AEUG Madison Solar, LLC
Kentucky State Board on Electric Generation and Transmission Siting Application

Application Documents
Volume I
Case No. 2020-00219

December 2020

Madison Solar Project:

Kentucky State Board on Electric Generation and Transmission Siting Application

DECEMBER 2020

PREPARED FOR

AEUG Madison Solar, LLC

PREPARED BY

SWCA Environmental Consultants

MADISON SOLAR PROJECT:
KENTUCKY STATE BOARD ON ELECTRIC GENERATION AND TRANSMISSION SITING APPLICATION

Prepared for

AEUG Madison Solar, LLC
55 E. Monroe Street, Suite 1925
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SWCA Project No. 62236

December 2020

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1 APPLICANT INFORMATION

REQUIREMENT: *per KRS 278.706 (2)(a); The name, address, and telephone number of the person proposing to construct and own the merchant electric generating facility*

COMPLIANCE: Please see below for the requested information.

AEUG Madison Solar, LLC
Attn: Mark Randall, Senior Project Development Manager
55 E. Monroe Street, Suite 1925
Chicago, Illinois 60603
(312) 673-3000

2 DESCRIPTION OF PROPOSED SITE

REQUIREMENT: *per KRS 278.706 (2)(b); A full description of the proposed site, including a map showing the distance of the proposed site from residential neighborhoods, the nearest residential structures, schools, and public and private parks that are located within a two (2) mile radius of the proposed facility*

COMPLIANCE: AEUG Madison Solar, LLC (AEUG Madison Solar) proposes to develop the 100-megawatt (MW) photovoltaic (PV) Madison Solar Project (Project) in Madison County, Kentucky (see Appendix A). The Project would be built on portions of approximately 1,770 acres (Project Area). The majority (81.01%) of the Project Area currently is in agricultural use (U.S. Geological Survey 2016) (Table 1).

Table 1. Land Cover Types in the Madison Solar Project Area

Land Cover Class	Acres	Percentage of Project Area
Pasture/Hay	1,434.44	81.01
Cultivated Crops	31.58	1.78
Deciduous Forest	136.99	7.74
Mixed Forest	86.51	4.89
Shrub/Scrub	5.11	0.29
Developed, Open Space	25.35	1.43
Open Water	1.11	0.06
Grassland/Herbaceous	19.12	1.08
Emergent Herbaceous Wetlands	0.22	0.01
Developed, Low Intensity	5.34	0.30
Barren Land	13.57	0.77
Evergreen Forest	11.34	0.64
Total	**1,770.71**	**100.00**

Source: U.S. Geological Survey (2016)

The Project Area is located between the towns of Richmond and Ford in Madison County. It is roughly bounded by the intersection of State Highways 388 and 627 in the north, Dr. Robert R. Martin Bypass on the south, State Highway 388 on the east, and U.S. Highway 75 on the west. The topography in the area consists of a series of gently to moderately rolling hills and swales. Land use is primarily pasture and agricultural, with no large, forested areas except outside of the 2-mile buffer area in and around the state park. Tree lines typically occur at parcel boundaries, in riparian zones, and along roadways. Scattered rural residential development, commercial and retail businesses, communication facilities, and vehicular transportation networks are all present within the Project Area. A map showing the locations of residential structures, residential neighborhoods, schools, and public and private parks relative to the proposed Project Area is provided in Appendix A.

Based on the preliminary design, the Project will consist of the following components: solar panels with an approximate maximum height of 6 feet; inverters; racking system; associated wiring and balance of system; substation; warehouse; and operations and maintenance (O&M) building. The Project racking system, which affixes the solar panels to the ground, has a relatively small footprint and does not require concrete. The power generated by the Project will be linked to the electric transmission grid via the Three Forks-Dale 138-kilovolt (kV) line.

AEUG Madison Solar will secure the Project perimeter using 6-foot-high chain link fencing topped by barbed wire and meeting National Electrical Safety Code requirements. Project entrance gates are anticipated to be approximately 8 feet high and 12 feet wide to allow for emergency and maintenance access. A map showing the locations of residential structures, schools, and public and private parks relative to the proposed Project location can be found in Appendix A.

3 PUBLIC NOTICE EVIDENCE

REQUIREMENT: *per KRS 278.706 (2)(c); Evidence of public notice that shall include the location of the proposed site and a general description of the project, state that the proposed construction is subject to approval by the board, and provide the telephone number and address of the Public Service Commission. Public notice shall be given within thirty (30) days immediately preceding the application filing to:*

1. *Landowners whose property borders the proposed site; and*
2. *The general public in a newspaper of general circulation in the county or municipality in which the facility is proposed to be located*

COMPLIANCE: AEUG Madison Solar, LLC sent letters to 162 adjoining property owners on December 7, 2020, and posted the following notice in the *Richmond Register* on December 8, 2020:

NOTICE OF APPLICATION AEUG

AEUG Madison Solar, LLC, is proposing to construct and operate a 100-megawatt AC solar energy project located south of Lost Fork Road (KY 3377), primarily north of Three Forks Road, east of Interstate 75, and primarily west of Red House Road (KY 388) between Old Convict Road and Kentucky Route 32 in Madison County, Kentucky. The proposed Madison Solar Project will consist of about 1,100 acres of solar PV panels and associated racking, inverters, and a project substation transformer.

AEUG Madison Solar, LLC is required to file an application for construction and operation of the proposed facility. This application is subject to the approval of the Kentucky State Siting Board on Electric Generation and Transmission Siting, which can be reached at P.O. Box 615, 211 Sower Boulevard, Frankfort, Kentucky 40602-0615, or via phone at (502) 564-3940.

A person who wishes to become a party to a proceeding before the board may, by written motion filed no later than thirty (30) days after the application has been submitted, request leave to intervene. A party may, upon written motion filed no later than thirty (30) days after an application has been filed, request the board to schedule an evidentiary hearing at the offices of the Public Service Commission, 211 Sower Boulevard, Frankfort, Kentucky 40602-0615.

A request for a local public hearing or local public information meeting shall be made by at least three (3) interested persons who reside in the county or municipal corporation in which the pipeline, plant, or transmission line is proposed to be located. The request shall be made in writing and shall be filed within thirty (30) days following the filing of a completed application. Any questions related to the application or its process may be directed to the Kentucky State Board on Electric Generation and Transmission Siting Board (Siting Board), which can be reached at P.O. Box 615, 211 Sower Boulevard, Frankfort, Kentucky 40602-0615, or via phone at (502) 564-3940.

A sample of the letter sent to neighboring landowners, a list of the recipients, and an affidavit of publication are provided in Appendix B.

4 COMPLIANCE WITH LOCAL ORDINANCES AND REGULATIONS

REQUIREMENT: *per KRS 278.706 (2)(d); A statement certifying that the proposed plant will be in compliance with all local ordinances and regulations concerning noise control and with any local planning and zoning ordinances. The statement shall also disclose setback requirements established by the planning and zoning commission as provided under KRS 278.704(3)*

COMPLIANCE:

The Project is located in Madison County. In July 2020 the Madison County Fiscal Court enacted Ordinance 20-17 requiring Commercial Solar Energy Facilities proposed on agricultural zoned land to apply for and receive a Conditional Use Permit (CUP) prior to the start of construction. AEUG Madison Solar applied for the required CUP on August 6, 2020 and received approval by the Board of Adjustments on Thursday December 3rd, 2020.

The Madison County Board of Adjustments issued a CUP to AEUG Madison Solar on December 7, 2020. The CUP includes 20 conditions that address local issues such as signage, lighting, fencing, decommissioning, and setbacks. The CUP established setbacks of 200 feet from the center of any road; 200 feet between the solar facility (including fencing, panels, structures and related equipment) and any adjacent nonparticipating property; and 200 feet between the solar facility and any adjacent property which contains a residence. A copy of the CUP is included in Appendix D.

AEUG Madison Solar certifies that the Project will follow all local ordinances and regulations concerning noise control, and with any applicable local planning and zoning ordinances. A statement certifying these facts is submitted as Appendix D.

5 SETBACK REQUIREMENTS

REQUIREMENT: *per KRS 278.706 (2)(e); If the facility is not proposed to be located on a site of a former coal processing plant and the facility will use on-site waste coal as a fuel source or in an area where a planning and zoning commission has established a setback requirement pursuant to KRS*

278.704(3), a statement that the exhaust stack of the proposed facility and any wind turbine is at least one thousand (1,000) feet from the property boundary of any adjoining property owner and all proposed structures or facilities used for generation of electricity are two thousand (2,000) feet from any residential neighborhood, school, hospital, or nursing home facility, unless facilities capable of generating ten megawatts (10MW) or more currently exist on the site. If the facility is proposed to be located on a site of a former coal processing plant and the facility will use on-site waste coal as a fuel source, a statement that the proposed site is compatible with the setback requirements provided under KRS 278.704(5). If the facility is proposed to be located in a jurisdiction that has established setback requirements pursuant to KRS 278.704(3), a statement that the proposed site is in compliance with those established setback requirements:

COMPLIANCE:

The Project is not proposed to be located on the site of a former coal processing plant, nor will it use any waste coal as a fuel source. No existing electricity generating facilities are on-site at the Project location. Madison County has established setback requirements for this location, per the information provided in Section 4.

The Project will not include any exhaust stacks or wind turbines as part of the facility; therefore, there are no established setback requirements from the property boundary of any adjoining property owner to the energy generating facilities.

KRS 278.704(3) states:

> If the merchant electric generating facility is proposed to be located in a county or a municipality with planning and zoning, then setback requirements from a property boundary, residential neighborhood, school, hospital, or nursing home facility may be established by the planning and zoning commission. Any setback established by a planning and zoning commission for a facility in an area over which it has jurisdiction shall
>
> (a) Have primacy over the setback requirement in subsections (2) and (5) of this section; and
>
> (b) Not be subject to modification or waiver by the board through a request for deviation by the applicant, as provided in subsection (4) of this section.

The Project is within the jurisdiction of the Madison County Planning Commission and has specific setback requirements set by the CUP, which is attached as Appendix D. Accordingly, the setback requirements identified in KRS 278.704(2) and KRS 278.706(2)(e) do not apply to this Project. The setbacks established by the CUP require the facility to be at least 200 feet from the center of the road, nonparticipating properties, and any adjacent property owner which contains a residence. The Project will comply with those setback requirements over which Madison County has primacy. As such, no motion for deviation is required.

6 PUBLIC INVOLVEMENT REPORT

REQUIREMENT: *per KRS 278.706 (2)(f); A complete report of the applicant's public involvement program activities undertaken prior to the filing of the application, including:*

1. *The scheduling and conducting of a public meeting in the county or counties in which the proposed facility will be constructed at least ninety (90) days prior to the filing of an application,*

for the purpose of informing the public of the project being considered and receiving comment on it;

2. *Evidence that notice of the time, subject, and location of the meeting was published in the newspaper of general circulation in the county, and that individual notice was mailed to all owners of property adjoining the proposed project at least two (2) weeks prior to the meeting; and*
3. *Any use of media coverage, direct mailing, fliers, newsletters, additional public meetings, establishment of a community advisory group, and any other efforts to obtain local involvement in the siting process*

COMPLIANCE: AEUG Madison Solar has been active in the Project Area since March 2020. During that time AEUG Madison Solar has met with landowners, stakeholders, and local government officials about the proposed 100-MW solar power project just north of Richmond.

A public meeting was held from 6:00 p.m. to 8:00 p.m. on August 6, 2020, to inform the public about the Project and receive comments from the public. Due to the ongoing global pandemic, this meeting was conducted in compliance with guidance from the U.S. Centers for Disease Control and Prevention and guidelines from the Office of the Governor intended to reduce the potential spread of COVID-19. Attendance at this meeting was limited to no more than 25 people and preregistration was required. Per the executive order of the governor, all in-person attendees were required to correctly wear masks that would potentially prevent the spread of illness. Attendees were asked to practice social distancing for the duration of the meeting. Hand sanitizer and masks were available on-site for attendees. AEUG Madison Solar provided a large-scale (24 × 36 inches) layout map of the proposed solar facility, which otherwise would have been made available to the public for inspection at a public meeting, available to the public by displaying the map in the entrance to the Madison County Public Library the day of the public meeting. Due to the extraordinary circumstances of this time, the meeting was also made available for public participation through a digital "virtual" meeting with online and call-in options. The meeting was also held and in compliance with the Siting Board's Order of July 15, 2020, prescribing the form of the meeting.

The in-person meeting was held at the Madison County Public Library Community Meeting Room #013, which is located at 507 West Main Street in Richmond, close to the Project site. Approximately 27 people participated in the public meeting virtually and seven participated in person. In addition to the presentation, provided in Appendix C, the discussion included environmental constraints, the permitting process at the state and local level, interconnection studies, impacts to local electric bills, impacts to the local tax base, decommissioning, and the history of the company with other operating solar projects.

A notice announcing the public meeting was printed in the *Richmond Register* on July 21, 2020. AEUG Madison Solar, LLC also mailed letters to all adjoining landowners notifying them of the public meeting. An affidavit of this notice and a copy of the information packet sent to neighboring landowners is included in Appendix C.

In addition to the public meeting, AEUG Madison Solar held a virtual community meeting on Monday August 3, 2020. This meeting was held virtually out of an abundance of caution due to the COVID-19 situation. Neighbors were invited to pick up dinner at a Drive-Thru BBQ between 5:30 and 6:30 p.m., followed by an online virtual presentation about the Project at 7:00 p.m. The dinner was catered by Smokin' Jax and was well attended with over 30 dinners distributed and approximately 30 participants attending the online virtual presentation. The presentations given by AEUG Madison Solar at the public meeting and the community meeting are also included in Appendix C.

The CUP required by Madison County has further enhanced public involvement in the Project Area. Since submitting the CUP application on August 6, 2020, AEUG Madison Solar has been present at four public meetings before the Madison County Board of Adjustments. The application process included a public notice via posting signage at participating landowners' properties. Additionally, AEUG Madison Solar has proactively engaged concerned citizens and additional requests from the Board of Adjustments by offering supplemental Project information, including information on the development and operation of commercial-scale solar projects. In some cases, AEUG Madison Solar has even addressed the community's concerns by amending its Project design/layout.

7 EFFORTS TO LOCATE NEAR EXISTING ELECTRIC GENERATION

REQUIREMENT: *per KRS 278.706 (2)(g); A summary of the efforts made by the applicant to locate the proposed facility on a site where existing electric generating facilities are located;*

COMPLIANCE: It is difficult to find an existing generation site with enough land available to install a large utility-scale solar facility. Therefore, AEUG Madison Solar sited the Project near the existing Three Forks-Dale 138-kV line. AEUG Madison Solar will be responsible for building a new interconnection to this line as described in the System Impact Study provided in Appendix F.

8 PROOF OF SERVICE TO COUNTY AND MUNICIPALITY OFFICIALS

REQUIREMENT: *per KRS 278.706 (2)(h); Proof of service of a copy of the application upon the chief executive officer of each county and municipal corporation in which the proposed facility is to be located, and upon the chief officer of each public agency charged with the duty of planning land use in the jurisdiction in which the facility is proposed to be located;*

COMPLIANCE: As indicated in the Certificate of Service, a copy of the Siting Board application for AEUG Madison Solar, was electronically transmitted to the Judge-Executive of Madison County, Reagan Taylor, on the date of the electronic filing of this application. Additionally, a paper copy will be mailed to him.

9 EFFECT ON KENTUCKY ELECTRICITY GENERATION SYSTEM

REQUIREMENT: *per KRS 278.706 (2)(i); An analysis of the proposed facility's projected effect on the electricity transmission system in Kentucky;*

COMPLIANCE: The proposed Project is located within the Pennsylvania, Jersey, Maryland Power Pool (PJM) territory. The PJM is the Regional Transmission Organization for several states, including portions of Kentucky. The PJM therefore is managing the Project interconnection in coordination with Eastern Kentucky Power Cooperative (EKPC), which owns the Three Forks-Dale 138-kV line to which the Project would interconnect.

PJM's interconnection study process is composed of three parts: 1) Feasibility Study dated July 2019, 2) System Impact Study dated February 2020, and 3) Facilities Study. The Feasibility Study has been

completed for the Project. The final Feasibility Study report was issued to Tenaska Solar VIII, LLC the previous owner of the Project, and is provided herein as Appendix E. The System Impact Study also has been completed for the Project. The final System Impact study report is dated February 2020 and is provided herein as Appendix F. The Facilities Study currently is in progress, and a final report is anticipated to be issued in April 2021.

10 EFFECT ON LOCAL AND REGIONAL ECONOMIES

REQUIREMENT: *per KRS 278.706 (2)(j); An analysis of the proposed facility's economic impact on the affected region and the state;*

COMPLIANCE: Please see Appendix G, Economic Impact Report. Pages 1 and 2 of the Economic Impact Report summarize the following economic and land use impacts of the Project.

Jobs - all jobs numbers are full-time equivalents

- 160 new local jobs during construction for Madison County
- 394 new local jobs during construction for the Commonwealth of Kentucky
- Over 10.4 new local long-term jobs for Madison County
- Over 12.8 new local long-term jobs for the Commonwealth of Kentucky

Earnings

- Over $13.2 million in new local earnings during construction for Madison County
- Over $27.8 million in new local earnings during construction for the Commonwealth of Kentucky
- Over $425 thousand in new local long-term earnings for Madison County annually
- Over $798 thousand in new local long-term earnings for the Commonwealth of Kentucky annually

Output

- Over $19.5 million in new local output during construction for Madison County
- Over $44.8 million in new local output during construction for the Commonwealth of Kentucky
- Over $1 million in new local long-term output for Madison County annually
- Over $1.6 million in new local long-term output for the Commonwealth of Kentucky annually

Property Taxes

- Over $6.6 million in property taxes in total over the life of the Project

Using a real-options analysis, the land use value of solar leasing far exceeds the value for agricultural use.

Madison County:

- The price of corn would need to rise to $14.25 per bushel or yields for corn would need to rise to 274 bushels per acre by the year 2052 for corn farming to generate more income for the landowner and local community than the solar lease.

- Alternatively, the price of soybeans would need to rise to $48.69 per bushel or yields for soybeans would need to rise to 90.4 bushels per acre by the year 2052 for soybean farming to generate more income for the landowner and local community than the solar lease.
- The price of hay would need to rise to $696.28 per ton or yields for hay would need to rise to 5.9 tons per acre by the year 2052 for hay farming to generate more income for the landowner and local community than the solar lease.
- At this time of this report, corn, soybean, and hay prices are $4.10 per bushel, $9.10 per bushel, and $150 per ton, respectively, and yields are 140 bushels per acre, 30 bushels per acre, and 2.3 tons per acre, respectively.

11 RECORD OF ENVIRONMENTAL VIOLATIONS

REQUIREMENT: *per KRS 278.706 (2)(k); A detailed listing of all violations by it, or any person with an ownership interest, of federal or state environmental laws, rules, or administrative regulations, whether judicial or administrative, where violations have resulted in criminal convictions or civil or administrative fines exceeding five thousand dollars ($5,000). The status of any pending action, whether judicial or administrative, shall also be submitted;*

COMPLIANCE: Neither AEUG Madison Solar, which is the Applicant and sole owner of the Project, nor Acciona Energy USA Global LLC, which is the parent and sole owner of AEUG Madison Solar, has violated any state or federal environmental laws or regulations. Likewise, there are no such pending actions against AEUG Madison Solar or Acciona Energy USA Global LLC.

12 SITE ASSESSMENT REPORT

REQUIREMENT: *per KRS 278.706 (2)(l); A site assessment report as specified in KRS 278.708. The applicant may submit and the board may accept documentation of compliance with the National Environmental Policy Act (NEPA) rather than a site assessment report.*

COMPLIANCE: The Site Assessment Report is being contemporaneously filed herewith. Please see the separate document titled “Madison County Kentucky Solar: Site Assessment Report” and labeled as Appendix H.

13 REFERENCES

U.S. Geological Survey. 2016

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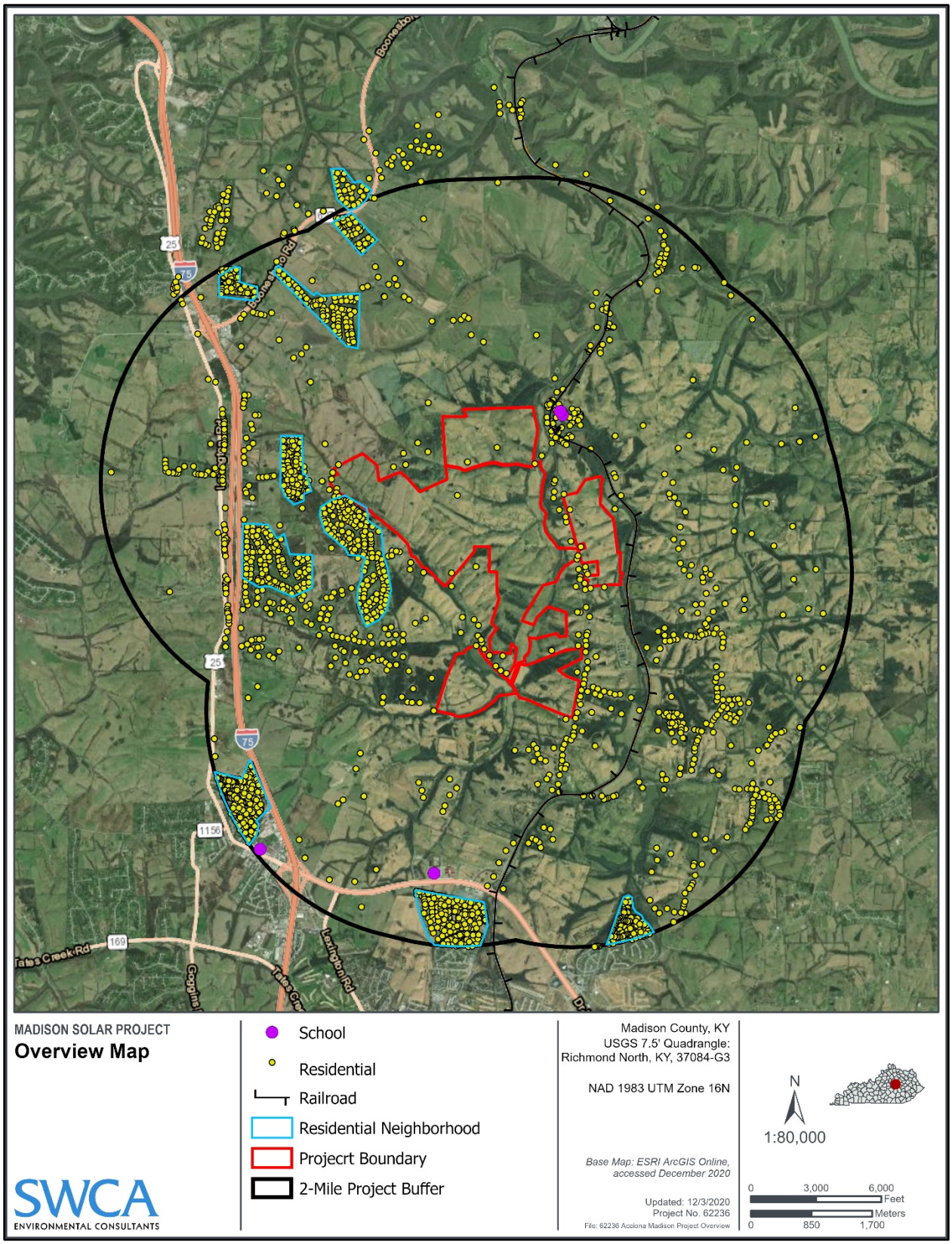
APPENDIX A

Map of Surrounding Residential Neighborhoods


MADISON SOLAR PROJECT
Overview Map
School
Residential
Railroad
Residential Neighborhood
Projecrt Boundary
2-Mile Project Buffer
Madison County, KY
USGS 7.5' Quadrangle:
Richmond North, KY, 37084-G3
NAD 1983 UTM Zone 16N
Base Map: ESRI ArcGIS Online, accessed December 2020
Updated: 12/3/2020
Project No. 62236
File: 62236 Acciona Madison Project Overview
N
1:80,000
0 3,000 6,000 Feet
0 850 1,700 Meters
SWCA
ENVIRONMENTAL CONSULTANTS

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APPENDIX B

Proof of Notice of Application

AEUG MADISON SOLAR, LLC
55 E MONROE ST. SUITE 1925
CHICAGO IL 60603

CERTIFIED MAIL®

9307 1699 6670 0000 0000 10

1-1

COLEMAN WITT & DREXEL CONLEY
PO BOX 11426
LEXINGTON KY 40575-1426

1234 1

NOTICE OF APPLICATION AEUG

Madison Solar, LLC, is proposing to construct and operate a 100-megawatt AC solar energy project located south of Lost Fork Road (KY 3377), primarily north of Three Forks Road, east of Interstate 75, and primarily west of Red House Road (KY 388) between Old Convict Road and Kentucky Route 32 in Madison County, Kentucky. The proposed Madison Solar Project will consist of about 1,100 acres of solar photovoltaic panels and associated racking, inverters, and a project substation transformer.

AEUG Madison Solar, LLC is required to file an application for construction and operation of the proposed facility. This application is subject to the approval of the Kentucky State Siting Board on Electric Generation and Transmission Siting, which can be reached at P.O. Box 615, 211 Sower Boulevard, Frankfort, Kentucky 40602-0615, or via phone at (502) 564-3940.

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AEUG MADISON SOLAR, LLC
55 E MONROE ST. SUITE 1925
CHICAGO IL 60603

CERTIFIED MAIL®

9307 1699 6670 0000 0000 10

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JIMMIE & VIVAN YOUNG
133 SYCAMORE DR
RICHMOND KY 40475-8001

1234 1

NOTICE OF APPLICATION AEUG

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AEUG MADISON SOLAR, LLC
55 E MONROE ST. SUITE 1925
CHICAGO IL 60603

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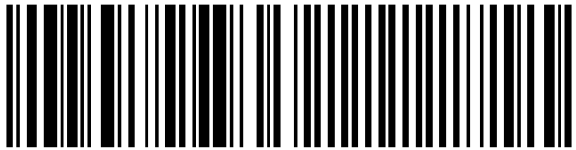

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BRYANT & MISTY EDEN
236 PINEUR RD
RICHMOND KY 40475-8458

1234 1

NOTICE OF APPLICATION AEUG

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AEUG MADISON SOLAR, LLC
55 E MONROE ST. SUITE 1925
CHICAGO IL 60603

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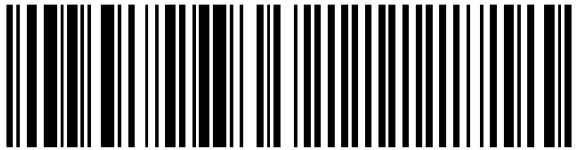

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HAROLD EDWARDS & BONNIE SHANKS
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RICHMOND KY 40475-9354

1234 1

NOTICE OF APPLICATION AEUG

Madison Solar, LLC, is proposing to construct and operate a 100-megawatt AC solar energy project located south of Lost Fork Road (KY 3377), primarily north of Three Forks Road, east of Interstate 75, and primarily west of Red House Road (KY 388) between Old Convict Road and Kentucky Route 32 in Madison County, Kentucky. The proposed Madison Solar Project will consist of about 1,100 acres of solar photovoltaic panels and associated racking, inverters, and a project substation transformer.

AEUG Madison Solar, LLC is required to file an application for construction and operation of the proposed facility. This application is subject to the approval of the Kentucky State Siting Board on Electric Generation and Transmission Siting, which can be reached at P.O. Box 615, 211 Sower Boulevard, Frankfort, Kentucky 40602-0615, or via phone at (502) 564-3940.

A person who wishes to become a party to a proceeding before the board may, by written motion filed no later than thirty (30) days after the application has been submitted, request leave to intervene. A party may, upon written motion filed no later than thirty (30) days after an application has been filed, request the board to schedule an evidentiary hearing at the offices of the Public Service Commission, 211 Sower Boulevard, Frankfort, Kentucky 40602-0615.

A request for a local public hearing or local public information meeting shall be made by at least three (3) interested persons who reside in the county or municipal corporation in which the pipeline, plant, or transmission line is proposed to be located. The request shall be made in writing and shall be filed within thirty (30) days following the filing of a completed application. Any questions related to the application or its process may be directed to the Kentucky State Siting Board, which can be reached at P.O. Box 615, 211 Sower Boulevard, Frankfort, Kentucky 40602-0615, or via phone at (502) 564-3940.

NAME	ADDRESS	CITY	STATE	ZIP
SID & DINA ADAMS	2300 RED HOUSE ROAD	RICHMOND	KENTUCKY	40475
JAMES & RITA AGEE	2119 RED HOUSE ROAD	RICHMOND	KENTUCKY	40475
JEREMY JAY & BETH ANDREWS	2322 RED HOUSE RD	RICHMOND	KENTUCKY	40475
CLIFFORD & MICKEY ARMES	1971 RED HOUSE ROAD	RICHMOND	KENTUCKY	40475
DAVID & SALLY ARMS	104 BEAVER DRIVE	RICHMOND	KENTUCKY	40475
ALVIN DALE & JASON ARROWOOD	114 SYCAMORE DR	RICHMOND	KENTUCKY	40475
ALANNA BABCOCK	109 SYCAMORE DR	RICHMOND	KENTUCKY	40475
CASEY & SPENCER BAILEY	111 SYCAMORE DR	RICHMOND	KENTUCKY	40475
TERRY LEE BARBER	800 THREE FORKS RD	RICHMOND	KENTUCKY	40475
JORDAN & JACK BARNES	130 SYCAMORE DR	RICHMOND	KENTUCKY	40475
JORDAN T BARNES	118 SYCAMORE DR	RICHMOND	KENTUCKY	40475
MELINDA BATES	2328 RED HOUSE RD	RICHMOND	KENTUCKY	40475
BILLY & REBECCA BELL	802 BOONE TRAIL RD	RICHMOND	KENTUCKY	40475
KIMBERLY & THOMAS BLETHEN	882 THREE FORKS RD	RICHMOND	KENTUCKY	40475
BLM INVESTMENTS LLC	218 WHIRL A WAY LANE	RICHMOND	KENTUCKY	40475
MARK & CYNTHIA BOGGS	2105 RED HOUSE RD	RICHMOND	KENTUCKY	40475
CHARLIE BRAGG	876 THREE FORKS RD	RICHMOND	KENTUCKY	40475
KEITH & HEATHER BROCKMAN	476 THREE FORKS RD	RICHMOND	KENTUCKY	40475
KOGAN & KELLY BRUMFIELD	2252 RED HOUSE RD	RICHMOND	KENTUCKY	40475
MICHAEL & LUANN BRYANT	1701 RED HOUSE ROAD	RICHMOND	KENTUCKY	40475
GARY & JANET BUCHER	449 THREE FORKS ROAD	RICHMOND	KENTUCKY	40475
HAROLD & JEAN BUCHER	2815 RED HOUSE ROAD	RICHMOND	KENTUCKY	40475
JAMES & CHERYL BUCK	450 THREE FORKS ROAD	RICHMOND	KENTUCKY	40475
SHELBY JOE BURGIN	3197 LEXINGTON ROAD	RICHMOND	KENTUCKY	40475
WILLIAM & CATHERYNE BURKE	155 PEARSON LANE	RICHMOND	KENTUCKY	40475
J B & SHIRLEY BURNS	954 BOONE TRAIL RD	RICHMOND	KENTUCKY	40475
ANTHONY BUSH	926 BOONE TRAIL RD #2	RICHMOND	KENTUCKY	40475
WALTER JOE & BARBARA BUTLER	122 SYCAMORE DR	RICHMOND	KENTUCKY	40475
BRIAN S CALLEBS	252 CRYSTAL CREEK LN	RICHMOND	KENTUCKY	40475
EARL & JOYCE CAMPBELL	675 THREE FORKS ROAD	RICHMOND	KENTUCKY	40475
KRISTA GAIL CAMPBELL	1791 RED HOUSE RD	RICHMOND	KENTUCKY	40475
WILLIAM & MARY CAUDILL	454 THREE FORKS ROAD	RICHMOND	KENTUCKY	40475
CHURCHES OF CHRIST & CHRISTIAN UNION	PO BOX 30	CIRCLEVILLE	OHIO	43113
SCOTT & SHELLY COOMER	260 E BILL EADES ROAD	RICHMOND	KENTUCKY	40475
OCTAVIO CORREA	433 PROFESSIONAL DR	RICHMOND	KENTUCKY	40475
EDDIE & LINDA COULTER	1975 RED HOUSE ROAD	RICHMOND	KENTUCKY	40475
DONNIE & MARY CREECH	850 BOONE TRAIL RD	RICHMOND	KENTUCKY	40475
KATHY & BRYAN CROSS	1510 WEST AVENUE A	BELLE GLADE	FLORIDA	33430
ANGELA DAVIS	139 SYCAMORE DRIVE	RICHMOND	KENTUCKY	40475

NAME	ADDRESS	CITY	STATE	ZIP
RAY & VICKY DAVIS	132 SYCAMORE DR	RICHMOND	KENTUCKY	40475
LARRY & PAMELA DAY	1761 RED HOUSE ROAD	RICHMOND	KENTUCKY	40475
SHAUN & KRISTY DAY	806 BOONE TRAIL RD	RICHMOND	KENTUCKY	40475
JEFFREY DEATHERAGE	430 LOST FORK ROAD	RICHMOND	KENTUCKY	40475
SHELBY & MARY JO DENNIS	824 THREE FORKS RD	RICHMOND	KENTUCKY	40475
DONALD & TONYA DONSELMAN	814 BOONE TRAIL RD	RICHMOND	KENTUCKY	40475
SHERRY A DUERSON & STEVEN BUCHER	968 BARKER LN W	BEREA	KENTUCKY	40403
LESLEY DURHAM	1015 BOONE TRAIL RD	RICHMOND	KENTUCKY	40475
LESLIE DALE EADS	147 SYCAMORE DR	RICHMOND	KENTUCKY	40475
EAST KENTUCKY POWER CORP INC	PO BOX 707	WINCHESTER	KENTUCKY	40392
BRYANT & MISTY EDEN	236 PINEUR ROAD	RICHMOND	KENTUCKY	40475
HAROLD EDWARDS & BONNIE SHANKS	918 BOONE TRAIL RD	RICHMOND	KENTUCKY	40475
AVERY & SHAWNA EVANS	1644 SAINT ANDREWS DR	MURFREESBORO	TENNESSEE	37218
MATTHEW & HEATHER EVANS	600 CHERRY TRACE DRIVE	RICHMOND	KENTUCKY	40475
CHRISTOPHER FLANNERY & HANNAH J TEMPLEMAN	1037 BOONE TRAIL RD	RICHMOND	KENTUCKY	40475
FLOYD J & GOMEZ J & TURNER H L C/O BILLY JOE TURNER	380 E BILL EADS RD	RICHMOND	KENTUCKY	40475
CAROLYN & PRESLEY GARRETT	100 SYCAMORE DRIVE	RICHMOND	KENTUCKY	40475
ARLENE & FRANK GIBSON	P O BOX 163	RICHMOND	KENTUCKY	40475
GREGORY & KEIREN GILLUM	665 THREE FORKS ROAD	RICHMOND	KENTUCKY	40475
JAMES JR & REBECCA GINTER	103 BEAVER DR	RICHMOND	KENTUCKY	40475
BILLY & SYLVIA GOINS	101 SYCAMORE DR	RICHMOND	KENTUCKY	40475
SHERI & CHEYENNE GORDON	2111 RED HOUSE RD	RICHMOND	KENTUCKY	40475
JEFFREY & TAMMY GORMAN	355 E BILL EADS RD	RICHMOND	KENTUCKY	40475
CHRIS & AMY GRAHAM	80 NOLAND RD	RICHMOND	KENTUCKY	40475
GARY & LINDA GRAHAM	107 LOST FORK ROAD	RICHMOND	KENTUCKY	40475
JOHNIE & MOLLIE GRANT	121 SYCAMORE DR	RICHMOND	KENTUCKY	40475
RONNIE & ROSEMARY GREER	435 LOST FORK RD	RICHMOND	KENTUCKY	40475
JEREMY & KIMBERLY HALL	1721 RED HOUSE ROAD	RICHMOND	KENTUCKY	40475
KEVIN HALL	432 THREE FORKS ROAD	RICHMOND	KENTUCKY	40475
RALPH & SHIRLEY MAE HALL	880 THREE FORKS RD	RICHMOND	KENTUCKY	40475
JAMES MITCHELL HARRIS	910 BOONE TRAIL RD	RICHMOND	KENTUCKY	40475
GRACIE HARRISON	418 THREE FORKS RD	RICHMOND	KENTUCKY	40475
GARY & LINDA HART	320 E BILL EADES ROAD	RICHMOND	KENTUCKY	40475
MICHAEL N & BARBARA HARVEY	2388 RED HOUSE ROAD	RICHMOND	KENTUCKY	40475
LARRY & JULIE HENSLEY	2023 REDHOUSE ROAD	RICHMOND	KENTUCKY	40475
BRIAN RAY HILL	373 OXFORD CIRCLE	RICHMOND	KENTUCKY	40475

NAME	ADDRESS	CITY	STATE	ZIP
RONALD & GEORGIA HOLBROOK	655 THREE FORKS ROAD	RICHMOND	KENTUCKY	40475
WILLIAM & TRACY HOLBROOK	14885 GLEN VALLEY DR	MIDDLEFIELD	OHO	44062
INDIAN VALLEY FARM LLC	352 AVAWAM DR	RICHMOND	KENTUCKY	40475
JAMES & BRENDA ISSACS	818 BOONE TRAIL RD	RICHMOND	KENTUCKY	40475
RANDALL & JENNIFER ISAACS	810 BOONE TRAIL RD	RICHMOND	KENTUCKY	40475
OLIVIA B JACKSON / CHRISTOPHER A. JACKSON	2030 RED HOUSE ROAD	RICHMOND	KENTUCKY	40475
WILLIAM & KAMERA JACKSON	2414 RED HOUSE ROAD	RICHMOND	KENTUCKY	40475
RICHARD & ROSE JONES	812 THREE FORKS RD	RICHMOND	KENTUCKY	40475
FREDDIE M II & SANDYE KABALEN	1926 RED HOUSE ROAD	RICHMOND	KENTUCKY	40475
KBC LLC & BFC LLC	1510 WEST AVENUE A	BELLE GLADE	FLORIDA	33430
KENNETH EDGAR KELLEY	221 CRYSTAL CREEK LN	RICHMOND	KENTUCKY	40475
JANA KERSEY	458 THREE FORKS RD	RICHMOND	KENTUCKY	40475
STEVE & JANICE KING	1927 RED HOUSE ROAD	RICHMOND	KENTUCKY	40475
RONALD KLEIN	2013 RED HOUSE RD	RICHMOND	KENTUCKY	40475
MARY LEE LAMB	914 BOONE TRAIL ROAD	RICHMOND	KENTUCKY	40475
GEORGE & KAREN LANDON	470 THREE FORKS RD	RICHMOND	KENTUCKY	40475
JOHN H LANGE	337 DYLAN COURT	RICHMOND	KENTUCKY	40475
CANDACE & KYLE LOGAN	424 THREE FORKS RD	RICHMOND	KENTUCKY	40475
MICHAEL & JESSICA LYNN	1923 RED HOUSE ROAD	RICHMOND	KENTUCKY	40475
TAMMY D LYONS	1795 REDHOUSE RD	RICHMOND	KENTUCKY	40475
MADISON COUNTY GOVERNMENT	101 WEST MAIN ST	RICHMOND	KENTUCKY	40475
BENNY & CATHY MARSHALL	385 LOST FORK ROAD	RICHMOND	KENTUCKY	40475
CALVIN R & TERESA MARSHALL	2412 RED HOUSE ROAD	RICHMOND	KENTUCKY	40475
WALTER & IRENE MARSHALL	2410 RED HOUSE RD	RICHMOND	KENTUCKY	40475
THOMAS & CONSTANCE MASTERS	P O BOX 358	RICHMOND	KENTUCKY	40475
ASHLEY & JASON MAYO	1085 BOONE TRAIL ROAD	RICHMOND	KENTUCKY	40475
GARY & KAY MCCARTY	498 THREE FORKS ROAD	RICHMOND	KENTUCKY	40475
ROSCOE F & RUTH MCINTOSH	400 THREE FORKS ROAD	RICHMOND	KENTUCKY	40475
WAVELENE HALL MCKINNEY	105 SYCAMORE DR	RICHMOND	KENTUCKY	40475
WILLIAM D SR & DEBRA MCKINNEY	1803 RED HOUSE ROAD	RICHMOND	KENTUCKY	40475
MATTHEW C MOBERLY	251 CRYSTAL CREEK LANE	RICHMOND	KENTUCKY	40475
SONDRA L MOBERLY	2095 RED HOUSE ROAD	RICHMOND	KENTUCKY	40475
DEBRA LYNN MOORES	475 THREE FORKS ROAD	RICHMOND	KENTUCKY	40475
NEELEY FARMS LLC	165 CAMPBELL BRANCH RD	RICHMOND	KENTUCKY	40475
DAVID & JANET NORTHERN	2079 RED HOUSE RD	RICHMOND	KENTUCKY	40475
NORTHERN PROPERTIES LLC	2075 RED HOUSE RD	RICHMOND	KENTUCKY	40475
RALPH & ASHLEE OLIVER	1974 RED HOUSE RD	RICHMOND	KENTUCKY	40475
JOSHUA OVERPECK	2100 RED HOUSE ROAD	RICHMOND	KENTUCKY	40475
DONALD PAPE	129 SYCAMORE DR	RICHMOND	KENTUCKY	40475

NAME	ADDRESS	CITY	STATE	ZIP
GARNETT PARKE	150 LOST FORK ROAD	RICHMOND	KENTUCKY	40475
KEITH & BETTY PARKE	360 PEACOCK ROAD	RICHMOND	KENTUCKY	40475
TIMOTHY P PARKER	141 SYCAMORE DR	RICHMOND	KENTUCKY	40475
JOHN & KATHLEEN PASSAFIUME	240 PINEUR DRIVE	RICHMOND	KENTUCKY	40475
TOMMY PHILLIPS	1060 BOONE TRAIL	RICHMOND	KENTUCKY	40475
JACK PITTMAN	116 SYCAMORE DR	RICHMOND	KENTUCKY	40475
MELISSA POPE	946 BOONE TRAIL ROAD	RICHMOND	KENTUCKY	40475
LINDA PORTWOOD	166 EAST BILL EADES ROAD	RICHMOND	KENTUCKY	40475
DONLAD & CARMEN POWELL	820 BOONE TRAIL RD	RICHMOND	KENTUCKY	40475
JOSEPHINE RAMSEY	934 BOONE TRAIL RD	RICHMOND	KENTUCKY	40475
FOSTER & KELLY RATLIFF	101 W BENNINGTON	RICHMOND	KENTUCKY	40475
GARY D & MARIANNE REAMS	1833 RED HOUSE ROAD	RICHMOND	KENTUCKY	40475
RED HOUSE BAPTIST CHURCH INC	2301 RED HOUSE ROAD	RICHMOND	KENTUCKY	40475
RED HOUSE METHODIST CHURCH	2400 RED HOUSE RD	RICHMOND	KENTUCKY	40475
JAMES & CAROLYN RENFRO	117 SYCAMORE DR	RICHMOND	KENTUCKY	40475
DAN & PATTI REYNOLDS	1821 RED HOUSE ROAD	RICHMOND	KENTUCKY	40475
JERRY & VIVIAN REYNOLDS	1006 BOONE TRAIL RD	RICHMOND	KENTUCKY	40475
RONALD ALLEN EVANS JR	1014 BOONE TRAIL ROAD	RICHMOND	KENTUCKY	40475
TOMMY & LINDA RICE	2140 RED HOUSE ROAD	RICHMOND	KENTUCKY	40475
DON & ANNE RICHARDSON	1809 RED HOUSE ROAD	RICHMOND	KENTUCKY	40475
BARRY S ROBERTS	2222 RED HOUSE ROAD	RICHMOND	KENTUCKY	40475
WILLIAM ROGERS	3976 KY 3436	CORBIN	KENTUCKY	40701
HARLESS JR & AGANA ROWLAND	101 LOST FORK RD	RICHMOND	KENTUCKY	40475
SCOTTY SCHARF	475 THREE FORKS ROAD	RICHMOND	KENTUCKY	40475
SCOTT ARTHUR WAYNE JR	131 SYCAMORE DR	RICHMOND	KENTUCKY	40475
DERRICK SEARS & SARAH NOTHERN SEARS	2071 RED HOUSE ROAD	RICHMOND	KENTUCKY	40475
MARK & CAROLYN SUE SWEET	1969 RED HOUSE ROAD	RICHMOND	KENTUCKY	40475
DANIEL W NEVITT & MARIE SWINFORD	185 PASADENA DRIVE STE 255	LEXINGTON	KENTUCKY	40503
SWORD FARM REAL ESTATE LLC	1135 OLE DANIEL BOONE RD	RICHMOND	KENTUCKY	40475
ROBERT & BARBARA TAYLOR	124 SYCAMORE DR	RICHMOND	KENTUCKY	40475
ROBERT W & CHARLENE TEVIS	221 PEARSON LANE	RICHMOND	KENTUCKY	40475
JEFFREY & YVONNE THOMPSON	410 THREE FORKS ROAD	RICHMOND	KENTUCKY	40475
ROY THOMPSON	8470 MCKEE RD	IRVINE	KENTUCKY	40336
RICKY & NANETTE TIMBERLAKE	117 PINEUR DR	RICHMOND	KENTUCKY	40475
JOSE & VANESSA TORRES	106 SYCAMORE DRIVE	RICHMOND	KENTUCKY	40475
ELLIOTT & ROBBIN TURNER	502 THREE FORKS RD	RICHMOND	KENTUCKY	40475
ERIC & CAROLE VOGLER	2098 RED HOUSE ROAD	RICHMOND	KENTUCKY	40475
RICHARD & ANNE WALLS	846 THREE FORKS RD	RICHMOND	KENTUCKY	40475

NAME	ADDRESS	CITY	STATE	ZIP
STEPHEN & SUSAN WELLS	380 THREE FORKS ROAD	RICHMOND	KENTUCKY	40475
JEAN WILCOX	212 STONE HAVEN DR	NICHOLASVILLE	KENTUCKY	40356
RUBY WILCOX	1020 BOONE TRAIL RD	RICHMOND	KENTUCKY	40475
GEORGE & IDA WILSON	440 THREE FORKS ROAD	RICHMOND	KENTUCKY	40475
ANGEL & CLEO WINCHESTER	926 BOONE TRAIL RD	RICHMOND	KENTUCKY	40475
COLEMAN WITT & DREXEL CONLEY	P O BOX 11426	LEXINGTON	KENTUCKY	40513
JIMMIE & VIVAN YOUNG	133 SYCAMORE DR	RICHMOND	KENTUCKY	40475
COLLEEN B. CHANEY	135 WEST IRVINE STREET, SUITE 300	RICHMOND	KENTUCKY	40475
REAGAN TAYLOR	2254 BOONESBOROUGH RD	RICHMOND	KENTUCKY	40475

Richmond Register Classifieds

Hours: 8 am - 5 p.m.
Mon - Fri

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147 Legals

EK Quick Mart LLC (HarJit Kaur)
mailing address
507 Leighway Dr. Richmond, Ky 40475
hereby declares intention to apply for a
NQ Retail Malt Beverage Package License
no later than **December 30, 2020**, the business to be licensed will be located at
507 Leighway Dr. Richmond, KY 40475
doing business as
EK Quick Mart LLC
The owners; Principal Officers and Directors; Limited Partners; or Members are as follows:
Officer **HarJit Kaur**
2391 Sir Barton Way, Lexington, KY 40509
Any person, association, corporation, or body politic may protest the granting of the license(s) by writing the Dept. of Alcoholic Beverage Control, 500 Mero Street, 2NE33, Frankfort, Kentucky 40601 within 30 days (KRS 243.430) of the date of this legal publication.

