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

Application Documents
Volume I
Case No. 2020-00206

November 2020

Fleming Solar Project:

Kentucky State Board on Electric Generation and Transmission Application

NOVEMBER 2020

PREPARED FOR

AEUG Fleming Solar, LLC

PREPARED BY

SWCA Environmental Consultants

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

Prepared for

AEUG Fleming Solar, LLC
55 East Monroe Street, Suite 1925
Chicago, Illinois 60603
(312) 673-3000

Prepared by

SWCA Environmental Consultants
201 Chatham Street, Suite 3
Sanford, North Carolina 27330
(919) 292-2200
www.swca.com

SWCA Project No. 63272

November 2020

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Appendices

Tables

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 Fleming Solar, LLC
Attn: Mark A Randall, Senior Project Development Manager
55 East 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 Fleming Solar, LLC (AEUG Fleming Solar) proposes to develop the 188- megawatt (MW) photovoltaic (PV) Fleming Solar Project (Project) in Fleming County, Kentucky (see Appendix A). The Project would be built on portions of approximately 1,590 acres (Project Area). The majority (94.7%) of the Project Area currently is in agricultural use (U.S. Geological Survey 2016) (Table 1).

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

Land Cover Class	Acres	Percent of Project Area
Pasture/Hay	1,198.8	75.4
Cultivated Crops	306.7	19.3
Deciduous Forest	62.2	3.9
Mixed Forest	16.5	1.0
Shrub/Scrub	3.6	0.2
Developed, Open Space	1.7	0.1
Open Water	0.3	<0.1
Grassland/Herbaceous	0.1	<0.1
Total	**1,589.9**	**100.0**

Source: U.S. Geological Survey (2016)

The Project Area is located between Elizaville, Flemingsburg Junction, and Flemingsburg. It is roughly bounded by Old Convict Road on the north, Highway 32 on the south, Highway 11 on the east, and Nepton Road to the west. The topography in the area consists of a series of gently rolling hills and swales. Land use is primarily pasture and agricultural, as noted above, with no large forested areas. 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 network are all present within and surrounding the Project Area. A map showing the locations of

residential structures, 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 Flemingsburg-Spurlock 138-kilovolt (kV) line.

AEUG Fleming Solar would secure the Project perimeter using 6-foot-high chain-link fencing topped by razor wire and meeting national electrical code requirements. Project entrance gates are anticipated to be approximately 8 feet high and 12 feet wide to allow for emergency and maintenance access. All fencing would be placed at or above grade to ensure drainage flows are unobstructed.

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 Fleming Solar, LLC sent letters to 96 adjoining property owners on November 19, 2020 and posted the following notice in the Flemingsburg Gazette on November 18, 2020.

NOTICE OF APPLICATION AEUG Fleming Solar, LLC, is proposing to construct and operate a 188-megawatt AC solar energy project approximately located between Old Convict Road and Kentucky Route 32 in Fleming County, Kentucky. The proposed Fleming Solar Project will consist of about 1,500 acres of solar photovoltaic panels and associated racking, inverters, and a project substation transformer.

AEUG Fleming 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.

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

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 Fleming County. The County has not enacted any planning, zoning, or permitting requirements for the Project location. There are no setback requirements established by a planning and zoning commission for the Project location and no noise control ordinance applicable to the project.

For the construction phase of the proposed Project, predictive noise modeling has considered the range of potential impacts likely noting that noise generating activities will progressively move across the site over the duration of construction. As such, the highest noise levels would not be expected to be experienced at a single receptor for more than one day while construction equipment (e.g. piling drill rig) is at the closest point to the receptor. At the closest receptor, the calculated noise level during construction is a maximum of 82.9 dBA.

The "as proposed" scenario day and night noise level (L_{dn}) at the nearest sensitive receptor, a residence on the north side of the Project 739 feet from the nearest inverter, is estimated to be 54.8 dBA L_{dn}, which is below the EPA's recommended 24-hour average day and night value of 55 dBA L_{dn} (EPA 1974).

AEUG Fleming 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. Fleming County has no established setback requirements for this location, nor has a planning unit enacted any 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.

Residential neighborhoods (as defined by KRS 278.700[6]) and the Fleming County High School are within 2,000 feet of the Project's facilities. Pursuant to KRS 278.704(4), AEUG Fleming Solar will be moving the Siting Board for a deviation from this setback requirement. See Appendix A for a map showing the residential neighborhoods and Fleming County High School in relation to the Project.

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 Fleming Solar has been active in the Project Area since March 2020. During that time AEUG Fleming Solar has met with landowners, stakeholders, and local government officials about the proposed 188-MW solar power project between the communities of Elizaville and Flemingsburg.

A public meeting was held at 6:00 p.m. on August 7, 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 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 pre-registration 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 Fleming 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, to the public by displaying the map in the entrance to the Fleming County Fiscal Court 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.

A notice announcing the public meeting was printed in the *Flemingsburg Gazette* on July 15, 2020. AEUG Fleming Solar also mailed letters to all adjoining landowners notifying them of the public meeting. A scan of this notice and a copy of the information packet sent to neighboring landowners is included in Appendix C.

The in-person meeting was held at the Fleming County Fiscal Court Meeting Room, which is located at 100 Court Square in Flemingsburg, close to the Project site. Approximately one dozen people participated in the public meeting virtually and 5 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.

In addition to the public meeting, AEUG Fleming Solar held a virtual community meeting on Wednesday, July 22. This meeting was held virtually out of an abundance of caution due to the COVID-19 situation. Neighbors were invited to pick up dinner through 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 V&V Catering and was well attended with 40 dinners distributed and three dozen participants attending the online virtual presentation. The presentations given by AEUG Fleming Solar at the public meeting and the community meeting are included in Appendix C.

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 Fleming Solar sited the Project near the existing Flemingsburg-Spurlock 138-kV line. AEUG Fleming Solar would be responsible for building a new interconnection to this line as described in the System Impact Study provided in Appendix F to this Application.

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 Fleming Solar, LLC, was electronically transmitted to the Judge-Executive of Fleming County, Larry Foxworthy, on the date of 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 Project interconnection in coordination with Eastern Kentucky Power Cooperative (EKPC), who owns the Flemingsburg-Spurlock 138-kV line to which the Project would interconnect.

PJM's interconnection study process is composed of three parts: 1) Feasibility Study, 2) System Impact Study, and 3) Facilities Study. The Feasibility Study has been completed for the Project. The final study report is dated January 2020, was issued to Tenaska Solar XIII, LLC the previous owner of the AEUG Fleming project, and is provided herein as Appendix E. The System Impact Study also has been completed for the Project. The final study report is dated August 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

- 245 new local jobs during construction for Fleming County
- 543 new local jobs during construction for the Commonwealth of Kentucky
- Over 17.6 new local long-term jobs for Fleming County
- Over 22.0 new local long-term jobs for the Commonwealth of Kentucky

Earnings

- Over $17.0 million in new local earnings during construction for Fleming County
- Over $39.4 million in new local earnings during construction for the Commonwealth of Kentucky
- Over $678 thousand in new local long-term earnings for Fleming County annually
- Over $1.4 million in new local long-term earnings for the Commonwealth of Kentucky annually

Output

- Over $25.7 million in new local output during construction for Fleming County
- Over $61.6 million in new local output during construction for the Commonwealth of Kentucky

- Over $1.7 million in new local long-term output for Fleming County annually
- Over $2.8 million in new local long-term output for the Commonwealth of Kentucky annually

Property Taxes

- $9.3 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.

Fleming County:

- The price of corn would need to rise to $16.78 per bushel or yields for corn would need to rise to 311.2 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 $47.83 per bushel or yields for soybeans would need to rise to 119.9 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 $831.45 per ton or yields for hay would need to rise to 7.1 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 the 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 135 bushels per acre, 40.5 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 Fleming Solar, LLC, 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 Fleming Solar, LLC, has violated any state or federal environmental laws or regulations. Likewise, there are no such pending actions against AEUG Fleming Solar, LLC, 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 “Fleming County Kentucky Solar: Site Assessment Report” and labeled as Appendix H.

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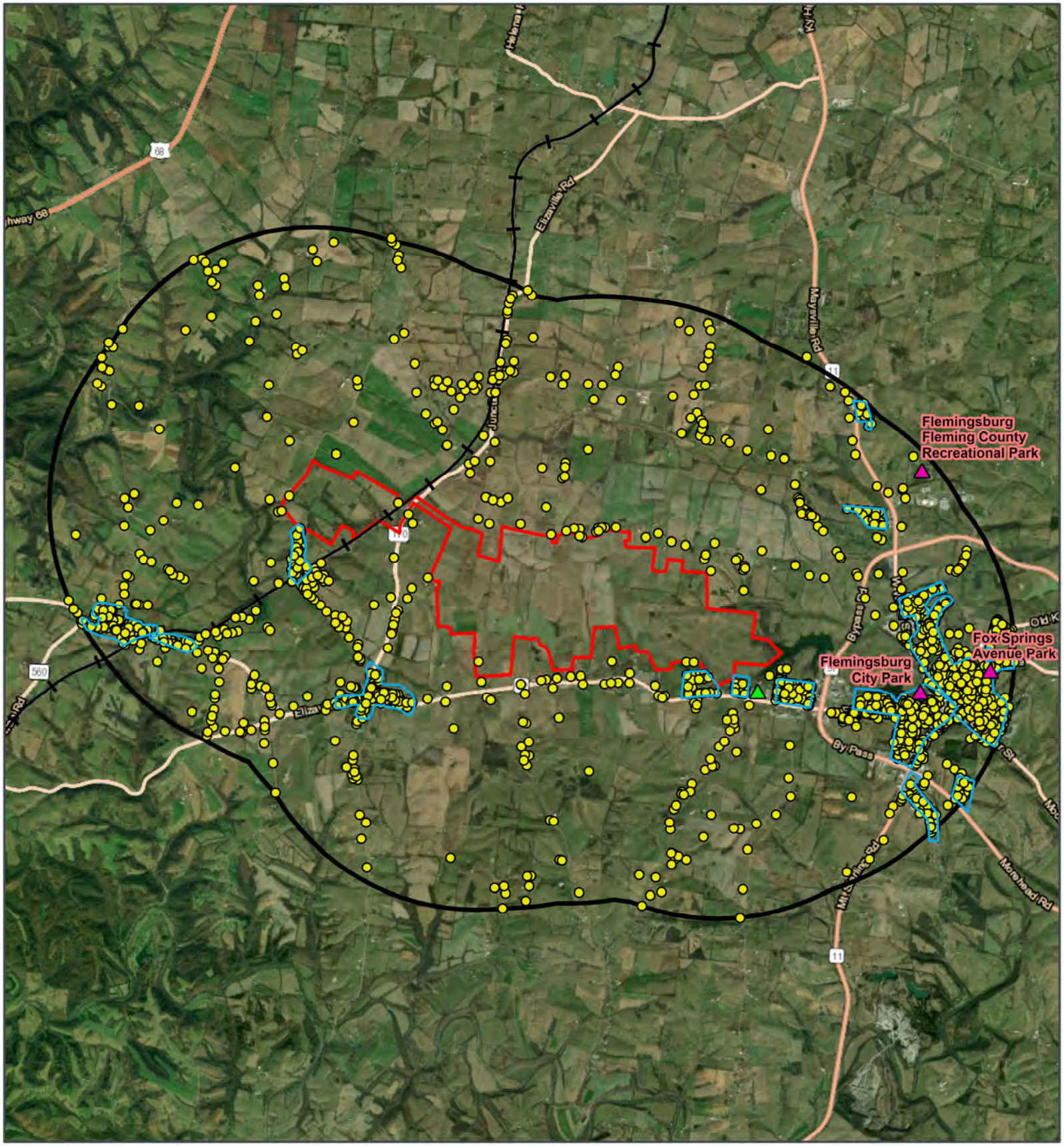
APPENDIX A

Map of Surrounding Residential Neighborhoods



FLEMING SOLAR PROJECT

Overview Map

- Park
- Residential
- Fleming County Highschool
- Railroad
- Residential Neighborhood
- Fleming Solar Project Boundary
- 2-Mile Project Buffer

Fleming County, KY

NAD 1983 UTM Zone 17N

N

1:90,000

Base Map: ESRI ArcGIS Online, accessed November 2020

Updated: 11/24/2020
Project No. XXXXX
File: layout name

0 3,000 6,000 Feet

0 960 1,920 Meters

SWCA
ENVIRONMENTAL CONSULTANTS

APPENDIX B

Proof of Notice of Application

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

CERTIFIED MAIL®

9307 1699 6670 0000 0000 10

JONATHAN EUBANKS & DESTINY FETTERS
5935 EWING ROAD
EWING
KY 41 41

NOTICE OF APPLICATION

AEUG Fleming Solar, LLC, is proposing to construct and operate a 188-megawatt AC solar energy project approximately located between Old Convict Road and Kentucky Route 32 in Fleming County, Kentucky. The proposed Fleming Solar Project will consist of about 1,500 acres of solar photovoltaic panels and associated racking, inverters, and a project substation transformer.

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NAME	STREET	CITY	STATE	ZIP	MAP ID #
Eugene W Crain	120 Fairwood Lane	Lexington	KY	40502	038-00-00-023.03
Robert W Crain	120 Fairwood Lane	Lexington	KY	40502	038-00-00-023.00
Larry Gilvin	11950 Purdy Road	Sardina	OH	45171	030-00-00-018.00
Fleming Farms LLC	1213 Old Jersey Ridge Road	Maysville	KY	41056	030-00-00-017.00
William Dale Hord	1213 Old Jersey Ridge Road	Maysville	KY	41056	030-00-00-019.00
Dominic & Angela Sgantas	1742 Convict Pike	Flemingsburg	KY	41041	030-00-00-020.00
Elizabeth Ring & Amanda Ritchie	869 Convict Pike	Flemingsburg	KY	41041	030-00-00-042.00
Jodie Kidd	887 Convict Pike	Flemingsburg	KY	41041	030-00-00-042.02
Dorothy Brown	117 Glascock Drive	Flemingsburg	KY	41041	030-00-00-042.01
Debra K Bryant	905 Convict Pike	Flemingsburg	KY	41041	030-00-00-041.00
Anthony & Tyler Toller	12125 KY 344	Wallingford	KY	41093	030-00-00-040.00
Laura Puente	991 Convict Pike	Flemingsburg	KY	41041	030-00-00-039.01
Jackie & Tammi Boling	1275 Convict Pike	Flemingsburg	KY	41041	030-00-00-039.00
Kathy Rayburn	1313 Convict Pike	Flemingsburg	KY	41041	030-00-00-038.00
Sam Harris	118 Fonda Lane	Nicholasville	KY	40356	030-00-00-037.00
Robert & Martha Masters	1615 Convict Pike	Flemingsburg	KY	41041	030-00-00-034.00
John & Marjorie Shank	7382 MT Clinton Pike	Rockingham	VA	22821	030-00-00-021.00
Rhonda Hall	2198 Convict Pike	Flemingsburg	KY	41041	030-00-00-028.00
Betty Jones	2254 Convict Pike	Flemingsburg	KY	41041	030-00-00-027.00
Denny & Pam Lowe	1053 Helena Road	Flemingsburg	KY	41041	030-00-00-022.02
Robert E Masters	2132 MT Carmel Road	Flemingsburg	KY	41041	030-00-00-026.00
Douglas & Connie Masters	2423 Convict Pike	Flemingsburg	KY	41041	030-00-00-025.00
Tommy & Wilhemina Whisman	2416 Convict Pike	Flemingsburg	KY	41041	030-00-00-022.04
Gregory & Teresa Dunaway	364 Asbury Road	Flemingsburg	KY	41041	084-00-00-057.00
Jared & Brenda Coyle	2476 Convict Pike	Flemingsburg	KY	41041	030-00-00-022.01
Christina Hollar & Melissa Workman	2536 Convict Pike	Flemingsburg	KY	41041	030-00-00-024.01
Willard & Darlene Horst	176 Whisman Road	Flemingsburg	KY	41041	030-00-00-022.00
Wayne & Linda Hickerson	2661 Convict Pike	Flemingsburg	KY	41041	023-00-00-021.01
John & Joyce Carpenter	2670 Convict Pike	Flemingsburg	KY	41041	023-00-00-022.00
William & Sandra Cooper	2952 Convict Pike	Flemingsburg	KY	41041	023-00-00-023.01
Anthony & Gwendolyn Hargett	3262 Convict Pike	Flemingsburg	KY	41041	023-00-00-023.02
Robert Thomas Johnson	3642 Convict Pike	Flemingsburg	KY	41041	023-00-00-006.00
Lazy Oaks LLC	4540 West Dry River Road	Dayton	VA	22821	023-00-00-007.00
Mary Lynn & Charles Corwin	50 Buffalo Trace	Ewing	KY	41039	023-00-00-002.01
Sue Fryman	1604 Junction Road	Flemingsburg	KY	41041	023-00-00-011.00
Tim & Kathy Earlywine	1269 Junction Road	Flemingsburg	KY	41041	023-00-00-012.00
Raymond & Barbara Williams	1102 Nepton Road	Ewing	KY	41039	023-00-00-013.00
Terry & Gayle Vice	952 Junction Road	Ewing	KY	41039	023-00-00-014.01
Billy & Paula Fryman	927 Junction Road	Ewing	KY	41039	023-00-00-014.02
Ricky & Peggy Gray	786 Junction Road	Ewing	KY	41039	023-00-00-016.01
Amy & Patrick Price	730 Junction Road	Ewing	KY	41039	023-00-00-016.04
Jeanne Conley	686 Junction Road	Ewing	KY	41039	023-00-00-016.03
Rickey & Vicki Watson	640 Junction Road	Ewing	KY	41039	023-00-00-016.02
Tim & Kathy Earlywine	1263 Junction Road	Flemingsburg	KY	41041	023-00-00-017.01
Levi M Stoltzfus	484 Junction Road	Ewing	KY	41039	023-00-00-017.00
Jackson Floyd Edward Estate	4642 Elizaville Road	Ewing	KY	41039	024-00-00-002.00
William A Cooper	4506 Elizaville Road	Ewing	KY	41039	024-00-00-004.01
Timmy & Amy Saunders	288 Hunter Trace Drive	Ewing	KY	41039	031-70-00-026.00
Dan & Bettye Masters	250 Hunter Trace Drive	Ewing	KY	41039	031-70-00-028.00
Evelyn F Shannon	216 Hunter Trace Drive	Ewing	KY	41039	031-70-00-030.00
Wayne T Brown	184 Hunter Trace Drive	Ewing	KY	41039	031-70-00-023.00
Jeremy & Denise Brown	158 Hunter Trace Drive	Ewing	KY	41039	031-70-00-024.00
Jonathan Eubanks & Destiny Fetters	5935 Ewing Road	Ewing	KY	41039	031-70-00-014.00
Janice Horton / Lorene Horton	1165 Pike Bluff Road	Ewing	KY	41039	031-70-00-004.00
Flemingsburg Baptist Church	P.O. Box 4	Flemingsburg	KY	41041	031-70-00-025.00
James & Brenda Smoot	291 Hunter Trace Drive	Ewing	KY	41039	031-70-00-029.00
Jeffery & Pamela Ocull	80 Mallard Court	Ewing	KY	41039	031-70-00-031.00
Roscoe Wayne & Charlotte Fannin	237 Hunter Trace Drive	Ewing	KY	41039	031-70-00-027.00
Jeffery & Kimberly Perkins	189 Hunter Trace Drive	Ewing	KY	41039	031-70-00-032.00
Olivia J Overbey Rev. Living Trust	2208 Elizaville Road	Ewing	KY	41039	031-70-00-016.00
Martin Todd & Cheryl Roberts	2102 Elizaville Road	Ewing	KY	41039	031-70-00-020.00
Justine Gulley	2074 Elizaville Road	Ewing	KY	41039	031-70-00-019.00
Jeremy & Jessica McCleese	2044 Elizaville Road	Ewing	KY	41039	031-70-00-015.00
Patricia Hurd Atherton	96 Gardenside Drive	Flemingsburg	KY	41041	031-70-00-021.00
Anthony & Betsy Case	71 Gardenside Drive	Flemingsburg	KY	41041	031-70-00-006.00
Harold & Willa Porter	78 Gardenside Drive	Flemingsburg	KY	41041	031-70-00-007.00
Jarrod & Hanna Fizer	33 Gardenside Drive	Flemingsburg	KY	41041	031-70-00-009.00
Thomas Helen Donovan	26 Gardenside Drive	Flemingsburg	KY	41041	031-70-00-008.00
Larry & Connie Bryant	80 Lantern Ridge Drive	Flemingsburg	KY	41041	031-00-00-011.02
Ronnie & Wanda Fern	30 Lantern Ridge Drive	Flemingsburg	KY	41041	031-00-00-011.01
Fleming County Board of Education	211 W Water Street	Flemingsburg	KY	41041	031-70-00-001.00

NAME	STREET	CITY	STATE	ZIP	MAP ID #
Randall & Jowana Fritz	195 Country Lane	Flemingsburg	KY	41041	039-10-01-003.01
Robert Fidler	261 Country Lane	Flemingsburg	KY	41041	039-10-01-001.00
Nathan & Whitney Hinton	266 Country Lane	Flemingsburg	KY	41041	039-10-02-011.00
Thomas & Sandra Perkins	155 Annadd Drive	Flemingsburg	KY	41041	024-00-00-006.01
Brian & Julie Clark	4312 Elizaville Road	Ewing	KY	41039	024-00-00-006.00
Michael & Michele Butler	4455 Elizaville Road	Ewing	KY	41039	024-00-00-003.01
Roger Kirk Owens	328 E Second Street	Maysville	KY	41056	024-00-00-005.00
Michael & Melinda Fultz	4245 Elizaville Road	Ewing	KY	41039	024-00-00-007.00
William & Kathlene Szymanski	4001 Elizaville Road	Ewing	KY	41039	024-00-00-010.00
Larry & Danny Fryman	2332 Hilltop Road	Ewing	KY	41039	024-00-00-008.00
Clover Ridge Farms INC	316 Craintown Road	Ewing	KY	41039	024-00-00-014.00
Danny Doyle	P.O. Box 166	Flemingsburg	KY	41041	024-00-00-011.00
Minnie Doyle	P.O. Box 87	Ewing	KY	41041	023-00-00-028.00
Mary Lou Perkins	3466 Elizaville Road	Ewing	KY	41039	023-00-00-026.00
Nathaniel & Lori Perkins	3372 Elizaville Road	Ewing	KY	41039	023-00-00-026.01
William Gordon Hillis	1257 Cherry Grove Road	Flemingsburg	KY	41041	024-00-00-012.00
Jessica Boggs	3397 Elizaville Road	Ewing	KY	41039	024-00-00-012.04
Norman Jr. & Barbara Story	8594 Morehead Road	Flemingsburg	KY	41041	024-00-00-012.01
Gregory & Patricia Lowe	7214 Sam Bob Lane	Corryton	TN	37721	031-00-00-002.00
Steven & Karen Brown	2971 Elizaville Road	Ewing	KY	41039	031-00-00-003.00
Savannah Nicole Davis	2933 Elizaville Road	Ewing	KY	41039	031-00-00-003.01
Randall & Rita Dials	2853 Elizaville Road	Ewing	KY	41039	031-00-00-004.00
Gary & Beverly Cooper	2743 Elizaville Road	Ewing	KY	41039	031-00-00-006.00
Steven & Karen Brown	2971 Elizaville Road	Ewing	KY	41039	030-00-00-044.00
Daniel & Jeanie Suit	2524 Elizaville Road	Ewing	KY	41039	031-00-00-008.00
Sharon Hyatt Keller	12941 Hillside Drive	Anchorage	AK	99516	031-00-00-009.00
Steven & William Brown	2971 Elizaville Road	Ewing	KY	41039	031-00-00-010.00
Chad & Sarah Bryant	129 Promise Lane	Ewing	KY	41039	031-70-00-035.00
Andrew & Aimee Mullholand	130 Promise Lane	Ewing	KY	41039	031-70-00-034.00
Harold & Carolyn James	127 Elizaville Ave	Flemingsburg	KY	41041	031-00-00-016.00
John & Heather Dowdy	314 Hunter Trace Drive	Ewing	KY	41039	031-70-00-037.00

OPINIONS

The opinion page does not reflect the views of the KyNewsGroup.

Heaven Is A Lot Like Kentucky

By Charles Mattox

MICHAEL HAD A DREAM

"The Indians shot Bennett and Spahr pretty dead, and then sprang upon Cassidy,"

William "Lazy Bill" Clinkenbeard, Draper Manuscripts volume 12 CC.

"Father was very fleet of foot and could outrun almost any man until he reached the age of 65."

Francis Cassidy, second son of Michael Cassidy, Draper Manuscripts volume 21S page 184.

Early November 1784.

Close to the confluence of Plumb Lick Creek and Ned Boone's Creek, at the present-day community of Little Rock, near the Bourbon/Nicholas County border.

From his hiding place, under the roots of a Hawthorn tree along the edge of Ned Boone's Creek, Michael Cassidy drifted between life and death.

His face was numb and swollen.

His jaw, both cheeks, left orbital socket and several other areas of his skull, were fractured; Vicious impacts from Shawnee war clubs and tomahawks had done that.

He had other painful wounds too, and he was fairly convinced there was more of his blood spilling in the small stream around him than what was left in his broken body.

Five Shawnee warriors had attacked their surveying camp just before daylight.

His two companions: Joshua Bennett and Mathias Spahr were killed almost instantly.

He was probably dying too, but he decided for now, he would stay hidden, almost completely submerged along the edge of the stream, in a tangle of tree roots.

He'd managed to get his hands on his tomahawk during his beating and he knew that one or two of his swings had done damage. If he could stay hidden a while longer, the Shawnee might decide to make a quick exit with three horses, three guns and other plunder.

He knew at the worst of the mauling he had began to strike a couple of blows with his tomahawk, but then one of the warriors had hit him from behind with his own musket, holding it by the barrel and swinging it like he was chopping wood, breaking the gun stock over his head as the other warriors howled their approval.

Even as he sank to his knees, he blindly swung that tomahawk and kept them at bay until he rolled into the darkness and then jumped to his feet and ran.

One of the warriors threw a tomahawk, which struck him in the back, which cracked two ribs and made another deep cut.

But he'd lost the Shawnee in the dark.

He did not want to think about dying in the mud along the creek amid Shawnee humiliation as Ned Boone had four years earlier, just a few hundred yards from where he was.

He thought instead of his past, and he started with Ireland.

At 12-years of age, with his father recently deceased, he and his older brother, Andrew, had lived in a Dublin, boarding school, thanks to the small sum his mother and her brother, William Langston, paid the school master.

They also sent money to Andrew to share with Michael, but Andrew had kept it all and laughed at his little brother.

They'd fought and Andrew had beaten him.

But he didn't beat his spirit.

No one would ever do that.

He defiantly told Andrew the next day of his plans to stow away on a ship, The Maryland Merchant, which was bound for Baltimore in America: a land of opportunity.

Andrew had literally gotten on his knees and begged Michael to stay there on the dreary Irish dock the next morn.

But Michael had a dream and he was going to America.

The long trip across the ocean was hard.

When the ship arrived in Baltimore, Michael was sold into seven years of indentured servitude to cover his passage fee. He was sold to William Creighton, a tanner, from Martinsburg.

It had been Creighton that worked him hard and encouraged him to join the Colonial Army and fight the British.

And so he had.

Fighting was one thing he was always good at, that and foot racing.

He never lost a foot race, and aside from the thrashing Andrew had given him as a boy, he had never really lost another fight until now.

He thought of all those terrible fights he'd endured during the Revolutionary War.

He thought about the Battles of Mud Fort, Germantown, Brandywine, Monmouth, Trenton, the miserable winter at Valley Forge, the third of eight long winters he would be encamped during the war before the final victory at Yorktown.

It was in the trenches at Yorktown where he learned that his brother Andrew was a surgeon in the British Army.

He snuck across the enemy trenches more than once searching for Andrew, but he found nothing but misery and often had to fight his way to get back inside the American lines.

With the surrender of British General, Lord Charles Cornwallis, at Yorktown, the war in the east ended and Cassidy went with his old Martinsburg neighbors; The Berkley Men; westward to Kentucky and eventually to Captain John Strode's Station where his hometown neighbors from back east were flocking to.

He imagined now that he would die in this place held so sacred by his new Native American enemies.

He'd fought them at Captain John Holder's Defeat in Aug. 1782 near the confluence of the Licking River and Battle Run Branch.

When his new friend, Captain John Fleming, was wounded and surrounded by Shawnee and Wyandotte warriors during the battle, he'd mad a wild, suicidal charge to save his friend.

After that day, he began taking scalps and other trophies of war.

Now as his blood flowed from him he hoped he would manage to keep his own scalp.

The sounds of the Shawnee torturing Bennett and Spahr made him think of his own evil deeds, and he thought of the horrible things he had done when he had helped burn the Shawnee villages during General, George Rogers Clarke's great northern raid of 1782.

The water was cold and he grew weaker with each breath.

"Oh to be standing next to a fire," he thought, just before he lost consciousness. He wouldn't remember much of the next 48 hours; how he continually eluded the Shawnee, how he crawled and staggered all those miles back toward Captain John Strode's Station before being found by James Beath and carried into the fortified station. He was in a coma for a while there, and more dead than alive, but he survived, slowly healed and then sat about the task of revenge.

If the Good Lord is willing, dear reader, we may ride once again this winter with Michael Cassidy, James Beath, William Clinkenbeard and a few of the other Berkley men.

Yesteryear

November 16, 1950

Sharpsburg School Destroyed by Fire.

Fire destroyed the Sharpsburg High and Elementary school building shortly after classes began today, routing the 200 pupils. The pupils marched safely from the 38-year-old, two-story brick building. They were allowed to reenter to recover wraps, books and other personal belongings. School officials said the loss, estimated at several thousand dollars, was covered in part by insurance. Pupils probably will be sent to other schools until a new building can be constructed. Cafeteria workers who were preparing the noon lunch discovered the fire when flames burst through the ceiling of the room. Apparently the fire originated in a second story room above the cafeteria. The second floor was destroyed and officials said walls of the first floor likely would have to be torn down. A pumper truck from the Mt. Sterling Fire department was called but the building was nearly destroyed before it arrived. Officials said the Sharpsburg fire crew could not get its pumper into action for some time.

Other News…

Rowan Woman is Killed in Wreck.

Two Bath Co Girls Are Burned Fatally.

Maysville Man Burned to Death.

Winter Collins Named Cadet Captain.

Talk of the Town…

Mr. and Mrs. Ben Royse Celebrate 50th Anniversary.

Mrs. W.B. Garriott Hostess to Garden Club.

Elizaville Christian Church Holds Weiner Roast and Hay Ride.

Girl Scout Troup Holds First Meeting.

Ads of the Week…

Card Tables $4.95/C.L. Mains and Son.

Dresses $6.95/Markwell and Jones.

Turkeys .49cents/Kroger

Frigidaire Refrigerator $259.75/A. E Arnolds.

November 3, 1960

Kenneth Jones at Dunbar Drug.

Kenneth Jones has accepted a position with Dunbar Drug store according to an announcement this week by Hank Dunbar, owner. For the past three years Mr. Jones has been a salesman for Davenport Farm Supply. He also manages the Princess Theatre, assisted by his wife, the former Dorothy Perkins of Hillsboro. . They have one son, Ricky, 7 years of age. Mr. Jones attended Fleming County High School and is the son of Levi Jones and the late Belle Jones.

Other News…

Farm Bureau Dues Upped to $10 at Annual Meeting.

McClure's Appliances Store Moves Uptown.

Garr and M.C. Colliver Join Crain Warehouse.

Merchants and Committee Meet to Discuss Beef Show and Sales.

Talk of the Town…

Tina Jo born October 22 to Mr. and Mrs. Thomas Johnson.

Jeffrey David born to Mr. and Mrs. Donald Ogden.

Elizabeth Ann born October 12 to Rev. and Mrs. Henry Baumann.

Wanda Bellamy and Carl Gray Wedding Saturday.

Ads of the Week…

Goodyear Tires $15.95/Eldridge Brothers.

Men's Insulated Boots $9.75/W.A. Hinton Home Store.

Men's Dress Pants $3.95/Fried's.

Ladies Coats $23.00/Lermans.

November 15, 1970

Miss Fearin Awarded Music Certificate.

Genevieve Fearin of Route 2, Wallingford, Ky. has just been awarded a Certificate of Award by the U.S. School of Music, of Port Washington, New York, after completing one year of study of the accordion and passing the final written examination in that subject. For a short time Miss Fearin has entertained friends with her music at church and at home accompanied by her mother on the guitar and harmonica. Miss Fearin is a graduate of Fleming County High School and a member of Ramey's Chapel United Methodist Church. At the present time she is the son leader and Sunday School Teacher at the Little Mission Church at Wallingford. She is also a student at La Salle Extension University in Chicago, Illinois, where she is studying to be a Certified Public Accountant. She also loves horseback riding and training her own horses. Miss Fearin resides with her parents, Mr. and Mrs. Welbie F. Fearin at Wallingford.

Other News…

Bill Mineer Chosen Outstanding Farmer.

Mrs. Sam Dowd Has Freak Accident.

Gorman Animal First in Charlois Show.

City Council Ponders Gas Rate Increase.

Talk of the Town…

Frances Gay Estep and Sgt. James M. Burton Engagement Told.

Michele Lynn McKee and Rick Hunter Engagement Told.

Douglas Doyle Celebrates Birthday Nov. 7th.

Connie Crager Celebrates Birthday Nov. 10th.

Ads of the Week…

Coca-Cola 8 pk Bottles .79cnets/Bob's Shopworth.

3 Room Group $299/Campbell Home Furnishings.

Weber's Sausage $1.23/Palmer's.

House Shoes $2.99/Case's Men's Wear.

NOTICE OF APPLICATION AEUG Fleming Solar, LLC, is proposing to construct and operate a 188-megawatt AC solar energy project approximately located between Old Convict Road and Kentucky Route 32 in Fleming County, Kentucky. The proposed Fleming Solar Project will consist of about 1,500 acres of solar photovoltaic panels and associated racking, inverters, and a project substation transformer.

AEUG Fleming 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.

Published in the Flemingsburg Gazette 11.18.20

Affidavit of Publication

I, Petrea Allison, hereby certify that I am Graphic Designer of the Flemingsburg Gazette. I certify that the attached clipping of the advertisement is a true copy of said advertisement in the said Newspaper on Nov. 18, 2020.

In Testimony whereof, witness my signature this 19 day of Nov. 2020.

The Newspaper Office

BY Petrea Allison

Subscribed and sworn to before me this 19 day of Nov 2020

My Commission expires: May 2, 2023

Melissa McKee

Notary Public

APPENDIX C

Public Involvement Documents

OPINIONS/COMMUNITY

The opinion page does not reflect the views of the KyNewsGroup.

Heaven Is A Lot Like Kentucky

By Charles Mattox

THE ROWAN COUNTY WAR PART VI: THE TREMBLING OF HEAVEN AND EARTH

Following the shooting death of William Logan, in his father, Howard Logan's store, an air of conspiracy filled the air in and around Morehead, which involved members of the Young, Pelfrey, Logan and Rayburn clans.

The air was also filled with violence, and on August 27, a bizarre incident occurred which shows the callous indifference to violence among some of the residents.

On that day, former Sheriff, John Day, entered the barroom at the Raine hotel (a headquarters for Tolliver supporters, of which Day family members were part of) and John Day ordered a bottle of whiskey from his cousin, Tom Allen Day, who was bartending.

Tom Allen Day smiled and placed a bottle of Brandy, not whiskey, in front of John Day and John Day began drinking it. Tom then loudly said that John Day was such a D… Fool that he couldn't tell the difference between whiskey and brandy!

Everyone at the bar laughed, including John Day who simply grinned and finished another drink then casually walked across the room to the pool table and grabbed a pool cue and rushed Tom, striking his cousin viciously across the face several times with the pool cue, kicking him and finally breaking a few random whiskey glasses on his head.

John Day had a few choice words as he stepped over his cousin and walked out of the bar. As he did so, Tom Day came to his senses and retrieved his revolver from beneath the bar and followed John Day outside and shot him in the back.

John Day died four days later. About this time a relative of the Days: J.W.Day, a blind musician who played a fiddle upside down with his left hand began publicly performing. He would later compose and play a song about the Rowan County War.

In October, Sheriff William Ramey was appointed sheriff of Rowan County and former Justice of the Peace, Squire Hogg, was a deputy.

On November 18, H.M. Logan left the Gault House (Martin faction headquarters) and was shot at twice by a concealed assassin using a shotgun. The first blast missed Logan's face by less than an inch and the second blast broke one of his legs.

January 1887 saw the return of Craig Tolliver to Morehead and about that same time Squire Hogg became sheriff and one of his sureties was Craig Tolliver. On Jan. 3, 1887 a large celebration and dance was held inside the Power's Hotel. Morehead constable Mason Keaton got drunk and shot the off one of the fingers of John Rogers. An unknown individual shot Keaton through the heart, killing him.

On Jan. 11, 1887 Wiley Tolliver died from knife wounds he suffered from the hand of one of the Bentley brothers-who were not allied with either the Tollivers or Martin-Logan faction.

In February a stranger, James Harris, reported to authorities that he had been hired by Logan family members to kill Judge Cole, and the father and son law team of Z.T and Allie Young. Henry Logan, Louis Rayburn, Lon Rayburn and Henry Logan's sons: W.H and John B. were indicted and Henry Logan was jailed with a $6,000 cash bond. He was then transferred to Lexington jail.

