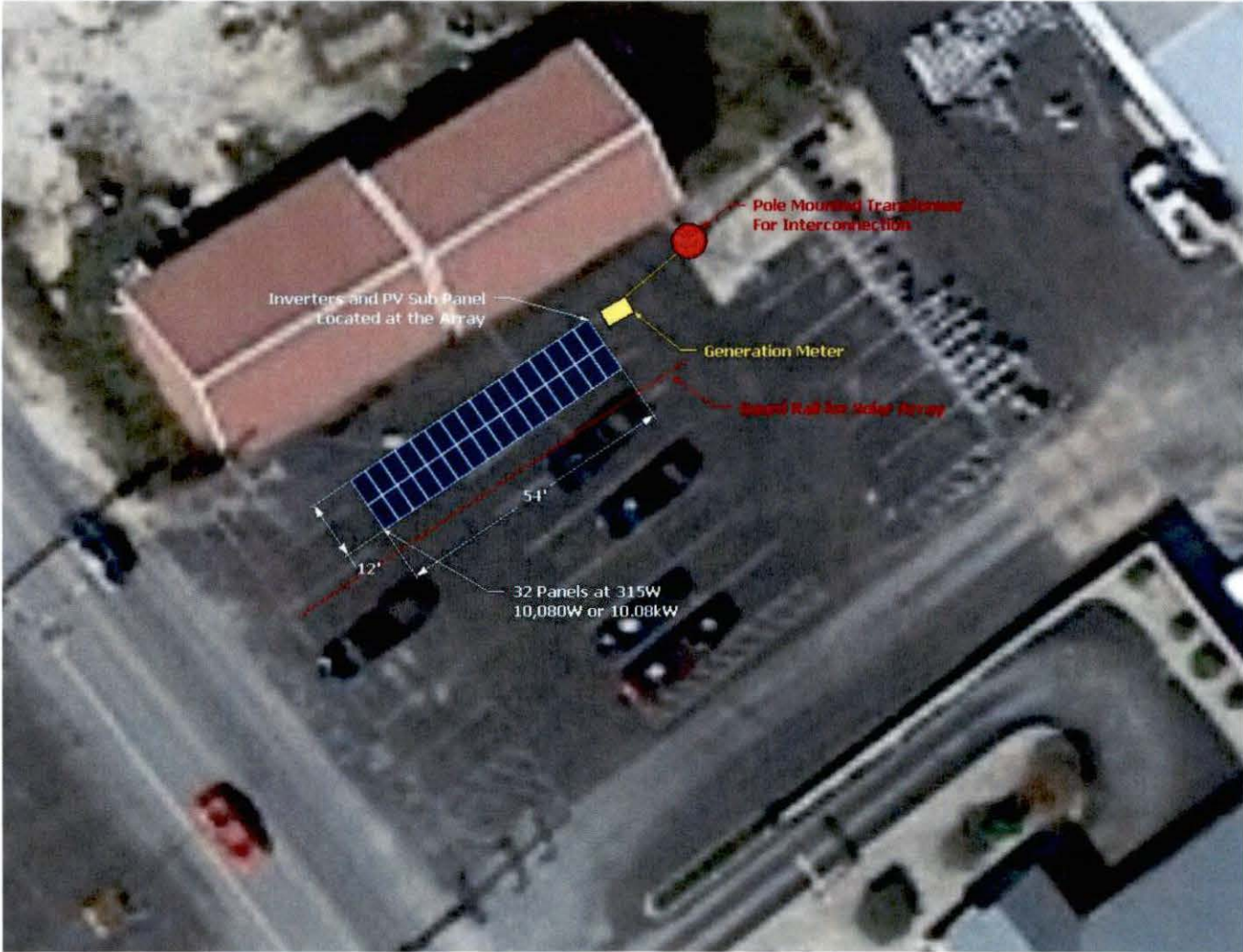




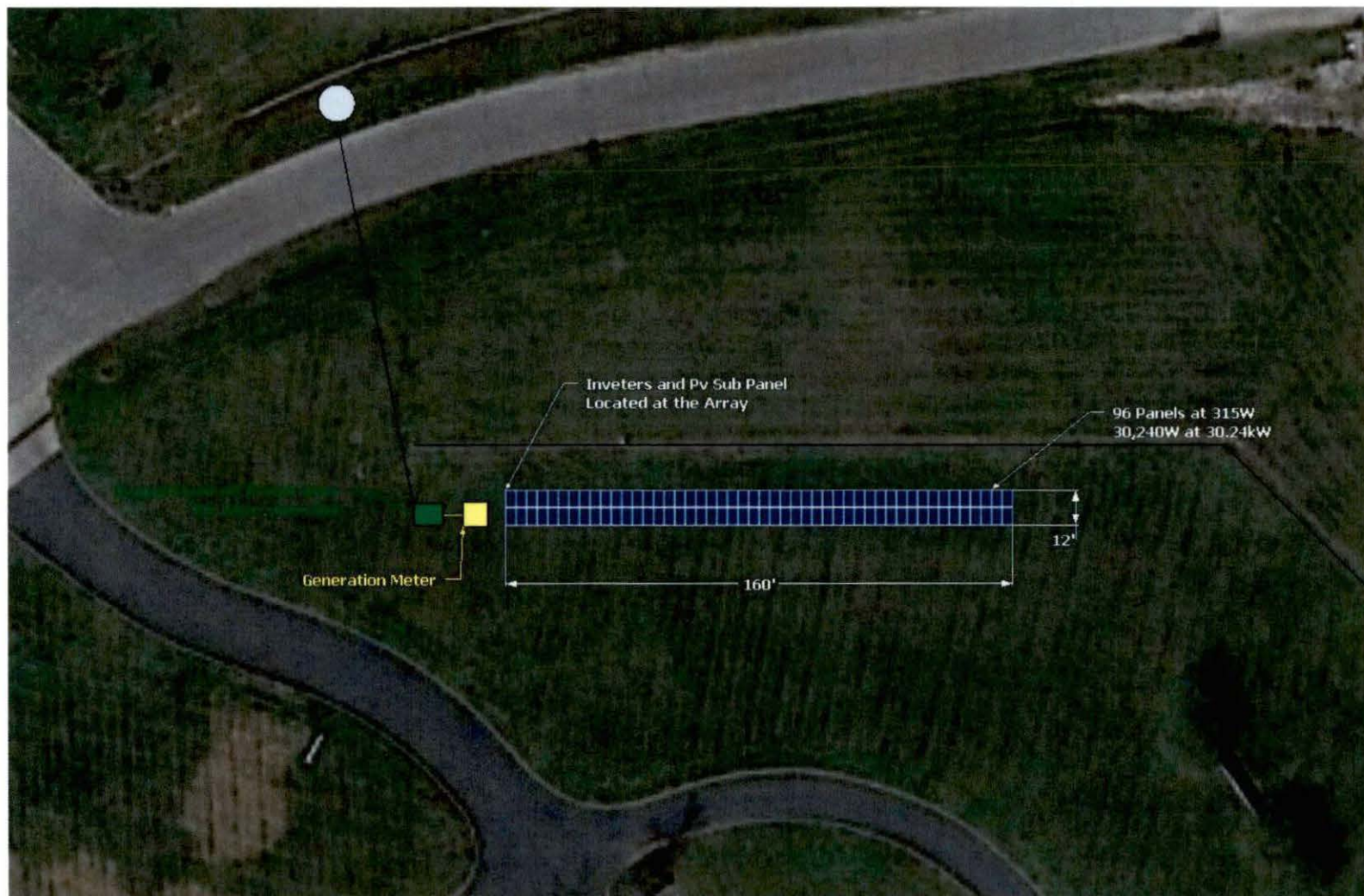
**Big Rivers Electric Corporation**  
**Meade County – Brandenburg Solar Array Education and Demonstration Project**  
**November 2016**