165 Public Notices

David's Wrecker Service
217 East Irvine St.
Richmond, KY 40475
859-623-2266
This is a pubic notice that automobiles will be sold on **12-9-2020** for wrecker, storage, and repair fees.
Vin#
5NPD84LF3HH159191
2017 Hyundai Elantra
Red
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Elkhart ,Indiana 46516
Owner: Dalton Allen
1021 Blackwell Ct.
Apt. 1, Richmond, Ky 40475

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510 Homes

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ALL REAL ESTATE ADVERTISING IN THIS NEWSPAPER IS Subject to the Fair Housing Act which makes it illegal to advertise "any preference, limitation or discrimination, based on Race, color, religion, sex, handicap, familiar status or national origin, or an intention, to make any such preference, limitation or discrimination." Familiar status includes children under the age of 18 living with parents of legal custodians, pregnant women and people securing custody of children under 18. This newspaper will not knowingly accept an advertisement for real estate which is in violation of the law. Our readers are hereby informed that all dwelling advertised in this newspaper are available on an equal opportunity basis.

f

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some furnished
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SCAN ME

Notice is hereby given that Dan and Debbie Drawson at 1399 Goggins Lane, Richmond Ky, 40475, has filed an application with the energy & Environment Cabinet to replace and expand their sunroom, The property is located off Tates Creek Rd in the Hickory Hills Subdivision on Goggins Lane, just past Holly Hill Dr., Irvine Lick Creek runs through the property. Any comments or objections shall be directed in writing to :
Ky Division of Water, Floodplain Management Section, 300 Sower Blvd 3rd Floor,
Frankfort, Ky 40601.

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Everyone's Logging On To Madison County's #1 website
www.richmondregister.com

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NOTICE OF APPLICATION

AEUG Madison Solar, LLC, is proposing to construct and operate a 100-megawatt AC solar energy project located south of Lost Fork Road (KY 3377), primarily north of Three Forks Road, east of Interstate 75, and primarily west of Red House Road (KY 388) between Old Convict Road and Kentucky Route 32 in Madison County, Kentucky. The proposed Madison Solar Project will consist of about 1,100 acres of solar photovoltaic panels and associated racking, inverters, and a project substation transformer.

AEUG Madison Solar, LLC is required to file an application for construction and operation of the proposed facility. This application is subject to the approval of the Kentucky State Siting Board on Electric Generation and Transmission Siting, which can be reached at P.O. Box 615, 211 Sower Boulevard, Frankfort, Kentucky 40602-0615, or via phone at (502) 564-3940.

A person who wishes to become a party to a proceeding before the board may, by written motion filed no later than thirty (30) days after the application has been submitted, request leave to intervene. A party may, upon written motion filed no later than thirty (30) days after an application has been filed, request the board to schedule an evidentiary hearing at the offices of the Public Service Commission, 211 Sower Boulevard, Frankfort, Kentucky 40602-0615.

A request for a local public hearing or local public information meeting shall be made by at least three (3) interested persons who reside in the county or municipal corporation in which the pipeline, plant, or transmission line is proposed to be located. The request shall be made in writing and shall be filed within thirty (30) days following the filing of a completed application. Any questions related to the application or its process may be directed to the Kentucky State Siting Board, which can be reached at P.O. Box 615, 211 Sower Boulevard, Frankfort, Kentucky 40602-0615, or via phone at (502) 564-3940.

RICHMOND REGISTER

Madison County Advertiser

AFFIDAVIT

I, Pamela Bond (name), Classified Ad Rep (title) of the Richmond Register and the Madison County Advertiser, hereby state the advertisement concerning Notice of Application did run in the Richmond Register (newspaper) on the requested date(s), Tuesday, Dec. 8, 2020 (dates).

Pamela Bond
(Signature)

12/8/2020
(Date)

Heather Russell (Affirm)
(Notary Public Signature)

12/8/2020
(Date)

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APPENDIX C

Public Involvement Documents

acciona

BUSINESS AS UNUSUAL

TENASKA®

Madison County Solar
Public Meeting
August 6, 2020

Tips for a successful multi-channel public meeting

- All lines will be muted by the moderator until the open Q&A
- A Q&A will follow the presentation. Questions can also be submitted via chat option
- Follow up with us after tonight's meeting
- We're here to share our plans and listen to you

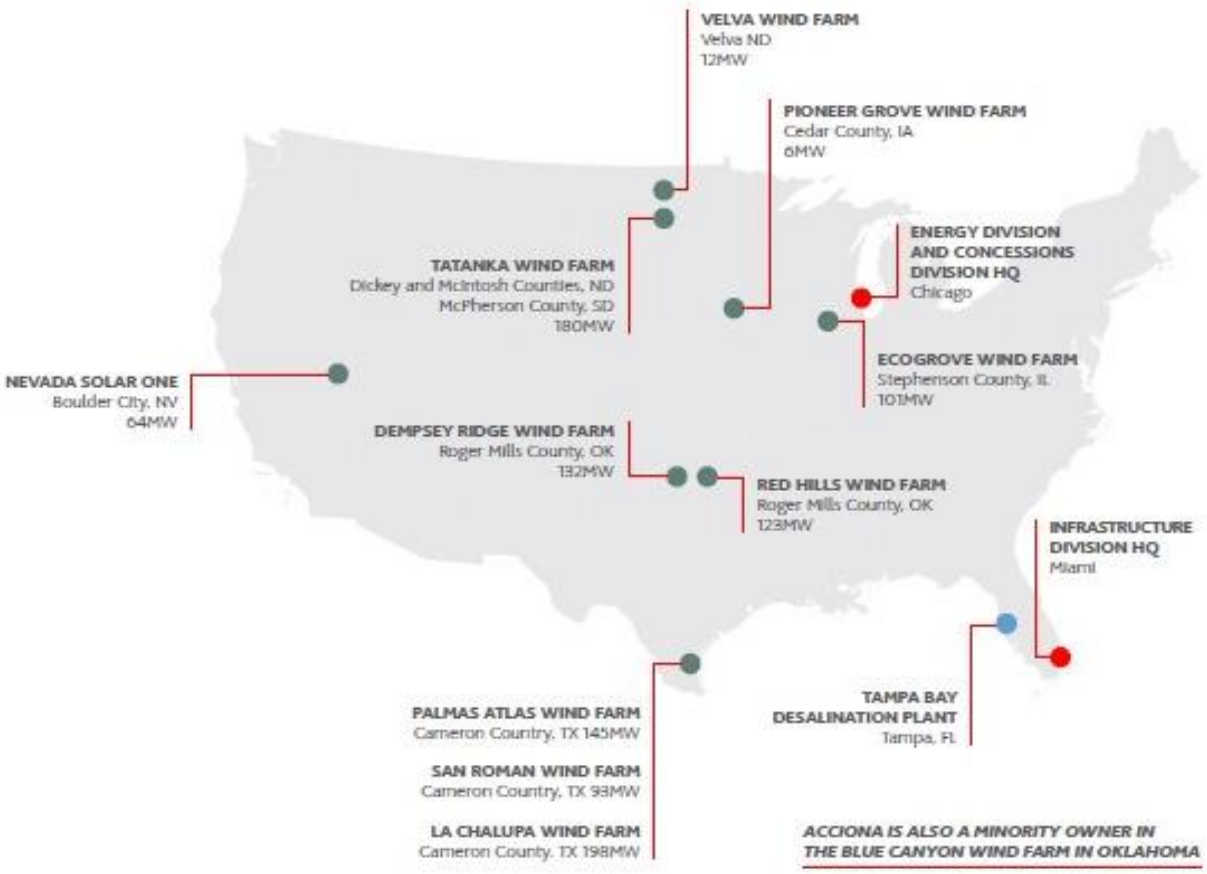
Agenda

1. Who are ACCIONA and Tenaska?
2. Solar PV 101: What should I know?
3. Why Madison County?
4. Local benefits of the Madison County Solar Project
5. Next steps
6. Q&A

Meet Tonight's Presenters

- Adam Stratton, Director of Solar Development, ACCIONA
- Kyle Gerking, Project Manager, Engineering & Construction, Tenaska
- Dave Loomis, President, Strategic Economic Research

About ACCIONA

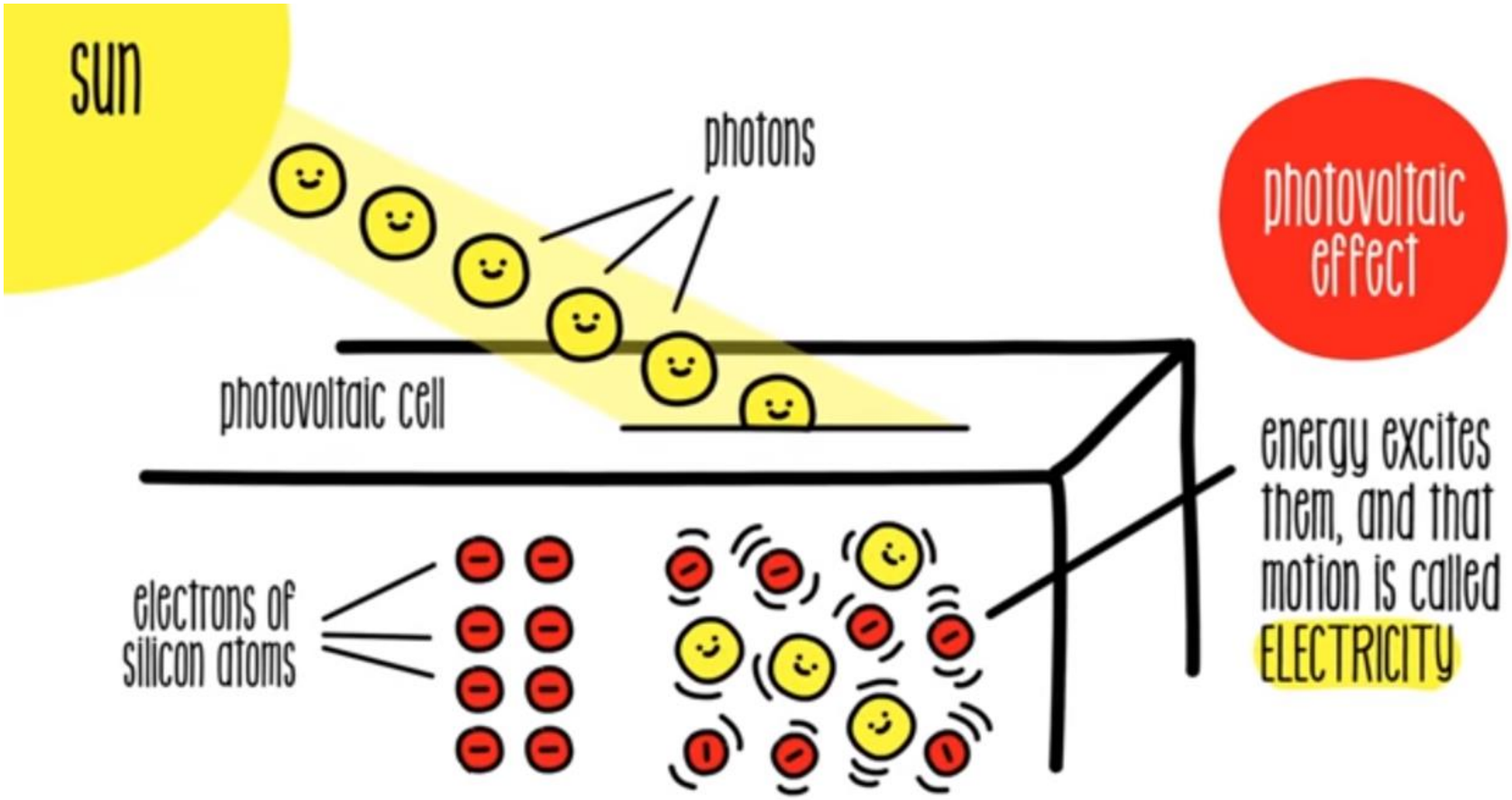


- ACCIONA is a global renewable energy and infrastructure company
- 1,000+ MW of generating capacity in the US
- Company focuses on projects that drive community, environmental benefit
- Local social impact central to every project

About Tenaska

- Omaha, Nebraska-based energy company
- Developed 10,500 MW of energy projects, including 775 MW of renewables
- Working closely with ACCIONA on the development of Madison County Solar

Solar PV 101: What should I know?



Solar panels convert the sun's radiation into electricity through the photovoltaic effect. The sun's rays excite electrons in the photovoltaic cells. This creates motion which is called electricity, which is collected and fed onto the electric grid.

Solar PV 101: What should I know?

Short grass plantings around this solar farm in Illinois provide habitat for beneficial insects and help with storm water mitigation and dust control.

- Solar panels about 7’ high, low profile
- Glare limited by finish on the surface
- Vegetation management key to operations
- Low hum inaudible off-site
- Opportunities to incorporate native, pollinator plantings
- Useful life of 30+ years

Solar PV 101: What should I know?

A local worker surveys panels at ACCIONA's Sishen solar farm in South Africa.

- Construction: up to 300 jobs at peak
- Operations: 5-7 jobs
- O&M look for local employees who know community, have interest, commitment
- Site will operate for 30+ years
- Opportunities to work with local businesses

Solar PV 101: Solar and Local Economic Impacts

Construction crews install the racking system at ACCIONA's Puerto Libertard solar farm in Mexico.

- Total jobs supported is often 2-3X the number of onsite jobs because of supply chain impacts
- Foundation materials are often sourced locally
- Taxes paid on the project will be over $400,000 initially
- Landowners benefit from lease payments

Solar PV 101: Value of Solar to Agricultural Properties

Horses graze in the morning sun in Madison County.

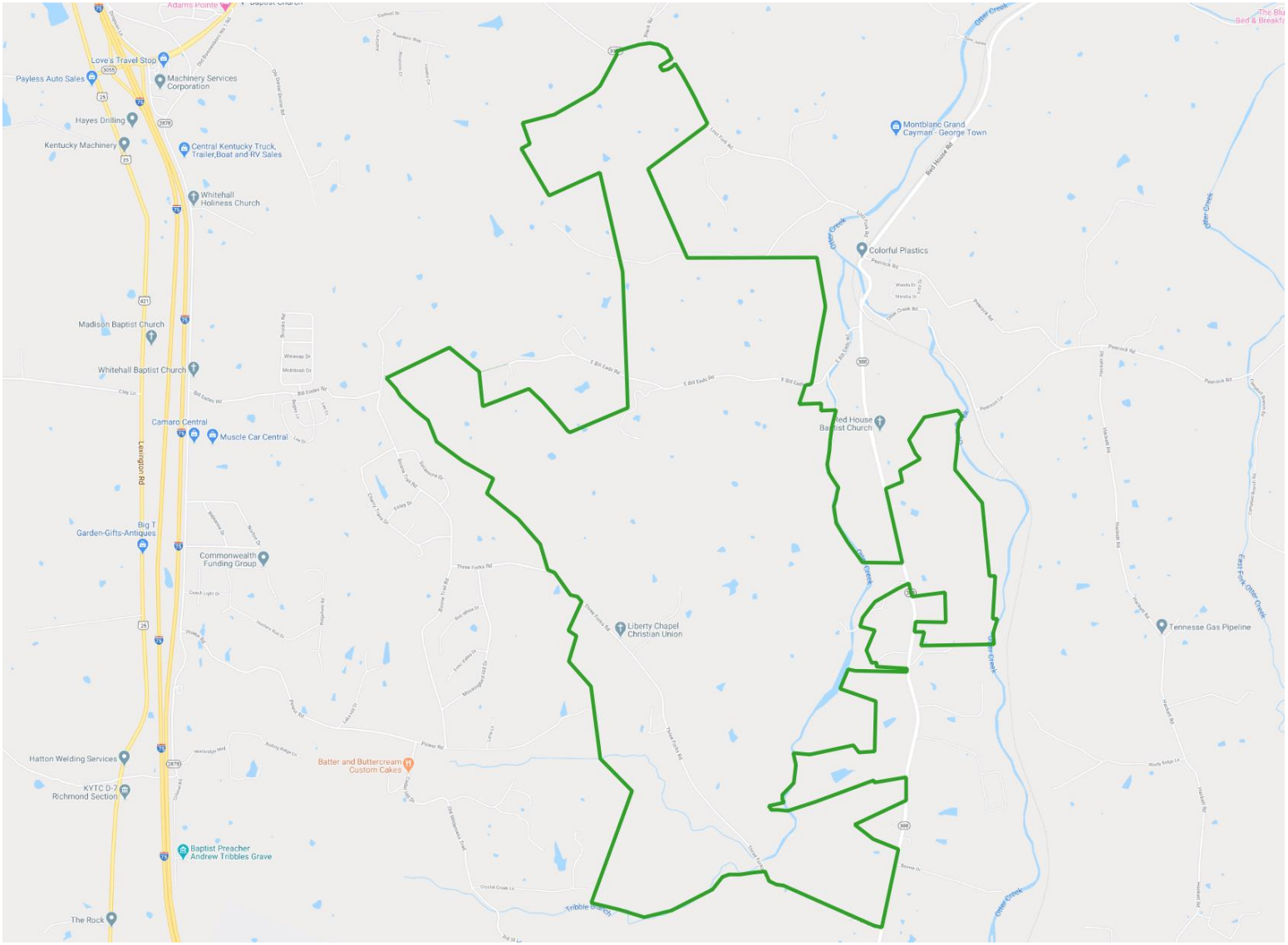
- Lease payments are higher and more stable source of income than farming
- Low crop prices mean that less land is needed to produce food
- Using simulations of future prices and yields, rarely does farming yield higher profits than solar leasing

Why Madison County?

Studies are now being done to identify and preserve any historical features at the Madison County site.

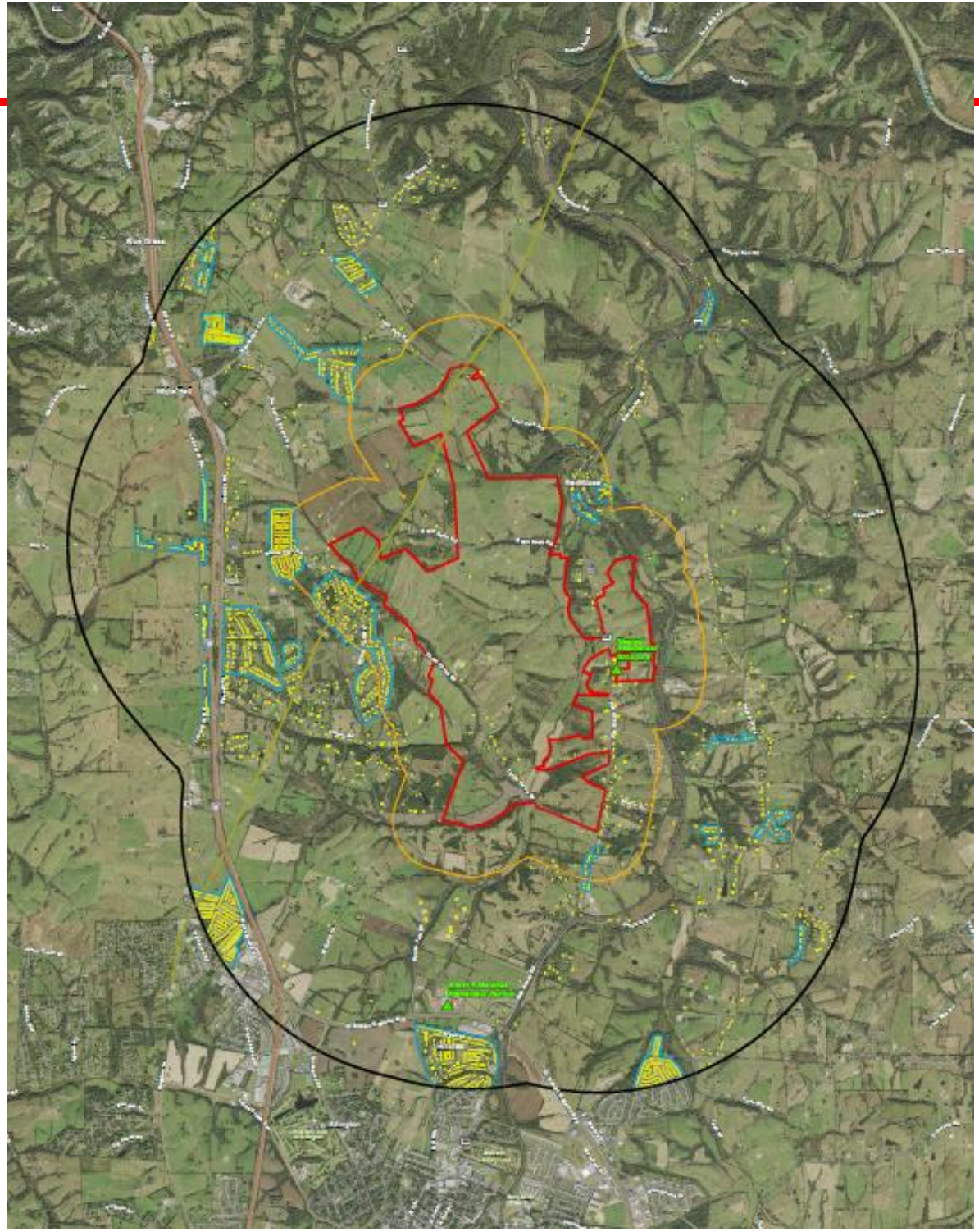
- Infrastructure in place to allow development
- Local commitment to economic development
- Local labor force
- Strong local solar resource
- Increasing demand for reliable, clean energy from businesses, electricity sector

Where will Madison County Solar be built?



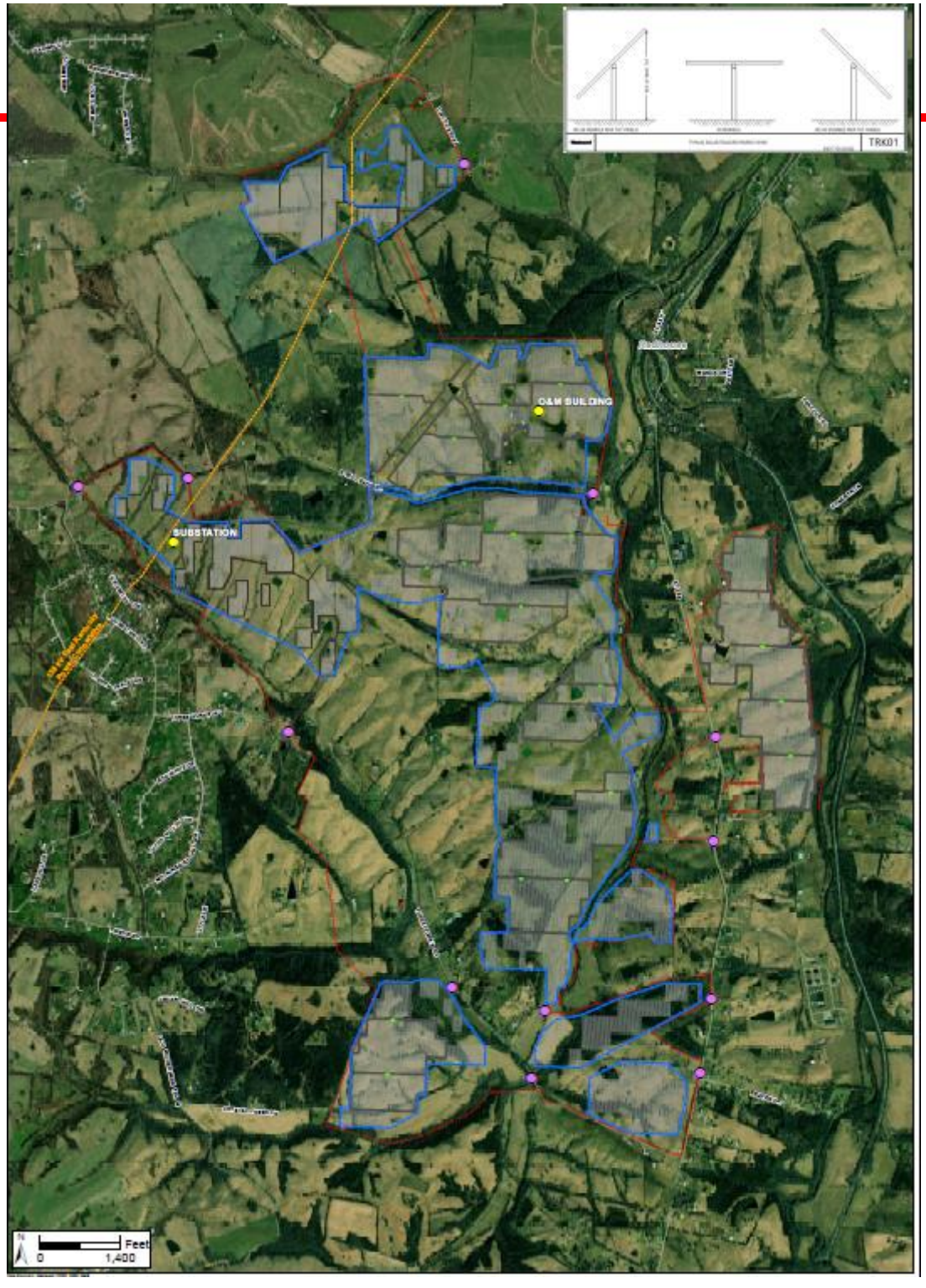
Project Details:

- 100 megawatts
- 1,100 acres
- N of Richmond. S of Lost Fork Rd, N of Three Forks Rd, E of I-75, W of Red House Rd.
- Interconnection to the Three Forks-Dale 138 kV Line



Contextual map

- Shows 2,000 foot and 2 mile radius around project area
- Residential structures highlighted in yellow
- Residential neighborhoods outlined in blue
- Existing Eastern Kentucky Power Cooperative Transmisson Line in red



Proposed layout

- Includes substation, operations building and proposed access roads
- Project design incorporates setbacks from wetland areas, residential structures
- Approximately 250K panels

Local benefits for Madison County

Palmas Altas Construction Team Toys for Tots Drive with the U.S. Marine Corps in Harlingen, Texas, December 2019.

- Tax revenue with limited demand on local services like schools, police
- Potential construction jobs, and O&M employment opportunities
- Use of local businesses, services
- Partnerships with local schools, non-profits
- Estimated $120M investment in Madison County

ACCIONA's commitment to social impact

Palmas Altas Construction Team food drive in 2019 for the San Benito food pantry in South Texas.

- Social impact projects are designed for every project ACCIONA builds
- A portion of revenue from the project must be reinvested in the community
- Opportunity for partnerships
- Goal is to impact specific local community needs such as education, wellness and environment

Next Steps, Project Timeline

- **2020-2021**
  - Finalize land transactions & permit review; secure power purchase agreement
  - Initial engineering layout & environmental review
  - Local approvals
  - Siting board process
- **2021-2022**
  - Construction
- **2022**
  - Begin operation

Open Q&A

Do you have questions about the Madison County Solar Project?

Thank You, Madison County!

Send follow-up questions to MadisonCountySolar@ACCIONA.com!

Coming Soon: MadisonSolarFarm.com

The Richmond Register

August 4, 2020

Solar farm to come to Madison County

By Taylor Six

With solar plants all over the world and in almost every continent, Acciona — a Spanish-based conglomerate focused on infrastructure and renewable energy — is hoping to make Madison County its newest location.

The company and county officials are in the early stages of bringing a solar energy facility to the area, consequently creating more jobs and increasing the county's tax base.

"This is supporting clean energy and creating more revenue and having a stronger tax base," said Judge/Executive Reagan Taylor in a previous fiscal court meeting with approved documents to support moving forward with the project.

According to Adam Stratton, director of Solar Business Development of Acciona's energy division in North America, the Madison County project would be a nearly $120 million investment.

"This project during the time of construction is likely to have 300 jobs at the peak time …," Stratton said. "The workforce would then be contributing to the local economy during that time, and that is always exciting to people in the county."

Once the solar facility is up and running, it has the potential to create five to seven full-time operational jobs.

But before all that can come to fruition, Stratton and others on the project explained the process of site-selection is an extended one with new ideas, rebuilding strategies and ultimately — transparency.

"This is a big infrastructure," Tracy Stoddard, vice president of development, said. "There's a lot of work behind it, … but the details go through time. We are solving problems and generating ideas as we speak, and we want to be transparent about those."

Rafael Esteban, CEO of Acconia's energy division in North America, agreed.

"We take very seriously the way we, locally, are accepted," he told The Register. "We take a very long time to analyze and see very well the acceptance (our company) would have in the community. If we are going to make investments … We want to be here in the long term. We want to be sure why we are here, what we are going to do and be as transparent as we can be."

Stratton said Kentucky is not recognized for leading efforts in solar energy, but Acciona aspired to help, starting in Madison County.

In terms of the specific site-selection, Stratton said, it is a long, detailed process where officials begin to look at the site's existing grid structure and analyze it before moving forward.

From there, the company arrives at a decision point of whether or not to engage and look toward landowners, the community and economic development in the area.

"We have done so many of these all over the world, we can kind of identify if we will have acceptance and if the want and need is there as well," he told The Register. "These are long development cycles where millions of dollars of development capital is going into this risk."

Additionally, the local labor force, sun exposure and other factors are calculated into the location decision.

All of which Madison County apparently has.

"We have seen strong local support from agencies, and we are still in early stages and want to make aware that we are coming," Stratton said. "… We like to be a good neighbor."

Before they can be a neighbor, the county fiscal court approved several readings of an ordinance that pertained to conditional use permits in zones that could be used for development.

Per Ordinance 20-17, the planning commission voted to recommend to the court that text of Section 402.6 Uses Allowed, and Section 402.7 Moderate Hazard Occupancies of the planning and zoning regulations be changed to make commercial solar energy facilities a conditional use in several different zones.

Some of these included neighborhood commercial, general commercial, urban agricultural, rural agricultural, heavy industry, light industry and urban and rural resource extraction.

Like the planning commission, the court gave its unanimous approval for the ordinance.

Taylor said the conditional use documents are to make sure the county is protecting subdivisions, which the area has a lot of, he said.

"This is still going through planning and zoning, and we want to be very transparent about what it is we are doing," he said.

Magistrate John Tudor shared his support, saying he believes solar energy is the future.

"We need to get upfront with (regulations) on this and make it the same playing field for everyone that depends on it," he said. "It doesn't matter what area of the county, what business it is, they should be on the same field upfront, and these regulations do that for us."

For more information about Accionia, visit acciona.com/.

Reach Taylor Six at 624-6623 or follow her on Twitter @TaylorSixRR.

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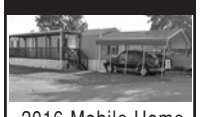

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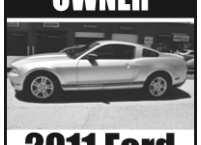

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NOTICE OF PUBLIC MEETING

AEUG MADISON SOLAR, LLC, (Madison Solar) is proposing to construct and operate a 100 MW solar energy project in Madison County, Kentucky. The proposed Madison Solar project will be located within a project area of approximately 1,100 acres situated south of Lost Fork Road (KY 3377), primarily north of Three Forks Road, east of Interstate 75, and primarily west of Red House Road (KY 388). A public meeting to inform the community about the project and to answer questions about the project will take place on August 6, 2020 between 6 p.m. and 8 p.m. in the Ground Floor Community Room #013 at the Richmond branch of the Madison County Public Library (507 West Main Street, Richmond). Due to the ongoing global pandemic, this meeting will be conducted in compliance with guidance from U.S. Centers for Disease Control and guidelines from the Office of the Governor intended to reduce the potential spread of COVID-19. Attendance at this meeting will be limited to no more than 25 people to allow social distancing, and pre-registration will be required. Per the executive order of the Governor, all in-person attendees will be required to correctly wear masks that will potentially prevent the spread of illness. Seating in the room will be set up to allow social distancing for the duration of the meeting, and attendees will be asked to not move the seats, this due to the meeting being held indoors, in an enclosed space. Hand sanitizer and masks will be available on-site for attendees. Madison Solar will make a large-scale (24 inches by 36 inches) layout map of the proposed solar facility, which otherwise would have been made available to the public for inspection at a public meeting, available to the public by displaying the map in the entrance to the Richmond branch of the Madison County Public Library on the day of the public meeting. Due to the extraordinary circumstances of this time, the meeting also will be made available for public participation through a digital "virtual" meeting. The digital meeting will be available through Microsoft Teams, which can be accessed through a web browser, and will also be accessible through a call-in number. Given the on-going public health situation and limited attendance cap intended to limit the potential spread of COVID-19, Madison Solar strongly encourages participation in this meeting virtually and via the call-in option. Pre-registration will also be required for participation in the virtual meeting and the call-in meeting. Registration is free of charge.

To Register email MadisonCountySolar@acciona.com or call Austin Roach at (312) 870-1436. The proposed photovoltaic solar project will consist of solar panels with an approximate maximum height of 6 feet, inverters, associated wiring and balance of system, and a substation. The power generated by the project will be linked to the electric transmission grid via the Three Forks-Dale 138Kv line. Anyone with questions about the August 6, 2020 public meeting or Madison Solar may request information by emailing Austin Roach at MadisonCountySolar@acciona.com or calling him at (312) 870-1436.

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RICHMOND REGISTER

Madison County Advertiser

I, Pamela Bowlin (name), advertising rep. (title)

of the Richmond Register and the Madison County Advertiser hereby state that the advertisement concerning Public meeting did run in the Richmond Register on the requested date(s), Tuesday, July 21, 2020 (dates).

Pamela Bowlin
Signature

7/21/2020
Date

Marilyn S. Stewart
Notary Public Signature

Jan. 2021
Expiration Date

380 Big Hill Avenue • Richmond, KY 40475
859-623-1669 • fax 859-623-2337

AEUG Madison Solar, LLC
55 East Monroe Street, Suite 1925
Chicago, IL 60603
312.673.3000
312.673.3001 (f)
www.acciona.us

July 21, 2020

Dear Madison County resident,

My name is Adam Stratton and I work for a renewable energy company that is developing the Madison Solar Project, which we bought last year from Tenaska. We are also a developer of renewable energy projects across the United States. I wanted to provide you with some information about ACCIONA, our company, and the Madison Solar Project, an exciting project we are hoping to bring to Madison County. The Madison Solar Project is an estimated $120 million dollar project that will create up to 300 jobs during peak construction and will add to the local revenue stream for local government including, but not limited to schools, first responders and roadways.

I put together this package with the hopes it will show you a bit more about us and our projects. Enclosed, please find an invitation to a drive-thru dinner. That dinner will be followed by a virtual meeting, where we will share more about solar energy and the project. Also, please find the announcement for a public meeting about the project that will be happening on August 6.

Inside please find:

- A letter from our CEO
- An invitation to Drive-Thru BBQ and virtual meeting
- Notice of Public Meeting
- A project area map
- About ACCIONA one pager

We know that solar energy is new to Madison County, but we are excited to invest in your community and we look forward to learning more about you.

If you have any questions about the Madison Solar Project, I encourage you to email me at astratton@acciona.com or to call me at (312) 870-1480.

Sincerely,

Adam W Stratton
Director
Solar Business Development
AEUG Madison Solar, LLC

ACCIONA Energy USA Global LLC

55 East Monroe Street, Suite 1925
Chicago, IL 60603
312.673.3000
312.673.3001 (f)
www.acciona.us

July 21, 2020

Dear Madison County families and businesses,

I am writing to introduce myself, tell you about our local solar development, and to share with you a bit about ACCIONA. We have built and we operate more than 10,000 MW of renewable energy around the globe. In the United States, we own and operate about 1,000 MW of renewables. Our corporate headquarters is in Chicago, but our teams live across the nation in Nevada, the Dakotas, Texas, Oklahoma, Iowa, and Illinois. Our hope is that soon we will have a new address in Madison County.

I am proud to work for ACCIONA because we design every project to have a positive impact on the community where it is located. When ACCIONA builds a project, we are in it for the long haul. We are in it to bring benefits to community, the economy and the environment. Our project company, AEUG Madison Solar, LLC, is engineering the project in Madison County to operate for more than 30 years.

Over the life of the project, we will get to know each other very well. I am excited to learn more about your community. For example, I hope to participate in Berea's Spoonbread Festival and I can't wait to try Richmond's restaurants. Mostly, I look forward to meeting many of you and learning about your community's rich history.

Some things I want to share about our project: We anticipate more than 200 jobs will be created during peak construction of the project. Where possible, we like to hire local contractors for work on our projects. Once operational, my team will be hiring a team of five technicians to work on the site. To fill those jobs, we'll be looking for local residents who have a desire and commitment to the work and to the environment. Of course, we'll also be part of the local economy, working with local businesses to maintain our vehicles, help with landscaping, and feed our team and guests.

Our project will pay local taxes, which will go to the county to support local schools, first responders and roadways. Our projects also include a commitment to support local education and environmental and wellness efforts. We hope to have a lot more to share about that in the coming months.

I thank you for taking the time to learn a bit more about us. If you have any questions, I invite you to email my team at MadisonCountySolar@acciona.com. If you want to learn about ACCIONA, I invite you to visit our website at www.acciona.com.

All my best,

Rafael Esteban
CEO
Acciona Energy USA Global LLC

You're Invited to a Drive-Thru BBQ

The ACCIONA team is excited to connect with you on the evening of Monday, August 3, to talk about our new solar energy project planned for Madison County. We invite you to a free "drive-thru" dinner between 5:00-6:30 p.m. to be followed at 7:00 p.m. with an on-line, virtual presentation about the project.

Out of an abundance of caution during the COVID-19 situation, all meals will be served to go. You don't even need to leave your vehicle! Just pull up, and grab your take out, family style meal of pulled pork (or pulled chicken) mac & cheese and green beans provided by local favorite Smokin' Jax!

This offer is limited to the first 65 families that respond. To reserve your meal, and to get the link for the online meeting, shoot us an email at MadisonCountySolar@acciona.com or call Austin Roach at (312) 870-1436.

acciona

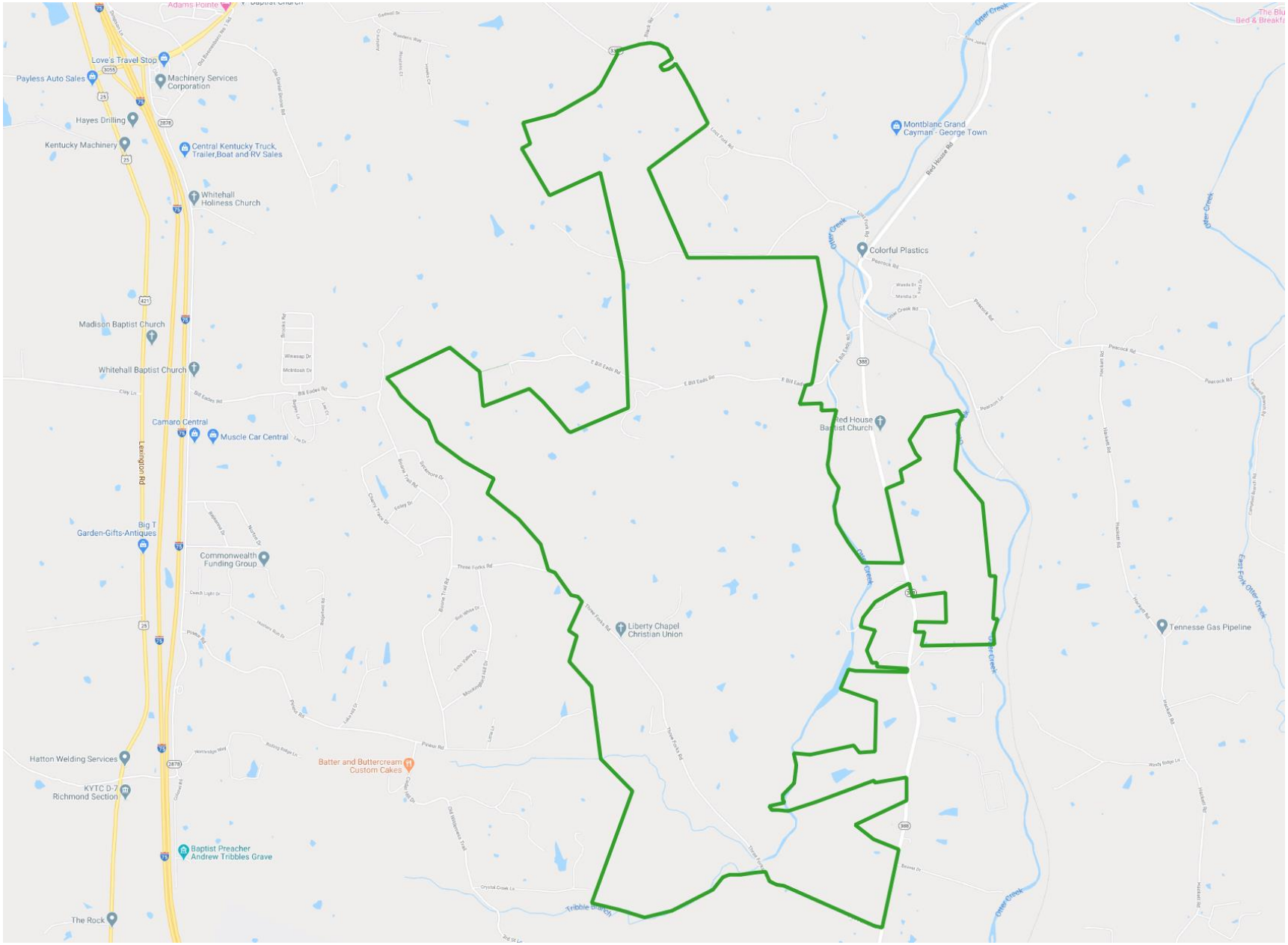
pig image from Stockio.com

NOTICE OF PUBLIC MEETING

AEUG MADISON SOLAR, LLC, (Madison Solar) is proposing to construct and operate a 100 MW solar energy project in Madison County, Kentucky. The proposed Madison Solar project will be located within a project area of approximately 1,100 acres situated south of Lost Fork Road (KY 3377), primarily north of Three Forks Road, east of Interstate 75, and primarily west of Red House Road (KY 388). A public meeting to inform the community about the project and to answer questions about the project will take place on August 6, 2020 between 6 p.m. and 8 p.m. in the Ground Floor Community Room #013 at the Richmond branch of the Madison County Public Library (507 West Main Street, Richmond). Due to the ongoing global pandemic, this meeting will be conducted in compliance with guidance from U.S. Centers for Disease Control and guidelines from the Office of the Governor intended to reduce the potential spread of COVID-19. Attendance at this meeting will be limited to no more than 25 people to allow social distancing, and pre-registration will be required. Per the executive order of the Governor, all in-person attendees will be required to correctly wear masks that will potentially prevent the spread of illness. Seating in the room will be set up to allow social distancing for the duration of the meeting, and attendees will be asked to not move the seats, this due to the meeting being held indoors, in an enclosed space. Hand sanitizer and masks will be available on-site for attendees. Madison Solar will make a large-scale (24 inches by 36 inches) layout map of the proposed solar facility, which otherwise would have been made available to the public for inspection at a public meeting, available to the public by displaying the map in the entrance to the Richmond branch of the Madison County Public Library on the day of the public meeting. Due to the extraordinary circumstances of this time, the meeting also will be made available for public participation through a digital "virtual" meeting. The digital meeting will be available through Microsoft Teams, which can be accessed through a web browser, and will also be accessible through a call-in number. Given the on-going public health situation and limited attendance cap intended to limit the potential spread of COVID-19, Madison Solar strongly encourages participation in this meeting virtually and via the call-in option. Pre-registration will also be required for participation in the virtual meeting and the call-in meeting. Registration is free of charge. To Register email MadisonCountySolar@acciona.com or call Austin Roach at (312) 870-1436. The proposed photovoltaic solar project will consist of solar panels with an approximate maximum height of 6 feet, inverters, associated wiring and balance of system, and a substation. The power generated by the project will be linked to the electric transmission grid via the Three Forks-Dale 138Kv line. Anyone with questions about the August 6, 2020 public meeting or Madison Solar may request information by emailing Austin Roach at MadisonCountySolar@acciona.com or calling him at (312) 870-1436.

Project Area Map

The Proposed Madison County Project will be situated on approximately 1,100-acres north of the city of Richmond, Kentucky. It is located south of Lost Fork Road (KY 3377), primarily north of Three Forks Road, east of Interstate 75 and primarily west of Red House Road (KY 388).



ACCIONA in the US

- ACCIONA is a leading supplier of renewable energy, water technology solutions, civil infrastructure and concessions projects.
- One of the main renewable energy operators in the world, with 30 years' experience and 10,240 MW under ownership.
- With almost two decades of experience in the United States, ACCIONA holds a portfolio that is 100% renewable energy.
- Own and operate more than 850 MW in the US. The company has a pipeline of projects to add more than 1,000 MW of Solar PV by 2023.
- 28.8 Million gallons of water desalinated daily in Florida.
- The company is carbon neutral and committed to 100% renewable energy.

Employs more than 200 professionals across the US with headquarters in Chicago and Miami.

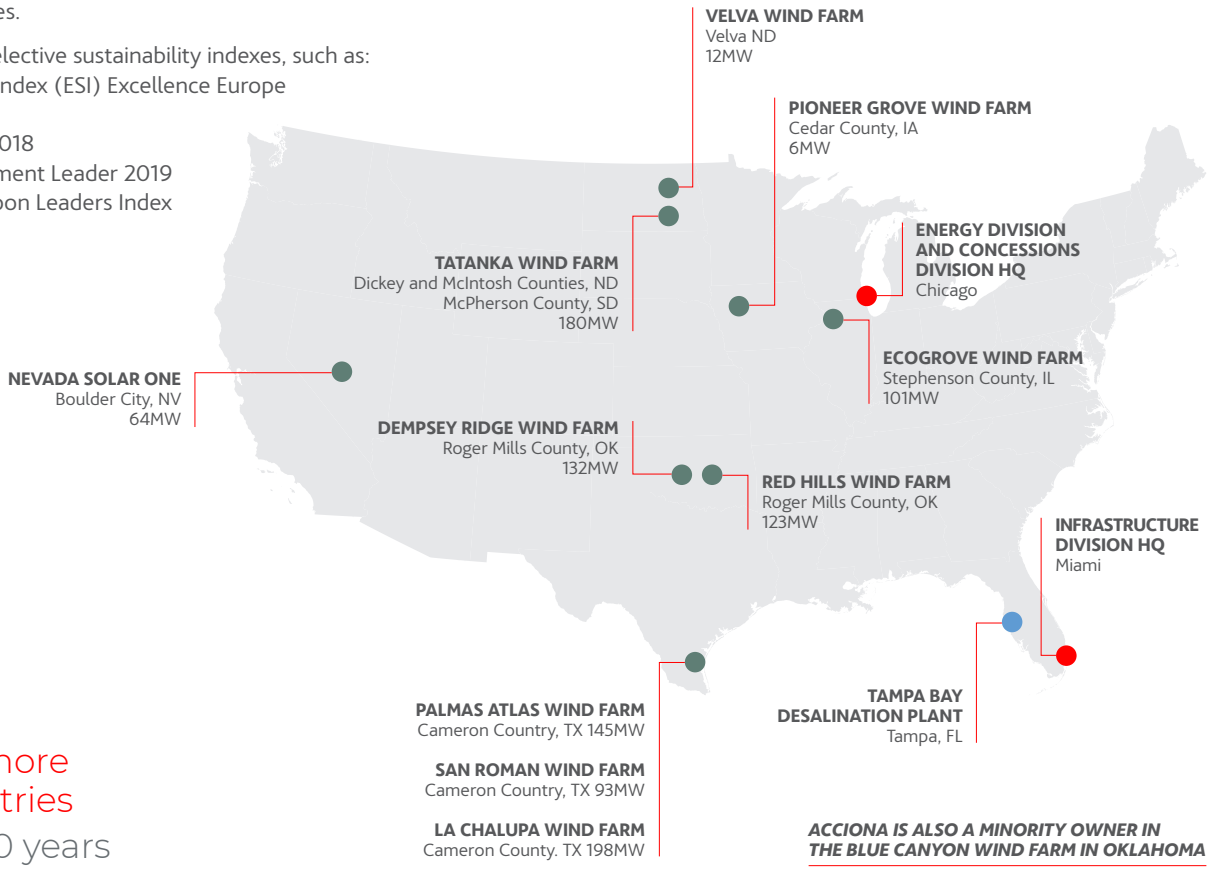
Develops customized renewable energy and infrastructure solutions for clients in the private and public sector. The company launched its US concessions offerings in 2019.