Harris had a complaint of grand larceny sworn out against him by Marion Gray of Flemingsburg, who filed the complaint in Bath County and Bath lawmen went to Morehead to arrest Harris.

The Tolliver gang made sure that didn't happen and brandished Winchester rifles, shotguns and pistols and the Bath lawmen got back on the train empty handed.

On March 14, Craig Tolliver, John Trumbo and J. T. Witcher, were drinking whiskey and practicing with their pistols in Witcher and J.C. Tolliver's unlicensed saloon (there were several of these controlled by the Tolliver faction at this time) when Trumbo and Witcher began bragging about one another's deadliness with weapons. Witcher bragged that he could "cut Trumbo's throat with a knife before Trumbo could pull his pistol" if they ever got into a scrap with one another. Trumbo laughed and pulled his pistol, and the weapon "accidentally" fired, with the bullet striking Witcher in the head and killing him instantly.

The coroner ruled the shooting was accidental.

The H.C. Powers House/ hotel was mobbed' on April 28, and all the windows broken. Powers had tried to avoid picking a side but gave up and moved away, renting his hotel to Craig Tolliver for $250 a year. Tolliver changed the name to the American Hotel.

On May 10th John 'Bunk' Manning (Mannin) became Morehead Town Marshall, his opponent in the race, Craig Tolliver, became police judge on May 19th.

The population of Morehead shrank to 300, down several hundred residents from two years prior.

In June of 1887, signs began appearing in Morehead suggesting, Hiram Cooper, a man of ill repute, should leave town immediately and about that same time Cooper swore out complaints against W.H. Logan, Jackson Logan, Boone Logan, Nathan Fowler and John Pigman, alleging the five were "ku-kluxing" and were banding together to murder him.

A posse led by Craig Tolliver, Bunk Manning, Bud and Jay Tolliver, Jim Manning, Sheriff George Hogg and a few others served warrants against the Logans at the Logan house, located about three miles from Morehead, along Bratton Branch.

When the Logan boys saw the posse they ran inside the house, as members of the posse began blasting away at them.

When Bunk Manning entered, he was greeted with a shotgun blast, which wounded him in the shoulder and arm.

The members of the posse returned fire and thought it best to burn the house. Sheriff Hogge gave his solemn promise that if the boys surrendered he would ensure they received fair treatment and would not be harmed.

W.H. "Billy" Logan, was 25-years old and was very frail, having suffered from 'consumption' for several months. His brother, J.B. Logan was a youth of 19, a devout Christian, studying to become a minister.

When the porch was set ablaze, Hogge asked the members of the posse if he could extinguish the flames and persuade the boys to surrender. Craig Tolliver granted Hogge permission and soon the blaze was extinguished and Hogge entered the home and talked the two brothers into surrendering, giving his word that he personally would protect them, but when the boys exited the home and began walking with the posse back to Morehead, John Manning shot Billy Logan in the back and then the Tollivers and the rest of the posses excluding Hogge, opened fire in general, shooting the brothers repeatedly even after they fell lifeless. Bunk Manning and his brother then began kicking the lifeless bodies and jumping up and down on their faces, until the two brothers were no longer recognizable.

George Hogge ran from the scene at the first shot, unbelieving that he had been so used.

As he stopped on a hill overlooking Morehead he began weeping and though Craig Tolliver tried to comfort him as the posse 'got their story straight', Hogge could not look at them and as his grief overwhelmed him, his body shook with anger, remorse and fear; not fear of the Tollivers but the fear of God; and it felt as if Heaven and Earth were trembling.

To be continued.

The winner of the 'Like and Share' contest for the Flemingsburg and Fleming County Virtual Fourth of July Parade is Lindsey Crump. Lindsey won a $25 Gift Check donated by the Fleming County Chamber of Commerce. Congratulations to Lindsey, and thank you to everyone who participated in the contest and posted your photos and videos on the Virtual Parade page!

The Muses Mills Fire Dept. will be taking sealed bids on a 1995 GMC Topkick Tanker engine 3116 CAT, 5-speed diesel. it has stainless steel 2,000 gallon tank, new rubber tires, air brakes, The odometer reads 329,452 miles.

Bids must be recieved by Aug. 5, 2020 truck can be seen at the Muses Mills Fire Station

Call 606-748-2667 for an appointment. mail bids to the Muses Mills Fire Dept at 3057 Muses Mills Road, Wallingford, Ky. 41093. All bids will remain sealed until they are reviewed by the Fire dept. Board at their august meeting. We reserve the right to reject any and all bids.

Published in the Flemingsburg Gazette 07.15.20 and Rowan County News 7.16.20

NOTICE OF PUBLIC MEETING

AEUG FLEMING SOLAR, LLC, is proposing to construct and operate a solar energy project in Fleming County, Kentucky. The proposed AEUG FLEMING SOLAR, LLC (Fleming Solar) project will be located within a project area of approximately 1500 acres between Old Convict Road and Kentucky Route 32. A public meeting to inform the community about the project and answer questions about the project will take place on August 7, 2020 between 6 p.m. and 8 p.m. in the Fleming County Fiscal Court Meeting Room. 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 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. Attendees will be asked to practice social distancing for the duration of the meeting. Hand sanitizer and masks will be available on-site for attendees. Fleming 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 Fleming County Fiscal Court 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, Fleming 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 FlemingCountySolar@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 Flemingsburg-Spurlock 138Kv line. Anyone with questions about the August 7, 2020 public meeting or Fleming Solar may request information by emailing Austin Roach at FlemingCountySolar@acciona.com or calling him at (312) 870-1436.

Published in the Flemingsburg Gazette 07.15.20

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 13, 2020

Dear Fleming County resident,

My name is Adam Stratton and I work for a renewable energy company that is developing the Fleming Solar Project and is 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 Fleming Solar Project, an exciting project we are hoping to bring to Fleming County. The Fleming Solar Project is an estimated $195 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've created 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 will be followed by a virtual meeting, where we'll 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 7th.

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 Fleming 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 Fleming 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 Fleming 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 13, 2020

Dear Fleming 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 Fleming County, Kentucky.

I am proud to work for ACCIONA because we design every project to have a positive impact on the community where it is located. Let me explain: 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 Fleming Solar, LLC, is engineering the project in Fleming 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 the Covered Bridge Festival and I look forward to learning about the artists and meanings behind the barn quilts that hang throughout the County. 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 300 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 to seven 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'll have 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 reach out to my team at FlemingCountySolar@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 Wednesday, July 22, about our solar energy project planned for the area. We invite you to a free "drive-thru" dinner between 5:30-6:30 p.m. to be followed at 7:00 p.m. with an online, 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, coleslaw and beans provided by V&V Catering.

This offer is limited to the first 50 families that respond. To reserve your meal, and to get the link for the online meeting, shoot us an email at FlemingCountySolar@acciona.com or call Austin Roach at (312) 870-1436.

acciona

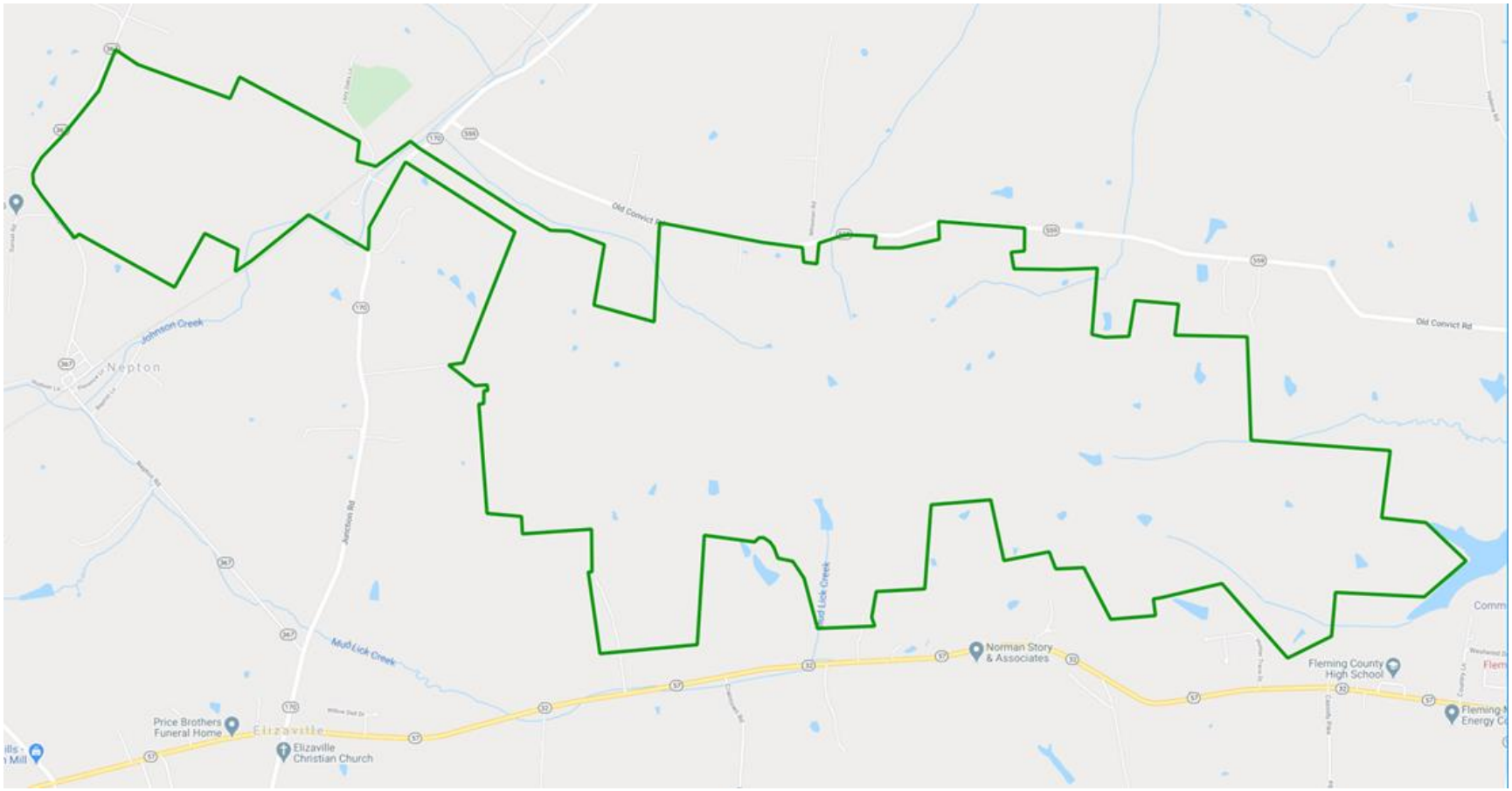
pig image from Stockio.com

NOTICE OF PUBLIC MEETING

AEUG FLEMING SOLAR, LLC, is proposing to construct and operate a solar energy project in Fleming County, Kentucky. The proposed AEUG FLEMING SOLAR, LLC (Fleming Solar) project will be located within a project area of approximately 1500 acres between Old Convict Road and Kentucky Route 32. A public meeting to inform the community about the project and answer questions about the project will take place on August 7, 2020 between 6 p.m. and 8 p.m. in the Fleming County Fiscal Court Meeting Room. 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 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. Attendees will be asked to practice social distancing for the duration of the meeting. Hand sanitizer and masks will be available on-site for attendees. Fleming 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 Fleming County Fiscal Court 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, Fleming 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 FlemingCountySolar@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 Flemingsburg-Spurlock 138Kv line. Anyone with questions about the August 7, 2020 public meeting or Fleming Solar may request information by emailing Austin Roach at FlemingCountySolar@acciona.com or calling him at (312) 870-1436.

Project Area Map

The Proposed Fleming County Solar Project will be situated on a 1,500 acre area roughly bounded by Old Convict Road and Kentucky Route 32, with a small portion of the project area located west of Route Kentucky 170, north of Nepton.



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.

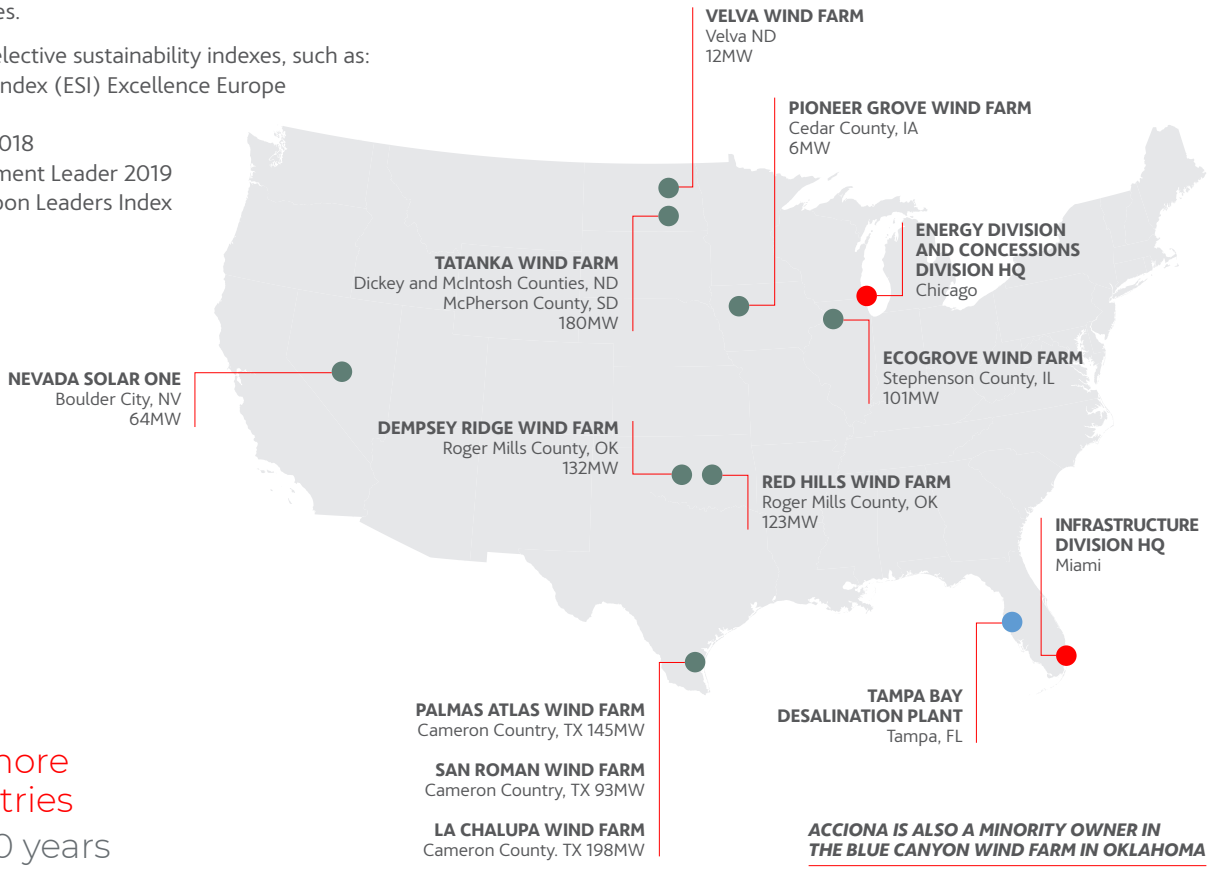
Develops customized renewable energy and infrastructure solutions for clients in the private and public sector. The company launched its US concessions offerings in 2019.

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

NAME	STREET	CITY	STATE	ZIP	MAP ID #
Eugene W Crain	120 Fairwood Lane	Lexington	KY	40502	038-00-00-023.03
Robert W Crain	120 Fairwood Lane	Lexington	KY	40502	038-00-00-023.00
Larry Gilvin	11950 Purdy Road	Sardina	OH	45171	030-00-00-018.00
Fleming Farms LLC	1213 Old Jersey Ridge Road	Maysville	KY	41056	030-00-00-017.00
William Dale Hord	1213 Old Jersey Ridge Road	Maysville	KY	41056	030-00-00-019.00
Dominic & Angela Sgantas	1742 Convict Pike	Flemingsburg	KY	41041	030-00-00-020.00
Elizabeth Ring & Amanda Ritchie	869 Convict Pike	Flemingsburg	KY	41041	030-00-00-042.00
Jodie Kidd	887 Convict Pike	Flemingsburg	KY	41041	030-00-00-042.02
Dorothy Brown	117 Glascock Drive	Flemingsburg	KY	41041	030-00-00-042.01
Debra K Bryant	905 Convict Pike	Flemingsburg	KY	41041	030-00-00-041.00
Anthony & Tyler Toller	12125 KY 344	Wallingford	KY	41093	030-00-00-040.00
Laura Puente	991 Convict Pike	Flemingsburg	KY	41041	030-00-00-039.01
Jackie & Tammi Boling	1275 Convict Pike	Flemingsburg	KY	41041	030-00-00-039.00
Kathy Rayburn	1313 Convict Pike	Flemingsburg	KY	41041	030-00-00-038.00
Sam Harris	118 Fonda Lane	Nicholasville	KY	40356	030-00-00-037.00
Robert & Martha Masters	1615 Convict Pike	Flemingsburg	KY	41041	030-00-00-034.00
John & Marjorie Shank	7382 MT Clinton Pike	Rockingham	VA	22821	030-00-00-021.00
Rhonda Hall	2198 Convict Pike	Flemingsburg	KY	41041	030-00-00-028.00
Betty Jones	2254 Convict Pike	Flemingsburg	KY	41041	030-00-00-027.00
Denny & Pam Lowe	1053 Helena Road	Flemingsburg	KY	41041	030-00-00-022.02
Robert E Masters	2132 MT Carmel Road	Flemingsburg	KY	41041	030-00-00-026.00
Douglas & Connie Masters	2423 Convict Pike	Flemingsburg	KY	41041	030-00-00-025.00
Tommy & Wilhemina Whisman	2416 Convict Pike	Flemingsburg	KY	41041	030-00-00-022.04
Gregory & Teresa Dunaway	364 Asbury Road	Flemingsburg	KY	41041	084-00-00-057.00
Jared & Brenda Coyle	2476 Convict Pike	Flemingsburg	KY	41041	030-00-00-022.01
Christina Hollar & Melissa Workman	2536 Convict Pike	Flemingsburg	KY	41041	030-00-00-024.01
Willard & Darlene Horst	176 Whisman Road	Flemingsburg	KY	41041	030-00-00-022.00
Wayne & Linda Hickerson	2661 Convict Pike	Flemingsburg	KY	41041	023-00-00-021.01
John & Joyce Carpenter	2670 Convict Pike	Flemingsburg	KY	41041	023-00-00-022.00
William & Sandra Cooper	2952 Convict Pike	Flemingsburg	KY	41041	023-00-00-023.01
Anthony & Gwendolyn Hargett	3262 Convict Pike	Flemingsburg	KY	41041	023-00-00-023.02
Robert Thomas Johnson	3642 Convict Pike	Flemingsburg	KY	41041	023-00-00-006.00
Lazy Oaks LLC	4540 West Dry River Road	Dayton	VA	22821	023-00-00-007.00
Mary Lynn & Charles Corwin	50 Buffalo Trace	Ewing	KY	41039	023-00-00-002.01
Sue Fryman	1604 Junction Road	Flemingsburg	KY	41041	023-00-00-011.00
Tim & Kathy Earlywine	1269 Junction Road	Flemingsburg	KY	41041	023-00-00-012.00
Raymond & Barbara Williams	1102 Nepton Road	Ewing	KY	41039	023-00-00-013.00
Terry & Gayle Vice	952 Junction Road	Ewing	KY	41039	023-00-00-014.01
Billy & Paula Fryman	927 Junction Road	Ewing	KY	41039	023-00-00-014.02
Ricky & Peggy Gray	786 Junction Road	Ewing	KY	41039	023-00-00-016.01
Amy & Patrick Price	730 Junction Road	Ewing	KY	41039	023-00-00-016.04
Jeanne Conley	686 Junction Road	Ewing	KY	41039	023-00-00-016.03
Rickey & Vicki Watson	640 Junction Road	Ewing	KY	41039	023-00-00-016.02
Tim & Kathy Earlywine	1263 Junction Road	Flemingsburg	KY	41041	023-00-00-017.01
Levi M Stoltzfus	484 Junction Road	Ewing	KY	41039	023-00-00-017.00
Jackson Floyd Edward Estate	4642 Elizaville Road	Ewing	KY	41039	024-00-00-002.00
William A Cooper	4506 Elizaville Road	Ewing	KY	41039	024-00-00-004.01
Timmy & Amy Saunders	288 Hunter Trace Drive	Ewing	KY	41039	031-70-00-026.00
Dan & Bettye Masters	250 Hunter Trace Drive	Ewing	KY	41039	031-70-00-028.00
Evelyn F Shannon	216 Hunter Trace Drive	Ewing	KY	41039	031-70-00-030.00
Wayne T Brown	184 Hunter Trace Drive	Ewing	KY	41039	031-70-00-023.00
Jeremy & Denise Brown	158 Hunter Trace Drive	Ewing	KY	41039	031-70-00-024.00
Jonathan Eubanks & Destiny Fetters	5935 Ewing Road	Ewing	KY	41039	031-70-00-014.00
Janice Horton / Lorene Horton	1165 Pike Bluff Road	Ewing	KY	41039	031-70-00-004.00
Flemingsburg Baptist Church	P.O. Box 4	Flemingsburg	KY	41041	031-70-00-025.00
James & Brenda Smoot	291 Hunter Trace Drive	Ewing	KY	41039	031-70-00-029.00
Jeffery & Pamela Ocull	80 Mallard Court	Ewing	KY	41039	031-70-00-031.00
Roscoe Wayne & Charlotte Fannin	237 Hunter Trace Drive	Ewing	KY	41039	031-70-00-027.00
Jeffery & Kimberly Perkins	189 Hunter Trace Drive	Ewing	KY	41039	031-70-00-032.00
Olivia J Overbey Rev. Living Trust	2208 Elizaville Road	Ewing	KY	41039	031-70-00-016.00
Martin Todd & Cheryl Roberts	2102 Elizaville Road	Ewing	KY	41039	031-70-00-020.00
Justine Gulley	2074 Elizaville Road	Ewing	KY	41039	031-70-00-019.00
Jeremy & Jessica McCleese	2044 Elizaville Road	Ewing	KY	41039	031-70-00-015.00
Patricia Hurd Atherton	96 Gardenside Drive	Flemingsburg	KY	41041	031-70-00-021.00
Anthony & Betsy Case	71 Gardenside Drive	Flemingsburg	KY	41041	031-70-00-006.00
Harold & Willa Porter	78 Gardenside Drive	Flemingsburg	KY	41041	031-70-00-007.00
Jarrod & Hanna Fizer	33 Gardenside Drive	Flemingsburg	KY	41041	031-70-00-009.00
Thomas Helen Donovan	26 Gardenside Drive	Flemingsburg	KY	41041	031-70-00-008.00
Larry & Connie Bryant	80 Lantern Ridge Drive	Flemingsburg	KY	41041	031-00-00-011.02
Ronnie & Wanda Fern	30 Lantern Ridge Drive	Flemingsburg	KY	41041	031-00-00-011.01
Fleming County Board of Education	211 W Water Street	Flemingsburg	KY	41041	031-70-00-001.00

NAME	STREET	CITY	STATE	ZIP	MAP ID #
Randall & Jowana Fritz	195 Country Lane	Flemingsburg	KY	41041	039-10-01-003.01
Robert Fidler	261 Country Lane	Flemingsburg	KY	41041	039-10-01-001.00
Nathan & Whitney Hinton	266 Country Lane	Flemingsburg	KY	41041	039-10-02-011.00
Thomas & Sandra Perkins	155 Annadd Drive	Flemingsburg	KY	41041	024-00-00-006.01
Brian & Julie Clark	4312 Elizaville Road	Ewing	KY	41039	024-00-00-006.00
Michael & Michele Butler	4455 Elizaville Road	Ewing	KY	41039	024-00-00-003.01
Roger Kirk Owens	328 E Second Street	Maysville	KY	41056	024-00-00-005.00
Michael & Melinda Fultz	4245 Elizaville Road	Ewing	KY	41039	024-00-00-007.00
William & Kathlene Szymanski	4001 Elizaville Road	Ewing	KY	41039	024-00-00-010.00
Larry & Danny Fryman	2332 Hilltop Road	Ewing	KY	41039	024-00-00-008.00
Clover Ridge Farms INC	316 Craintown Road	Ewing	KY	41039	024-00-00-014.00
Danny Doyle	P.O. Box 166	Flemingsburg	KY	41041	024-00-00-011.00
Minnie Doyle	P.O. Box 87	Ewing	KY	41041	023-00-00-028.00
Mary Lou Perkins	3466 Elizaville Road	Ewing	KY	41039	023-00-00-026.00
Nathaniel & Lori Perkins	3372 Elizaville Road	Ewing	KY	41039	023-00-00-026.01
William Gordon Hillis	1257 Cherry Grove Road	Flemingsburg	KY	41041	024-00-00-012.00
Jessica Boggs	3397 Elizaville Road	Ewing	KY	41039	024-00-00-012.04
Norman Jr. & Barbara Story	8594 Morehead Road	Flemingsburg	KY	41041	024-00-00-012.01
Gregory & Patricia Lowe	7214 Sam Bob Lane	Corryton	TN	37721	031-00-00-002.00
Steven & Karen Brown	2971 Elizaville Road	Ewing	KY	41039	031-00-00-003.00
Savannah Nicole Davis	2933 Elizaville Road	Ewing	KY	41039	031-00-00-003.01
Randall & Rita Dials	2853 Elizaville Road	Ewing	KY	41039	031-00-00-004.00
Gary & Beverly Cooper	2743 Elizaville Road	Ewing	KY	41039	031-00-00-006.00
Steven & Karen Brown	2971 Elizaville Road	Ewing	KY	41039	030-00-00-044.00
Daniel & Jeanie Suit	2524 Elizaville Road	Ewing	KY	41039	031-00-00-008.00
Sharon Hyatt Keller	12941 Hillside Drive	Anchorage	AK	99516	031-00-00-009.00
Steven & William Brown	2971 Elizaville Road	Ewing	KY	41039	031-00-00-010.00
Chad & Sarah Bryant	129 Promise Lane	Ewing	KY	41039	031-70-00-035.00
Andrew & Aimee Mullholand	130 Promise Lane	Ewing	KY	41039	031-70-00-034.00
Harold & Carolyn James	127 Elizaville Ave	Flemingsburg	KY	41041	031-00-00-016.00
John & Heather Dowdy	314 Hunter Trace Drive	Ewing	KY	41039	031-70-00-037.00

Fleming County Solar
Public Meeting
August 7, 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

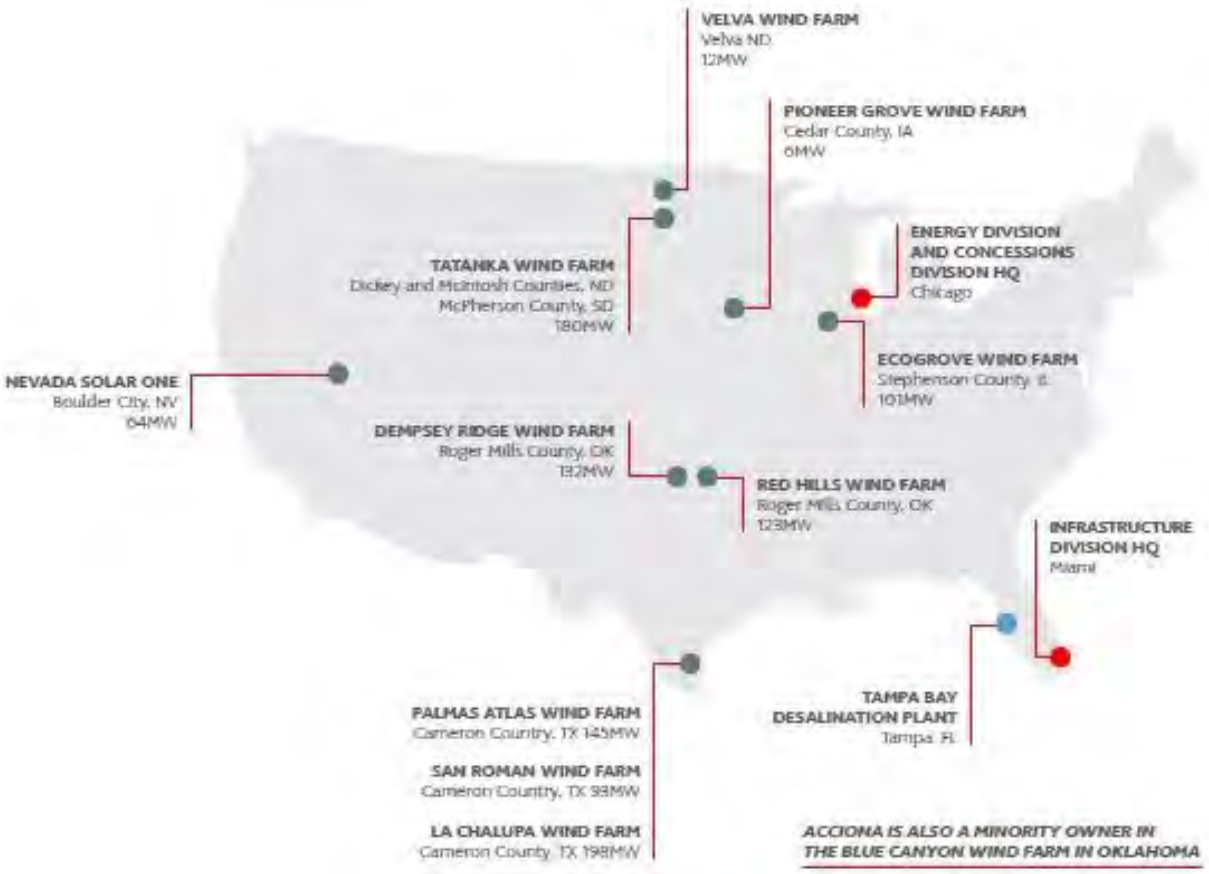
Agenda

1. Who are ACCIONA and Tenaska?
2. Solar PV 101: What should I know?
3. Why Fleming County?
4. Local benefits of the Fleming 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

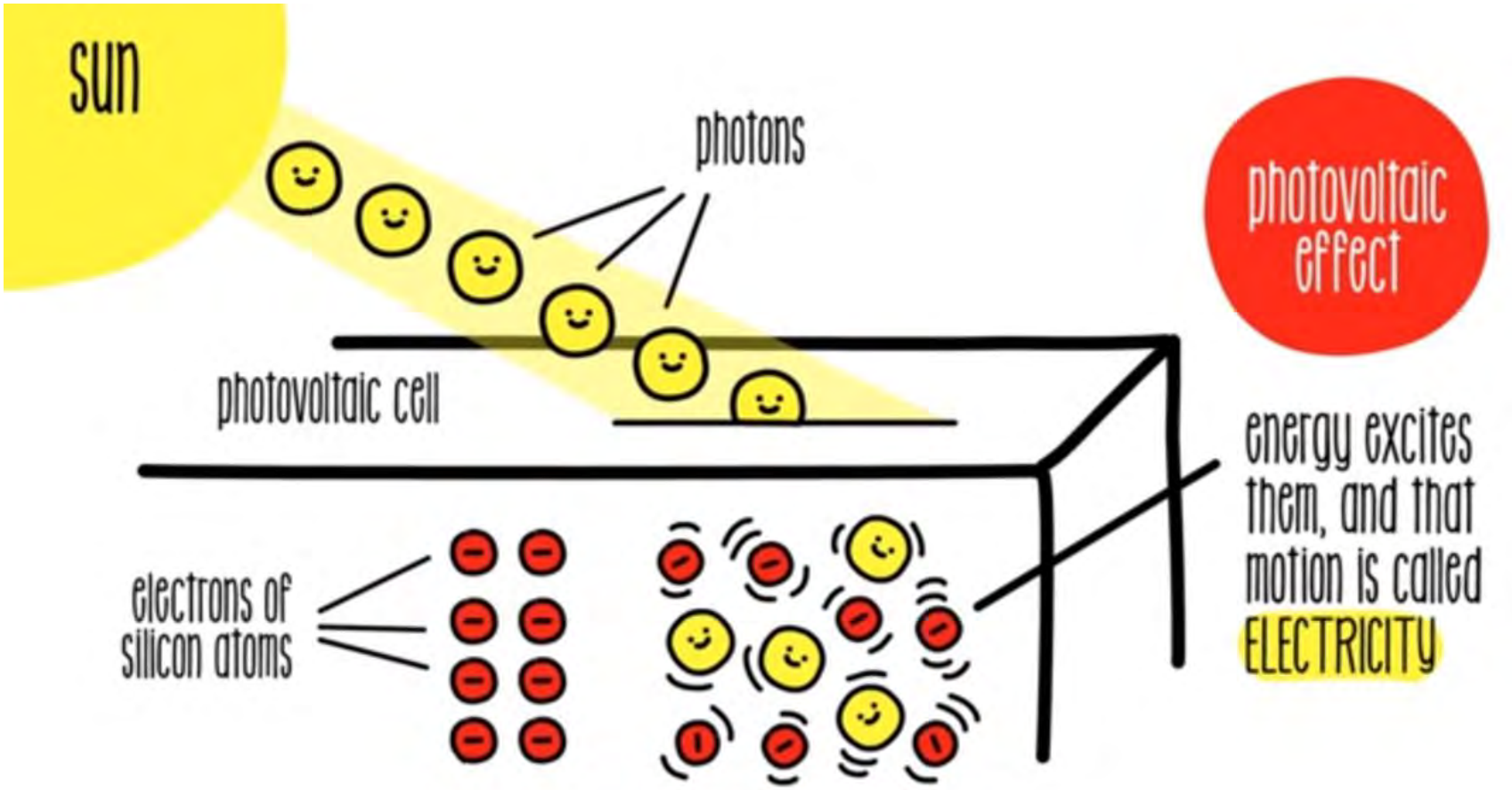


- ACCIONA is a global renewable energy and infrastructure company
- 1,000+ MW of generating capacity in the US
- Company focuses on projects that drive community, environmental benefit
- Local social impact central to every project

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 Fleming 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
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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 will 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 for the solar panel's at ACCIONA's Puerto Libertad solar array 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

Autumn in Fleming County.

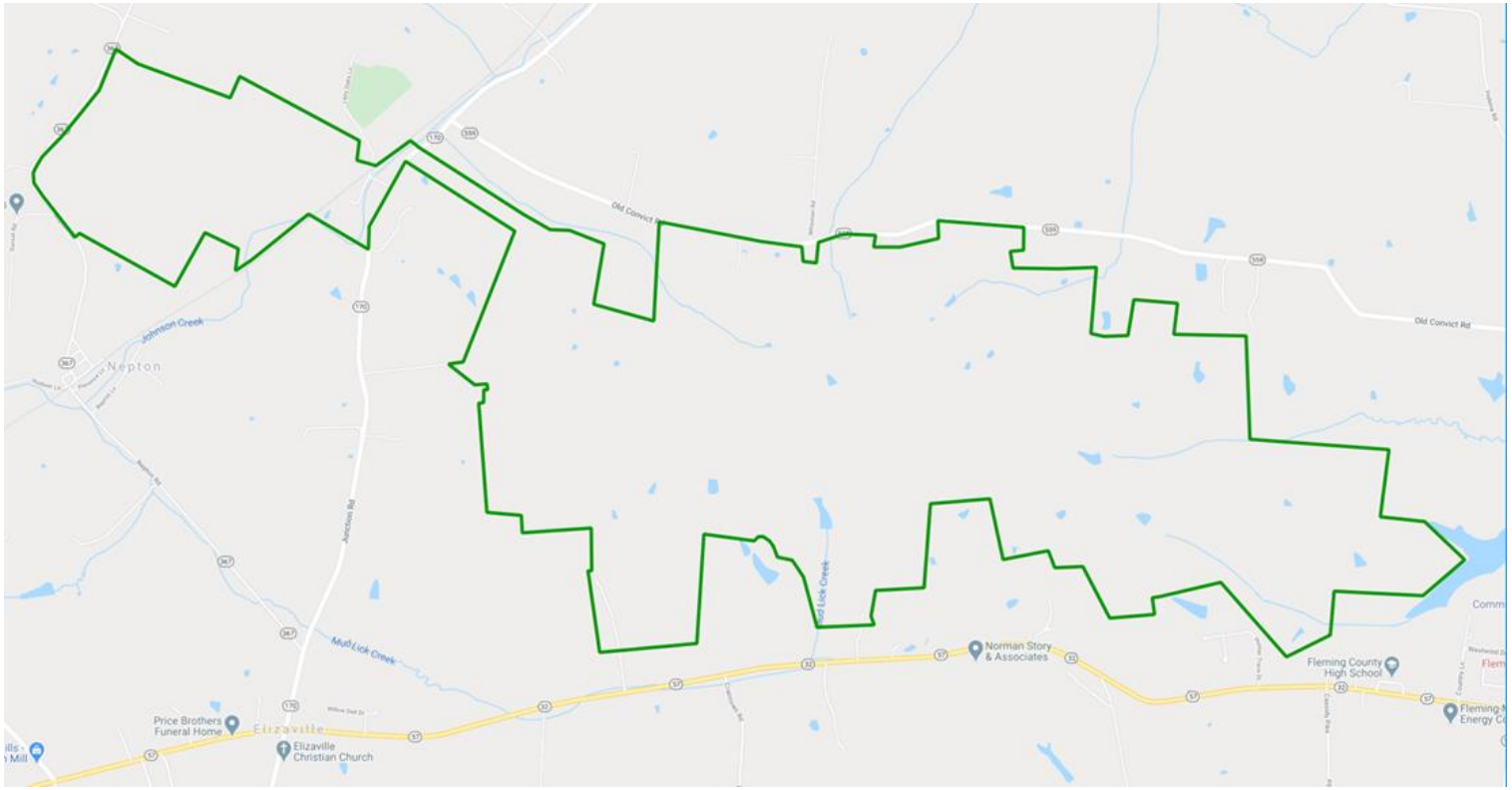
- Lease payments are higher and more stable source of income than farming
- Low crop prices mean that less land is needed to produce food
- Using simulations of future prices and yields, rarely does farming yield higher profits than solar leasing

Why Fleming County?