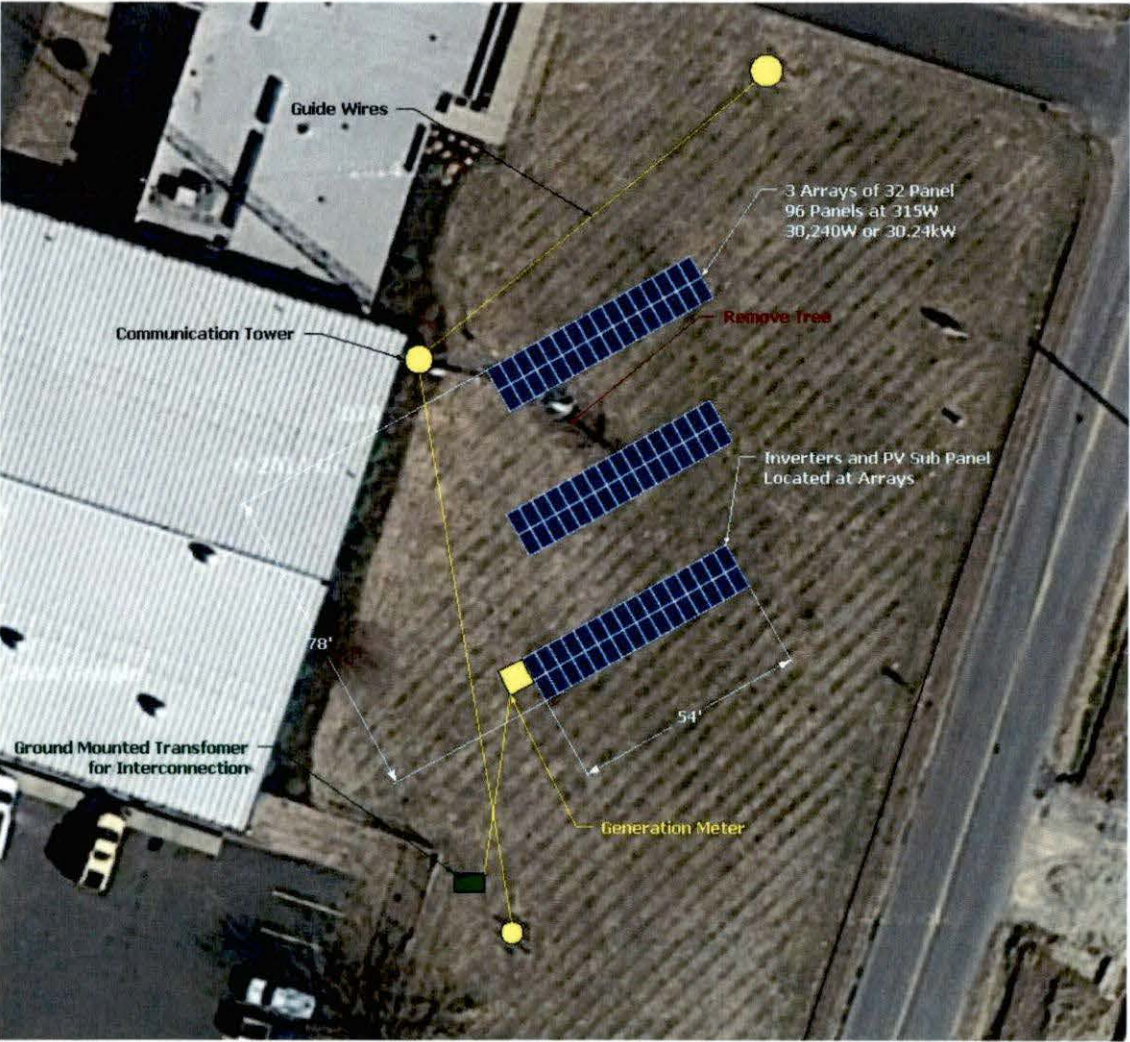
**Big Rivers Electric Corporation**  
**Meade County – Hardinsburg Solar Array Education and Demonstration Project**  
**November 2016**



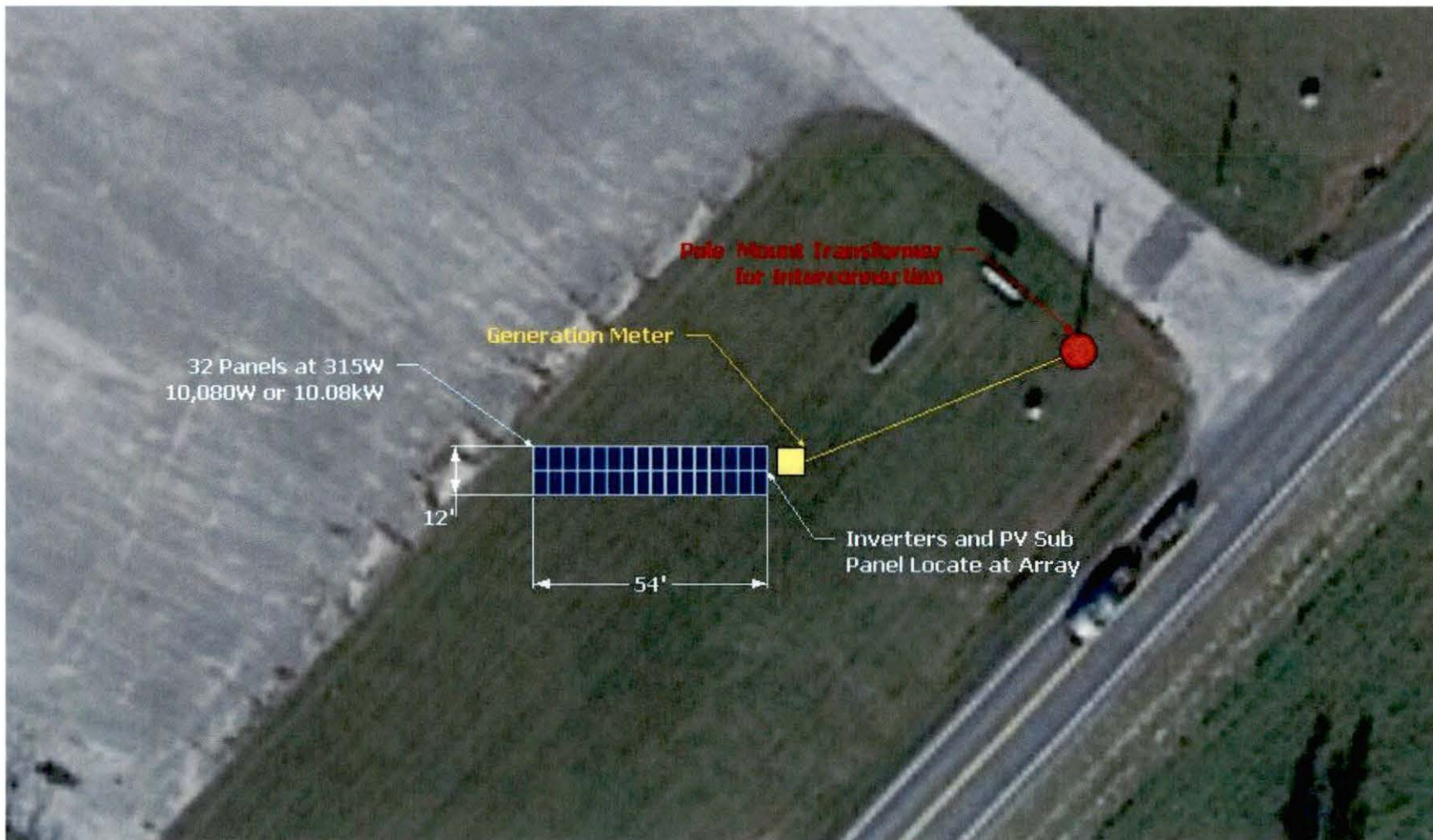
**Big Rivers Electric Corporation  
Kenergy – Henderson Solar Array Education and Demonstration Project  
November 2016**



**Big Rivers Electric Corporation**  
**Kenergy – Owensboro Solar Array Education and Demonstration Project**  
**November 2016**



**Big Rivers Electric Corporation  
Livingston County Solar Array Education and Demonstration Project  
November 2016**



**Big Rivers Electric Corporation  
McCracken County Solar Array Education and Demonstration Project  
November 2016**



**Big Rivers Electric Corporation  
Marshall County Solar Array Education and Demonstration Project  
November 2016**



**Exhibit C**

**Case No. 2016-00\_\_\_\_\_**



**ORIGINAL**



Your Touchstone Energy® Cooperative 

**COMMONWEALTH OF KENTUCKY**

**BEFORE THE PUBLIC SERVICE COMMISSION OF KENTUCKY**

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**APPLICATION )  
OF BIG RIVERS ELECTRIC CORPORATION )  
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FACILITIES TO BE ORDINARY EXTENSIONS OF )  
EXISTING SYSTEMS IN THE USUAL COURSE OF )  
BUSINESS )**

**Case No.  
2016-00\_\_\_\_\_**

**DIRECT TESTIMONY**

**OF**

**RUSSELL L. POGUE  
MANAGER, MEMBER RELATIONS**

**ON BEHALF OF**

**BIG RIVERS ELECTRIC CORPORATION**

**FILED: November 28, 2016**

**ORIGINAL**

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**DIRECT TESTIMONY  
OF  
RUSSELL L. POGUE**

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

6 A. My name is Russell L. Pogue, and my business address is Big Rivers  
7 Electric Corporation (“Big Rivers”), 201 Third Street, Henderson, Kentucky,  
8 42420. I am the Manager, Member Relations for Big Rivers. I report to  
9 Mark J. Eacret, Big Rivers’ Vice President Energy Services.