Leads in infrastructure and construction innovation to improve safety and cut project timelines.

ACCIONA features in selective sustainability indexes, such as:
- Ethibel Sustainability Index (ESI) Excellence Europe
- FTSE4Good
- CDP Water Security 2018
- CDP Supplier Engagement Leader 2019
- MSCI Global Low Carbon Leaders Index

ENERGY INFRASTRUCTURE

WATER INFRASTRUCTURE



ACCIONA IS ALSO A MINORITY OWNER IN THE BLUE CANYON WIND FARM IN OKLAHOMA

Presence in more than 40 countries

More than 100 years of experience

FLAGSHIP PROJECTS

ENERGY INFRASTRUCTURE

ACCIONA has ownership in ten operational wind farms, and one concentrated solar plant.

- More than 850MW of renewable energy capacity and a robust pipeline of future wind and solar PV projects in PJM, ERCOT and SPP.
- ACCIONA develops, constructs, and operates renewable energy projects across the US.

WATER INFRASTRUCTURE

- ACCIONA operates one of the largest desalination plants in the US, which supplies 10% of the clean water for Tampa, Florida.
- The company also helped to preserve healthy water levels in the protected Carmel River and Seaside to supply Monterrey, California.

FEATURED PROJECT

PALMAS ALTAS WIND FARM (145 MW)

Renewable energy for more than 43,000 homes in Texas

LOCATION: Cameron County, Texas

CONFIGURATION: 46 AW125/3150 ACCIONA Nordex wind turbines

INVESTMENT: Around $200M

PRODUCTION: Equivalent to the consumption of 43,000 Texas homes

TATANKA WIND FARM (180 MW)

Our largest installation in the US

LOCATION: North Dakota and South Dakota, US

CONFIGURATION: One hundred twenty 1.5 MW wind turbines

INVESTMENT: $381M

PRODUCTION: equivalent to the consumption of 60,000 US homes

acciona

BUSINESS AS UNUSUAL

TENASKA®

Madison County Solar

Tips for a successful virtual meeting

- Please mute your line if you are not talking
- A Q&A will follow the presentation
- Follow up with us after tonight's meeting
- We're here to share our plans and listen to you

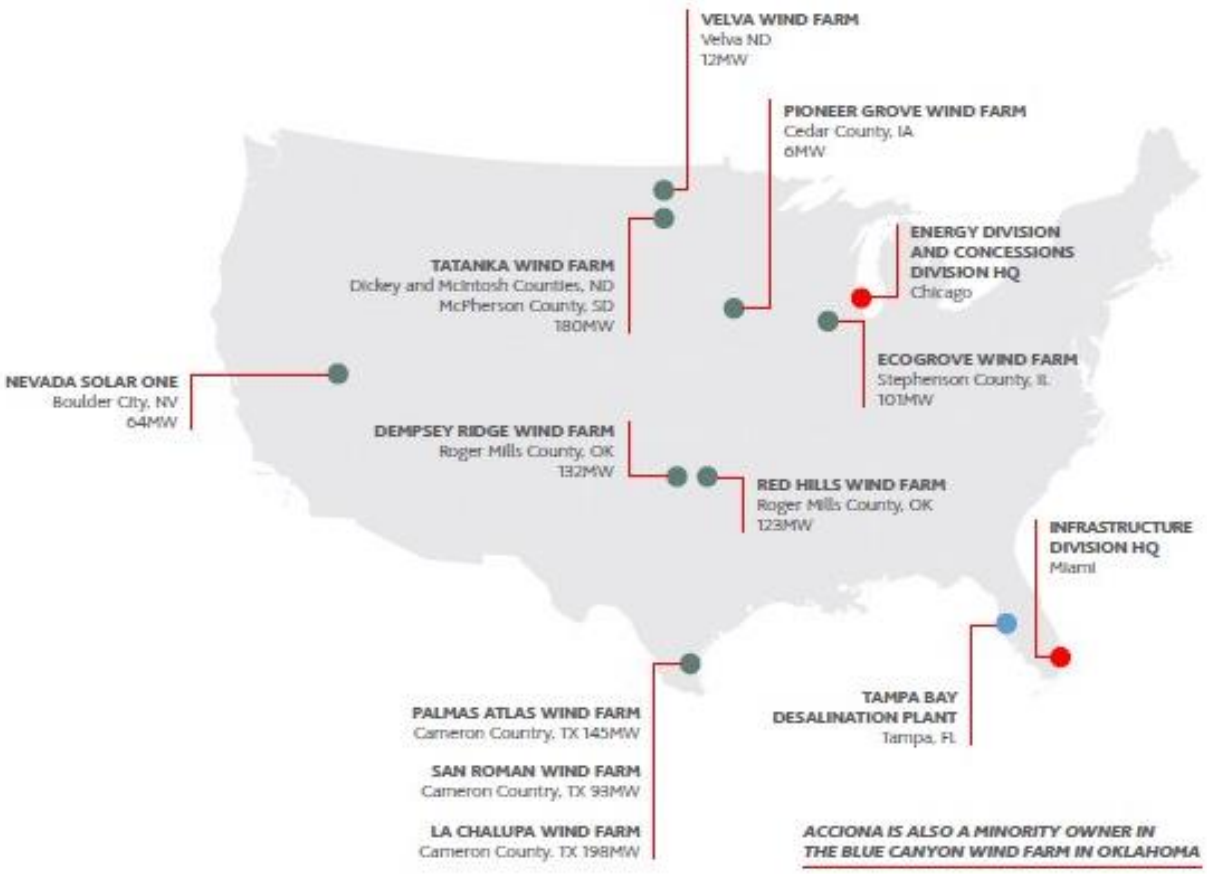
Agenda

1. Meet the team
2. Who are ACCIONA and Tenaska?
3. Solar PV 101: What should I know?
4. Why Madison County?
5. Local benefits of the Madison County Solar Project
6. Next steps
7. Q&A

Meet the Team

- Adam Stratton, Director of Solar Development, ACCIONA
- Kyle Gerking, Project Manager, Engineering & Construction, Tenaska
- Mary Connor, Senior Manager Environmental, Social and Sustainability, ACCIONA
- Tiffany J. Allison, owner, TiffanyJ Media
- David Jakubiak, Senior External Relations Manager, ACCIONA

About ACCIONA

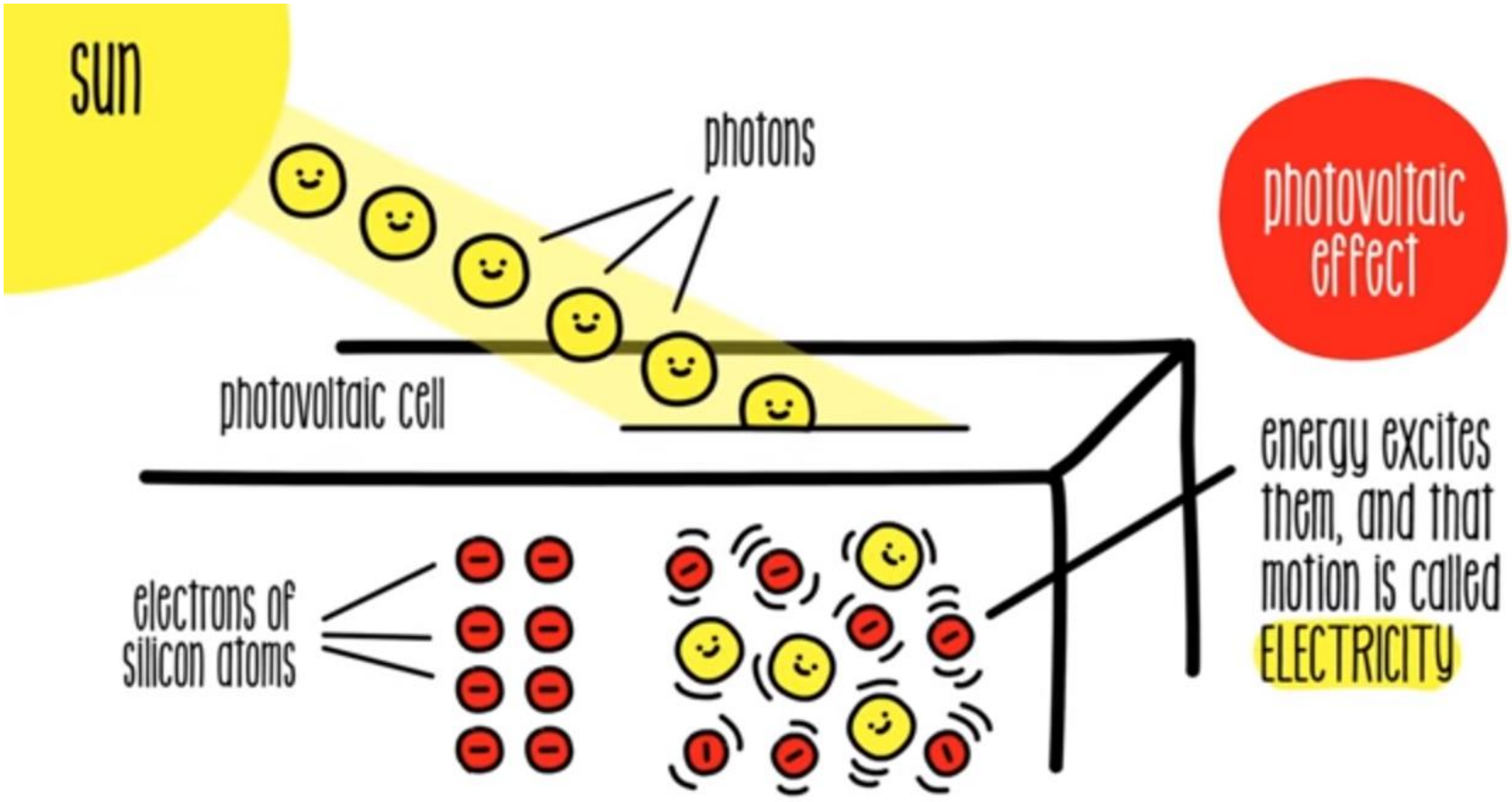


- ACCIONA is a global renewable energy and infrastructure company
- 1,000+ MW of generating capacity in the US
- Company focuses on projects that drive community, environmental benefit
- Local social impact central to every project

About Tenaska

- Omaha, Nebraska-based energy company
- Developed 10,500 MW of energy projects, including 775 MW of renewables
- Working closely with ACCIONA on the development of Madison County Solar

Solar PV 101: What should I know?



Solar panels convert the sun's radiation into electricity through the photovoltaic effect. The sun's rays excite electrons in the photovoltaic cells. This creates motion which is called electricity, which is collected and fed onto the electric grid.

Solar PV 101: What should I know?

Short grass plantings around this solar farm in Illinois provide habitat for beneficial insects and help with storm water mitigation.

- Solar panels about 7’ high, low profile
- Glare limited by finish on the surface
- Vegetation management key to operations
- Low hum inaudible off-site
- Opportunities to incorporate grazing, pollinator plantings
- Useful life of 30+ years

Solar PV 101: What should I know?

A local worker surveys panels at ACCIONA's Sishen solar farm in South Africa.

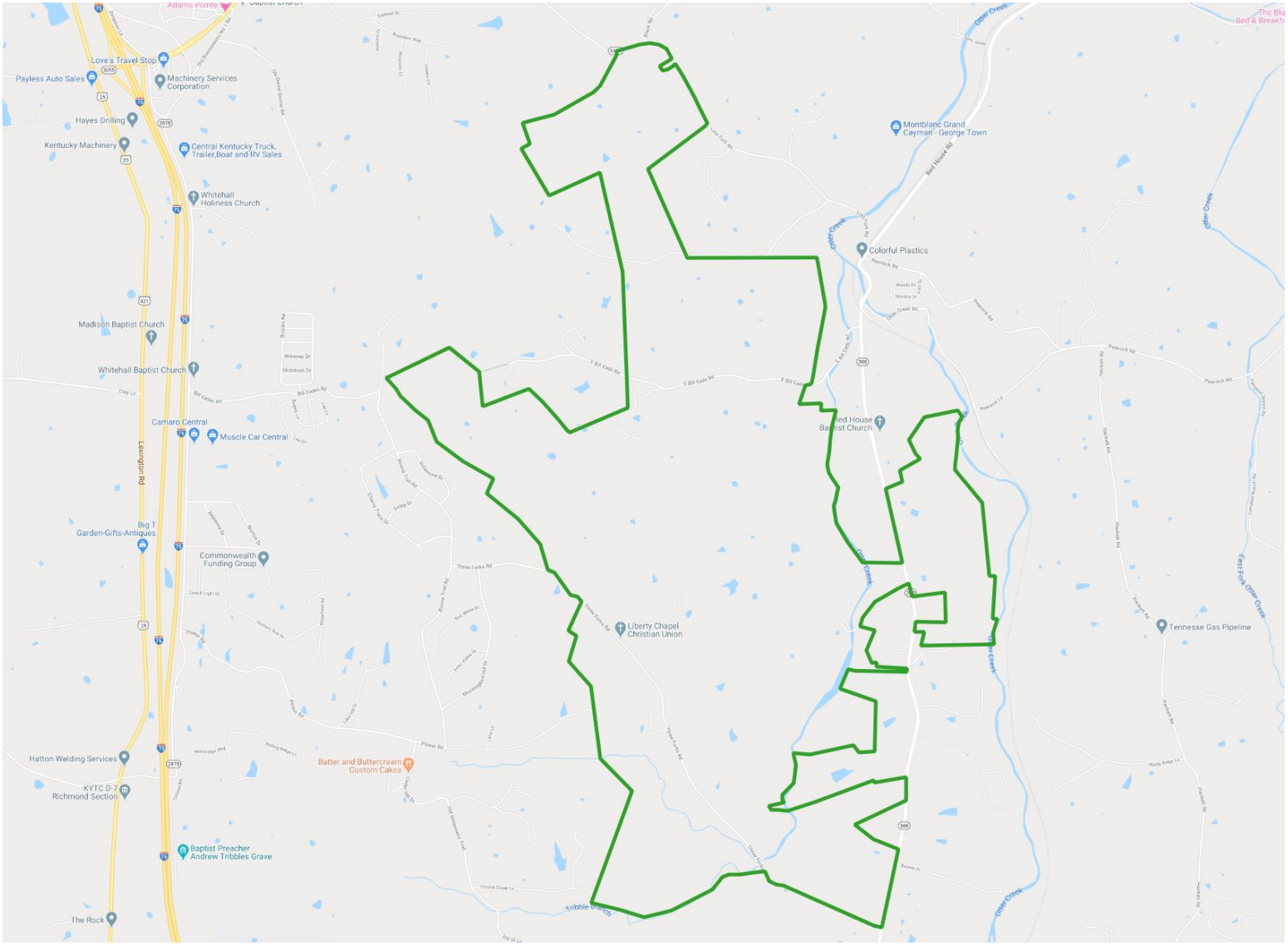
- Construction: up to 300 jobs at peak
- Operations: 5-7 jobs
- O&M look for local employees who know community, have interest, commitment
- Site will operate for 30+ years
- Opportunities to work with local businesses

Why Madison County?

Studies are now being done to identify and preserve any historical features at the Madison County site.

- Infrastructure in place to allow development
- Local commitment to economic development
- Local labor force
- Strong local solar resource
- Increasing demand for reliable, clean energy from businesses, electricity sector

Where will Madison County Solar be built?



Project Details:

- 100 megawatts
- 1,100 acres
- N of Richmond. S of Lost Fork Rd, N of Three Forks Rd, E of I-75, W of Red House Rd.
- Interconnection to the Three Forks-Dale 138 kV Line
- Approximately 250K solar panels

Local benefits for Madison County

Palmas Altas Construction Team Toys for Tots Drive with the U.S. Marine Corps in Harlingen, Texas, December 2019.

- Tax revenue with limited demand on local services like schools, police
- Potential construction jobs, and O&M employment opportunities
- Use of local businesses, services
- Partnerships with local schools, non-profits
- Estimated $120M investment in Madison County

ACCIONA's commitment to social impact

Palmas Altas Construction Team food drive in 2019 for the San Benito food pantry in South Texas.

- Social impact projects are designed for every project ACCIONA builds
- A portion of revenue from the project must be reinvested in the community
- Opportunity for partnerships
- Goal is to impact specific local community needs such as education, wellness and environment

Next Steps, Project Timeline

- **2020-2021**
  - Finalize land transactions & permit review; secure power purchase agreement
  - Initial engineering layout & environmental review
  - Local approvals
  - Siting board process
- **2021-2022**
  - Construction
- **2022**
  - Begin operation

Q&A

Some commonly asked questions about solar energy installations:

Q: How will local government, schools and counties benefit from a project like this?

Q: Has an economic impact analysis been performed on this project?

Q: Will the local community have access to the jobs created by this project?

Q: How long will construction last?

Q&A

Some commonly asked questions about solar energy installations:

Q: What will you be planting around the site? How will you maintain the area around the panels once the site is operational?

Q: Are there fire or other safety issues with solar farms?

Q: Are there noise or glare impacts from solar?

Open Q&A

Do you have questions about the Madison County Solar Project?

Thank You, Madison County!

Send follow-up questions to MadisonCountySolar@ACCIONA.com!

Coming Soon: MadisonSolarFarm.com

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APPENDIX D

Certificate of Compliance with Local Regulations

KENTUCKY STATE BOARD ON ELECTRIC GENERATION AND TRANSMISSION SITING

AEUG MADISON SOLAR, LLC
CASE NO. 2020-00219

STATEMENT REGARDING CERTIFICATIONS REQUIRED BY KRS 278.706(2)(d)

Comes the undersigned and states as follows:

1. That my name is Tracy Stoddard and I am a Vice President, of AEUG Madison Solar, LLC, the Applicant herein;

2. That I am over 18 years of age and am a resident of the State of Illinois;

3. That I have conducted an inquiry into the facts contained in this Statement and believe them to be true to the best of my knowledge;

4. That the proposed facility as planned will be in compliance with any and all local ordinances and regulations concerning noise control, and will also be in compliance with any and all applicable local planning and zoning ordinances as provided in KRS 278.704(3).

5. The proposed facility will be constructed in compliance with the setback requirements established by Madison County and the Madison County Board of Adjustments approval of AEUG's Conditional Use Permit, which is attached hereto.
.

Signed this tenth day of December 2020.

Tracy Stoddard

Vice President, Business Development

AEUG Madison Solar, LLC

MADISON COUNTY
KENTUCKY
Planning & Building Codes
135 W. Irvine St., 3rd Floor
Richmond, KY 40475
859-624-4780
www.madisoncountyky.us

CERTIFICATION OF LAND USE RESTRICTION

NAME: AEUG Madison Solar, LLC

ADDRESS: 55 E. Monroe St. Suite 1925, Chicago, IL 60603

TYPE OF RESTRICTION(S):

☐ Zoning Map Amendment: _____ To _____ Zone

☐ Development Plan

☐ Unrecorded Subdivision Plat

☐ Dimensional Variance

☒ Conditional Use Permit

☐ Conditional Zoning Condition

☐ Other; Specify: _____

SPECIFICATIONS:

The Madison County Board of Adjustments has issued a Conditional Use Permit for the operation of a Commercial Solar Farm on the following Madison County PVA parcels, for applicable conditions please see attached.

a.167 E Bill Eads Road, Richmond, Ky
b. PVA Parcel # 0066-0000-00015, D Tract 1-3, Red House Road
c. PVA Parcel # 0053-0000-0017-2, Tract 2, Three Forks Road
d. 600 Three Forks Road, Richmond, Ky
e. PVA Parcel # 0053-0000-0017-4, Tract 4, Three Forks Road
f. PVA Parcel # 0053-0000-0017-5, Tract 5, Three Forks Road
g. PVA Parcel # 0053-0000-0017-6, Tract 6, Three Forks Road
h. 510 Three Forks Road, Richmond, Ky
I. 2146 Red House Road, Richmond, Ky
j. 172 E Bill Eads Road, Richmond, Ky
k. 433 Lost Fork Road, Richmond, Ky
l. 1050 Boone Trial Road, Richmond, Ky
m. 285 E Bill Eads Road, Richmond, Ky

MADISON COUNTY
KENTUCKY

Planning & Building Codes
135 W. Irvine St., 3rd Floor
Richmond, KY 40475
859-624-4780
www.madisoncountyky.us

n. PVA Parcel # 0066-0000-0001, E Bill Eads Road
o. 2255 Red House Road, Richmond, Ky
p. 2103 Red House Road, Richmond, Ky
q. 1802 Red House Road, Richmond, Ky
r. PVA Parcel # 0066-0000-0025-A, Red House Road
s. PVA Parcel # 0066-0000-0017-B, Tract 3-Three Forks Road
t. PVA Parcel # 0066-0000-0017-IB, Tract 2B-Three Forks Road
u. 150 Lost Fork Road, Richmond, Ky

Issued: December 7, 2020

Director, Planning & Development

Solar Farm Facilities are subject to the following requirements/conditions:

1. **Setbacks:** Setbacks shall be 200ft from the center of any road. Setbacks shall be 200ft between the solar facility (includes fencing, panels, structures, or other related equipment) and any adjacent nonparticipating property. Setbacks shall be 200ft between the solar facility (includes fencing, panels, structures or other related equipment) and any adjacent property which contains a residence.

2. **Solar Panel Height:** Height of panels shall not exceed 10ft at maximum tilt of the solar panels

3. **Fencing:** A Fence shall be constructed to enclose and secure the solar farm facility. Fencing shall be at least 6ft in height above ground level. If fencing is made of chain link material it must be slatted with a color to match the surrounding environment. If fencing is not a chain link material, fence must be made of an opaque material with color of natural wood or surrounding environment. This fence must meet all electric utility safety and security guidelines.

4. **Maintenance:** Applicant shall provide to the Madison County Planning and Development Director a continuing maintenance plan for the entire project prior to construction and before production of solar energy commences on the solar farm. This plan will be updated annually on July 1st. This plan will include but not be limited to the following:

a. Any physical modifications to the solar farm and/or its infrastructure

b. Complaints pertaining to setbacks, noise, appearance, safety, lighting and any use of public roads received by the applicant, owner and/or operator concerning the solar farm facility and the resolutions of such complaints

c. Calls for emergency services, including the nature of the emergency and how it was resolved – this includes any environmental incidents whether considered emergency or not

d. Status/proof of liability insurance

e. Maintenance of Access Roads, Solar Panels, vegetation control, fence line maintenance, trash and debris clean up, wildlife protection, creek and stream protection and environmental protection

f. In addition this plan must provide a local point of contact should an emergency or other issue arise

g. Any other information that the County might reasonably request on the initial plans or annual updates

h. Within 30 days of submission of initial and subsequent Maintenance Plans to the Planning and Development Director, the Planning and Development Office will review the Maintenance Plan and conduct an on-site field inspection of the solar farm facility.

i. Within 60 days of Maintenance Plan submission, Planning and Development office will compile a written report of any findings and request the help of any Madison County department to assist them with any remedy recommendations. The Solar Farm Facility will have a reasonable time, set by the Planning and Development Director, to remedy any maintenance issues not found to comply.

j. There will be a $500 Fee for the initial and each subsequent annual maintenance plans. This fee will be due upon submission of each report. Failure to provide the annual maintenance plans and payment of required fee shall be considered a cessation of operations.

k. The Applicant, owner and/or operator of the solar farm facility shall provide, the Madison County Planning and Development office personnel and any other person(s) accompanied by and deemed necessary by the Madison County Planning and Development office to be present, access to the Solar Farm Facility upon a 24 hour notice. Failure to provide access shall be deemed a violation of this Conditional Use Permit.

5. **Installation and Design**: Solar Farm Facility will be designed and located to prevent/limit glare toward any adjacent properties and all roadways in addition to any requirements of the Federal Aviation Administration

6. **Lighting:** Lighting will be shielded and directed so that it does not spill on to adjacent properties and roadways.

7. **Noise:** Noise levels, during operation, shall not exceed 50 decibels when measured at the property line of an adjacent nonparticipating properties. Noise levels will be enforced by local and state officials.

8. **Landscaping:** A landscaping screen will be provided between the required fencing and the perimeter of the solar farm.

a) The screening shall consist of a continuous line of native evergreen foliage and/or native shrubs and/or native trees and/or any existing wooded area and/or plantings of tall native grasses and other native flowering plants. Screening shall not be required if solar farm is not visible to a dwelling or roadway by virtue of existing topography as determined by the Madison County Planning and Development Director.

b) Landscaping under panels will be of native or other types of grasses. No gravel or concrete ground covering unless needed for roadway or to be support pads for accessory equipment or allow proper drainage.

9) **Wiring:** All Wiring between solar panels and other facilities (ie substations, O&M Buildings, Inverters) shall be underground unless applicant can show a special hardship in a particular location. A waiver may be granted by the Madison County Planning and Development Director.

10) **Outdoor storage:** Only outdoor storage of materials, vehicles and equipment that directly support the operation and maintenance of this solar farm facility will be allowed and shall be subject to the same fencing and screening requirements as the rest of the solar farm unless already within the confines of the required fencing in Condition #3.

11) **Buildings:** Any buildings built in support of this solar farm must be constructed of material that best blend in with the surrounding environment (ie: color, building height, foundation type, etc). This condition will be at the discretion of the Planning and Development director.

12) **Access Points:** Any new access point for this project from county roads must be approved by the Madison County Road Supervisor. These access points must be similar in design to the surrounding properties. Any new access points on state highways must be approved by the KY State Highway Department and must also be similar in design to the surrounding properties.

13) **Roads:** Prior to the start of construction, the applicant will provide the Madison County Road Department with a roads survey. This survey will map and log all the conditions of the county roads that will be used during the construction of this project. This will ensure that the applicant returns the roads post construction to pre-construction condition or better. in addition, the applicant shall post a bond in an amount determined by the Madison County Road Supervisor sufficient to guarantee the above. Madison County Fiscal Court will be the beneficiary of such bond.

14) **Decommission:** Prior to the start of construction, applicant will submit a decommissioning plan to the Madison County Planning and Development office and make it available to anyone upon request. Applicant will commit to the following decommissioning requirements to be performed within 12 months from the date the lease expires or terminates or proof that the Solar Farm Facility is no longer generating/producing solar energy:

a. Description of the plan to remove the solar farm facility equipment, solar panels and any other improvements and restore the land to its previous use upon the end of the project's life

b. Provisions for Removal of solar facilities, structures, debris and associated equipment to a depth of not less than 4ft of surface grade and the sequence in which removal is to be expected

c. Provisions for removal of all infrastructure including concrete mountings and foundations

d. Provisions to restore the land to as close to pre-construction condition as reasonably practical including soil and vegetation restoration

e. An estimate of the decommissioning costs in future dollars at the time of filing certified by a disinterested third party certified professional engineer

f. A written financial plan approved by the Planning and Development Director to ensure that funds will be available for decommissioning and land restoration

g. A provision that the terms of the decommissioning plan shall be binding upon the applicant, owner and/or operator and any of their successors, assigns or heirs

h. Upon review of the decommissioning plan, the Planning and Development Director/Office shall set an amount to be held in the form of a Bond

i. This Plan shall state that the project applicant/owner/operator shall provide the Madison County Fiscal Court with financial assurance to cover the estimated costs of decommissioning of the solar farm facility/project and that the Madison County Fiscal Court shall have access to the solar farm facility/project and to the Bond proceeds to effect or complete decommissioning within one (1) year after cessation of operations; and,

j. The Applicant/owner/operator shall provide Madison County Planning and Development Director/Office with a new estimate of the cost of decommissioning of the solar farm facility/project every five (5) years under the same conditions as set forth in this section above. Salvage value of structures, electrical wire and other appurtenances shall be considered within the cost estimate calculations. Upon receipt of this new estimate, the county may require, and the applicant, owner and/or operator shall provide, a new financial plan for decommissioning acceptable to the Planning and Development Director/Office or their designated representative. A new Bond amount may be determined and required to ensure decommissioning is adequately funded. Failure to provide these new cost estimates and updated financial plans every five (5) years shall be considered a cessation of operations.

15) **Bonds/Guarantees:** ACCIONA Energy USA Global LLC, the 100% owner of AEUG Madison Solar, LLC, will provide a bond/guarantee ensuring the decommissioning of the site under the proposed requirements stated above. The beneficiary of said bond/guarantee shall be:

a. If leased there will be a dual beneficiary between the property owner and Madison County Fiscal court. In the event the property owner fails to reclaim the property to pre-construction condition, Madison County Fiscal court shall have the sole authority to execute the bond for purposes of reclaiming the property to pre-construction condition.

b. If property is owned by applicant, then Madison County Fiscal court will be beneficiary of said bond/guarantee and shall have the sole authority to execute the bond for purposes of reclaiming property to pre-construction condition.

16) **Safety:** Applicant shall provide a report to the planning and development office identifying any special hazards associated with this project. Report will identify any special signage High Hazard areas or specialized training that may be required for first responders related to this project.

17) **Compliance:**

In addition to the items listed above the applicant must comply with any and all Local, State, and Federal guidelines that would be related to a project such as this. In the event the applicant fails to comply with any condition mentioned above, the permit to operate this facility will be suspended and the facility must cease production until such time as the deficiencies are corrected or the solar farm facility/project must be decommissioned.

18) **Cessation of Operations:**

If any Solar arm Facility/Project has not been in operation and production of solar energy electricity for at least two hundred seventy (270) consecutive days then it will be deemed to be in cessation of operations and decommissioning must commence. The Madison County Planning and Development Office/Director shall notify applicant, owner and/or operator of their decommissioning commitment. Within 30 days the applicant, owner and/or operator shall provide evidence of operation and production of solar energy electricity or begin decommissioning. If the applicant, owner and/or operator fails to refuse to begin decommissioning then the Madison County Fiscal Court has the right to bring legal action and claim Bond proceeds to begin decommissioning.

19) **Indemnification and Liability:**

a. The applicant, owner and/or operator of the solar farm facility/project shall defend, indemnify, and hold harmless the County of Madison and its officials from and against any and all claims, demands, losses, suits, causes of action, damages, injuries, costs, expenses and liabilities whatsoever, including attorney's fees, without limitation, arising out of acts or omissions of the applicant, owner and/or operator associated with the construction and/or operation of this solar farm facility/project.

b. The applicant, owner and/or operator of the solar farm facility/project shall maintain a current general liability policy covering bodily injury and property damage with limits set by the Planning and Development Office/Director and/or their designated representative sufficient to cover a project of this size. Evidence of liability coverage must be reported and presented to the Madison County Planning and Development Office/Director prior to any construction and on an annual basis every July 1st. Any loss of coverage must be reported to the Madison County Planning and Development Office/Director within three (3) working days of loss. Failure to maintain coverage shall be considered a cessation of operations.

20) **Penalties**

a. A failure to obtain applicable building permit(s) for construction of this solar farm facility/project or failure to comply with the requirements of a building permit or the provisions of this Conditional Use Permit shall be deemed a violation of this Conditional Use Permit. The Madison County Attorney and/or the KY Commonwealth Attorney may bring action to enforce compliance.

b. Applicant, Owner and or Operator could be imposed with fines of not less than $25 or no more than $500 for violations of any of the terms of this Conditional Use Permit.

c. Nothing herein shall prevent the Madison County Fiscal Court from seeking such other legal remedies available to prevent or remedy any violations of this Conditional Use Permit.

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APPENDIX E

PJM Interconnection – Feasibility Study

Generation Interconnection

Feasibility Study Report

for

Queue Project AE2-308

THREE FORKS-DALE 138 KV

110 MW Capacity / 150 MW Energy

July, 2019

Table of Contents

1 Preface

The intent of the feasibility study is to determine a plan, with ballpark cost and construction time estimates, to connect the subject generation to the PJM network at a location specified by the Interconnection Customer. The Interconnection Customer may request the interconnection of generation as a capacity resource or as an energy-only resource. As a requirement for interconnection, the Interconnection Customer may be responsible for the cost of constructing: (1) Direct Connections, which are new facilities and/or facilities upgrades needed to connect the generator to the PJM network, and (2) Network Upgrades, which are facility additions, or upgrades to existing facilities, that are needed to maintain the reliability of the PJM system.

In some instances a generator interconnection may not be responsible for 100% of the identified network upgrade cost because other transmission network uses, e.g. another generation interconnection, may also contribute to the need for the same network reinforcement. Cost allocation rules for network upgrades can be found in PJM Manual 14A, Attachment B. The possibility of sharing the reinforcement costs with other projects may be identified in the feasibility study, but the actual allocation will be deferred until the impact study is performed.

The Interconnection Customer seeking to interconnect a wind or solar generation facility shall maintain meteorological data facilities as well as provide that meteorological data which is required per Schedule H to the Interconnection Service Agreement and Section 8 of Manual 14D.

An Interconnection Customer with a proposed new Customer Facility that has a Maximum Facility Output equal to or greater than 100 MW shall install and maintain, at its expense, phasor measurement units (PMUs). See Section 8.5.3 of Appendix 2 to the Interconnection Service Agreement as well as section 4.3 of PJM Manual 14D for additional information.

PJM utilizes manufacturer models to ensure the performance of turbines is properly captured during the simulations performed for stability verification and, where applicable, for compliance with low voltage ride through requirements. Turbine manufacturers provide such models to their customers. The list of manufacturer models PJM has already validated is contained in Attachment B of Manual 14G. Manufacturer models may be updated from time to time, for various reasons such as to reflect changes to the control systems or to more accurately represent the capabilities turbines and controls which are currently available in the field. Additionally, as new turbine models are developed, turbine manufacturers provide such new models which must be used in the conduct of these studies. PJM needs adequate time to evaluate the new models in order to reduce delays to the System Impact Study process timeline for the Interconnection Customer as well as other Interconnection Customers in the study group. Therefore, PJM will require that any Interconnection Customer with a new manufacturer model must supply that model to PJM, along with a $10,000 fully refundable deposit, no later than three (3) months prior to the starting date of the System Impact Study (See Section 4.3 for starting dates) for the Interconnection Request which shall specify the use of the new model. The Interconnection Customer will be required to submit a completed dynamic model study request form (Attachment B-1 of Manual 14G) in order to document the request for the study.

The Feasibility Study estimates do not include the feasibility, cost, or time required to obtain property rights and permits for construction of the required facilities. The project developer is responsible for the right of way, real estate, and construction permit issues. For properties currently owned by Transmission Owners, the costs may be included in the study.

2 General

The Interconnection Customer (IC), has proposed a Solar; Storage generating facility located in Madison County, Kentucky. The installed facilities will have a total capability of 150 MW with 110 MW of this output being recognized by PJM as Capacity. The proposed in-service date for this project is 5/31/2021. This study does not imply a TO commitment to this in-service date.

Queue Number	**AE2-308**
Project Name	THREE FORKS-DALE 138 KV
State	Kentucky
County	Madison
Transmission Owner	EKPC
MFO	150
MWE	150
MWC	110
Fuel	Solar; Storage
Basecase Study Year	2022

2.1 Point of Interconnection

AE2-308 will interconnect with the EKPC transmission system tapping the Three Forks to Dale 138kV line.

2.2 Cost Summary

The AE2-308 project will be responsible for the following costs:

Description	Total Cost
Attachment Facilities	$250,000
Direct Connection Network Upgrade	$5,650,000
Non Direct Connection Network Upgrades	$100,000
Total Costs	$6,000,000

In addition, the AE2-308 project may be responsible for a contribution to the following costs

Description	Total Cost
System Upgrades	$19,210,000

Cost allocations for these upgrades will be provided in the System Impact Study Report.

3 Transmission Owner Scope of Work

4 Attachment Facilities

The total preliminary cost estimate for the Attachment work is given in the table below. These costs do not include CIAC Tax Gross-up.

Description	Total Cost
Install a 138 kV switch structure at the point of demarcation.	$250,000
Total Attachment Facility Costs	$250,000

5 Direct Connection Cost Estimate

The total preliminary cost estimate for the Direct Connection work is given in the table below. These costs do not include CIAC Tax Gross-up.

Description	Total Cost
Build 138kV switching station along the Dale – Three Forks 138kV line, includes line work. **Estimated Time to Construct: 24 months**	$5,650,000
Total Direct Connection Facility Costs	$5,650,000

6 Non-Direct Connection Cost Estimate

The total preliminary cost estimate for the Non-Direct Connection work is given in the table below. These costs do not include CIAC Tax Gross-up.

Description	Total Cost
Relaying upgrades at the remote end substations	$100,000
Total Non-Direct Connection Facility Costs	$100,000

7 Incremental Capacity Transfer Rights (ICTRs)

Will be determined at a later study phase

8 Interconnection Customer Requirements

1. An Interconnection Customer entering the New Services Queue on or after October 1, 2012 with a proposed new Customer Facility that has a Maximum Facility Output equal to or greater than 100 MW shall install and maintain, at its expense, phasor measurement units (PMUs). See Section 8.5.3 of Appendix 2 to the Interconnection Service Agreement as well as section 4.3 of PJM Manual 14D for additional information.

2. The Interconnection Customer may be required to install and/or pay for metering as necessary to properly track real time output of the facility as well as installing metering which shall be used for billing purposes. See Section 8 of Appendix 2 to the Interconnection Service Agreement as well as Section 4 of PJM Manual 14D for additional information.

9 Revenue Metering and SCADA Requirements

9.1 PJM Requirements

The Interconnection Customer will be required to install equipment necessary to provide Revenue Metering (KWH, KVARH) and real time data (KW, KVAR) for IC's generating Resource. See PJM Manuals M-01 and M-14D, and PJM Tariff Sections 24.1 and 24.2.

9.2 EKPC Requirements

The Interconnection Customer will be required to comply with all EKPC Revenue Metering Requirements for Generation Interconnection Customers. The Revenue Metering Requirements may be found within the "EKPC Facility Connection Requirements" document located at the following link:

http://www.pjm.com/planning/design-engineering/to-tech-standards/ekpc.aspx

10 Network Impacts Option-1

The Queue Project AE2-308 was evaluated as a 151.0 MW (Capacity 111.0 MW) injection tapping the Three Forks to Dale 138kV line in the EKPC area. Project AE2-308 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AE2-308 was studied with a commercial probability of 0.53. Potential network impacts were as follows:

Summer Peak Load Flow

11 Generation Deliverability

(Single or N-1 contingencies for the Capacity portion only of the interconnection)

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
8971658	342574	4DALE	EKPC	342565	4BOONESBORT	EKPC	1	EKPC_P1-2_JKS-NCLA345	single	296.0	92.42	105.39	DC	38.38

12 Multiple Facility Contingency

(Double Circuit Tower Line, Fault with a Stuck Breaker, and Bus Fault contingencies for the full energy output)

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
7407802	253038	09KILLEN	DAY	242938	05MARQUI	AEP	1	AEP_P4_#2085_05BEATTY 345_304C	breaker	1372.0	99.64	100.14	DC	15.22
7407803	253038	09KILLEN	DAY	242938	05MARQUI	AEP	1	AEP_P4_#2866_05BEATTY 345_304W	breaker	1372.0	99.81	100.3	DC	15.07

13 Contribution to Previously Identified Overloads

(This project contributes to the following contingency overloads, i.e. "Network Impacts", identified for earlier generation or transmission interconnection projects in the PJM Queue)

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
7408997	253038	09KILLEN	DAY	242938	05MARQUI	AEP	1	DAY_P7_BEATTY-S. CHARLESTON 34542_1-A	tower	1372.0	112.84	113.38	DC	16.28
7408998	253038	09KILLEN	DAY	242938	05MARQUI	AEP	1	DAY_P7_BEATTY-S. CHARLESTON 34542_1-B	tower	1372.0	110.75	111.28	DC	16.28
8971300	324114	7TRIMBLE CO	LGEE	248000	06CLIFTY	OVEC	1	Base Case	single	1134.0	151.31	152.54	DC	13.99
8971950	342559	4BOONE CO	EKPC	250054	08LONG BR	DEO&K	1	DEO&K-DAY-EKPC.C5 4541MELDAHLSPRLCKSTUARTSPURLOC KDPLEK	tower	284.0	103.59	105.4	DC	11.3
8971638	342607	4JK SMITH	EKPC	342574	4DALE	EKPC	1	EKPC_P1-2_JKS-NCLA345	single	284.0	103.89	108.79	DC	13.91
8970928	342838	7SPURLOCK	EKPC	253077	09STUART	DAY	1	.138.DEO&K.C2 816_SILVERGROVE	breaker	1421.0	121.47	122.63	DC	36.58
8970929	342838	7SPURLOCK	EKPC	253077	09STUART	DAY	1	.345.DEO&K.C2 1493_RED BANK	breaker	1421.0	121.35	122.51	DC	36.53
8971488	342838	7SPURLOCK	EKPC	253077	09STUART	DAY	1	.345.DEO&K.B2 RED BANK-SG-ZIMMER 4545	single	1421.0	116.18	118.07	DC	26.79
8971491	342838	7SPURLOCK	EKPC	253077	09STUART	DAY	1	Base Case	single	1240.0	112.9	114.93	DC	25.16

14 Potential Congestion due to Local Energy Deliverability

PJM also studied the delivery of the energy portion of this interconnection request. Any problems identified below are likely to result in operational restrictions to the project under study. The developer can proceed

with network upgrades to eliminate the operational restriction at their discretion by submitting a Merchant Transmission Interconnection request.

Note: Only the most severely overloaded conditions are listed below. There is no guarantee of full delivery of energy for this project by fixing only the conditions listed in this section. With a Transmission Interconnection Request, a subsequent analysis will be performed which shall study all overload conditions associated with the overloaded element(s) identified.

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
7408712	253038	09KILLEN	DAY	242938	05MARQUI	AEP	1	AEP_P1-2_#762	operation	1372.0	99.6	100.09	DC	15.06
8971294	324114	7TRIMBLE CO	LGEE	248000	06CLIFTY	OVEC	1	AEP_P1-2_#363	operation	1451.0	158.92	160.2	DC	18.81
8971295	324114	7TRIMBLE CO	LGEE	248000	06CLIFTY	OVEC	1	Base Case	operation	1134.0	156.95	158.59	DC	19.08
8971657	342574	4DALE	EKPC	342565	4BOONESBORT	EKPC	1	EKPC_P1-2_JKS-NCLA345	operation	296.0	89.81	107.49	DC	52.33
8971639	342607	4JK SMITH	EKPC	342574	4DALE	EKPC	1	EKPC_P1-2_JKS-NCLA345	operation	284.0	100.65	105.56	DC	13.91
8971487	342838	7SPURLOCK	EKPC	253077	09STUART	DAY	1	.345.DEO&K.B2 RED BANK-SG-ZIMMER 4545	operation	1421.0	121.29	122.45	DC	36.53
8971489	342838	7SPURLOCK	EKPC	253077	09STUART	DAY	1	Base Case	operation	1240.0	116.17	117.42	DC	34.32

15 System Reinforcements

ID	Index	Facility	Upgrade Description	Cost
8971950	4	4BOONE CO 138.0 kV - 08LONGBR 138.0 kV Ckt 1	8971950 Facility is 100% Owned by EKPC. No DL reinforcements needed. r0009 (646) : Increase MOT of Boone-Longbranch 138kV line section 954 MCM conductor to 275F (~2.25 miles) Project Type : FAC Cost : $200,000 Time Estimate : 6 Months r0010 (647) : upgrade jumpers associated with Boone 138kV bus using 2-500 MCM 37 CU conductor or equivalent Project Type : FAC Cost : $20,000 Time Estimate : 6 Months	$220,000
8971300	3	7TRIMBLE CO 345.0 kV - 06CLIFTY 345.0 kV Ckt 1	8971300 This facility is owned by LGEE. NonPJMArea (778) : The external (i.e. Non-PJM) Transmission Owner, LGEE, will not evaluate this violation until the impact study phase. Project Type : FAC Cost : $0 Time Estimate : N/A Months	$0
8971638	5	4JK SMITH 138.0 kV - 4DALE 138.0 kV Ckt 1	r0011 (648) : No violation. Rating Correction: [Rate A: 229, Rate B: 296, Rate C: 358] Project Type : FAC Cost : $0 Time Estimate : N/A Months r0012a (649) : rebuild Dale 138kV bus using 2-500 MCM conductor or equivalent (Dale-JK Smith 138kV) Project Type : FAC Cost : $1,000,000 Time Estimate : 12 Months	$1,000,000

ID	Index	Facility	Upgrade Description	Cost
7408998,7408997,7407803,7407802	2	09KILLEN 345.0 kV - 05MARQUI 345.0 kV Ckt 1	**AEP** **AEPO0007a (116) : Perform sag study on Don Marquis-Killen 345kV circuit, 32.1 miles of 2-983.1 ACAR 30/7 Rail5 conductor. Since Killen will be retired, the conductor between Don Marquis and Stuart will become a complete circuit and the whole circuit will need to be sag studied. Perform sag study on Killen-Stuart 345kV circuit, 15.2 miles of 2-983.1 ACAR 30/7 Rail5 conductor.** **Project Type : FAC** **Cost : $190,000** **Time Estimate : 6-12 Months** **DAY** **r190008 (359) : Reconductor line with 795 ACCR high temperature conductor in a twin bundle** **Project Type : FAC** **Cost : $6,500,000** **Time Estimate : 18.0 Months** **r190009 (360) : Replace 2000A wave trap with 3000A** **Project Type : FAC** **Cost : $100,000** **Time Estimate : 12.0 Months** **r190010 (361) : Replace substation riser conductor with 2-1024.5 ACAR 30x7** **Project Type : FAC** **Cost : $100,000** **Time Estimate : 12.0 Months**	$6,890,000
8970928,8970929,8971488,8971491	6	7SPURLOCK 345.0 kV - 09STUART 345.0 kV Ckt 1	**DAY** **r190002 (353) : Replace substation riser conductor with 2500AAC (parallel)** **Project Type : FAC** **Cost : $100,000** **Time Estimate : 12.0 Months** **r190004 (355) : Reconductor line with 795 ACCR high temperature conductor in a twin bundle** **Project Type : FAC** **Cost : $10,000,000** **Time Estimate : 18.0 Months** **EKPC** **r0005 (640) : No Violation. EKPC emergency rating 1792 MVA.** **Project Type : FAC** **Cost : $0** **Time Estimate : N/A Months**	$10,100,000
8971658	1	4DALE 138.0 kV - 4BOONESBOR T 138.0 kV Ckt 1	**r0012b (651) : rebuild Dale 138kV bus using 2-500 MCM conductor or equivalent (Dale-Boonesboro North 138kV)** **Project Type : FAC** **Cost : $1,000,000** **Time Estimate : 12 Months**	$1,000,000
			TOTAL COST	**$19,210,000**

16 Flow Gate Details

The following appendices contain additional information about each flowgate presented in the body of the report. For each appendix, a description of the flowgate and its contingency was included for convenience. However, the intent of the appendix section is to provide more information on which projects/generators have contributions to the flowgate in question. Although this information is not used "as is" for cost allocation purposes, it can be used to gage other generators impact.It should be noted the generator contributions presented in the appendices sections are full contributions, whereas in the body of the report, those contributions take into consideration the commercial probability of each project.