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

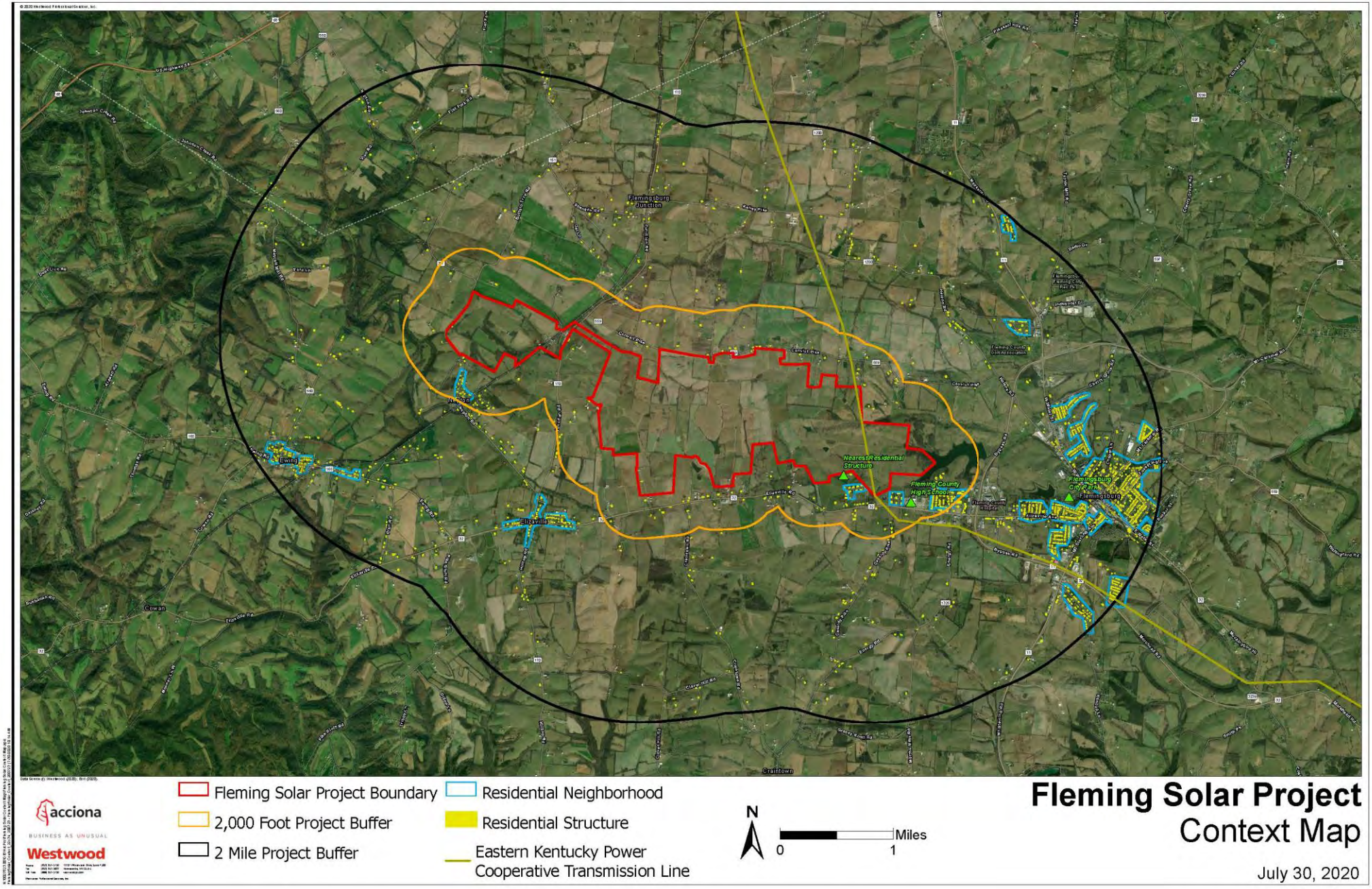
- Infrastructure in place to allow development
- Local commitment to economic development
- Local labor force
- Strong local solar resource
- Increasing demand for reliable, clean energy from businesses, electricity sector

Where will Fleming County solar be built?



Project Details:

- 188 megawatts
- 1,500 acres
- Between N Old Convict Rd, S Kentucky Rt 32, W Junction Rd, E Rt 11
- Interconnection to the Flemingsburg-Spurlock 138 kV Line
- Approximately 500K solar panels


Fleming Solar Project Boundary
2,000 Foot Project Buffer
2 Mile Project Buffer
Residential Neighborhood
Residential Structure
Eastern Kentucky Power Cooperative Transmission Line
N
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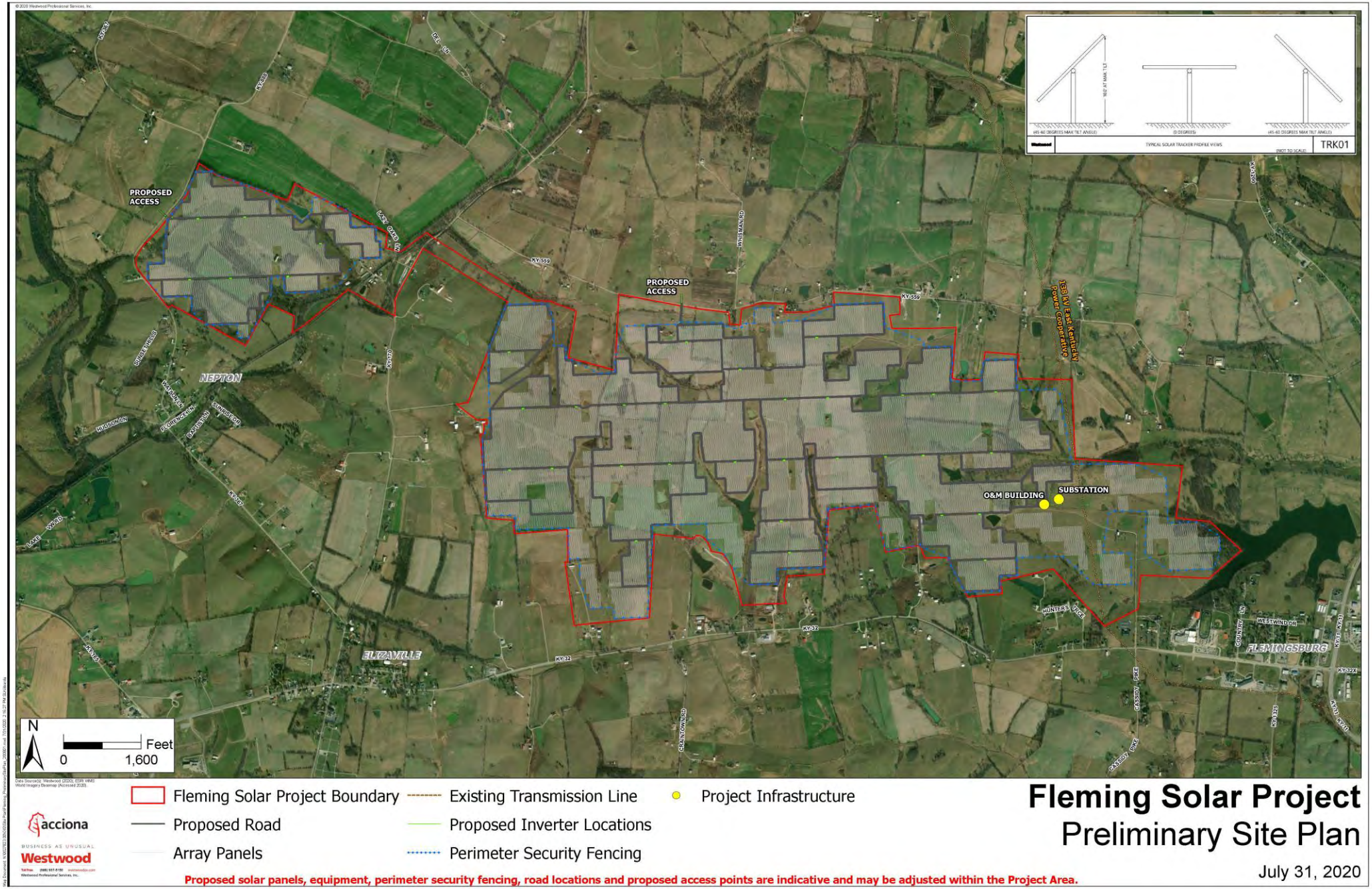
Miles
acciona
BUSINESS AS UNUSUAL
Westwood
Fleming Solar Project
Context Map
July 30, 2020


PROPOSED ACCESS
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ELIZAVILLE
FLEMINGSBURG
O&M BUILDING
SUBSTATION
138 kV East Kentucky Power Cooperative
TRK01
TYPICAL SOLAR TRACKER PROFILE VIEWS
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Fleming Solar Project Boundary
Proposed Road
Array Panels
Existing Transmission Line
Proposed Inverter Locations
Perimeter Security Fencing
Project Infrastructure
Fleming Solar Project
Preliminary Site Plan
July 31, 2020
Proposed solar panels, equipment, perimeter security fencing, road locations and proposed access points are indicative and may be adjusted within the Project Area.

Local benefits for Fleming County Solar

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 $195M investment in Fleming 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**
  - 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 Fleming County Solar Project?

Thank You, Fleming County!

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

Coming Soon: FlemingSolarFarm.com

acciona

BUSINESS AS UNUSUAL

TENASKA®

Fleming County Solar

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Meet the Team

- Adam Stratton, Director of Solar Development, ACCIONA
- Kyle Gerking, Project Manager, Engineering & Construction, Tenaska
- Dave Gladem, Director of O&M, PV Solar & Energy Storage, ACCIONA
- Mary Connor, Senior Manager Environmental, Social and Sustainability, ACCIONA
- Tiffany J. Allison, owner, TiffanyJ Media

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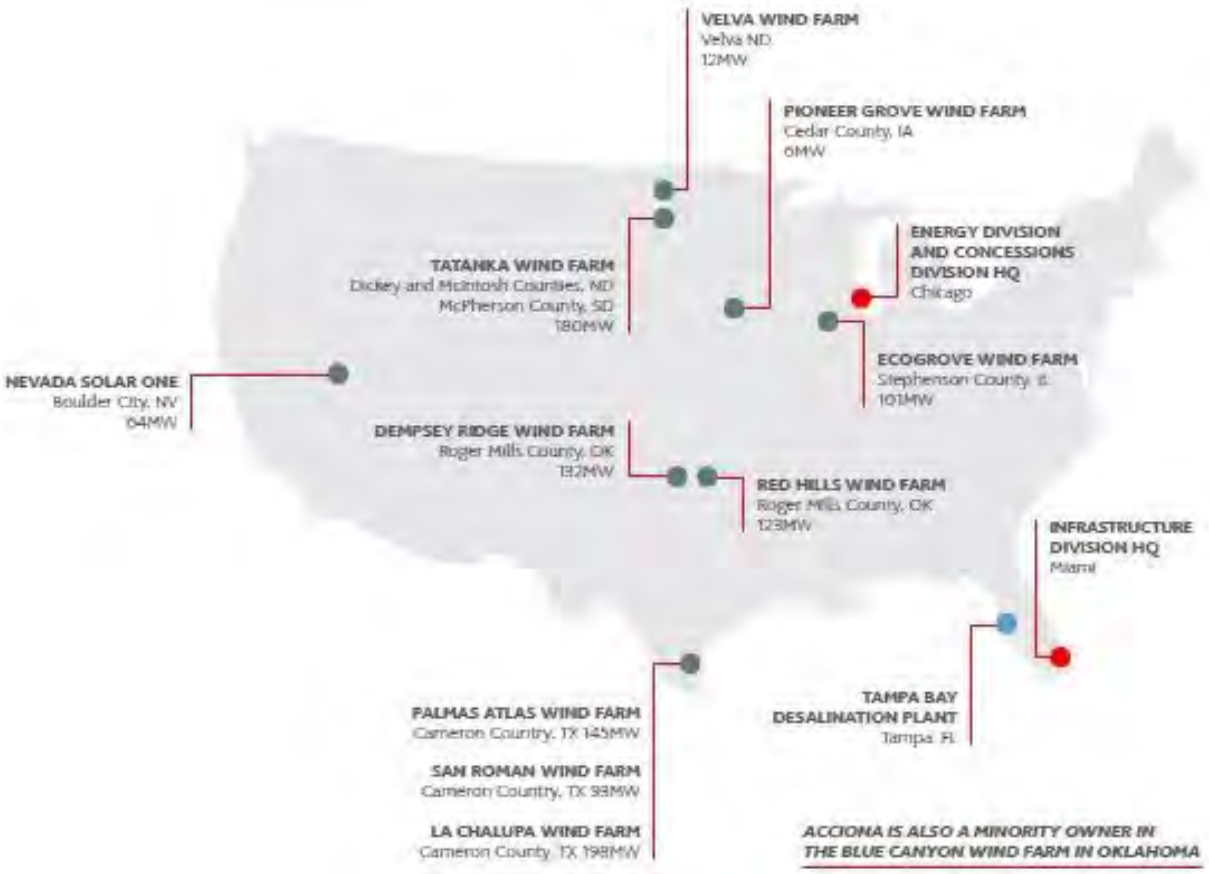

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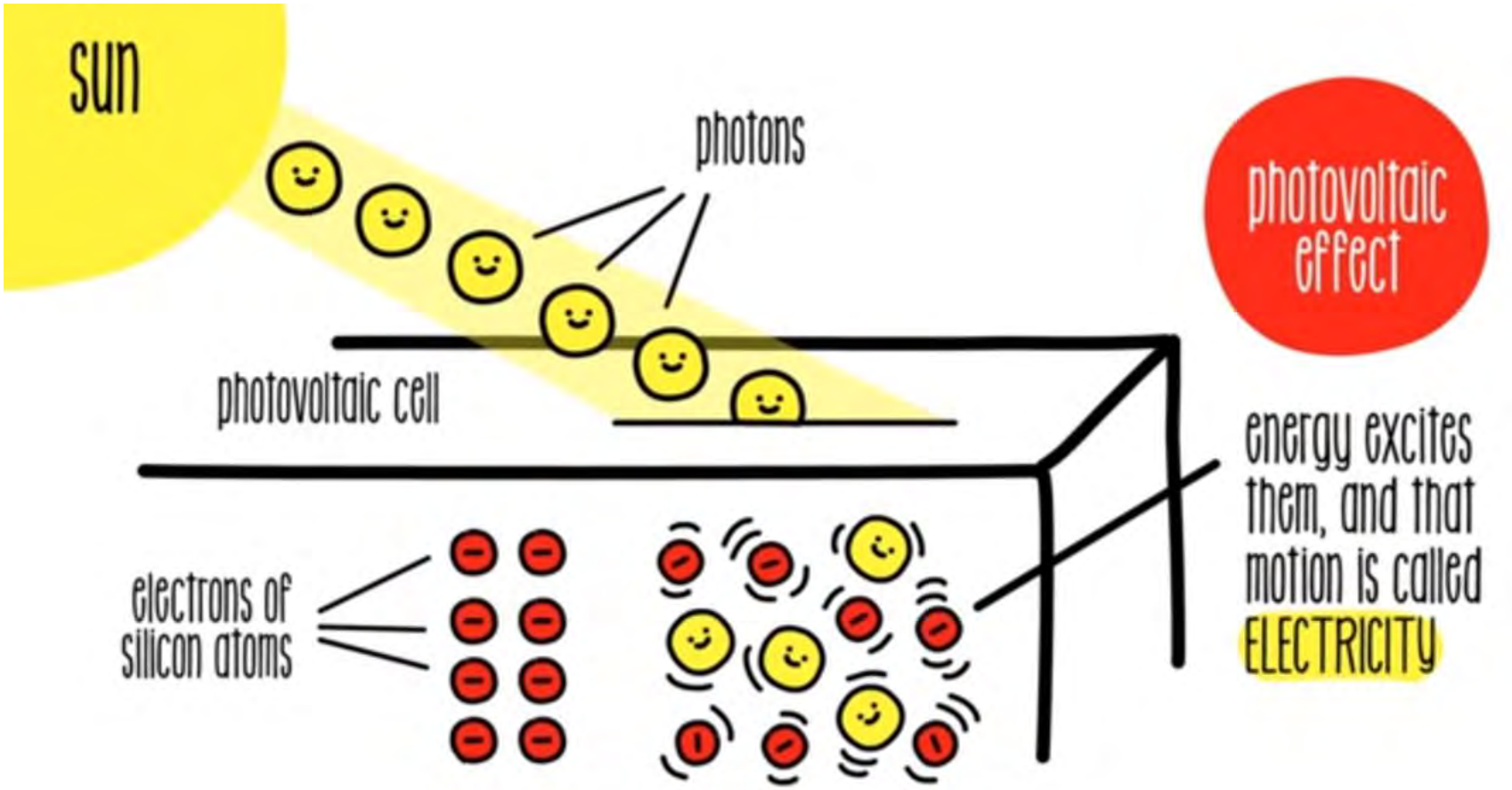

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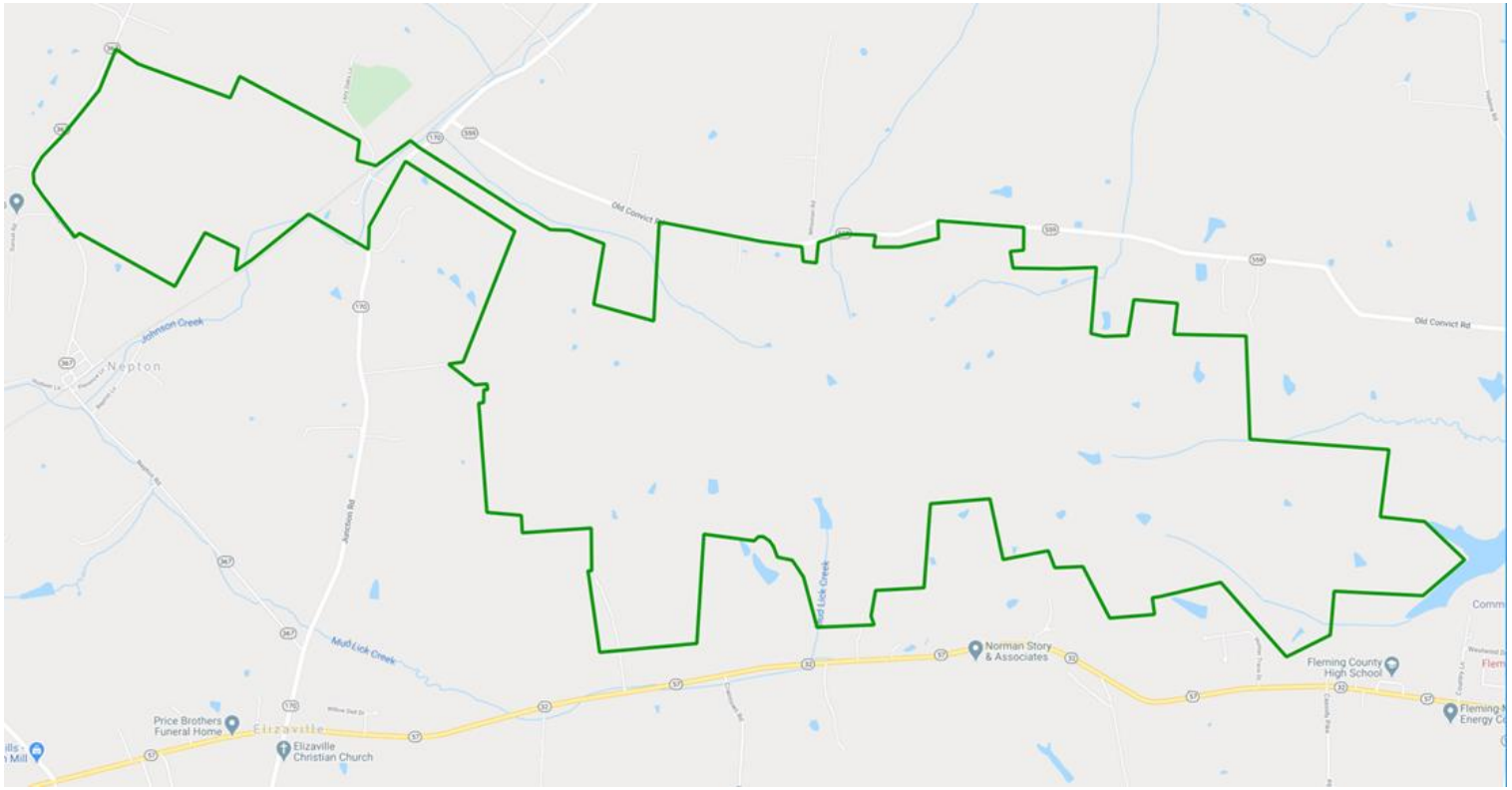
- Increasing demand for reliable, clean energy from businesses, electricity sector

Where will Fleming County solar be built?



Project Details:

- 188 megawatts
- 1,500 acres
- Between N Old Convict Rd, S Kentucky Rt 32, W Junction Rd, E Rt 11
- Interconnection to the Flemingsburg-Spurlock 138 kV Line
- Approximately 500K solar panels

Local benefits for Fleming County Solar

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 $195M investment in Fleming 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**
  - 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 Fleming County Solar Project?

Thank You, Fleming County!

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

Coming Soon: FlemingSolarFarm.com

APPENDIX D

Certificate of Compliance with Local Regulations

KENTUCKY STATE BOARD ON ELECTRIC GENERATION AND TRANSMISSION SITING
AEUG FLEMING SOLAR, LLC
CASE NO. 2020-00206
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, Business Development, of AEUG Fleming 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. There are no setback requirements established by Fleming County, including AEUG Fleming's project area.

Signed this 24th day of November 2020.

_____

Tracy Stoddard
Vice President, Business Development
AEUG Fleming Solar, LLC

APPENDIX E

PJM Interconnection – Feasibility Study

Generation Interconnection

Feasibility Study Report

for

Queue Project AF1-233

FLEMINGSBURG 138 KV

150.6 MW Capacity / 225 MW Energy

January, 2020

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 Fleming County, KY. The installed facilities will have a total capability of 225 MW with 150.6 MW of this output being recognized by PJM as Capacity. The proposed in-service date for this project is 5/31/2022. This study does not imply a TO commitment to this in-service date.

Queue Number	**AF1-233**
Project Name	FLEMINGSBURG 138 KV
State	Kentucky
County	Fleming
Transmission Owner	EKPC
MFO	225
MWE	225
MWC	150.6
Fuel	Solar; Storage
Basecase Study Year	2023

2.1 Point of Interconnection

AF1-233 will interconnect with the EKPC transmission system at the Flemingsburg 138 kV substation.

2.2 Cost Summary

The AF1-233 project will be responsible for the following costs:

Description	Total Cost
Attachment Facilities	$565,000
Direct Connection Network Upgrade	$5,520,000
Non Direct Connection Network Upgrades	$1,605,000
Total Costs	$7,690,000

In addition, the AF1-233 project may be responsible for a contribution to the following costs

Description	Total Cost
System Upgrades	$166,210,301

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 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 Flemingsburg 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 near the EKPC Flemingsburg distribution substation to facilitate connection of the IC solar generation project (Estimated time to implement is 24 months)	$5,520,000
Total Direct Connection Facility Costs	$5,520,000

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 Spurlock-Flemingsburg-Goddard 138 kV line into the new Flemingsburg switching station (Estimated time to implement is 24 months)	$225,000
Modify relays and/or settings at the Spurlock substation for the existing line to the new Flemingsburg switching station (Estimated time to implement is 9 months)	$65,000

Description	Total Cost
Modify relays and/or settings at Goddard substation for the existing line to the new Flemingsburg switching station (Estimated time to implement is 9 months)	$65,000
Install OPGW on the Flemingsburg-Goddard 138 kV line (9.2 miles) (Estimated time to implement is 16 months)	$1,250,000
Total Non-Direct Connection Facility Costs	$1,605,000

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 AF1-233 was evaluated as a 225.0 MW (Capacity 150.6 MW) injection at the Flemingsburg 138 kV substation in the EKPC area. Project AF1-233 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AF1-233 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
41039805	250077	08MTZION	138.0	DEO&K	249991	08BUFTN1	138.0	DEO&K	1	DAY_P734541 34553	tower	298.0	95.37	103.66	DC	24.61
41039825	342091	2PLUMVILLE	69.0	EKPC	341923	2MURPHYSVIL	69.0	EKPC	1	DAY_P734541 34553	tower	63.0	94.71	104.2	DC	13.28
41643526	342091	2PLUMVILLE	69.0	EKPC	341923	2MURPHYSVIL	69.0	EKPC	1	EKPC_P4-6_SPUR N39-92T	breaker	63.0	52.44	135.86	DC	52.56
41039844	342664	4SPURLOCK	138.0	EKPC	342661	4SPUR-KENT-R	138.0	EKPC	1	DAY_P734541 34553	tower	291.0	99.4	102.46	DC	19.46
42774709	944520	AF1-117 TAP	345.0	DAY	253100	09ATLNTA	345.0	DAY	1	DAY_P7_495	tower	1195.0	99.94	100.75	DC	21.54

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
43551565	243453	05BEATTY	345.0	AEP	243454	05BIXBY	345.0	AEP	1	AEP_P4_#3196_05BEATTY 345_302E	breaker	1203.0	133.48	134.34	DC	22.94
43551566	243453	05BEATTY	345.0	AEP	243454	05BIXBY	345.0	AEP	1	AEP_P4_#10715_05COLE 345_C	breaker	1203.0	131.52	132.35	DC	22.08
43551625	243453	05BEATTY	345.0	AEP	244022	05COLE	345.0	AEP	1	AEP_P4_#3195_05BEATTY 345_304E	breaker	1203.0	120.36	121.09	DC	19.47
43551626	243453	05BEATTY	345.0	AEP	244022	05COLE	345.0	AEP	1	AEP_P4_#8094_05BIXBY 345_C	breaker	1203.0	118.44	119.16	DC	19.2
43551670	243454	05BIXBY	345.0	AEP	243459	05KIRK	345.0	AEP	1	AEP_P4_#10715_05COLE 345_C	breaker	1409.0	112.54	113.11	DC	21.38
43551671	243454	05BIXBY	345.0	AEP	243459	05KIRK	345.0	AEP	1	AEP_P4_#3196_05BEATTY 345_302E	breaker	1409.0	113.14	113.84	DC	21.83
43928952	246800		138.0	AEP	247034	05EMERSS	138.0	AEP	1	DAY_P734541 34553	tower	185.0	103.09	108.11	DC	20.63
43928168	246946	05WLDCAT	138.0	AEP	243019	05HILLSB	138.0	AEP	1	DAY_P4_L34553-1	breaker	185.0	117.22	120.49	DC	13.42
43928856	246946	05WLDCAT	138.0	AEP	243019	05HILLSB	138.0	AEP	1	DAY_P734541 34553	tower	185.0	155.83	160.86	DC	20.63
43928953	247034	05EMERSS	138.0	AEP	246946	05WLDCAT	138.0	AEP	1	DAY_P734541 34553	tower	185.0	101.85	106.87	DC	20.63
41039754	250054	08LONGBR	138.0	DEO&K	250077	08MTZION	138.0	DEO&K	1	DAY_P734541 34553	tower	284.0	104.62	113.31	DC	24.61
42774575	253014	09CLINTO	345.0	DAY	253027	09GREENE	345.0	DAY	1	DAY_P734569 34598 34524	tower	1374.0	108.84	109.49	DC	19.74

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
42774576	253014	09CLINTO	345.0	DAY	253027	09GREENE	345.0	DAY	1	DEOK_P7-1_C5 4524FOSTRSUGRCRK34598FOSTERBATH	tower	1374.0	101.87	102.46	DC	17.97
41039741	253038	09KILLEN	345.0	DAY	242938	05MARQUI	345.0	AEP	1	DAY_P7_34506 34542_1-A	tower	1372.0	103.4	104.64	DC	37.77
41039742	253038	09KILLEN	345.0	DAY	242938	05MARQUI	345.0	AEP	1	DAY_P7_34506 34542_1-B	tower	1372.0	100.82	102.06	DC	37.77
42774539	253077	09STUART	345.0	DAY	253038	09KILLEN	345.0	DAY	1	DAY_P7_34506 34542_1-A	tower	1374.0	103.25	104.48	DC	37.77
42774540	253077	09STUART	345.0	DAY	253038	09KILLEN	345.0	DAY	1	DAY_P7_34506 34542_1-B	tower	1374.0	100.67	101.91	DC	37.77
42246784	253100	09ATLNTA	345.0	DAY	253110	09ADKINS	345.0	DAY	1	AEP_P4_#6774_05MARQUI 345_D	breaker	1195.0	111.69	113.67	DC	23.71
42246785	253100	09ATLNTA	345.0	DAY	253110	09ADKINS	345.0	DAY	1	AEP_P4_#2900_05MARQUI 345_D2	breaker	1195.0	108.93	110.94	DC	23.93
42774590	253100	09ATLNTA	345.0	DAY	253110	09ADKINS	345.0	DAY	1	DAY_P7_495	tower	1195.0	111.21	112.02	DC	21.25
41039687	253110	09ADKINS	345.0	DAY	243453	05BEATTY	345.0	AEP	1	DAY_P7_495	tower	1372.0	122.29	122.97	DC	20.66
41643719	253110	09ADKINS	345.0	DAY	243453	05BEATTY	345.0	AEP	1	DAY_P4_L34526-3	breaker	1372.0	119.36	120.03	DC	20.21
43552225	324267	4KENTON	138.0	LGEE	246800		138.0	AEP	1	DAY_P734541 34553	tower	185.0	106.12	111.14	DC	20.63
41039730	342559	4BOONECO	138.0	EKPC	250054	08LONGBR	138.0	DEO&K	1	DAY_P734541 34553	tower	284.0	111.94	120.64	DC	24.61
41039806	342661	4SPUR-KENT-R	138.0	EKPC	324267	4KENTON	138.0	LGEE	1	DAY_P734541 34553	tower	281.0	102.83	106.0	DC	19.46
41039697	342838	7SPURLOCK	345.0	EKPC	253077	09STUART	345.0	DAY	1	DEOK_P7-1_C5 CIRCUIT1883&4545REDBANKSILGRVZIMMER	tower	1532.0	119.22	125.33	DC	93.2
41326847	342838	7SPURLOCK	345.0	EKPC	253077	09STUART	345.0	DAY	1	DEOK_P1-3_B3 SILVER GROVE 345/138 TB23*	single	1532.0	113.59	117.68	DC	62.37
41643705	342838	7SPURLOCK	345.0	EKPC	253077	09STUART	345.0	DAY	1	DEOK_P2-3_C2 816_SILVERGROVE	breaker	1532.0	119.37	125.48	DC	93.25
41643706	342838	7SPURLOCK	345.0	EKPC	253077	09STUART	345.0	DAY	1	DEOK_P2-3_C2 1493_RED BANK	breaker	1532.0	119.28	125.38	DC	93.19
41863140	342838	7SPURLOCK	345.0	EKPC	253077	09STUART	345.0	DAY	1	DEOK_P2-2_C1 SILVER GROVE 345 BUS	bus	1532.0	119.21	125.32	DC	93.19
42774566	926060	AC1-085 TAP	345.0	DAY	942090	AE2-221 TAP	345.0	DAY	1	DAY_P734569 34598 34524	tower	1374.0	108.9	109.58	DC	20.75
42774567	926060	AC1-085 TAP	345.0	DAY	942090	AE2-221 TAP	345.0	DAY	1	DEOK_P7-1_C5 4524FOSTRSUGRCRK34598FOSTERBATH	tower	1374.0	103.0	103.61	DC	18.81
42246778	942090	AE2-221 TAP	345.0	DAY	253014	09CLINTO	345.0	DAY	1	DEOK_P5-5_FOSTER345 BUS1+RELAYFAIL	breaker	1374.0	109.5	110.15	DC	19.84
42246779	942090	AE2-221 TAP	345.0	DAY	253014	09CLINTO	345.0	DAY	1	DEOK_P2-3_C2 1349_FOSTER	breaker	1374.0	108.99	109.64	DC	19.8
42774500	942090	AE2-221 TAP	345.0	DAY	253014	09CLINTO	345.0	DAY	1	DAY_P734569 34598 34524	tower	1374.0	121.08	121.76	DC	20.75
42774501	942090	AE2-221 TAP	345.0	DAY	253014	09CLINTO	345.0	DAY	1	DEOK_P7-1_C5 4524FOSTRSUGRCRK34598FOSTERBATH	tower	1374.0	114.96	115.58	DC	18.81

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
4355191 7	243453	05BEATTY	345.0	AEP	243454	05BIXBY	345.0	AEP	1	AEP_P1-2_#714	operation	1203.0	122.79	123.57	DC	20.95
4355204 2	243453	05BEATTY	345.0	AEP	244022	05COLE	345.0	AEP	1	AEP_P1-2_#713	operation	1203.0	111.87	112.57	DC	18.52
4355204 8	243454	05BIXBY	345.0	AEP	243459	05KIRK	345.0	AEP	1	AEP_P1-2_#10137	operation	1409.0	109.28	109.96	DC	21.38
4392862 3	246946	05WLDCAT	138.0	AEP	243019	05HILLSB	138.0	AEP	1	DAY-P1-STU SPUR	operation	185.0	116.75	120.03	DC	13.45
4255329 7	253100	09ATLNTA	345.0	DAY	253110	09ADKINS	345.0	DAY	1	DAY_P1-2_#764	operation	1195.0	108.44	110.43	DC	23.73
4255329 8	253100	09ATLNTA	345.0	DAY	253110	09ADKINS	345.0	DAY	1	DAY_P1_894_B2	operation	1195.0	108.44	110.43	DC	23.73
4132693 9	253110	09ADKINS	345.0	DAY	243453	05BEATTY	345.0	AEP	1	DAY_P1_AC1-085_ST_FSA-B	operation	1372.0	119.15	119.81	DC	20.12
4132694 1	253110	09ADKINS	345.0	DAY	243453	05BEATTY	345.0	AEP	1	Base Case	operation	1233.0	118.19	118.85	DC	17.96
4132684 4	342838	7SPURLOCK	345.0	EKPC	253077	09STUART	345.0	DAY	1	Base Case	operation	1240.0	122.36	129.34	DC	86.33
4132684 5	342838	7SPURLOCK	345.0	EKPC	253077	09STUART	345.0	DAY	1	DEOK_P1-3_B3 SILVER GROVE 345/138 TB23*	operation	1532.0	119.17	125.28	DC	93.19
4255325 8	941510	AE2-148 TAP	345.0	DAY	945630	AF1-228 TAP	345.0	DAY	1	DAY_P1-2_#762	operation	1374.0	106.13	106.74	DC	18.75
4255323 9	942090	AE2-221 TAP	345.0	DAY	253014	09CLINTO	345.0	DAY	1	DAY_P1-2_#762	operation	1374.0	108.91	109.54	DC	19.04
4132699 8	945630	AF1-228 TAP	345.0	DAY	243453	05BEATTY	345.0	AEP	1	DAY_P1-2_#762	operation	1374.0	114.01	114.62	DC	18.75

15 System Reinforcements

ID	Index	Facility	Upgrade Description	Cost
42774567,42774566	21	AC1-085 TAP 345.0 kV - AE2-221 TAP 345.0 kV Ckt 1	DAY DAYr190050 (1199) : Replace 2000A wave traps with 3000A at AC1-085 sub and AE2-221 sub Project Type : FAC Cost : $200,000 Time Estimate : 12.0 Months	$200,000
42774709	4	AF1-117 TAP 345.0 kV - 09ATLNTA 345.0 kV Ckt 1	DAY DAYr190027 (1176) : Replace Atlanta metering equipment to increase thermal line rating Project Type : FAC Cost : $100,000 Time Estimate : 12.0 Months	$100,000
43928952	8	138.0 kV - 05EMERSS 138.0 kV Ckt 1	AEP AEPO0039a (649) : A Sag Study will be required on the 4.5 miles ofACSR ~ 477 ~ 26/7 ~ HAWK- Conductor to mitigate the overload. Depending on the sag study results, the cost for this upgrade is expected to be between $18,000 (no remediations required, just sag study) and $6.75 million (complete line reconductor/rebuild). New rating after sag study: S/N: 185 S/E: 257. Time Estimate: a) Sag Study: 6-12 months b) Rebuild: The standard time required for construction differs from state to state. An approximate construction time would be 24 to 36 months after signing an interconnection agreement. Project Type : FAC Cost : $18,000 Time Estimate : Sag Study : 6 - 12 months Months	$18,000
43928168,43928856	9	05WLDCAT 138.0 kV - 05HILLSB 138.0 kV Ckt 1	AEP N5472 (491) : A Sag Study will be required on the 10 miles ofACSR ~ 477 ~ 26/7 ~ HAWK- Conductor to mitigate the overload. Depending on the sag study results, the cost for this upgrade is expected to be between $40,000 (no remediations required, just sag study) and $15 million (complete line reconductor/rebuild). New rating after sag study: S/N: 185 S/E: 257. Time Estimate: a) Sag Study: 6-12 months b) Rebuild: The standard time required for construction differs from state to state. An approximate construction time would be 24 to 36 months after signing an interconnection agreement. Project Type : FAC Cost : $186,000 Time Estimate : 6-12 Months N5857 (492) : Rebuild / reconductor 10 miles of ACSR ~ 477 ~ 26/7 ~ HAWK- Conductor Section 1. Estimated cost: $15 million. Project Type : FAC Cost : $15,040,000 Time Estimate : 24-36 Months	$15,226,000