10  
11 **Q. Please summarize your education and professional experience.**

12 A. I have Bachelor of Science degree in Engineering Management/Mechanical  
13 Engineering from the Missouri Institute of Science and Technology. I am a  
14 Certified Energy Manager (C.E.M.), Certified Business Energy Professional  
15 (CBEP), a Certified Demand Side Manager (CDSM), and a member of the  
16 Association of Energy Engineers. Prior to joining Big Rivers, I designed  
17 and implemented Demand-Side Management (“DSM”) programs at  
18 Associated Electric Cooperative in Springfield, Missouri, and was a Senior  
19 Project Engineer at the Mid-America Manufacturing Technology Center in  
20 Rolla, Missouri.

21  
22 **Q. Please summarize your duties at Big Rivers.**

1 A. I am responsible for Big Rivers' Member relations. Among other things, I  
2 work with Big Rivers' Members on the administration, development, and  
3 documentation of their respective Demand-Side Management/Energy  
4 Efficiency ("DSM/EE") programs. This includes periodic meetings of the  
5 joint Big Rivers/Members DSM/EE Working Group which has oversight of  
6 these programs. I also am responsible for a major component of Big Rivers  
7 Integrated Resource Plan ("IRP") including the IRP's DSM/EE Potential  
8 Study Report and its related appendices.

9

10 **Q. Have you previously testified before this Commission?**

11 A. Yes. I testified on behalf of one of Big Rivers' Members, Meade County  
12 Rural Electric Cooperative Corporation ("Meade County") in one of Meade  
13 County's general rate proceedings, Case No. 2010-00222. I have answered  
14 data requests in Big Rivers' DSM/EE tariff filings – Case Nos. 2012-00142,  
15 2013-00099, and 2015-00118. I was also a witness responding to data  
16 requests in Big Rivers' most recent IRP filings – Case Nos. 2010-00443 and  
17 2014-00166. Finally, I either responded to, or drafted responses to, certain  
18 DSM/EE-related data requests in Big Rivers' two most recent general rate  
19 proceedings – Case Nos. 2012-00535 and 2013-00199.

20

21

1 **Q. What is the purpose of your testimony in this proceeding?**

2 A. The purpose of my testimony is to describe the purpose, design, and  
3 implementation of Big Rivers' solar education and demonstration project.

4  
5 **Q. Please provide a general description of Big Rivers' solar array  
6 education and demonstration project.**

7 A. Big Rivers will lease land from either its Members or other organizations  
8 within its Members' service territories. Seven (7) locations have been  
9 selected. Big Rivers will construct solar arrays at these seven locations  
10 with the array capacity ranging from 10 to 30 kW direct current ("dc"). Big  
11 Rivers will own the arrays, lease the land on which they sit, and will sell  
12 the power to its Members under Big Rivers' Rural Delivery Service tariff  
13 currently on file with the Commission. The power will be transformed to  
14 alternating current (ac) using an inverter, metered and then fed into the  
15 local distribution system of Big Rivers Member Cooperatives.

16  
17 **Q. Who are the lessors?**

18 A. Two of the lessors are Big Rivers' Members – Meade County Rural Electric  
19 Cooperative Corporation ("Meade County") and Kenergy Corp. ("Kenergy").  
20 The other lessors are the Livingston County Board of Education  
21 ("Livingston County"), the McCracken County Board of Education

1 (“McCracken County”), and the Marshall County Fiscal Court (“Marshall  
2 County”).

3  
4 **Q. You do not mention Big Rivers’ third Member, Jackson Purchase**  
5 **Energy Corporation (“Jackson Purchase”). Please explain why**  
6 **Jackson Purchase is not mentioned.**

7 A. As I’ve indicated, the solar arrays are located at either one of Big Rivers’  
8 Members or at third parties within a Member’s service territory. In the  
9 case of Jackson Purchase, the Livingston County, McCracken County, and  
10 Marshall County locations are within Jackson Purchase’s service territory.

11 These locations were chosen since Jackson Purchase’s offices were all  
12 within the service territory of the Paducah Power System. Using the  
13 Livingston County, McCracken County, and Marshall County locations will  
14 allow Big Rivers to feed power directly to Jackson Purchase’s grid.

15  
16

1 **Q. Where are the arrays to be constructed and how were those sites**  
2 **chosen?**

3 A. The arrays will be constructed at the addresses listed in the table below.  
4 Those locations were determined by both Big Rivers and the respective  
5 lessors.

6

<b>Big Rivers Electric Corporation (<i>Lessee</i>) Solar Array Education and Demonstration Project Locations</b>	
<b>Lessor</b>	<b>Solar Array Locations</b>
Meade County	1351 Highway 79, Brandenburg, KY
	127 East Old Highway 60, Hardinsburg, KY
Kenergy	6402 Old Corydon Road, Henderson, KY
	3111 Fairview Drive, Owensboro, KY
Livingston County Middle School	1370 U.S. Highway 60 East, Burna, KY
McCracken County High School	6530 Old Highway 60, Paducah, KY
Marshall County – Mike Miller Park	596 U.S. Highway 68 West, Benton, KY

7

8 Exhibit B of the Application contains a map showing these locations and  
9 satellite photos of each location. Exhibit D of the Application provides a  
10 one-line diagram for each location and shows the interconnection with the  
11 distribution systems of each of Big Rivers' Members. Additional  
12 descriptions of the property at each solar array location can be found in the  
13 appendices of the respective land leases.

14

1 **Q. You mentioned that Big Rivers will sell the power to its Members.**  
2 **Will Big Rivers use a special tariff for this power? How will the**  
3 **billing work?**

4 A. Because these solar arrays are education and demonstration projects, Big  
5 Rivers will sell their power under Big Rivers' existing Standard Rate  
6 Schedule – Rural Delivery Service (“SRS-RDS”). As I have mentioned, the  
7 SRS-RDS is in Big Rivers' Tariff which is on file with the Commission.  
8 Given the limited amount of power to be generated, this tariff was chosen  
9 versus the Standard Rate Schedule – Large Industrial Customer or a  
10 special tariff.

11 Big Rivers will meter the energy from each array and the charges for  
12 that energy will appear on each Member's monthly billing statement.  
13 There will be no changes to the monthly billing process.

14

15 **Q. You have used the term “education and demonstration project.”**  
16 **What does that term mean or imply?**

17 A. By education and demonstration project, Big Rivers means that these solar  
18 arrays will demonstrate how the various components that make up the  
19 solar arrays operate to produce and deliver electricity to the Members'  
20 retail members. Both students attending the high schools at which arrays  
21 are located, and the general public will be able to view related cost, weather

1 and production data about solar arrays. Big Rivers will provide this  
2 information on-line. As such, the arrays will also serve an educational  
3 purpose. These arrays will not replace, and are not a material supplement  
4 to, any of Big Rivers' existing generation.

5  
6 **Q. How do these solar arrays differ from those which the Commission**  
7 **approved for Louisville Gas and Electric Company and Kentucky**  
8 **Utilities Company (“LG&E/KU”), and which the Commission is**  
9 **reviewing for East Kentucky Power Cooperative, Inc. (“EKPC”)?**

10 **A.** The arrays share most design and technological features with utility scale  
11 solar generation with the exception of scope. Big Rivers' solar facilities will  
12 be more similar to the size and configuration of residential and small  
13 commercial solar generation.

14 EKPC's proposal in Case No. 2016-00269 is for an eight and a half  
15 (8.5) MW community solar facility at EKPC's Clark County, Kentucky  
16 offices. LG&E/KU's universal solar array in Mercer County is ten (10)  
17 MWs. Collectively, the Big Rivers seven education and demonstration solar  
18 arrays will total approximately 120 kW (dc), or 1.4% of EKPC's 8.5 MW  
19 proposed facility and 1.2% of LG&E/KU's 10 MW solar facility.

20  
21 **Q. Will Big Rivers construct the arrays itself?**



1 A. No. Following late-August 2016 site visits by potential vendors, vendors  
2 submitted their proposals in September 2016. Big Rivers' staff and  
3 representatives of the representatives of the National Renewable  
4 Cooperative Organization ("NRCO") evaluated the vendor proposals.  
5 NRCO was formed by rural electric cooperatives to facilitate the  
6 development and deployment of renewable energy resources. Big Rivers  
7 selected Harvest Energy Solutions ("Harvest Energy") of Almo, Calloway  
8 County, Kentucky to construct the arrays, assuming the Commission's  
9 approval and the negotiation of a final contract. More information about  
10 Harvest Energy is available at: [www.harvestenergysolutions.com](http://www.harvestenergysolutions.com).

11

12 **Q. Please provide a general description of the arrays.**

13 A. Each array will consist of 32 to 96 solar panels. The number of panels at  
14 each location will depend on the size of the location. Each panel measures  
15 approximately 3 x 6 feet; each panel will have a rated capacity of 315 watts  
16 (dc). The exact siting and orientation of each array at each location  
17 depends on the relative elevation of the terrain, a geotech survey of the  
18 location, and the latitude/longitude at each location. Also, since these  
19 arrays are education and demonstration projects, consideration will be  
20 given to walkway access and drive-by viewing of the arrays.