16.1 Index 1

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
8971658	342574	4DALE	EKPC	342565	4BOONESBORT	EKPC	1	EKPC_P1-2_JKS-NCLA345	single	296.0	92.42	105.39	DC	38.38

Bus #	Bus	MW Impact
342900	1COOPER1 G	0.77
342903	1COOPER2 G	1.49
342918	1JKCT 1G	2.5
342921	1JKCT 2G	2.5
342924	1JKCT 3G	2.5
342927	1JKCT 4G	1.66
342930	1JKCT 5G	1.65
342933	1JKCT 6G	1.66
342936	1JKCT 7G	1.66
342939	1JKCT 9G	1.34
342942	1JKCT 10G	1.34
342945	1LAUREL 1G	0.58
935011	AD1-134	12.57
936571	AD2-072 C O1	4.55
936821	AD2-105 C O1	2.24
942411	AE2-254 C O1	2.81
942591	AE2-275 C O1	12.47
942891	AE2-308 C O1	38.38
CARR	CARR	0.03
CBM-S1	CBM-S1	4.43
CBM-S2	CBM-S2	1.26
CBM-W1	CBM-W1	0.54
CBM-W2	CBM-W2	19.29
CIN	CIN	0.92
CPLE	CPLE	0.39
IPL	IPL	0.35
LGEE	LGEE	0.86
MEC	MEC	1.91
RENSSELAER	RENSSELAER	0.02
WEC	WEC	0.09

16.2 Index 2

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
7408997	253038	09KILLEN	DAY	242938	05MARQUI	AEP	1	DAY_P7_BEATTY-S. CHARLESTON 34542_1-A	tower	1372.0	112.84	113.38	DC	16.28

Bus #	Bus	MW Impact
253038	09KILLEN	298.51
253077	09STUART	478.92
902531	W2-040 C	0.7
902532	W2-040 E	1.13
904722	V4-073 E	0.15
913222	Y1-054 E	1.77
914372	Y2-111 E	1.12
915582	Y3-080 E	0.75
915662	Y3-099 E	0.16
915672	Y3-100 E	0.16
916182	Z1-065 E	0.54
916272	Z1-080 E	0.47
918802	AA1-099 E	0.31
925242	AB2-178 E	1.56
925921	AC1-068 C	7.92
925922	AC1-068 E	3.71
925931	AC1-069 C	7.92
925932	AC1-069 E	3.71
925981	AC1-074 C O1	7.04
925982	AC1-074 E O1	3.02
926061	AC1-085 C O1	34.6
926062	AC1-085 E O1	56.44
926101	AC1-089 C O1	4.35
926102	AC1-089 E O1	7.1
926791	AC1-165 C	7.83
926792	AC1-165 E	3.8
926801	AC1-166 C	7.83
926802	AC1-166 E	3.8
930062	AB1-014 E	13.64
931181	AB1-169	301.62
932462	AC2-066 E	0.44
932481	AC2-068 C	2.36
932482	AC2-068 E	3.86
932551	AC2-075 C	1.67
932552	AC2-075 E	0.84
932661	AC2-088 C O1	7.58
932662	AC2-088 E O1	6.24
935011	AD1-134	7.68
935031	AD1-136 C	1.07
935032	AD1-136 E	0.91
935041	AD1-140 C O1	7.32

Bus #	Bus	MW Impact
935042	AD1-140 E O1	6.06
936251	AD2-031 C O1	2.3
936252	AD2-031 E O1	3.76
936281	AD2-036 C	5.03
936282	AD2-036 E	2.51
936381	AD2-048 C	5.59
936382	AD2-048 E	2.79
936571	AD2-072 C O1	4.96
936572	AD2-072 E O1	2.43
937111	AD2-147 C O1	4.65
937112	AD2-147 E O1	6.41
937151	AD2-151 C O1	7.55
937152	AD2-151 E O1	10.43
938051	AE1-007 C	0.68
938052	AE1-007 E	1.1
938271	AE1-040 C O1	2.56
938272	AE1-040 E O1	1.29
938921	AE1-120	7.75
939141	AE1-144 C O1	13.3
939142	AE1-144 E O1	6.6
940531	AE2-038 C O1	8.87
940532	AE2-038 E O1	4.39
941411	AE2-138 C	26.57
941412	AE2-138 E	9.83
941511	AE2-148 C	43.93
941512	AE2-148 E	19.87
941981	AE2-210 C O1	9.04
941982	AE2-210 E O1	3.4
942061	AE2-218 C	8.21
942062	AE2-218 E	5.58
942091	AE2-221 C	32.57
942092	AE2-221 E	21.71
942231	AE2-235 C O1	6.33
942232	AE2-235 E O1	2.73
942411	AE2-254 C O1	2.36
942412	AE2-254 E O1	1.57
942521	AE2-267 C O1	2.99
942522	AE2-267 E O1	1.85
942591	AE2-275 C O1	6.97
942592	AE2-275 E O1	2.62
942781	AE2-296 O1	9.52
942891	AE2-308 C O1	11.94
942892	AE2-308 E O1	4.34
942951	AE2-315	2.31
942981	AE2-320 C O1	15.59
942982	AE2-320 E O1	7.71
943111	AE2-339 C	4.02
943112	AE2-339 E	1.98
943191	AE2-318 C	10.18
943192	AE2-318 E	4.97
943201	AE2-319 C O1	15.59
943202	AE2-319 E O1	7.71

Bus #	Bus	MW Impact
CARR	CARR	0.47
CATAWBA	CATAWBA	0.07
CBM-S1	CBM-S1	8.51
CBM-W1	CBM-W1	10.07
CBM-W2	CBM-W2	56.95
CIN	CIN	9.04
G-007	G-007	1.37
HAMLET	HAMLET	0.22
IPL	IPL	6.18
LGEE	LGEE	3.95
MEC	MEC	9.91
MECS	MECS	3.8
O-066	O-066	8.76
RENSSELAER	RENSSELAER	0.37
WEC	WEC	1.35

16.3 Index 3

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
8971300	324114	7TRIMBLE CO	LGEE	248000	06CLIFTY	OVEC	1	Base Case	single	1134.0	151.31	152.54	DC	13.99

Bus #	Bus	MW Impact
342900	1COOPER1 G	2.08
342903	1COOPER2 G	4.04
342918	1JKCT 1G	1.67
342921	1JKCT 2G	1.67
342924	1JKCT 3G	1.67
342927	1JKCT 4G	1.11
342930	1JKCT 5G	1.1
342933	1JKCT 6G	1.11
342936	1JKCT 7G	1.11
342939	1JKCT 9G	1.14
342942	1JKCT 10G	1.14
342945	1LAUREL 1G	1.18
925981	AC1-074 C O1	5.08
932551	AC2-075 C	1.21
935011	AD1-134	8.84
936281	AD2-036 C	3.63
936381	AD2-048 C	4.44
936571	AD2-072 C O1	12.34
936821	AD2-105 C O1	3.65
936831	AD2-106 C O1	2.21
936841	AD2-107 C O1	1.48
939131	AE1-143 C	11.58
940041	AE1-246 C O1	14.33
940051	AE1-247 C O1	24.33
940831	AE2-071 C O1	3.63
941411	AE2-138 C	18.77
941961	AE2-208	1.61
941981	AE2-210 C O1	6.59
942231	AE2-235 C O1	2.35
942411	AE2-254 C O1	4.9
942591	AE2-275 C O1	8.41
942891	AE2-308 C O1	13.99
943111	AE2-339 C	4.01
952471	J708	47.79
952811	J759	11.5
952821	J762	36.21
952861	J783 C	10.89
953611	J800	14.73
953831	J842 C	3.43
953841	J843 C	3.69
953931	J856	10.79
CARR	CARR	0.1

Bus #	Bus	MW Impact
CBM-S1	CBM-S1	44.7
CBM-S2	CBM-S2	4.84
CBM-W1	CBM-W1	5.83
CBM-W2	CBM-W2	163.55
CIN	CIN	24.9
CPLE	CPLE	1.42
IPL	IPL	12.59
LGEE	LGEE	27.85
MEC	MEC	14.95
RENSSELAER	RENSSELAER	0.08
WEC	WEC	0.91

16.4 Index 4

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
8971950	342559	4BOONE CO	EKPC	250054	08LONGBR	DEO&K	1	DEO&K-DAY-EKPC.C5 4541MELDAHLSPRLCKSTUARTSPURLOCK DPLEK	tower	284.0	103.59	105.4	DC	11.3

Bus #	Bus	MW Impact
342957	1SPURLK1G	4.49
342960	1SPURLK2G	7.03
342963	1SPURLK3G	3.69
342966	1SPURLK4G	3.69
925981	AC1-074 C O1	9.17
925982	AC1-074 E O1	3.93
932551	AC2-075 C	2.18
932552	AC2-075 E	1.1
935011	AD1-134	5.06
936281	AD2-036 C	6.55
936282	AD2-036 E	3.27
936381	AD2-048 C	5.97
936382	AD2-048 E	2.98
936571	AD2-072 C O1	3.35
936572	AD2-072 E O1	1.64
939141	AE1-144 C O1	8.69
939142	AE1-144 E O1	4.31
940531	AE2-038 C O1	5.79
940532	AE2-038 E O1	2.87
941411	AE2-138 C	16.37
941412	AE2-138 E	6.05
941981	AE2-210 C O1	5.66
941982	AE2-210 E O1	2.13
942231	AE2-235 C O1	4.52
942232	AE2-235 E O1	1.95
942411	AE2-254 C O1	1.61
942412	AE2-254 E O1	1.07
942591	AE2-275 C O1	4.63
942592	AE2-275 E O1	1.74
942891	AE2-308 C O1	8.29
942892	AE2-308 E O1	3.01
943111	AE2-339 C	3.03
943112	AE2-339 E	1.49
CARR	CARR	0.05
CBM-S1	CBM-S1	4.34
CBM-S2	CBM-S2	0.84
CBM-W1	CBM-W1	0.14
CBM-W2	CBM-W2	15.68
CIN	CIN	1.16
CPLE	CPLE	0.25

Bus #	Bus	MW Impact
G-007	G-007	0.12
IPL	IPL	0.49
LGEE	LGEE	1.78
MEC	MEC	1.39
O-066	O-066	0.78
RENSSELAER	RENSSELAER	0.04
WEC	WEC	0.04

16.5 Index 5

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
8971638	342607	4JK SMITH	EKPC	342574	4DALE	EKPC	1	EKPC_P1-2_JKS-NCLA345	single	284.0	103.89	108.79	DC	13.91

Bus #	Bus	MW Impact
342918	1JKCT 1G	2.72
342921	1JKCT 2G	2.72
342924	1JKCT 3G	2.72
342927	1JKCT 4G	1.81
342930	1JKCT 5G	1.8
342933	1JKCT 6G	1.81
342936	1JKCT 7G	1.81
342939	1JKCT 9G	1.41
342942	1JKCT 10G	1.41
935011	AD1-134	11.75
942591	AE2-275 C O1	5.17
942893	AE2-308 BAT	13.91
CARR	CARR	0.03
CBM-S1	CBM-S1	2.16
CBM-S2	CBM-S2	0.65
CBM-W1	CBM-W1	0.07
CBM-W2	CBM-W2	9.69
CIN	CIN	0.44
CPLE	CPLE	0.2
IPL	IPL	0.15
LGEE	LGEE	0.31
MEC	MEC	0.86
RENSSELAER	RENSSELAER	0.02
WEC	WEC	0.02

16.6 Index 6

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
8970929	342838	7SPURLOCK	EKPC	253077	09STUART	DAY	1	.345.DEO&K.C2 1493_RED BANK	breaker	1421.0	121.35	122.51	DC	36.53

Bus #	Bus	MW Impact
251968	08ZIMRHP	33.39
251969	08ZIMRLP	18.29
251970	08MELDL1	1.69
251971	08MELDL2	1.69
251972	08MELDL3	1.7
342957	1SPURLK1G	17.48
342960	1SPURLK2G	33.1
342963	1SPURLK3G	17.39
342966	1SPURLK4G	17.39
925981	AC1-074 C O1	15.31
925982	AC1-074 E O1	6.56
926951	AC1-182	0.8
932551	AC2-075 C	3.64
932552	AC2-075 E	1.83
935011	AD1-134	17.48
936281	AD2-036 C	10.93
936282	AD2-036 E	5.47
936381	AD2-048 C	11.97
936382	AD2-048 E	5.97
936571	AD2-072 C O1	9.64
936572	AD2-072 E O1	4.73
936821	AD2-105 C O1	4.08
936822	AD2-105 E O1	5.98
936831	AD2-106 C O1	2.82
936832	AD2-106 E O1	3.9
936841	AD2-107 C O1	2.23
936842	AD2-107 E O1	3.08
939131	AE1-143 C	7.15
939132	AE1-143 E	3.54
939141	AE1-144 C O1	32.16
939142	AE1-144 E O1	15.96
940531	AE2-038 C O1	21.45
940532	AE2-038 E O1	10.63
941411	AE2-138 C	62.82
941412	AE2-138 E	23.23
941961	AE2-208	2.43
941981	AE2-210 C O1	21.29
941982	AE2-210 E O1	8.01
942231	AE2-235 C O1	14.72
942232	AE2-235 E O1	6.36
942411	AE2-254 C O1	4.87

Bus #	Bus	MW Impact
942412	AE2-254 E O1	3.25
942591	AE2-275 C O1	15.67
942592	AE2-275 E O1	5.89
942891	AE2-308 C O1	26.79
942892	AE2-308 E O1	9.74
943111	AE2-339 C	9.06
943112	AE2-339 E	4.46
CARR	CARR	0.51
CBM-S1	CBM-S1	13.72
CBM-S2	CBM-S2	1.86
CBM-W1	CBM-W1	3.85
CBM-W2	CBM-W2	65.29
CIN	CIN	7.07
CPLE	CPLE	0.39
G-007	G-007	1.38
IPL	IPL	4.27
LGEE	LGEE	5.18
MEC	MEC	7.85
O-066	O-066	8.9
RENSSELAER	RENSSELAER	0.4
WEC	WEC	0.68

Affected Systems

17 Affected Systems

17.1 LG&E

LG&E Impacts to be determined during later study phases (as applicable).

17.2 MISO

MISO Impacts to be determined during later study phases (as applicable).

17.3 TVA

TVA Impacts to be determined during later study phases (as applicable).

17.4 Duke Energy Progress

Duke Energy Progress Impacts to be determined during later study phases (as applicable).

17.5 NYISO

NYISO Impacts to be determined during later study phases (as applicable).

Contingency Name	Contingency Definition
DEO&K-DAY-EKPC.C5 4541MELDAHLSPRLCKSTUARTSPURLOCKDPLEK	CONTINGENCY 'DEO&K-DAY-EKPC.C5 4541MELDAHLSPRLCKSTUARTSPURLOCKDPLEK' OPEN BRANCH FROM BUS 342838 TO BUS 249581 CKT 1 OPEN BRANCH FROM BUS 253077 TO BUS 342838 CKT 1 END
EKPC_P1-2_JKS-NCLA345	CONTINGENCY 'EKPC_P1-2_JKS-NCLA345' /* JK SMITH - N CLARK OPEN BRANCH FROM BUS 342832 TO BUS 342835 CKT 1 /* 342832 7JK SMITH 345.00 342835 7N CLARK 345.00 END
AEP_P4_#2866_05BEATTY 345_304W	CONTINGENCY 'AEP_P4_#2866_05BEATTY 345_304W' OPEN BRANCH FROM BUS 243453 TO BUS 253110 CKT 1 / 243453 05BEATTY 345 253110 09ADKINS 345 1 OPEN BRANCH FROM BUS 243453 TO BUS 243469 CKT 3 / 243453 05BEATTY 345 243469 05BEATTY 138 3 END
.345.DEO&K.C2 1493_RED BANK	CONTINGENCY '.345.DEO&K.C2 1493_RED BANK' OPEN BRANCH FROM BUS 249571 TO BUS 249573 CKT 1 OPEN BRANCH FROM BUS 249573 TO BUS 250097 CKT 1 OPEN BRANCH FROM BUS 249573 TO BUS 249577 CKT 1 OPEN BRANCH FROM BUS 249571 TO BUS 250092 CKT 1 END
.345.DEO&K.B2 RED BANK-SG-ZIMMER 4545	CONTINGENCY '.345.DEO&K.B2 RED BANK-SG-ZIMMER 4545' OPEN BRANCH FROM BUS 249573 TO BUS 249577 CKT 1 OPEN BRANCH FROM BUS 249573 TO BUS 250097 CKT 1 OPEN BRANCH FROM BUS 249571 TO BUS 249573 CKT 1 END
.138.DEO&K.C2 816_SILVERGROVE	CONTINGENCY '.138.DEO&K.C2 816_SILVERGROVE' OPEN BRANCH FROM BUS 249573 TO BUS 250097 CKT 1 OPEN BRANCH FROM BUS 249988 TO BUS 250097 CKT 1 OPEN BRANCH FROM BUS 250042 TO BUS 250097 CKT 1 OPEN BRANCH FROM BUS 250052 TO BUS 250097 CKT 1 OPEN BRANCH FROM BUS 250053 TO BUS 250097 CKT 1 OPEN BRANCH FROM BUS 249571 TO BUS 249573 CKT 1 OPEN BRANCH FROM BUS 249573 TO BUS 249577 CKT 1 END
AEP_P4_#2085_05BEATTY 345_304C	CONTINGENCY 'AEP_P4_#2085_05BEATTY 345_304C' OPEN BRANCH FROM BUS 243453 TO BUS 243454 CKT 1 / 243453 05BEATTY 345 243454 05BIXBY 345 1 OPEN BRANCH FROM BUS 243453 TO BUS 253110 CKT 1 / 243453 05BEATTY 345 253110 09ADKINS 345 1 END
AEP_P1-2_#363	CONTINGENCY 'AEP_P1-2_#363' OPEN BRANCH FROM BUS 243208 TO BUS 243209 CKT 1 / 243208 05JEFRSO 765 243209 05ROCKPT 765 1 END

Contingency Name	Contingency Definition
Base Case	
DAY_P7_BEATTY-S. CHARLESTON 34542_1-B	CONTINGENCY 'DAY_P7_BEATTY-S. CHARLESTON 34542_1-B' OPEN BRANCH FROM BUS 243453 TO BUS 253110 CKT 1 / 243453 05BEATTY 345 253110 09ADKINS 345 1 OPEN BRANCH FROM BUS 941510 TO BUS 253248 CKT 1 / 941510 AE2-148 TAP 345 253248 09SCHARL 345 1 END
DAY_P7_BEATTY-S. CHARLESTON 34542_1-A	CONTINGENCY 'DAY_P7_BEATTY-S. CHARLESTON 34542_1-A' OPEN BRANCH FROM BUS 243453 TO BUS 253110 CKT 1 / 243453 05BEATTY 345 253110 09ADKINS 345 1 OPEN BRANCH FROM BUS 243453 TO BUS 941510 CKT 1 / 243453 05BEATTY 345 941510 AE2-148 TAP 345 1 END
AEP_P1-2_#762	CONTINGENCY 'AEP_P1-2_#762' OPEN BRANCH FROM BUS 243453 TO BUS 253110 CKT 1 / 243453 05BEATTY 345 253110 09ADKINS 345 1 END

Short Circuit

18 Short Circuit

The following Breakers are overduty

None.

19 Point of Interconnection Option-2

AE2-308 will interconnect with the EKPC transmission system tapping the Fawkes to JK Smith 138kV line.

20 Network Impacts Option-2

The Queue Project AE2-308 was evaluated as a 151.0 MW (Capacity 111.0 MW) injection tapping the Fawkes to JK Smith 138kV line in the EKPC area. Project AE2-308 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AE2-308 was studied with a commercial probability of 0.53. Potential network impacts were as follows:

Summer Peak Load Flow

21 Generation Deliverability

(Single or N-1 contingencies for the Capacity portion only of the interconnection)

None

22 Multiple Facility Contingency

(Double Circuit Tower Line, Fault with a Stuck Breaker, and Bus Fault contingencies for the full energy output)

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
7407803	253038	09KILLEN	DAY	242938	05MARQUI	AEP	1	AEP_P4_#2866_05BEATTY 345_304W	breaker	1372.0	99.98	100.46	DC	14.53
14744611	942890	AE2-308 TAP	EKPC	342577	4FAWKES EK	EKPC	1	EKPC_P4-6_JKSM E63-91T	breaker	284.0	90.54	121.98	DC	89.29
14744612	942890	AE2-308 TAP	EKPC	342577	4FAWKES EK	EKPC	1	EKPC_P4-6_JKSM E63-92T	breaker	284.0	70.72	103.09	DC	91.93

23 Contribution to Previously Identified Overloads

(This project contributes to the following contingency overloads, i.e. "Network Impacts", identified for earlier generation or transmission interconnection projects in the PJM Queue)

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
7407802	253038	09KILLEN	DAY	242938	05MARQUI	AEP	1	AEP_P4_#2085_05BEATTY 345_304C	breaker	1372.0	100.53	101.01	DC	14.69
7408997	253038	09KILLEN	DAY	242938	05MARQUI	AEP	1	DAY_P7_BEATTY-S. CHARLESTON 34542_1-A	tower	1372.0	113.27	113.79	DC	15.74
7408998	253038	09KILLEN	DAY	242938	05MARQUI	AEP	1	DAY_P7_BEATTY-S. CHARLESTON 34542_1-B	tower	1372.0	111.15	111.67	DC	15.74
8971300	324114	7TRIMBLE CO	LGEE	248000	06CLIFTY	OVEC	1	Base Case	single	1134.0	151.12	152.38	DC	14.32
8971950	342559	4BOONE CO	EKPC	250054	08LONG BR	DEO&K	1	DEO&K-DAY-EKPC.C5 4541MELDAHLSPRLCKSTUARTSPURLOCKDPLEK	tower	284.0	103.71	105.39	DC	10.52
8970928	342838	7SPURLOCK	EKPC	253077	09STUART	DAY	1	.138.DEO&K.C2 816_SILVERGROVE	breaker	1421.0	121.53	122.65	DC	35.16
8970929	342838	7SPURLOCK	EKPC	253077	09STUART	DAY	1	.345.DEO&K.C2 1493_RED BANK	breaker	1421.0	121.42	122.53	DC	35.12
8971488	342838	7SPURLOCK	EKPC	253077	09STUART	DAY	1	.345.DEO&K.B2 RED BANK-SG-ZIMMER 4545	single	1421.0	116.32	117.14	DC	25.76
8971491	342838	7SPURLOCK	EKPC	253077	09STUART	DAY	1	Base Case	single	1240.0	113.12	115.07	DC	24.21

24 Potential Congestion due to Local Energy Deliverability

PJM also studied the delivery of the energy portion of this interconnection request. Any problems identified below are likely to result in operational restrictions to the project under study. The developer can proceed with network upgrades to eliminate the operational restriction at their discretion by submitting a Merchant Transmission Interconnection request.

Note: Only the most severely overloaded conditions are listed below. There is no guarantee of full delivery of energy for this project by fixing only the conditions listed in this section. With a Transmission Interconnection Request, a subsequent analysis will be performed which shall study all overload conditions associated with the overloaded element(s) identified.

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
7408712	253038	09KILLEN	DAY	242938	05MARQUI	AEP	1	AEP_P1-2_#762	operation	1372.0	99.77	100.25	DC	14.52
8971294	324114	7TRIMBLE CO	LGEE	248000	06CLIFTY	OVEC	1	AEP_P1-2_#363	operation	1451.0	158.83	160.14	DC	19.26
8971295	324114	7TRIMBLE CO	LGEE	248000	06CLIFTY	OVEC	1	Base Case	operation	1134.0	156.83	158.5	DC	19.52
8971487	342838	7SPURLOCK	EKPC	253077	09STUART	DAY	1	.345.DEO&K.B2 RED BANK-SG-ZIMMER 4545	operation	1421.0	121.35	122.47	DC	35.12
8971489	342838	7SPURLOCK	EKPC	253077	09STUART	DAY	1	Base Case	operation	1240.0	116.48	117.68	DC	33.01

25 Flow Gate Details

The following appendices contain additional information about each flowgate presented in the body of the report. For each appendix, a description of the flowgate and its contingency was included for convenience. However, the intent of the appendix section is to provide more information on which projects/generators have contributions to the flowgate in question. Although this information is not used "as is" for cost allocation purposes, it can be used to gage other generators impact.It should be noted the generator contributions presented in the appendices sections are full contributions, whereas in the body of the report, those contributions take into consideration the commercial probability of each project.

25.1 Index 1

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
7408997	253038	09KILLEN	DAY	242938	05MARQUI	AEP	1	DAY_P7_BEATTY-S. CHARLESTON 34542_1-A	tower	1372.0	113.27	113.79	DC	15.74

Bus #	Bus	MW Impact
253038	09KILLEN	298.8
253077	09STUART	479.97
902531	W2-040 C	0.71
902532	W2-040 E	1.15
904722	V4-073 E	0.15
913222	Y1-054 E	1.79
914372	Y2-111 E	1.14
915582	Y3-080 E	0.76
915662	Y3-099 E	0.16
915672	Y3-100 E	0.16
916182	Z1-065 E	0.54
916272	Z1-080 E	0.47
918802	AA1-099 E	0.32
925242	AB2-178 E	1.57
925921	AC1-068 C	7.95
925922	AC1-068 E	3.72
925931	AC1-069 C	7.95
925932	AC1-069 E	3.72
925981	AC1-074 C O1	7.06
925982	AC1-074 E O1	3.03
926061	AC1-085 C O1	34.71
926062	AC1-085 E O1	56.64
926101	AC1-089 C O1	4.38
926102	AC1-089 E O1	7.15
926791	AC1-165 C	7.85
926792	AC1-165 E	3.81
926801	AC1-166 C	7.85
926802	AC1-166 E	3.81
930062	AB1-014 E	13.7
931181	AB1-169	302.28
932462	AC2-066 E	0.44
932481	AC2-068 C	2.39
932482	AC2-068 E	3.91
932551	AC2-075 C	1.68
932552	AC2-075 E	0.85
932661	AC2-088 C O1	7.6
932662	AC2-088 E O1	6.26
935011	AD1-134	7.71
935031	AD1-136 C	1.07
935032	AD1-136 E	0.91
935041	AD1-140 C O1	7.66

Bus #	Bus	MW Impact
935042	AD1-140 E O1	6.33
936251	AD2-031 C O1	2.32
936252	AD2-031 E O1	3.79
936281	AD2-036 C	5.05
936282	AD2-036 E	2.52
936381	AD2-048 C	5.61
936382	AD2-048 E	2.8
936571	AD2-072 C O1	4.99
936572	AD2-072 E O1	2.44
937111	AD2-147 C O1	4.7
937112	AD2-147 E O1	6.49
937151	AD2-151 C O1	7.58
937152	AD2-151 E O1	10.47
938051	AE1-007 C	0.68
938052	AE1-007 E	1.12
938271	AE1-040 C O1	2.58
938272	AE1-040 E O1	1.3
938921	AE1-120	7.78
939141	AE1-144 C O1	13.34
939142	AE1-144 E O1	6.62
940531	AE2-038 C O2	8.36
940532	AE2-038 E O2	4.17
941411	AE2-138 C O2	26.31
941412	AE2-138 E O2	9.73
941511	AE2-148 C	44.43
941512	AE2-148 E	20.09
941981	AE2-210 C O2	9.19
941982	AE2-210 E O2	3.46
942061	AE2-218 C	8.32
942062	AE2-218 E	5.65
942091	AE2-221 C	32.74
942092	AE2-221 E	21.83
942231	AE2-235 C O2	7.89
942232	AE2-235 E O2	3.41
942411	AE2-254 C O2	2.38
942412	AE2-254 E O2	1.58
942521	AE2-267 C O2	2.92
942522	AE2-267 E O2	1.8
942591	AE2-275 C O2	6.92
942592	AE2-275 E O2	2.6
942781	AE2-296 O2	9.74
942891	AE2-308 C O1	11.55
942892	AE2-308 E O1	4.2
942951	AE2-315	2.34
942981	AE2-320 C O2	17.35
942982	AE2-320 E O2	8.59
943111	AE2-339 C	4.03
943112	AE2-339 E	1.98
943191	AE2-318 C	10.23
943192	AE2-318 E	4.99
943201	AE2-319 C O2	17.35
943202	AE2-319 E O2	8.59

Bus #	Bus	MW Impact
CARR	CARR	0.48
CATAWBA	CATAWBA	0.07
CBM-S1	CBM-S1	8.57
CBM-W1	CBM-W1	10.14
CBM-W2	CBM-W2	57.35
CIN	CIN	9.1
G-007	G-007	1.38
HAMLET	HAMLET	0.22
IPL	IPL	6.22
LGEE	LGEE	3.97
MEC	MEC	9.98
MECS	MECS	3.82
O-066	O-066	8.83
RENSSELAER	RENSSELAER	0.38
WEC	WEC	1.36

25.2 Index 2

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
14744611	942890	AE2-308 TAP	EKPC	342577	4FAWKES EK	EKPC	1	EKPC_P4-6_JKSM E63-91T	breaker	284.0	90.54	121.98	DC	89.29

Bus #	Bus	MW Impact
342918	1JKCT 1G	2.26
342921	1JKCT 2G	2.26
342924	1JKCT 3G	2.26
342927	1JKCT 4G	1.5
342933	1JKCT 6G	1.5
342936	1JKCT 7G	1.5
935011	AD1-134	8.66
942891	AE2-308 C O1	65.48
942892	AE2-308 E O1	23.81
BLUEG	BLUEG	1.24
CALDERWOOD	CALDERWOOD	0.16
CANNELTON	CANNELTON	0.09
CARR	CARR	0.02
CATAWBA	CATAWBA	0.07
CHEOAH	CHEOAH	0.14
CHILHOWEE	CHILHOWEE	0.05
COFFEEN	COFFEEN	0.08
COTTONWOOD	COTTONWOOD	0.54
DUCKCREEK	DUCKCREEK	0.15
EDWARDS	EDWARDS	0.06
ELMERSMITH	ELMERSMITH	0.16
FARMERCITY	FARMERCITY	0.06
G-007	G-007	0.07
GIBSON	GIBSON	0.04
HAMLET	HAMLET	0.1
NEWTON	NEWTON	0.23
O-066	O-066	0.45
PRAIRIE	PRAIRIE	0.51
RENSSELAER	RENSSELAER	0.02
SANTEETLA	SANTEETLA	0.04
SMITHLAND	SMITHLAND	0.06
TATANKA	TATANKA	0.1
TILTON	TILTON	0.08
TRIMBLE	TRIMBLE	0.13
TVA	TVA	0.54
UNIONPOWER	UNIONPOWER	0.19

25.3 Index 3

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
8971300	324114	7TRIMBLE CO	LGEE	248000	06CLIFTY	OVEC	1	Base Case	single	1134.0	151.12	152.38	DC	14.32

Bus #	Bus	MW Impact
342900	1COOPER1 G	2.08
342903	1COOPER2 G	4.04
342918	1JKCT 1G	1.67
342921	1JKCT 2G	1.67
342924	1JKCT 3G	1.67
342927	1JKCT 4G	1.11
342930	1JKCT 5G	1.1
342933	1JKCT 6G	1.11
342936	1JKCT 7G	1.11
342939	1JKCT 9G	1.14
342942	1JKCT 10G	1.14
342945	1LAUREL 1G	1.18
925981	AC1-074 C O1	5.08
932551	AC2-075 C	1.21
935011	AD1-134	8.84
936281	AD2-036 C	3.63
936381	AD2-048 C	4.44
936571	AD2-072 C O1	12.34
936821	AD2-105 C O1	3.65
936831	AD2-106 C O1	2.21
936841	AD2-107 C O1	1.48
939131	AE1-143 C	11.58
940041	AE1-246 C O1	14.33
940051	AE1-247 C O1	24.34
940831	AE2-071 C O2	3.63
941411	AE2-138 C O2	19.13
941961	AE2-208	1.61
941981	AE2-210 C O2	6.47
942411	AE2-254 C O2	4.91
942591	AE2-275 C O2	8.31
942891	AE2-308 C O1	14.32
943111	AE2-339 C	4.01
952471	J708	47.79
952811	J759	11.5
952821	J762	36.21
952861	J783 C	10.89
953611	J800	14.73
953831	J842 C	3.43
953841	J843 C	3.69
953931	J856	10.79
CARR	CARR	0.1
CBM-S1	CBM-S1	44.7

Bus #	Bus	MW Impact
CBM-S2	CBM-S2	4.84
CBM-W1	CBM-W1	5.83
CBM-W2	CBM-W2	163.55
CIN	CIN	24.9
CPLE	CPLE	1.42
IPL	IPL	12.59
LGEE	LGEE	27.85
MEC	MEC	14.95
RENSSELAER	RENSSELAER	0.08
WEC	WEC	0.91

25.4 Index 4

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
8971950	342559	4BOONE CO	EKPC	250054	08LONGBR	DEO&K	1	DEO&K-DAY-EKPC.C5 4541MELDAHLSPRLCKSTUARTSPURLOCK DPLEK	tower	284.0	103.71	105.39	DC	10.52

Bus #	Bus	MW Impact
342957	1SPURLK1G	4.49
342960	1SPURLK2G	7.03
342963	1SPURLK3G	3.69
342966	1SPURLK4G	3.69
925981	AC1-074 C O1	9.16
925982	AC1-074 E O1	3.93
932551	AC2-075 C	2.18
932552	AC2-075 E	1.1
935011	AD1-134	5.06
936281	AD2-036 C	6.55
936282	AD2-036 E	3.27
936381	AD2-048 C	5.97
936382	AD2-048 E	2.98
936571	AD2-072 C O1	3.35
936572	AD2-072 E O1	1.64
939141	AE1-144 C O1	8.69
939142	AE1-144 E O1	4.31
940531	AE2-038 C O2	5.46
940532	AE2-038 E O2	2.72
941411	AE2-138 C O2	16.44
941412	AE2-138 E O2	6.08
941981	AE2-210 C O2	5.64
941982	AE2-210 E O2	2.12
942231	AE2-235 C O2	5.02
942232	AE2-235 E O2	2.17
942411	AE2-254 C O2	1.62
942412	AE2-254 E O2	1.08
942591	AE2-275 C O2	4.58
942592	AE2-275 E O2	1.72
942891	AE2-308 C O1	7.72
942892	AE2-308 E O1	2.81
943111	AE2-339 C	3.03
943112	AE2-339 E	1.49
CARR	CARR	0.05
CBM-S1	CBM-S1	4.34
CBM-S2	CBM-S2	0.84
CBM-W1	CBM-W1	0.14
CBM-W2	CBM-W2	15.68
CIN	CIN	1.16
CPLE	CPLE	0.25

Bus #	Bus	MW Impact
G-007	G-007	0.12
IPL	IPL	0.49
LGEE	LGEE	1.78
MEC	MEC	1.39
O-066	O-066	0.78
RENSSELAER	RENSSELAER	0.04
WEC	WEC	0.04

25.5 Index 5

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
8970929	342838	7SPURLOCK	EKPC	253077	09STUART	DAY	1	.345.DEO&K.C2 1493_RED BANK	breaker	1421.0	121.42	122.53	DC	35.12

Bus #	Bus	MW Impact
251968	08ZIMRHP	33.39
251969	08ZIMRLP	18.29
251970	08MELDL1	1.69
251971	08MELDL2	1.69
251972	08MELDL3	1.7
342957	1SPURLK1G	17.48
342960	1SPURLK2G	33.1
342963	1SPURLK3G	17.39
342966	1SPURLK4G	17.39
925981	AC1-074 C O1	15.31
925982	AC1-074 E O1	6.56
926951	AC1-182	0.8
932551	AC2-075 C	3.64
932552	AC2-075 E	1.83
935011	AD1-134	17.48
936281	AD2-036 C	10.93
936282	AD2-036 E	5.47
936381	AD2-048 C	11.97
936382	AD2-048 E	5.97
936571	AD2-072 C O1	9.64
936572	AD2-072 E O1	4.73
936821	AD2-105 C O1	4.08
936822	AD2-105 E O1	5.98
936841	AD2-107 C O1	2.23
936842	AD2-107 E O1	3.08
939131	AE1-143 C	7.15
939132	AE1-143 E	3.54
939141	AE1-144 C O1	32.16
939142	AE1-144 E O1	15.96
940531	AE2-038 C O2	20.11
940532	AE2-038 E O2	10.02
941411	AE2-138 C O2	61.77
941412	AE2-138 E O2	22.85
941961	AE2-208	2.43
941981	AE2-210 C O2	21.64
941982	AE2-210 E O2	8.14
942231	AE2-235 C O2	19.29
942232	AE2-235 E O2	8.33
942411	AE2-254 C O2	4.88
942412	AE2-254 E O2	3.25
942591	AE2-275 C O2	15.55

Bus #	Bus	MW Impact
942592	AE2-275 E O2	5.85
942891	AE2-308 C O1	25.76
942892	AE2-308 E O1	9.37
943111	AE2-339 C	9.06
943112	AE2-339 E	4.46
CARR	CARR	0.51
CBM-S1	CBM-S1	13.73
CBM-S2	CBM-S2	1.86
CBM-W1	CBM-W1	3.87
CBM-W2	CBM-W2	65.34
CIN	CIN	7.07
CPLE	CPLE	0.39
G-007	G-007	1.38
IPL	IPL	4.27
LGEE	LGEE	5.19
MEC	MEC	7.86
O-066	O-066	8.9
RENSSELAER	RENSSELAER	0.4
WEC	WEC	0.68

Affected Systems

26 Affected Systems

26.1 LG&E

LG&E Impacts to be determined during later study phases (as applicable).

26.2 MISO

MISO Impacts to be determined during later study phases (as applicable).

26.3 TVA

TVA Impacts to be determined during later study phases (as applicable).

26.4 Duke Energy Progress

Duke Energy Progress Impacts to be determined during later study phases (as applicable).

26.5 NYISO

NYISO Impacts to be determined during later study phases (as applicable).

Contingency Name	Contingency Definition
DEO&K-DAY-EKPC.C5 4541MELDAHLSPRLCKSTUARTSPURLOCKDPLEK	CONTINGENCY 'DEO&K-DAY-EKPC.C5 4541MELDAHLSPRLCKSTUARTSPURLOCKDPLEK' OPEN BRANCH FROM BUS 342838 TO BUS 249581 CKT 1 OPEN BRANCH FROM BUS 253077 TO BUS 342838 CKT 1 END
EKPC_P4-6_JKSM E63-92T	CONTINGENCY 'EKPC_P4-6_JKSM E63-92T' /* JK SMITH OPEN BRANCH FROM BUS 342607 TO BUS 942590 CKT 1 /* 342607 4JK SMITH 138.00 942590 AE2-275 TAP T138.00 OPEN BRANCH FROM BUS 342607 TO BUS 935010 CKT 1 /* 342607 4JK SMITH 138.00 935010 AD1-134 TAP 138.00 /* CONTINGENCY LINE ADDED FOR AE1 BUILD END
.138.DEO&K.C2 816_SILVERGROVE	CONTINGENCY '.138.DEO&K.C2 816_SILVERGROVE' OPEN BRANCH FROM BUS 249573 TO BUS 250097 CKT 1 OPEN BRANCH FROM BUS 249988 TO BUS 250097 CKT 1 OPEN BRANCH FROM BUS 250042 TO BUS 250097 CKT 1 OPEN BRANCH FROM BUS 250052 TO BUS 250097 CKT 1 OPEN BRANCH FROM BUS 250053 TO BUS 250097 CKT 1 OPEN BRANCH FROM BUS 249571 TO BUS 249573 CKT 1 OPEN BRANCH FROM BUS 249573 TO BUS 249577 CKT 1 END
EKPC_P4-6_JKSM E63-91T	CONTINGENCY 'EKPC_P4-6_JKSM E63-91T' /* JK SMITH OPEN BRANCH FROM BUS 342574 TO BUS 342607 CKT 1 /* 342574 4DALE 138.00 342607 4JK SMITH 138.00 OPEN BRANCH FROM BUS 942590 TO BUS 342607 CKT 1 /* 942590 AE2-275 TAP 138.00 342607 4JK SMITH 138.00 END
AEP_P4_#2866_05BEATTY 345_304W	CONTINGENCY 'AEP_P4_#2866_05BEATTY 345_304W' OPEN BRANCH FROM BUS 243453 TO BUS 253110 CKT 1 / 243453 05BEATTY 345 253110 09ADKINS 345 1 OPEN BRANCH FROM BUS 243453 TO BUS 243469 CKT 3 / 243453 05BEATTY 345 243469 05BEATTY 138 3 END
.345.DEO&K.C2 1493_RED BANK	CONTINGENCY '.345.DEO&K.C2 1493_RED BANK' OPEN BRANCH FROM BUS 249571 TO BUS 249573 CKT 1 OPEN BRANCH FROM BUS 249573 TO BUS 250097 CKT 1 OPEN BRANCH FROM BUS 249573 TO BUS 249577 CKT 1 OPEN BRANCH FROM BUS 249571 TO BUS 250092 CKT 1 END
.345.DEO&K.B2 RED BANK-SG-ZIMMER 4545	CONTINGENCY '.345.DEO&K.B2 RED BANK-SG-ZIMMER 4545' OPEN BRANCH FROM BUS 249573 TO BUS 249577 CKT 1 OPEN BRANCH FROM BUS 249573 TO BUS 250097 CKT 1 OPEN BRANCH FROM BUS 249571 TO BUS 249573 CKT 1 END

Contingency Name	Contingency Definition
AEP_P4_#2085_05BEATTY 345_304C	CONTINGENCY 'AEP_P4_#2085_05BEATTY 345_304C' OPEN BRANCH FROM BUS 243453 TO BUS 243454 CKT 1 / 243453 05BEATTY 345 243454 05BIXBY 345 1 OPEN BRANCH FROM BUS 243453 TO BUS 253110 CKT 1 / 243453 05BEATTY 345 253110 09ADKINS 345 1 END
AEP_P1-2_#363	CONTINGENCY 'AEP_P1-2_#363' OPEN BRANCH FROM BUS 243208 TO BUS 243209 CKT 1 / 243208 05JEFRSO 765 243209 05ROCKPT 765 1 END
Base Case	
DAY_P7_BEATTY-S. CHARLESTON 34542_1-B	CONTINGENCY 'DAY_P7_BEATTY-S. CHARLESTON 34542_1-B' OPEN BRANCH FROM BUS 243453 TO BUS 253110 CKT 1 / 243453 05BEATTY 345 253110 09ADKINS 345 1 OPEN BRANCH FROM BUS 941510 TO BUS 253248 CKT 1 / 941510 AE2-148 TAP 345 253248 09SCHARL 345 1 END
DAY_P7_BEATTY-S. CHARLESTON 34542_1-A	CONTINGENCY 'DAY_P7_BEATTY-S. CHARLESTON 34542_1-A' OPEN BRANCH FROM BUS 243453 TO BUS 253110 CKT 1 / 243453 05BEATTY 345 253110 09ADKINS 345 1 OPEN BRANCH FROM BUS 243453 TO BUS 941510 CKT 1 / 243453 05BEATTY 345 941510 AE2-148 TAP 345 1 END
AEP_P1-2_#762	CONTINGENCY 'AEP_P1-2_#762' OPEN BRANCH FROM BUS 243453 TO BUS 253110 CKT 1 / 243453 05BEATTY 345 253110 09ADKINS 345 1 END

Short Circuit

27 Short Circuit

The following Breakers are overduty

None

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APPENDIX F

PJM Interconnection – System Impact Study

Generation Interconnection

System Impact Study Report

for

Queue Project AE2-308

THREE FORKS-DALE 138 KV

110 MW Capacity / 150 MW Energy

February 2020

Table of Contents

1 Preface

The intent of the System Impact Study is to determine a plan, with approximate cost and construction time estimates, to connect the subject generation interconnection project to the PJM network at a location specified by the Interconnection Customer. As a requirement for interconnection, the Interconnection Customer may be responsible for the cost of constructing: Network Upgrades, which are facility additions, or upgrades to existing facilities, that are needed to maintain the reliability of the PJM system. All facilities required for interconnection of a generation interconnection project must be designed to meet the technical specifications (on PJM web site) for the appropriate transmission owner.

In some instances, a generator interconnection may not be responsible for 100% of the identified network upgrade cost because other transmission network uses, e.g. another generation interconnection, may also contribute to the need for the same network reinforcement. Cost allocation rules for network upgrades can be found in PJM Manual 14A, Attachment B. The possibility of sharing the reinforcement costs with other projects may be identified in the feasibility study, but the actual allocation will be deferred until the impact study is performed.

The System Impact Study estimates do not include the feasibility, cost, or time required to obtain property rights and permits for construction of the required facilities. The project developer is responsible for the right of way, real estate, and construction permit issues. For properties currently owned by Transmission Owners, the costs may be included in the study.

The Interconnection Customer seeking to interconnect a wind or solar generation facility shall maintain meteorological data facilities as well as provide that meteorological data which is required per Schedule H to the Interconnection Service Agreement and Section 8 of Manual 14D.

An Interconnection Customer with a proposed new Customer Facility that has a Maximum Facility Output equal to or greater than 100 MW shall install and maintain, at its expense, phasor measurement units (PMUs). See Section 8.5.3 of Appendix 2 to the Interconnection Service Agreement as well as section 4.3 of PJM Manual 14D for additional information.

2 General

The Interconnection Customer (IC), has proposed a Solar; Storage generating facility located in Madison County, Kentucky. The installed facilities will have a total capability of 150 MW with 110 MW of this output being recognized by PJM as Capacity. The proposed in-service date for this project is 5/31/2021. This study does not imply a TO commitment to this in-service date.

Queue Number	**AE2-308**
Project Name	THREE FORKS-DALE 138 KV
Interconnection Customer	AEUG Madison Solar, LLC
State	Kentucky
County	Madison
Transmission Owner	EKPC
MFO	150
MWE	150
MWC	110
Fuel	Solar; Storage
Basecase Study Year	2022

2.1 Point of Interconnection

AE2-308 will interconnect with the EKPC transmission system tapping the Three Forks to Dale 138kV line.

2.2 Cost Summary

The AE2-308 project will be responsible for the following costs:

Description	Total Cost
Attachment Facilities	$565,000
Direct Connection Network Upgrade	$5,020,000
Non Direct Connection Network Upgrades	$1,140,000
Allocation for New System Upgrades	$400,000
Contribution for Previously Identified Upgrades	$2,548,376
Total Costs	$9,673,376

3 Transmission Owner Scope of Work

4 Attachment Facilities

The total preliminary cost estimate for the Attachment work is given in the table below. These costs do not include CIAC Tax Gross-up.