ID	Index	Facility	Upgrade Description	Cost
42774539,42774540	14	09STUART 345.0 kV - 09KILLEN 345.0 kV Ckt 1	DAY DAYr190028 (1177) : Reconductor Stuart-Killen 345kV line with 795 ACCR high temperature conductor in a twin bundle Project Type : FAC Cost : $31,000,000 Time Estimate : 42.0 Months DAYr190029 (1178) : Replace 2000A wave trap with 3000A at both Stuart and Killen substations Project Type : FAC Cost : $200,000 Time Estimate : 12.0 Months DAYr190030 (1179) : Replace substation riser conductor with 2500AAC (parallel) at both Stuart and Killen substations Project Type : FAC Cost : $200,000 Time Estimate : 12.0 Months DAYr190031 (1180) : Replace 2000A disconnect switch at Killen with 1600A (parallel) Project Type : FAC Cost : $125,000 Time Estimate : 12.0 Months	$31,525,000
42774575,42774576	12	09CLINTO 345.0 kV - 09GREENE 345.0 kV Ckt 1	DAY r190005 (1122) : Replace 2000A wave trap with 3000A Project Type : FAC Cost : $100,000 Time Estimate : 12.0 Months r190007 (1124) : Replace 2000A wave trap with 3000A Project Type : FAC Cost : $100,000 Time Estimate : 12.0 Months	$200,000
41039805	1	08MTZION 138.0 kV - 08BUFTN1 138.0 kV Ckt 1	DEOK n6785 (1209) : Rebuild the line and Substation Bus Conductor on the Buffington terminal at Mt. Zion, Replace equipment at Buffington Project Type : FAC Cost : $4,973,025 Time Estimate : 30.0 Months	$4,973,025

ID	Index	Facility	Upgrade Description	Cost
42774501,42774500, 42246778,42246779	22	AE2-221 TAP 345.0 kV - 09CLINTO 345.0 kV Ckt 1	**DAY** **DAYr190046 (1150) : Replace Clinton 2000A wave trap with 3000A** **Project Type : FAC** **Cost : $100,000** **Time Estimate : 12.0 Months** **DAYr190047 (1151) : Reconductor AE2-221 Tap to Clinton line with twin bundle 1351 ACSR** **Project Type : FAC** **Cost : $15,000,000** **Time Estimate : 18.0 Months** **DAYr190048 (1197) : Replace Clinton substation riser conductor with 2500AAC (parallel)** **Project Type : FAC** **Cost : $100,000** **Time Estimate : 12.0 Months** **DAYr190049 (1198) : Replace Clinton 2000A disconnect switch with 1600A (parallel)** **Project Type : FAC** **Cost : $125,000** **Time Estimate : 12.0 Months**	$15,325,000
41643705,41039697, 41863140,41643706, 41326847	20	7SPURLOCK 345.0 kV - 09STUART 345.0 kV Ckt 1	**DAY** **DAYr190039 (1188) : Reconductor Stuart-Spurlock line with twin bundle 1033 Curlew ACCR conductor** **Project Type : FAC** **Cost : $17,000,000** **Time Estimate : 18.0 Months** **DAYr190040 (1189) : Replace Stuart substation riser conductor with 2500AAC (parallel)** **Project Type : FAC** **Cost : $100,000** **Time Estimate : 12.0 Months** **DAYr190041 (1190) : Reconductor Stuart substation conductor with twin bundle 1033 Curlew ACCR conductor** **Project Type : FAC** **Cost : $250,000** **Time Estimate : 12.0 Months** **EKPC** **r0040 (1853) : Replace the 1500A interconnection metering CTs with 2000A equipment.** **Project Type : FAC** **Cost : $150,000** **Time Estimate : 9.0 Months** **r0041 (1854) : Replace the 3000A wave trap with 3600A equipment.** **Project Type : FAC** **Cost : $170,000** **Time Estimate : 9.0 Months**	$17,670,000

ID	Index	Facility	Upgrade Description	Cost
43551671,43551670	7	05BIXBY 345.0 kV - 05KIRK 345.0 kV Ckt 1	AEP AEPO0038a (641) : Replace Kirk Riser, Sub Cond 954 ACSR 45/7 Project Type : FAC Cost : $100,000 Time Estimate : 12-18 months Months AEPO0038b (642) : An engineering study will need to be conducted to determine if the Kirk Relay Thermal limits 1386 Amps settings can be adjusted to mitigate the overload, Estimated Cost $25,000. New relay packages will be required if the settings cannot be adjusted. Estimated Cost: $600,000. Project Type : FAC Cost : $25,000 Time Estimate : 12-18 months Months AEPO0038c (643) : Replace two Kirk risers, Sub cond 1700 kcm AAC 61 Str. Project Type : FAC Cost : $200,000 Time Estimate : 12-18 months Months AEPO0038d (644) : Sag Study will be required on 37.9 miles of line between Bixby and kirk .The cost is expected to be 151,600.New Ratings after sag study : S/N: 1409MVA S/E: 1887 MVA.Rebuild/Reconductor, cost : $ 75.8 million Project Type : FAC Cost : $151,600 Time Estimate : Sag Study : 6 - 12 months Months AEPO0038e (645) : An engineering study will need to be conducted to determine if the Kirk Compliance Thermal limits 2396 Amps settings can be adjusted to mitigate the overload, Estimated Cost $25,000. New relay packages will be required if the settings cannot be adjusted. Estimated Cost: $600,000. Project Type : FAC Cost : $25,000 Time Estimate : 12-18 months Months AEPO0038f (646) : Replace Bixby switch (2000A) Project Type : FAC Cost : $100,000 Time Estimate : 12-18 months Months AEPO0038g (647) : Replace Bixby Riser, Sub Cond 954 ACSR 45/7 Project Type : FAC Cost : $100,000 Time Estimate : 12-18 months Months AEPO0038h (648) : Replace Kirk Riser, Sub Cond 954 ACSR 45/7 Project Type : FAC Cost : $100,000 Time Estimate : 12-18 months Months	$801,600

ID	Index	Facility	Upgrade Description	Cost
42246785,42246784, 42774590	15	09ATLNTA 345.0 kV - 09ADKINS 345.0 kV Ckt 1	**DEOK** **r190011 (1171) : Replace metering equipment to increase thermal line rating** **Project Type : FAC** **Cost : $100,000** **Time Estimate : 12.0 Months**	$100,000
41039687,41643719	16	09ADKINS 345.0 kV - 05BEATTY 345.0 kV Ckt 1	**AEP** **AEPO0004a (464) : Rebuild 13.0 miles of 2-983.1 ACAR 30/7 Rail 5 conductor on Beatty-Adkins circuit (3.7 miles of double circuit construction). Bare minimum conductor is 2-1024.5 ACAR 30/7 Rail1 which provide no additional margin. Upgrade other elements previously rated by DP&L. Ratings validation of this equipment is currently underway. This will require relay upgrades at Beatty and Adkins.** **Project Type : FAC** **Cost : $55,000,000** **Time Estimate : 24-36 Months** **AEPO0004b (465) : Replace equipment at Adkins station formerly owned by DP&L that is now owned by AEP. Further investigation is required to see exactly what equipiment is to be replaced and whether it can be simply re-rated according to AEP's standards.** **Project Type : FAC** **Cost : $1,000,000** **Time Estimate : 36-48 Months**	$56,000,000
41039730	18	4BOONE CO 138.0 kV - 08LONGBR 138.0 kV Ckt 1	**EKPC** **r0009 (1821) : Increase MOT of Boone-Longbranch 138kV line section 954 MCM conductor to 275F (~2.25 miles)** **Project Type : FAC** **Cost : $200,000** **Time Estimate : 6.0 Months** **r0010 (1822) : 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 : 6.0 Months**	$370,000
41039806	19	4SPUR-KENT-R 138.0 kV - 4KENTON 138.0 kV Ckt 1	**EKPC** **n6041 (1815) : Replace the 5% 1200A reactor at Spurlock with a 7.5% 1600A reactor** **Project Type : FAC** **Cost : $600,000** **Time Estimate : 9.0 Months** **LGEE** **NonPJMArea : The external (i.e. Non-PJM) Transmission Owner, LGEE, will not evaluate this violation until the impact study phase.**	$600,000

ID	Index	Facility	Upgrade Description	Cost
43928953	10	05EMERSS 138.0 kV - 05WLDCAT 138.0 kV Ckt 1	AEP AEPO0006a (467) : Perform sag study on AEP's portion of Wildcat-Kenton 138kV circuit, , 1.3 miles of 477 ACSR 26/7 Hawk. Project Type : FAC Cost : $20,000 Time Estimate : 6-12 Months	$20,000
41643526,41039825	2	2PLUMVILLE 69.0 kV - 2MURPHYSVIL 69.0 kV Ckt 1	EKPC r0060 (1873) : Rebuild the Plumville-Murphysville 69 kV line section using 795 MCM ACSR conductor at 212 degrees F (9.9 miles) Project Type : FAC Cost : $8,140,000 Time Estimate : 20.0 Months r0061 (1874) : Replace the 4/0 copper bus and jumpers at the Murphysville substation using 750 MCM copper or equivalent Project Type : FAC Cost : $120,000 Time Estimate : 6.0 Months r0062 (1875) : Replace the 4/0 copper bus and jumpers at the Plumville substation using 750 MCM copper or equivalent Project Type : FAC Cost : $120,000 Time Estimate : 6.0 Months	$8,380,000

ID	Index	Facility	Upgrade Description	Cost
41039742,41039741	13	09KILLEN 345.0 kV - 05MARQUI 345.0 kV Ckt 1	**AEP** **AEPO0007a (468)** : 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** **DAYr190042 (1191)** : Replace 2000A wave trap with 3000A **Project Type** : FAC **Cost** : $100,000 **Time Estimate** : 12.0 Months **DAYr190043 (1192)** : Reconductor Killen-Marquis line with 795 ACCR high temperature conductor in a twin bundle **Project Type** : FAC **Cost** : $6,500,000 **Time Estimate** : 18.0 Months **DAYr190044 (1193)** : Replace Killen substation riser conductor with 2-1024.5 ACAR 30x7 **Project Type** : FAC **Cost** : $100,000 **Time Estimate** : 12.0 Months **DAYr190045 (1194)** : Replace Killen 2000A disconnect switch with 1600A (parallel) **Project Type** : FAC **Cost** : $125,000 **Time Estimate** : 12.0 Months	$7,015,000
43552225	17	4KENTON 138.0 kV - 138.0 kV Ckt 1	**AEP** **AEPO0040a (650)** : A Sag Study will be required on the 24 miles ofACSR ~ 477 ~ 26/7 ~ HAWK- Conductor section 1 to mitigate the overload. Depending on the sag study results, the cost for this upgrade is expected to be between $96,000 (no remediations required, just sag study) and $36 million (complete line reconductor/rebuild). New rating after sag study: S/N: 185 S/E: 257. Time Estimate: a) Sag Study: 6-12 months b) Rebuild: The standard time required for construction differs from state to state. An approximate construction time would be 24 to 36 months after signing an interconnection agreement. **Project Type** : FAC **Cost** : $96,000 **Time Estimate** : Sag Study : 6 - 12 months Months	$96,000

ID	Index	Facility	Upgrade Description	Cost
43551565,43551566	5	05BEATTY 345.0 kV - 05BIXBY 345.0 kV Ckt 1	AEP AEPO0003a (463) : Upgrade/Replace Three 345kV 1600A switches and 2-954 ACSR risers at Beatty station Project Type : FAC Cost : $1,500,000 Time Estimate : 12-18 Months AEPO0003b (607) : 1) A sag study will be required on the 9.5 miles of ACSR ~ 954 ~ 45/7 ~ Bundled - Conductor Section 1 to mitigate the overload. Depending on the sag study results, the cost for this upgrade is expected to be between $38,000 (no remediation required, just sag study) and $19 million (complete line reconductor/rebuild). New rating after sag study: S/N:1409 S/E: 1887 . Time Estimate: a) Sag Study: 6-12 months. b) Rebuild: The standard time required for construction differs from state to state. An approximate construction time would be 24 to 36 months after signing an interconnection agreement. Project Type : FAC Cost : $38,000 Time Estimate : 12-18 Months AEPO0003c (608) : Upgrade/Replace four 345kV 2000A Bixby switches Project Type : FAC Cost : $1,500,000 Time Estimate : 12-18 Months AEPO0003d (609) : Replace 2-954 ACSR risers at Bixby station Project Type : FAC Cost : $175,000 Time Estimate : 12-19 Months	$3,213,000

ID	Index	Facility	Upgrade Description	Cost
43551626,43551625	6	05BEATTY 345.0 kV - 05COLE 345.0 kV Ckt 1	AEP AEPO0001a (459) : Upgrade/Replace 3-345kV 1600A switches at Beatty station Project Type : FAC Cost : $1,500,000 Time Estimate : 12-18 Months AEPO0001b (460) : 1) A sag study will be required on the 9.7 miles of ACSR ~ 954 ~ 45/7 ~ Bundled - Conductor Section 1 to mitigate the overload. Depending on the sag study results, the cost for this upgrade is expected to be between $42,000 (no remediation required, just sag study) and $40 million (complete line reconductor/rebuild). New rating after sag study: S/N:1409 S/E: 1887 . Time Estimate: a) Sag Study: 6-12 months. b) Rebuild: The standard time required for construction differs from state to state. An approximate construction time would be 24 to 36 months after signing an interconnection agreement. Project Type : FAC Cost : $42,000 Time Estimate : 6-12 Months AEPO0001c (610) : Replace 2-954 ACSR risers at Beatty station Project Type : FAC Cost : $175,000 Time Estimate : 12-20 Months	$1,717,000
41039754	11	08LONGBR 138.0 kV - 08MTZION 138.0 kV Ckt 1	DEOK n30581 (1208) : Rebuild the line and Substation Bus Conductor on the Longbranch terminal at Mt. Zion Project Type : FAC Cost : $2,660,676 Time Estimate : 30.0 Months	$2,660,676
41039844	3	4SPURLOCK 138.0 kV - 4SPUR-KENT-R 138.0 kV Ckt 1	EKPC n6041 (1815) : Replace the 5% 1200A reactor at Spurlock with a 7.5% 1600A reactor Project Type : FAC Cost : $600,000 Time Estimate : 9.0 Months	$600,000
			TOTAL COST	$166,210,301

16 Flow Gate Details

The following indices contain additional information about each flowgate presented in the body of the report. For each index, 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
41039805	250077	08MTZION	DEO&K	249991	08BUFTN1	DEO&K	1	DAY_P734541 34553	tower	298.0	95.37	103.66	DC	24.61

Bus #	Bus	MW Impact
342957	1SPURLK1G	5.1535
342960	1SPURLK2G	8.0926
342963	1SPURLK3G	4.2526
342966	1SPURLK4G	4.2526
925981	AC1-074 C O1	9.2562
925982	AC1-074 E O1	3.9670
932551	AC2-075 C	2.1984
932552	AC2-075 E	1.1074
936381	AD2-048 C	6.0729
936382	AD2-048 E	3.0299
936571	AD2-072 C O1	2.9465
936572	AD2-072 E O1	1.4447
939141	AE1-144 C O1	8.7899
939142	AE1-144 E O1	4.3621
940531	AE2-038 C O1	5.8636
940532	AE2-038 E O1	2.9044
941411	AE2-138 C	14.2325
941412	AE2-138 E	5.2641
941981	AE2-210 C O1	4.9041
941982	AE2-210 E O1	1.8447
942411	AE2-254 C O1	1.4096
942412	AE2-254 E O1	0.9398
942591	AE2-275 C O1	4.0264
942592	AE2-275 E O1	1.5145
942891	AE2-308 C O1	6.9274
942892	AE2-308 E O1	2.5191
943111	AE2-339 C	2.0999
943112	AE2-339 E	1.0343
944211	AF1-089 C O1	1.5157
944212	AF1-089 E O1	0.4638
944621	AF1-127 C O1	2.1479
944622	AF1-127 E O1	1.0579
945541	AF1-219 C O1	0.6926
945542	AF1-219 E O1	0.2248
945681	AF1-233 C O1	16.4726
945682	AF1-233 E O1	8.1379
945861	AF1-251 C	5.2663
945862	AF1-251 E	3.5109
945911	AF1-256 C	5.3174
945912	AF1-256 E	3.5450
946021	AF1-267 C O1	1.1808
946022	AF1-267 E O1	0.5425

Bus #	Bus	MW Impact
LGEE	LGEE	1.7069
CPLE	CPLE	0.2792
WEC	WEC	0.0350
CBM-W2	CBM-W2	6.2080
NY	NY	0.0735
CBM-W1	CBM-W1	0.6755
TVA	TVA	1.6156
O-066	O-066	0.7325
CBM-S2	CBM-S2	3.3062
CBM-S1	CBM-S1	12.7459
G-007	G-007	0.1123
MADISON	MADISON	3.7740
MEC	MEC	0.5673

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
41643526	342091	2PLUMVILLE	EKPC	341923	2MURPHYSVIL	EKPC	1	EKPC_P4-6_SPUR N39-92T	breaker	63.0	52.44	135.86	DC	52.56

Bus #	Bus	MW Impact
939141	AE1-144 C O1	23.9269
939142	AE1-144 E O1	11.8739
940531	AE2-038 C O1	15.9612
940532	AE2-038 E O1	7.9060
945681	AF1-233 C O1	35.1771
945682	AF1-233 E O1	17.3784
945911	AF1-256 C	11.2118
945912	AF1-256 E	7.4746
DUCKCREEK	DUCKCREEK	0.0507
NEWTON	NEWTON	0.0505
CPLE	CPLE	0.0351
FARMERCITY	FARMERCITY	0.0014
G-007A	G-007A	0.0408
VFT	VFT	0.1096
TVA	TVA	0.0560
PRAIRIE	PRAIRIE	0.0672
COFFEEN	COFFEEN	0.0227
CBM-S2	CBM-S2	0.3295
EDWARDS	EDWARDS	0.0161
CBM-S1	CBM-S1	0.0767
TILTON	TILTON	0.0378
MADISON	MADISON	0.2782
GIBSON	GIBSON	0.0399
BLUEG	BLUEG	0.1910
TRIMBLE	TRIMBLE	0.0646

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
41039844	342664	4SPURLOCK	EKPC	342661	4SPUR-KENT-R	EKPC	1	DAY_P734541 34553	tower	291.0	99.4	102.46	DC	19.46

Bus #	Bus	MW Impact
342957	1SPURLK1G	6.4835
342960	1SPURLK2G	9.4323
342963	1SPURLK3G	4.9566
342966	1SPURLK4G	4.9566
925981	AC1-074 C O1	2.4428
925982	AC1-074 E O1	1.0469
932551	AC2-075 C	0.5802
932552	AC2-075 E	0.2923
939141	AE1-144 C O1	5.2600
939142	AE1-144 E O1	2.6103
940531	AE2-038 C O1	3.5089
940532	AE2-038 E O1	1.7380
941411	AE2-138 C	11.1398
941412	AE2-138 E	4.1202
941981	AE2-210 C O1	3.8385
941982	AE2-210 E O1	1.4438
944621	AF1-127 C O1	1.5826
944622	AF1-127 E O1	0.7795
945681	AF1-233 C O1	5.8686
945682	AF1-233 E O1	2.8992
945861	AF1-251 C	4.0068
945862	AF1-251 E	2.6712
945911	AF1-256 C	2.0212
945912	AF1-256 E	1.3475
LGEE	LGEE	0.3206
CPLE	CPLE	0.0582
WEC	WEC	0.0038
CBM-W2	CBM-W2	2.0721
NY	NY	0.0841
TVA	TVA	0.6020
O-066	O-066	0.9744
CBM-S2	CBM-S2	0.9132
CBM-S1	CBM-S1	3.8766
G-007	G-007	0.1498
MADISON	MADISON	1.0786
MEC	MEC	0.1700

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
42774709	944520	AF1-117 TAP	DAY	253100	09ATLNTA	DAY	1	DAY_P7_495	tower	1195.0	99.94	100.75	DC	21.54

Bus #	Bus	MW Impact
251830	BIOENGRY	0.0706
253077	**09STUART (Deativation : 09/30/17)**	**260.9026**
342957	1SPURLK1G	4.5610
342960	1SPURLK2G	8.4862
342963	1SPURLK3G	4.4594
342966	1SPURLK4G	4.4594
923522	AB1-169 C OP	167.7830
925921	AC1-068 C	-8.0420
925922	AC1-068 E	-3.7608
925931	AC1-069 C	-8.0420
925932	AC1-069 E	-3.7608
925981	AC1-074 C O1	3.4448
925982	AC1-074 E O1	1.4763
926061	AC1-085 C	23.1846
926062	AC1-085 E	37.8274
926791	AC1-165 C	-7.9474
926792	AC1-165 E	-3.8554
926801	AC1-166 C	-7.9474
926802	AC1-166 E	-3.8554
926951	AC1-182	1.2464
930062	AB1-014 E	5.9920
932461	AC2-066 C	2.2035
932462	AC2-066 E	3.5952
932551	AC2-075 C	0.8181
932552	AC2-075 E	0.4121
932661	AC2-088 C O1	4.0439
932662	AC2-088 E O1	3.3278
935031	AD1-136 C	0.5687
935032	AD1-136 E	0.4844
936381	AD2-048 C	2.7941
936382	AD2-048 E	1.3941
938921	AE1-120	3.4019
939141	AE1-144 C O1	6.4721
939142	AE1-144 E O1	3.2118
940531	AE2-038 C O1	4.3174
940532	AE2-038 E O1	2.1385
941411	AE2-138 C	12.8709
941412	AE2-138 E	4.7605
941981	AE2-210 C O1	4.4350
941982	AE2-210 E O1	1.6682
942091	AE2-221 C	27.4554
942092	AE2-221 E	18.3036

Bus #	Bus	MW Impact
942591	AE2-275 C O1	3.4699
942592	AE2-275 E O1	1.3052
942891	AE2-308 C O1	5.8307
942892	AE2-308 E O1	2.1202
943111	AE2-339 C	1.5910
943112	AE2-339 E	0.7836
943201	AE2-318 C	4.3708
943202	AE2-318 E	2.1334
943771	AF1-045	1.7995
944521	AF1-117 C	85.5888
944522	AF1-117 E	26.3652
944621	AF1-127 C O1	1.8822
944622	AF1-127 E O1	0.9271
945681	AF1-233 C O1	6.4948
945682	AF1-233 E O1	3.2086
945861	AF1-251 C	4.6925
945862	AF1-251 E	3.1283
945911	AF1-256 C	2.0990
945912	AF1-256 E	1.3994
946021	AF1-267 C O1	1.0226
946022	AF1-267 E O1	0.4698
946102	AF1-275 BAT	3.4935
946171	AF1-282 C	9.1518
946172	AF1-282 E	6.1012
946181	AF1-283 C	11.8973
946182	AF1-283 E	7.9316
946511	AF1-315 C O1	1.2775
946512	AF1-315 E O1	0.8517
LGEE	LGEE	1.9517
CPLE	CPLE	0.3731
WEC	WEC	0.2750
CBM-W2	CBM-W2	13.1040
NY	NY	0.3788
CBM-W1	CBM-W1	7.1933
TVA	TVA	2.3464
O-066	O-066	4.4150
CBM-S2	CBM-S2	4.6702
CBM-S1	CBM-S1	17.0400
G-007	G-007	0.6791
MEC	MEC	1.8258

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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
43551565	243453	05BEATTY	AEP	243454	05BIXBY	AEP	1	AEP_P4_#3196_05BEATTY 345_302E	breaker	1203.0	133.48	134.34	DC	22.94

Bus #	Bus	MW Impact
250164	08BKJDB1	0.1465
250165	08BKJDB2	0.1465
251827	WILLYESP	0.4700
251828	CLNTESP1	0.4757
251829	CLNTESP2	0.3171
253077	**09STUART (Deativation : 09/30/17)**	**200.3363**
253110	09ADKINS	30.1137
253261	09MON D	0.2593
902531	**W2-040 C (Withdrawn : 01/23/2020)**	**0.9122**
902532	**W2-040 E (Withdrawn : 01/23/2020)**	**1.4882**
904722	V4-073 E	0.2005
913222	Y1-054 E	1.5322
918802	AA1-099 E	0.3171
923522	AB1-169 C OP	128.8336
925242	**AB2-178 E (Withdrawn : 12/10/2019)**	**1.4507**
925921	AC1-068 C	12.4535
925922	AC1-068 E	5.8239
925931	AC1-069 C	12.4535
925932	AC1-069 E	5.8239
925981	AC1-074 C O1	4.0931
925982	AC1-074 E O1	1.7542
926011	AC1-078 C O1	7.8899
926012	AC1-078 E O1	13.1498
926061	AC1-085 C	23.9628
926062	AC1-085 E	39.0972
926101	AC1-089 C O1	4.2166
926102	AC1-089 E O1	6.8797
926791	AC1-165 C	12.3070
926792	AC1-165 E	5.9704
926801	AC1-166 C	12.3070
926802	AC1-166 E	5.9704
926951	AC1-182	1.7969
930062	AB1-014 E	8.0585
932381	AC2-055 C	1.8528
932382	AC2-055 E	3.0229
932421	AC2-060 C	6.5693
932422	AC2-060 E	3.6953
932431	AC2-061 C	4.2851
932432	AC2-061 E	4.3441
932461	AC2-066 C	2.9634
932462	AC2-066 E	4.8351
932481	AC2-068 C	3.1003

Bus #	Bus	MW Impact
932482	AC2-068 E	5.0775
932551	AC2-075 C	0.9721
932552	AC2-075 E	0.4897
932651	**AC2-087 C O1 (Withdrawn : 01/15/2020)**	**4.8654**
932652	**AC2-087 E O1 (Withdrawn : 01/15/2020)**	**3.8595**
932661	AC2-088 C O1	4.0470
932662	AC2-088 E O1	3.3304
934491	AD1-073 C	1.3549
934492	AD1-073 E	0.6980
934561	AD1-081 C	1.5780
934562	AD1-081 E	0.8129
935031	AD1-136 C	0.5691
935032	AD1-136 E	0.4848
935041	AD1-140 C O1	11.5264
935042	AD1-140 E O1	9.5291
936251	AD2-031 C O1	2.4065
936252	AD2-031 E O1	3.9264
936381	AD2-048 C	3.3665
936382	AD2-048 E	1.6797
938051	AE1-007 C	0.8892
938052	AE1-007 E	1.4507
938271	AE1-040 C O1	4.0620
938272	AE1-040 E O1	2.0439
938921	AE1-120	4.5751
939141	AE1-144 C O1	6.9240
939142	AE1-144 E O1	3.4361
940531	AE2-038 C O1	4.6189
940532	AE2-038 E O1	2.2879
941411	AE2-138 C	14.2019
941412	AE2-138 E	5.2528
941511	AE2-148 C	184.4227
941512	AE2-148 E	83.4149
941981	AE2-210 C O1	4.8936
941982	AE2-210 E O1	1.8407
942051	AE2-217 C	9.8015
942052	AE2-217 E	6.5343
942061	AE2-218 C	10.6174
942062	AE2-218 E	7.2118
942091	AE2-221 C	30.1050
942092	AE2-221 E	20.0700
942521	AE2-267 C O1	1.4378
942522	AE2-267 E O1	0.8888
942621	AE2-278 C	6.7842
942622	AE2-278 E	4.5253
942951	AE2-315	3.0392
942981	AE2-320 C O1	24.5041
942982	AE2-320 E O1	12.1239
943111	AE2-339 C	1.8424
943112	AE2-339 E	0.9075
943191	AE2-319 C O1	24.5041
943192	AE2-319 E O1	12.1239
943201	AE2-318 C	6.6168

Bus #	Bus	MW Impact
943202	AE2-318 E	3.2296
943771	AF1-045	2.7241
943943	AF1-062 BAT	20.5100
944521	AF1-117 C	52.2154
944522	AF1-117 E	16.0847
944621	AF1-127 C O1	2.0938
944622	AF1-127 E O1	1.0313
944941	AF1-159	0.7384
945631	AF1-228 C	45.6007
945632	AF1-228 E	30.4005
945681	AF1-233 C O1	6.9168
945682	AF1-233 E O1	3.4171
945821	**AF1-247 C (Withdrawn : 01/27/2020)**	**1.4378**
945822	**AF1-247 E (Withdrawn : 01/27/2020)**	**0.8888**
945841	AF1-249 C	0.6205
945842	AF1-249 E	0.2920
945861	AF1-251 C	5.1973
945862	AF1-251 E	3.4649
945911	AF1-256 C	2.2292
945912	AF1-256 E	1.4861
946171	AF1-282 C	9.4590
946172	AF1-282 E	6.3060
946181	AF1-283 C	12.2967
946182	AF1-283 E	8.1978
946511	AF1-315 C O1	1.8917
946512	AF1-315 E O1	1.2611
LGEE	LGEE	3.2216
CPLE	CPLE	0.2156
WEC	WEC	0.7349
CBM-W2	CBM-W2	24.0458
NY	NY	0.9727
CBM-W1	CBM-W1	22.6681
TVA	TVA	3.5112
O-066	O-066	11.6256
CBM-S2	CBM-S2	4.3870
CBM-S1	CBM-S1	26.3353
G-007	G-007	1.7919
MEC	MEC	4.0472

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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
43551625	243453	05BEATTY	AEP	244022	05COLE	AEP	1	AEP_P4_#3195_05BEATTY 345_304E	breaker	1203.0	120.36	121.09	DC	19.47

Bus #	Bus	MW Impact
247964	Y1-063 BAT	0.3062
250164	08BKJDB1	0.1221
250165	08BKJDB2	0.1221
251827	WILLYESP	0.3864
251828	CLNTESP1	0.4043
251829	CLNTESP2	0.2696
253077	**09STUART (Deativation : 09/30/17)**	**170.8071**
253110	09ADKINS	25.3067
253261	09MON D	0.2050
902531	**W2-040 C (Withdrawn : 01/23/2020)**	**0.7288**
902532	**W2-040 E (Withdrawn : 01/23/2020)**	**1.1891**
904722	V4-073 E	0.1611
913222	Y1-054 E	1.2662
918802	AA1-099 E	0.2696
923522	AB1-169 C OP	109.8438
925242	**AB2-178 E (Withdrawn : 12/10/2019)**	**1.2092**
925921	AC1-068 C	10.4859
925922	AC1-068 E	4.9037
925931	AC1-069 C	10.4859
925932	AC1-069 E	4.9037
925981	AC1-074 C O1	3.4396
925982	AC1-074 E O1	1.4741
926011	AC1-078 C O1	4.7584
926012	AC1-078 E O1	7.9307
926061	AC1-085 C	20.0108
926062	AC1-085 E	32.6492
926101	AC1-089 C O1	3.6623
926102	AC1-089 E O1	5.9754
926791	AC1-165 C	10.3626
926792	AC1-165 E	5.0271
926801	AC1-166 C	10.3626
926802	AC1-166 E	5.0271
926951	AC1-182	1.4999
930062	AB1-014 E	6.7608
932381	AC2-055 C	1.7366
932382	AC2-055 E	2.8334
932421	AC2-060 C	6.1575
932422	AC2-060 E	3.4636
932431	AC2-061 C	3.7241
932432	AC2-061 E	3.7754
932461	AC2-066 C	2.4862
932462	AC2-066 E	4.0565

Bus #	Bus	MW Impact
932481	AC2-068 C	2.4559
932482	AC2-068 E	4.0221
932551	AC2-075 C	0.8169
932552	AC2-075 E	0.4115
932651	**AC2-087 C O1 (Withdrawn : 01/15/2020)**	**4.5604**
932652	**AC2-087 E O1 (Withdrawn : 01/15/2020)**	**3.6176**
932661	AC2-088 C O1	3.4190
932662	AC2-088 E O1	2.8136
934491	AD1-073 C	1.2700
934492	AD1-073 E	0.6542
934561	AD1-081 C	0.9517
934562	AD1-081 E	0.4903
935031	AD1-136 C	0.4808
935032	AD1-136 E	0.4096
935041	AD1-140 C O1	8.3962
935042	AD1-140 E O1	6.9414
936251	AD2-031 C O1	2.3877
936252	AD2-031 E O1	3.8958
936381	AD2-048 C	2.8334
936382	AD2-048 E	1.4137
938051	AE1-007 C	0.7043
938052	AE1-007 E	1.1492
938271	AE1-040 C O1	4.3077
938272	AE1-040 E O1	2.1675
938921	AE1-120	3.8384
939141	AE1-144 C O1	5.8769
939142	AE1-144 E O1	2.9165
940531	AE2-038 C O1	3.9204
940532	AE2-038 E O1	1.9419
941411	AE2-138 C	11.9578
941412	AE2-138 E	4.4227
941511	AE2-148 C	154.4305
941512	AE2-148 E	69.8494
941981	AE2-210 C O1	4.1203
941982	AE2-210 E O1	1.5498
942061	AE2-218 C	7.9874
942062	AE2-218 E	5.4254
942091	AE2-221 C	24.9318
942092	AE2-221 E	16.6212
942521	AE2-267 C O1	1.1814
942522	AE2-267 E O1	0.7303
942951	AE2-315	2.4419
942981	AE2-320 C O1	20.6326
942982	AE2-320 E O1	10.2084
943191	AE2-319 C O1	20.6326
943192	AE2-319 E O1	10.2084
943201	AE2-318 C	5.5321
943202	AE2-318 E	2.7002
943771	AF1-045	2.2775
944521	AF1-117 C	43.9679
944522	AF1-117 E	13.5441
944621	AF1-127 C O1	1.7620

Bus #	Bus	MW Impact
944622	AF1-127 E O1	0.8678
944941	AF1-159	1.3824
945631	AF1-228 C	38.2221
945632	AF1-228 E	25.4814
945681	AF1-233 C O1	5.8720
945682	AF1-233 E O1	2.9009
945821	**AF1-247 C (Withdrawn : 01/27/2020)**	**1.1814**
945822	**AF1-247 E (Withdrawn : 01/27/2020)**	**0.7303**
945841	AF1-249 C	0.5126
945842	AF1-249 E	0.2412
945861	AF1-251 C	4.3749
945862	AF1-251 E	2.9166
945911	AF1-256 C	1.8921
945912	AF1-256 E	1.2614
946102	AF1-275 BAT	18.6700
946171	AF1-282 C	7.8990
946172	AF1-282 E	5.2660
946181	AF1-283 C	10.2687
946182	AF1-283 E	6.8458
946511	AF1-315 C O1	1.5829
946512	AF1-315 E O1	1.0553
LGEE	LGEE	2.6157
CPLE	CPLE	0.2514
WEC	WEC	0.4158
CBM-W2	CBM-W2	17.8624
NY	NY	0.7250
CBM-W1	CBM-W1	11.5217
TVA	TVA	2.7944
O-066	O-066	8.6486
CBM-S2	CBM-S2	4.1443
CBM-S1	CBM-S1	21.1040
G-007	G-007	1.3322
MEC	MEC	2.6028

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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
43551671	243454	05BIXBY	AEP	243459	05KIRK	AEP	1	AEP_P4_#3196_05BEATTY 345_302E	breaker	1409.0	113.14	113.84	DC	21.83

Bus #	Bus	MW Impact
250164	08BKJDB1	0.1401
250165	08BKJDB2	0.1401
251827	WILLYESP	0.4269
251828	CLNTESP1	0.4890
251829	CLNTESP2	0.3260
253077	**09STUART (Deativation : 09/30/17)**	**183.9360**
253110	09ADKINS	20.9360
902531	**W2-040 C (Withdrawn : 01/23/2020)**	**0.7175**
902532	**W2-040 E (Withdrawn : 01/23/2020)**	**1.1707**
904722	V4-073 E	0.1565
913222	Y1-054 E	1.4170
918802	AA1-099 E	0.3260
923522	AB1-169 C OP	118.2868
924351	AB2-083 C O1	4.8226
924352	AB2-083 E O1	2.2694
924371	AB2-085 C O1	5.1516
924372	AB2-085 E O1	2.4243
925242	**AB2-178 E (Withdrawn : 12/10/2019)**	**1.3870**
925341	AC1-001 C O1	9.6451
925342	AC1-001 E O1	4.5389
925921	AC1-068 C	9.0239
925922	AC1-068 E	4.2200
925931	AC1-069 C	9.0239
925932	AC1-069 E	4.2200
925981	AC1-074 C O1	3.9170
925982	AC1-074 E O1	1.6787
926011	AC1-078 C O1	6.5558
926012	AC1-078 E O1	10.9264
926061	AC1-085 C	20.2099
926062	AC1-085 E	32.9741
926101	AC1-089 C O1	4.7127
926102	AC1-089 E O1	7.6892
926791	AC1-165 C	8.9178
926792	AC1-165 E	4.3262
926801	AC1-166 C	8.9178
926802	AC1-166 E	4.3262
926951	AC1-182	1.6402
930062	AB1-014 E	7.2522
932201	AC2-029 C	4.9527
932202	AC2-029 E	8.0806
932381	AC2-055 C	3.1871
932382	AC2-055 E	5.2000