1           The solar panels in each array will produce direct current electricity.  
2           Since the grid operates on alternating current electricity, each array will  
3           include an inverter to convert the direct current electricity to alternating  
4           current electricity. There will be at least one inverter for each array, and  
5           more may be used depending on the final design. The metering of the  
6           electricity will be after the conversion from direct current to alternating  
7           current.

8  
9   **Q. Will Big Rivers need to issue debt to finance these arrays?**

10  A. No. Based upon the Harvest Energy bid, Big Rivers expects the total cost of  
11   the seven arrays to be less than \$500,000. Consequently, Big Rivers will  
12   self-finance their construction from current cash flow.

13  
14  **Q. Can you provide a summary of project cost information based upon**  
15   **the Harvest Energy bid?**

16  A. Yes. Based upon the Harvest Energy bid, Big Rivers currently estimates  
17   the project costs as shown in the table on the next page.

1

<b>Big Rivers Electric Corporation Solar Array Education and Demonstration Project Current Estimated Project Costs</b>				
<b>Array Sites</b>	<b>Size (Watts)</b>	<b>Base Price = (a) + (b)</b>	<b>Base Labor (a)</b>	<b>Base Materials (b)</b>
Meade County – Brandenburg	20,160	\$ 56,500	\$ 21,500	\$ 35,000
Meade County – Hardinsburg	10,080	31,000	12,000	19,000
Kenergy – Henderson	30,240	82,500	32,500	50,000
Kenergy – Owensboro	30,240	81,000	31,000	50,000
Livingston County Middle School	10,080	30,000	12,000	18,000
McCracken County High School	10,080	34,000	13,000	21,000
Marshall County – Mike Miller Park	10,080	31,000	12,000	19,000
<b>Estimated Array Costs</b>		<b>\$ 346,000</b>	<b>\$ 134,000</b>	<b>\$ 212,000</b>
<b>Other Costs –</b>			2 Borings per Site, Seven Sites	
Geo Tech Survey		10,000		
Professional Engineer Evaluation		16,000		
Distribution & Interconnection		50,000		
<b>Estimated Project Costs</b>		<b>\$ 422,000</b>		

2

3

Altogether, Big Rivers currently believes the estimated projects costs and project contingencies will total less than \$500,000.

4

5

6

1 **Q. How long of a construction period does Big Rivers anticipate?**

2 A. Once the Commission has issued its Order, Harvest Energy could begin  
3 construction within about two (2) months. From the commencement of  
4 construction, Big Rivers anticipates the arrays will be complete, all testing  
5 completed, and power will begin to flow in about four (4) to six (6) months,  
6 depending on weather.

7

8 **Q. Does this conclude your testimony?**

9 A. Yes.

10

**BIG RIVERS ELECTRIC CORPORATION**

**APPLICATION  
OF BIG RIVERS ELECTRIC CORPORATION  
FOR AN ORDER DECLARING THE  
CONSTRUCTION OF SEVEN SOLAR POWER FACILITIES  
TO BE ORDINARY EXTENSIONS OF EXISTING SYSTEMS  
IN THE USUAL COURSE OF BUSINESS  
CASE NO. 2016-00\_\_\_\_\_**

**VERIFICATION**

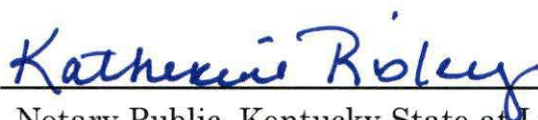
I, Russell L. (Russ) Pogue, verify, state, and affirm that I prepared or supervised the preparation of my testimony filed with this Verification, and that testimony is true and accurate to the best of my knowledge, information, and belief formed after a reasonable inquiry.



\_\_\_\_\_  
Russell L. (Russ) Pogue

COMMONWEALTH OF KENTUCKY )  
COUNTY OF HENDERSON )

SUBSCRIBED AND SWORN TO before me by Russell L. (Russ) Pogue on this the 28<sup>th</sup> day of November, 2016.



\_\_\_\_\_  
Notary Public, Kentucky State at Large

My Commission Expires 10-31-2020

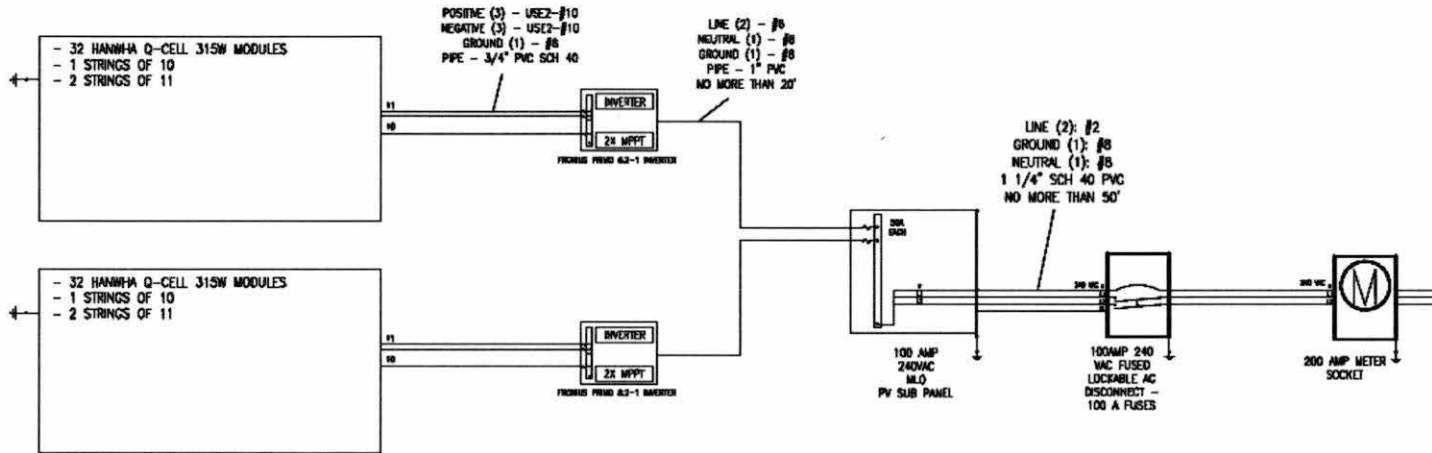


**Exhibit D**

**Case No. 2016-00\_\_\_\_\_**

**Big Rivers Electric Corporation**  
**Meade County – Brandenburg Solar Array Education and Demonstration Project**  
**November 2016**

## 20.16 KW DC SOLAR GENERATOR ONE-LINE DIAGRAM



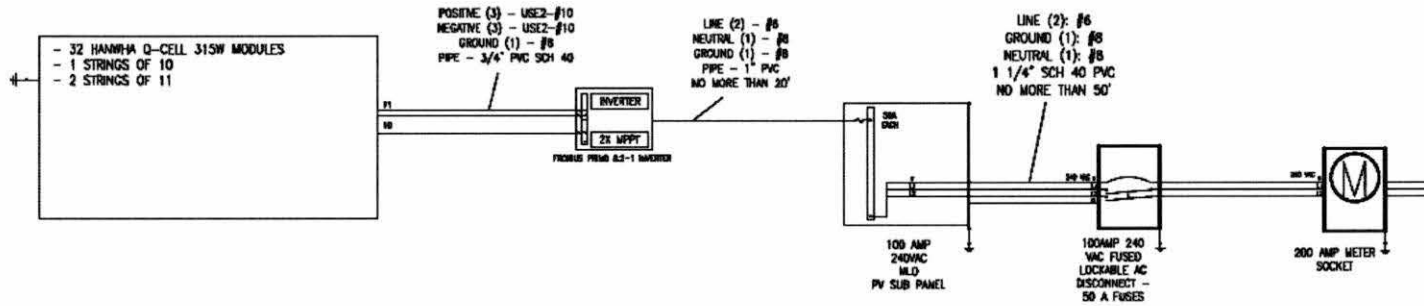
- EQUIPMENT SHALL BE INSTALLED IN ACCORDANCE WITH NEC ARTICLE 705.
- PROVIDE WARNING SIGN PER NEC 690-17 READING "WARNING-ELECTRIC SHOCK HAZARD-DO NOT TOUCH TERMINALS - TERMINALS ON BOTH THE LINE AND LOAD MAY BE ENERGIZED IN THE OFF POSITION".
- LABEL "SOLAR POWER SYSTEM DEDICATED KW-HR METER", OPTIONAL.
- LABEL SWITCH AS "PV GENERATOR SAFETY DISCONNECT SWITCH".
- USE APPROPRIATE WIRE GAUGE IF RUN FROM DISCONNECT TO INVERTER TO HOME IS > 200FT
- THIS DRAWING IS FOR REFERENCE
- VARIATIONS MAY BE MADE IN ACCORDANCE WITH NEC GUIDELINES