Description	Total Cost
Install necessary equipment (a 138 kV isolation switch structure and associated switch, plus interconnection metering, fiber-optic connection and telecommunications equipment, circuit breaker and associated switches, and relay panel) at the new Three Forks Tap switching station, to accept the IC generator lead line/bus (Estimated time to implement is 24 months)	$565,000
Total Attachment Facility Costs	$565,000

5 Direct Connection Cost Estimate

The total preliminary cost estimate for the Direct Connection work is given in the table below. These costs do not include CIAC Tax Gross-up.

Description	Total Cost
Construct a new 138 kV switching station (Three Forks Tap Switching) to facilitate connection of the IC solar generation project to the existing JK Smith-Fawkes 138 kV line (Estimated time to implement is 24 months)	$5,020,000
Total Direct Connection Facility Costs	$5,020,000

6 Non-Direct Connection Cost Estimate

The total preliminary cost estimate for the Non-Direct Connection work is given in the table below. These costs do not include CIAC Tax Gross-up.

Description	Total Cost
Construct facilities to loop the existing Dale-Fawkes 138 kV line into the new Three Forks Tap switching station (Estimated time to implement is 24 months)	$520,000
Modify relays and/or settings at Dale substation for the existing line to the new Three Forks Tap switching station (Estimated time to implement is 9 months)	$65,000
Modify relays and/or settings at Fawkes substation for the existing line to the new Three Forks Tap switching station (Estimated time to implement is 9 months)	$65,000
Install OPGW on the Three Forks Tap-Fawkes 138 kV line (3.6 miles) (Estimated time to implement is 14 months)	$490,000
Total Non-Direct Connection Facility Costs	$1,140,000

7 Incremental Capacity Transfer Rights (ICTRs)

None

8 Interconnection Customer Requirements

1. An Interconnection Customer entering the New Services Queue on or after October 1, 2012 with a proposed new Customer Facility that has a Maximum Facility Output equal to or greater than 100 MW shall install and maintain, at its expense, phasor measurement units (PMUs). See Section 8.5.3 of Appendix 2 to the Interconnection Service Agreement as well as section 4.3 of PJM Manual 14D for additional information.

2. The Interconnection Customer may be required to install and/or pay for metering as necessary to properly track real time output of the facility as well as installing metering which shall be used for billing purposes. See Section 8 of Appendix 2 to the Interconnection Service Agreement as well as Section 4 of PJM Manual 14D for additional information.

9 Revenue Metering and SCADA Requirements

9.1 PJM Requirements

The Interconnection Customer will be required to install equipment necessary to provide Revenue Metering (KWH, KVARH) and real time data (KW, KVAR) for IC's generating Resource. See PJM Manuals M-01 and M-14D, and PJM Tariff Sections 24.1 and 24.2.

9.2 EKPC Requirements

The Interconnection Customer will be required to comply with all EKPC Revenue Metering Requirements for Generation Interconnection Customers. The Revenue Metering Requirements may be found within the "EKPC Facility Connection Requirements" document located at the following link:

http://www.pjm.com/planning/design-engineering/to-tech-standards/ekpc.aspx

10 Network Impacts

The Queue Project AE2-308 was evaluated as a 150.0 MW (Capacity 110.0 MW) injection tapping the Three Forks to Dale 138kV line in the EKPC area. Project AE2-308 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AE2-308 was studied with a commercial probability of 1.00. Potential network impacts were as follows:

Summer Peak Load Flow

11 Generation Deliverability

(Single or N-1 contingencies for the Capacity portion only of the interconnection)

None

12 Multiple Facility Contingency

(Double Circuit Tower Line, Fault with a Stuck Breaker, and Bus Fault contingencies for the full energy output)

ID	FROM BUS#	FROM BUS	kV	FROM BUS AREA	TO BUS#	TO BUS	kV	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC| DC	MW IMPACT
8971988	250054	08LONGBR	138.0	DEO&K	250077	08MTZION	138.0	DEO&K	1	DEO&K-DAY-EKPC.C5 4541MELDAHLSPRLCKSTUARTSPUR LOCKDPLEK	tower	284.0	98.52	101.78	AC	10.83

13 Contribution to Previously Identified Overloads

(This project contributes to the following contingency overloads, i.e. "Network Impacts", identified for earlier generation or transmission interconnection projects in the PJM Queue)

ID	FROM BUS#	FROM BUS	kV	FROM BUS AREA	TO BUS#	TO BUS	kV	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC| DC	MW IMPACT
8971300	324114	7TRIMBLE CO	345.0	LGEE	248000	06CLIFTY	345.0	OVEC	1	Base Case	single	1134.0	146.9	148.21	AC	14.31
8971950	342559	4BOONECO	138.0	EKPC	250054	08LONGBR	138.0	DEO&K	1	DEO&K-DAY-EKPC.C5 4541MELDAHLSPRLCKSTUARTSPUR LOCKDPLEK	tower	284.0	105.68	108.93	AC	10.83
8970928	342838	7SPURLOCK	345.0	EKPC	253077	09STUART	345.0	DAY	1	.138.DEO&K.C2 816_SILVERGROVE	breaker	1421.0	121.64	123.8	AC	35.33
8970929	342838	7SPURLOCK	345.0	EKPC	253077	09STUART	345.0	DAY	1	.345.DEO&K.C2 1493_RED BANK	breaker	1421.0	121.57	123.73	AC	35.28
8971488	342838	7SPURLOCK	345.0	EKPC	253077	09STUART	345.0	DAY	1	.345.DEO&K.B2 RED BANK-SG-ZIMMER 4545	single	1421.0	116.47	118.35	AC	25.88
8971491	342838	7SPURLOCK	345.0	EKPC	253077	09STUART	345.0	DAY	1	Base Case	single	1240.0	113.12	115.12	AC	24.32
8971837	342838	7SPURLOCK	345.0	EKPC	253077	09STUART	345.0	DAY	1	.345.DEO&K.C5 CIRCUIT1883&4545REDBANKSILGRVZIMMER	tower	1421.0	121.37	123.53	AC	35.29

14 Potential Congestion due to Local Energy Deliverability

PJM also studied the delivery of the energy portion of this interconnection request. Any problems identified below are likely to result in operational restrictions to the project under study. The developer can proceed with network upgrades to eliminate the operational restriction at their discretion by submitting a Merchant Transmission Interconnection request.

Note: Only the most severely overloaded conditions are listed below. There is no guarantee of full delivery of energy for this project by fixing only the conditions listed in this section. With a Transmission Interconnection

Request, a subsequent analysis will be performed which shall study all overload conditions associated with the overloaded element(s) identified.

ID	FROM BUS#	FROM BUS	kV	FROM BUS AREA	TO BUS#	TO BUS	kV	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
8971294	324114	7TRIMBLE CO	345.0	LGEE	248000	06CLIFTY	345.0	OVEC	1	AEP_P1-2_#363	operation	1451.0	164.93	166.28	AC	19.25
8971295	324114	7TRIMBLE CO	345.0	LGEE	248000	06CLIFTY	345.0	OVEC	1	Base Case	operation	1134.0	160.23	161.99	AC	19.51
8971487	342838	7SPURLOCK	345.0	EKPC	253077	09STUART	345.0	DAY	1	.345.DEO&K.B 2 RED BANK-SG-ZIMMER 4545	operation	1421.0	121.45	123.61	AC	35.29
8971489	342838	7SPURLOCK	345.0	EKPC	253077	09STUART	345.0	DAY	1	Base Case	operation	1240.0	115.48	117.76	AC	33.16

15 Steady-State Voltage Requirements

(Summary of the VAR requirements based upon the results of the steady-state voltage studies)

None

16 Stability and Reactive Power Requirements for Low Voltage Ride Through

(Summary of the VAR requirements based upon the results of the dynamic studies)

Generator Interconnection Request AE2-308 is for a 150 MW Maximum Facility Output (MFO) of the a solar and battery powered generating facility. AE2-308 consists of 34 x SG3150U 2.99 MW PV Inverter with a total capacity of 101.66 MW and 20 x SC2500U 2.375 MW Battery Inverter with a total capacity of 47.5 MW. The Point of Interconnection (POI) is a tap on Three Forks – Dale 138 kV circuit in the East Kentucky Power Cooperative (EKPC) transmission system, Madison County, Kentucky.

This report describes a dynamic simulation analysis of AE2-308 as part of the overall system impact study.

The load flow scenario for the analysis was based on the RTEP 2022 peak load case, modified to include applicable queue projects. AE2-308 has been dispatched online at maximum power output, with 1.0 p.u. voltage at the generator bus.

AE2-308 was tested for compliance with NERC, PJM, Transmission Owner and other applicable criteria. Steady-state condition and 38 contingencies were studied, each with a 20 second simulation time period. Studied faults included:

a) Steady state operation (20 second);

b) Three phase faults with normal clearing time;

c) Single phase faults with stuck breaker;

d) Single-phase faults placed at 80% of the line with delayed (Zone 2) clearing at line end remote from the fault due to primary communications/relay failure;

No relevant bus faults, multiple-circuit tower faults and high-speed reclosing (HSR) contingencies were identified for this study.

For all simulations, the queue project under study along with the rest of the PJM system were required to maintain synchronism and with all states returning to an acceptable new condition following the disturbance.

For all of the fault contingencies tested on the 2022 peak load case:

a) AE2-308 was able to ride through the faults (except for faults where protective action trips a generator(s)),

b) The system with AE2-308 included is transiently stable and post-contingency oscillations were positively damped with a damping margin of at least 3%.

c) Following fault clearing, all bus voltages recovered to a minimum of 0.7 per unit after 2.5 seconds (except where protective action isolates that bus).

d) No transmission element tripped, other than those either directly connected or designed to trip as a consequence of that fault.

The reactive power capability of AE2-308 meets the 0.95 lagging and leading PF requirement at the high side of the main transformer.

The reactive power output of AE2-308 exhibited slow reactive power recovery for several contingencies (P1.08, P1.09, P1.10, P1.11, P4.15, P4.16, P4.17, P5.06, P5.07, P5.08). Therefore, the initial gain Ki of reactive power controller in power plant controller, Ki CON(J+2) in REPCAU1 module, was tuned to resolve the issue. Acceptable reactive power (Qelec) response was obtained after updating Ki to 30 from the initial value of 3. Certain contingencies exhibit a slower reactive power recovery for AE2-308 than others, however the response is acceptable.

No mitigations were found to be required.

17 Light Load Analysis

Light Load Studies (applicable to wind, coal, nuclear, and pumped storage projects).

No violations

18 System Reinforcements

ID	Index	Facility	Upgrade Description	Cost	Cost Allocated to AE2-308	Upgrade Number
8971300	2	7TRIMBLE CO 345.0 kV - 06CLIFTY 345.0 kV Ckt 1	Trimble-Clifty 345 kV tie line between LG&E and OVEC. The line is owned by LG&E. The potential upgrade on the Trimble-Clifty 345 kV line, if determined to be a constraint by LG&E, is to reconductor the line with a high temperature conductor and upgrade necessary terminal equipment to achieve ratings of 2610/2610 MVA SN/SE. Cost estimate is $17.4M with a time estimate of 18 months. LG&E will determine if there are any LG&E system impacts, including on Trimble- Clifty line. Final LG&E Impacts and necessary LG&E system upgrade(s) will be determined once the LG&E affected system study is completed by LG&E.	$17,400,000	$0	N/A
8971988	1	08LONGBR 138.0 kV - 08MTZION 138.0 kV Ckt 1	DEOK No Violation. DEOK emergency rating is 298 MVA. EKPC N6460.1: Increase the EKPC-owned 3.7 miles of conductor MOT to 275 degrees F. Project Type : FAC Cost : $ 400,000 New Ratings: Rate A: 297 MVA Rate B: 344 MVA	$400,000	$400,000	N6460.1

<table>
<tr><th>ID</th><th>Index</th><th>Facility</th><th>Upgrade Description</th><th>Cost</th><th>Cost Allocated to AE2-308</th><th>Upgrade Number</th></tr>
<tr>
<td>8970928,8970929,8971837,8971488,8971491</td>
<td>4</td>
<td>7SPURLOCK 345.0 kV - 09STUART 345.0 kV Ckt 1</td>
<td>
EKPC
No Violation. EKPC emergency rating is 1792 MVA.

DAY
N5780: Reconductor Stuart-Spurlock line with twin bundle 1033 Curlew ACCR conductor
Project Type : FAC
Cost : $ 17,000,000
Time Estimate : 18 Months
New Ratings:
Rate A: 1339 MVA
Rate B: 1556 MVA
Rate C: 1556 MVA

N5780.1: Replace Stuart substation riser conductor with 2500AAC (parallel)
Project Type : FAC
Cost : $ 100,000
Time Estimate : 12 Months
New Ratings:
Rate A: 1561 MVA
Rate B: 1800 MVA
Rate C: 1800 MVA

The cost allocation table is below:
<table>
<tr><th>Queue</th><th>MW contribution</th><th>Percentage of Cost</th><th>Cost ($17.1M)</th></tr>
<tr><td>AE1-144</td><td>48.19</td><td>19.20%</td><td>$3,283,849</td></tr>
<tr><td>AE2-038</td><td>32.12</td><td>12.80%</td><td>$2,188,778</td></tr>
<tr><td>AE2-138</td><td>84.73</td><td>33.77%</td><td>$5,773,822</td></tr>
<tr><td>AE2-210</td><td>29.33</td><td>11.69%</td><td>$1,998,657</td></tr>
<tr><td>AE2-275</td><td>21.24</td><td>8.46%</td><td>$1,447,374</td></tr>
<tr><td>AE2-308</td><td>35.33</td><td>14.08%</td><td>$2,407,520</td></tr>
</table>
</td>
<td>$17,100,000</td>
<td>$2,407,520</td>
<td>N5780
N5780.1</td>
</tr>
</table>

<table>
<tr><th>ID</th><th>Index</th><th>Facility</th><th>Upgrade Description</th><th>Cost</th><th>Cost Allocated to AE2-308</th><th>Upgrade Number</th></tr>
<tr><td>8971950</td><td>3</td><td>4BOONE CO 138.0 kV - 08LONGBR 138.0 kV Ckt 1</td><td>EKPC
N6463.1: Increase MOT of Boone-Longbranch 138kV line section 954 MCM conductor to 275F (~2.25 miles)
Project Type : FAC
Cost : $ 200,000
Time Estimate : 6 Months
New Ratings:
Rate A: 229 MVA
Rate B: 296 MVA

The cost allocation table is below:
<table>
<tr><th>Queue</th><th>MW contribution</th><th>Percentage of Cost</th><th>Cost ($0.2M)</th></tr>
<tr><td>AE2-138</td><td>22.5</td><td>47.47%</td><td>94,937</td></tr>
<tr><td>AE2-210</td><td>7.8</td><td>12.09%</td><td>24,186</td></tr>
<tr><td>AE2-275</td><td>6.3</td><td>9.77%</td><td>19,535</td></tr>
<tr><td>AE2-308</td><td>10.8</td><td>16.74%</td><td>33,488</td></tr>
</table>
N6463.2: Upgrade bus and jumpers associated with Boone 138 kV bus using 2-500 MCM 37 CU conductor or equivalent.
Project Type : FAC
Cost : $ 170,000
Time Estimate : 6 Months
New Ratings:
Rate A: 297 MVA
Rate B: 354 MVA

The cost allocation table is below:
<table>
<tr><th>Queue</th><th>MW contribution</th><th>Percentage of Cost</th><th>Cost ($0.17M)</th></tr>
<tr><td>AE2-275</td><td>6.3</td><td>36.84%</td><td>62,632</td></tr>
<tr><td>AE2-308</td><td>10.8</td><td>63.16%</td><td>107,368</td></tr>
</table>
DEOK
LINE is completely owned by EKPC</td><td>$370,000</td><td>$140,856</td><td>N6463.1
N6463.2</td></tr>
<tr><td></td><td></td><td></td><td>TOTAL COST</td><td>$35,270,000</td><td>$2,948,376</td><td></td></tr>
</table>

19 Flow Gate Details

The following appendices contain additional information about each flowgate presented in the body of the report. For each appendix, a description of the flowgate and its contingency was included for convenience. However, the intent of the appendix section is to provide more information on which projects/generators have contributions to the flowgate in question. Although this information is not used "as is" for cost allocation purposes, it can be used to gage other generators impact.It should be noted the generator contributions presented in the appendices sections are full contributions, whereas in the body of the report, those contributions take into consideration the commercial probability of each project.

19.1 Index 1

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
8971988	250054	08LONGBR	DEO&K	250077	08MTZION	DEO&K	1	DEO&K-DAY-EKPC.C5 4541MELDAHLSPRLCKSTUARTSPURLOCK DPLEK	tower	284.0	98.52	101.78	AC	10.83

Bus #	Bus	MW Impact
342957	1SPURLK1G	4.8837
342960	1SPURLK2G	7.6437
342963	1SPURLK3G	4.0167
342966	1SPURLK4G	4.0167
925981	AC1-074 C O1	9.1683
925982	AC1-074 E O1	3.9293
932551	AC2-075 C	2.1775
932552	AC2-075 E	1.0969
936381	AD2-048 C	5.9734
936382	AD2-048 E	2.9803
936571	AD2-072 C O1	2.8473
936572	AD2-072 E O1	1.3961
939141	AE1-144 C O1	8.6905
939142	AE1-144 E O1	4.3127
940531	AE2-038 C O1	5.7973
940532	AE2-038 E O1	2.8715
941411	AE2-138 C	13.9809
941412	AE2-138 E	5.1710
941981	AE2-210 C O1	4.8174
941982	AE2-210 E O1	1.8121
942411	AE2-254 C O1	1.3709
942412	AE2-254 E O1	0.9139
942591	AE2-275 C O1	3.9135
942592	AE2-275 E O1	1.4721
942891	AE2-308 C O1	6.7479
942892	AE2-308 E O1	2.4538
943111	AE2-339 C	2.0584
943112	AE2-339 E	1.0138
LGEE	LGEE	1.7856
CIN	CIN	1.1760
CPLE	CPLE	0.2487
IPL	IPL	0.5008
G-007	G-007	0.1165
CBM-W2	CBM-W2	15.8222
CBM-W1	CBM-W1	0.1563
WEC	WEC	0.0479
O-066	O-066	0.7538
CBM-S2	CBM-S2	0.8446
CARR	CARR	0.0481
CBM-S1	CBM-S1	4.3567

Bus #	Bus	MW Impact
MEC	MEC	1.4091
RENSSELAER	RENSSELAER	0.0381

19.2 Index 2

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
8971300	324114	7TRIMBLE CO	LGEE	248000	06CLIFTY	OVEC	1	Base Case	single	1134.0	146.9	148.21	AC	14.31

Bus #	Bus	MW Impact
342900	1COOPER1 G	2.2661
342903	1COOPER2 G	4.3946
342918	1JKCT 1G	1.8197
342921	1JKCT 2G	1.8197
342924	1JKCT 3G	1.8197
342927	1JKCT 4G	1.2076
342930	1JKCT 5G	1.2010
342933	1JKCT 6G	1.2076
342936	1JKCT 7G	1.2076
342939	1JKCT 9G	1.2402
342942	1JKCT 10G	1.2402
342945	1LAUREL 1G	1.2838
925981	AC1-074 C O1	5.0988
932551	AC2-075 C	1.2110
936381	AD2-048 C	4.4561
936571	AD2-072 C O1	12.3519
936821	AD2-105 C O1	3.6625
936831	AD2-106 C O1	2.2142
936841	AD2-107 C O1	1.4849
939131	AE1-143 C	11.5997
940041	AE1-246 C O1	14.3420
940051	AE1-247 C O1	24.3654
940831	AE2-071 C	3.6385
941411	AE2-138 C	19.1831
941961	AE2-208	1.6070
941981	AE2-210 C O1	6.6100
942411	AE2-254 C O1	4.9122
942591	AE2-275 C O1	8.5007
942891	AE2-308 C O1	14.3066
943111	AE2-339 C	3.2155
952471	J708	47.7880
952811	J759	11.5003
952821	J762	36.2060
952861	J783 C	10.8918
953611	J800	14.7300
953831	J842 C	3.4248
953841	J843 C	3.6944
953931	J856	10.7904
LGEE	LGEE	27.8578
CIN	CIN	24.9361
CPLE	CPLE	1.4335
IPL	IPL	12.6110

Bus #	Bus	MW Impact
CBM-W2	CBM-W2	163.9046
CBM-W1	CBM-W1	5.7263
WEC	WEC	0.9190
CBM-S2	CBM-S2	4.8626
CARR	CARR	0.0970
CBM-S1	CBM-S1	44.6872
MEC	MEC	15.0104
Z1-043	Z1-043	0.0000
CHOCTAW /* 35% REVERSE 4566958 4511400	CHOCTAW /* 35% REVERSE 4566958 4511400	0.0000
RENSSELAER	RENSSELAER	0.0764

19.3 Index 3

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
8971950	342559	4BOONE CO	EKPC	250054	08LONGBR	DEO&K	1	DEO&K-DAY-EKPC.C5 4541MELDAHLSPRLCKSTUARTSPURLOCK DPLEK	tower	284.0	105.68	108.93	AC	10.83

Bus #	Bus	MW Impact
342957	1SPURLK1G	4.8837
342960	1SPURLK2G	7.6437
342963	1SPURLK3G	4.0167
342966	1SPURLK4G	4.0167
925981	AC1-074 C O1	9.1683
925982	AC1-074 E O1	3.9293
932551	AC2-075 C	2.1775
932552	AC2-075 E	1.0969
936381	AD2-048 C	5.9734
936382	AD2-048 E	2.9803
936571	AD2-072 C O1	2.8473
936572	AD2-072 E O1	1.3961
939141	AE1-144 C O1	8.6905
939142	AE1-144 E O1	4.3127
940531	AE2-038 C O1	5.7973
940532	AE2-038 E O1	2.8715
941411	AE2-138 C	13.9809
941412	AE2-138 E	5.1710
941981	AE2-210 C O1	4.8174
941982	AE2-210 E O1	1.8121
942411	AE2-254 C O1	1.3709
942412	AE2-254 E O1	0.9139
942591	AE2-275 C O1	3.9135
942592	AE2-275 E O1	1.4721
942891	AE2-308 C O1	6.7479
942892	AE2-308 E O1	2.4538
943111	AE2-339 C	2.0584
943112	AE2-339 E	1.0138
LGEE	LGEE	1.7856
CIN	CIN	1.1760
CPLE	CPLE	0.2487
IPL	IPL	0.5008
G-007	G-007	0.1165
CBM-W2	CBM-W2	15.8222
CBM-W1	CBM-W1	0.1563
WEC	WEC	0.0479
O-066	O-066	0.7538
CBM-S2	CBM-S2	0.8446
CARR	CARR	0.0481
CBM-S1	CBM-S1	4.3567

Bus #	Bus	MW Impact
MEC	MEC	1.4091
RENSSELAER	RENSSELAER	0.0381

19.4 Index 4

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
8971837	342838	7SPURLOCK	EKPC	253077	09STUART	DAY	1	.345.DEO&K.C5 CIRCUIT1883&4545REDBANKSILGRVZIMMER	tower	1421.0	121.37	123.53	AC	35.29

Bus #	Bus	MW Impact
251968	08ZIMRHP	36.3193
251969	08ZIMRLP	19.8892
251970	08MELDL1	1.8400
251971	08MELDL2	1.8400
251972	08MELDL3	1.8449
342957	1SPURLK1G	19.0046
342960	1SPURLK2G	35.9911
342963	1SPURLK3G	18.9129
342966	1SPURLK4G	18.9129
925981	AC1-074 C O1	15.3205
925982	AC1-074 E O1	6.5659
926061	AC1-085 C O1	-28.7354
926101	AC1-089 C O1	4.0344
926102	AC1-089 E O1	6.5825
926791	AC1-165 C	-3.4532
926951	AC1-182	6.5296
930061	AB1-014 C	-5.2112
932461	AC2-066 C	-3.1267
932551	AC2-075 C	3.6386
932552	AC2-075 E	1.8330
936381	AD2-048 C	10.1802
936382	AD2-048 E	5.0792
936571	AD2-072 C O1	8.2082
936572	AD2-072 E O1	4.0246
936821	AD2-105 C O1	3.4786
936822	AD2-105 E O1	5.0894
936831	AD2-106 C O1	2.4056
936832	AD2-106 E O1	3.3220
936841	AD2-107 C O1	1.9018
936842	AD2-107 E O1	2.6264
939131	AE1-143 C	6.0873
939132	AE1-143 E	3.0152
939141	AE1-144 C O1	32.1778
939142	AE1-144 E O1	15.9686
940531	AE2-038 C O1	21.4653
940532	AE2-038 E O1	10.6323
941411	AE2-138 C	61.8141
941412	AE2-138 E	22.8627
941961	AE2-208	2.0583
941981	AE2-210 C O1	21.2995

Bus #	Bus	MW Impact
941982	AE2-210 E O1	8.0117
942411	AE2-254 C O1	4.1430
942412	AE2-254 E O1	2.7620
942591	AE2-275 C O1	13.1053
942592	AE2-275 E O1	4.9295
942891	AE2-308 C O1	21.9968
942892	AE2-308 E O1	7.9988
943111	AE2-339 C	7.2556
943112	AE2-339 E	3.5736
LGEE	LGEE	5.2009
CIN	CIN	7.1221
CPLE	CPLE	0.3995
IPL	IPL	4.3061
G-007	G-007	1.3692
LGE-0012019	LGE-0012019	6.4746
CBM-W2	CBM-W2	65.7882
CBM-W1	CBM-W1	3.9546
WEC	WEC	0.6956
O-066	O-066	8.8028
CBM-S2	CBM-S2	1.8909
CARR	CARR	0.5053
CBM-S1	CBM-S1	13.7816
MEC	MEC	7.9510
RENSSELAER	RENSSELAER	0.3991

Affected Systems

20 Affected Systems

20.1 TVA

None

20.2 Duke Energy Progress

None

20.3 MISO

MISO Impacts to be determined during later study phases (as applicable).

20.4 LG&E

An LG&E affected system study will be required for AE2-308.

Trimble-Clifty 345 kV tie line between LG&E and OVEC. The line is owned by LG&E. The potential upgrade on the Trimble-Clifty 345 kV line, if determined to be a constraint by LG&E, is to reconductor the line with a high temperature conductor and upgrade necessary terminal equipment to achieve ratings of 2610/2610 MVA SN/SE. Cost estimate is $17.4M with a time estimate of 18 months.

LG&E will determine if there are any LG&E system impacts, including on Trimble- Clifty line. Final LG&E Impacts and necessary LG&E system upgrade(s) will be determined once the LG&E affected system study is completed by LG&E.

21 Contingency Descriptions

Contingency Name	Contingency Definition
DEO&K-DAY-EKPC.C5 4541MELDAHLSPRLCKSTUARTSPURLOCKDPLEK	CONTINGENCY 'DEO&K-DAY-EKPC.C5 4541MELDAHLSPRLCKSTUARTSPURLOCKDPLEK' OPEN BRANCH FROM BUS 342838 TO BUS 249581 CKT 1 OPEN BRANCH FROM BUS 253077 TO BUS 342838 CKT 1 END
.138.DEO&K.C2 816_SILVERGROVE	CONTINGENCY '.138.DEO&K.C2 816_SILVERGROVE' OPEN BRANCH FROM BUS 249573 TO BUS 250097 CKT 1 OPEN BRANCH FROM BUS 249988 TO BUS 250097 CKT 1 OPEN BRANCH FROM BUS 250042 TO BUS 250097 CKT 1 OPEN BRANCH FROM BUS 250052 TO BUS 250097 CKT 1 OPEN BRANCH FROM BUS 250053 TO BUS 250097 CKT 1 OPEN BRANCH FROM BUS 249571 TO BUS 249573 CKT 1 OPEN BRANCH FROM BUS 249573 TO BUS 249577 CKT 1 END
.345.DEO&K.C5 CIRCUIT1883&4545REDBANKSILGRVZIMMER	CONTINGENCY '.345.DEO&K.C5 CIRCUIT1883&4545REDBANKSILGRVZIMMER' OPEN BRANCH FROM BUS 249989 TO BUS 250080 CKT 1 OPEN BRANCH FROM BUS 250079 TO BUS 250080 CKT Z1 OPEN BRANCH FROM BUS 250079 TO BUS 250092 CKT 1 OPEN BRANCH FROM BUS 249573 TO BUS 249577 CKT 1 OPEN BRANCH FROM BUS 249573 TO BUS 250097 CKT 1 OPEN BRANCH FROM BUS 249571 TO BUS 249573 CKT 1 END
.345.DEO&K.C2 1493_RED BANK	CONTINGENCY '.345.DEO&K.C2 1493_RED BANK' OPEN BRANCH FROM BUS 249571 TO BUS 249573 CKT 1 OPEN BRANCH FROM BUS 249573 TO BUS 250097 CKT 1 OPEN BRANCH FROM BUS 249573 TO BUS 249577 CKT 1 OPEN BRANCH FROM BUS 249571 TO BUS 250092 CKT 1 END
AEP_P1-2_#363	CONTINGENCY 'AEP_P1-2_#363' OPEN BRANCH FROM BUS 243208 TO BUS 243209 CKT 1 / 243208 05JEFRSO 765 243209 05ROCKPT 765 1 END
.345.DEO&K.B2 RED BANK-SG-ZIMMER 4545	CONTINGENCY '.345.DEO&K.B2 RED BANK-SG-ZIMMER 4545' OPEN BRANCH FROM BUS 249573 TO BUS 249577 CKT 1 OPEN BRANCH FROM BUS 249573 TO BUS 250097 CKT 1 OPEN BRANCH FROM BUS 249571 TO BUS 249573 CKT 1 END
Base Case	

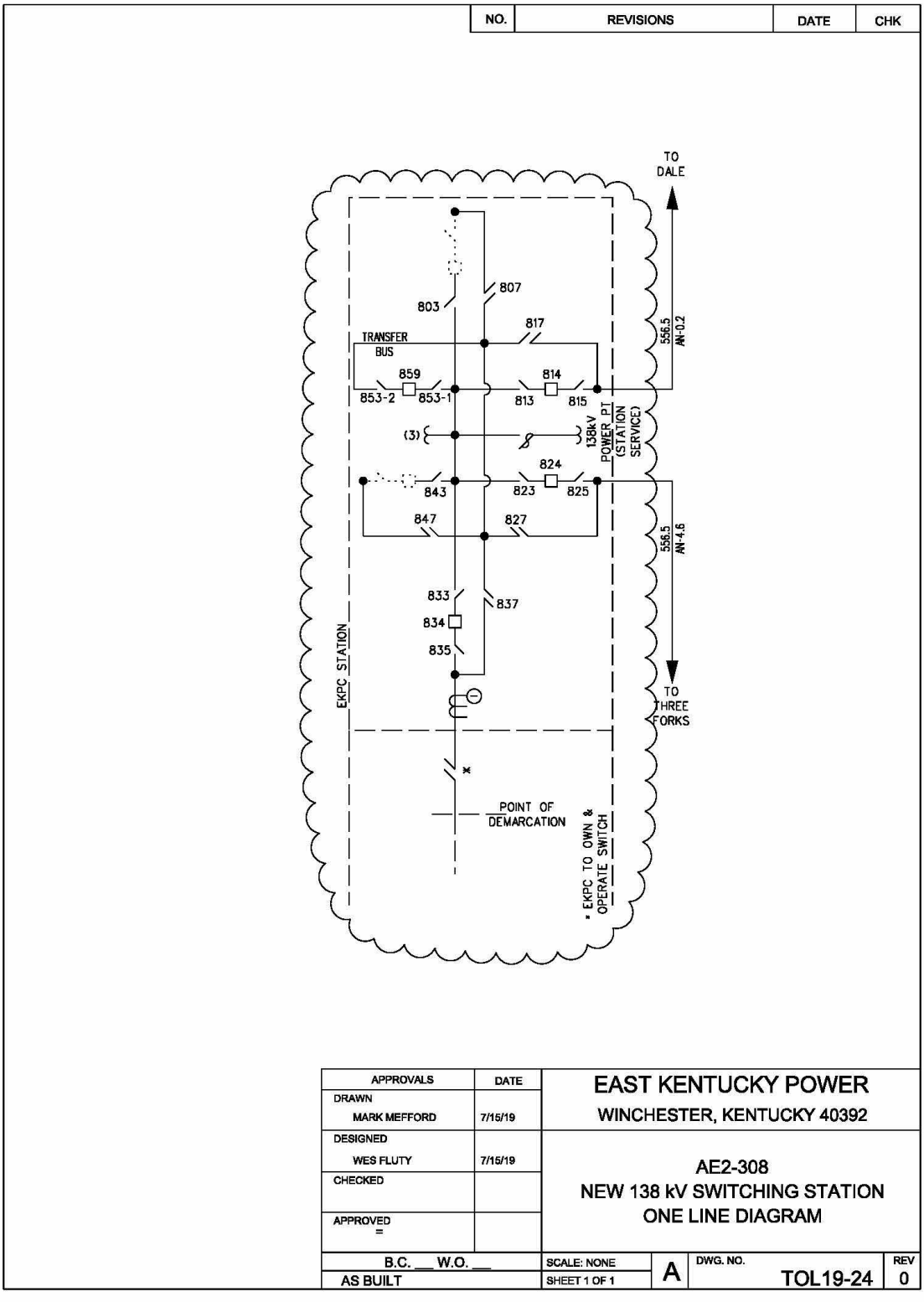
Short Circuit

22 Short Circuit

The following Breakers are overduty

None

23 Attachment 1. Single Line Diagram



APPENDIX G

Economic Impact Report

Economic Impact and Land Use Analysis of Madison Solar Project

September 2020

David G. Loomis, Ph.D.

SER Strategic Economic Research, LLC

About the Author

Dr. David G. Loomis is Professor of Economics at Illinois State University and Co-Founder of the Center for Renewable Energy. He has over 10 years of experience in the renewable energy field and has performed economic analyses at the county, region, state and national levels for utility-scale wind and solar generation. In particular, he has performed economic impact analyses for renewable energy projects in Illinois, Iowa, Kansas, Michigan, Nebraska, New Mexico, New York, Ohio, Pennsylvania, and South Dakota. He has served as a consultant for Apex, Clean Line Energy Partners, EDF Renewables, EO.N, Geronimo Energy, Invenergy, J-Power, the National Renewable Energy Laboratories, Ranger Power, State of Illinois, Tradewind, and others. He has testified on the economic impacts of energy projects before the Illinois Commerce Commission, Illinois Senate Energy and Environment Committee, Missouri Public Service Commission, the New Mexico Public Regulation Commission, and numerous county boards. Dr. Loomis is a widely recognized expert and has been quoted in the Wall Street Journal, Forbes Magazine, Associated Press, and Chicago Tribune as well as appearing on CNN.

Dr. Loomis has published over 25 peer-reviewed articles in leading energy policy and economics journals. He has raised and managed over $7 million in grants and contracts from government, corporate and foundation sources. Dr. Loomis received his Ph.D. in economics from Temple University in 1995.

SER Strategic Economic Research, LLC

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SER Strategic Economic Research, LLC

I. Executive Summary

Acciona Energy is developing the Madison Solar Project in Madison County, Kentucky. The purpose of this report is to aid decision makers in evaluating the economic impact of this project on Madison County and the Commonwealth of Kentucky. The basis of this analysis is to study the direct, indirect, and induced impacts on job creation, wages, and total economic output.

Madison Solar is a 100 MW solar project using single-axis tracking panels. The project represents an investment in excess of $120million. The total development is anticipated to result in the following:

Economic Impact

Jobs - all jobs numbers are full-time equivalents

- 160 new local jobs during construction for Madison County
- 394 new local jobs during construction for the Commonwealth of Kentucky
- Over 10.4 new local long-term jobs for Madison County
- Over 12.8 new local long-term jobs for the Commonwealth of Kentucky

Earnings

- Over $13.2 million in new local earnings during construction for Madison County
- Over $27.8 million in new local earnings during construction for the Commonwealth of Kentucky
- Over $425 thousand in new local long-term earnings for Madison County annually
- Over $798 thousand in new local long-term earnings for the Commonwealth of Kentucky annually

Output

- Over $19.5 million in new local output during construction for Madison County
- Over $44.8 million in new local output during construction for the Commonwealth of Kentucky
- Over $1 million in new local long-term output for Madison County annually
- Over $1.6 million in new local long-term output for the Commonwealth of Kentucky annually

Property Taxes

- Over $6.6 million in property taxes in total over the life of the Project

This report also performs an economic land use analysis regarding the leasing of agricultural land for the new solar farm. That analysis yields the following results:

Land Use

- Using a real-options analysis, the land use value of solar leasing far exceeds the value for agricultural use.
- Madison County:
  - The price of corn would need to rise to $14.25 per bushel or yields for corn would need to rise to 274 bushels per acre by the year 2052 for corn farming to generate more income for the landowner and local community than the solar lease.
  - Alternatively, the price of soybeans would need to rise to $48.69 per bushel or yields for soybeans would need to rise to 90.4 bushels per acre by the year 2052 for soybean farming to generate more income for the landowner and local community than the solar lease.
  - The price of hay would need to rise to $696.28 per ton or yields for hay would need to rise to 5.9 tons per acre by the year 2052 for hay farming to generate more income for the landowner and local community than the solar lease.
  - At this time of this report, corn, soybean, and hay prices are $4.10 per bushel, $9.10 per bushel, and $150 per ton respectively and yields are 140 bushels per acre, 30 bushels per acre, and 2.3 tons per acre respectively.

II. U.S. Solar PV Industry Growth and Economic Development

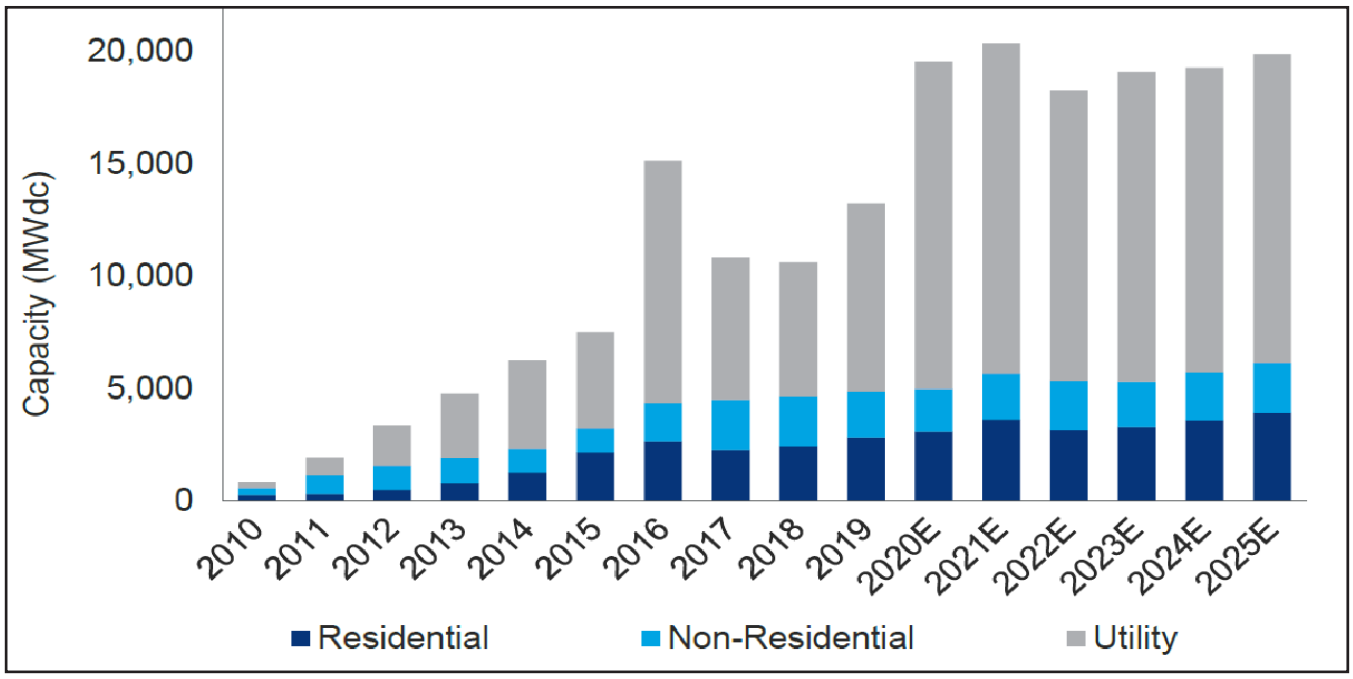
a. U.S. Solar PV Industry Growth

The U.S. solar industry is growing at a rapid but uneven pace, with systems installed for onsite use, including residential, commercial and industrial properties and with utility-scale facilities intended for wholesale distribution, such as Madison Solar. From 2013 to 2018, the amount of electricity generated from solar had more than quadrupled, increasing 444%. (EIA, 2020). The industry continued to add increasing numbers of PV systems to the grid. In 2019, the U.S. installed 13,300 MWdc of solar PV driven mostly by utility-scale PV, which is a 23% increase from 2018. The installations have stabilized after a record-setting year in 2016.[1] As Figure 1 clearly shows, the capacity additions in 2017-2019 still outpaced any year before 2016. The primary driver of this overall sharp pace of growth is large price declines in solar equipment. Since 2000, the price of solar PV has declined from about $10-$12/watt in 2000 to $2.4-$3.7/watt in 2018 according to Figure 2. Solar PV also benefits from the Federal Investment Tax Credit (ITC) which provides 30 percent tax credit for residential and commercial properties.

Utility-scale PV leads the installation growth in the U.S. A total of 8,402 MWdc of utility PV projects were completed in 2019 and accounted for 63% of the total installed capacity in 2019. An additional 9,988 MWdc are under construction and are expected to come on-line in 2020. According to Figure 3, there are 340,954 MWdc of utility-scale PV solar operating in the U.S. and an additional 48,118 MWdc has been contracted as well as another 59,669 MWdc announced.

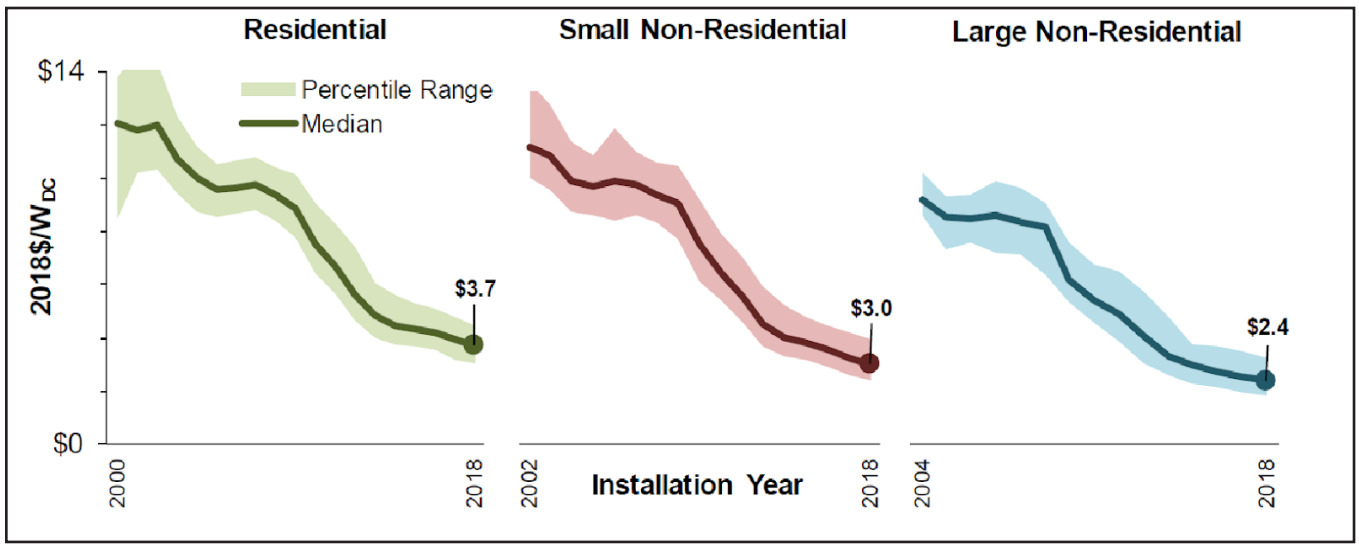
[1] There was a dramatic increase in 2016 because the industry was expecting the expiration of the federal investment tax credit and rushed to complete as many projects as possible before the expected expiration. This rush effectively pulled projects that were originally slated for 2017 and 2018 forward into 2016 resulting in the high amount installed in 2016 but a lower amount installed in 2017 and 2018.

Figure 1. — Annual U.S. Solar PV Installations, 2010 - 2025



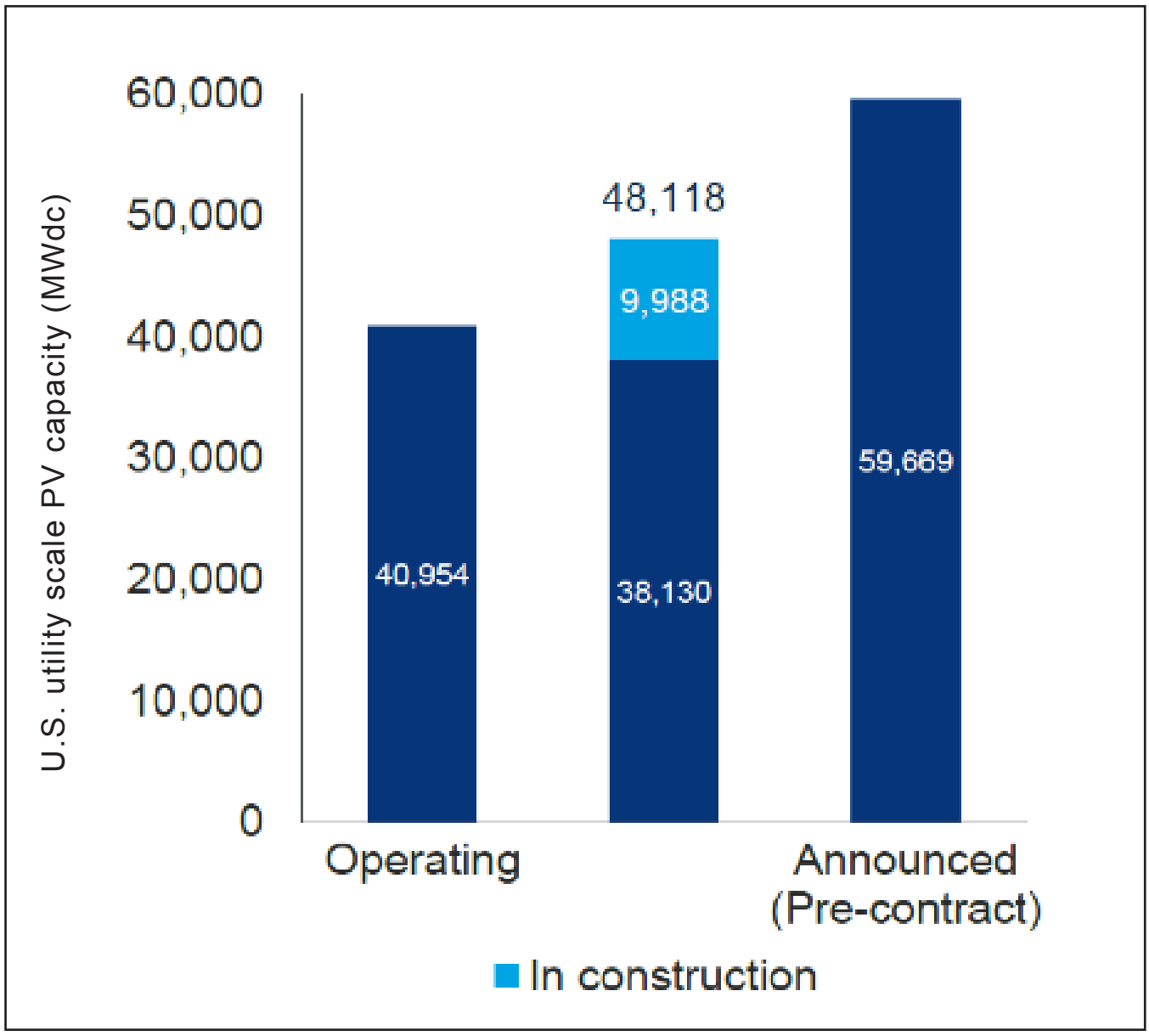
Solar Energy Industries Association, Solar Market Insight Report 2019 Year in review

Figure 2. — U.S. Annual Solar PV Installated Price Trends Over Time



Tracking the Sun: Pricing and Design Trends for Distributed Photovoltaic Systems in the United States, 2019 Edition

Figure 3. — U.S. Utility PV Pipeline



Solar Energy Industries Association, Solar Market Insight Report 2019 Year in review

b. Kentucky Solar PV Industry

According to SEIA, Kentucky is ranked 46th in the U.S. in cumulative installations of solar PV. California, North Carolina, and Arizona are the top 3 states for solar PV which may not be surprising because of the high solar irradiation that they receive. However, other states with similar solar irradiation to Kentucky rank highly including New Jersey (7th), Massachusetts (8th), New York (10th), and Maryland (15th). In 2019, Kentucky installed 5.15 MW of solar electric capacity bringing its cumulative capacity to 53.71 MW.