Bus #	Bus	MW Impact
932411	AC2-059 C	13.0337
932412	AC2-059 E	13.4508
932421	AC2-060 C	11.3005
932422	AC2-060 E	6.3565
932431	AC2-061 C	4.8452
932432	AC2-061 E	4.9119
932451	**AC2-064 C (Withdrawn : 12/09/2019)**	**5.1413**
932452	**AC2-064 E (Withdrawn : 12/09/2019)**	**3.4275**
932461	AC2-066 C	2.6669
932462	AC2-066 E	4.3513
932481	AC2-068 C	2.4113
932482	AC2-068 E	3.9491
932551	AC2-075 C	0.9303
932552	AC2-075 E	0.4686
932651	**AC2-087 C O1 (Withdrawn : 01/15/2020)**	**8.3694**
932652	**AC2-087 E O1 (Withdrawn : 01/15/2020)**	**6.6390**
932661	AC2-088 C O1	3.7164
932662	AC2-088 E O1	3.0583
934481	AD1-072 C	2.8633
934482	AD1-072 E	1.3075
934491	AD1-073 C	2.3307
934492	AD1-073 E	1.2007
934561	AD1-081 C	1.3112
934562	AD1-081 E	0.6755
935031	AD1-136 C	0.5226
935032	AD1-136 E	0.4452
935041	AD1-140 C O1	8.4190
935042	AD1-140 E O1	6.9602
935051	AD1-141 C O1	2.2080
935052	AD1-141 E O1	1.4720
936111	AD2-016 C	13.0337
936112	AD2-016 E	13.4508
936251	AD2-031 C O1	2.5846
936252	AD2-031 E O1	4.2169
936381	AD2-048 C	3.2494
936382	AD2-048 E	1.6212
937231	AD2-162 C	14.8845
937232	AD2-162 E	7.2981
938051	AE1-007 C	0.6915
938052	AE1-007 E	1.1283
938271	AE1-040 C O1	5.7781
938272	AE1-040 E O1	2.9073
938921	AE1-120	4.1174
939141	AE1-144 C O1	6.5927
939142	AE1-144 E O1	3.2717
940531	AE2-038 C O1	4.3979
940532	AE2-038 E O1	2.1784
941411	AE2-138 C	13.5130
941412	AE2-138 E	4.9980
941511	AE2-148 C	126.1070
941512	AE2-148 E	57.0386
941521	AE2-149 C	100.8623

Bus #	Bus	MW Impact
941522	AE2-149 E	37.5897
941981	AE2-210 C O1	4.6562
941982	AE2-210 E O1	1.7514
942051	AE2-217 C	7.0365
942052	AE2-217 E	4.6910
942061	AE2-218 C	7.8387
942062	AE2-218 E	5.3244
942091	AE2-221 C	24.4944
942092	AE2-221 E	16.3296
942521	AE2-267 C O1	1.2694
942522	AE2-267 E O1	0.7846
942831	AE2-302 C O1	1.4413
942832	AE2-302 E O1	0.9609
942951	AE2-315	2.3734
942981	AE2-320 C O1	17.7559
942982	AE2-320 E O1	8.7851
943041	AE2-327 C	6.3220
943042	AE2-327 E	4.2046
943111	AE2-339 C	1.7702
943112	AE2-339 E	0.8719
943191	AE2-319 C O1	17.7559
943192	AE2-319 E O1	8.7851
943201	AE2-318 C	5.9765
943202	AE2-318 E	2.9171
943771	AF1-045	2.4605
943943	AF1-062 BAT	43.2400
944521	AF1-117 C	37.8993
944522	AF1-117 E	11.6747
944621	AF1-127 C O1	1.9955
944622	AF1-127 E O1	0.9829
944941	AF1-159	1.4963
945631	AF1-228 C	31.0620
945632	AF1-228 E	20.7080
945681	AF1-233 C O1	6.5824
945682	AF1-233 E O1	3.2518
945821	**AF1-247 C (Withdrawn : 01/27/2020)**	**1.2694**
945822	**AF1-247 E (Withdrawn : 01/27/2020)**	**0.7846**
945841	AF1-249 C	0.5606
945842	AF1-249 E	0.2638
945861	AF1-251 C	4.9494
945862	AF1-251 E	3.2996
945911	AF1-256 C	2.1168
945912	AF1-256 E	1.4112
946171	AF1-282 C	7.9776
946172	AF1-282 E	5.3184
946181	AF1-283 C	10.3709
946182	AF1-283 E	6.9139
946441	AF1-308 C O1	1.8690
946442	AF1-308 E O1	1.2460
946511	AF1-315 C O1	1.7095
946512	AF1-315 E O1	1.1397
LGEE	LGEE	3.1788

Bus #	Bus	MW Impact
CPLE	CPLE	0.6211
WEC	WEC	0.5906
CBM-W2	CBM-W2	24.2014
NY	NY	0.9545
CBM-W1	CBM-W1	19.4906
TVA	TVA	3.9746
O-066	O-066	11.4240
CBM-S2	CBM-S2	8.0920
CBM-S1	CBM-S1	28.5164
G-007	G-007	1.7597
MEC	MEC	3.6293

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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
43928952	246800		AEP	247034	05EMERSS	AEP	1	DAY_P734541 34553	tower	185.0	103.09	108.11	DC	20.63

Bus #	Bus	MW Impact
251831	Z1-080 BAT	0.5186
918802	AA1-099 E	-0.2939
918803	AA1-099 BAT	0.3457
925981	AC1-074 C O1	2.6670
925982	AC1-074 E O1	1.1430
932551	AC2-075 C	0.6334
932552	AC2-075 E	0.3191
936381	AD2-048 C	3.0966
936382	AD2-048 E	1.5450
939141	AE1-144 C O1	6.3793
939142	AE1-144 E O1	3.1658
940531	AE2-038 C O1	4.2556
940532	AE2-038 E O1	2.1079
941411	AE2-138 C	8.9377
941412	AE2-138 E	3.3057
941981	AE2-210 C O1	3.0797
941982	AE2-210 E O1	1.1584
943111	AE2-339 C	1.1504
943112	AE2-339 E	0.5666
944621	AF1-127 C O1	1.3160
944622	AF1-127 E O1	0.6482
945681	AF1-233 C O1	6.2207
945682	AF1-233 E O1	3.0732
945861	AF1-251 C	3.2688
945862	AF1-251 E	2.1792
945911	AF1-256 C	1.9773
945912	AF1-256 E	1.3182
LGEE	LGEE	0.9231
CPLE	CPLE	0.1376
WEC	WEC	0.0617
CBM-W2	CBM-W2	4.4472
NY	NY	0.0824
CBM-W1	CBM-W1	1.7264
TVA	TVA	1.0108
O-066	O-066	0.9341
CBM-S2	CBM-S2	1.7860
CBM-S1	CBM-S1	7.5743
G-007	G-007	0.1435
MADISON	MADISON	1.9212
MEC	MEC	0.5244

16.9 Index 9

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
43928856	246946	05WLDCAT	AEP	243019	05HILLSB	AEP	1	DAY_P734541 34553	tower	185.0	155.83	160.86	DC	20.63

Bus #	Bus	MW Impact
251831	Z1-080 BAT	0.5186
918802	AA1-099 E	-0.2939
918803	AA1-099 BAT	0.3457
925981	AC1-074 C O1	2.6670
925982	AC1-074 E O1	1.1430
926101	AC1-089 C O1	40.2705
926102	AC1-089 E O1	65.7045
932551	AC2-075 C	0.6334
932552	AC2-075 E	0.3191
936381	AD2-048 C	3.0966
936382	AD2-048 E	1.5450
939141	AE1-144 C O1	6.3793
939142	AE1-144 E O1	3.1658
940531	AE2-038 C O1	4.2556
940532	AE2-038 E O1	2.1079
941411	AE2-138 C	8.9377
941412	AE2-138 E	3.3057
941981	AE2-210 C O1	3.0797
941982	AE2-210 E O1	1.1584
943111	AE2-339 C	1.1504
943112	AE2-339 E	0.5666
944621	AF1-127 C O1	1.3160
944622	AF1-127 E O1	0.6482
945681	AF1-233 C O1	6.2207
945682	AF1-233 E O1	3.0732
945861	AF1-251 C	3.2688
945862	AF1-251 E	2.1792
945911	AF1-256 C	1.9773
945912	AF1-256 E	1.3182
LGEE	LGEE	0.9231
CPLE	CPLE	0.1376
WEC	WEC	0.0617
CBM-W2	CBM-W2	4.4472
NY	NY	0.0824
CBM-W1	CBM-W1	1.7264
TVA	TVA	1.0108
O-066	O-066	0.9341
CBM-S2	CBM-S2	1.7860
CBM-S1	CBM-S1	7.5743
G-007	G-007	0.1435
MADISON	MADISON	1.9212
MEC	MEC	0.5244

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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
43928953	247034	05EMERSS	AEP	246946	05WLDCAT	AEP	1	DAY_P734541 34553	tower	185.0	101.85	106.87	DC	20.63

Bus #	Bus	MW Impact
251831	Z1-080 BAT	0.5186
918802	AA1-099 E	-0.2939
918803	AA1-099 BAT	0.3457
925981	AC1-074 C O1	2.6670
925982	AC1-074 E O1	1.1430
932551	AC2-075 C	0.6334
932552	AC2-075 E	0.3191
936381	AD2-048 C	3.0966
936382	AD2-048 E	1.5450
939141	AE1-144 C O1	6.3793
939142	AE1-144 E O1	3.1658
940531	AE2-038 C O1	4.2556
940532	AE2-038 E O1	2.1079
941411	AE2-138 C	8.9377
941412	AE2-138 E	3.3057
941981	AE2-210 C O1	3.0797
941982	AE2-210 E O1	1.1584
943111	AE2-339 C	1.1504
943112	AE2-339 E	0.5666
944621	AF1-127 C O1	1.3160
944622	AF1-127 E O1	0.6482
945681	AF1-233 C O1	6.2207
945682	AF1-233 E O1	3.0732
945861	AF1-251 C	3.2688
945862	AF1-251 E	2.1792
945911	AF1-256 C	1.9773
945912	AF1-256 E	1.3182
LGEE	LGEE	0.9231
CPLE	CPLE	0.1376
WEC	WEC	0.0617
CBM-W2	CBM-W2	4.4472
NY	NY	0.0824
CBM-W1	CBM-W1	1.7264
TVA	TVA	1.0108
O-066	O-066	0.9341
CBM-S2	CBM-S2	1.7860
CBM-S1	CBM-S1	7.5743
G-007	G-007	0.1435
MADISON	MADISON	1.9212
MEC	MEC	0.5244

16.11 Index 11

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
41039754	250054	08LONGBR	DEO&K	250077	08MTZION	DEO&K	1	DAY_P734541 34553	tower	284.0	104.62	113.31	DC	24.61

Bus #	Bus	MW Impact
342957	1SPURLK1G	5.1535
342960	1SPURLK2G	8.0926
342963	1SPURLK3G	4.2526
342966	1SPURLK4G	4.2526
925981	AC1-074 C O1	9.2562
925982	AC1-074 E O1	3.9670
932551	AC2-075 C	2.1984
932552	AC2-075 E	1.1074
936381	AD2-048 C	6.0729
936382	AD2-048 E	3.0299
936571	AD2-072 C O1	2.9465
936572	AD2-072 E O1	1.4447
939141	AE1-144 C O1	8.7899
939142	AE1-144 E O1	4.3621
940531	AE2-038 C O1	5.8636
940532	AE2-038 E O1	2.9044
941411	AE2-138 C	14.2325
941412	AE2-138 E	5.2641
941981	AE2-210 C O1	4.9041
941982	AE2-210 E O1	1.8447
942411	AE2-254 C O1	1.4096
942412	AE2-254 E O1	0.9398
942591	AE2-275 C O1	4.0264
942592	AE2-275 E O1	1.5145
942891	AE2-308 C O1	6.9274
942892	AE2-308 E O1	2.5191
943111	AE2-339 C	2.0999
943112	AE2-339 E	1.0343
944211	AF1-089 C O1	1.5157
944212	AF1-089 E O1	0.4638
944621	AF1-127 C O1	2.1479
944622	AF1-127 E O1	1.0579
945541	AF1-219 C O1	0.6926
945542	AF1-219 E O1	0.2248
945681	AF1-233 C O1	16.4726
945682	AF1-233 E O1	8.1379
945861	AF1-251 C	5.2663
945862	AF1-251 E	3.5109
945911	AF1-256 C	5.3174
945912	AF1-256 E	3.5450
946021	AF1-267 C O1	1.1808
946022	AF1-267 E O1	0.5425

Bus #	Bus	MW Impact
LGEE	LGEE	1.7069
CPLE	CPLE	0.2792
WEC	WEC	0.0350
CBM-W2	CBM-W2	6.2080
NY	NY	0.0735
CBM-W1	CBM-W1	0.6755
TVA	TVA	1.6156
O-066	O-066	0.7325
CBM-S2	CBM-S2	3.3062
CBM-S1	CBM-S1	12.7459
G-007	G-007	0.1123
MADISON	MADISON	3.7740
MEC	MEC	0.5673

16.12 Index 12

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
42774575	253014	09CLINTO	DAY	253027	09GREENE	DAY	1	DAY_P734569 34598 34524	tower	1374.0	108.84	109.49	DC	19.74

Bus #	Bus	MW Impact
250166	HLCRST AB114	0.8140
251830	BIOENGRY	0.0779
253077	**09STUART (Deativation : 09/30/17)**	**250.2975**
342957	1SPURLK1G	4.1980
342960	1SPURLK2G	7.8641
342963	1SPURLK3G	4.1325
342966	1SPURLK4G	4.1325
923522	AB1-169 C OP	160.9630
925981	AC1-074 C O1	2.9755
925982	AC1-074 E O1	1.2752
926061	AC1-085 C	59.0870
926062	AC1-085 E	96.4050
926951	AC1-182	0.9739
927181	AC1-212 C	-0.1251
927182	AC1-212 E	-1.1848
927183	AC1-212 BAT	1.5411
930062	AB1-014 E	9.5147
932381	AC2-055 C	1.2064
932382	AC2-055 E	1.9683
932421	AC2-060 C	4.2775
932422	AC2-060 E	2.4061
932461	AC2-066 C	3.4989
932462	AC2-066 E	5.7088
932481	AC2-068 C	-2.6203
932482	AC2-068 E	-4.2914
932551	AC2-075 C	0.7067
932552	AC2-075 E	0.3560
932651	**AC2-087 C O1 (Withdrawn : 01/15/2020)**	**3.1680**
932652	**AC2-087 E O1 (Withdrawn : 01/15/2020)**	**2.5130**
932661	AC2-088 C O1	4.4625
932662	AC2-088 E O1	3.6722
934491	AD1-073 C	0.8822
934492	AD1-073 E	0.4545
935031	AD1-136 C	0.6275
935032	AD1-136 E	0.5346
936251	AD2-031 C O1	6.1741
936252	AD2-031 E O1	10.0735
936381	AD2-048 C	2.4277
936382	AD2-048 E	1.2113
938271	AE1-040 C O1	2.2216
938272	AE1-040 E O1	1.1178
938921	AE1-120	5.4019

Bus #	Bus	MW Impact
939141	AE1-144 C O1	5.9260
939142	AE1-144 E O1	2.9408
940531	AE2-038 C O1	3.9531
940532	AE2-038 E O1	1.9581
941411	AE2-138 C	11.4512
941412	AE2-138 E	4.2354
941981	AE2-210 C O1	3.9458
941982	AE2-210 E O1	1.4842
942091	AE2-221 C	91.0746
942092	AE2-221 E	60.7164
942591	AE2-275 C O1	2.9957
942592	AE2-275 E O1	1.1268
942891	AE2-308 C O1	5.0275
942892	AE2-308 E O1	1.8282
943111	AE2-339 C	1.3843
943112	AE2-339 E	0.6818
943201	AE2-318 C	4.7844
943202	AE2-318 E	2.3352
943771	AF1-045	1.9697
943863	AF1-054 BAT	3.1424
944521	AF1-117 C	3.7203
944522	AF1-117 E	1.1460
944621	AF1-127 C O1	1.6685
944622	AF1-127 E O1	0.8218
944941	AF1-159	3.5745
945681	AF1-233 C O1	5.9527
945682	AF1-233 E O1	2.9408
945861	AF1-251 C	4.1680
945862	AF1-251 E	2.7786
945911	AF1-256 C	1.9248
945912	AF1-256 E	1.2832
946021	AF1-267 C O1	0.8829
946022	AF1-267 E O1	0.4057
946171	AF1-282 C	23.3238
946172	AF1-282 E	15.5492
946181	AF1-283 C	30.3209
946182	AF1-283 E	20.2140
946511	AF1-315 C O1	1.4244
946512	AF1-315 E O1	0.9496
LGEE	LGEE	1.2945
CPLE	CPLE	0.3903
WEC	WEC	0.0180
CBM-W2	CBM-W2	6.9943
NY	NY	0.1781
TVA	TVA	1.6436
O-066	O-066	1.9354
CBM-S2	CBM-S2	4.3061
CBM-S1	CBM-S1	11.7320
G-007	G-007	0.2954
MEC	MEC	0.5848

16.13 Index 13

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
41039741	253038	09KILLEN	DAY	242938	05MARQUI	AEP	1	DAY_P7_34506 34542_1-A	tower	1372.0	103.4	104.64	DC	37.77

Bus #	Bus	MW Impact
250164	08BKJDB1	0.1315
250165	08BKJDB2	0.1315
251827	WILLYESP	0.4460
251828	CLNTESP1	0.3871
251829	CLNTESP2	0.2581
253077	**09STUART (Deativation : 09/30/17)**	**461.4416**
902531	**W2-040 C (Withdrawn : 01/23/2020)**	**0.5727**
902532	**W2-040 E (Withdrawn : 01/23/2020)**	**0.9344**
904722	V4-073 E	0.1255
913222	Y1-054 E	1.4751
918802	AA1-099 E	0.2581
923522	AB1-169 C OP	296.7470
925242	**AB2-178 E (Withdrawn : 12/10/2019)**	**1.3020**
925921	AC1-068 C	6.6522
925922	AC1-068 E	3.1109
925931	AC1-069 C	6.6522
925932	AC1-069 E	3.1109
925981	AC1-074 C O1	6.0171
925982	AC1-074 E O1	2.5788
926061	AC1-085 C	26.2741
926062	AC1-085 E	42.8683
926101	AC1-089 C O1	3.6846
926102	AC1-089 E O1	6.0118
926791	AC1-165 C	6.5739
926792	AC1-165 E	3.1891
926801	AC1-166 C	6.5739
926802	AC1-166 E	3.1891
926951	AC1-182	2.3555
930062	AB1-014 E	11.3792
932461	AC2-066 C	4.1846
932462	AC2-066 E	6.8275
932481	AC2-068 C	1.9444
932482	AC2-068 E	3.1843
932551	AC2-075 C	1.4291
932552	AC2-075 E	0.7199
932661	AC2-088 C O1	6.3233
932662	AC2-088 E O1	5.2036
935031	AD1-136 C	0.8892
935032	AD1-136 E	0.7575
935041	AD1-140 C O1	6.0722
935042	AD1-140 E O1	5.0201
936251	AD2-031 C O1	1.9159

Bus #	Bus	MW Impact
936252	AD2-031 E O1	3.1259
936381	AD2-048 C	4.8805
936382	AD2-048 E	2.4350
936571	AD2-072 C O1	4.2702
936572	AD2-072 E O1	2.0937
938051	AE1-007 C	0.5576
938052	AE1-007 E	0.9098
938271	AE1-040 C O1	2.1426
938272	AE1-040 E O1	1.0781
938921	AE1-120	6.4605
939141	AE1-144 C O1	11.3551
939142	AE1-144 E O1	5.6351
940531	AE2-038 C O1	7.5748
940532	AE2-038 E O1	3.7520
941411	AE2-138 C	22.4007
941412	AE2-138 E	8.2852
941511	AE2-148 C	19.2747
941512	AE2-148 E	8.7180
941981	AE2-210 C O1	7.7187
941982	AE2-210 E O1	2.9034
942061	AE2-218 C	6.7476
942062	AE2-218 E	4.5833
942091	AE2-221 C	26.1997
942092	AE2-221 E	17.4665
942411	AE2-254 C O1	2.0288
942412	AE2-254 E O1	1.3525
942521	AE2-267 C O1	1.2986
942522	AE2-267 E O1	0.8027
942591	AE2-275 C O1	5.8970
942592	AE2-275 E O1	2.2181
942891	AE2-308 C O1	9.9185
942892	AE2-308 E O1	3.6067
942951	AE2-315	1.9022
942981	AE2-320 C O1	13.0892
942982	AE2-320 E O1	6.4761
943111	AE2-339 C	2.7505
943112	AE2-339 E	1.3547
943191	AE2-319 C O1	13.0892
943192	AE2-319 E O1	6.4761
943201	AE2-318 C	8.4800
943202	AE2-318 E	4.1391
943771	AF1-045	3.4912
944211	AF1-089 C O1	1.6314
944212	AF1-089 E O1	0.4991
944521	AF1-117 C	39.4834
944522	AF1-117 E	12.1626
944621	AF1-127 C O1	3.2724
944622	AF1-127 E O1	1.6118
944941	AF1-159	0.5879
945541	AF1-219 C O1	1.0344
945542	AF1-219 E O1	0.3357
945631	AF1-228 C	4.5114

Bus #	Bus	MW Impact
945632	AF1-228 E	3.0076
945681	AF1-233 C O1	11.3885
945682	AF1-233 E O1	5.6262
945821	**AF1-247 C (Withdrawn : 01/27/2020)**	**1.2986**
945822	**AF1-247 E (Withdrawn : 01/27/2020)**	**0.8027**
945841	AF1-249 C	0.5690
945842	AF1-249 E	0.2678
945861	AF1-251 C	8.1629
945862	AF1-251 E	5.4419
945911	AF1-256 C	3.6862
945912	AF1-256 E	2.4575
946021	AF1-267 C O1	1.7305
946022	AF1-267 E O1	0.7951
946171	AF1-282 C	5.4968
946172	AF1-282 E	3.6645
946181	AF1-283 C	7.1459
946182	AF1-283 E	4.7639
946511	AF1-315 C O1	2.4671
946512	AF1-315 E O1	1.6447
LGEE	LGEE	3.2981
WEC	WEC	0.6505
CBM-W2	CBM-W2	19.9508
NY	NY	0.7405
CBM-W1	CBM-W1	21.7424
TVA	TVA	2.7216
O-066	O-066	9.1325
CBM-S1	CBM-S1	22.6376
G-007	G-007	1.4123
MEC	MEC	3.4624
CATAWBA	CATAWBA	0.0735

16.14 Index 14

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
42774539	253077	09STUART	DAY	253038	09KILLEN	DAY	1	DAY_P7_34506 34542_1-A	tower	1374.0	103.25	104.48	DC	37.77

Bus #	Bus	MW Impact
250164	08BKJDB1	0.1315
250165	08BKJDB2	0.1315
251827	WILLYESP	0.4460
251828	CLNTESP1	0.3871
251829	CLNTESP2	0.2581
253077	**09STUART (Deativation : 09/30/17)**	**461.4416**
902531	**W2-040 C (Withdrawn : 01/23/2020)**	**0.5727**
902532	**W2-040 E (Withdrawn : 01/23/2020)**	**0.9344**
904722	V4-073 E	0.1255
913222	Y1-054 E	1.4751
918802	AA1-099 E	0.2581
923522	AB1-169 C OP	296.7470
925242	**AB2-178 E (Withdrawn : 12/10/2019)**	**1.3020**
925921	AC1-068 C	6.6522
925922	AC1-068 E	3.1109
925931	AC1-069 C	6.6522
925932	AC1-069 E	3.1109
925981	AC1-074 C O1	6.0171
925982	AC1-074 E O1	2.5788
926061	AC1-085 C	26.2741
926062	AC1-085 E	42.8683
926101	AC1-089 C O1	3.6846
926102	AC1-089 E O1	6.0118
926791	AC1-165 C	6.5739
926792	AC1-165 E	3.1891
926801	AC1-166 C	6.5739
926802	AC1-166 E	3.1891
926951	AC1-182	2.3555
930062	AB1-014 E	11.3792
932461	AC2-066 C	4.1846
932462	AC2-066 E	6.8275
932481	AC2-068 C	1.9444
932482	AC2-068 E	3.1843
932551	AC2-075 C	1.4291
932552	AC2-075 E	0.7199
932661	AC2-088 C O1	6.3233
932662	AC2-088 E O1	5.2036
935031	AD1-136 C	0.8892
935032	AD1-136 E	0.7575
935041	AD1-140 C O1	6.0722
935042	AD1-140 E O1	5.0201
936251	AD2-031 C O1	1.9159

Bus #	Bus	MW Impact
936252	AD2-031 E O1	3.1259
936381	AD2-048 C	4.8805
936382	AD2-048 E	2.4350
936571	AD2-072 C O1	4.2702
936572	AD2-072 E O1	2.0937
938051	AE1-007 C	0.5576
938052	AE1-007 E	0.9098
938271	AE1-040 C O1	2.1426
938272	AE1-040 E O1	1.0781
938921	AE1-120	6.4605
939141	AE1-144 C O1	11.3551
939142	AE1-144 E O1	5.6351
940531	AE2-038 C O1	7.5748
940532	AE2-038 E O1	3.7520
941411	AE2-138 C	22.4007
941412	AE2-138 E	8.2852
941511	AE2-148 C	19.2747
941512	AE2-148 E	8.7180
941981	AE2-210 C O1	7.7187
941982	AE2-210 E O1	2.9034
942061	AE2-218 C	6.7476
942062	AE2-218 E	4.5833
942091	AE2-221 C	26.1997
942092	AE2-221 E	17.4665
942411	AE2-254 C O1	2.0288
942412	AE2-254 E O1	1.3525
942521	AE2-267 C O1	1.2986
942522	AE2-267 E O1	0.8027
942591	AE2-275 C O1	5.8970
942592	AE2-275 E O1	2.2181
942891	AE2-308 C O1	9.9185
942892	AE2-308 E O1	3.6067
942951	AE2-315	1.9022
942981	AE2-320 C O1	13.0892
942982	AE2-320 E O1	6.4761
943111	AE2-339 C	2.7505
943112	AE2-339 E	1.3547
943191	AE2-319 C O1	13.0892
943192	AE2-319 E O1	6.4761
943201	AE2-318 C	8.4800
943202	AE2-318 E	4.1391
943771	AF1-045	3.4912
944211	AF1-089 C O1	1.6314
944212	AF1-089 E O1	0.4991
944521	AF1-117 C	39.4834
944522	AF1-117 E	12.1626
944621	AF1-127 C O1	3.2724
944622	AF1-127 E O1	1.6118
944941	AF1-159	0.5879
945541	AF1-219 C O1	1.0344
945542	AF1-219 E O1	0.3357
945631	AF1-228 C	4.5114

Bus #	Bus	MW Impact
945632	AF1-228 E	3.0076
945681	AF1-233 C O1	11.3885
945682	AF1-233 E O1	5.6262
945821	**AF1-247 C (Withdrawn : 01/27/2020)**	**1.2986**
945822	**AF1-247 E (Withdrawn : 01/27/2020)**	**0.8027**
945841	AF1-249 C	0.5690
945842	AF1-249 E	0.2678
945861	AF1-251 C	8.1629
945862	AF1-251 E	5.4419
945911	AF1-256 C	3.6862
945912	AF1-256 E	2.4575
946021	AF1-267 C O1	1.7305
946022	AF1-267 E O1	0.7951
946171	AF1-282 C	5.4968
946172	AF1-282 E	3.6645
946181	AF1-283 C	7.1459
946182	AF1-283 E	4.7639
946511	AF1-315 C O1	2.4671
946512	AF1-315 E O1	1.6447
LGEE	LGEE	3.2981
WEC	WEC	0.6505
CBM-W2	CBM-W2	19.9508
NY	NY	0.7405
CBM-W1	CBM-W1	21.7424
TVA	TVA	2.7216
O-066	O-066	9.1325
CBM-S1	CBM-S1	22.6376
G-007	G-007	1.4123
MEC	MEC	3.4624
CATAWBA	CATAWBA	0.0735

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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
42246784	253100	09ATLNTA	DAY	253110	09ADKINS	DAY	1	AEP_P4_#6774_05MARQUI 345_D	breaker	1195.0	111.69	113.67	DC	23.71

Bus #	Bus	MW Impact
250166	HLCRST AB114	0.6783
251830	BIOENGRY	0.0784
253077	**09STUART (Deativation : 09/30/17)**	**282.4720**
342957	1SPURLK1G	5.0082
342960	1SPURLK2G	9.2771
342963	1SPURLK3G	4.8751
342966	1SPURLK4G	4.8751
923522	AB1-169 C OP	181.6540
925921	AC1-068 C	19.0737
925922	AC1-068 E	8.9197
925931	AC1-069 C	19.0737
925932	AC1-069 E	8.9197
926061	AC1-085 C	17.1927
926062	AC1-085 E	28.0513
926791	AC1-165 C	18.8493
926792	AC1-165 E	9.1441
926801	AC1-166 C	18.8493
926802	AC1-166 E	9.1441
926951	AC1-182	1.4159
930062	AB1-014 E	7.9283
932381	AC2-055 C	1.4318
932382	AC2-055 E	2.3360
932421	AC2-060 C	5.0766
932422	AC2-060 E	2.8556
932461	AC2-066 C	2.9156
932462	AC2-066 E	4.7570
932651	**AC2-087 C O1 (Withdrawn : 01/15/2020)**	**3.7599**
932652	**AC2-087 E O1 (Withdrawn : 01/15/2020)**	**2.9825**
932661	AC2-088 C O1	4.4959
932662	AC2-088 E O1	3.6997
934491	AD1-073 C	1.0471
934492	AD1-073 E	0.5394
935031	AD1-136 C	0.6322
935032	AD1-136 E	0.5386
938271	AE1-040 C O1	3.9465
938272	AE1-040 E O1	1.9858
938921	AE1-120	4.5012
939141	AE1-144 C O1	8.3889
939142	AE1-144 E O1	4.1631
940531	AE2-038 C O1	5.5961
940532	AE2-038 E O1	2.7719
941411	AE2-138 C	14.1486

Bus #	Bus	MW Impact
941412	AE2-138 E	5.2331
941981	AE2-210 C O1	4.8752
941982	AE2-210 E O1	1.8338
942091	AE2-221 C	13.4548
942092	AE2-221 E	8.9699
942981	AE2-320 C O1	37.5302
942982	AE2-320 E O1	18.5688
943191	AE2-319 C O1	37.5302
943192	AE2-319 E O1	18.5688
943201	AE2-318 C	5.0031
943202	AE2-318 E	2.4420
943771	AF1-045	2.0598
944521	AF1-117 C	83.3412
944522	AF1-117 E	25.6728
944621	AF1-127 C O1	2.0706
944622	AF1-127 E O1	1.0198
945681	AF1-233 C O1	15.8687
945682	AF1-233 E O1	7.8395
945861	AF1-251 C	5.1599
945862	AF1-251 E	3.4399
945911	AF1-256 C	5.1274
945912	AF1-256 E	3.4182
946171	AF1-282 C	6.7866
946172	AF1-282 E	4.5244
946181	AF1-283 C	8.8226
946182	AF1-283 E	5.8817
946511	AF1-315 C O1	1.4580
946512	AF1-315 E O1	0.9720
LGEE	LGEE	2.2341
CPLE	CPLE	0.3003
WEC	WEC	0.3676
CBM-W2	CBM-W2	15.1269
NY	NY	0.4568
CBM-W1	CBM-W1	10.6585
TVA	TVA	2.5438
O-066	O-066	5.4029
CBM-S2	CBM-S2	4.2194
CBM-S1	CBM-S1	18.8036
G-007	G-007	0.8320
MEC	MEC	2.2580

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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
41039687	253110	09ADKINS	DAY	243453	05BEATTY	AEP	1	DAY_P7_495	tower	1372.0	122.29	122.97	DC	20.66

Bus #	Bus	MW Impact
253077	**09STUART (Deativation : 09/30/17)**	**211.4734**
253110	09ADKINS	49.4595
923522	AB1-169 C OP	135.9957
925921	AC1-068 C	18.7459
925922	AC1-068 E	8.7665
925931	AC1-069 C	18.7459
925932	AC1-069 E	8.7665
926061	AC1-085 C	18.7921
926062	AC1-085 E	30.6609
926791	AC1-165 C	18.5254
926792	AC1-165 E	8.9870
926801	AC1-166 C	18.5254
926802	AC1-166 E	8.9870
930062	AB1-014 E	5.7627
932381	AC2-055 C	1.5076
932382	AC2-055 E	2.4597
932421	AC2-060 C	5.3453
932422	AC2-060 E	3.0068
932461	AC2-066 C	2.1192
932462	AC2-066 E	3.4576
932651	**AC2-087 C O1 (Withdrawn : 01/15/2020)**	**3.9589**
932652	**AC2-087 E O1 (Withdrawn : 01/15/2020)**	**3.1404**
932661	AC2-088 C O1	3.3103
932662	AC2-088 E O1	2.7241
934491	AD1-073 C	1.1025
934492	AD1-073 E	0.5679
935031	AD1-136 C	0.4655
935032	AD1-136 E	0.3966
936251	AD2-031 C O1	1.4141
936252	AD2-031 E O1	2.3072
938271	AE1-040 C O1	3.4222
938272	AE1-040 E O1	1.7219
938921	AE1-120	3.2718
939141	AE1-144 C O1	6.2123
939142	AE1-144 E O1	3.0829
940531	AE2-038 C O1	4.1441
940532	AE2-038 E O1	2.0527
942091	AE2-221 C	22.2538
942092	AE2-221 E	14.8359
942981	AE2-320 C O1	36.8853
942982	AE2-320 E O1	18.2497
943191	AE2-319 C O1	36.8853
943192	AE2-319 E O1	18.2497

Bus #	Bus	MW Impact
944521	AF1-117 C	81.3627
944522	AF1-117 E	25.0633
944941	AF1-159	0.4339
945681	AF1-233 C O1	6.2302
945682	AF1-233 E O1	3.0779
945911	AF1-256 C	2.0132
945912	AF1-256 E	1.3421
946171	AF1-282 C	3.9315
946172	AF1-282 E	2.6210
946181	AF1-283 C	5.1110
946182	AF1-283 E	3.4073
LGEE	LGEE	1.8227
CPLE	CPLE	0.2044
WEC	WEC	0.2035
CBM-W2	CBM-W2	11.2285
NY	NY	0.5336
CBM-W1	CBM-W1	4.2909
TVA	TVA	2.0076
O-066	O-066	6.2765
CBM-S2	CBM-S2	3.2137
CBM-S1	CBM-S1	15.0037
G-007	G-007	0.9672
MEC	MEC	1.4635

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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
43552225	324267	4KENTON	LGEE	246800		AEP	1	DAY_P734541 34553	tower	185.0	106.12	111.14	DC	20.63

Bus #	Bus	MW Impact
251831	Z1-080 BAT	0.5186
918802	AA1-099 E	-0.2939
918803	AA1-099 BAT	0.3457
925981	AC1-074 C O1	2.6670
925982	AC1-074 E O1	1.1430
932551	AC2-075 C	0.6334
932552	AC2-075 E	0.3191
936381	AD2-048 C	3.0966
936382	AD2-048 E	1.5450
939141	AE1-144 C O1	6.3793
939142	AE1-144 E O1	3.1658
940531	AE2-038 C O1	4.2556
940532	AE2-038 E O1	2.1079
941411	AE2-138 C	8.9377
941412	AE2-138 E	3.3057
941981	AE2-210 C O1	3.0797
941982	AE2-210 E O1	1.1584
943111	AE2-339 C	1.1504
943112	AE2-339 E	0.5666
944621	AF1-127 C O1	1.3160
944622	AF1-127 E O1	0.6482
945681	AF1-233 C O1	6.2207
945682	AF1-233 E O1	3.0732
945861	AF1-251 C	3.2688
945862	AF1-251 E	2.1792
945911	AF1-256 C	1.9773
945912	AF1-256 E	1.3182
LGEE	LGEE	0.9231
CPLE	CPLE	0.1376
WEC	WEC	0.0617
CBM-W2	CBM-W2	4.4472
NY	NY	0.0824
CBM-W1	CBM-W1	1.7264
TVA	TVA	1.0108
O-066	O-066	0.9341
CBM-S2	CBM-S2	1.7860
CBM-S1	CBM-S1	7.5743
G-007	G-007	0.1435
MADISON	MADISON	1.9212
MEC	MEC	0.5244

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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
41039730	342559	4BOONE CO	EKPC	250054	08LONGBR	DEO&K	1	DAY_P734541 34553	tower	284.0	111.94	120.64	DC	24.61