**SYSTEM SPECS:**  
**240 VAC SINGLE PHASE**  
**20,160 WDC**  
**85.25 AMPS MAXIMUM**  
**64 - HANWHA Q-CELL 315W PANEL**  
**2 - FRONIUS PRIMO 8.2-1**

WIRE COLOR CODING*		* WIRE RATINGS *		HARVEST ENERGY SOLUTIONS	
BLACK	HIGH VOLTAGE LINE AND LOAD	NOTE: THIS DRAWING MAY INCLUDE UNPUBLISHED FIELD-WIRE RATING INFORMATION	RATINGS FOR COPPER THIN OR MTW WIRE	JACKSON, MICHIGAN	
RED	HIGH VOLTAGE LINE AND LOAD	BY HARVEST ENERGY AND AS SUCH IS NOT TO BE CONSIDERED	1/2" AWG - 200 AMPS	DATE: 10/28/2016	PROJECT: MEADE COUNTY RECC BRANDENBURG
WHITE	A.C. NEUTRAL	BY HARVEST ENERGY AND AS SUCH IS NOT TO BE CONSIDERED	3/4" AWG - 100 AMPS	DESIGNER: RTS	CLIENT: BIG RIVER ELECTRIC CORPORATION
YELLOW	HIGH VOLTAGE LINE AND LOAD	BY HARVEST ENERGY AND AS SUCH IS NOT TO BE CONSIDERED	1" AWG - 100 AMPS	DATE: 10/28/2016	PROJECT: MEADE COUNTY RECC BRANDENBURG
GREEN W/YELLOW	DRIFT GROUND	BY HARVEST ENERGY AND AS SUCH IS NOT TO BE CONSIDERED	2" AWG - 100 AMPS	DATE: 10/28/2016	PROJECT: MEADE COUNTY RECC BRANDENBURG
BLUE	D.C. VOLTAGE	BY HARVEST ENERGY AND AS SUCH IS NOT TO BE CONSIDERED	3" AWG - 100 AMPS	DATE: 10/28/2016	PROJECT: MEADE COUNTY RECC BRANDENBURG
BLACK W/WHITE	D.C. NEUTRAL	BY HARVEST ENERGY AND AS SUCH IS NOT TO BE CONSIDERED	4" AWG - 100 AMPS	DATE: 10/28/2016	PROJECT: MEADE COUNTY RECC BRANDENBURG
ORANGE	SEPARATE CABLES	BY HARVEST ENERGY AND AS SUCH IS NOT TO BE CONSIDERED	5" AWG - 100 AMPS	DATE: 10/28/2016	PROJECT: MEADE COUNTY RECC BRANDENBURG
RED/WHITE	SEPARATE CABLES	BY HARVEST ENERGY AND AS SUCH IS NOT TO BE CONSIDERED	6" AWG - 100 AMPS	DATE: 10/28/2016	PROJECT: MEADE COUNTY RECC BRANDENBURG
ORANGE/WHITE	SEPARATE CABLES	BY HARVEST ENERGY AND AS SUCH IS NOT TO BE CONSIDERED	8" AWG - 100 AMPS	DATE: 10/28/2016	PROJECT: MEADE COUNTY RECC BRANDENBURG
ALL UNLESS NOTED TO BE RUN IN BUNDLED CABLES				DATE: 10/28/2016	PROJECT: MEADE COUNTY RECC BRANDENBURG

**Big Rivers Electric Corporation**  
**Meade County – Hardinsburg Solar Array Education and Demonstration Project**  
**November 2016**

**10.08 KW DC SOLAR GENERATOR ONE-LINE DIAGRAM**



- EQUIPMENT SHALL BE INSTALLED IN ACCORDANCE WITH NEC ARTICLE 705.
- PROVIDE WARNING SIGN PER NEC 690-17 READING "WARNING-ELECTRIC SHOCK HAZARD-DO NOT TOUCH TERMINALS - TERMINALS ON BOTH THE LINE AND LOAD MAY BE ENERGIZED IN THE OFF POSITION".
- LABEL "SOLAR POWER SYSTEM DEDICATED KW-HR METER", OPTIONAL.
- LABEL SWITCH AS "PV GENERATOR SAFETY DISCONNECT SWITCH".
- USE APPROPRIATE WIRE GAUGE IF RUN FROM DISCONNECT TO INVERTER TO HOME IS > 200FT
- THIS DRAWING IS FOR REFERENCE
- VARIATIONS MAY BE MADE IN ACCORDANCE WITH NEC GUIDELINES

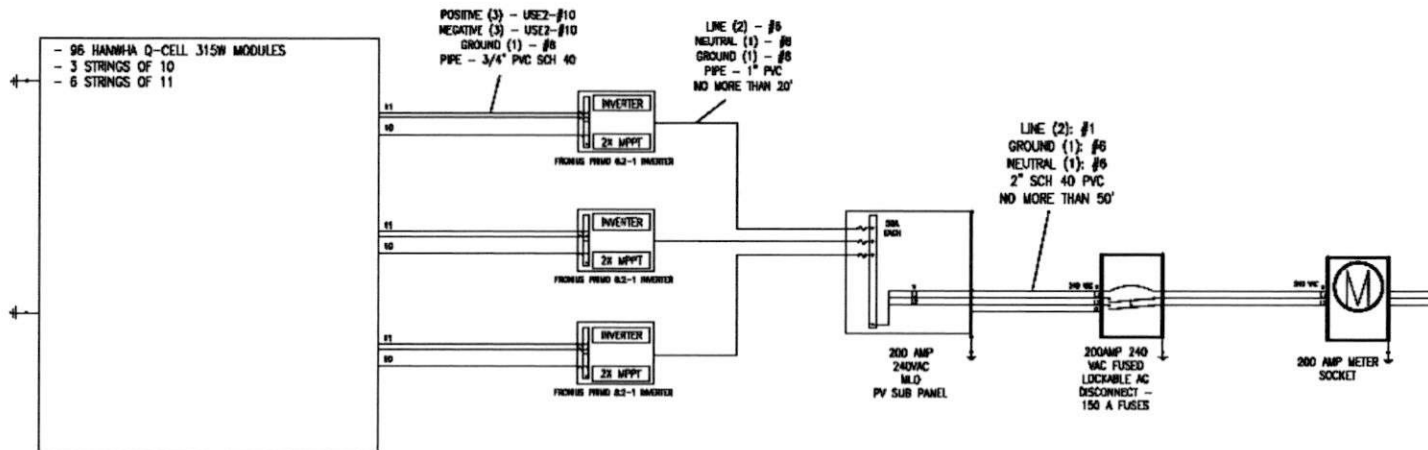
**SYSTEM SPECS:**  
 240 VAC SINGLE PHASE  
 10,080 WDC  
 42.625 AMPS MAXIMUM  
 32 - HANWHA Q-CELL 315W PANEL  
 1 - FRONIUS PRIMO 8.2-1

<b>WIRE COLOR CODING</b> <small>(NEC ARTICLE 310.15)</small>		<b>WIRE RATINGS</b> <small>(NEC ARTICLE 310.15)</small>		<b>HARVEST ENERGY SOLUTIONS</b> <small>JACKSON, MICHIGAN</small>			
BLACK	3PH VOLTAGE LINE AND LOAD	14 AWG	20 AMP	14 AWG	20 AMP	14 AWG	20 AMP
RED	3PH VOLTAGE LINE AND LOAD	12 AWG	25 AMP	12 AWG	25 AMP	12 AWG	25 AMP
WHITE	A.C. NEUTRAL	10 AWG	30 AMP	10 AWG	30 AMP	10 AWG	30 AMP
YELLOW	3PH VOLTAGE LINE AND LOAD	8 AWG	40 AMP	8 AWG	40 AMP	8 AWG	40 AMP
GREEN/YELLOW	GROUNDING	6 AWG	55 AMP	6 AWG	55 AMP	6 AWG	55 AMP
BLUE	D.C. VOLTAGE	4 AWG	75 AMP	4 AWG	75 AMP	4 AWG	75 AMP
SLATE GRAY	SHIELDED CABLES	3 AWG	100 AMP	3 AWG	100 AMP	3 AWG	100 AMP
UNCOLORED	ALL OTHERS SHOULD BE RUN IN SHIELDED CABLES	2 AWG	125 AMP	2 AWG	125 AMP	2 AWG	125 AMP
NOTICE: THIS DRAWING MAY INCLUDE UNPUBLISHED PREVIOUS EDITIONS, CORRECTED BY HARVEST ENERGY AND AS SUCH IS NOT TO BE COPIED, REPRODUCED, DISCLOSED OR USED IN ANY WAY FOR PURPOSES WITHOUT HARVEST ENERGY SOLUTIONS' AUTHORIZATION.				PROJECT: MEADE COUNTY RECC HANDISBURG DATE: 10.08 KW SOLAR POWER ONE-LINE DIAGRAM SHEET: V2949			