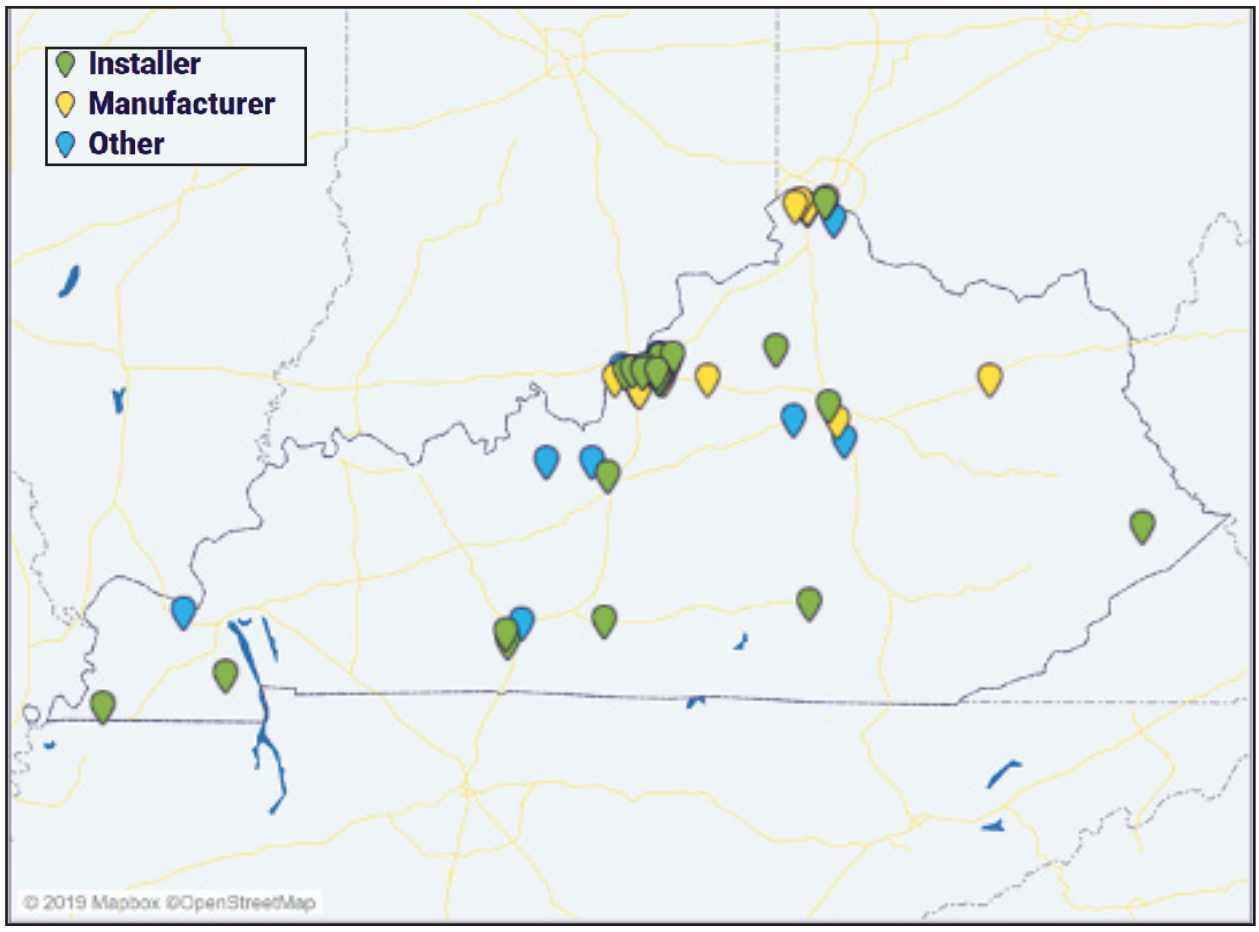
Kentucky has great potential to expand its solar installations. Kentucky's three largest solar farms in operation are: Cooperative Solar One is a 8.5 MW installation; General Motors has a 0.85 MW installation in Bowling Green, KY; and the Crittenden Solar Facility is a 2 MW installation. The 100 MW Madison Solar Project will be one of the largest installations in Kentucky to date.

There are more than 43 solar companies in Kentucky including 11 manufacturers, 17 installers/developers, and 15 others.[2] Figure 4 shows the locations of solar companies in Kentucky as of the time of this report. Currently, there are 1,362 solar jobs in the Commonwealth of Kentucky according to SEIA.

Figure 5 shows the Kentucky historical installed capacity by year according to the SEIA. Huge growth in solar is forecasted in the next 5 years, a projection of over 396 MW.

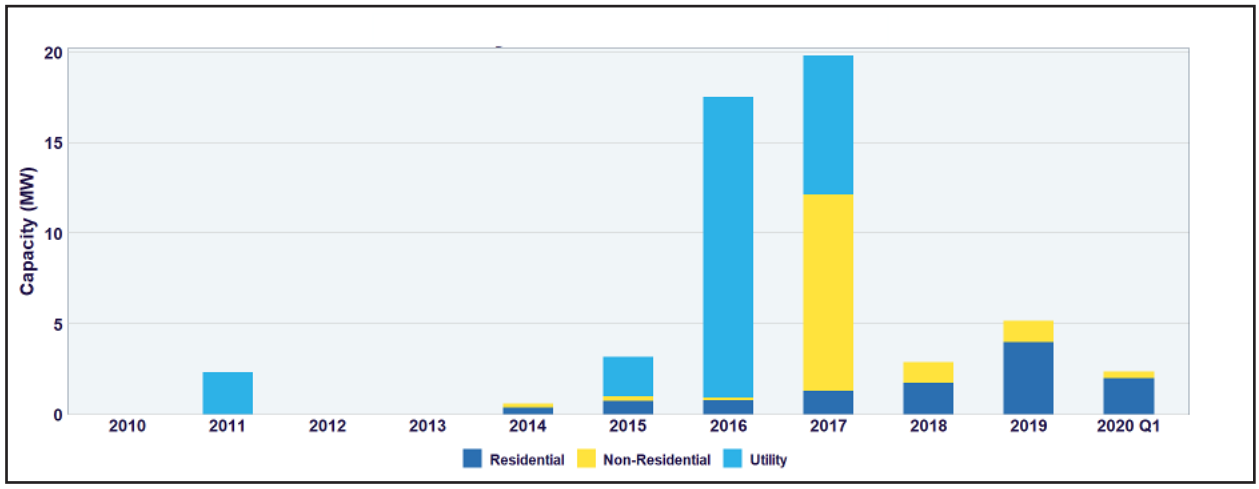
[2] "Other" includes Sales and Distribution, Project Management, and Engineering.

Figure 4. — Solar Company Locations in Kentucky



Solar Energy Industries Association, Solar Spotlight: Kentucky

Figure 5. — Kentucky Annual Solar Installations



Solar Energy Industries Association, Solar Spotlight: Kentucky

c. Economic Benefits of Utility-Scale Solar PV Energy

Utility-scale solar energy projects have numerous economic benefits. Solar installations create job opportunities in the local area during both the short-term construction phase and the long-term operational phase. In addition to the workers directly involved in the construction and maintenance of the solar energy project, numerous other jobs are supported through indirect supply chain purchases and the higher spending that is induced by these workers. Solar projects strengthen the local tax base and help improve county services, and local infrastructure, such as public roads.

Numerous studies have quantified the economic benefits of Solar PV projects across the United States and have been published in peer-reviewed academic journals using the same methodology as this report. Some of these studies examine smaller-scale solar systems, and some examine utility-scale solar energy. Croucher (2012) uses NREL's Jobs and Economic Development Impacts ("JEDI") modeling methodology to find which state will receive the greatest economic impact from installing one hundred 2.5 kW residential systems. He shows that Pennsylvania ranked first supporting 28.98 jobs during installation and 0.20 jobs during operations. Illinois ranked second supporting 27.65 jobs during construction and 0.18 jobs during operations.

Jo et. al. (2016) analyzes the financing options and economic impact of solar PV systems in Normal, IL and uses the JEDI model to determine the county and state economic impact. The study examines the effect of 100 residential retrofit fixed-mount crystalline-silicone systems having a nameplate capacity of 5kW. Eight JEDI models estimated the economic impacts using different input assumptions. They found that county employment impacts varied from 377 to 1,059 job-years during construction and 18.8 to 40.5 job-years during the operating years. Each job-year is a full-time equivalent job of 2,080 hours for a year.

Loomis et. al. (2016) estimates the economic impact for the State of Illinois if the state were to reach its maximum potential for solar PV. The study estimates the economic impact of three different scenarios for Illinois – building new solar installations of either 2,292 MW, 2,714 MW or 11,265 MW. The study assumes that 60% of the capacity is utility-scale solar, 30% of the capacity is commercial, and 10% of the capacity is residential. It was found that employment impacts vary from 26,753 to 131,779 job years during construction and from 1,223 to 6,010 job years during operating years.

Several other reports quantify the economic impact of solar energy. Bezdek (2006) estimates the economic impact for the State of Ohio, and finds the potential for PV market in Ohio to be $25 million with 200 direct jobs and 460 total jobs. The Center for Competitive Florida (2009) estimates the impact if the state were to install 1,500 MW of solar and finds that 45,000 direct jobs and 50,000 indirect jobs could be created. The Solar Foundation (2013) uses the JEDI modeling methodology to show that Colorado's solar PV installation to date created 10,790 job-years. They also analyze what would happen if the state were to install 2,750 MW of solar PV from 2013 to 2030 and find that it would result in nearly 32,500 job years. Berkman et. al (2011) estimates the economic and fiscal impacts of the 550 MWAC Desert Sunlight Solar Farm. The project creates approximately 440 construction jobs over a 26-month period, $15 million in new sales tax revenues, $12 million in new property revenues for Riverside County, CA, and $336 million in indirect benefits to local businesses in the county.

III. Madison Solar Project Description and Location

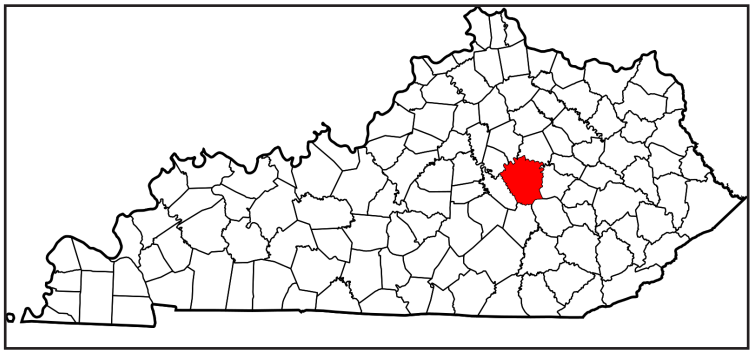
a. Madison Solar Project Description

Madison Solar will be constructed on certain properties located near the Red House Rd community in Madison County.
The Project will consist of approximately 1,100 acres of solar photovoltaic panels and associated racking (approximately 100MW), 35 inverters, and a project substation transformer which will connect to East Kentucky Power Cooperatives Three Forks-Dale 138kv transmission line.

b. Madison County, Kentucky

Madison County is located in the Central part of Kentucky (see Figure 6). It has a total area of 443 square miles and the U.S. Census estimates that the 2010 population was 41,440. The county has a population density of 209 (persons per square mile) compared to 110 for the Commonwealth of Kentucky. Median household income in the county was $41,945.

Figure 6. — Location of Madison County, Kentucky



https://upload.wikimedia.org/wikipedia/commons/thumb/a/a3/Map_of_Kentucky_highlighting_Madison_County.svg/1600px-Map_of_Kentucky_highlighting_Madison_County.svg.png

As shown in Table 1, the largest industry is "Administrative Government" followed by "Accommodation and Food Services," "Manufacturing" and "Retail Trade." These data for Table 1 come from IMPLAN covering the year 2018 (the latest year available).

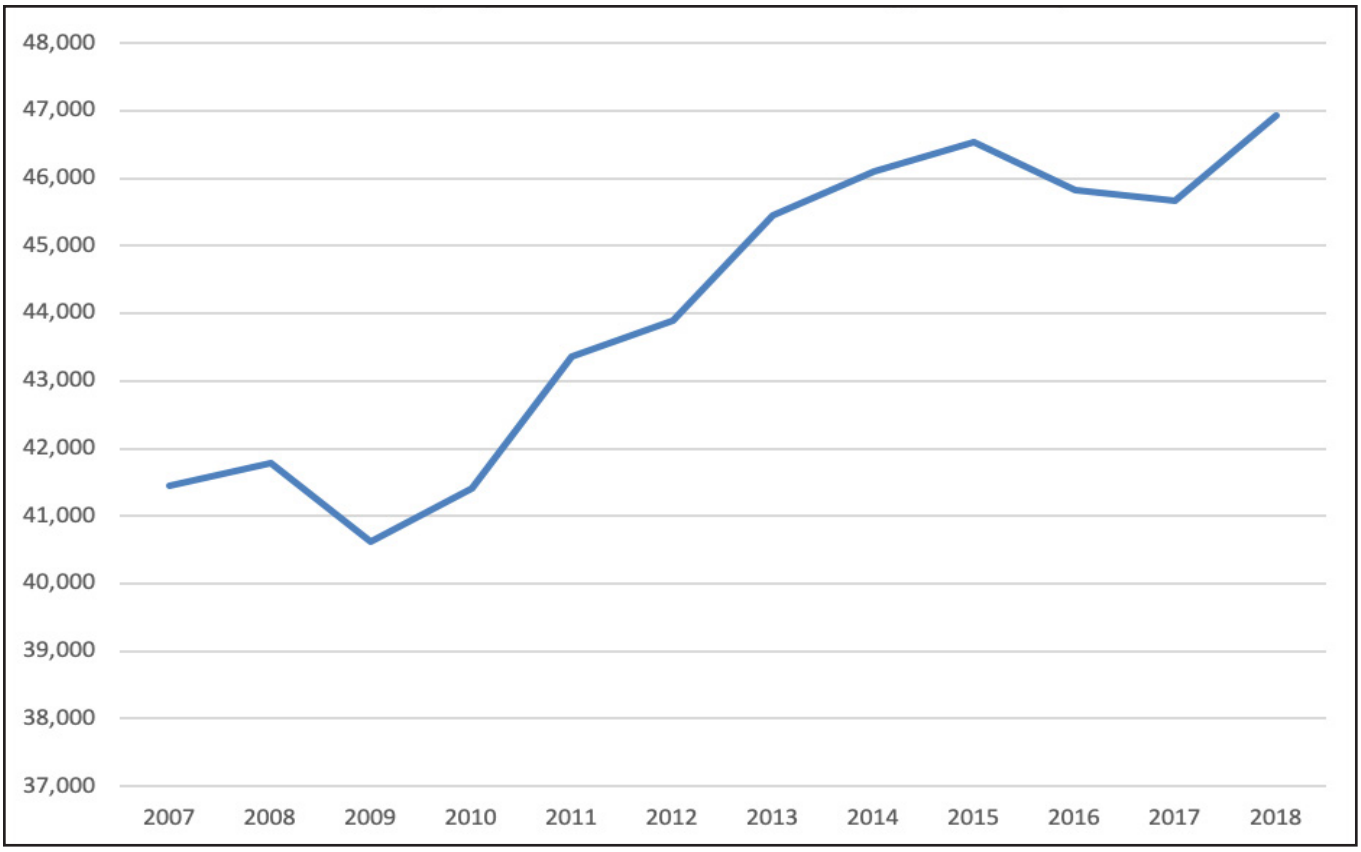
Table 1. — Employment by Industry in Madison County

Industry	Number	Percent
Administrative Government	7,596	16.5%
Accommodation and Food Services	5,101	11.1%
Manufacturing	5,052	11.0%
Retail Trade	4,849	10.6%
Health Care and Social Assistance	4,152	9.0%
Professional, Scientific, and Technical Services	3,392	7.4%
Construction	2,743	6.0%
Other Services (except Public Administration)	2,515	5.5%
Administrative and Support and Waste Management and Remediation Services	2,411	5.3%
Real Estate and Rental and Leasing	1,801	3.9%
Educational Services	1,250	2.7%
Agriculture, Forestry, Fishing and Hunting	1,136	2.5%
Finance and Insurance	1,057	2.3%
Arts, Entertainment, and Recreation	618	1.3%
Wholesale Trade	549	1.2%
Transportation and Warehousing	509	1.1%
Information	445	1.0%
Government Enterprises	307	0.7%
Mining, Quarrying, and Oil and Gas Extraction	248	0.5%
Management of Companies and Enterprises	111	0.2%
Utilities	58	0.1%

Source: Impact Analysis for Planning (IMPLAN), County Employment by Industry

Table 1 provides the most recent snapshot of total employment but does not examine the historical trends within the county. Figure 7 shows employment from 2007 to 2018. Total employment in Madison County was at its lowest at the 40,622 in 2009 and its highest at 46,920 in 2018.

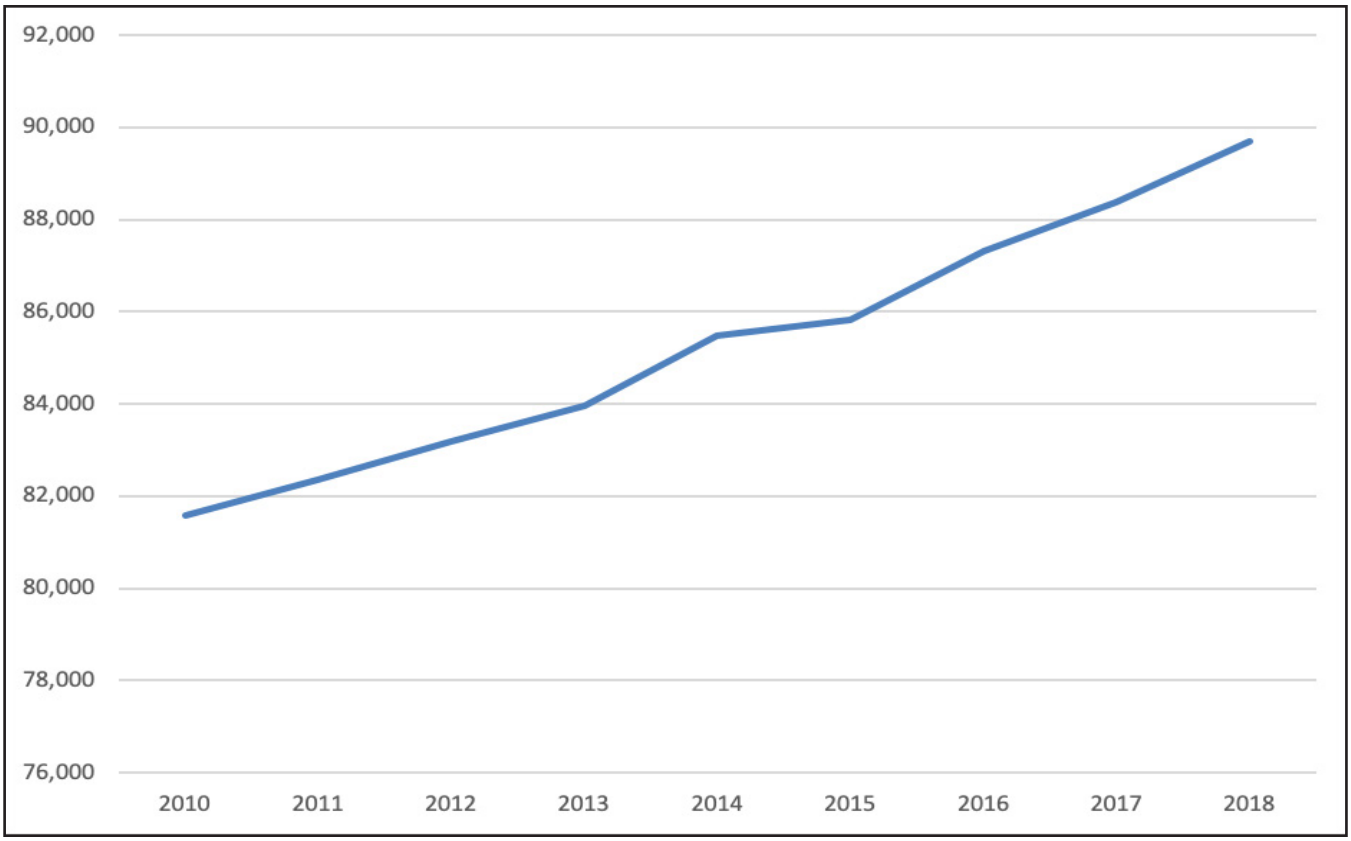
Figure 7. — Total Employment in Madison County from 2007 to 2018



Source: Bureau of Economic Analysis, Regional Data, GDP and Personal Income

Similar to the upward trend of employment, the overall population in the county has been increasing steadily, as shown in Figure 8. Madison County population was 81,580 in 2010 and 89,700 in 2018, a gain of 8,120. The average annual population increase over this time period was 1,015.

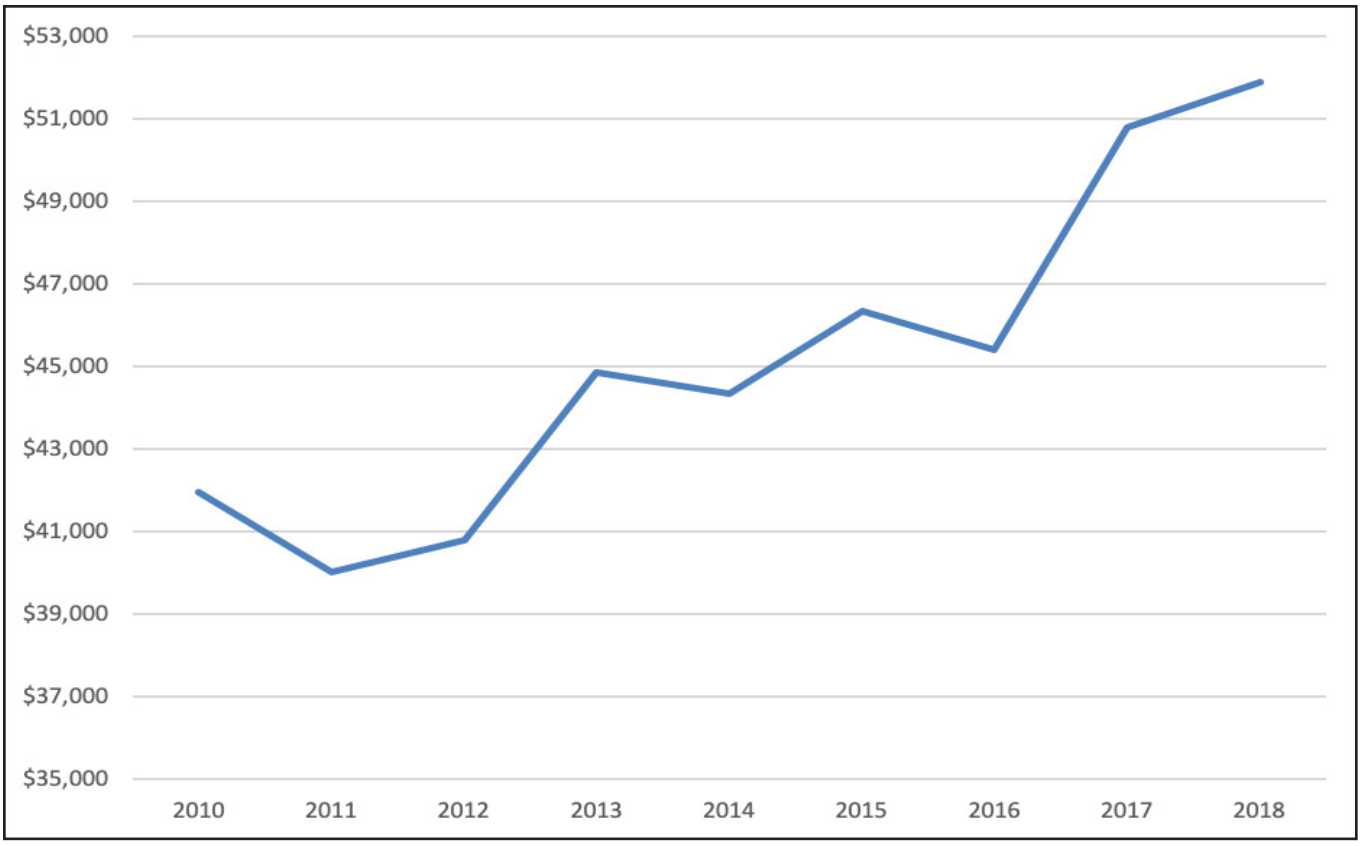
Figure 8. — Population in Madison County 2010-2018



Source: Federal Reserve Bank of St. Louis Economic Data, U.S. Census Bureau, Estimate of Median Household Income

Similar to the population trends, household income has been trending upward in Madison County. Figure 9 shows the median household income in Madison County from 2010 to 2018. Household income was at its lowest at $40,034 in 2011 and its highest at $51,897 in 2018.

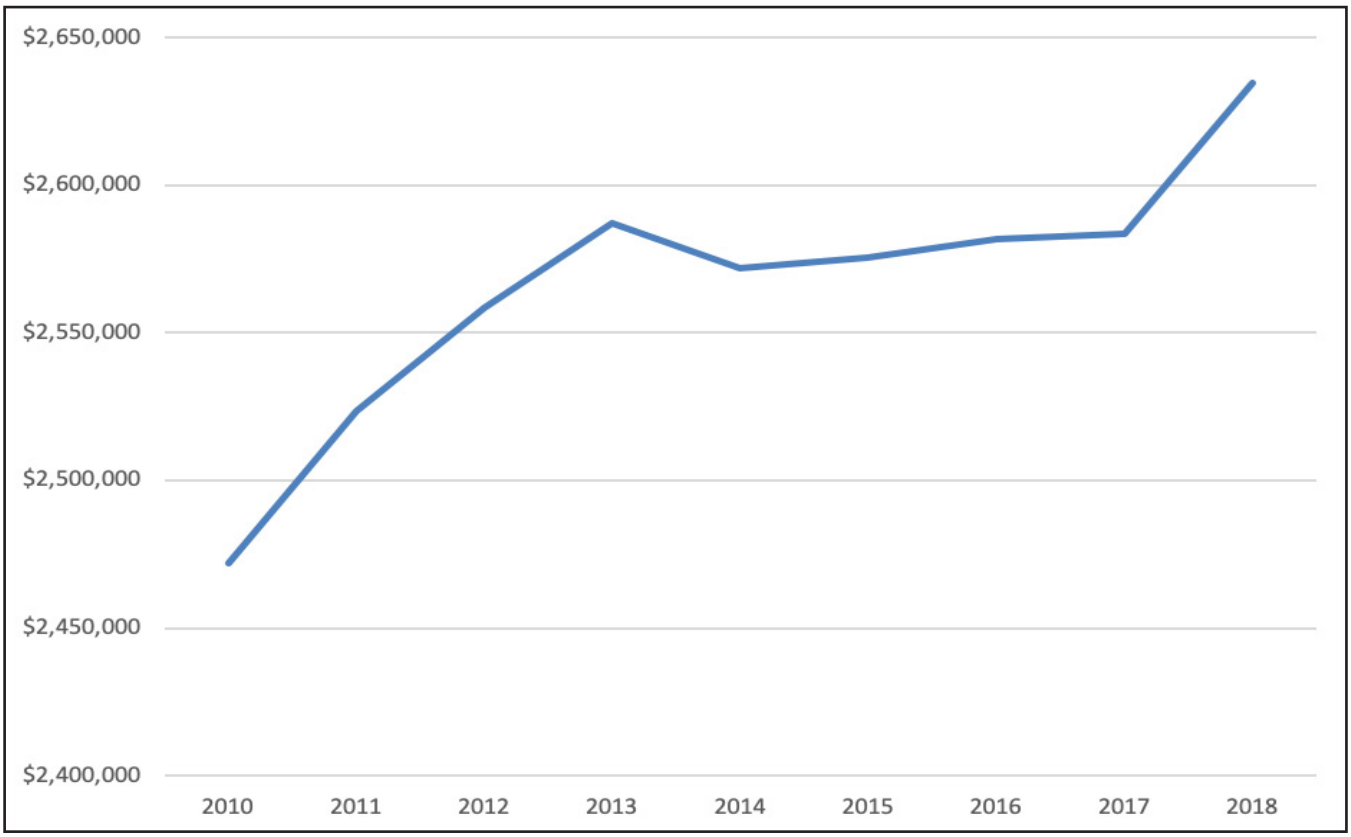
Figure 9. — Median Household Income in Madison County from 2010 to 2018



Source: Federal Reserve Bank of St. Louis Economic Data, U.S. Census Bureau, Estimate of Median Household Income

Real Gross Domestic Product (GDP) is a measure of the value of goods and services produced in an area and adjusted for inflation over time. The Real GDP for Madison County has been increasing since hitting a low in 2010, as shown in Figure 10.

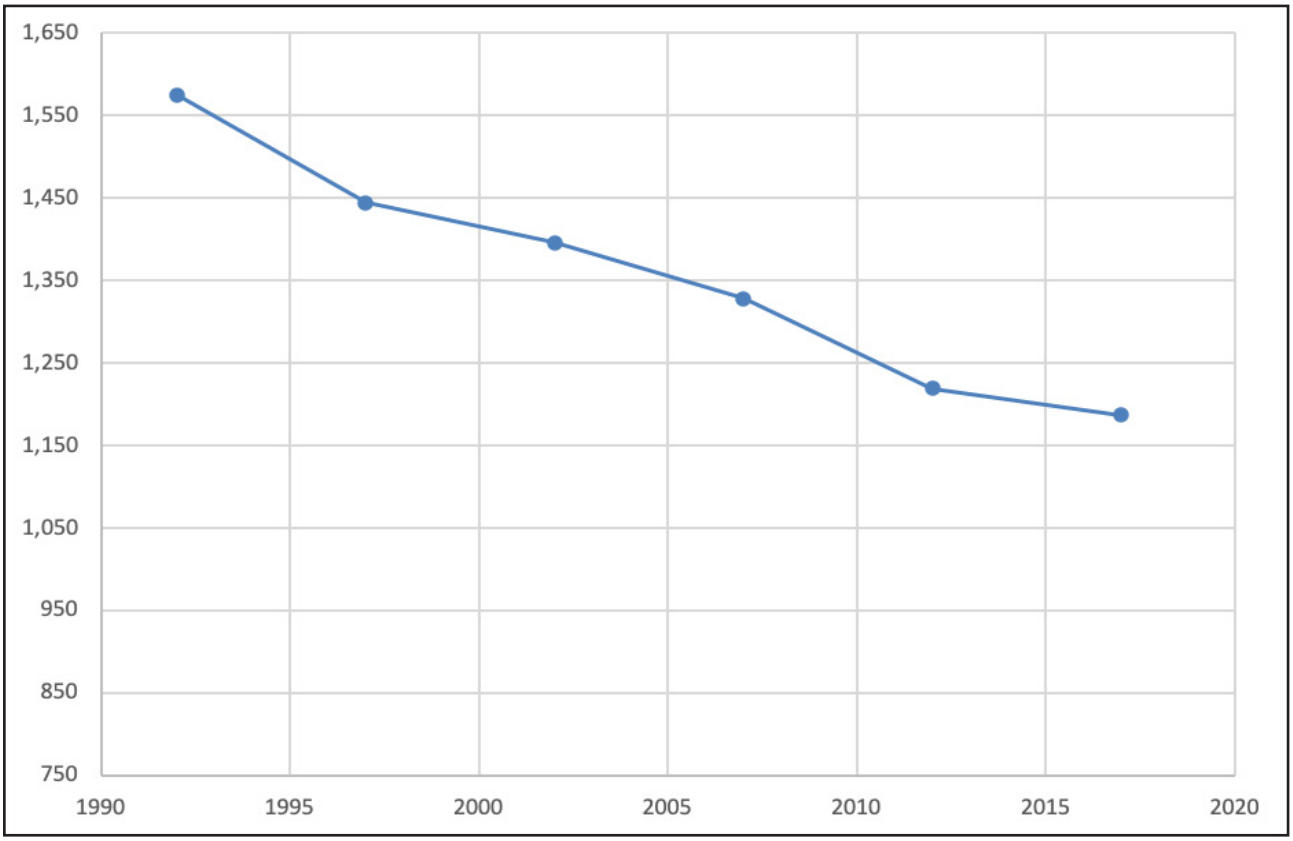
Figure 10. — Real Gross Domestic Product (GDP) in Madison County from 2010-2018



Source: Bureau of Economic Analysis, Regional Data, GDP and Personal Income

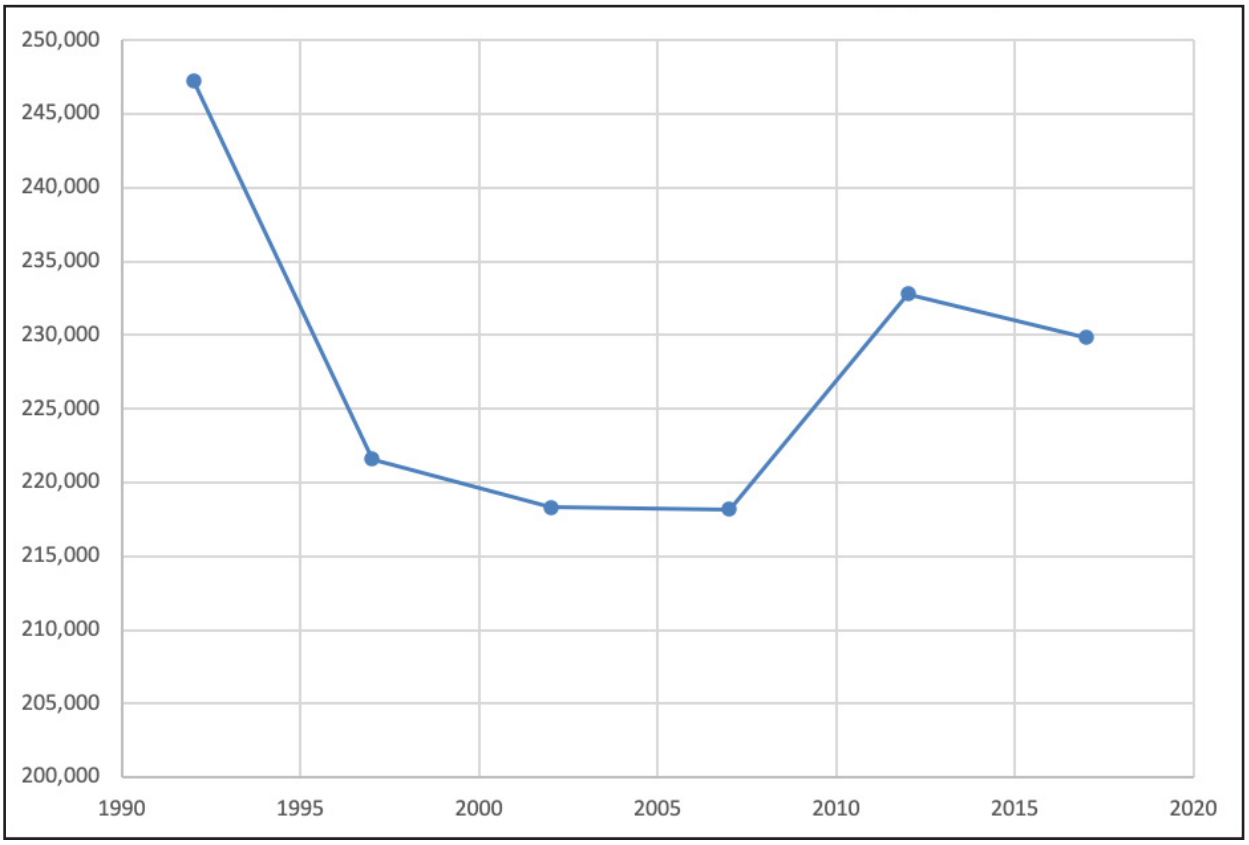
The farming industry has decreased in Madison County. As shown in Figure 11, the number of farms has decreased from 1,575 in 1992 to 1,187 in 2017. The amount of land in farms has fluctuated greatly. The county farmland hit a low of 218,194 acres in 2007, and then rising to 229,824 acres in 2017 according to Figure 12.

Figure 11. — Number of Farms in Madison County from 1992 to 2017



Source: Census of Agriculture, 1992-2017

Figure 12. — Land in Farms in Madison County from 1992 to 2017



Source: Census of Agriculture, 1992-2017

ii. Agricultural Statistics

Kentucky is ranked twenty-sixth among U. S. states in total value of agricultural products sold (Census, 2017). It is ranked twenty-third in the value of livestock, and twenty-third in the value of crops (Census, 2017). In 2019, Kentucky had 74,800 farms and 12.9 million acres in operation with the average farm being 172 acres (State Agricultural Overview, 2019). Kentucky had 50 thousand cattle and produced 941 million pounds of milk (State Agricultural Overview, 2019). In 2019, Kentucky yields averaged 169 bushels per acre for grain corn with a total market value of $1.0 billion (State Agricultural Overview, 2019). Soybean yields averaged 46 bushels per acre with a total market value of $707 million (State Agricultural Overview, 2019). The average net cash farm income per farm is $20,784 (Census, 2017).

In 2017, Madison County had 1,187 farms covering 229,824 acres for an average farm size of 194 acres (Census, 2017). The total market value of products sold was $50 million with 85 percent coming from livestock sales and 15 percent coming from crop sales (Census, 2017). The average net cash farm income of operations was $4,567 (Census, 2017).

The 1,100 acres planned to be used by the Madison Solar Project represents just 0.4% of the acres used for farming in Madison County. As we will show in the next section, solar farming is a better land use on a purely economic basis than livestock or crops for the particular land in this Project.

IV. Land Use Methodology

a. Agricultural Land Use

NREL: National Renewable Energy Laboratory

JEDI: Jobs and Economic Development Impacts

IMPLAN: IMpact Analysis for PLANning

Many are concerned about the conversion of farmland to residential, commercial and industrial uses. In his article, "Is America Running out of Farmland?" Paul Gottlieb shows that in the Continental United States, prime farmland has declined 1.6% from 1982-2010. Conversion of farmland to other uses "has a number of direct and indirect consequences, including loss of food production, increases in the cost of inputs needed when lower quality land is used to replace higher quality land, greater transportation costs of products to more distant markets, and loss of ecosystem services. Reduced production must be replaced by increasing productivity on remaining land or by farming new lands." (Franscis et. al., 2012)

On the other side of the debate, Dwight Lee considers the reduction in farmland as good news. In his article, "Running Out of Agricultural Land," he writes, "farmland has been paved over for shopping centers and highways, converted into suburban housing tracts, covered with amusement parks, developed into golf courses, and otherwise converted because consumers have communicated through market prices that development is more valuable than the food that could have been grown on the land." (Lee, 2000)

Total U.S. cropland has remained steady over the past five years. In 2012, 257.4 million acres in the U.S. were cropland while in 2017, 249.8 million acres were cropland. In 2012, just over 40 percent of all U.S. land was farmland (Census of Agriculture, 2012). According to the World Bank, the percentage of agricultural land has increased worldwide from 36.0 in 1961 to 37.3 in 2015. The Arab World, Caribbean Small States, East Asia, South Asia and Sub-Sahara Africa have all experienced growth in the percentage of agricultural land. Thus, from a global perspective, it is simply not true that we are running out of farmland. Even in the U.S., large quantities of farmland are not disappearing.

One valid criticism of the "market forces" arguments is that flow of land only goes from agricultural to non-agricultural uses. In theory, land should move in a costless way back and forth between urban and rural uses in response to new market information. Since agricultural land seldom goes back to agricultural use once it is converted, one needs to account for this in the analysis of farmland. The common assumption then is that urban development is irreversible and leads to an "option value" argument. (Gottlieb, 2015)

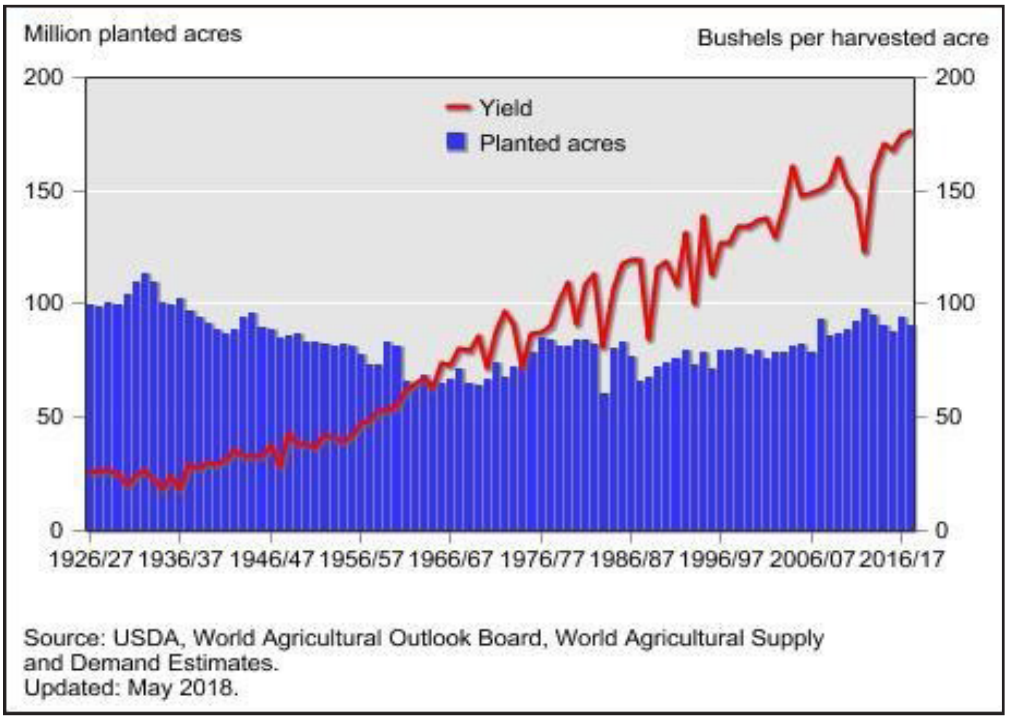
In finance, an option is a contract which gives the holder the right but not the obligation to buy or sell an underlying asset. A real option value is a choice made with business investment opportunities, referred to as "real" because it typically references a tangible asset instead of financial instrument. In the case of agricultural land, the owner retains the right to sell the land in future years if they don't sell in the current year. From a finance viewpoint, this "option" to sell in the future has value to the owner and since it is a tangible asset rather than a financial instrument, we call it a "real option."

b. Agricultural Land and Solar Farms

However, the present case of leasing agricultural land for a solar energy generating facility rises above this debate in several important ways. First, the use of agricultural land for a solar energy center is only temporary, and certainly not irreversible. The term of the solar easements for this Project is thirty years with extensions after that, then the easements would expire. At the end of the easement, the land will be restored to its original condition and will likely return to agricultural use. This restoration is ensured by easement terms and conditions as well as likely permit conditions. This is far different from residential or commercial development where the land is often owned in fee and there are no decommissioning requirements or surety. Second, the total amount of agricultural land being used for solar energy is miniscule compared to the conversion of agricultural land permanently to residential housing and commercial development. Third, the ongoing annual lease payments will continue to go to the landowner who will retain ownership of the land both during and after the lease. At the end of the lease and when the project is responsibly decommissioned, the landowner could resume farming the land. In other conversions, the land is sold by the farmer to another party – usually a housing developer or commercial real estate broker. In this case, the values and goals of the new landowner differ significantly from the original landowner. Fourth, the free market economic forces are working properly because solar farms present landowners with an opportunity for a higher value use on their land. This also allows the landowner to diversify their income away from agricultural products alone, better weather economic downturns, and keep the land in the family.

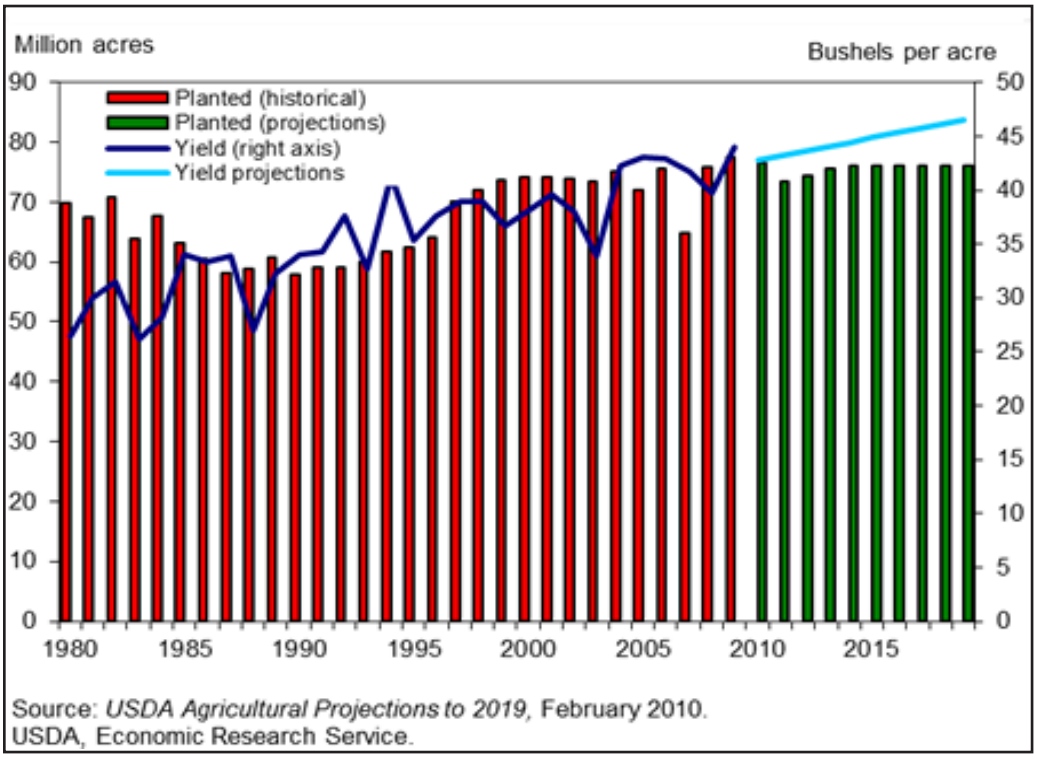
Farmland has gotten more productive over the years with better farming equipment and techniques resulting in higher yields on the same amount of land. Corn production has risen due to improvements in seed varieties, fertilizers, pesticides, machinery, reduced tillage, irrigation, crop rotations and pest management systems. Figure 13 shows the dramatic increase U.S. corn yields since 1926. Soybean yields have also increased though not as dramatically. Figure 14 displays the soybean yields in the U.S. since 1980.