Bus #	Bus	MW Impact
342957	1SPURLK1G	5.1535
342960	1SPURLK2G	8.0926
342963	1SPURLK3G	4.2526
342966	1SPURLK4G	4.2526
925981	AC1-074 C O1	9.2562
925982	AC1-074 E O1	3.9670
932551	AC2-075 C	2.1984
932552	AC2-075 E	1.1074
936381	AD2-048 C	6.0729
936382	AD2-048 E	3.0299
936571	AD2-072 C O1	2.9465
936572	AD2-072 E O1	1.4447
939141	AE1-144 C O1	8.7899
939142	AE1-144 E O1	4.3621
940531	AE2-038 C O1	5.8636
940532	AE2-038 E O1	2.9044
941411	AE2-138 C	14.2325
941412	AE2-138 E	5.2641
941981	AE2-210 C O1	4.9041
941982	AE2-210 E O1	1.8447
942411	AE2-254 C O1	1.4096
942412	AE2-254 E O1	0.9398
942591	AE2-275 C O1	4.0264
942592	AE2-275 E O1	1.5145
942891	AE2-308 C O1	6.9274
942892	AE2-308 E O1	2.5191
943111	AE2-339 C	2.0999
943112	AE2-339 E	1.0343
944211	AF1-089 C O1	1.5157
944212	AF1-089 E O1	0.4638
944621	AF1-127 C O1	2.1479
944622	AF1-127 E O1	1.0579
945541	AF1-219 C O1	0.6926
945542	AF1-219 E O1	0.2248
945681	AF1-233 C O1	16.4726
945682	AF1-233 E O1	8.1379
945861	AF1-251 C	5.2663
945862	AF1-251 E	3.5109
945911	AF1-256 C	5.3174
945912	AF1-256 E	3.5450
946021	AF1-267 C O1	1.1808
946022	AF1-267 E O1	0.5425

Bus #	Bus	MW Impact
LGEE	LGEE	1.7069
CPLE	CPLE	0.2792
WEC	WEC	0.0350
CBM-W2	CBM-W2	6.2080
NY	NY	0.0735
CBM-W1	CBM-W1	0.6755
TVA	TVA	1.6156
O-066	O-066	0.7325
CBM-S2	CBM-S2	3.3062
CBM-S1	CBM-S1	12.7459
G-007	G-007	0.1123
MADISON	MADISON	3.7740
MEC	MEC	0.5673

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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
41039806	342661	4SPUR-KENT-R	EKPC	324267	4KENTON	LGEE	1	DAY_P734541 34553	tower	281.0	102.83	106.0	DC	19.46

Bus #	Bus	MW Impact
342957	1SPURLK1G	6.4835
342960	1SPURLK2G	9.4323
342963	1SPURLK3G	4.9566
342966	1SPURLK4G	4.9566
925981	AC1-074 C O1	2.4428
925982	AC1-074 E O1	1.0469
932551	AC2-075 C	0.5802
932552	AC2-075 E	0.2923
939141	AE1-144 C O1	5.2600
939142	AE1-144 E O1	2.6103
940531	AE2-038 C O1	3.5089
940532	AE2-038 E O1	1.7380
941411	AE2-138 C	11.1398
941412	AE2-138 E	4.1202
941981	AE2-210 C O1	3.8385
941982	AE2-210 E O1	1.4438
944621	AF1-127 C O1	1.5826
944622	AF1-127 E O1	0.7795
945681	AF1-233 C O1	5.8686
945682	AF1-233 E O1	2.8992
945861	AF1-251 C	4.0068
945862	AF1-251 E	2.6712
945911	AF1-256 C	2.0212
945912	AF1-256 E	1.3475
LGEE	LGEE	0.3206
CPLE	CPLE	0.0582
WEC	WEC	0.0038
CBM-W2	CBM-W2	2.0721
NY	NY	0.0841
TVA	TVA	0.6020
O-066	O-066	0.9744
CBM-S2	CBM-S2	0.9132
CBM-S1	CBM-S1	3.8766
G-007	G-007	0.1498
MADISON	MADISON	1.0786
MEC	MEC	0.1700

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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
41863140	342838	7SPURLOCK	EKPC	253077	09STUART	DAY	1	DEOK_P2-2_C1 SILVER GROVE 345 BUS	bus	1532.0	119.21	125.32	DC	93.19

Bus #	Bus	MW Impact
251968	08ZIMRHP	39.2669
251969	08ZIMRLP	21.5033
251970	08MELDL1	1.9892
251971	08MELDL2	1.9892
251972	08MELDL3	1.9946
342957	1SPURLK1G	20.1913
342960	1SPURLK2G	38.4191
342963	1SPURLK3G	20.1889
342966	1SPURLK4G	20.1889
925921	AC1-068 C	-3.5400
925922	AC1-068 E	-1.6555
925931	AC1-069 C	-3.5400
925932	AC1-069 E	-1.6555
925981	AC1-074 C O1	15.7063
925982	AC1-074 E O1	6.7313
926101	AC1-089 C O1	4.0790
926102	AC1-089 E O1	6.6552
926791	AC1-165 C	-3.4983
926792	AC1-165 E	-1.6971
926801	AC1-166 C	-3.4983
926802	AC1-166 E	-1.6971
926951	AC1-182	6.6980
932461	AC2-066 C	-3.1887
932462	AC2-066 E	-5.2027
932551	AC2-075 C	3.7303
932552	AC2-075 E	1.8791
936381	AD2-048 C	10.7895
936382	AD2-048 E	5.3832
936571	AD2-072 C O1	8.5203
936572	AD2-072 E O1	4.1776
936821	AD2-105 C O1	3.6360
936822	AD2-105 E O1	5.3196
936831	AD2-106 C O1	2.5615
936832	AD2-106 E O1	3.5374
936841	AD2-107 C O1	2.0318
936842	AD2-107 E O1	2.8059
939131	AE1-143 C	6.3754
939132	AE1-143 E	3.1579
939141	AE1-144 C O1	32.8515
939142	AE1-144 E O1	16.3029

Bus #	Bus	MW Impact
940531	AE2-038 C O1	21.9147
940532	AE2-038 E O1	10.8549
941411	AE2-138 C	63.0876
941412	AE2-138 E	23.3338
941961	AE2-208	2.1989
941981	AE2-210 C O1	21.7383
941982	AE2-210 E O1	8.1768
942411	AE2-254 C O1	4.2815
942412	AE2-254 E O1	2.8543
942591	AE2-275 C O1	13.4850
942592	AE2-275 E O1	5.0723
942891	AE2-308 C O1	22.6036
942892	AE2-308 E O1	8.2195
943111	AE2-339 C	7.4394
943112	AE2-339 E	3.6642
943701	AF1-038 C	1.6966
943702	AF1-038 E	1.1310
943772	AF1-045 BAT	4.6964
943821	AF1-050 C	1.5068
943822	AF1-050 E	1.0045
944151	AF1-083 C O1	1.5843
944152	AF1-083 E O1	1.0562
944211	AF1-089 C O1	2.4799
944212	AF1-089 E O1	0.7588
944511	AF1-116 C	3.7895
944512	AF1-116 E	2.5263
944621	AF1-127 C O1	17.2758
944622	AF1-127 E O1	8.5090
945541	AF1-219 C O1	2.0568
945542	AF1-219 E O1	0.6674
945681	AF1-233 C O1	62.3740
945682	AF1-233 E O1	30.8142
945861	AF1-251 C	43.2419
945862	AF1-251 E	28.8279
945911	AF1-256 C	20.2128
945912	AF1-256 E	13.4752
946021	AF1-267 C O1	3.9648
946022	AF1-267 E O1	1.8217
LGEE	LGEE	4.6422
CPLE	CPLE	0.4545
WEC	WEC	0.3597
LGE-0012019	LGE-0012019	6.2986
CBM-W2	CBM-W2	24.2260
NY	NY	0.7897
CBM-W1	CBM-W1	9.0572
TVA	TVA	5.1954
O-066	O-066	9.2400
CBM-S2	CBM-S2	7.3522
CBM-S1	CBM-S1	38.6212
G-007	G-007	1.4248
MADISON	MADISON	3.2780
MEC	MEC	2.9190

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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
42774566	926060	AC1-085 TAP	DAY	942090	AE2-221 TAP	DAY	1	DAY_P734569 34598 34524	tower	1374.0	108.9	109.58	DC	20.75

Bus #	Bus	MW Impact
250166	HLCRST AB114	0.8727
251830	BIOENGRY	0.0826
253077	**09STUART (Deativation : 09/30/17)**	**270.4985**
342957	1SPURLK1G	4.4622
342960	1SPURLK2G	8.4450
342963	1SPURLK3G	4.4377
342966	1SPURLK4G	4.4377
923522	AB1-169 C OP	173.9540
925981	AC1-074 C O1	3.1445
925982	AC1-074 E O1	1.3476
926061	AC1-085 C	65.1806
926062	AC1-085 E	106.3474
926951	AC1-182	1.0406
927181	AC1-212 C	-0.1208
927182	AC1-212 E	-1.1441
927183	AC1-212 BAT	1.4881
930062	AB1-014 E	10.2006
932461	AC2-066 C	3.7512
932462	AC2-066 E	6.1203
932481	AC2-068 C	-2.8280
932482	AC2-068 E	-4.6315
932551	AC2-075 C	0.7468
932552	AC2-075 E	0.3762
932661	AC2-088 C O1	4.7332
932662	AC2-088 E O1	3.8950
935031	AD1-136 C	0.6656
935032	AD1-136 E	0.5670
936381	AD2-048 C	2.5107
936382	AD2-048 E	1.2527
938921	AE1-120	5.7913
939141	AE1-144 C O1	6.2171
939142	AE1-144 E O1	3.0853
940531	AE2-038 C O1	4.1473
940532	AE2-038 E O1	2.0543
941411	AE2-138 C	12.2143
941412	AE2-138 E	4.5176
941981	AE2-210 C O1	4.2087
941982	AE2-210 E O1	1.5831
942591	AE2-275 C O1	3.1697
942592	AE2-275 E O1	1.1923
942891	AE2-308 C O1	5.3173
942892	AE2-308 E O1	1.9336

Bus #	Bus	MW Impact
943111	AE2-339 C	1.4695
943112	AE2-339 E	0.7238
943201	AE2-318 C	5.0460
943202	AE2-318 E	2.4629
943771	AF1-045	2.0774
943863	AF1-054 BAT	3.0940
944521	AF1-117 C	3.6452
944522	AF1-117 E	1.1229
944621	AF1-127 C O1	1.7784
944622	AF1-127 E O1	0.8759
945681	AF1-233 C O1	6.2553
945682	AF1-233 E O1	3.0903
945861	AF1-251 C	4.4439
945862	AF1-251 E	2.9626
945911	AF1-256 C	2.0255
945912	AF1-256 E	1.3503
946021	AF1-267 C O1	0.9341
946022	AF1-267 E O1	0.4292
946171	AF1-282 C	25.7292
946172	AF1-282 E	17.1528
946181	AF1-283 C	33.4480
946182	AF1-283 E	22.2986
946511	AF1-315 C O1	1.5052
946512	AF1-315 E O1	1.0035
LGEE	LGEE	1.3658
CPLE	CPLE	0.3890
WEC	WEC	0.0343
CBM-W2	CBM-W2	7.4693
NY	NY	0.1886
TVA	TVA	1.7178
O-066	O-066	2.0698
CBM-S2	CBM-S2	4.3408
CBM-S1	CBM-S1	12.3029
G-007	G-007	0.3172
MEC	MEC	0.6706

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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
42774500	942090	AE2-221 TAP	DAY	253014	09CLINTO	DAY	1	DAY_P734569 34598 34524	tower	1374.0	121.08	121.76	DC	20.75

Bus #	Bus	MW Impact
250166	HLCRST AB114	0.8727
251830	BIOENGRY	0.0826
253077	**09STUART (Deativation : 09/30/17)**	**270.4985**
342957	1SPURLK1G	4.4622
342960	1SPURLK2G	8.4450
342963	1SPURLK3G	4.4377
342966	1SPURLK4G	4.4377
923522	AB1-169 C OP	173.9540
925981	AC1-074 C O1	3.1445
925982	AC1-074 E O1	1.3476
926061	AC1-085 C	65.1806
926062	AC1-085 E	106.3474
926951	AC1-182	1.0406
927181	AC1-212 C	-0.1208
927182	AC1-212 E	-1.1441
927183	AC1-212 BAT	1.4881
930062	AB1-014 E	10.2006
932461	AC2-066 C	3.7512
932462	AC2-066 E	6.1203
932481	AC2-068 C	-2.8280
932482	AC2-068 E	-4.6315
932551	AC2-075 C	0.7468
932552	AC2-075 E	0.3762
932661	AC2-088 C O1	4.7332
932662	AC2-088 E O1	3.8950
935031	AD1-136 C	0.6656
935032	AD1-136 E	0.5670
936381	AD2-048 C	2.5107
936382	AD2-048 E	1.2527
938921	AE1-120	5.7913
939141	AE1-144 C O1	6.2171
939142	AE1-144 E O1	3.0853
940531	AE2-038 C O1	4.1473
940532	AE2-038 E O1	2.0543
941411	AE2-138 C	12.2143
941412	AE2-138 E	4.5176
941981	AE2-210 C O1	4.2087
941982	AE2-210 E O1	1.5831
942091	AE2-221 C	100.7514
942092	AE2-221 E	67.1676
942591	AE2-275 C O1	3.1697
942592	AE2-275 E O1	1.1923

Bus #	Bus	MW Impact
942891	AE2-308 C O1	5.3173
942892	AE2-308 E O1	1.9336
943111	AE2-339 C	1.4695
943112	AE2-339 E	0.7238
943201	AE2-318 C	5.0460
943202	AE2-318 E	2.4629
943771	AF1-045	2.0774
943863	AF1-054 BAT	3.0940
944521	AF1-117 C	3.6452
944522	AF1-117 E	1.1229
944621	AF1-127 C O1	1.7784
944622	AF1-127 E O1	0.8759
945681	AF1-233 C O1	6.2553
945682	AF1-233 E O1	3.0903
945861	AF1-251 C	4.4439
945862	AF1-251 E	2.9626
945911	AF1-256 C	2.0255
945912	AF1-256 E	1.3503
946021	AF1-267 C O1	0.9341
946022	AF1-267 E O1	0.4292
946171	AF1-282 C	25.7292
946172	AF1-282 E	17.1528
946181	AF1-283 C	33.4480
946182	AF1-283 E	22.2986
946511	AF1-315 C O1	1.5052
946512	AF1-315 E O1	1.0035
LGEE	LGEE	1.3658
CPLE	CPLE	0.3890
WEC	WEC	0.0343
CBM-W2	CBM-W2	7.4693
NY	NY	0.1886
TVA	TVA	1.7178
O-066	O-066	2.0698
CBM-S2	CBM-S2	4.3408
CBM-S1	CBM-S1	12.3029
G-007	G-007	0.3172
MEC	MEC	0.6706

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).

18 Contingency Descriptions

Contingency Name	Contingency Definition
Base Case	
DAY_P734569 34598 34524	CONTINGENCY 'DAY_P734569 34598 34524' OPEN BRANCH FROM BUS 249566 TO BUS 249578 CKT 1 / OPEN BRANCH FROM BUS 249566 TO BUS 253006 CKT 1 / 249566 08FOSTER 345 253006 09BATH 345 1 OPEN BRANCH FROM BUS 249566 TO BUS 253079 CKT 1 / 249566 08FOSTER 345 253079 09SUGRCK 345 1 END
DEOK_P2-3_C2 1493_RED BANK	CONTINGENCY 'DEOK_P2-3_C2 1493_RED BANK' OPEN BRANCH FROM BUS 249571 TO BUS 249573 CKT 1 / 249571 08REDBK1 345 249573 08SGROVE 345 1 OPEN BRANCH FROM BUS 249573 TO BUS 250097 CKT 1 / 249573 08SGROVE 345 250097 08SGROVE 138 1 OPEN BRANCH FROM BUS 249573 TO BUS 249577 CKT 1 / 249573 08SGROVE 345 249577 08ZIMER 345 1 OPEN BRANCH FROM BUS 249571 TO BUS 250092 CKT 1 / 249571 08REDBK1 345 250092 08REDBK1 138 1 END
DAY_P4_L34553-1	CONTINGENCY 'DAY_P4_L34553-1' OPEN LINE FROM BUS 253077 TO BUS 342838 CKT 1 /* 09STUART 345 - 7SPURLK 345 OPEN LINE FROM BUS 253077 TO BUS 253076 CKT 1 /* 09STUART 345 - 09STUART 138 END
DAY_P1-2_#764	CONTINGENCY 'DAY_P1-2_#764' OPEN BRANCH FROM BUS 242938 TO BUS 253038 CKT 1 / 242938 05MARQUI 345 253038 09KILLEN 345 1 END
DAY_P1_894_B2	CONTINGENCY 'DAY_P1_894_B2' OPEN BRANCH FROM BUS 253038 TO BUS 253077 CKT 1 / 253038 09KILLEN 345 253077 09STUART 345 1 END
DAY_P4_L34526-3	CONTINGENCY 'DAY_P4_L34526-3' OPEN LINE FROM BUS 253027 TO BUS 253006 CKT 1 /* 09GREENE 345 - 09BATH 345 OPEN LINE FROM BUS 253027 TO BUS 253014 CKT 1 /* 09GREENE 345 - 09CLINTO 345 OPEN LINE FROM BUS 253014 TO BUS 253013 CKT 1 /* 09CLINTON 69 - 09CLINTO 345 OPEN LINE FROM BUS 253014 TO BUS 253013 CKT 2 /* 09CLINTON 69 - 09CLINTO 345 END
DAY_P1-2_#762	CONTINGENCY 'DAY_P1-2_#762' OPEN BRANCH FROM BUS 243453 TO BUS 253110 CKT 1 / 243453 05BEATTY 345 253110 09ADKINS 345 1 END

Contingency Name	Contingency Definition
AEP_P4_#3195_05BEATTY 345_304E	CONTINGENCY 'AEP_P4_#3195_05BEATTY 345_304E' OPEN BRANCH FROM BUS 243453 TO BUS 243454 CKT 1 / 243453 05BEATTY 345 243454 05BIXBY 345 1 OPEN BRANCH FROM BUS 243453 TO BUS 243468 CKT 4 / 243453 05BEATTY 345 243468 05BEATTX 138 4 END
EKPC_P4-6_SPUR N39-92T	CONTINGENCY 'EKPC_P4-6_SPUR N39-92T' /* SPURLOCK OPEN BRANCH FROM BUS 342622 TO BUS 342664 CKT 1 /* 342622 4MAYSVIL I T138.00 342664 4SPURLOCK 138.00 OPEN BRANCH FROM BUS 342622 TO BUS 342625 CKT 1 /* 342622 4MAYSVIL I T138.00 342625 4MAYSVIL IND138.00 OPEN BRANCH FROM BUS 342622 TO BUS 342634 CKT 1 /* 342622 4MAYSVIL I T138.00 342634 4PLUMVILLE 138.00 OPEN BRANCH FROM BUS 945910 TO BUS 342664 CKT 1 /* 945910 AF1-256 TAP 138.00 342664 4SPURLOCK 138.00 END
DAY_P7_34506 34542_1-B	CONTINGENCY 'DAY_P7_34506 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_34506 34542_1-A	CONTINGENCY 'DAY_P7_34506 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 945630 CKT 1 / 243453 05BEATTY 345 941510 AF1-228 TAP 345 1 END
DAY_P734541 34553	CONTINGENCY 'DAY_P734541 34553' OPEN BRANCH FROM BUS 249581 TO BUS 342838 CKT 1 /* 249581 08MELDAL 345.00 342838 7SPURLOCK 345.00 OPEN BRANCH FROM BUS 253077 TO BUS 342838 CKT 1 /* 253077 09STUART 345.00 342838 7SPURLOCK 345.00 END
DEOK_P5-5_FOSTER345 BUS1+RELAYFAIL	CONTINGENCY 'DEOK_P5-5_FOSTER345 BUS1+RELAYFAIL' OPEN BRANCH FROM BUS 249566 TO BUS 250035 CKT 1 / 249566 08FOSTER 345 250035 08FTRM11 138 1 OPEN BRANCH FROM BUS 249566 TO BUS 249578 CKT 1 / 249566 08FOSTER 345 249578 08HILCRT 345 1 OPEN BRANCH FROM BUS 249566 TO BUS 253079 CKT 1 / 249566 08FOSTER 345 253079 09SUGRCK 345 1 END

Contingency Name	Contingency Definition
AEP_P4_#2900_05MARQUI 345_D2	CONTINGENCY 'AEP_P4_#2900_05MARQUI 345_D2' OPEN BRANCH FROM BUS 242938 TO BUS 248003 CKT 1 / 242938 05MARQUI 345 248003 06DOE530 345 1 OPEN BRANCH FROM BUS 242938 TO BUS 253038 CKT 1 / 242938 05MARQUI 345 253038 09KILLEN 345 1 OPEN BRANCH FROM BUS 242938 TO BUS 243034 CKT 3 / 242938 05MARQUI 345 243034 05MARQUI 138 3 END
AEP_P4_#10715_05COLE 345_C	CONTINGENCY 'AEP_P4_#10715_05COLE 345_C' OPEN BRANCH FROM BUS 244022 TO BUS 243457 CKT 1 / 244022 05COLE 345 243457 05HAYDEN 345 1 OPEN BRANCH FROM BUS 244022 TO BUS 244023 CKT 1 / 244022 05COLE 345 244023 05COLE 138 1 END
DEOK_P2-2_C1 SILVER GROVE 345 BUS	CONTINGENCY 'DEOK_P2-2_C1 SILVER GROVE 345 BUS' OPEN BRANCH FROM BUS 249573 TO BUS 249577 CKT 1 / 249573 08SGROVE 345 249577 08ZIMER 345 1 OPEN BRANCH FROM BUS 249573 TO BUS 250097 CKT 1 / 249573 08SGROVE 345 250097 08SGROVE 138 1 OPEN BRANCH FROM BUS 249571 TO BUS 249573 CKT 1 / 249571 08REDBK1 345 249573 08SGROVE 345 1 END
DEOK_P7-1_C5 CIRCUIT1883&4545REDBANKSILGRVZIMMER	CONTINGENCY 'DEOK_P7-1_C5 CIRCUIT1883&4545REDBANKSILGRVZIMMER' OPEN BRANCH FROM BUS 249989 TO BUS 250080 CKT 1 / 249989 08BKJ246 138 250080 08NWTWN2 138 1 OPEN BRANCH FROM BUS 250079 TO BUS 250080 CKT Z1 / 250079 08NWTWN1 138 250080 08NWTWN2 138 Z1 OPEN BRANCH FROM BUS 250079 TO BUS 250092 CKT 1 / 250079 08NWTWN1 138 250092 08REDBK1 138 1 OPEN BRANCH FROM BUS 249573 TO BUS 249577 CKT 1 / 249573 08SGROVE 345 249577 08ZIMER 345 1 OPEN BRANCH FROM BUS 249573 TO BUS 250097 CKT 1 / 249573 08SGROVE 345 250097 08SGROVE 138 1 OPEN BRANCH FROM BUS 249571 TO BUS 249573 CKT 1 / 249571 08REDBK1 345 249573 08SGROVE 345 1 END
AEP_P4_#8094_05BIXBY 345_C	CONTINGENCY 'AEP_P4_#8094_05BIXBY 345_C' OPEN BRANCH FROM BUS 243453 TO BUS 243454 CKT 1 / 243453 05BEATTY 345 243454 05BIXBY 345 1 OPEN BRANCH FROM BUS 941520 TO BUS 243454 CKT 1 / 941520 AE2-149 TAP 345 243454 05BIXBY 345 1 END

Contingency Name	Contingency Definition
DEOK_P2-3_C2 816_SILVERGROVE	CONTINGENCY 'DEOK_P2-3_C2 816_SILVERGROVE' OPEN BRANCH FROM BUS 249573 TO BUS 250097 CKT 1 / 249573 08SGROVE 345 250097 08SGROVE 138 1 OPEN BRANCH FROM BUS 249988 TO BUS 250097 CKT 1 / 249988 08BKJ135 138 250097 08SGROVE 138 1 OPEN BRANCH FROM BUS 250042 TO BUS 250097 CKT 1 / 250042 08HANDS1 138 250097 08SGROVE 138 1 OPEN BRANCH FROM BUS 250052 TO BUS 250097 CKT 1 / 250052 08KYUNIV 138 250097 08SGROVE 138 1 OPEN BRANCH FROM BUS 250053 TO BUS 250097 CKT 1 / 250053 08LAFARG 138 250097 08SGROVE 138 1 OPEN BRANCH FROM BUS 249571 TO BUS 249573 CKT 1 / 249571 08REDBK1 345 249573 08SGROVE 345 1 OPEN BRANCH FROM BUS 249573 TO BUS 249577 CKT 1 / 249573 08SGROVE 345 249577 08ZIMER 345 1 END
DAY-P1-STU SPUR	CONTINGENCY 'DAY-P1-STU SPUR' DISCONNECT BRANCH FROM BUS 253077 TO BUS 342838 CKT 1 /* STU SPUR END
DEOK_P7-1_C5 4524FOSTRSUGRCRK34598FOSTERBATH	CONTINGENCY 'DEOK_P7-1_C5 4524FOSTRSUGRCRK34598FOSTERBATH' OPEN BRANCH FROM BUS 249566 TO BUS 253079 CKT 1 / 249566 08FOSTER 345 253079 09SUGRCK 345 1 OPEN BRANCH FROM BUS 249566 TO BUS 253006 CKT 1 / 249566 08FOSTER 345 253006 09BATH 345 1 END
AEP_P1-2_#714	CONTINGENCY 'AEP_P1-2_#714' OPEN BRANCH FROM BUS 244022 TO BUS 243457 CKT 1 / 244022 05COLE 345 243457 05HAYDEN 345 1 END
AEP_P1-2_#713	CONTINGENCY 'AEP_P1-2_#713' OPEN BRANCH FROM BUS 243453 TO BUS 243454 CKT 1 / 243453 05BEATTY 345 243454 05BIXBY 345 1 END
DEOK_P2-3_C2 1349_FOSTER	CONTINGENCY 'DEOK_P2-3_C2 1349_FOSTER' OPEN BRANCH FROM BUS 249566 TO BUS 253006 CKT 1 / 249566 08FOSTER 345 253006 09BATH 345 1 OPEN BRANCH FROM BUS 249566 TO BUS 249578 CKT 1 / 249566 08FOSTER 345 249578 08HILCRT 345 1 END
DAY_P7_495	CONTINGENCY 'DAY_P7_495' OPEN BRANCH FROM BUS 249566 TO BUS 253006 CKT 1 / 249566 08FOSTER 345 253006 09BATH 345 1 OPEN BRANCH FROM BUS 253014 TO BUS 253027 CKT 1 / 253014 09CLINTO 345 253027 09GREENE 345 1 OPEN BRANCH FROM BUS 253014 TO BUS 253013 CKT 1 / 253014 09CLINTO 345 253013 09CLINTO 69.0 1 OPEN BRANCH FROM BUS 253014 TO BUS 253013 CKT 2 / 253014 09CLINTO 345 253013 09CLINTO 69.0 1 END

Contingency Name	Contingency Definition
DEOK_P1-3_B3 SILVER GROVE 345/138 TB23*	CONTINGENCY 'DEOK_P1-3_B3 SILVER GROVE 345/138 TB23*' OPEN BRANCH FROM BUS 249573 TO BUS 250097 CKT 1 / 249573 08SGROVE 345 250097 08SGROVE 138 1 OPEN BRANCH FROM BUS 249571 TO BUS 249573 CKT 1 / 249571 08REDBK1 345 249573 08SGROVE 345 1 OPEN BRANCH FROM BUS 249573 TO BUS 249577 CKT 1 / 249573 08SGROVE 345 249577 08ZIMER 345 1 END
AEP_P1-2_#10137	CONTINGENCY 'AEP_P1-2_#10137' OPEN BRANCH FROM BUS 243453 TO BUS 244022 CKT 1 / 243453 05BEATTY 345 244022 05COLE 345 1 END
DAY_P1_AC1-085_ST_FSA-B	CONTINGENCY 'DAY_P1_AC1-085_ST_FSA-B' OPEN BRANCH FROM BUS 253014 TO BUS 942090 CKT 1 END
AEP_P4_#6774_05MARQUI 345_D	CONTINGENCY 'AEP_P4_#6774_05MARQUI 345_D' OPEN BRANCH FROM BUS 246888 TO BUS 242938 CKT 1 / 246888 05BIERSR 345 242938 05MARQUI 345 1 OPEN BRANCH FROM BUS 242938 TO BUS 253038 CKT 1 / 242938 05MARQUI 345 253038 09KILLEN 345 1 END
AEP_P4_#3196_05BEATTY 345_302E	CONTINGENCY 'AEP_P4_#3196_05BEATTY 345_302E' OPEN BRANCH FROM BUS 243453 TO BUS 244022 CKT 1 / 243453 05BEATTY 345 244022 05COLE 345 1 OPEN BRANCH FROM BUS 243453 TO BUS 243468 CKT 4 / 243453 05BEATTY 345 243468 05BEATTX 138 4 END

Short Circuit

19 Short Circuit

The following Breakers are overduty

Bus Number	Bus Name	BREAKER	Type	Capacity (Amps)	Duty Percentage Post Queue	Duty Percentage Pre Queue

20 Network Impacts – Option 2

The Queue Project AF1-233 was evaluated as a 225.0 MW (Capacity 150.6 MW) injection tapping the Flemingsburg to Spurlock 138 kV line in the EKPC area. Project AF1-233 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AF1-233 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	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
41039805	250077	08MTZION	138.0	DEO&K	249991	08BUFTN1	138.0	DEO&K	1	DAY_P734541 34553	tower	298.0	95.46	103.81	DC	24.8
41643526	342091	2PLUMVILLE	69.0	EKPC	341923	2MURPHYSVIL	69.0	EKPC	1	EKPC_P4-6_SPUR N39-92T	breaker	63.0	52.44	135.86	DC	52.56
59571804	342091	2PLUMVILLE	69.0	EKPC	341923	2MURPHYSVIL	69.0	EKPC	1	EKPC_P2-4_SPUR N39-92T	bus	63.0	52.44	135.86	DC	52.56
59573089	342091	2PLUMVILLE	69.0	EKPC	341923	2MURPHYSVIL	69.0	EKPC	1	EKPC_P7-1_SPUR 138 DBL-C	tower	63.0	52.44	135.86	DC	52.56
59573090	342091	2PLUMVILLE	69.0	EKPC	341923	2MURPHYSVIL	69.0	EKPC	1	EKPC_P7-1_SPUR 138 DBL-B	tower	63.0	52.6	136.02	DC	52.56
41039844	342664	4SPURLOCK	138.0	EKPC	342661	4SPUR-KENT-R	138.0	EKPC	1	DAY_P734541 34553	tower	291.0	98.58	101.78	DC	20.39
42774709	944520	AF1-117 TAP	345.0	DAY	253100	09ATLNTA	345.0	DAY	1	DAY_P7_495	tower	1195.0	99.92	100.74	DC	21.72

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	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
43551565	243453	05BEATTY	345.0	AEP	243454	05BIXBY	345.0	AEP	1	AEP_P4_#3196_05BEATTY 345_302E	breaker	1203.0	133.46	134.33	DC	23.09
43551566	243453	05BEATTY	345.0	AEP	243454	05BIXBY	345.0	AEP	1	AEP_P4_#10715_05COLE 345_C	breaker	1203.0	131.26	132.1	DC	22.22
43551625	243453	05BEATTY	345.0	AEP	244022	05COLE	345.0	AEP	1	AEP_P4_#3195_05BEATTY 345_304E	breaker	1203.0	120.54	121.28	DC	19.6
43551626	243453	05BEATTY	345.0	AEP	244022	05COLE	345.0	AEP	1	AEP_P4_#8094_05BIXBY 345_C	breaker	1203.0	119.46	120.18	DC	19.32
43551670	243454	05BIXBY	345.0	AEP	243459	05KIRK	345.0	AEP	1	AEP_P4_#10715_05COLE 345_C	breaker	1409.0	112.52	113.1	DC	21.49
43551671	243454	05BIXBY	345.0	AEP	243459	05KIRK	345.0	AEP	1	AEP_P4_#3196_05BEATTY 345_302E	breaker	1409.0	113.12	113.82	DC	21.95
43928952	246800		138.0	AEP	247034	05EMERSS	138.0	AEP	1	DAY_P734541 34553	tower	185.0	103.01	108.03	DC	20.6
43928168	246946	05WLDCAT	138.0	AEP	243019	05HILLSB	138.0	AEP	1	DAY_P4_L34553-1	breaker	185.0	117.22	120.46	DC	13.32
43928856	246946	05WLDCAT	138.0	AEP	243019	05HILLSB	138.0	AEP	1	DAY_P734541 34553	tower	185.0	155.76	160.77	DC	20.6

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
43928953	247034	05EMERSS	138.0	AEP	246946	05WLDCAT	138.0	AEP	1	DAY_P734541 34553	tower	185.0	101.77	106.79	DC	20.6
41039754	250054	08LONGBR	138.0	DEO&K	250077	08MTZION	138.0	DEO&K	1	DAY_P734541 34553	tower	284.0	104.67	113.44	DC	24.8
42774575	253014	09CLINTO	345.0	DAY	253027	09GREENE	345.0	DAY	1	DAY_P734569 34598 34524	tower	1374.0	108.82	109.47	DC	19.91
42774576	253014	09CLINTO	345.0	DAY	253027	09GREENE	345.0	DAY	1	DEOK_P7-1_C5 4524FOSTRSUGRCRK34598FOSTERBATH	tower	1374.0	101.85	102.45	DC	18.11
41039741	253038	09KILLEN	345.0	DAY	242938	05MARQUI	345.0	AEP	1	DAY_P7_34506 34542_1-A	tower	1372.0	103.36	104.61	DC	38.12
41039742	253038	09KILLEN	345.0	DAY	242938	05MARQUI	345.0	AEP	1	DAY_P7_34506 34542_1-B	tower	1372.0	100.77	102.03	DC	38.12
42774539	253077	09STUART	345.0	DAY	253038	09KILLEN	345.0	DAY	1	DAY_P7_34506 34542_1-A	tower	1374.0	103.21	104.46	DC	38.12
42774540	253077	09STUART	345.0	DAY	253038	09KILLEN	345.0	DAY	1	DAY_P7_34506 34542_1-B	tower	1374.0	100.63	101.88	DC	38.12
42246784	253100	09ATLNTA	345.0	DAY	253110	09ADKINS	345.0	DAY	1	AEP_P4_#6774_05MARQUI 345_D	breaker	1195.0	111.43	113.43	DC	23.9
42246785	253100	09ATLNTA	345.0	DAY	253110	09ADKINS	345.0	DAY	1	AEP_P4_#2900_05MARQUI 345_D2	breaker	1195.0	108.67	110.69	DC	24.13
42774590	253100	09ATLNTA	345.0	DAY	253110	09ADKINS	345.0	DAY	1	DAY_P7_495	tower	1195.0	111.21	112.02	DC	21.42
41039687	253110	09ADKINS	345.0	DAY	243453	05BEATTY	345.0	AEP	1	DAY_P7_495	tower	1372.0	122.28	122.97	DC	20.83
41643719	253110	09ADKINS	345.0	DAY	243453	05BEATTY	345.0	AEP	1	DAY_P4_L34526-3	breaker	1372.0	119.36	120.03	DC	20.38
43552225	324267	4KENTON	138.0	LGEE	246800		138.0	AEP	1	DAY_P734541 34553	tower	185.0	106.04	111.06	DC	20.6
41039730	342559	4BOONECO	138.0	EKPC	250054	08LONGBR	138.0	DEO&K	1	DAY_P734541 34553	tower	284.0	112.0	120.76	DC	24.8
41039806	342661	4SPUR-KENT-R	138.0	EKPC	324267	4KENTON	138.0	LGEE	1	DAY_P734541 34553	tower	281.0	101.98	105.29	DC	20.39
41039697	342838	7SPURLOCK	345.0	EKPC	253077	09STUART	345.0	DAY	1	DEOK_P7-1_C5 CIRCUIT1883&4545REDBANKSILGRVZIMMER	tower	1532.0	118.99	125.16	DC	94.12
41326846	342838	7SPURLOCK	345.0	EKPC	253077	09STUART	345.0	DAY	1	Base Case	single	1240.0	118.99	123.71	DC	58.35
41326847	342838	7SPURLOCK	345.0	EKPC	253077	09STUART	345.0	DAY	1	DEOK_P1-3_B3 SILVER GROVE 345/138 TB23*	single	1532.0	113.45	117.58	DC	62.99
41643705	342838	7SPURLOCK	345.0	EKPC	253077	09STUART	345.0	DAY	1	DEOK_P2-3_C2 816_SILVERGROVE	breaker	1532.0	119.15	125.32	DC	94.17
41643706	342838	7SPURLOCK	345.0	EKPC	253077	09STUART	345.0	DAY	1	DEOK_P2-3_C2 1493_RED BANK	breaker	1532.0	119.05	125.22	DC	94.11
41863140	342838	7SPURLOCK	345.0	EKPC	253077	09STUART	345.0	DAY	1	DEOK_P2-2_C1 SILVER GROVE 345 BUS	bus	1532.0	118.99	125.15	DC	94.11
42774566	926060	AC1-085 TAP	345.0	DAY	942090	AE2-221 TAP	345.0	DAY	1	DAY_P734569 34598 34524	tower	1374.0	108.88	109.56	DC	20.94
42774567	926060	AC1-085 TAP	345.0	DAY	942090	AE2-221 TAP	345.0	DAY	1	DEOK_P7-1_C5 4524FOSTRSUGRCRK34598FOSTERBATH	tower	1374.0	102.98	103.6	DC	18.99
42246778	942090	AE2-221 TAP	345.0	DAY	253014	09CLINTO	345.0	DAY	1	DEOK_P5-5_FOSTER345 BUS1+RELAYFAIL	breaker	1374.0	109.47	110.13	DC	20.03
42246779	942090	AE2-221 TAP	345.0	DAY	253014	09CLINTO	345.0	DAY	1	DEOK_P2-3_C2 1349_FOSTER	breaker	1374.0	108.96	109.62	DC	19.99
42774500	942090	AE2-221 TAP	345.0	DAY	253014	09CLINTO	345.0	DAY	1	DAY_P734569 34598 34524	tower	1374.0	121.05	121.74	DC	20.94
42774501	942090	AE2-221 TAP	345.0	DAY	253014	09CLINTO	345.0	DAY	1	DEOK_P7-1_C5 4524FOSTRSUGRCRK34598FOSTERBATH	tower	1374.0	114.94	115.56	DC	18.99