**Big Rivers Electric Corporation**  
**Kenergy – Henderson Solar Array Education and Demonstration Project**  
**November 2016**

## 30.24 KW DC SOLAR GENERATOR ONE-LINE DIAGRAM



1. EQUIPMENT SHALL BE INSTALLED IN ACCORDANCE WITH NEC ARTICLE 705.
2. PROVIDE WARNING SIGN PER NEC 690-17 READING "WARNING-ELECTRIC SHOCK HAZARD-DO NOT TOUCH TERMINALS - TERMINALS ON BOTH THE LINE AND LOAD MAY BE ENERGIZED IN THE OFF POSITION".
3. LABEL "SOLAR POWER SYSTEM DEDICATED KW-HR METER", OPTIONAL.
4. LABEL SWITCH AS "PV GENERATOR SAFETY DISCONNECT SWITCH".
5. USE APPROPRIATE WIRE GAUGE IF RUN FROM DISCONNECT TO INVERTER TO HOME IS > 200FT
6. THIS DRAWING IS FOR REFERENCE
7. VARIATIONS MAY BE MADE IN ACCORDANCE WITH NEC GUIDELINES

**SYSTEM SPECS:**  
 240 VAC SINGLE PHASE  
 30,240 WDC  
 127.875 AMPS MAXIMUM  
 96 – HANWHA Q-CELL 315W PANEL  
 3 – FRONIUS PRIMO 8.2-1

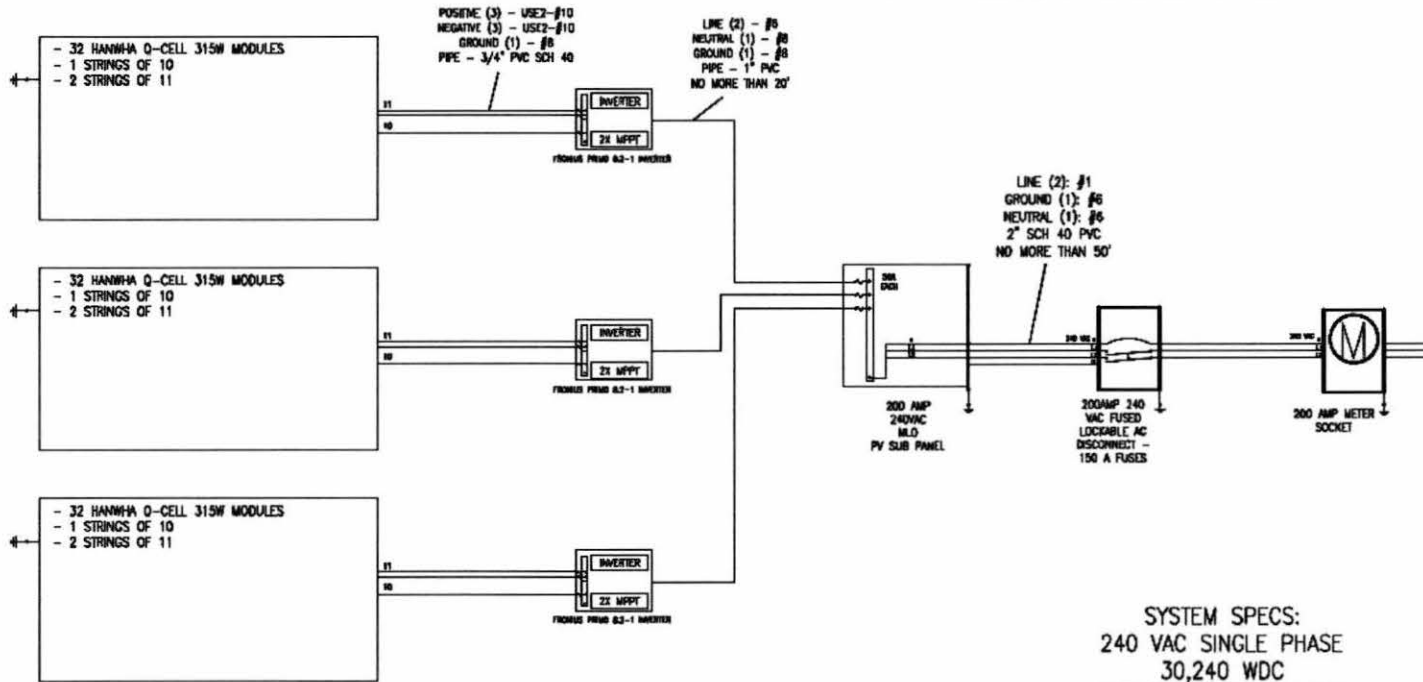
WIRE COLOR CODING • <small>UNLESS OTHERWISE SPECIFIED</small>	• WIRE RATINGS • <small>WIRE MUST BE SIZED ACCORDING TO CURRENT LIMITING DEVICE OR COMPONENT CURRENT RATING</small>	<b>HARVEST ENERGY SOLUTIONS</b>																																										
<table border="0" style="font-size: small;"> <tr><td>BLACK</td><td>HIGH VOLTAGE LINE AND LOAD</td></tr> <tr><td>RED</td><td>HIGH VOLTAGE LINE AND LOAD</td></tr> <tr><td>WHITE</td><td>A.C. NEUTRAL</td></tr> <tr><td>YELLOW</td><td>HIGH VOLTAGE LINE AND LOAD</td></tr> <tr><td>GREEN W/YELLOW</td><td>SAFETY GROUND</td></tr> <tr><td>BLUE</td><td>D.C. VOLTAGE</td></tr> <tr><td>BLUE W/WHITE</td><td>D.C. RETURN</td></tr> <tr><td>ORANGE</td><td>SHIELDED CABLES</td></tr> <tr><td>PURPLE</td><td>OPTICAL</td></tr> <tr><td>ALL OTHERS</td><td>SHOULD BE USED IN SHIELDED CABLES</td></tr> </table>	BLACK	HIGH VOLTAGE LINE AND LOAD	RED	HIGH VOLTAGE LINE AND LOAD	WHITE	A.C. NEUTRAL	YELLOW	HIGH VOLTAGE LINE AND LOAD	GREEN W/YELLOW	SAFETY GROUND	BLUE	D.C. VOLTAGE	BLUE W/WHITE	D.C. RETURN	ORANGE	SHIELDED CABLES	PURPLE	OPTICAL	ALL OTHERS	SHOULD BE USED IN SHIELDED CABLES	<table border="0" style="font-size: small;"> <tr><th colspan="2">RATINGS FOR COPPER</th></tr> <tr><th>THAN OR AWG WIRE</th><th></th></tr> <tr><td>1/2" - 1/4"</td><td>10 AWG - 30 AMPS</td></tr> <tr><td>3/8" - 1/2"</td><td>8 AWG - 40 AMPS</td></tr> <tr><td>1/2" - 5/8"</td><td>6 AWG - 55 AMPS</td></tr> <tr><td>5/8" - 3/4"</td><td>4 AWG - 75 AMPS</td></tr> <tr><td>3/4" - 7/8"</td><td>3 AWG - 100 AMPS</td></tr> <tr><td>7/8" - 1"</td><td>2 AWG - 125 AMPS</td></tr> <tr><td>1" - 1 1/8"</td><td>1 AWG - 175 AMPS</td></tr> <tr><td>1 1/8" - 1 1/2"</td><td>3/4" - 225 AMPS</td></tr> <tr><td>1 1/2" - 1 3/4"</td><td>5/8" - 300 AMPS</td></tr> </table>	RATINGS FOR COPPER		THAN OR AWG WIRE		1/2" - 1/4"	10 AWG - 30 AMPS	3/8" - 1/2"	8 AWG - 40 AMPS	1/2" - 5/8"	6 AWG - 55 AMPS	5/8" - 3/4"	4 AWG - 75 AMPS	3/4" - 7/8"	3 AWG - 100 AMPS	7/8" - 1"	2 AWG - 125 AMPS	1" - 1 1/8"	1 AWG - 175 AMPS	1 1/8" - 1 1/2"	3/4" - 225 AMPS	1 1/2" - 1 3/4"	5/8" - 300 AMPS	JACKSON, MICHIGAN BIG RIVER ELECTRIC CORPORATION KENERGY HENDERSON OFFICE 30.24 KW SOLAR POWER ONE-LINE DIAGRAM V2949
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# Big Rivers Electric Corporation