Figure 13. — U.S. Corn Acreage and Yield



Source: USDA, Economic Research Service,
https://www.ers.usda.gov/topics/crops/corn-and-other-feedgrains/background/

Figure 14. — U.S. Soybean Acreage and Yield



c. Methodology

To analyze the specific economic land use decision for a solar energy center, this section uses a methodology first proposed by Gazheli and Di Corato (2013). A "real options" model is used to look at the critical factors affecting the decision to lease agricultural land to a company installing a solar energy generating facility. According to their model, the landowner will look at his expected returns from the land that include the following: the price that they can get for the crop (typically corn or soybeans); the average yields from the land that will depend on amount and timing of rainfall, temperature and farming practices; and the cost of inputs including seed, fuel, herbicide, pesticide and fertilizer. Not considered is the fact that the landowner faces annual uncertainty on all these items and must be compensated for the risk involved in each of these parameters changing in the future. In a competitive world with perfect information, the returns to the land for its productivity should relate to the cash rent for the land.

For the landowner, the key analysis will be comparing the net present value of the annual solar lease payments to expected profits from farming. The farmer will choose the solar farm lease if:

$$NPV\ (Solar\ Lease\ Payment_t) > NPV\ (P_t * Yield_t - Cost_t)$$

Where NPV is the net present value; Solar Lease $Payment_t$ is the lease payment the owner receives in year t; P_t is the price that the farmer receives for the crop (corn or soybeans) in year t; $Yield_t$ is the yield based on the number of acres and historical average of county-specific productivity in year t; $Cost_t$ is the total cost of farming in year t and will include (the cost of seed, fertilizer, the opportunity cost of the farmer's time. Farming profit is the difference between revenue (price times yield) and cost. The model will use historical agricultural data from the county (or state when the county data is not available).

The standard net present value calculation presented above, uses the expected value of many of the variables that are stochastic (have some randomness to them). The "real options" enhancement allows for the possibility that subsequent decisions could modify the farming NPV. This enhancement allows for a more dynamic modeling process than the static analysis implied by the standard NPV. By projecting historical trends and year-to-year variations of farming profits into the future, the real options model captures the new information about farming profitability that comes from crop prices, yields and cost in each future year.

In order to forecast returns from agriculture in future years, we use a linear regression using an intercept and time trend on historical data to predict future profits.

$$\pi_t = \propto + \beta * time$$

Where π_t is the farming profit in year t; α is intercept; β is the trend and time is a simple time trend starting at 1 and increasing by 1 each time period.

V. Land Use Results

In order to analyze future returns from farming the land, we will use historical data from Madison County to examine the local context for this analysis. The United States Department of Agriculture's National Agricultural Statistics Service publishes county-level statistics every five years. Table 2 shows the historical data from 1992 to 2017 for total farm income, production expenses, average farm size, net cash income, and average market value of machinery per farm.

Table 2. — Agricultural Statistics for Madison County, Kentucky

	1992	1997	2002	2007	2012	2017
Total Farm Income Per Farm	NA	NA	$3,082	$5,631	$6,375	$6,382
Total Farm Production Expenses (average/farm)	$18,776	$19,224	$20,163	$31,794	$49,399	$39,836
Average Farm Size (acres)	157	153	156	164	191	194
Net Cash Income per Farm[3]	$10,308	$12,225	$7,538	$2,358	$2,239	$4,567
Average Market Value of Machinery Per Farm	$22,929	$25,739	$29,911	$51,885	$65,868	$71,336

Source: United States Department of Agriculture's National Agricultural Statistics Service (NASS), Census of Agriculture

The production expenses listed in Table 2 include all direct expenses like seed, fertilizer, fuel, etc. but do not include the depreciation of equipment and the opportunity cost of the farmer's own time in farming. To estimate these last two items, we can use the average market value of machinery per farm and use straight-line depreciation for 20 years with no salvage value. This is a very conservative estimate of the depreciation since the machinery will likely qualify for a shorter life and accelerated or bonus depreciation. To calculate the opportunity cost of the farmers time, we obtained the mean hourly wage for farming in each of these years from the Bureau of Labor Statistics. Again, to be conservative, we estimate that the farmer spends a total of 16 weeks @ 40 hours/week farming in a year. It seems quite likely that a farmer spends many more hours than this including direct and administrative time on the farm. These statistics and calculations are shown in Table 3.

[3] Net Cash Income per farm is reported by the NASS and does not exactly equal income minus expenses. NASS definition for this item is, "Net cash farm income of the operators. This value is the operators' total revenue (fees for producing under a production contract, total sales not under a production contract, government payments, and farm-related income) minus total expenses paid by the operators. Net cash farm income of the operator includes the payments received for producing under a production contract and does not include value of commodities produced under production contract by the contract growers. Depreciation is not used in the calculation of net cash farm income."

Table 3. - Machinery Depreciation and Opportunity Cost of Farmer's Time for Madison County, Kentucky

	1992	1997	2002	2007	2012	2017
Average Market Value Machinery Per Farm	$22,929	$25,739	$29,911	$51,885	$65,868	$71,336
Annual Machinery Depreciation over 30 years - Straight Line (Market Value divided by 30)	$764	$858	$997	$1,730	$2,196	$2,378
Mean Hourly Wage in KY for Farming (Bureau of Labor Statistics)	$6.72	$7.64	$9.50	$9.95	$10.27	$12.62
Annual Opportunity Cost of Farmer's Time (Wage times 8 weeks times 40 Hours/Week)	$2,151	$2,445	$3,040	$3,184	$3,286	$4,038

Source: United States Department of Agriculture's National Agricultural Statistics Service (NASS), Census of Agriculture

To get the total profitability of the land, we take the net cash income per farm and subtract depreciation expenses and the opportunity cost of the farmer's time. To get the profit per acre, we divide by the average farm size. Finally, to account for inflation, we use the Consumer Price Index (CPI) to convert all profit into 2017 dollars (i.e. current dollars).[4] These calculations and results are shown in Table 4.

Table 4. — Profit Per Farm Calculations for Madison County, Kentucky

	1992	1997	2002	2007	2012	2017
Net Cash Income per Farm	$10,308	$12,225	$7,538	$2,358	$2,239	$4,567
Machinery Depreciation	($764)	($858)	($997)	($1,730)	($2,196)	($2,378)
Opportunity Cost of Farmer's Time	($2,151)	($2,445)	($3,040)	($3,184)	($3,286)	($4,038)
Profit	$7,393	$8,922	$3,501	-$2,556	-$3,243	-$1,849
Average Farm Size (Acres)	157	153	156	164	191	194
Profit Per Acre in 2012 Dollars	$47.09	$58.32	$22.44	-$15.58	-$16.98	-$9.53
CPI	141.9	161.3	180.9	210.036	229.601	246.524
Profit Per Acre in 2017 Dollars	$81.81	$89.13	$30.58	-$18.29	-$18.23	-$9.53

[4] We will use the Consumer Price Index for All Urban Consumers (CPI-U) which is the most common CPI used in calculations. For simplicity, we will just use the CPI abbreviation.

Using an unsophisticated static analysis, the farmer would be better off using his land for solar if the solar lease rental per acre exceeds the 2017 profit per acre of -$9.53 which adjusts to -$9.97 after counting for inflation in Madison County. Yet this static analysis fails to capture the dynamics of the agricultural market and the farmer's hope for future prices and crop yields to exceed the current level. To account for this dynamic, we use the real options model discussed in the previous section. Recall that the net returns from agriculture fluctuates according to the following equation:

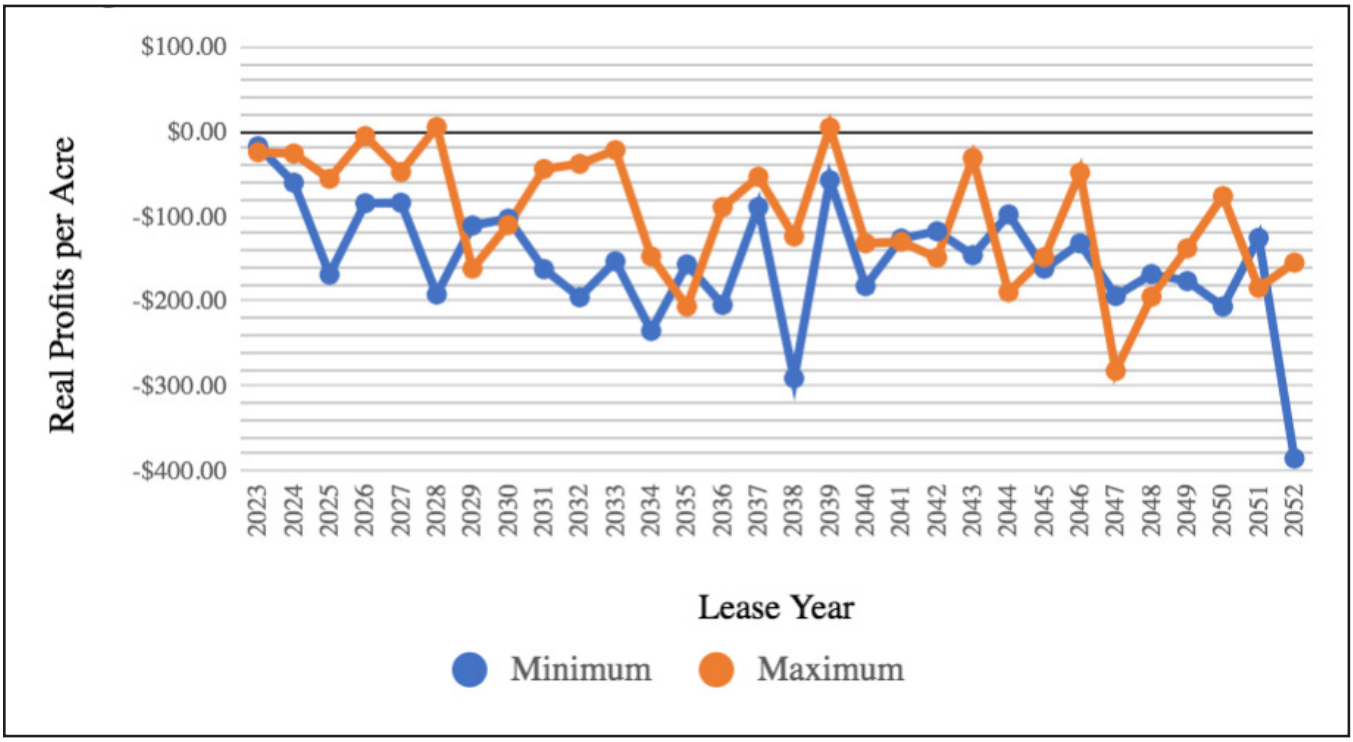
$$\pi_t = \propto + \beta * time$$

Where π_t is the farming profit in year t; α is intercept; β is the trend and time is a simple time trend starting at 1 and increasing by 1 each time period.

Using the Census of Agriculture data from 1992 to the present, the intercept is $89.76 with a standard error of $19.15. The time trend is $-4.73 with a standard error of 1.2. This means that agriculture profits are expected to decline by $4.73 per year. Both the intercept and the coefficient on the time trend have a wide variation as measured by the standard error. The wide variation means that there will be a lot of variability in agricultural profits from year to year.

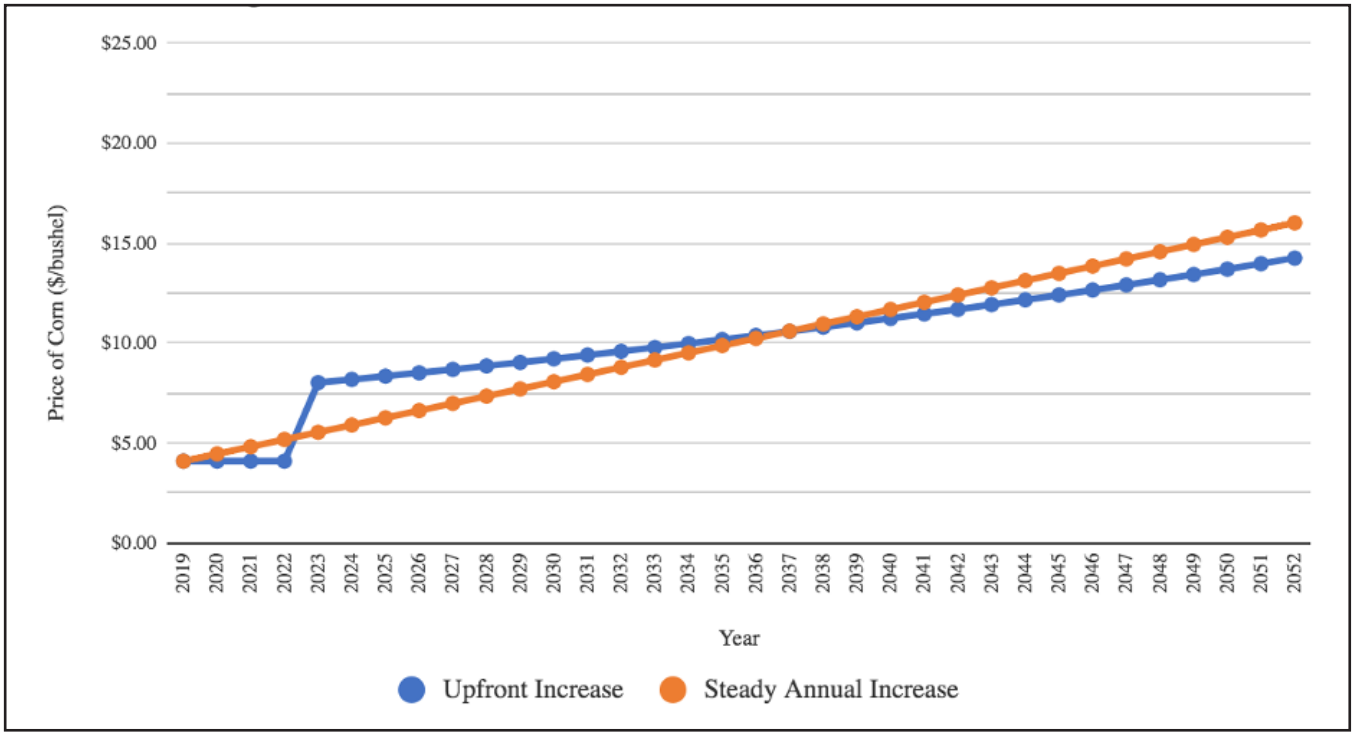
Over the period from 2017 to 2052, we assume that the profit per acre follows the equation above but allows for the random fluctuations. Because of this randomness, we can simulate multiple futures using Monte Carlo simulation. We assume that the solar farm will begin operation in 2023 and operate through 2052. Using 500 different simulations, the real profit per acre never exceeds $102 in any single year. Overall, the maximum average annual profit over the 30 years is $-123 and the minimum average annual profit is $-148. Figure 15 is a graph of the highest and lowest real profit per acre simulations. When comparing the average annual payment projected in the maximum simulation by 2052 to the solar lease per acre payment, the solar lease provides higher returns than farming in all of the 500 simulations. This means the farmer is financially better off under the solar lease in 100% of the 500 scenarios analyzed.

Figure 15. — Simulations of Real Profits Per Acre Based on Data from 1992



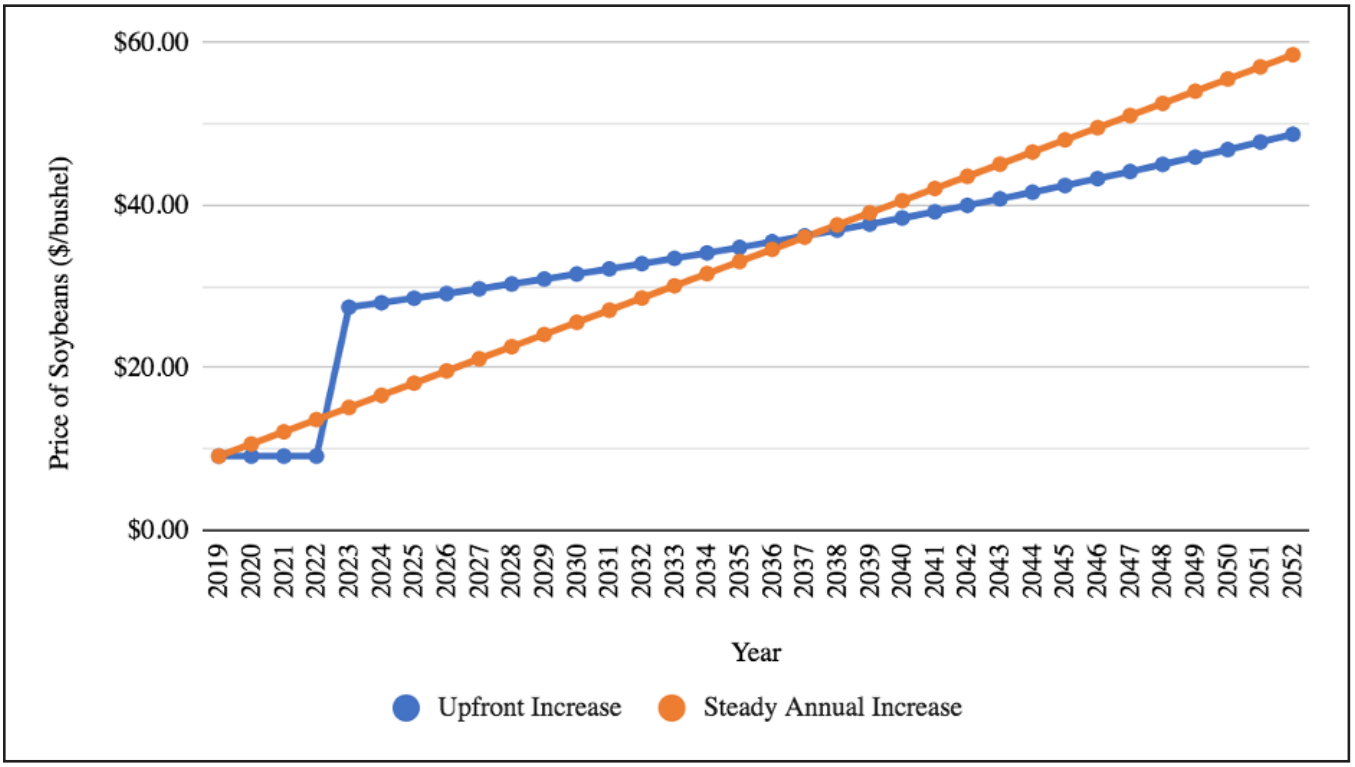
Another way to look at this problem would be to ask: How high would the price of corn have to rise to make farming more profitable than the solar lease? Below we assume that the yields on the land and all other input costs stay the same. In this case, the price of corn would have to rise from $4.10 per bushel in 2019 to $8.03 in 2022 and rise to $14.25 per bushel by 2052 as shown in Figure 16. Alternatively, the price of corn would need to rise by $0.36 per bushel each year from 2019 to 2052 when it would reach $16.02 per bushel.

Figure 16. — Simulated Price of Corn Per Bushel to Match the Solar Lease



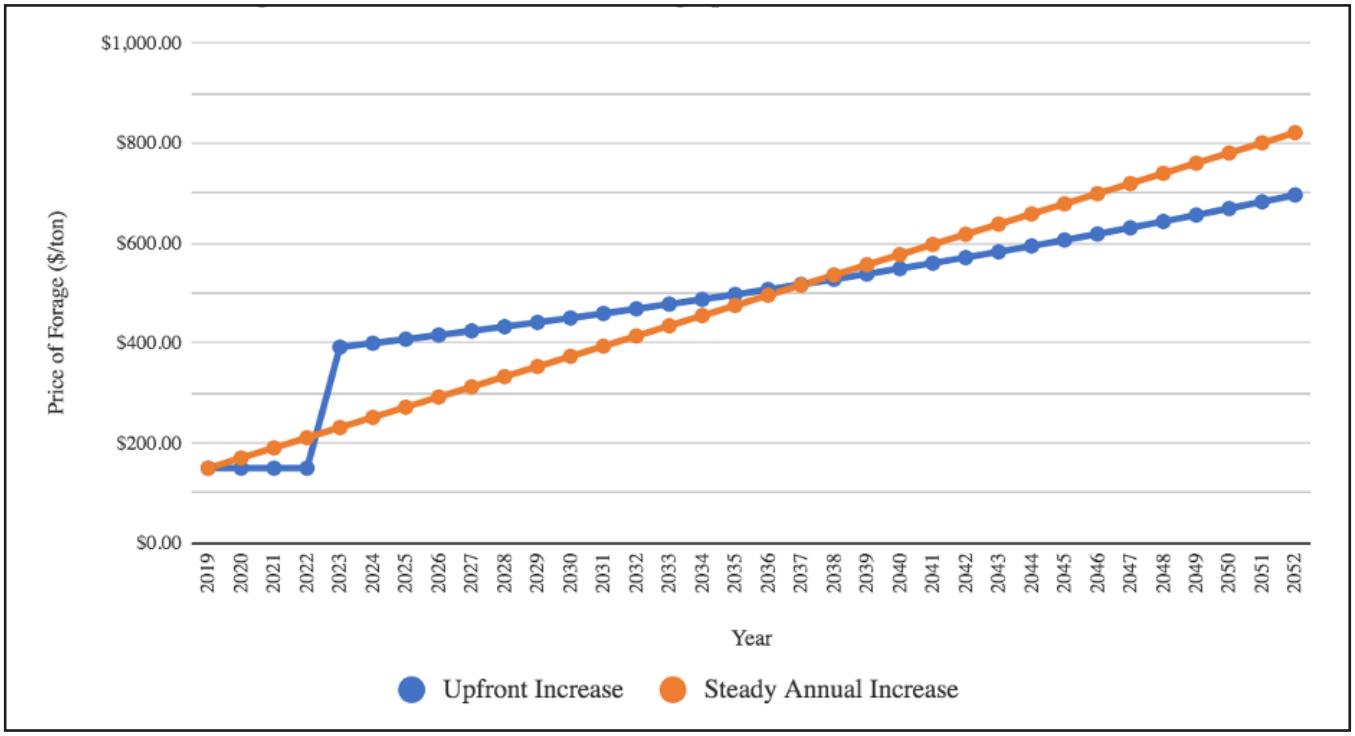
Now let's turn our attention to soybeans. If we assume the yields and input costs stay the same, the price of soybeans would have to rise from $9.10 per bushel in 2019 to $27.42 per bushel in 2022 and rise to $48.69 by 2052 as shown in Figure 17. For a linear increase, the price of soybeans would need to rise by $1.50 per bushel each year from 2019 to 2052 when it would reach $58.47 per bushel.

Figure 17. — Simulated Price of Soybeans Per Bushel to Match the Solar Lease



We also want to take a look at hay. In this case, the price of hay would have to rise from $150 per ton in 2019 to $392.08 in 2022 and rise to $696.28 per ton by 2052 as shown in Figure 18. Alternatively, the price of hay would need to rise by $20.33 per ton each year from 2019 to 2052 when it would reach $820.95 per ton.

Figure 18. — Simulated Price of Forage per Ton to Match the Solar Lease



If we assume that the price of corn stays the same, the yields for corn would need to increase from 140 bushels per acre in 2019 to 274 bushels per acre in 2023 and stay at that level until 2052. The yields for soybeans would need to rise from 30 bushels per acre in 2019 to 90.4 bushels per acre in 2023 and stay there until 2052. The yields for hay would need to increase from 2.3 tons per acre in 2019 to 5.9 tons per acre in 2023 and stay at that level until 2052.

VI. Economic Impact Methodology

The economic analysis of solar PV project presented uses NREL's latest Jobs and Economic Development Impacts (JEDI) PV Model (PV12.23.16). The JEDI PV Model is an input-output model that measures the spending patterns and location-specific economic structures that reflect expenditures supporting varying levels of employment, income, and output. That is, the JEDI Model takes into account that the output of one industry can be used as an input for another. For example, when a PV system is installed, there are both soft costs consisting of permitting, installation and customer acquisition costs, and hardware costs, of which the PV module is the largest component. The purchase of a module not only increases demand for manufactured components and raw materials, but also supports labor to build and install a module. When a module is purchased from a manufacturing facility, the manufacturer uses some of that money to pay employees. The employees use a portion of their compensation to purchase goods and services within their community. Likewise, when a developer pays workers to install the systems, those workers spend money in the local economy that boosts economic activity and employment in other sectors. The goal of economic impact analysis is to quantify all of those reverberations throughout the local and state economy.

The first JEDI Model was developed in 2002 to demonstrate the economic benefits associated with developing wind farms in the United States. Since then, JEDI models have been developed for biofuels, natural gas, coal, transmission lines and many other forms of energy. These models were created by Marshall Goldberg of MRG & Associates, under contract with the National Renewable Energy Laboratory. The JEDI model utilizes state-specific industry multipliers obtained from IMPLAN (IMpact analysis for PLANning). IMPLAN software and data are managed and updated by the Minnesota IMPLAN Group, Inc., using data collected at federal, state, and local levels. This study analyzes the gross jobs that the new solar energy project development supports and does not analyze the potential loss of jobs due to declines in other forms of electric generation.

The total economic impact can be broken down into three distinct types: direct impacts, indirect impacts, and induced impacts. **Direct impacts** during the construction period refer to the changes that occur in the onsite construction industries in which the direct final demand (i.e., spending on construction labor and services) change is made. Onsite construction-related services include installation labor, engineering, design, and other professional services. Direct impacts during operating years refer to the final demand changes that occur in the onsite spending for the solar operations and maintenance workers.

The initial spending on the construction and operation of the PV installation will create a second layer of impacts, referred to as "supply chain impacts" or "indirect impacts." **Indirect impacts** during the construction period consist of changes in inter-industry purchases resulting from the direct final demand changes and include construction spending on materials and PV equipment, as well as other purchases of goods and offsite services. Utility-scale solar PV indirect impacts include PV modules, invertors, tracking systems, cabling, and foundations.

Induced impacts during construction refer to the changes that occur in household spending as household income increases or decreases as a result of the direct and indirect effects of final demand changes. Local spending by employees working directly or indirectly on the Project that receive their paychecks and then spend money in the community is included. The model includes additional local jobs and economic activity that are supported by the purchases of these goods and services.

VII. Economic Impact Results

The economic impact results were derived from detailed project cost estimates supplied by Acciona Energy. In addition, Acciona Energy also estimated the percentages of project materials and labor that will be coming from within Madison County and the Commonwealth of Kentucky.

Two separate JEDI models were produced to show the economic impact of the Madison Solar Project. The first JEDI model used the 2018 Madison County multipliers from IMPLAN. The second JEDI model used the 2018 IMPLAN multipliers for the Commonwealth of Kentucky and the same project costs.

Tables 5-7 show the output from these models. Table 5 lists the total employment impact from the Madison Solar Project for Madison County and the Commonwealth of Kentucky. Table 6 shows the impact on total earnings and Table 7 contains the impact on total output.

Table 5. — Total Employment Impact from the Madison SolarProject

	Madison County Jobs	Commonwealth of Kentucky Jobs
Construction		
Project Development and Onsite Labor Impacts (direct)	99	212
Module and Supply Chain Impacts (indirect)	42	109
Induced Impacts	19	73
New Local Jobs during Construction	160	394
Operations (Annual)		
Onsite Labor Impacts (direct)	4.5	4.5
Local Revenue and Supply Chain Impacts (indirect)	4.3	4.9
Induced Impacts	1.5	3.4
New Local Long-Term Jobs	10.4	12.8

The results from the JEDI model show significant employment impacts from the Madison Solar Project. Employment impacts can be broken down into several different components. Direct jobs created during the construction phase typically last anywhere from 12 to 18 months depending on the size of the project; however, the direct job numbers present in Table 5 from the JEDI model are based on a full time equivalent (FTE) basis for a year. In other words, 1 job = 1 FTE = 2,080 hours worked in a year. A part time or temporary job would constitute only a fraction of a job according to the JEDI model. For example, the JEDI model results show 99 new direct jobs during construction in Madison County, though the construction of the solar center could involve closer to 198 workers working half-time for a year. Thus, due to the short-term nature of construction projects, the JEDI model often significantly understates the number of people actually hired to work on the project. It is important to keep this fact in mind when looking at the numbers or when reporting the numbers.

As shown in Table 5, new local jobs created or retained during construction total 160 for Madison County, and 394 for the Commonwealth of Kentucky. New local long-term jobs created from the Madison Solar Project total 10.4 for Madison County and 12.8 for the Commonwealth of Kentucky.

Direct jobs created during the operational phase last the life of the solar energy project, typically 20-30 years. Direct construction jobs and operations and maintenance jobs both require highly-skilled workers in the fields of construction, management, and engineering. These well-paid professionals boost economic development in rural communities where new employment opportunities are often welcome due to economic downturns. Accordingly, it is important to not just look at the number of jobs but also the earnings that they produce. Table 6 shows the earnings impacts from the Madison Solar Project, which are categorized by construction impacts and operations impacts. The new local earnings during construction total over $13.2 million for Madison County and over $27.8 million for the Commonwealth of Kentucky. The new local long-term earnings total over $425 thousand for Madison County and over $798 thousand for the Commonwealth of Kentucky.

By taking the total earnings from Table 6 and dividing by the number of jobs in Table 5, we can estimate the average total earnings (wages and benefits) in the various classifications. In Madison County, average earnings for project development and onsite jobs is $107,150 and the average earnings overall during operations is $63,192.

Table 6. — Total Earnings Impact from Madison Solar Project

	Madison County	Commonwealth of Kentucky
Construction		
Project Development and Onsite Earnings Impacts	$10,601,129	$20,398,129
Module and Supply Chain Impacts	$1,898,481	$4,604,128
Induced Impacts	$710,577	$2,864,749
New Local Earnings during Construction	$13,210,187	$27,867,007
Operations (Annual)		
Onsite Labor Impacts	$224,315	$447,672
Local Revenue and Supply Chain Impacts	$145,366	$214,928
Induced Impacts	$55,855	$135,471
New Local Long-Term Earnings	$425,536	$798,071

Output refers to economic activity or the value of production in the state or local economy. It is an equivalent measure to the Gross Domestic Product, which measures output on a national basis. According to Table 7, the new local output during construction totals over $19.5 million for Madison County and over $44.8 million for the Commonwealth of Kentucky. The new local long-term output totals over $1 million for Madison County and over $1.6 million for the Commonwealth of Kentucky.

Table 7. — Total Output Impact from Madison Solar Project

	Madison County	Commonwealth of Kentucky
Construction		
Project Development and Onsite Jobs Impacts on Output	$12,130,231	$23,237,162
Module and Supply Chain Impacts	$4,986,038	$12,825,000
Induced Impacts	$2,458,433	$8,820,242
New Local Output during Construction	$19,574,702	$44,882,403
Operations (Annual)		
Onsite Labor Impacts	$224,315	$447,672
Local Revenue and Supply Chain Impacts	$648,088	$819,186
Induced Impacts	$191,615	$415,817
New Local Long-Term Output	$1,064,017	$1,682,675

VIII. Property Tax Revenue

Solar energy projects increase the property tax base of a county, creating a new revenue source for education and other local government services, such as fire protection, park districts, and road maintenance. According to the guidelines posted on the Kentucky Department of Revenue[5], solar electric equipment is divided into three categories: manufacturing machinery, tangible personal property and real property. Each of these three categories is taxed at different rates. Solar panels, invertors & convertors, transformers, mounting racks, DC meters, cables and convertors are classified as manufacturing machinery. Above ground transmission power lines, switchgears, meters, cables and connectors are classified as tangible personal property. The land used for solar panels, right-of-way conduits, buildings, and fencing is classified as real personal property.

[5] Accessed at https://revenue.ky.gov/Property/Public-Service/PublishingImages/Pages/default/Solar%20Farm%20Assessment%20Recommended%20Guidelines_2_April%202020.pdf

Table 8 details the tax implications of Madison Solar Project. There are several important assumptions built into the analysis in these tables.

- First, the analysis assumes that the first-year manufacturing machinery value is $89.7 million, the first-year tangible personal property value is $10.7 million, and the first-year real property value is $7.7 million.
- Second, the table assumes manufacturing machinery depreciation rate of 4% per year, a tangible personal property depreciation rate of 6.67% per year and a value increase of 0.75% in real property.
- Third, the maximum depreciation is 70% for manufacturing machinery and 80% for tangible personal property.
- Fourth, all tax rates are assumed to stay constant at their 2020 (2019 tax year) rates. For example, the current local tax rate on tangible personal property is 0.72% and is assumed to stay constant through 2053. The state tax rate on manufacturing machinery is 0.15%, the state rate on tangible personal property is 0.45% and the tax rate on real property is 1.01813%.
- Fifth, no comprehensive tax payment was calculated, and these calculations are only to be used to illustrate the economic impact of the Project.

According to Table 8, a conservative estimate of the total property taxes paid by the Project starts out at over $338 thousand but declines due to depreciation. The expected total property taxes paid over the lifetime of the Project is over $6.6 million and the average annual property taxes paid will be $221,977.

Table 8. — Property Tax Revenue from Madison Solar Project

Tax Year	Manufacturing Machinery Taxes	Tangible Personal Property Taxes	Real Personal Property Taxes	Total
2024	$134,511	$125,067	$78,521	$338,099
2025	$129,130	$116,600	$79,110	$324,840
2026	$123,965	$108,707	$79,703	$312,375
2027	$119,007	$101,347	$80,301	$300,654
2028	$114,246	$94,486	$80,903	$289,635
2029	$109,676	$88,089	$81,510	$279,275
2030	$105,289	$82,126	$82,121	$269,536
2031	$101,078	$76,566	$82,737	$260,380
2032	$97,035	$71,382	$83,357	$251,774
2033	$93,153	$66,550	$83,983	$243,686
2034	$89,427	$62,044	$84,612	$236,084
2035	$85,850	$57,844	$85,247	$228,941
2036	$82,416	$53,928	$85,886	$222,230
2037	$79,119	$50,277	$86,531	$215,927
2038	$75,955	$46,873	$87,180	$210,007
2039	$72,917	$43,700	$87,833	$204,450
2040	$70,000	$40,741	$88,492	$199,233
2041	$67,200	$37,983	$89,156	$194,339
2042	$64,512	$35,412	$89,824	$189,748
2043	$61,931	$33,014	$90,498	$185,444
2044	$59,454	$30,779	$91,177	$181,410
2045	$57,076	$28,695	$91,861	$177,632
2046	$54,793	$26,753	$92,550	$174,095
2047	$52,601	$25,013	$93,244	$170,859
2048	$50,497	$25,013	$93,943	$169,454
2049	$48,477	$25,013	$94,648	$168,138
2050	$46,538	$25,013	$95,358	$166,909
2051	$44,677	$25,013	$96,073	$165,763
2052	$42,890	$25,013	$96,793	$164,696
2053	$41,174	$25,013	$97,519	$163,707
TOTAL	$ 2,374,596	$1,654,058	$2,630,669	$6,659,323
30 YR AVG	$79,153	$55,135	$87,689	$221,977

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Loomis. (2018). Economic Impact and Land Use Analysis of the Badger Hollow Solar Farm, filed in Docket No. 9697-CE-100, November, 2018, ERF #353532.

Loomis. (2019). Economic Impact and Land Use Analysis of the Badger State Solar, filed in Docket No. 9800-CE-100, November, 2019, ERF #375551.

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Toothman, Jessica, and Aldous, Scott. (2013). How Solar Cells Work, How Stuff Works, accessed on 10/28/2013 at http://science.howstuffworks.com/environmental/energy/solar-cell.htm.

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X. Curriculum Vita - David Loomis

David G. Loomis
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Education

Doctor of Philosophy, Economics, Temple University, Philadelphia, Pennsylvania, May 1995.

Bachelor of Arts, Mathematics and Honors Economics, Temple University, Magna Cum Laude, May 1985.

Experience

1996-present Illinois State University, Normal, IL
Full Professor – Department of Economics (2010-present)
Associate Professor - Department of Economics (2002-2009)
Assistant Professor - Department of Economics (1996-2002)

- Taught Regulatory Economics, Telecommunications Economics and Public Policy, Industrial Organization and Pricing, Individual and Social Choice, Economics of Energy and Public Policy and a Graduate Seminar Course in Electricity, Natural Gas and Telecommunications Issues.
- Supervised as many as 5 graduate students in research projects each semester.
- Served on numerous departmental committees.

1997-present Institute for Regulatory Policy Studies, Normal, IL
Executive Director (2005-present)
Co-Director (1997-2005)

- Grew contributing membership from 5 companies to 16 organizations.
- Doubled the number of workshop/training events annually.
- Supervised 2 Directors, Administrative Staff and internship program.
- Developed and implemented state-level workshops concerning regulatory issues related to the electric, natural gas, and telecommunications industries.

Experience (cont'd)

2006-2018 Illinois Wind Working Group, Normal, IL
Director

- Founded the organization and grew the organizing committee to over 200 key wind stakeholders
- Organized annual wind energy conference with over 400 attendees
- Organized strategic conferences to address critical wind energy issues
- Initiated monthly conference calls to stakeholders
- Devised organizational structure and bylaws

2007-2018 Center for Renewable Energy, Normal, IL
Director

- Created founding document approved by the Illinois State University Board of Trustees and Illinois Board of Higher Education.
- Secured over $150,000 in funding from private companies.
- Hired and supervised 4 professional staff members and supervised 3 faculty members as Associate Directors.
- Reviewed renewable energy manufacturing grant applications for Illinois Department of Commerce and Economic Opportunity for a $30 million program.
- Created technical "Due Diligence" documents for the Illinois Finance Authority loan program for wind farm projects in Illinois.

2011-present Strategic Economic Research, LLC
President

- Performed economic impact analyses on policy initiatives and energy projects such as wind energy, solar energy, natural gas plants and transmission lines at the county and state level.
- Provided expert testimony before state legislative bodies, state public utility commissions, and county boards.
- Wrote telecommunications policy impact report comparing Illinois to other Midwestern states.

1997-2002 International Communications Forecasting Conference
Chair

- Expanded Planning Committee with representatives from over 18 different international companies and delivered high quality conference attracting over 500 people over 4 years.

Experience (cont'd)

1985-1996 Bell Atlantic, Philadelphia, Pa.
Economist - Business Research

- Wrote and taught Applied Business Forecasting multimedia course.
- Developed and documented 25 econometric demand models that were used in regulatory filings.
- Provided statistical and analytic support to regulatory costing studies.
- Served as subject matter expert in switched and special access.
- Administered $4 million budget including $1.8 million consulting budget.

Professional Awards and Memberships

2016 Outstanding Cross-Disciplinary Team Research Award with Jin Jo and Matt Aldeman – recognizes exemplary collaborative research conducted by multiple investigators from different disciplines.

2011 Midwestern Regional Wind Advocacy Award from the U. S. Department of Energy's Wind Powering America presented at WindPower 2011

2009 Economics Department Scott M. Elliott Faculty Excellence Award – awarded to faculty who demonstrate excellence in teaching, research and service.

2009 Illinois State University Million Dollar Club – awarded to faculty who have over $1 million in grants through the university.

2008 Outstanding State Wind Working Group Award from the U. S. Department of Energy's Wind Power America presented at WindPower 2008.

1999 Illinois State University Teaching Initiative Award

Member of the American Economic Association, National Association of Business Economists, International Association for Energy Economics, Institute for Business Forecasters; Institute for International Forecasters, International Telecommunications Society.

Professional Publications

34. Aldeman, M.R., Jo, J.H., and Loomis, D.G. (2018). Quantification of Uncertainty Associated with Wind Assessments of Various Intervals, Transactions of the Canadian Society for Mechanical Engineering, forthcoming.

33. Jin, J.H., Cross, J., Rose, Z., Daebel, E., Verderber, A., and Loomis, D. G. (2016). Financing options and economic impact: distributed generation using solar photovoltaic systems in Normal, Illinois, AIMS Energy, 4(3): 504-516.

Professional Publications (cont'd)

32. Loomis, D.G., Hayden, J., Noll, S. and Payne, J.E. (2016). Economic Impact of Wind Energy Development in Illinois, The Journal of Business Valuation and Economic Loss Analysis, 11(1), 3-23.

31. Loomis, D.G., Jo, J.H., and Aldeman, M.R., (2016). Economic Impact Potential of Solar Photovoltiacs in Illinois, Renewable Energy, 87, 253-258.

30. Aldeman, M.R., Jo, J.H., and Loomis, D.G. (2015). The Technical Potential for Wind Energy in Illinois, Energy, 90(1), 1082-1090.

29. Tegen, S., Keyser, D., Flores-Espino, F., Miles, J., Zammit, D. and Loomis, D. (2015). Offshore Wind Jobs and Economic Development Impacts in the United States: Four Regional Scenarios, National Renewable Energy Laboratory Technical Report, NREL/TP-5000-61315, February.

28. Loomis, D. G. and Bowden, N. S. (2013). Nationwide Database of Electric Rates to Become Available, Natural Gas & Electricity, 30 (5), 20-25.

27. Jin, J. H., Loomis, D. G., and Aldeman, M. R. (2013). Optimum penetration of utility-scale grid-connected solar photovoltaic systems in Illinois, Renewable Energy, 60, 20-26.

26. Malm, E., Loomis, D. G., DeFranco, J. (2012). A Campus Technology Choice Model with Incorporated Network Effects: Choosing Between General Use and Campus Systems, International Journal of Computer Trends and Technology, 3(4), 622-629.

25. Chupp, B. A., Hickey, E.A. & Loomis, D. G. (2012). Optimal Wind Portfolios in Illinois, Electricity Journal, 25, 46-56.

24. Hickey, E., Loomis, D. G., & Mohammadi, H. (2012). Forecasting hourly electricity prices using ARMAX-GARCH models: An application to MISO hubs, Energy Economics, 34, 307-315.

23. Theron, S., Winter, J.R, Loomis, D. G., & Spaulding, A. D. (2011). Attitudes Concerning Wind Energy in Central Illinois. Journal of the America Society of Farm Managers and Rural Appraisers, 74, 120-128.

22. Payne, J. E., Loomis, D. G. & Wilson, R. (2011). Residential Natural Gas Demand in Illinois: Evidence from the ARDL Bounds Testing Approach. Journal of Regional Analysis and Policy, 41(2), 138.

Professional Publications (cont'd)

21. Loomis, D. G. & Ohler, A. O. (2010). Are Renewable Portfolio Standards A Policy Cure-all? A Case Study of Illinois's Experience. Environmental Law and Policy Review, 35, 135-182.

20. Gil-Alana, L. A., Loomis, D. G., & Payne, J. E. (2010). Does energy consumption by the U.S. electric power sector exhibit long memory behavior ? Energy Policy, 38, 7512-7518.

19. Carlson, J. L., Payne, J. E., & Loomis, D. G. (2010). An assessment of the Economic Impact of the Wind Turbine Supply Chain in Illinois. Electricity Journal, 13, 75-93.

18. Apergis, N., Payne, J. E., & Loomis, D. G. (2010). Are shocks to natural gas consumption transitory or permanent? Energy Policy, 38, 4734-4736.

17. Apergis, N., Payne, J. E., & Loomis, D. G. (2010). Are fluctuations in coal consumption transitory or permanent? Evidence from a panel of U.S. states. Applied Energy, 87, 2424-2426.

16. Hickey, E. A., Carlson, J. L., & Loomis, D. G. (2010). Issues in the determination of the optimal portfolio of electricity supply options. Energy Policy, 38, 2198-2207.

15. Carlson, J. L., & Loomis, D. G. (2008). An assessment of the impact of deregulation on the relative price of electricity in Illinois. Electricity Journal, 21, 60-70.

14. Loomis, D. G., (2008). The telecommunications industry. In H. Bidgoli (Ed.), The handbook of computer networks (pp. 3-19). Hoboken, NJ: John Wiley & Sons.

13. Cox, J. E., Jr., & Loomis, D. G. (2007). A managerial approach to using error measures in the evaluation of forecasting methods. International Journal of Business Research, 7, 143-149.

12. Cox, J. E., Jr., & Loomis, D. G. (2006). Improving forecasting through textbooks – a 25 year review. International Journal of Forecasting, 22, 617-624.

11. Swann, C. M., & Loomis, D. G. (2005). Competition in local telecommunications – there's more than you think. Business Economics, 40, 18-28.

10. Swann, C. M., & Loomis, D. G. (2005). Intermodal competition in local telecommunications markets. Information Economics and Policy, 17, 97-113.

Professional Publications (cont'd)

9. Swann, C. M., & Loomis, D. G. (2004) Telecommunications demand forecasting with intermodal competition – a multi-equation modeling approach. Telektronikk, 100, 180-184.

8. Cox, J. E., Jr., & Loomis, D. G. (2003). Principles for teaching economic forecasting. International Review of Economics Education, 1, 69-79.

7. Taylor, L. D. & Loomis, D. G. (2002). Forecasting the internet: understanding the explosive growth of data communications. Boston: Kluwer Academic Publishers.

6. Wiedman, J. & Loomis, D. G. (2002). U.S. broadband pricing and alternatives for internet service providers. In D. G. Loomis & L. D. Taylor (Eds.) Boston: Kluwer Academic Publishers.

5. Cox, J. E., Jr. & Loomis, D. G. (2001). Diffusion of forecasting principles: an assessment of books relevant to forecasting. In J. S. Armstrong (Ed.), Principles of Forecasting: A Handbook for Researchers and Practitioners (pp. 633-650). Norwell, MA: Kluwer Academic Publishers.

4. Cox, J. E., Jr. & Loomis, D. G. (2000). A course in economic forecasting: rationale and content. Journal of Economics Education, 31, 349-357.

3. Malm, E. & Loomis, D. G. (1999). Active market share: measuring competitiveness in retail energy markets. Utilities Policy, 8, 213-221.

2. Loomis, D. G. (1999). Forecasting of new products and the impact of competition. In D. G. Loomis & L. D. Taylor (Eds.), The future of the telecommunications industry: forecasting and demand analysis. Boston: Kluwer Academic Publishers.

Loomis, D. G. (1997). Strategic substitutes and strategic complements with interdependent demands. The Review of Industrial Organization, 12,
781-791.

Expert Testimony

23. McLean County (Illinois) Zoning Board of Appeals, Application for Special Use Permit for a Wind Energy Conversion System, on behalf of Invenergy, LLC, Direct Oral Testimony, January 4, 2018.

22. New Mexico Public Regulation Commission, Case No. 17-00275-UT, Application of Sagamore Wind Energy LLC, on behalf of Invenergy, LLC, Direct Written Testimony filed November 6, 2017.

Expert Testimony (cont'd)

21. Ohio Power Siting Board, Case No. 17-773-EL-BGN, In the Matter of Hardin Solar Energy LLC for a Certificate of Environmental Compatibility and Public Need to Construct a Solar-Powered Electric Generation Facility in Hardin County, Ohio, on behalf of Invenergy, LLC, Exhibit with Report filed July 5, 2017.