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	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
43551917	243453	05BEATTY	345.0	AEP	243454	05BIXBY	345.0	AEP	1	AEP_P1-2_#714	operation	1203.0	122.55	123.34	DC	21.09
43552042	243453	05BEATTY	345.0	AEP	244022	05COLE	345.0	AEP	1	AEP_P1-2_#713	operation	1203.0	111.65	112.35	DC	18.64
43552048	243454	05BIXBY	345.0	AEP	243459	05KIRK	345.0	AEP	1	AEP_P1-2_#10137	operation	1409.0	109.26	109.95	DC	21.49
43928623	246946	05WLDCAT	138.0	AEP	243019	05HILLSB	138.0	AEP	1	DAY-P1-STU SPUR	operation	185.0	116.75	120.0	DC	13.34
42553297	253100	09ATLNTA	345.0	DAY	253110	09ADKINS	345.0	DAY	1	DAY_P1-2_#764	operation	1195.0	108.18	110.18	DC	23.92
42553298	253100	09ATLNTA	345.0	DAY	253110	09ADKINS	345.0	DAY	1	DAY_P1_894_B2	operation	1195.0	108.18	110.18	DC	23.92
41326939	253110	09ADKINS	345.0	DAY	243453	05BEATTY	345.0	AEP	1	DAY_P1_AC1-085_ST_FSA-B	operation	1372.0	119.15	119.81	DC	20.28
41326941	253110	09ADKINS	345.0	DAY	243453	05BEATTY	345.0	AEP	1	Base Case	operation	1233.0	118.19	118.85	DC	18.1
41326844	342838	7SPURLOCK	345.0	EKPC	253077	09STUART	345.0	DAY	1	Base Case	operation	1240.0	122.11	129.16	DC	87.18
41326845	342838	7SPURLOCK	345.0	EKPC	253077	09STUART	345.0	DAY	1	DEOK_P1-3_B3 SILVER GROVE 345/138 TB23*	operation	1532.0	118.95	125.11	DC	94.11
42553258	941510	AE2-148 TAP	345.0	DAY	945630	AF1-228 TAP	345.0	DAY	1	DAY_P1-2_#762	operation	1374.0	106.04	106.66	DC	18.86
42553239	942090	AE2-221 TAP	345.0	DAY	253014	09CLINTO	345.0	DAY	1	DAY_P1-2_#762	operation	1374.0	108.89	109.52	DC	19.23
41326998	945630	AF1-228 TAP	345.0	DAY	243453	05BEATTY	345.0	AEP	1	DAY_P1-2_#762	operation	1374.0	113.74	114.35	DC	18.86

25 Flow Gate Details

The following indices contain additional information about each flowgate presented in the body of the report. For each index, 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
41039805	250077	08MTZION	DEO&K	249991	08BUFTN1	DEO&K	1	DAY_P734541 34553	tower	298.0	95.46	103.81	DC	24.8

Bus #	Bus	MW Impact
342957	1SPURLK1G	5.1535
342960	1SPURLK2G	8.0926
342963	1SPURLK3G	4.2526
342966	1SPURLK4G	4.2526
925981	AC1-074 C O1	9.2562
925982	AC1-074 E O1	3.9670
932551	AC2-075 C	2.1984
932552	AC2-075 E	1.1074
936381	AD2-048 C	6.0729
936382	AD2-048 E	3.0299
936571	AD2-072 C O1	2.9465
936572	AD2-072 E O1	1.4447
939141	AE1-144 C O1	8.7899
939142	AE1-144 E O1	4.3621
940531	AE2-038 C O1	5.8636
940532	AE2-038 E O1	2.9044
941411	AE2-138 C	14.2325
941412	AE2-138 E	5.2641
941981	AE2-210 C O1	4.9041
941982	AE2-210 E O1	1.8447
942411	AE2-254 C O1	1.4096
942412	AE2-254 E O1	0.9398
942591	AE2-275 C O1	4.0264
942592	AE2-275 E O1	1.5145
942891	AE2-308 C O1	6.9274
942892	AE2-308 E O1	2.5191
943111	AE2-339 C	2.0999
943112	AE2-339 E	1.0343
944211	AF1-089 C O2	1.5123
944212	AF1-089 E O2	0.4627
944621	AF1-127 C O2	2.2259
944622	AF1-127 E O2	1.0963
945541	AF1-219 C O2	0.7318
945542	AF1-219 E O2	0.2375
945681	AF1-233 C O2	16.5976
945682	AF1-233 E O2	8.1996
945861	AF1-251 C	5.2663
945862	AF1-251 E	3.5109
945911	AF1-256 C	5.3174
945912	AF1-256 E	3.5450
946021	AF1-267 C O2	1.1750
946022	AF1-267 E O2	0.5398

Bus #	Bus	MW Impact
LGEE	LGEE	1.7069
CPLE	CPLE	0.2792
WEC	WEC	0.0350
CBM-W2	CBM-W2	6.2080
NY	NY	0.0735
CBM-W1	CBM-W1	0.6755
TVA	TVA	1.6156
O-066	O-066	0.7325
CBM-S2	CBM-S2	3.3062
CBM-S1	CBM-S1	12.7459
G-007	G-007	0.1123
MADISON	MADISON	3.7740
MEC	MEC	0.5673

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
59573090	342091	2PLUMVILLE	EKPC	341923	2MURPHYSVIL	EKPC	1	EKPC_P7-1_SPUR 138 DBL-B	tower	63.0	52.6	136.02	DC	52.56

Bus #	Bus	MW Impact
939141	AE1-144 C O1	23.9269
939142	AE1-144 E O1	11.8739
940531	AE2-038 C O1	15.9612
940532	AE2-038 E O1	7.9060
945681	AF1-233 C O2	35.1771
945682	AF1-233 E O2	17.3784
DUCKCREEK	DUCKCREEK	0.0507
NEWTON	NEWTON	0.0505
CPLE	CPLE	0.0351
FARMERCITY	FARMERCITY	0.0014
G-007A	G-007A	0.0408
VFT	VFT	0.1096
TVA	TVA	0.0560
PRAIRIE	PRAIRIE	0.0672
COFFEEN	COFFEEN	0.0227
CBM-S2	CBM-S2	0.3295
EDWARDS	EDWARDS	0.0161
CBM-S1	CBM-S1	0.0767
TILTON	TILTON	0.0378
MADISON	MADISON	0.2782
GIBSON	GIBSON	0.0399
BLUEG	BLUEG	0.1910
TRIMBLE	TRIMBLE	0.0646

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
41039844	342664	4SPURLOCK	EKPC	342661	4SPUR-KENT-R	EKPC	1	DAY_P734541 34553	tower	291.0	98.58	101.78	DC	20.39

Bus #	Bus	MW Impact
342957	1SPURLK1G	6.4835
342960	1SPURLK2G	9.4323
342963	1SPURLK3G	4.9566
342966	1SPURLK4G	4.9566
925981	AC1-074 C O1	2.4428
925982	AC1-074 E O1	1.0469
932551	AC2-075 C	0.5802
932552	AC2-075 E	0.2923
939141	AE1-144 C O1	5.2600
939142	AE1-144 E O1	2.6103
940531	AE2-038 C O1	3.5089
940532	AE2-038 E O1	1.7380
941411	AE2-138 C	11.1398
941412	AE2-138 E	4.1202
941981	AE2-210 C O1	3.8385
941982	AE2-210 E O1	1.4438
945681	AF1-233 C O2	6.1481
945682	AF1-233 E O2	3.0373
945861	AF1-251 C	4.0068
945862	AF1-251 E	2.6712
945911	AF1-256 C	2.0212
945912	AF1-256 E	1.3475
LGEE	LGEE	0.3206
CPLE	CPLE	0.0582
WEC	WEC	0.0038
CBM-W2	CBM-W2	2.0721
NY	NY	0.0841
TVA	TVA	0.6020
O-066	O-066	0.9744
CBM-S2	CBM-S2	0.9132
CBM-S1	CBM-S1	3.8766
G-007	G-007	0.1498
MADISON	MADISON	1.0786
MEC	MEC	0.1700

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
42774709	944520	AF1-117 TAP	DAY	253100	09ATLNTA	DAY	1	DAY_P7_495	tower	1195.0	99.92	100.74	DC	21.72

Bus #	Bus	MW Impact
251830	BIOENGRY	0.0706
253077	**09STUART (Deativation : 09/30/17)**	**260.9026**
342957	1SPURLK1G	4.5610
342960	1SPURLK2G	8.4862
342963	1SPURLK3G	4.4594
342966	1SPURLK4G	4.4594
923522	AB1-169 C OP	167.7830
925921	AC1-068 C	-8.0420
925922	AC1-068 E	-3.7608
925931	AC1-069 C	-8.0420
925932	AC1-069 E	-3.7608
925981	AC1-074 C O1	3.4448
925982	AC1-074 E O1	1.4763
926061	AC1-085 C	23.1846
926062	AC1-085 E	37.8274
926791	AC1-165 C	-7.9474
926792	AC1-165 E	-3.8554
926801	AC1-166 C	-7.9474
926802	AC1-166 E	-3.8554
926951	AC1-182	1.2464
930062	AB1-014 E	5.9920
932461	AC2-066 C	2.2035
932462	AC2-066 E	3.5952
932551	AC2-075 C	0.8181
932552	AC2-075 E	0.4121
932661	AC2-088 C O1	4.0439
932662	AC2-088 E O1	3.3278
935031	AD1-136 C	0.5687
935032	AD1-136 E	0.4844
936381	AD2-048 C	2.7941
936382	AD2-048 E	1.3941
938921	AE1-120	3.4019
939141	AE1-144 C O1	6.4721
939142	AE1-144 E O1	3.2118
940531	AE2-038 C O1	4.3174
940532	AE2-038 E O1	2.1385
941411	AE2-138 C	12.8709
941412	AE2-138 E	4.7605
941981	AE2-210 C O1	4.4350
941982	AE2-210 E O1	1.6682
942091	AE2-221 C	27.4554
942092	AE2-221 E	18.3036

Bus #	Bus	MW Impact
942591	AE2-275 C O1	3.4699
942592	AE2-275 E O1	1.3052
942891	AE2-308 C O1	5.8307
942892	AE2-308 E O1	2.1202
943111	AE2-339 C	1.5910
943112	AE2-339 E	0.7836
943201	AE2-318 C	4.3708
943202	AE2-318 E	2.1334
943771	AF1-045	1.7995
944521	AF1-117 C	85.5888
944522	AF1-117 E	26.3652
944621	AF1-127 C O2	1.6864
944622	AF1-127 E O2	0.8306
945681	AF1-233 C O2	6.5484
945682	AF1-233 E O2	3.2351
945861	AF1-251 C	4.6925
945862	AF1-251 E	3.1283
945911	AF1-256 C	2.0990
945912	AF1-256 E	1.3994
946021	AF1-267 C O2	1.0161
946022	AF1-267 E O2	0.4669
946102	AF1-275 BAT	3.4935
946171	AF1-282 C	9.1518
946172	AF1-282 E	6.1012
946181	AF1-283 C	11.8973
946182	AF1-283 E	7.9316
946511	AF1-315 C O1	1.2775
946512	AF1-315 E O1	0.8517
LGEE	LGEE	1.9517
CPLE	CPLE	0.3731
WEC	WEC	0.2750
CBM-W2	CBM-W2	13.1040
NY	NY	0.3788
CBM-W1	CBM-W1	7.1933
TVA	TVA	2.3464
O-066	O-066	4.4150
CBM-S2	CBM-S2	4.6702
CBM-S1	CBM-S1	17.0400
G-007	G-007	0.6791
MEC	MEC	1.8258

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
43551565	243453	05BEATTY	AEP	243454	05BIXBY	AEP	1	AEP_P4_#3196_05BEATTY 345_302E	breaker	1203.0	133.46	134.33	DC	23.09

Bus #	Bus	MW Impact
250164	08BKJDB1	0.1465
250165	08BKJDB2	0.1465
251827	WILLYESP	0.4700
251828	CLNTESP1	0.4757
251829	CLNTESP2	0.3171
253077	**09STUART (Deativation : 09/30/17)**	**200.3363**
253110	09ADKINS	30.1137
253261	09MON D	0.2593
902531	W2-040 C	0.9122
902532	W2-040 E	1.4882
904722	V4-073 E	0.2005
913222	Y1-054 E	1.5322
918802	AA1-099 E	0.3171
923522	AB1-169 C OP	128.8336
925242	**AB2-178 E (Withdrawn : 12/10/2019)**	**1.4507**
925921	AC1-068 C	12.4535
925922	AC1-068 E	5.8239
925931	AC1-069 C	12.4535
925932	AC1-069 E	5.8239
925981	AC1-074 C O1	4.0931
925982	AC1-074 E O1	1.7542
926011	AC1-078 C O1	7.8899
926012	AC1-078 E O1	13.1498
926061	AC1-085 C	23.9628
926062	AC1-085 E	39.0972
926101	AC1-089 C O1	4.2166
926102	AC1-089 E O1	6.8797
926791	AC1-165 C	12.3070
926792	AC1-165 E	5.9704
926801	AC1-166 C	12.3070
926802	AC1-166 E	5.9704
926951	AC1-182	1.7969
930062	AB1-014 E	8.0585
932381	AC2-055 C	1.8528
932382	AC2-055 E	3.0229
932421	AC2-060 C	6.5693
932422	AC2-060 E	3.6953
932431	AC2-061 C	4.2851
932432	AC2-061 E	4.3441
932461	AC2-066 C	2.9634
932462	AC2-066 E	4.8351
932481	AC2-068 C	3.1003

Bus #	Bus	MW Impact
932482	AC2-068 E	5.0775
932551	AC2-075 C	0.9721
932552	AC2-075 E	0.4897
932651	AC2-087 C O1	4.8654
932652	AC2-087 E O1	3.8595
932661	AC2-088 C O1	4.0470
932662	AC2-088 E O1	3.3304
934491	AD1-073 C	1.3549
934492	AD1-073 E	0.6980
934561	AD1-081 C	1.5780
934562	AD1-081 E	0.8129
935031	AD1-136 C	0.5691
935032	AD1-136 E	0.4848
935041	AD1-140 C O1	11.5264
935042	AD1-140 E O1	9.5291
936251	AD2-031 C O1	2.4065
936252	AD2-031 E O1	3.9264
936381	AD2-048 C	3.3665
936382	AD2-048 E	1.6797
938051	AE1-007 C	0.8892
938052	AE1-007 E	1.4507
938271	AE1-040 C O1	4.0620
938272	AE1-040 E O1	2.0439
938921	AE1-120	4.5751
939141	AE1-144 C O1	6.9240
939142	AE1-144 E O1	3.4361
940531	AE2-038 C O1	4.6189
940532	AE2-038 E O1	2.2879
941411	AE2-138 C	14.2019
941412	AE2-138 E	5.2528
941511	AE2-148 C	184.4227
941512	AE2-148 E	83.4149
941981	AE2-210 C O1	4.8936
941982	AE2-210 E O1	1.8407
942051	AE2-217 C	9.8015
942052	AE2-217 E	6.5343
942061	AE2-218 C	10.6174
942062	AE2-218 E	7.2118
942091	AE2-221 C	30.1050
942092	AE2-221 E	20.0700
942521	AE2-267 C O1	1.4378
942522	AE2-267 E O1	0.8888
942621	AE2-278 C	6.7842
942622	AE2-278 E	4.5253
942951	AE2-315	3.0392
942981	AE2-320 C O1	24.5041
942982	AE2-320 E O1	12.1239
943111	AE2-339 C	1.8424
943112	AE2-339 E	0.9075
943191	AE2-319 C O1	24.5041
943192	AE2-319 E O1	12.1239
943201	AE2-318 C	6.6168

Bus #	Bus	MW Impact
943202	AE2-318 E	3.2296
943771	AF1-045	2.7241
943943	AF1-062 BAT	20.5100
944521	AF1-117 C	52.2154
944522	AF1-117 E	16.0847
944621	AF1-127 C O2	1.9530
944622	AF1-127 E O2	0.9619
944941	AF1-159	0.7384
945631	AF1-228 C	45.6007
945632	AF1-228 E	30.4005
945681	AF1-233 C O2	6.9623
945682	AF1-233 E O2	3.4395
945821	AF1-247 C	1.4378
945822	AF1-247 E	0.8888
945841	AF1-249 C	0.6205
945842	AF1-249 E	0.2920
945861	AF1-251 C	5.1973
945862	AF1-251 E	3.4649
945911	AF1-256 C	2.2292
945912	AF1-256 E	1.4861
946171	AF1-282 C	9.4590
946172	AF1-282 E	6.3060
946181	AF1-283 C	12.2967
946182	AF1-283 E	8.1978
946511	AF1-315 C O1	1.8917
946512	AF1-315 E O1	1.2611
LGEE	LGEE	3.2216
CPLE	CPLE	0.2156
WEC	WEC	0.7349
CBM-W2	CBM-W2	24.0458
NY	NY	0.9727
CBM-W1	CBM-W1	22.6681
TVA	TVA	3.5112
O-066	O-066	11.6256
CBM-S2	CBM-S2	4.3870
CBM-S1	CBM-S1	26.3353
G-007	G-007	1.7919
MEC	MEC	4.0472

25.6 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
43551625	243453	05BEATTY	AEP	244022	05COLE	AEP	1	AEP_P4_#3195_05BEATTY 345_304E	breaker	1203.0	120.54	121.28	DC	19.6

Bus #	Bus	MW Impact
247964	Y1-063 BAT	0.3062
250164	08BKJDB1	0.1221
250165	08BKJDB2	0.1221
251827	WILLYESP	0.3864
251828	CLNTESP1	0.4043
251829	CLNTESP2	0.2696
253077	**09STUART (Deativation : 09/30/17)**	**170.8071**
253110	09ADKINS	25.3067
253261	09MON D	0.2050
902531	W2-040 C	0.7288
902532	W2-040 E	1.1891
904722	V4-073 E	0.1611
913222	Y1-054 E	1.2662
918802	AA1-099 E	0.2696
923522	AB1-169 C OP	109.8438
925242	**AB2-178 E (Withdrawn : 12/10/2019)**	**1.2092**
925921	AC1-068 C	10.4859
925922	AC1-068 E	4.9037
925931	AC1-069 C	10.4859
925932	AC1-069 E	4.9037
925981	AC1-074 C O1	3.4396
925982	AC1-074 E O1	1.4741
926011	AC1-078 C O1	4.7584
926012	AC1-078 E O1	7.9307
926061	AC1-085 C	20.0108
926062	AC1-085 E	32.6492
926101	AC1-089 C O1	3.6623
926102	AC1-089 E O1	5.9754
926791	AC1-165 C	10.3626
926792	AC1-165 E	5.0271
926801	AC1-166 C	10.3626
926802	AC1-166 E	5.0271
926951	AC1-182	1.4999
930062	AB1-014 E	6.7608
932381	AC2-055 C	1.7366
932382	AC2-055 E	2.8334
932421	AC2-060 C	6.1575
932422	AC2-060 E	3.4636
932431	AC2-061 C	3.7241
932432	AC2-061 E	3.7754
932461	AC2-066 C	2.4862
932462	AC2-066 E	4.0565

Bus #	Bus	MW Impact
932481	AC2-068 C	2.4559
932482	AC2-068 E	4.0221
932551	AC2-075 C	0.8169
932552	AC2-075 E	0.4115
932651	AC2-087 C O1	4.5604
932652	AC2-087 E O1	3.6176
932661	AC2-088 C O1	3.4190
932662	AC2-088 E O1	2.8136
934491	AD1-073 C	1.2700
934492	AD1-073 E	0.6542
934561	AD1-081 C	0.9517
934562	AD1-081 E	0.4903
935031	AD1-136 C	0.4808
935032	AD1-136 E	0.4096
935041	AD1-140 C O1	8.3962
935042	AD1-140 E O1	6.9414
936251	AD2-031 C O1	2.3877
936252	AD2-031 E O1	3.8958
936381	AD2-048 C	2.8334
936382	AD2-048 E	1.4137
938051	AE1-007 C	0.7043
938052	AE1-007 E	1.1492
938271	AE1-040 C O1	4.3077
938272	AE1-040 E O1	2.1675
938921	AE1-120	3.8384
939141	AE1-144 C O1	5.8769
939142	AE1-144 E O1	2.9165
940531	AE2-038 C O1	3.9204
940532	AE2-038 E O1	1.9419
941411	AE2-138 C	11.9578
941412	AE2-138 E	4.4227
941511	AE2-148 C	154.4305
941512	AE2-148 E	69.8494
941981	AE2-210 C O1	4.1203
941982	AE2-210 E O1	1.5498
942061	AE2-218 C	7.9874
942062	AE2-218 E	5.4254
942091	AE2-221 C	24.9318
942092	AE2-221 E	16.6212
942521	AE2-267 C O1	1.1814
942522	AE2-267 E O1	0.7303
942951	AE2-315	2.4419
942981	AE2-320 C O1	20.6326
942982	AE2-320 E O1	10.2084
943111	AE2-339 C	1.5465
943112	AE2-339 E	0.7617
943191	AE2-319 C O1	20.6326
943192	AE2-319 E O1	10.2084
943201	AE2-318 C	5.5321
943202	AE2-318 E	2.7002
943771	AF1-045	2.2775
944521	AF1-117 C	43.9679

Bus #	Bus	MW Impact
944522	AF1-117 E	13.5441
944621	AF1-127 C O2	1.6393
944622	AF1-127 E O2	0.8074
944941	AF1-159	1.3824
945631	AF1-228 C	38.2221
945632	AF1-228 E	25.4814
945681	AF1-233 C O2	5.9100
945682	AF1-233 E O2	2.9197
945821	AF1-247 C	1.1814
945822	AF1-247 E	0.7303
945841	AF1-249 C	0.5126
945842	AF1-249 E	0.2412
945861	AF1-251 C	4.3749
945862	AF1-251 E	2.9166
945911	AF1-256 C	1.8921
945912	AF1-256 E	1.2614
946102	AF1-275 BAT	18.6700
946171	AF1-282 C	7.8990
946172	AF1-282 E	5.2660
946181	AF1-283 C	10.2687
946182	AF1-283 E	6.8458
946511	AF1-315 C O1	1.5829
946512	AF1-315 E O1	1.0553
LGEE	LGEE	2.6157
CPLE	CPLE	0.2514
WEC	WEC	0.4158
CBM-W2	CBM-W2	17.8624
NY	NY	0.7250
CBM-W1	CBM-W1	11.5217
TVA	TVA	2.7944
O-066	O-066	8.6486
CBM-S2	CBM-S2	4.1443
CBM-S1	CBM-S1	21.1040
G-007	G-007	1.3322
MEC	MEC	2.6028

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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
43551671	243454	05BIXBY	AEP	243459	05KIRK	AEP	1	AEP_P4_#3196_05BEATTY 345_302E	breaker	1409.0	113.12	113.82	DC	21.95

Bus #	Bus	MW Impact
250164	08BKJDB1	0.1401
250165	08BKJDB2	0.1401
251827	WILLYESP	0.4269
251828	CLNTESP1	0.4890
251829	CLNTESP2	0.3260
253077	**09STUART (Deativation : 09/30/17)**	**183.9360**
253110	09ADKINS	20.9360
902531	W2-040 C	0.7175
902532	W2-040 E	1.1707
904722	V4-073 E	0.1565
913222	Y1-054 E	1.4170
918802	AA1-099 E	0.3260
923522	AB1-169 C OP	118.2868
924351	AB2-083 C O1	4.8226
924352	AB2-083 E O1	2.2694
924371	AB2-085 C O1	5.1516
924372	AB2-085 E O1	2.4243
925242	**AB2-178 E (Withdrawn : 12/10/2019)**	**1.3870**
925341	AC1-001 C O1	9.6451
925342	AC1-001 E O1	4.5389
925921	AC1-068 C	9.0239
925922	AC1-068 E	4.2200
925931	AC1-069 C	9.0239
925932	AC1-069 E	4.2200
925981	AC1-074 C O1	3.9170
925982	AC1-074 E O1	1.6787
926011	AC1-078 C O1	6.5558
926012	AC1-078 E O1	10.9264
926061	AC1-085 C	20.2099
926062	AC1-085 E	32.9741
926101	AC1-089 C O1	4.7127
926102	AC1-089 E O1	7.6892
926791	AC1-165 C	8.9178
926792	AC1-165 E	4.3262
926801	AC1-166 C	8.9178
926802	AC1-166 E	4.3262
926951	AC1-182	1.6402
930062	AB1-014 E	7.2522
932201	AC2-029 C	4.9527
932202	AC2-029 E	8.0806
932381	AC2-055 C	3.1871
932382	AC2-055 E	5.2000

Bus #	Bus	MW Impact
932411	AC2-059 C	13.0337
932412	AC2-059 E	13.4508
932421	AC2-060 C	11.3005
932422	AC2-060 E	6.3565
932431	AC2-061 C	4.8452
932432	AC2-061 E	4.9119
932451	**AC2-064 C (Withdrawn : 12/09/2019)**	**5.1413**
932452	**AC2-064 E (Withdrawn : 12/09/2019)**	**3.4275**
932461	AC2-066 C	2.6669
932462	AC2-066 E	4.3513
932481	AC2-068 C	2.4113
932482	AC2-068 E	3.9491
932551	AC2-075 C	0.9303
932552	AC2-075 E	0.4686
932651	AC2-087 C O1	8.3694
932652	AC2-087 E O1	6.6390
932661	AC2-088 C O1	3.7164
932662	AC2-088 E O1	3.0583
934481	AD1-072 C	2.8633
934482	AD1-072 E	1.3075
934491	AD1-073 C	2.3307
934492	AD1-073 E	1.2007
934561	AD1-081 C	1.3112
934562	AD1-081 E	0.6755
935031	AD1-136 C	0.5226
935032	AD1-136 E	0.4452
935041	AD1-140 C O1	8.4190
935042	AD1-140 E O1	6.9602
935051	AD1-141 C O1	2.2080
935052	AD1-141 E O1	1.4720
936111	AD2-016 C	13.0337
936112	AD2-016 E	13.4508
936251	AD2-031 C O1	2.5846
936252	AD2-031 E O1	4.2169
936381	AD2-048 C	3.2494
936382	AD2-048 E	1.6212
937231	AD2-162 C	14.8845
937232	AD2-162 E	7.2981
938051	AE1-007 C	0.6915
938052	AE1-007 E	1.1283
938271	AE1-040 C O1	5.7781
938272	AE1-040 E O1	2.9073
938921	AE1-120	4.1174
939141	AE1-144 C O1	6.5927
939142	AE1-144 E O1	3.2717
940531	AE2-038 C O1	4.3979
940532	AE2-038 E O1	2.1784
941411	AE2-138 C	13.5130
941412	AE2-138 E	4.9980
941511	AE2-148 C	126.1070
941512	AE2-148 E	57.0386
941521	AE2-149 C	100.8623

Bus #	Bus	MW Impact
941522	AE2-149 E	37.5897
941981	AE2-210 C O1	4.6562
941982	AE2-210 E O1	1.7514
942051	AE2-217 C	7.0365
942052	AE2-217 E	4.6910
942061	AE2-218 C	7.8387
942062	AE2-218 E	5.3244
942091	AE2-221 C	24.4944
942092	AE2-221 E	16.3296
942521	AE2-267 C O1	1.2694
942522	AE2-267 E O1	0.7846
942831	AE2-302 C O1	1.4413
942832	AE2-302 E O1	0.9609
942951	AE2-315	2.3734
942981	AE2-320 C O1	17.7559
942982	AE2-320 E O1	8.7851
943041	AE2-327 C	6.3220
943042	AE2-327 E	4.2046
943111	AE2-339 C	1.7702
943112	AE2-339 E	0.8719
943191	AE2-319 C O1	17.7559
943192	AE2-319 E O1	8.7851
943201	AE2-318 C	5.9765
943202	AE2-318 E	2.9171
943771	AF1-045	2.4605
943943	AF1-062 BAT	43.2400
944521	AF1-117 C	37.8993
944522	AF1-117 E	11.6747
944621	AF1-127 C O2	1.8764
944622	AF1-127 E O2	0.9242
944941	AF1-159	1.4963
945631	AF1-228 C	31.0620
945632	AF1-228 E	20.7080
945681	AF1-233 C O2	6.6176
945682	AF1-233 E O2	3.2693
945821	AF1-247 C	1.2694
945822	AF1-247 E	0.7846
945841	AF1-249 C	0.5606
945842	AF1-249 E	0.2638
945861	AF1-251 C	4.9494
945862	AF1-251 E	3.2996
945911	AF1-256 C	2.1168
945912	AF1-256 E	1.4112
946171	AF1-282 C	7.9776
946172	AF1-282 E	5.3184
946181	AF1-283 C	10.3709
946182	AF1-283 E	6.9139
946441	AF1-308 C O2	1.8670
946442	AF1-308 E O2	1.2447
946511	AF1-315 C O1	1.7095
946512	AF1-315 E O1	1.1397
LGEE	LGEE	3.1788

Bus #	Bus	MW Impact
CPLE	CPLE	0.6211
WEC	WEC	0.5906
CBM-W2	CBM-W2	24.2014
NY	NY	0.9545
CBM-W1	CBM-W1	19.4906
TVA	TVA	3.9746
O-066	O-066	11.4240
CBM-S2	CBM-S2	8.0920
CBM-S1	CBM-S1	28.5164
G-007	G-007	1.7597
MEC	MEC	3.6293

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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
43928952	246800		AEP	247034	05EMERSS	AEP	1	DAY_P734541 34553	tower	185.0	103.01	108.03	DC	20.6

Bus #	Bus	MW Impact
251831	Z1-080 BAT	0.5186
918802	AA1-099 E	-0.2939
918803	AA1-099 BAT	0.3457
925981	AC1-074 C O1	2.6670
925982	AC1-074 E O1	1.1430
932551	AC2-075 C	0.6334
932552	AC2-075 E	0.3191
936381	AD2-048 C	3.0966
936382	AD2-048 E	1.5450
939141	AE1-144 C O1	6.3793
939142	AE1-144 E O1	3.1658
940531	AE2-038 C O1	4.2556
940532	AE2-038 E O1	2.1079
941411	AE2-138 C	8.9377
941412	AE2-138 E	3.3057
941981	AE2-210 C O1	3.0797
941982	AE2-210 E O1	1.1584
943111	AE2-339 C	1.1504
943112	AE2-339 E	0.5666
944621	AF1-127 C O2	1.2194
944622	AF1-127 E O2	0.6006
945681	AF1-233 C O2	6.2106
945682	AF1-233 E O2	3.0682
945861	AF1-251 C	3.2688
945862	AF1-251 E	2.1792
945911	AF1-256 C	1.9773
945912	AF1-256 E	1.3182
LGEE	LGEE	0.9231
CPLE	CPLE	0.1376
WEC	WEC	0.0617
CBM-W2	CBM-W2	4.4472
NY	NY	0.0824
CBM-W1	CBM-W1	1.7264
TVA	TVA	1.0108
O-066	O-066	0.9341
CBM-S2	CBM-S2	1.7860
CBM-S1	CBM-S1	7.5743
G-007	G-007	0.1435
MADISON	MADISON	1.9212
MEC	MEC	0.5244

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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
43928856	246946	05WLDCAT	AEP	243019	05HILLSB	AEP	1	DAY_P734541 34553	tower	185.0	155.76	160.77	DC	20.6

Bus #	Bus	MW Impact
251831	Z1-080 BAT	0.5186
918802	AA1-099 E	-0.2939
918803	AA1-099 BAT	0.3457
925981	AC1-074 C O1	2.6670
925982	AC1-074 E O1	1.1430
926101	AC1-089 C O1	40.2705
926102	AC1-089 E O1	65.7045
932551	AC2-075 C	0.6334
932552	AC2-075 E	0.3191
936381	AD2-048 C	3.0966
936382	AD2-048 E	1.5450
939141	AE1-144 C O1	6.3793
939142	AE1-144 E O1	3.1658
940531	AE2-038 C O1	4.2556
940532	AE2-038 E O1	2.1079
941411	AE2-138 C	8.9377
941412	AE2-138 E	3.3057
941981	AE2-210 C O1	3.0797
941982	AE2-210 E O1	1.1584
943111	AE2-339 C	1.1504
943112	AE2-339 E	0.5666
944621	AF1-127 C O2	1.2194
944622	AF1-127 E O2	0.6006
945681	AF1-233 C O2	6.2106
945682	AF1-233 E O2	3.0682
945861	AF1-251 C	3.2688
945862	AF1-251 E	2.1792
945911	AF1-256 C	1.9773
945912	AF1-256 E	1.3182
LGEE	LGEE	0.9231
CPLE	CPLE	0.1376
WEC	WEC	0.0617
CBM-W2	CBM-W2	4.4472
NY	NY	0.0824
CBM-W1	CBM-W1	1.7264
TVA	TVA	1.0108
O-066	O-066	0.9341
CBM-S2	CBM-S2	1.7860
CBM-S1	CBM-S1	7.5743
G-007	G-007	0.1435
MADISON	MADISON	1.9212
MEC	MEC	0.5244

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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
43928953	247034	05EMERSS	AEP	246946	05WLDCAT	AEP	1	DAY_P734541 34553	tower	185.0	101.77	106.79	DC	20.6

Bus #	Bus	MW Impact
251831	Z1-080 BAT	0.5186
918802	AA1-099 E	-0.2939
918803	AA1-099 BAT	0.3457
925981	AC1-074 C O1	2.6670
925982	AC1-074 E O1	1.1430
932551	AC2-075 C	0.6334
932552	AC2-075 E	0.3191
936381	AD2-048 C	3.0966
936382	AD2-048 E	1.5450
939141	AE1-144 C O1	6.3793
939142	AE1-144 E O1	3.1658
940531	AE2-038 C O1	4.2556
940532	AE2-038 E O1	2.1079
941411	AE2-138 C	8.9377
941412	AE2-138 E	3.3057
941981	AE2-210 C O1	3.0797
941982	AE2-210 E O1	1.1584
943111	AE2-339 C	1.1504
943112	AE2-339 E	0.5666
944621	AF1-127 C O2	1.2194
944622	AF1-127 E O2	0.6006
945681	AF1-233 C O2	6.2106
945682	AF1-233 E O2	3.0682
945861	AF1-251 C	3.2688
945862	AF1-251 E	2.1792
945911	AF1-256 C	1.9773
945912	AF1-256 E	1.3182
LGEE	LGEE	0.9231
CPLE	CPLE	0.1376
WEC	WEC	0.0617
CBM-W2	CBM-W2	4.4472
NY	NY	0.0824
CBM-W1	CBM-W1	1.7264
TVA	TVA	1.0108
O-066	O-066	0.9341
CBM-S2	CBM-S2	1.7860
CBM-S1	CBM-S1	7.5743
G-007	G-007	0.1435
MADISON	MADISON	1.9212
MEC	MEC	0.5244

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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
41039754	250054	08LONGBR	DEO&K	250077	08MTZION	DEO&K	1	DAY_P734541 34553	tower	284.0	104.67	113.44	DC	24.8

Bus #	Bus	MW Impact
342957	1SPURLK1G	5.1535
342960	1SPURLK2G	8.0926
342963	1SPURLK3G	4.2526
342966	1SPURLK4G	4.2526
925981	AC1-074 C O1	9.2562
925982	AC1-074 E O1	3.9670
932551	AC2-075 C	2.1984
932552	AC2-075 E	1.1074
936381	AD2-048 C	6.0729
936382	AD2-048 E	3.0299
936571	AD2-072 C O1	2.9465
936572	AD2-072 E O1	1.4447
939141	AE1-144 C O1	8.7899
939142	AE1-144 E O1	4.3621
940531	AE2-038 C O1	5.8636
940532	AE2-038 E O1	2.9044
941411	AE2-138 C	14.2325
941412	AE2-138 E	5.2641
941981	AE2-210 C O1	4.9041
941982	AE2-210 E O1	1.8447
942411	AE2-254 C O1	1.4096
942412	AE2-254 E O1	0.9398
942591	AE2-275 C O1	4.0264
942592	AE2-275 E O1	1.5145
942891	AE2-308 C O1	6.9274
942892	AE2-308 E O1	2.5191
943111	AE2-339 C	2.0999
943112	AE2-339 E	1.0343
944211	AF1-089 C O2	1.5123
944212	AF1-089 E O2	0.4627
944621	AF1-127 C O2	2.2259
944622	AF1-127 E O2	1.0963
945541	AF1-219 C O2	0.7318
945542	AF1-219 E O2	0.2375
945681	AF1-233 C O2	16.5976
945682	AF1-233 E O2	8.1996
945861	AF1-251 C	5.2663
945862	AF1-251 E	3.5109
945911	AF1-256 C	5.3174
945912	AF1-256 E	3.5450
946021	AF1-267 C O2	1.1750
946022	AF1-267 E O2	0.5398