## Kenergy - Owensboro Solar Array Education and Demonstration Project

November 2016

### 30.24 KW DC SOLAR GENERATOR ONE-LINE DIAGRAM



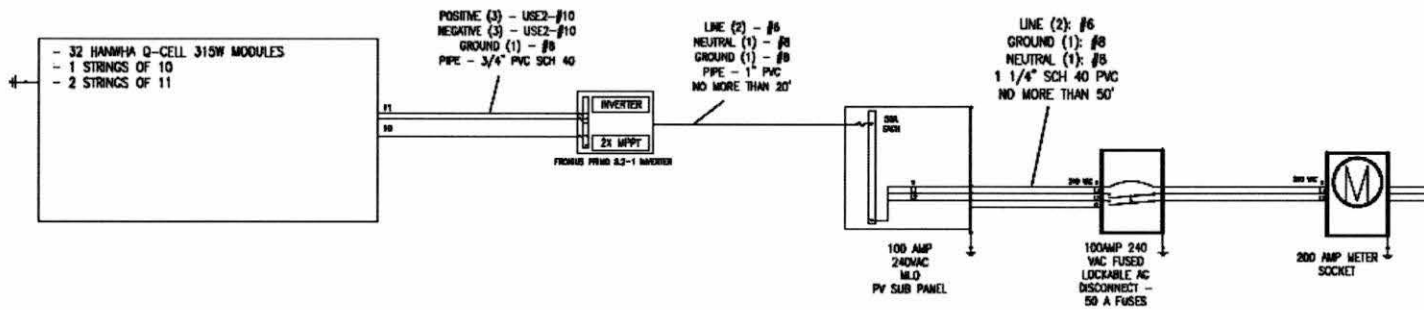
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6. THIS DRAWING IS FOR REFERENCE.
7. VARIATIONS MAY BE MADE IN ACCORDANCE WITH NEC GUIDELINES

**SYSTEM SPECS:**  
 240 VAC SINGLE PHASE  
 30,240 WDC  
 127.875 AMPS MAXIMUM  
 96 - HANWHA Q-CELL 315W PANEL  
 3 - FRONIUS PRIMO 8.2-1

WIRE COLOR CODING*	WIRE RATINGS*	HARVEST ENERGY SOLUTIONS
<small>NEC 690.41(A) (1) (2) (3) (4) (5) (6) (7) (8) (9) (10) (11) (12) (13) (14) (15) (16) (17) (18) (19) (20) (21) (22) (23) (24) (25) (26) (27) (28) (29) (30) (31) (32) (33) (34) (35) (36) (37) (38) (39) (40) (41) (42) (43) (44) (45) (46) (47) (48) (49) (50) (51) (52) (53) (54) (55) (56) (57) (58) (59) (60) (61) (62) (63) (64) (65) (66) (67) (68) (69) (70) (71) (72) (73) (74) (75) (76) (77) (78) (79) (80) (81) (82) (83) (84) (85) (86) (87) (88) (89) (90) (91) (92) (93) (94) (95) (96) (97) (98) (99) (100)</small> BLACK HIGH VOLTAGE LINE AND LOAD RED HIGH VOLTAGE LINE AND LOAD WHITE A.C. NEUTRAL YELLOW LOW VOLTAGE LINE AND LOAD GREEN/YELLOW DATA GROUND BLUE S.C. VOLTAGE BLUE/WHITE S.C. RETURN GREEN SHIELDED CABLES GREY OPTICAL FIBER ALL WIRE SHOULD BE RUN IN SHIELDED CABLES	<small>NEC 690.41(A) (1) (2) (3) (4) (5) (6) (7) (8) (9) (10) (11) (12) (13) (14) (15) (16) (17) (18) (19) (20) (21) (22) (23) (24) (25) (26) (27) (28) (29) (30) (31) (32) (33) (34) (35) (36) (37) (38) (39) (40) (41) (42) (43) (44) (45) (46) (47) (48) (49) (50) (51) (52) (53) (54) (55) (56) (57) (58) (59) (60) (61) (62) (63) (64) (65) (66) (67) (68) (69) (70) (71) (72) (73) (74) (75) (76) (77) (78) (79) (80) (81) (82) (83) (84) (85) (86) (87) (88) (89) (90) (91) (92) (93) (94) (95) (96) (97) (98) (99) (100)</small> * WIRE MUST BE SIZED ACCORDING TO CURRENT LIMITING DEVICE OR COMPONENT CURRENT RATING RATINGS FOR COPPER THIN OR MFTV WIRE 1/2" AWG - 20 AMPS 3/4" AWG - 25 AMPS 1" AWG - 30 AMPS 1 1/4" AWG - 35 AMPS 1 1/2" AWG - 40 AMPS 2" AWG - 50 AMPS 2 1/2" AWG - 60 AMPS 3" AWG - 75 AMPS 3 1/2" AWG - 85 AMPS 4" AWG - 100 AMPS	JACKSON, MICHIGAN BIG RIVER ELECTRIC CORPORATION KENERGY OWENSBORO OFFICE <b>30.24KW SOLAR POWER ONE-LINE DIAGRAM</b> V2949

**Big Rivers Electric Corporation**  
**Livingston County Solar Array Education and Demonstration Project**  
**November 2016**

**10.08 KW DC SOLAR GENERATOR ONE-LINE DIAGRAM**



- EQUIPMENT SHALL BE INSTALLED IN ACCORDANCE WITH NEC ARTICLE 705.
- PROVIDE WARNING SIGN PER NEC 690-17 READING "WARNING-ELECTRIC SHOCK HAZARD-DO NOT TOUCH TERMINALS - TERMINALS ON BOTH THE LINE AND LOAD MAY BE ENERGIZED IN THE OFF POSITION".
- LABEL "SOLAR POWER SYSTEM DEDICATED KW-HR METER", OPTIONAL.
- LABEL SWITCH AS "PV GENERATOR SAFETY DISCONNECT SWITCH".
- USE APPROPRIATE WIRE GAUGE IF RUN FROM DISCONNECT TO INVERTER TO HOME IS > 200FT
- THIS DRAWING IS FOR REFERENCE
- VARIATIONS MAY BE MADE IN ACCORDANCE WITH NEC GUIDELINES

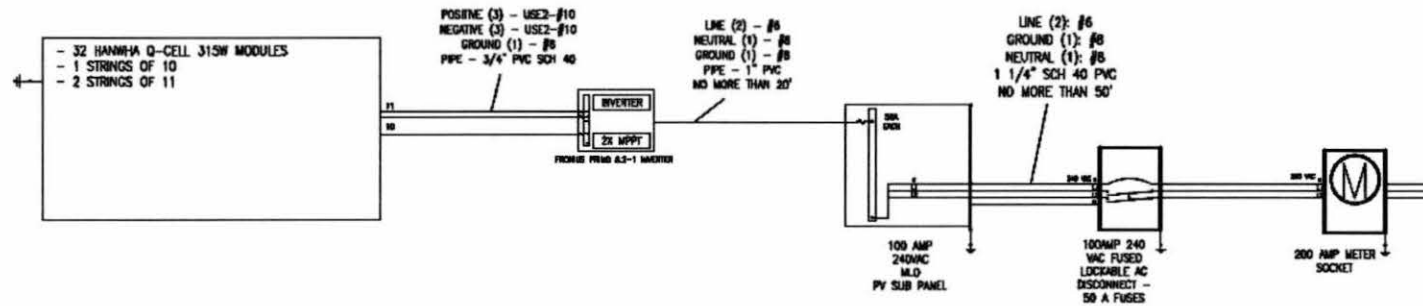
**SYSTEM SPECS:**  
 240 VAC SINGLE PHASE  
 10,080 WDC  
 42.625 AMPS MAXIMUM  
 32 - HANWHA Q-CELL 315W PANEL  
 1 - FRONIUS PRIMO 8.2-1

<b>WIRE COLOR CODING</b> <small>UNLESS OTHERWISE NOTED</small>		<b>WIRE RATINGS</b> <small>WIRE MUST BE SIZED ACCORDING TO CURRENT LIMITING RANGES OR COMPONENT CURRENT RATING</small>	
BLACK	NEW VOLTAGE LINE AND LOAD	<small>NOTICE: THIS GRAPHIC MAY INCLUDE UNAPPLICABLE PRO- PERMITS SPECIFIC CONDUCTOR BY SUBJECT JURISDICTION AND AS SUCH IS NOT TO BE CONSIDERED UNAPPLICABLE, COLORED OR USED IN ANY WAY OR FORM WITHOUT PRIOR WRITTEN AUTHORIZATION FROM HARVEST ENERGY SOLUTIONS</small>	<small>RATINGS FOR COPPER THAN OR METAL WIRE</small> 150 AMP - 200 AMP (1) AWG - 20 AMP 100 AMP - 150 AMP (2) AWG - 20 AMP 75 AMP - 100 AMP (3) AWG - 20 AMP 60 AMP - 75 AMP (4) AWG - 20 AMP 50 AMP - 60 AMP (5) AWG - 20 AMP 40 AMP - 50 AMP (6) AWG - 20 AMP
RED	NEW VOLTAGE LINE AND LOAD		
WHITE	A.C. NEUTRAL		
YELLOW	NEW VOLTAGE LINE AND LOAD		
GREEN w/YELLOW	DC/AC GROUNDING		
BLUE	D.C. VOLTAGE		
BLUE w/WHITE	D.C. RETURN		
ORANGE	SHIELDER CABLES		
ALL OTHERS	ALL OTHERS SHOULD BE RUN IN SHIELDED CABLES		