20. Macon County (Illinois) Environmental, Education, Health and Welfare Committee, Application for Special Use Permit for a Wind Energy Conversion System, on behalf of E.ON Energy, Direct Oral Testimony, August 20, 2015.

19. Illinois Commerce Commission, Case No. 15-0277, Oral Cross-examination Testimony on behalf of Grain Belt Express Clean Line LLC appeared before the Commission on August 19, 2015.

18. Macon County (Illinois) Zoning Board of Appeals, Application for Special Use Permit for a Wind Energy Conversion System, on behalf of E.ON Energy, Direct Oral Testimony, August 11, 2015.

17. Illinois Commerce Commission, Case No. 15-0277, Written Rebuttal Testimony on behalf of Grain Belt Express Clean Line LLC filed August 7, 2015.

16. Kankakee County (Illinois) Planning, Zoning, and Agriculture Committee, Application for Special Use Permit for a Wind Energy Conversion System, on behalf of EDF Renewables, Direct Oral Testimony, July 22, 2015.

15. Kankakee County (Illinois) Zoning Board of Appeals, Application for Special Use Permit for a Wind Energy Conversion System, on behalf of EDF Renewables, Direct Oral Testimony, July 13, 2015.

14. Bureau County (Illinois) Zoning Board of Appeals, Application for Special Use Permit for a Wind Energy Conversion System, on behalf of Berkshire Hathaway Energy/Geronimo Energy, Direct Oral Testimony, June 16, 2015.

13. Illinois Commerce Commission, Case No. 15-0277, Written Direct Testimony on behalf of Grain Belt Express Clean Line LLC filed April 10, 2015.

12. Livingston County (Illinois) Zoning Board of Appeals, Application for Special Use Permit for a Wind Energy Conversion System, on behalf of Invenergy, Oral Cross-Examination, December 8-9, 2014.

Expert Testimony (cont'd)

11. Missouri Public Service Commission, Case No. EA-2014-0207, Oral Cross-examination Testimony on behalf of Grain Belt Express Clean Line LLC appeared before the Commission on November 21, 2014.

10. Livingston County (Illinois) Zoning Board of Appeals, Application for Special Use Permit for a Wind Energy Conversion System, on behalf of Invenergy, Direct Oral Testimony, November 17-19, 2014.

9. Missouri Public Service Commission, Case No. EA-2014-0207, Written Surrebuttal Testimony on behalf of Grain Belt Express Clean Line LLC, filed October 14, 2014.

8. Missouri Public Service Commission, Case No. EA-2014-0207, Written Direct Testimony on behalf of Grain Belt Express Clean Line LLC, filed March 26, 2014.

7. Illinois Commerce Commission, Case No. 12-0560, Oral Cross-examination Testimony on behalf of Rock Island Clean Line LLC appeared before the Commission on December 11, 2013.

6. Illinois Commerce Commission, Case No. 12-0560, Written Rebuttal Testimony on behalf of Rock Island Clean Line LLC filed August 20, 2013.

5. Boone County (Illinois) Board, Examination of Wind Energy Conversion System Ordinance, Direct Testimony and Cross-Examination, April 23, 2013.

4. Illinois Commerce Commission, Case No. 12-0560, Written Direct Testimony on behalf of Rock Island Clean Line LLC filed October 10, 2012.

3. Whiteside County (Illinois) Board and Whiteside County Planning and Zoning Committee, Examination of Wind Energy Conversion System Ordinance, Direct Testimony and Cross-Examination, on behalf of the Center for Renewable Energy, April 12, 2012.

2. State of Illinois Senate Energy and Environment Committee, Direct Testimony and Cross-Examination, on behalf of the Center for Renewable Energy, October 28, 2010.

1. Livingston County (Illinois) Zoning Board of Appeals, Application for Special Use Permit for a Wind Energy Conversion System, on behalf of the Center for Renewable Energy, Direct Testimony and Cross-Examination, July 28, 2010.

Selected Presentations

"Smart Cities and Micro Grids: Cost Recovery Issues," presented September 12,2017 at the National Association of Regulatory Utility Commissioners Staff Subcommittee on Accounting and Finance Meeting, Springfield, IL.

"Cloud Computing: Regulatory Principles and ICC NOI," presented September 11,2017 at the National Association of Regulatory Utility Commissioners Staff Subcommittee on Accounting and Finance Meeting, Springfield, IL.

"Illinois Wind, Illinois Solar and the Illinois Future Energy Jobs Act," presented July 25, 2017 at the Illinois County Assessors Meeting, Normal, IL.

"Illinois Wind, Illinois Solar and the Illinois Future Energy Jobs Act," presented April 21, 2017 at the Illinois Association of County Zoning Officers Meeting, Bloomington, IL.

"Energy Storage Economics and RTOs," presented October 30, 2016 at the Energy Storage Conference at Argonne National Laboratory.

"Wind Energy in Illinois," on October 6, 2016 at the B/N Daybreak Rotary Club, Bloomington, IL.

"Smart Grid for Schools," presented August 17, 2016 to the Ameren External Affairs Meeting, Decatur, IL.

"Solar Energy in Illinois," presented July 28, 2016 at the 3rd Annual K-12 Teachers Clean Energy Workshop, Richland Community College, Decatur, IL

"Wind Energy in Illinois," presented July 28, 2016 at the 3rd Annual K-12 Teachers Clean Energy Workshop, Richland Community College, Decatur, IL

"Smart Grid for Schools," presented June 21, 2016 at the ISEIF Grantee and Ameren Meeting, Decatur, IL.

"Costs and Benefits of Renewable Energy," presented November 4, 2015 at the Osher Lifelong Learning Institute at Bradley, University, Peoria, IL.

"Energy Sector Workforce Issues," presented September 17, 2015 at the Illinois Workforce Investment Board, Springfield, IL.

"The Past, Present and Future of Wind Energy in Illinois," presented March 13, 2015 at the Peoria Rotary Club, Peoria, IL.

"Where Are All the Green Jobs?" presented January 28, 2015 at the 2015 Illinois Green Economy Network Sustainability Conference, Normal, IL.

Presentations (cont'd)

"Teaching Next Generation Energy Concepts with Next Generation Science Standards: Addressing the Critical Need for a More Energy-Literate Workforce," presented September 30, 2014 at the Mathematics and Science Partnerships Program 2014 Conference in Washington, DC.

"National Utility Rate Database," presented October 23, 2013 at Solar Power International, Chicago, IL.

"Potential Economic Impact of Offshore Wind Energy in the Great Lakes," presented May 6, 2013 at WindPower 2013, Chicago, IL.

"Why Illinois? Windy City, Prairie Power," presented May 5, 2013 at WindPower 2013, Chicago, IL.

"National Utility Rate Database," presented January 29, 2013 at the EUEC Conference, Phoenix, AZ.

"Energy Learning Exchange and Green Jobs," presented December 13, 2012 at the TRICON Meeting of Peoria and Tazewell County Counselors, Peoria, IL.

"Potential Economic Impact of Offshore Wind Energy in the Great Lakes," presented November 12, 2012 at the Offshore Wind Jobs and Economic Development Impacts Webinar.

"Energy Learning Exchange," presented October 31, 2012 at the Utility Workforce Development Meeting, Chicago, IL.

"Wind Energy in McLean County," presented June 26, 2012 at BN By the Numbers, Normal, IL.

"Wind Energy," presented June 14, 2012 at the Wind for Schools Statewide Teacher Workshop, Normal, IL.

"Economic Impact of Wind Energy in Illinois," presented June 6, 2012 at AWEA's WINDPOWER 2012, Atlanta, GA.

"Trends in Illinois Wind Energy," presented March 6, 2012 at the AWEA Regional Wind Energy Summit – Midwest in Chicago, IL.

"Challenges and New Growth Strategies in the Wind Energy Business," invited plenary session speaker at the Green Revolution Leaders Forum, November 18, 2011 in Seoul, South Korea.

"Overview of the Center for Renewable Energy," presented July 20, 2011 at the University-Industry Consortium Meeting at Illinois Institute of Technology, Chicago, IL.

Presentations (cont'd)

"Building the Wind Turbine Supply Chain," presented May 11, 2011 at the Supply Chain Growth Conference, Chicago, IL

"Building a Regional Energy Policy for Economic Development," presented April 4, 2011 at the Midwestern Legislative Conference's Economic Development Committee Webinar.

"Wind Energy 101," presented February 7, 2011 at the Wind Power in Central Illinois - A Public Forum, CCNET Renewable Energy Group, Champaign, IL.

"Alternative Energy Strategies," presented with Matt Aldeman November 19, 2010 at the Innovation Talent STEM Education Forum, Chicago, IL.

"Siting and Zoning in Illinois," presented November 17, 2010 at the Wind Powering America Webinar.

"What Governor Quinn Should Do about Energy?" presented November 15, 2010 at the Illinois Chamber of Commerce Energy Forum Conference, Chicago, IL.

"Is Wind Energy Development Right for Illinois," presented with Matt Aldeman October 28, 2010 at the Illinois Association of Illinois County Zoning Officials Annual Seminar in Utica, IL.

"Economic Impact of Wind Energy in Illinois," presented July 22, 2010 at the AgriEnergy Conference in Champaign, IL.

"Renewable Energy Major at ISU," presented July 21, 2010 at Green Universities and Colleges Subcommittee Webinar.

"Economics of Wind Energy," presented May 19, 2010 at the U.S. Green Building Council meeting in Chicago, IL.

"Forecasting: A Primer for the Small Business Entrepreneur," presented with James E. Cox, Jr. April 14, 2010 at the Allied Academies' Spring International Conference in New Orleans, LA.

"Are Renewable Portfolio Standards a Policy Cure-All? A Case Study of Illinois' Experience," presented January 30, 2010 at the 2010 William and Mary Environmental Law and Policy Review Symposium in Williamsburg, VA.

"Creating Partnerships between Universities and Industry," presented November 19, 2009, at New Ideas in Educating a Workforce in Renewable Energy and Energy Efficiency in Albany, NY.

"Educating Illinois in Renewable Energy, presented November 14, 2009 at the Illinois Science Teachers Association in Peoria, IL.

Presentations (cont'd)

"Green Collar Jobs," invited presentation October 14, 2009 at the 2009 Workforce Forum in Peoria, IL.

"The Role of Wind Power in Illinois," presented March 4, 2009 at the Association of Illinois Electric Cooperatives Engineering Seminar in Springfield, IL.

"The Economic Benefits of Wind Farms," presented January 30, 2009 at the East Central Illinois Economic Development District Meeting in Champaign, IL.

"Green Collar Jobs in Illinois," presented January 6, 2009 at the Illinois Workforce Investment Board Meeting in Macomb, Illinois.

"Green Collar Jobs: What Lies Ahead for Illinois?" presented August 1, 2008 at the Illinois Employment and Training Association Conference.

"Mapping Broadband Access in Illinois," presented October 16, 2007 at the Rural Telecon '07 conference.

"A Managerial Approach to Using Error Measures to Evaluate Forecasting Methods," presented October 15, 2007 at the International Academy of Business and Economics.

"Dollars and Sense: The Pros and Cons of Renewable Fuel," presented October 18, 2006 at Illinois State University Faculty Lecture Series.

"Broadband Access in Illinois," presented July 28, 2006 at the Illinois Association of Regional Councils Annual Meeting.

"Broadband Access in Illinois," presented November 17, 2005 at the University of Illinois' Connecting the e to Rural Illinois.

"Improving Forecasting Through Textbooks – A 25 Year Review," with James E. Cox, Jr., presented June 14, 2005 at the 25th International Symposium on Forecasting.

"Telecommunications Demand Forecasting with Intermodal Competition, with Christopher Swann, presented April 2, 2004 at the Telecommunications Systems Management Conference 2004.

"Intermodal Competition," with Christopher Swann, presented April 3, 2003 at the Telecommunications Systems Management Conference 2003.

Presentations (cont'd)

"Intermodal Competition in Local Exchange Markets," with Christopher Swann, presented June 26, 2002 at the 20th Annual International Communications Forecasting Conference.

"Assessing Retail Competition," presented May 23, 2002 at the Institute for Regulatory Policy Studies' Illinois Energy Policy for the 21st Century workshop.

"The Devil in the Details: An Analysis of Default Service and Switching," with Eric Malm presented May 24, 2001 at the 20th Annual Advanced Workshop on Regulation and Competition.

"Forecasting Challenges for U.S. Telecommunications with Local Competition," presented June 28, 1999 at the 19th International Symposium on Forecasting.

"Acceptance of Forecasting Principles in Forecasting Textbooks," presented June 28, 1999 at the 19th International Symposium on Forecasting.

"Forecasting Challenges for Telecommunications With Local Competition," presented June 17, 1999 at the 17th Annual International Communications Forecasting Conference.

"Measures of Market Competitiveness in Deregulating Industries," with Eric Malm, presented May 28, 1999 at the 18th Annual Advanced Workshop on Regulation and Competition.

"Trends in Telecommunications Forecasting and the Impact of Deregulation," Proceedings of EPRI's 11th Forecasting Symposium, 1998.

"Forecasting in a Competitive Age: Utilizing Macroeconomic Forecasts to Accurately Predict the Demand for Services," invited speaker, Institute for International Research Conference, September 29, 1997.

"Regulatory Fairness and Local Competition Pricing," presented May 30, 1996 at the 15th Annual Advanced Workshop in Regulation and Public Utility Economics.

"Optimal Pricing For a Regulated Monopolist Facing New Competition: The Case of Bell Atlantic Special Access Demand," presented May 28, 1992 at the Rutgers Advanced Workshop in Regulation and Public Utility Economics.

Grants

"SmartGrid for Schools 2018 and Energy Challenge," with William Hunter, Illinois Science and Energy Innovation Foundation, RSP Award # A15-0092-002 - extended, January 2017, $300,000.

"Energy Learning Exchange - Implementing Nationally Recognized Energy Curriculum and Credentials in Illinois," Northern Illinois University, RSP Award # A17-0098, February, 2017, $13,000.

"SmartGrid for Schools 2017 and Energy Challenge," with William Hunter, Illinois Science and Energy Innovation Foundation, RSP Award # A15-0092-002 - extended, January 2017, $350,000.

"Illinois Jobs Project," University of California Berkeley, RSP Award # A16-0148, August, 2016, $10,000.

"Energy Workforce Ready Through Building Performance Analysis," Illinois Department of Commerce and Economic Opportunity through the Department of Labor, RSP # A16-0139, June, 2016, $328,000 (grant was de-obligated before completion).

"SmartGrid for Schools 2016 and Smart Appliance Challenge," with William Hunter, Brad Christenson and Jeritt Williams, Illinois Science and Energy Innovation Foundation, RSP Award # A15-0092-002, January 2016, $450,000.

"SmartGrid for Schools 2015," with William Hunter and Matt Aldeman, Illinois Science and Energy Innovation Foundation, RSP Award # A15-0092-001, February 2015, $400,000.

"Economic Impact of Nuclear Plant Closings: A Response to HR 1146," Illinois Department of Economic Opportunity, RSP Award # 14-025001 amended, January, 2015, $22,000.

"Partnership with Midwest Renewable Energy Association for Solar Market Pathways" with Missy Nergard and Jin Jo, U.S. Department of Energy Award Number DE-EE0006910, October, 2014, $109,469 (ISU Award amount).

"Renewable Energy for Schools," with Matt Aldeman and Jin Jo, Illinois Department of Commerce and Economic Opportunity, Award Number 14-025001, June, 2014, $130,001.

"SmartGrid for Schools 2014," with William Hunter and Matt Aldeman, Illinois Science and Energy Innovation Foundation, RSP # 14B116, March 2014, $451,701.

"WINDPOWER 2014 Conference Exhibit," Illinois Department of Commerce and Economic Opportunity, RSP #14C167, March, 2014, $95,000.

Grants (cont'd)

"Lake Michigan Offshore Wind Energy Buoy," with Matt Aldeman, Illinois Clean Energy Community Foundation, Request ID 6435, November, 2013, $90,000.

"Teaching Next Generation Energy Concepts with Next Generation Science Standards," with William Hunter, Matt Aldeman and Amy Bloom, Illinois State Board of Education, RSP # 13B170A, October, 2013, second year, $159,954; amended to $223,914.

"Solar for Schools," with Matt Aldeman, Illinois Green Economy Network, RSP # 13C280, August, 2013, $66,072.

"Energy Learning Exchange Implementation Grant," with William Hunter and Matt Aldeman, Illinois Department of Commerce and Economic Opportunity, Award Number 13-052003, June, 2013, $350,000.

"Teaching Next Generation Energy Concepts with Next Generation Science Standards," with William Hunter, Matt Aldeman and Amy Bloom, Illinois State Board of Education, RSP # 13B170, April, 2013, $159,901.

"Illinois Sustainability Education SEP," Illinois Department of Commerce and Economic Opportunity, Award Number 08-431006, March, 2013, $225,000.

"Illinois Pathways Energy Learning Exchange Planning Grant," with William Hunter and Matt Aldeman, Illinois State Board of Education (Source: U.S. Department of Education), RSP # 13A007, December, 2012, $50,000.

"Illinois Sustainability Education SEP," Illinois Department of Commerce and Economic Opportunity, Award Number 08-431005, June 2011, amended March, 2012, $98,911.

"Wind for Schools Education and Outreach," with Matt Aldeman, Illinois Department of Commerce and Economic Opportunity, Award Number 11-025001, amended February, 2012, $111,752.

"A Proposal to Support Solar Energy Potential and Job Creation for the State of Illinois Focused on Large Scale Photovoltaic System," with Jin Jo (lead PI), Illinois Department of Commerce and Economic Opportunity, Award Number 12-025001, January 2012, $135,000.

"National Database of Utility Rates and Rate Structure," U.S. Department of Energy, Award Number DE-EE0005350TDD, 2011-2014, $850,000.

"Illinois Sustainability Education SEP," Illinois Department of Commerce and Economic Opportunity, Award Number 08-431005, June 2011, $75,000.

Grants (cont'd)

"Wind for Schools Education and Outreach," with Matt Aldeman, Illinois Department of Commerce and Economic Opportunity, Award Number 11-025001, March 2011, $190,818.

"Using Informal Science Education to Increase Public Knowledge of Wind Energy in Illinois," with Amy Bloom and Matt Aldeman, Scott Elliott Cross-Disciplinary Grant Program, February 2011, $13,713.

"Wind Turbine Market Research," with Matt Aldeman, Illinois Manufacturers Extension Center, May, 2010, $4,000.

"Petco Resource Assessment," with Matt Aldeman, Petco Petroleum Co., April, 2010 amended August 2010 $34,000; original amount $18,000.

"Wind for Schools Education and Outreach," with Anthony Lornbach and Matt Aldeman, Scott Elliott Cross-Disciplinary Grant Program, February, 2010, $13,635.

"IGA IFA/ISU Wind Due Diligence," Illinois Finance Authority, November, 2009, $8,580 amended December 2009; original amount $2,860.

"Green Industry Business Development Program, with the Shaw Group and Illinois Manufacturers Extension Center, Illinois Department of Commerce and Economic Opportunity, Award Number 09-021007, August 2009, $245,000.

"Wind Turbine Workshop Support," Illinois Department of Commerce and Economic Opportunity, June 2009, $14,900.

"Illinois Wind Workers Group," with Randy Winter, U.S. Department of Energy, Award Number DE-EE0000507, 2009-2011, $107,941.

"Wind Turbine Supply Chain Study," with J. Lon Carlson and James E. Payne, Illinois Department of Commerce and Economic Opportunity, Award Number 09-021003, April 2009, $125,000.

"Renewable Energy Team Travel to American Wind Energy Association WindPower 2009 Conference, Center for Mathematics, Science and Technology, February 2009, $3,005.

"Renewable Energy Educational Lab Equipment," with Randy Winter and David Kennell, Illinois Clean Energy Community Foundation (peer-reviewed), February, 2008, $232,600.

Grants (cont'd)

"Proposal for New Certificate Program in Electricity, Natural Gas and Telecommunications Economics," with James E. Payne, Extended Learning Program Grant, April, 2007, $29,600.

"Illinois Broadband Mapping Study," with J. Lon Carlson and Rajeev Goel, Illinois Department of Commerce and Economic Opportunity, Award Number 06-205008, 2006-2007, $75,000.

"Illinois Wind Energy Education and Outreach Project," with David Kennell and Randy Winter, U.S. Department of Energy, Award Number DE-FG36-06GO86091, 2006-2010, $990,000.

"Wind Turbine Installation at Illinois State University Farm," with Doug Kingman and David Kennell, Illinois Clean Energy Community Foundation (peer-reviewed), May, 2004, $500,000.

"Illinois State University Wind Measurement Project," Doug Kingman and David Kennell, Illinois Clean Energy Community Foundation (peer-reviewed), with August, 2003, $40,000.

"Illinois State University Wind Measurement Project," with Doug Kingman and David Kennell, NEG Micon matching contribution, August, 2003, $65,000.

"Distance Learning Technology Program," Illinois State University Faculty Technology Support Services, Summer 2002, $3,000.

"Providing an Understanding of Telecommunications Technology By Incorporating Multimedia into Economics 235," Instructional Technology Development Grant (peer-reviewed), January 15, 2001, $1,400.

"Using Real Presenter to create a virtual tour of GTE's Central Office," with Jack Chizmar, Instructional Technology Literacy Mentoring Project Grant (peer-reviewed), January 15, 2001, $1,000.

"An Empirical Study of Telecommunications Industry Forecasting Practices," with James E. Cox, College of Business University Research Grant (peer-reviewed), Summer, 1999, $6,000.

"Ownership Form and the Efficiency of Electric Utilities: A Meta-Analytic Review" with L. Dean Hiebert, Institute for Regulatory Policy Studies research grant (peer-reviewed), August 1998, $6,000.

Total Grants: $7,740,953

External Funding

Corporate Funding for Institute for Regulatory Policy Studies, Ameren ($7,500), Aqua Illinois ($7,500); Commonwealth Edison ($7,500); Exelon ($7,500); Illinois American Water ($7,500); Midcontinent ISO ($7,500); NICOR Energy ($7,500); People Gas Light and Coke ($7,500); PJM Interconnect ($7,500); Fiscal Year 2017, $67,500 total.

Workshop Surplus for Institute for Regulatory Policy Studies, with Adrienne Ohler, Fiscal Year 2017, $18,342.

Corporate Funding for Institute for Regulatory Policy Studies, Ameren ($7,500), Aqua Illinois ($7,500); Commonwealth Edison ($7,500); Exelon ($7,500); Illinois American Water ($7,500) ITC Holdings ($7,500); Midcontinent ISO ($7,500); NICOR Energy ($7,500); People Gas Light and Coke ($7,500); PJM Interconnect ($7,500); Fiscal Year 2017, $75,000 total.

Workshop Surplus for Institute for Regulatory Policy Studies, with Adrienne Ohler, Fiscal Year 2016, $19,667.

Corporate Funding for Energy Learning Exchange, Calendar Year 2016, $53,000.

Corporate Funding for Institute for Regulatory Policy Studies, Ameren ($7,500), Aqua Illinois ($7,500); Commonwealth Edison ($7,500); Exelon/Constellation NewEnergy ($7,500); Illinois American Water ($7,500) ITC Holdings ($7,500); Midcontinent ISO ($7,500); NICOR Energy ($7,500); People Gas Light and Coke ($7,500); PJM Interconnect ($7,500); Utilities, Inc. ($7,500) Fiscal Year 2016, $82,500 total.

Workshop Surplus for Institute for Regulatory Policy Studies, with Adrienne Ohler, Fiscal Year 2015, $15,897.

Corporate Funding for Institute for Regulatory Policy Studies, Ameren ($7,500), Alliance Pipeline ($7,500); Aqua Illinois ($7,500); AT&T ($7,500);Commonwealth Edison ($7,500); Exelon/ Constellation NewEnergy ($7,500); Illinois American Water ($7,500) ITC Holdings ($7,500); Midcontinent ISO ($7,500); NICOR Energy ($7,500); People Gas Light and Coke ($7,500); PJM Interconnect ($7,500); Fiscal Year 2015, $90,000 total.

Corporate Funding for Energy Learning Exchange, Calendar Year 2014, $55,000.

Workshop Surplus for Institute for Regulatory Policy Studies, with Adrienne Ohler, Fiscal Year 2014, $12,381.

External Funding (cont'd)

Corporate Funding for Institute for Regulatory Policy Studies, Ameren ($7,500), Alliance Pipeline ($7,500); Aqua Illinois ($7,500); AT&T ($7,500);Commonwealth Edison ($7,500); Constellation NewEnergy ($7,500); Illinois American Water ($7,500) ITC Holdings ($7,500); Midwest Energy Efficiency Alliance ($4,500); Midwest Generation ($7,500); MidWest ISO ($7,500); NICOR Energy ($7,500); People Gas Light and Coke ($7,500); PJM Interconnect ($7,500); Fiscal Year 2014, $102,000 total.

Corporate Funding for Energy Learning Exchange, Calendar Year 2013, $53,000.

Workshop Surplus for Institute for Regulatory Policy Studies, with Adrienne Ohler, Fiscal Year 2013, $17,097.

Corporate Funding for Institute for Regulatory Policy Studies, Ameren ($7,500), Alliance Pipeline ($7,500); Aqua Illinois ($7,500); AT&T ($7,500);Commonwealth Edison ($7,500); Constellation NewEnergy ($7,500); Illinois American Water ($7,500) ITC Holdings ($7,500); Midwest Generation ($7,500); MidWest ISO ($7,500); NICOR Energy ($7,500); People Gas Light and Coke ($7,500); PJM Interconnect ($7,500); Fiscal Year 2013, $97,500 total.

Corporate Funding for Illinois Wind Working Group, Calendar Year 2012, $29,325.

Workshop Surplus for Institute for Regulatory Policy Studies, with Adrienne Ohler, Fiscal Year 2012, $16,060.

Corporate Funding for Institute for Regulatory Policy Studies, Alliance Pipeline ($7,500); Aqua Illinois ($7,500); AT&T ($7,500);Commonwealth Edison ($7,500); Constellation NewEnergy ($7,500); Illinois American Water ($7,500) ITC Holdings ($7,500); Midwest Generation ($7,500); MidWest ISO ($7,500); NICOR Energy ($7,500); People Gas Light and Coke ($7,500); PJM Interconnect ($7,500); Fiscal Year 2012, $90,000 total.

Corporate Funding for Illinois Wind Working Group, Calendar Year 2011, $57,005.

Workshop Surplus for Institute for Regulatory Policy Studies, with Adrienne Ohler, Fiscal Year 2011, $13,562.

Corporate Funding for Institute for Regulatory Policy Studies, Alliance Pipeline ($7,500); Aqua Illinois ($7,500); AT&T ($7,500);Commonwealth Edison ($7,500); Constellation NewEnergy ($7,500); Illinois American Water ($7,500) ITC Holdings ($7,500); Midwest Generation ($7,500); MidWest ISO ($7,500); NICOR Energy ($7,500); People Gas Light and Coke ($7,500); PJM Interconnect ($7,500); Fiscal Year 2011, $90,000 total.

External Funding (cont'd)

Corporate Funding for Center for Renewable Energy, Calendar Year 2010, $50,000.

Corporate Funding for Illinois Wind Working Group, Calendar Year 2010, $49,000.

Workshop Surplus for Institute for Regulatory Policy Studies, with Lon Carlson, Fiscal Year 2010, $17,759.

Corporate Funding for Institute for Regulatory Policy Studies, Alliance Pipeline ($7,500); Ameren ($7,500); AT&T ($7,500);Commonwealth Edison ($7,500); Constellation NewEnergy ($7,500); ITC Holdings ($7,500); Midwest Generation ($7,500); MidWest ISO ($7,500); NICOR Energy ($7,500); People Gas Light and Coke ($7,500); PJM Interconnect ($7,500); Fiscal Year 2010, $82,500 total.

Corporate Funding for Illinois Wind Working Group, Calendar Year 2009, $57,140.

Workshop Surplus for Institute for Regulatory Policy Studies, with Lon Carlson, Fiscal Year 2009, $21,988.

Corporate Funding for Institute for Regulatory Policy Studies, Alliance Pipeline ($7,500); Ameren ($7,500); AT&T ($7,500);Commonwealth Edison ($7,500); Constellation NewEnergy ($7,500); MidAmerican Energy ($7,500); Midwest Generation ($7,500); MidWest ISO ($7,500); NICOR Energy ($7,500); People Gas Light and Coke ($7,500); PJM Interconnect ($7,500); Fiscal Year 2009, $82,500 total.

Corporate Funding for Center for Renewable Energy, Calendar Year 2008, $157,500.

Corporate Funding for Illinois Wind Working Group, Calendar Year 2008, $38,500.

Workshop Surplus for Institute for Regulatory Policy Studies, with Lon Carlson, Fiscal Year 2008, $28,489.

Corporate Funding for Institute for Regulatory Policy Studies, Alliance Pipeline ($5,000); Ameren ($5,000); AT&T ($5,000);Commonwealth Edison ($5,000); Constellation NewEnergy ($5,000); MidAmerican Energy ($5,000); Midwest Generation ($5,000); MidWest ISO ($5,000); NICOR Energy ($5,000); Peabody Energy ($5,000), People Gas Light and Coke ($5,000); PJM Interconnect ($5,000); Fiscal Year 2008, $60,000 total.

External Funding (cont'd)

Corporate Funding for Illinois Wind Working Group, Calendar Year 2007, $16,250.

Workshop Surplus for Institute for Regulatory Policy Studies, with Lon Carlson, Fiscal Year 2007, $19,403.

Corporate Funding for Institute for Regulatory Policy Studies, AARP ($3,000), Alliance Pipeline ($5,000), Ameren ($5,000); Citizens Utility Board ($5,000); Commonwealth Edison ($5,000); Constellation NewEnergy ($5,000); MidAmerican Energy ($5,000); Midwest Generation ($5,000); MidWest ISO ($5,000); NICOR Energy ($5,000); Peabody Energy ($5,000), People Gas Light and Coke ($5,000); PJM Interconnect ($5,000); SBC ($5,000); Verizon ($5,000); Fiscal Year 2007, $73,000 total.

Workshop Surplus for Institute for Regulatory Policy Studies, with Lon Carlson, Fiscal Year 2006, $13,360.

Corporate Funding for Institute for Regulatory Policy Studies, AARP ($1,500), Alliance Pipeline ($2,500), Ameren ($5,000); Citizens Utility Board ($5,000); Commonwealth Edison ($5,000); Constellation NewEnergy ($5,000); DTE Energy ($5,000); MidAmerican Energy ($5,000); Midwest Generation ($5,000); MidWest ISO ($5,000); NICOR Energy ($5,000); Peabody Energy ($2,500), People Gas Light and Coke ($5,000); PJM Interconnect ($5,000); SBC ($5,000); Verizon ($5,000); Fiscal Year 2006, $71,500 total.

Workshop Surplus for Institute for Regulatory Policy Studies, with L. Dean Hiebert, Fiscal Year 2005, $12,916.

Corporate Funding for Institute for Regulatory Policy Studies, with L. Dean Hiebert, AmerenCIPS ($5,000); Citizens Utility Board ($5,000); Commonwealth Edison ($5,000); Constellation NewEnergy ($5,000); Illinois Power ($5,000); MidAmerican Energy ($5,000); Midwest Generation ($5,000); MidWest ISO ($5,000); NICOR Energy ($5,000); People Gas Light and Coke ($5,000); PJM Interconnect ($5,000); SBC ($2,500); Verizon ($2,500); Fiscal Year 2005, $60,000 total.

Workshop Surplus for Institute for Regulatory Policy Studies, with L. Dean Hiebert, Fiscal Year 2004, $17,515.

Corporate Funding for Institute for Regulatory Policy Studies, with L. Dean Hiebert, AmerenCIPS ($5,000); Commonwealth Edison ($5,000); Constellation NewEnergy ($5,000); Illinois Power ($5,000); MidAmerican Energy ($5,000); Midwest Generation ($5,000); NICOR Energy ($5,000); People Gas Light and Coke ($5,000); PJM Interconnect ($5,000); Fiscal Year 2004, $45,000 total.

Workshop Surplus for Institute for Regulatory Policy Studies, with L. Dean Hiebert, Fiscal Year 2003, $8,300.

External Funding (cont'd)

Corporate Funding for Institute for Regulatory Policy Studies, with L. Dean Hiebert, AmerenCIPS ($5,000); AT&T ($2,500); Commonwealth Edison ($5,000); Illinois Power ($5,000); MidAmerican Energy ($5,000); NICOR Energy ($5,000); People Gas Light and Coke ($5,000); Fiscal Year 2003, $32,500 total.

Workshop Surplus for Institute for Regulatory Policy Studies, with L. Dean Hiebert, Calendar Year 2002, $15,700.

Corporate Funding for Institute for Regulatory Policy Studies, with L. Dean Hiebert, AmerenCIPS ($2,500); AT&T ($5,000); Commonwealth Edison ($2,500); Illinois Power ($2,500); MidAmerican Energy ($2,500); NICOR Energy ($2,500); People Gas Light and Coke ($2,500); Calendar Year 2002, $17,500 total.

Corporate Funding for International Communications Forecasting Conference, National Economic Research Associates ($10,000); Taylor Nelson Sofres Telecoms ($10,000); Calendar Year 2002, $20,000 total

Corporate Funding for Institute for Regulatory Policy Studies, with L. Dean Hiebert, AmerenCIPS ($5,000); AT&T ($5,000); Commonwealth Edison ($5,000); Illinois Power ($5,000); MidAmerican Energy ($5,000); NICOR Energy ($5,000); People Gas Light and Coke ($5,000); Calendar Year 2001, $35,000 total.

Workshop Surplus for Institute for Regulatory Policy Studies, with L. Dean Hiebert, Calendar Year 2001, $19,400.

Corporate Funding for International Communications Forecasting Conference, National Economic Research Associates ($10,000); Taylor Nelson Sofres Telecoms ($10,000); SAS Institute ($10,000); Calendar Year 2001, $30,000 total.

Corporate Funding for Institute for Regulatory Policy Studies, with L. Dean Hiebert, AmerenCIPS ($5,000); AT&T ($5,000); Commonwealth Edison ($5,000); Illinois Power ($5,000); MidAmerican Energy ($5,000); NICOR Energy ($5,000); People Gas Light and Coke ($5,000); Calendar Year 2000, $35,000 total.

Workshop Surplus for Institute for Regulatory Policy Studies, with L. Dean Hiebert, Calendar Year 2000, $20,270.

Corporate Funding for International Communications Forecasting Conference, National Economic Research Associates ($10,000); Taylor Nelson Sofres Telecoms ($10,000); Calendar Year 2000, $20,000 total.

External Funding (cont'd)

Corporate Funding for Institute for Regulatory Policy Studies, with L. Dean Hiebert, AmerenCIPS ($5,000); AT&T ($5,000); Commonwealth Edison ($5,000); Illinois Power ($5,000); MidAmerican Energy ($5,000); NICOR Energy ($5,000); People Gas Light and Coke ($5,000); Calendar Year 1999, $35,000 total.

Workshop Surplus for Institute for Regulatory Policy Studies, with L. Dean Hiebert, Calendar Year 1999, $10,520.

Corporate Funding for International Communications Forecasting Conference, National Economic Research Associates ($10,000); PNR Associates ($10,000); Calendar Year 1999, $20,000 total.

Corporate Funding for Institute for Regulatory Policy Studies, with L. Dean Hiebert, AmerenCIPS ($5,000); CILCO ($5,000); Commonwealth Edison ($5,000); Illinois Power ($5,000); MidAmerican Energy ($5,000); People Gas Light and Coke ($5,000); Calendar Year 1998, $30,000 total.

Workshop Surplus for Institute for Regulatory Policy Studies, with L. Dean Hiebert, Calendar Year 1998, $44,334.

Corporate Funding for International Communications Forecasting Conference, National Economic Research Associates ($10,000); PNR Associates ($10,000); Calendar Year 1998, $20,000 total.

Corporate Funding for Institute for Regulatory Policy Studies, with L. Dean Hiebert, AmerenCIPS ($5,000); CILCO ($5,000); Commonwealth Edison ($5,000); Illinois Power ($5,000); MidAmerican Energy ($5,000); People Gas Light and Coke ($5,000); Calendar Year 1997, $30,000 total.

Workshop Surplus for Institute for Regulatory Policy Studies, with L. Dean Hiebert, Calendar Year 1997, $19,717.

Total External Funding: $2,492,397

Strategic Economic Research, LLC

2705 Kolby Court, Bloomington, IL 61704
815-905-2750

Economic Impact and
Land Use Analysis of
Madison Solar Project

APPENDIX H

Site Assessment Report

The Site Assessment Report is located in Volume II and III of the Application

APPENDIX I

Certificate of Authority

1072349.06 vmiller ADD

Alison Lundergan Grimes
Kentucky Secretary of State
Received and Filed:
9/24/2019 11:55 AM
Fee Receipt: $90.00

COMMONWEALTH OF KENTUCKY
ALISON LUNDERGAN GRIMES, SECRETARY OF STATE

Division of Business Filings
Business Filings
PO Box 718, Frankfort, KY 40602
(502) 564-3490
www.sos.ky.gov

Certificate of Authority
(Foreign Business Entity)

FBE

Pursuant to the provisions of KRS 14A and KRS 271B, 273, 274,275, 362 and 386 the undersigned hereby applies for authority to transact business in Kentucky on behalf of the entity named below and, for that purpose, submits the following statements:

1. The entity is a :
☐ profit corporation (KRS 271B) ☐ nonprofit corporation (KRS 273) ☐ professional service corporation (KRS 274)
☐ business trust (KRS 386). ☒ limited liability company (KRS 275) ☐ professional limited liability company (KRS 275)
☐ limited partnership (KRS 362). ☐ ltd cooperative assn. (KRS) ☐ statutory trust
☐ non-profit llc (KRS 275) ☐ cooperative assn. (KRS)

2. The name of the entity is Tenaska Solar VIII, LLC
(The name must be identical to the name on record with the Secretary of State.)

3. The name of the entity to be used in Kentucky is (if applicable): _____
(Only provide if "real name" is unavailable for use; otherwise, leave blank.)

4. The state or country under whose law the entity is organized is Delaware.

5. The date of organization is August 12, 2019 and the period of duration is perpetual.
(If left blank, the period of duration is considered perpetual.)

6. The mailing address of the entity's principal office is

14302 FNB Parkway	Omaha	Nebraska	68154
Street Address	City	State	Zip Code

7. The street address of the entity's registered office in Kentucky is

421 West Main Street	Frankfort	KY	40601
Street Address (No P.O. Box Numbers)	City	State	Zip Code

and the name of the registered agent at that office is Corporation Service Company.

8. The names and business addresses of the entity's representatives (secretary, officers and directors, managers, trustees or general partners):

Name	Street or P.O. Box	City	State	Zip Code
See Attached Exhibit A				

9. If a professional service corporation, all the individual shareholders, not less than one half (1/2) of the directors, and all of the officers other than the secretary and treasurer are licensed in one or more states or territories of the United States or District of Columbia to render a professional service described in the statement of purposes of the corporation.

10. I certify that, as of the date of filing this application, the above-named entity validly exists under the laws of the jurisdiction of its formation.

11. If a limited partnership, it elects to be a limited liability limited partnership. Check the box if applicable: ☐

12. If a limited liability company, check box if manager-managed: ☑

13. This application will be effective upon filing, unless a delayed effective date and/or time is provided.
The effective date or the delayed effective date cannot be prior to the date the application is filed. The date and/or time is upon filing.

Please indicate the Kentucky county in which your business operates:
County: Madison

To complete the following, please shade the box completely.

Please indicate the size of your business:
☑ Small (Fewer than 50 employees)
☐ Large (50 or more employees)

Please indicate whether any of the following make up more than fifty percent (50%) of your business ownership:
☐ Women-Owned ☐ Veteran Owned ☐ Minority Owned

Please indicate which of the following best describes your business:
☐ Agriculture ☐ Mining ☐ Services ☐ Construction
☐ Wholesale Trade ☐ Retail Trade ☐ Manufacturing ☐ Finance, Insurance, Real Estate
☐ Public Administration ☑ Transportation, Communications, Electric, Gas, Sanitary Services
☐ Other

Andrew J. Fossum	Andrew J. Fossum SR VP & Gen Counsel	9-16-2019
Signature of Authorized Representative	Printed Name & Title	Date

I, Corporation Service Company, consent to serve as the registered agent on behalf of the business entity.
Type/Print Name of Registered Agent

By: Alison C. Henkel	Alison C. Henkel	Assistant Vice President	09-23-19
Signature of Registered Agent	Printed Name	Title	Date

(05/17)

EXHIBIT A

TENASKA SOLAR VIII, LLC

MANAGERS/OFFICERS RIDER

Name	Title	Address
Howard L. Hawks	Manager & Chairman	14302 FNB Parkway Omaha, Nebraska 68154
Thomas E. Hendricks	Manager & Executive Vice President	14302 FNB Parkway Omaha, Nebraska 68154
Jerry K. Crouse	Manager, CEO & President	14302 FNB Parkway Omaha, Nebraska 68154
Ronald N. Quinn	Manager, Executive Vice President & Secretary	14302 FNB Parkway Omaha, Nebraska 68154
Fred R. Hunzeker	Vice President	14302 FNB Parkway Omaha, Nebraska 68154
Nicholas N. Borman	Senior Vice President/ Engineering & Construction	14302 FNB Parkway Omaha, Nebraska 68154
Todd S. Jonas	Senior Vice President/ Operations	14302 FNB Parkway Omaha, Nebraska 68154
Gregory A. Van Dyke	CFO, Senior Vice President & Treasurer	14302 FNB Parkway Omaha, Nebraska 68154
Timothy G. Kudron	Senior Vice President/ Finance & Administration & Assistant Secretary	14302 FNB Parkway Omaha, Nebraska 68154
James B. Welniak	Vice President/ Engineering & Construction	14302 FNB Parkway Omaha, Nebraska 68154
Douglas A. Troupe	Assistant Secretary	14302 FNB Parkway Omaha, Nebraska 68154
Drew J. Fossum	Senior Vice President, General Counsel & Assistant Secretary	14302 FNB Parkway Omaha, Nebraska 68154

Name	Title	Address
Kevin R. Smith	Vice President	14302 FNB Parkway Omaha, Nebraska 68154
Corey S. Kopiasz	Vice President/ Finance	14302 FNB Parkway Omaha, Nebraska 68154
Delette J. Marengo	Vice President/ Government & Public Affairs	14302 FNB Parkway Omaha, Nebraska 68154
Aaron O. Dubberly	Vice President	14302 FNB Parkway Omaha, Nebraska 68154
Sheila R. Trueblood	Vice President & Corporate Controller	14302 FNB Parkway Omaha, Nebraska 68154
David T. Wingfield	Vice President/ Operations	14302 FNB Parkway Omaha, Nebraska 68154
Daniel G. Ramaekers	Vice President/ Information Technology	14302 FNB Parkway Omaha, Nebraska 68154
Larry G. Carlson	Vice President/ Environmental Affairs	14302 FNB Parkway Omaha, Nebraska 68154
Vasu S. Pinapati	Vice President/ Engineering	14302 FNB Parkway Omaha, Nebraska 68154
Gregory B. Kelly	Vice President	14302 FNB Parkway Omaha, Nebraska 68154
Christopher A. Leitner	Vice President	14302 FNB Parkway Omaha, Nebraska 68154
Jay M. Frisbie	Senior Vice President/ Finance	14302 FNB Parkway Omaha, Nebraska 68154
Ryan T. Schroer	Vice President/ Finance & Risk	14302 FNB Parkway Omaha, Nebraska 68154
David W. Kirkwood	Senior Vice President/ Finance	14302 FNB Parkway Omaha, Nebraska 68154
Bradley K. Heisey	Vice President	14302 FNB Parkway Omaha, Nebraska 68154

Name	Title	Address
Timothy E. Hemig	Vice President	14302 FNB Parkway Omaha, Nebraska 68154
Stephen R. Johnson	Vice President	14302 FNB Parkway Omaha, Nebraska 68154
Joel M. Link	Vice President	14302 FNB Parkway Omaha, Nebraska 68154
Robert A. Ramaekers	Vice President	14302 FNB Parkway Omaha, Nebraska 68154
Jason A. Behrens	Vice President	14302 FNB Parkway Omaha, Nebraska 68154
Rishi Bhaker	Vice President	14302 FNB Parkway Omaha, Nebraska 68154
Silke V. Jasinski	Vice President/ Finance	14302 FNB Parkway Omaha, Nebraska 68154
Scott P. Seier	Vice President	14302 FNB Parkway Omaha, Nebraska 68154
Michael H. Crabb	Vice President	14302 FNB Parkway Omaha, Nebraska 68154

1072349.06 balimonos AMD

Alison Lundergan Grimes
Kentucky Secretary of State
Received and Filed:
10/16/2019 11:26 AM
Fee Receipt: $40.00

COMMONWEALTH OF KENTUCKY
ALISON LUNDERGAN GRIMES, SECRETARY OF STATE

Division of Business Filings **Business Filings** PO Box 718, Frankfort, KY 40602 (502) 564-3490 www.sos.ky.gov	**Amended Certificate of Authority** **(Foreign Business Entity)** **FCA**

Pursuant to the provisions of KRS Chapter KRS 14A and 271B, 273, 274, 275, 362 or 386 the undersigned hereby applies for an amended certificate of authority on behalf of the entity named below and, for that purpose, submits the following statements:

1. The business entity is:
- ☐ profit corporation (KRS 271B)
- ☐ professional service corporation (KRS 274).
- ☒ limited liability company (KRS 275).
- ☐ professional limited liability company (KRS 275
- ☐ limited cooperative association
- ☐ cooperative association
- ☐ nonprofit corporation (KRS 273).
- ☐ business trust (KRS 386).
- ☐ limited partnership (KRS 362).
- ☐ statutory trust (KRS 386)
- ☐ non-profit LLC (KRS 275).

2. The name of the company is: Tenaska Solar VIII, LLC
(The name must be identical to the name on record with the Secretary of State.)

3. It is an entity organized and existing under the laws of the state or country of Delaware.

4. The entity received authority to transact business in Kentucky on September 24, 2019.

5. The entity has changed its **(check all that apply)**

- ☑ Domicile name to AEUG Madison Solar, LLC
- ☐ Name to be used in Kentucky to
- ☐ Jurisdiction of organization to
- ☐ Period of duration
- ☐ Form of organization
- ( ) Management type: ☐ Member managed ☐ Manager managed

6. This application will be effective upon filing, unless a delayed effective date and/or time is provided. The effective date or the delayed effective date cannot be prior to the date the application is filed. The date and/or time is
(Delayed effective date and/or time)

Please indicate the county in which your business operates:
County: Madison

To complete the following, please shade the box completely.

Please indicate the size of your business:	**Please indicate whether any of the following make up more than fifty percent (50%) of your business ownership:**
☑ Small (Fewer than 50 employees) ☐ Large (50 or more employees)	☐ Women-Owned ☐ Veteran Owned ☐ Minority Owned

Please indicate which of the following best describes your business:

☐ Agriculture	☐ Mining	☐ Services	☐ Construction
☐ Wholesale Trade	☐ Retail Trade	☐ Manufacturing	☐ Finance, Insurance, Real Estate
☐ Public Administration	☑ Transportation, Communications, Electric, Gas, Sanitary Services		
☐ Other			

I declare under penalty of perjury under the laws of the state of Kentucky that the foregoing is true and correct.

Signature of Authorized Representative	Printed Name	Title	Date
X Drew J. Fossum	Drew J. Fossum	Sr. VP & General Counsel	10/15/19

(05/17)