**HARVEST ENERGY SOLUTIONS**  
 JACKSON, MISSISSIPPI  
 01/27/2016 RTS LAG  
 BIG RIVER ELECTRIC CORPORATION  
 LIVINGSTON COUNTY MIDDLE SCHOOL  
 10.08 KW SOLAR POWER ONE-LINE DIAGRAM  
 V2949 1 1 V2949-2A

# Big Rivers Electric Corporation McCracken County Solar Array Education and Demonstration Project November 2016

## 10.08 KW DC SOLAR GENERATOR ONE-LINE DIAGRAM



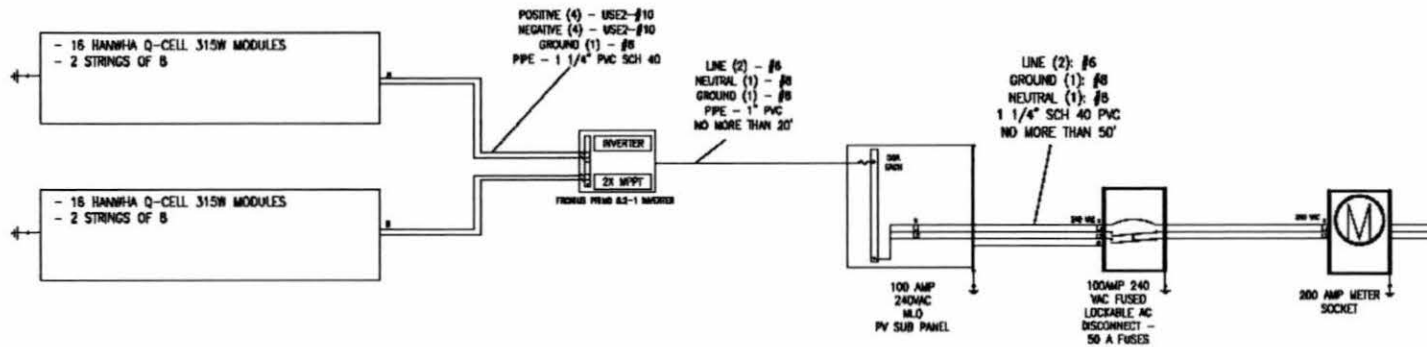
1. EQUIPMENT SHALL BE INSTALLED IN ACCORDANCE WITH NEC ARTICLE 705.
2. PROVIDE WARNING SIGN PER NEC 690-17 READING "WARNING-ELECTRIC SHOCK HAZARD-DO NOT TOUCH TERMINALS - TERMINALS ON BOTH THE LINE AND LOAD MAY BE ENERGIZED IN THE OFF POSITION".
3. LABEL "SOLAR POWER SYSTEM DEDICATED KW-HR METER", OPTIONAL.
4. LABEL SWITCH AS "PV GENERATOR SAFETY DISCONNECT SWITCH".
5. USE APPROPRIATE WIRE GAUGE IF RUN FROM DISCONNECT TO INVERTER TO HOME IS > 200FT
6. THIS DRAWING IS FOR REFERENCE
7. VARIATIONS MAY BE MADE IN ACCORDANCE WITH NEC GUIDELINES

**SYSTEM SPECS:**  
240 VAC SINGLE PHASE  
10,080 WDC  
42.625 AMPS MAXIMUM  
32 - HANWHA Q-CELL 315W PANEL  
1 - FRONIUS PRIMO 8.2-1

WIRE COLOR CODING	WIRE RATINGS	HARVEST ENERGY SOLUTIONS
<p><b>UNLESS OTHERWISE SPECIFIED:</b></p> <p>BLACK HIGH VOLTAGE LINE AND LOAD</p> <p>RED HIGH VOLTAGE LINE AND LOAD</p> <p>WHITE A.C. NEUTRAL</p> <p>YELLOW BOTH VOLTAGE LINE AND LOAD</p> <p>GREEN/YELLOW GROUND</p> <p>BLUE D.C. VOLTAGE</p> <p>BLACK/WHITE D.C. RETURN</p> <p>GRAY SHIELDED CABLES</p> <p>ORANGE JUNCTION</p> <p>ALL AMPERE RATINGS TO BE RUN IN SHIELDED CABLE</p>	<p><b>WIRE MUST BE SIZED ACCORDING TO CURRENT LIMITING DEVICE OR COMPONENT CURRENT RATING</b></p> <p><b>NOTICE THIS DRAWING MAY BE SUBJECT TO CHANGE WITHOUT NOTICE. CONTACT THE DESIGNER FOR ANY CHANGES TO BE MADE TO THIS DRAWING.</b></p> <p><b>REPRODUCED, COPIED OR USED IN ANY WAY FOR ANY PURPOSE WITHOUT THE WRITTEN PERMISSION OF HARVEST ENERGY SOLUTIONS</b></p>	<p>JACKSON, MICHIGAN</p> <p>DATE OF ISSUE: 11/10/16</p> <p>BY: [Signature]</p> <p>PROJECT: MCCracken HIGH SCHOOL</p> <p>DESCRIPTION: 10.08 KW SOLAR POWER ONE-LINE DIAGRAM</p> <p>REV: V2949</p>

**Big Rivers Electric Corporation**  
**Marshall County Solar Array Education and Demonstration Project**  
**November 2016**

**10.08 KW DC SOLAR GENERATOR ONE-LINE DIAGRAM**



- EQUIPMENT SHALL BE INSTALLED IN ACCORDANCE WITH NEC ARTICLE 705.
- PROVIDE WARNING SIGN PER NEC 690-17 READING "WARNING-ELECTRIC SHOCK HAZARD-DO NOT TOUCH TERMINALS - TERMINALS ON BOTH THE LINE AND LOAD MAY BE ENERGIZED IN THE OFF POSITION".
- LABEL "SOLAR POWER SYSTEM DEDICATED KW-HR METER", OPTIONAL.
- LABEL SWITCH AS "PV GENERATOR SAFETY DISCONNECT SWITCH".
- USE APPROPRIATE WIRE GAUGE IF RUN FROM DISCONNECT TO INVERTER TO HOME IS > 200FT
- THIS DRAWING IS FOR REFERENCE
- VARIATIONS MAY BE MADE IN ACCORDANCE WITH NEC GUIDELINES

**SYSTEM SPECS:**  
 240 VAC SINGLE PHASE  
 10,080 WDC  
 42.625 AMPS MAXIMUM  
 32 - HANWHA Q-CELL 315W PANEL  
 1 - FRONIUS PRIMO 8.2-1

WIRE COLOR CODING • SIZES, INSULATION, SECTIONS		• WIRE RATINGS • WIRE MUST BE SIZED ACCORDING TO CURRENT CARRYING CAPACITY OR COMPONENT CURRENT RATING		HARVEST ENERGY SOLUTIONS JACKSON, MISSISSIPPI	
BLACK	IEEE VOLTAGE LINE AND LOAD	NOTE: THIS DRAWING MAY INCLUDE CAPACITATED PPE FORWARD SPECIAL CONDUITS BY SCHEDULE 50 AND AS SPECIFIED OTHERWISE IN SPECIFICATIONS. (SEE 10.08 KW DC SOLAR POWER ONE-LINE DIAGRAM FOR MORE DETAILS.)	RATINGS FOR COPPER THIN OR NEW WDC	DATE	PROJECT #
RED	IEEE VOLTAGE LINE AND LOAD		1/2" - 150 AMPS	10/27/2016	RTS 1124
WHITE	A.C. NEUTRAL		3/4" - 100 AMPS	BIG RIVER ELECTRIC CORPORATION	
YELLOW	IEEE VOLTAGE LINE AND LOAD		1" - 75 AMPS	10.08 KW SOLAR POWER ONE-LINE DIAGRAM	
GREEN #/YELLOW	IEEE VOLTAGE LINE AND LOAD		1 1/4" - 50 AMPS	DRAWN BY: MIKE MILLER PARK	
BLUE	D.C. VOLTAGE		2" - 25 AMPS	DATE: 10.08 KW SOLAR POWER ONE-LINE DIAGRAM	
BLUE #/WHITE	D.C. NEUTRAL		2 1/2" - 20 AMPS	BY: V2949	
GRAY	SHIELDED CABLES		3" - 15 AMPS	DATE: 11/1/16	
ORANGE	GROUND		3 1/2" - 10 AMPS	PROJECT # V2949-2B	
COLORS					
ALL WIRELESS SHOULD BE RUN IN SHIELDED CABLES					