Bus #	Bus	MW Impact
LGEE	LGEE	1.7069
CPLE	CPLE	0.2792
WEC	WEC	0.0350
CBM-W2	CBM-W2	6.2080
NY	NY	0.0735
CBM-W1	CBM-W1	0.6755
TVA	TVA	1.6156
O-066	O-066	0.7325
CBM-S2	CBM-S2	3.3062
CBM-S1	CBM-S1	12.7459
G-007	G-007	0.1123
MADISON	MADISON	3.7740
MEC	MEC	0.5673

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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
42774575	253014	09CLINTO	DAY	253027	09GREENE	DAY	1	DAY_P734569 34598 34524	tower	1374.0	108.82	109.47	DC	19.91

Bus #	Bus	MW Impact
250166	HLCRST AB114	0.8140
251830	BIOENGRY	0.0779
253077	**09STUART (Deativation : 09/30/17)**	**250.2975**
342957	1SPURLK1G	4.1980
342960	1SPURLK2G	7.8641
342963	1SPURLK3G	4.1325
342966	1SPURLK4G	4.1325
923522	AB1-169 C OP	160.9630
925981	AC1-074 C O1	2.9755
925982	AC1-074 E O1	1.2752
926061	AC1-085 C	59.0870
926062	AC1-085 E	96.4050
926951	AC1-182	0.9739
927181	AC1-212 C	-0.1251
927182	AC1-212 E	-1.1848
927183	AC1-212 BAT	1.5411
930062	AB1-014 E	9.5147
932381	AC2-055 C	1.2064
932382	AC2-055 E	1.9683
932421	AC2-060 C	4.2775
932422	AC2-060 E	2.4061
932461	AC2-066 C	3.4989
932462	AC2-066 E	5.7088
932481	AC2-068 C	-2.6203
932482	AC2-068 E	-4.2914
932551	AC2-075 C	0.7067
932552	AC2-075 E	0.3560
932651	AC2-087 C O1	3.1680
932652	AC2-087 E O1	2.5130
932661	AC2-088 C O1	4.4625
932662	AC2-088 E O1	3.6722
934491	AD1-073 C	0.8822
934492	AD1-073 E	0.4545
935031	AD1-136 C	0.6275
935032	AD1-136 E	0.5346
936251	AD2-031 C O1	6.1741
936252	AD2-031 E O1	10.0735
936381	AD2-048 C	2.4277
936382	AD2-048 E	1.2113
938271	AE1-040 C O1	2.2216
938272	AE1-040 E O1	1.1178
938921	AE1-120	5.4019

Bus #	Bus	MW Impact
939141	AE1-144 C O1	5.9260
939142	AE1-144 E O1	2.9408
940531	AE2-038 C O1	3.9531
940532	AE2-038 E O1	1.9581
941411	AE2-138 C	11.4512
941412	AE2-138 E	4.2354
941981	AE2-210 C O1	3.9458
941982	AE2-210 E O1	1.4842
942091	AE2-221 C	91.0746
942092	AE2-221 E	60.7164
942591	AE2-275 C O1	2.9957
942592	AE2-275 E O1	1.1268
942891	AE2-308 C O1	5.0275
942892	AE2-308 E O1	1.8282
943111	AE2-339 C	1.3843
943112	AE2-339 E	0.6818
943201	AE2-318 C	4.7844
943202	AE2-318 E	2.3352
943771	AF1-045	1.9697
943863	AF1-054 BAT	3.1424
944521	AF1-117 C	3.7203
944522	AF1-117 E	1.1460
944621	AF1-127 C O2	1.4674
944622	AF1-127 E O2	0.7227
944941	AF1-159	3.5745
945681	AF1-233 C O2	6.0036
945682	AF1-233 E O2	2.9659
945861	AF1-251 C	4.1680
945862	AF1-251 E	2.7786
945911	AF1-256 C	1.9248
945912	AF1-256 E	1.2832
946021	AF1-267 C O2	0.8768
946022	AF1-267 E O2	0.4028
946171	AF1-282 C	23.3238
946172	AF1-282 E	15.5492
946181	AF1-283 C	30.3209
946182	AF1-283 E	20.2140
946511	AF1-315 C O1	1.4244
946512	AF1-315 E O1	0.9496
LGEE	LGEE	1.2945
CPLE	CPLE	0.3903
WEC	WEC	0.0180
CBM-W2	CBM-W2	6.9943
NY	NY	0.1781
TVA	TVA	1.6436
O-066	O-066	1.9354
CBM-S2	CBM-S2	4.3061
CBM-S1	CBM-S1	11.7320
G-007	G-007	0.2954
MEC	MEC	0.5848

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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
41039741	253038	09KILLEN	DAY	242938	05MARQUI	AEP	1	DAY_P7_34506 34542_1-A	tower	1372.0	103.36	104.61	DC	38.12

Bus #	Bus	MW Impact
250164	08BKJDB1	0.1315
250165	08BKJDB2	0.1315
251827	WILLYESP	0.4460
251828	CLNTESP1	0.3871
251829	CLNTESP2	0.2581
253077	**09STUART (Deativation : 09/30/17)**	**461.4416**
902531	W2-040 C	0.5727
902532	W2-040 E	0.9344
904722	V4-073 E	0.1255
913222	Y1-054 E	1.4751
918802	AA1-099 E	0.2581
923522	AB1-169 C OP	296.7470
925242	**AB2-178 E (Withdrawn : 12/10/2019)**	**1.3020**
925921	AC1-068 C	6.6522
925922	AC1-068 E	3.1109
925931	AC1-069 C	6.6522
925932	AC1-069 E	3.1109
925981	AC1-074 C O1	6.0171
925982	AC1-074 E O1	2.5788
926061	AC1-085 C	26.2741
926062	AC1-085 E	42.8683
926101	AC1-089 C O1	3.6846
926102	AC1-089 E O1	6.0118
926791	AC1-165 C	6.5739
926792	AC1-165 E	3.1891
926801	AC1-166 C	6.5739
926802	AC1-166 E	3.1891
926951	AC1-182	2.3555
930062	AB1-014 E	11.3792
932461	AC2-066 C	4.1846
932462	AC2-066 E	6.8275
932481	AC2-068 C	1.9444
932482	AC2-068 E	3.1843
932551	AC2-075 C	1.4291
932552	AC2-075 E	0.7199
932661	AC2-088 C O1	6.3233
932662	AC2-088 E O1	5.2036
935031	AD1-136 C	0.8892
935032	AD1-136 E	0.7575
935041	AD1-140 C O1	6.0722
935042	AD1-140 E O1	5.0201
936251	AD2-031 C O1	1.9159

Bus #	Bus	MW Impact
936252	AD2-031 E O1	3.1259
936381	AD2-048 C	4.8805
936382	AD2-048 E	2.4350
936571	AD2-072 C O1	4.2702
936572	AD2-072 E O1	2.0937
938051	AE1-007 C	0.5576
938052	AE1-007 E	0.9098
938271	AE1-040 C O1	2.1426
938272	AE1-040 E O1	1.0781
938921	AE1-120	6.4605
939141	AE1-144 C O1	11.3551
939142	AE1-144 E O1	5.6351
940531	AE2-038 C O1	7.5748
940532	AE2-038 E O1	3.7520
941411	AE2-138 C	22.4007
941412	AE2-138 E	8.2852
941511	AE2-148 C	19.2747
941512	AE2-148 E	8.7180
941981	AE2-210 C O1	7.7187
941982	AE2-210 E O1	2.9034
942061	AE2-218 C	6.7476
942062	AE2-218 E	4.5833
942091	AE2-221 C	26.1997
942092	AE2-221 E	17.4665
942411	AE2-254 C O1	2.0288
942412	AE2-254 E O1	1.3525
942521	AE2-267 C O1	1.2986
942522	AE2-267 E O1	0.8027
942591	AE2-275 C O1	5.8970
942592	AE2-275 E O1	2.2181
942891	AE2-308 C O1	9.9185
942892	AE2-308 E O1	3.6067
942951	AE2-315	1.9022
942981	AE2-320 C O1	13.0892
942982	AE2-320 E O1	6.4761
943111	AE2-339 C	2.7505
943112	AE2-339 E	1.3547
943191	AE2-319 C O1	13.0892
943192	AE2-319 E O1	6.4761
943201	AE2-318 C	8.4800
943202	AE2-318 E	4.1391
943771	AF1-045	3.4912
944211	AF1-089 C O2	1.6304
944212	AF1-089 E O2	0.4989
944521	AF1-117 C	39.4834
944522	AF1-117 E	12.1626
944621	AF1-127 C O2	2.9155
944622	AF1-127 E O2	1.4360
944941	AF1-159	0.5879
945541	AF1-219 C O2	1.0760
945542	AF1-219 E O2	0.3492
945631	AF1-228 C	4.5114

Bus #	Bus	MW Impact
945632	AF1-228 E	3.0076
945681	AF1-233 C O2	11.4930
945682	AF1-233 E O2	5.6778
945821	AF1-247 C	1.2986
945822	AF1-247 E	0.8027
945841	AF1-249 C	0.5690
945842	AF1-249 E	0.2678
945861	AF1-251 C	8.1629
945862	AF1-251 E	5.4419
945911	AF1-256 C	3.6862
945912	AF1-256 E	2.4575
946021	AF1-267 C O2	1.7180
946022	AF1-267 E O2	0.7894
946171	AF1-282 C	5.4968
946172	AF1-282 E	3.6645
946181	AF1-283 C	7.1459
946182	AF1-283 E	4.7639
946511	AF1-315 C O1	2.4671
946512	AF1-315 E O1	1.6447
LGEE	LGEE	3.2981
WEC	WEC	0.6505
CBM-W2	CBM-W2	19.9508
NY	NY	0.7405
CBM-W1	CBM-W1	21.7424
TVA	TVA	2.7216
O-066	O-066	9.1325
CBM-S1	CBM-S1	22.6376
G-007	G-007	1.4123
MEC	MEC	3.4624
CATAWBA	CATAWBA	0.0735

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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
42774539	253077	09STUART	DAY	253038	09KILLEN	DAY	1	DAY_P7_34506 34542_1-A	tower	1374.0	103.21	104.46	DC	38.12

Bus #	Bus	MW Impact
250164	08BKJDB1	0.1315
250165	08BKJDB2	0.1315
251827	WILLYESP	0.4460
251828	CLNTESP1	0.3871
251829	CLNTESP2	0.2581
253077	**09STUART (Deativation : 09/30/17)**	**461.4416**
902531	W2-040 C	0.5727
902532	W2-040 E	0.9344
904722	V4-073 E	0.1255
913222	Y1-054 E	1.4751
918802	AA1-099 E	0.2581
923522	AB1-169 C OP	296.7470
925242	**AB2-178 E (Withdrawn : 12/10/2019)**	**1.3020**
925921	AC1-068 C	6.6522
925922	AC1-068 E	3.1109
925931	AC1-069 C	6.6522
925932	AC1-069 E	3.1109
925981	AC1-074 C O1	6.0171
925982	AC1-074 E O1	2.5788
926061	AC1-085 C	26.2741
926062	AC1-085 E	42.8683
926101	AC1-089 C O1	3.6846
926102	AC1-089 E O1	6.0118
926791	AC1-165 C	6.5739
926792	AC1-165 E	3.1891
926801	AC1-166 C	6.5739
926802	AC1-166 E	3.1891
926951	AC1-182	2.3555
930062	AB1-014 E	11.3792
932461	AC2-066 C	4.1846
932462	AC2-066 E	6.8275
932481	AC2-068 C	1.9444
932482	AC2-068 E	3.1843
932551	AC2-075 C	1.4291
932552	AC2-075 E	0.7199
932661	AC2-088 C O1	6.3233
932662	AC2-088 E O1	5.2036
935031	AD1-136 C	0.8892
935032	AD1-136 E	0.7575
935041	AD1-140 C O1	6.0722
935042	AD1-140 E O1	5.0201
936251	AD2-031 C O1	1.9159

Bus #	Bus	MW Impact
936252	AD2-031 E O1	3.1259
936381	AD2-048 C	4.8805
936382	AD2-048 E	2.4350
936571	AD2-072 C O1	4.2702
936572	AD2-072 E O1	2.0937
938051	AE1-007 C	0.5576
938052	AE1-007 E	0.9098
938271	AE1-040 C O1	2.1426
938272	AE1-040 E O1	1.0781
938921	AE1-120	6.4605
939141	AE1-144 C O1	11.3551
939142	AE1-144 E O1	5.6351
940531	AE2-038 C O1	7.5748
940532	AE2-038 E O1	3.7520
941411	AE2-138 C	22.4007
941412	AE2-138 E	8.2852
941511	AE2-148 C	19.2747
941512	AE2-148 E	8.7180
941981	AE2-210 C O1	7.7187
941982	AE2-210 E O1	2.9034
942061	AE2-218 C	6.7476
942062	AE2-218 E	4.5833
942091	AE2-221 C	26.1997
942092	AE2-221 E	17.4665
942411	AE2-254 C O1	2.0288
942412	AE2-254 E O1	1.3525
942521	AE2-267 C O1	1.2986
942522	AE2-267 E O1	0.8027
942591	AE2-275 C O1	5.8970
942592	AE2-275 E O1	2.2181
942891	AE2-308 C O1	9.9185
942892	AE2-308 E O1	3.6067
942951	AE2-315	1.9022
942981	AE2-320 C O1	13.0892
942982	AE2-320 E O1	6.4761
943111	AE2-339 C	2.7505
943112	AE2-339 E	1.3547
943191	AE2-319 C O1	13.0892
943192	AE2-319 E O1	6.4761
943201	AE2-318 C	8.4800
943202	AE2-318 E	4.1391
943771	AF1-045	3.4912
944211	AF1-089 C O2	1.6304
944212	AF1-089 E O2	0.4989
944521	AF1-117 C	39.4834
944522	AF1-117 E	12.1626
944621	AF1-127 C O2	2.9155
944622	AF1-127 E O2	1.4360
944941	AF1-159	0.5879
945541	AF1-219 C O2	1.0760
945542	AF1-219 E O2	0.3492
945631	AF1-228 C	4.5114

Bus #	Bus	MW Impact
945632	AF1-228 E	3.0076
945681	AF1-233 C O2	11.4930
945682	AF1-233 E O2	5.6778
945821	AF1-247 C	1.2986
945822	AF1-247 E	0.8027
945841	AF1-249 C	0.5690
945842	AF1-249 E	0.2678
945861	AF1-251 C	8.1629
945862	AF1-251 E	5.4419
945911	AF1-256 C	3.6862
945912	AF1-256 E	2.4575
946021	AF1-267 C O2	1.7180
946022	AF1-267 E O2	0.7894
946171	AF1-282 C	5.4968
946172	AF1-282 E	3.6645
946181	AF1-283 C	7.1459
946182	AF1-283 E	4.7639
946511	AF1-315 C O1	2.4671
946512	AF1-315 E O1	1.6447
LGEE	LGEE	3.2981
WEC	WEC	0.6505
CBM-W2	CBM-W2	19.9508
NY	NY	0.7405
CBM-W1	CBM-W1	21.7424
TVA	TVA	2.7216
O-066	O-066	9.1325
CBM-S1	CBM-S1	22.6376
G-007	G-007	1.4123
MEC	MEC	3.4624
CATAWBA	CATAWBA	0.0735

25.15 Index 15

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
42246784	253100	09ATLNTA	DAY	253110	09ADKINS	DAY	1	AEP_P4_#6774_05MARQUI 345_D	breaker	1195.0	111.43	113.43	DC	23.9

Bus #	Bus	MW Impact
250166	HLCRST AB114	0.6783
251830	BIOENGRY	0.0784
253077	**09STUART (Deativation : 09/30/17)**	**282.4720**
342957	1SPURLK1G	5.0082
342960	1SPURLK2G	9.2771
342963	1SPURLK3G	4.8751
342966	1SPURLK4G	4.8751
923522	AB1-169 C OP	181.6540
925921	AC1-068 C	19.0737
925922	AC1-068 E	8.9197
925931	AC1-069 C	19.0737
925932	AC1-069 E	8.9197
926061	AC1-085 C	17.1927
926062	AC1-085 E	28.0513
926791	AC1-165 C	18.8493
926792	AC1-165 E	9.1441
926801	AC1-166 C	18.8493
926802	AC1-166 E	9.1441
926951	AC1-182	1.4159
930062	AB1-014 E	7.9283
932381	AC2-055 C	1.4318
932382	AC2-055 E	2.3360
932421	AC2-060 C	5.0766
932422	AC2-060 E	2.8556
932461	AC2-066 C	2.9156
932462	AC2-066 E	4.7570
932651	AC2-087 C O1	3.7599
932652	AC2-087 E O1	2.9825
932661	AC2-088 C O1	4.4959
932662	AC2-088 E O1	3.6997
934491	AD1-073 C	1.0471
934492	AD1-073 E	0.5394
935031	AD1-136 C	0.6322
935032	AD1-136 E	0.5386
938271	AE1-040 C O1	3.9465
938272	AE1-040 E O1	1.9858
938921	AE1-120	4.5012
939141	AE1-144 C O1	8.3889
939142	AE1-144 E O1	4.1631
940531	AE2-038 C O1	5.5961
940532	AE2-038 E O1	2.7719
941411	AE2-138 C	14.1486

Bus #	Bus	MW Impact
941412	AE2-138 E	5.2331
941981	AE2-210 C O1	4.8752
941982	AE2-210 E O1	1.8338
942091	AE2-221 C	13.4548
942092	AE2-221 E	8.9699
942981	AE2-320 C O1	37.5302
942982	AE2-320 E O1	18.5688
943191	AE2-319 C O1	37.5302
943192	AE2-319 E O1	18.5688
943201	AE2-318 C	5.0031
943202	AE2-318 E	2.4420
943771	AF1-045	2.0598
944521	AF1-117 C	83.3412
944522	AF1-117 E	25.6728
945681	AF1-233 C O2	15.9982
945682	AF1-233 E O2	7.9035
945861	AF1-251 C	5.1599
945862	AF1-251 E	3.4399
945911	AF1-256 C	5.1274
945912	AF1-256 E	3.4182
946171	AF1-282 C	6.7866
946172	AF1-282 E	4.5244
946181	AF1-283 C	8.8226
946182	AF1-283 E	5.8817
946511	AF1-315 C O1	1.4580
946512	AF1-315 E O1	0.9720
LGEE	LGEE	2.2341
CPLE	CPLE	0.3003
WEC	WEC	0.3676
CBM-W2	CBM-W2	15.1269
NY	NY	0.4568
CBM-W1	CBM-W1	10.6585
TVA	TVA	2.5438
O-066	O-066	5.4029
CBM-S2	CBM-S2	4.2194
CBM-S1	CBM-S1	18.8036
G-007	G-007	0.8320
MEC	MEC	2.2580

25.16 Index 16

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
41039687	253110	09ADKINS	DAY	243453	05BEATTY	AEP	1	DAY_P7_495	tower	1372.0	122.28	122.97	DC	20.83

Bus #	Bus	MW Impact
253077	**09STUART (Deativation : 09/30/17)**	**211.4734**
253110	09ADKINS	49.4595
923522	AB1-169 C OP	135.9957
925921	AC1-068 C	18.7459
925922	AC1-068 E	8.7665
925931	AC1-069 C	18.7459
925932	AC1-069 E	8.7665
926061	AC1-085 C	18.7921
926062	AC1-085 E	30.6609
926791	AC1-165 C	18.5254
926792	AC1-165 E	8.9870
926801	AC1-166 C	18.5254
926802	AC1-166 E	8.9870
930062	AB1-014 E	5.7627
932381	AC2-055 C	1.5076
932382	AC2-055 E	2.4597
932421	AC2-060 C	5.3453
932422	AC2-060 E	3.0068
932461	AC2-066 C	2.1192
932462	AC2-066 E	3.4576
932651	AC2-087 C O1	3.9589
932652	AC2-087 E O1	3.1404
932661	AC2-088 C O1	3.3103
932662	AC2-088 E O1	2.7241
934491	AD1-073 C	1.1025
934492	AD1-073 E	0.5679
935031	AD1-136 C	0.4655
935032	AD1-136 E	0.3966
936251	AD2-031 C O1	1.4141
936252	AD2-031 E O1	2.3072
938271	AE1-040 C O1	3.4222
938272	AE1-040 E O1	1.7219
938921	AE1-120	3.2718
939141	AE1-144 C O1	6.2123
939142	AE1-144 E O1	3.0829
940531	AE2-038 C O1	4.1441
940532	AE2-038 E O1	2.0527
942091	AE2-221 C	22.2538
942092	AE2-221 E	14.8359
942981	AE2-320 C O1	36.8853
942982	AE2-320 E O1	18.2497
943191	AE2-319 C O1	36.8853
943192	AE2-319 E O1	18.2497

Bus #	Bus	MW Impact
944521	AF1-117 C	81.3627
944522	AF1-117 E	25.0633
944941	AF1-159	0.4339
945681	AF1-233 C O2	6.2811
945682	AF1-233 E O2	3.1030
945911	AF1-256 C	2.0132
945912	AF1-256 E	1.3421
946171	AF1-282 C	3.9315
946172	AF1-282 E	2.6210
946181	AF1-283 C	5.1110
946182	AF1-283 E	3.4073
LGEE	LGEE	1.8227
CPLE	CPLE	0.2044
WEC	WEC	0.2035
CBM-W2	CBM-W2	11.2285
NY	NY	0.5336
CBM-W1	CBM-W1	4.2909
TVA	TVA	2.0076
O-066	O-066	6.2765
CBM-S2	CBM-S2	3.2137
CBM-S1	CBM-S1	15.0037
G-007	G-007	0.9672
MEC	MEC	1.4635

25.17 Index 17

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
43552225	324267	4KENTON	LGEE	246800		AEP	1	DAY_P734541 34553	tower	185.0	106.04	111.06	DC	20.6

Bus #	Bus	MW Impact
251831	Z1-080 BAT	0.5186
918802	AA1-099 E	-0.2939
918803	AA1-099 BAT	0.3457
925981	AC1-074 C O1	2.6670
925982	AC1-074 E O1	1.1430
932551	AC2-075 C	0.6334
932552	AC2-075 E	0.3191
936381	AD2-048 C	3.0966
936382	AD2-048 E	1.5450
939141	AE1-144 C O1	6.3793
939142	AE1-144 E O1	3.1658
940531	AE2-038 C O1	4.2556
940532	AE2-038 E O1	2.1079
941411	AE2-138 C	8.9377
941412	AE2-138 E	3.3057
941981	AE2-210 C O1	3.0797
941982	AE2-210 E O1	1.1584
943111	AE2-339 C	1.1504
943112	AE2-339 E	0.5666
944621	AF1-127 C O2	1.2194
944622	AF1-127 E O2	0.6006
945681	AF1-233 C O2	6.2106
945682	AF1-233 E O2	3.0682
945861	AF1-251 C	3.2688
945862	AF1-251 E	2.1792
945911	AF1-256 C	1.9773
945912	AF1-256 E	1.3182
LGEE	LGEE	0.9231
CPLE	CPLE	0.1376
WEC	WEC	0.0617
CBM-W2	CBM-W2	4.4472
NY	NY	0.0824
CBM-W1	CBM-W1	1.7264
TVA	TVA	1.0108
O-066	O-066	0.9341
CBM-S2	CBM-S2	1.7860
CBM-S1	CBM-S1	7.5743
G-007	G-007	0.1435
MADISON	MADISON	1.9212
MEC	MEC	0.5244

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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
41039730	342559	4BOONE CO	EKPC	250054	08LONGBR	DEO&K	1	DAY_P734541 34553	tower	284.0	112.0	120.76	DC	24.8

Bus #	Bus	MW Impact
342957	1SPURLK1G	5.1535
342960	1SPURLK2G	8.0926
342963	1SPURLK3G	4.2526
342966	1SPURLK4G	4.2526
925981	AC1-074 C O1	9.2562
925982	AC1-074 E O1	3.9670
932551	AC2-075 C	2.1984
932552	AC2-075 E	1.1074
936381	AD2-048 C	6.0729
936382	AD2-048 E	3.0299
936571	AD2-072 C O1	2.9465
936572	AD2-072 E O1	1.4447
939141	AE1-144 C O1	8.7899
939142	AE1-144 E O1	4.3621
940531	AE2-038 C O1	5.8636
940532	AE2-038 E O1	2.9044
941411	AE2-138 C	14.2325
941412	AE2-138 E	5.2641
941981	AE2-210 C O1	4.9041
941982	AE2-210 E O1	1.8447
942411	AE2-254 C O1	1.4096
942412	AE2-254 E O1	0.9398
942591	AE2-275 C O1	4.0264
942592	AE2-275 E O1	1.5145
942891	AE2-308 C O1	6.9274
942892	AE2-308 E O1	2.5191
943111	AE2-339 C	2.0999
943112	AE2-339 E	1.0343
944211	AF1-089 C O2	1.5123
944212	AF1-089 E O2	0.4627
944621	AF1-127 C O2	2.2259
944622	AF1-127 E O2	1.0963
945541	AF1-219 C O2	0.7318
945542	AF1-219 E O2	0.2375
945681	AF1-233 C O2	16.5976
945682	AF1-233 E O2	8.1996
945861	AF1-251 C	5.2663
945862	AF1-251 E	3.5109
945911	AF1-256 C	5.3174
945912	AF1-256 E	3.5450
946021	AF1-267 C O2	1.1750
946022	AF1-267 E O2	0.5398

Bus #	Bus	MW Impact
LGEE	LGEE	1.7069
CPLE	CPLE	0.2792
WEC	WEC	0.0350
CBM-W2	CBM-W2	6.2080
NY	NY	0.0735
CBM-W1	CBM-W1	0.6755
TVA	TVA	1.6156
O-066	O-066	0.7325
CBM-S2	CBM-S2	3.3062
CBM-S1	CBM-S1	12.7459
G-007	G-007	0.1123
MADISON	MADISON	3.7740
MEC	MEC	0.5673

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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
41039806	342661	4SPUR-KENT-R	EKPC	324267	4KENTON	LGEE	1	DAY_P734541 34553	tower	281.0	101.98	105.29	DC	20.39

Bus #	Bus	MW Impact
342957	1SPURLK1G	6.4835
342960	1SPURLK2G	9.4323
342963	1SPURLK3G	4.9566
342966	1SPURLK4G	4.9566
925981	AC1-074 C O1	2.4428
925982	AC1-074 E O1	1.0469
932551	AC2-075 C	0.5802
932552	AC2-075 E	0.2923
939141	AE1-144 C O1	5.2600
939142	AE1-144 E O1	2.6103
940531	AE2-038 C O1	3.5089
940532	AE2-038 E O1	1.7380
941411	AE2-138 C	11.1398
941412	AE2-138 E	4.1202
941981	AE2-210 C O1	3.8385
941982	AE2-210 E O1	1.4438
945681	AF1-233 C O2	6.1481
945682	AF1-233 E O2	3.0373
945861	AF1-251 C	4.0068
945862	AF1-251 E	2.6712
945911	AF1-256 C	2.0212
945912	AF1-256 E	1.3475
LGEE	LGEE	0.3206
CPLE	CPLE	0.0582
WEC	WEC	0.0038
CBM-W2	CBM-W2	2.0721
NY	NY	0.0841
TVA	TVA	0.6020
O-066	O-066	0.9744
CBM-S2	CBM-S2	0.9132
CBM-S1	CBM-S1	3.8766
G-007	G-007	0.1498
MADISON	MADISON	1.0786
MEC	MEC	0.1700

25.20 Index 20

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
41863140	342838	7SPURLOCK	EKPC	253077	09STUART	DAY	1	DEOK_P2-2_C1 SILVER GROVE 345 BUS	bus	1532.0	118.99	125.15	DC	94.11

Bus #	Bus	MW Impact
251968	08ZIMRHP	39.2669
251969	08ZIMRLP	21.5033
251970	08MELDL1	1.9892
251971	08MELDL2	1.9892
251972	08MELDL3	1.9946
342957	1SPURLK1G	20.1913
342960	1SPURLK2G	38.4191
342963	1SPURLK3G	20.1889
342966	1SPURLK4G	20.1889
925921	AC1-068 C	-3.5400
925922	AC1-068 E	-1.6555
925931	AC1-069 C	-3.5400
925932	AC1-069 E	-1.6555
925981	AC1-074 C O1	15.7063
925982	AC1-074 E O1	6.7313
926101	AC1-089 C O1	4.0790
926102	AC1-089 E O1	6.6552
926791	AC1-165 C	-3.4983
926792	AC1-165 E	-1.6971
926801	AC1-166 C	-3.4983
926802	AC1-166 E	-1.6971
926951	AC1-182	6.6980
932461	AC2-066 C	-3.1887
932462	AC2-066 E	-5.2027
932551	AC2-075 C	3.7303
932552	AC2-075 E	1.8791
936381	AD2-048 C	10.7895
936382	AD2-048 E	5.3832
936571	AD2-072 C O1	8.5203
936572	AD2-072 E O1	4.1776
936821	AD2-105 C O1	3.6360
936822	AD2-105 E O1	5.3196
936831	AD2-106 C O1	2.5615
936832	AD2-106 E O1	3.5374
936841	AD2-107 C O1	2.0318
936842	AD2-107 E O1	2.8059
939131	AE1-143 C	6.3754
939132	AE1-143 E	3.1579
939141	AE1-144 C O1	32.8515
939142	AE1-144 E O1	16.3029

Bus #	Bus	MW Impact
940531	AE2-038 C O1	21.9147
940532	AE2-038 E O1	10.8549
941411	AE2-138 C	63.0876
941412	AE2-138 E	23.3338
941961	AE2-208	2.1989
941981	AE2-210 C O1	21.7383
941982	AE2-210 E O1	8.1768
942411	AE2-254 C O1	4.2815
942412	AE2-254 E O1	2.8543
942591	AE2-275 C O1	13.4850
942592	AE2-275 E O1	5.0723
942891	AE2-308 C O1	22.6036
942892	AE2-308 E O1	8.2195
943111	AE2-339 C	7.4394
943112	AE2-339 E	3.6642
943701	AF1-038 C	1.6966
943702	AF1-038 E	1.1310
943772	AF1-045 BAT	4.6964
943821	AF1-050 C	1.5068
943822	AF1-050 E	1.0045
944151	AF1-083 C O2	1.5818
944152	AF1-083 E O2	1.0545
944211	AF1-089 C O2	2.4784
944212	AF1-089 E O2	0.7583
944511	AF1-116 C	3.7895
944512	AF1-116 E	2.5263
944621	AF1-127 C O2	14.8788
944622	AF1-127 E O2	7.3284
945541	AF1-219 C O2	2.1707
945542	AF1-219 E O2	0.7044
945681	AF1-233 C O2	62.9915
945682	AF1-233 E O2	31.1193
945861	AF1-251 C	43.2419
945862	AF1-251 E	28.8279
945911	AF1-256 C	20.2128
945912	AF1-256 E	13.4752
946021	AF1-267 C O2	3.9319
946022	AF1-267 E O2	1.8066
LGEE	LGEE	4.6422
CPLE	CPLE	0.4545
WEC	WEC	0.3597
LGE-0012019	LGE-0012019	6.2986
CBM-W2	CBM-W2	24.2260
NY	NY	0.7897
CBM-W1	CBM-W1	9.0572
TVA	TVA	5.1954
O-066	O-066	9.2400
CBM-S2	CBM-S2	7.3522
CBM-S1	CBM-S1	38.6212
G-007	G-007	1.4248
MADISON	MADISON	3.2780
MEC	MEC	2.9190

25.21 Index 21

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
42774566	926060	AC1-085 TAP	DAY	942090	AE2-221 TAP	DAY	1	DAY_P734569 34598 34524	tower	1374.0	108.88	109.56	DC	20.94

Bus #	Bus	MW Impact
250166	HLCRST AB114	0.8727
251830	BIOENGRY	0.0826
253077	**09STUART (Deativation : 09/30/17)**	**270.4985**
342957	1SPURLK1G	4.4622
342960	1SPURLK2G	8.4450
342963	1SPURLK3G	4.4377
342966	1SPURLK4G	4.4377
923522	AB1-169 C OP	173.9540
925981	AC1-074 C O1	3.1445
925982	AC1-074 E O1	1.3476
926061	AC1-085 C	65.1806
926062	AC1-085 E	106.3474
926951	AC1-182	1.0406
927181	AC1-212 C	-0.1208
927182	AC1-212 E	-1.1441
927183	AC1-212 BAT	1.4881
930062	AB1-014 E	10.2006
932461	AC2-066 C	3.7512
932462	AC2-066 E	6.1203
932481	AC2-068 C	-2.8280
932482	AC2-068 E	-4.6315
932551	AC2-075 C	0.7468
932552	AC2-075 E	0.3762
932661	AC2-088 C O1	4.7332
932662	AC2-088 E O1	3.8950
935031	AD1-136 C	0.6656
935032	AD1-136 E	0.5670
936381	AD2-048 C	2.5107
936382	AD2-048 E	1.2527
938921	AE1-120	5.7913
939141	AE1-144 C O1	6.2171
939142	AE1-144 E O1	3.0853
940531	AE2-038 C O1	4.1473
940532	AE2-038 E O1	2.0543
941411	AE2-138 C	12.2143
941412	AE2-138 E	4.5176
941981	AE2-210 C O1	4.2087
941982	AE2-210 E O1	1.5831
942591	AE2-275 C O1	3.1697
942592	AE2-275 E O1	1.1923
942891	AE2-308 C O1	5.3173
942892	AE2-308 E O1	1.9336

Bus #	Bus	MW Impact
943111	AE2-339 C	1.4695
943112	AE2-339 E	0.7238
943201	AE2-318 C	5.0460
943202	AE2-318 E	2.4629
943771	AF1-045	2.0774
943863	AF1-054 BAT	3.0940
944521	AF1-117 C	3.6452
944522	AF1-117 E	1.1229
944621	AF1-127 C O2	1.5577
944622	AF1-127 E O2	0.7672
945681	AF1-233 C O2	6.3144
945682	AF1-233 E O2	3.1194
945861	AF1-251 C	4.4439
945862	AF1-251 E	2.9626
945911	AF1-256 C	2.0255
945912	AF1-256 E	1.3503
946021	AF1-267 C O2	0.9273
946022	AF1-267 E O2	0.4260
946171	AF1-282 C	25.7292
946172	AF1-282 E	17.1528
946181	AF1-283 C	33.4480
946182	AF1-283 E	22.2986
946511	AF1-315 C O1	1.5052
946512	AF1-315 E O1	1.0035
LGEE	LGEE	1.3658
CPLE	CPLE	0.3890
WEC	WEC	0.0343
CBM-W2	CBM-W2	7.4693
NY	NY	0.1886
TVA	TVA	1.7178
O-066	O-066	2.0698
CBM-S2	CBM-S2	4.3408
CBM-S1	CBM-S1	12.3029
G-007	G-007	0.3172
MEC	MEC	0.6706

25.22 Index 22

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
42774500	942090	AE2-221 TAP	DAY	253014	09CLINTO	DAY	1	DAY_P734569 34598 34524	tower	1374.0	121.05	121.74	DC	20.94

Bus #	Bus	MW Impact
250166	HLCRST AB114	0.8727
251830	BIOENGRY	0.0826
253077	**09STUART (Deativation : 09/30/17)**	**270.4985**
342957	1SPURLK1G	4.4622
342960	1SPURLK2G	8.4450
342963	1SPURLK3G	4.4377
342966	1SPURLK4G	4.4377
923522	AB1-169 C OP	173.9540
925981	AC1-074 C O1	3.1445
925982	AC1-074 E O1	1.3476
926061	AC1-085 C	65.1806
926062	AC1-085 E	106.3474
926951	AC1-182	1.0406
927181	AC1-212 C	-0.1208
927182	AC1-212 E	-1.1441
927183	AC1-212 BAT	1.4881
930062	AB1-014 E	10.2006
932461	AC2-066 C	3.7512
932462	AC2-066 E	6.1203
932481	AC2-068 C	-2.8280
932482	AC2-068 E	-4.6315
932551	AC2-075 C	0.7468
932552	AC2-075 E	0.3762
932661	AC2-088 C O1	4.7332
932662	AC2-088 E O1	3.8950
935031	AD1-136 C	0.6656
935032	AD1-136 E	0.5670
936381	AD2-048 C	2.5107
936382	AD2-048 E	1.2527
938921	AE1-120	5.7913
939141	AE1-144 C O1	6.2171
939142	AE1-144 E O1	3.0853
940531	AE2-038 C O1	4.1473
940532	AE2-038 E O1	2.0543
941411	AE2-138 C	12.2143
941412	AE2-138 E	4.5176
941981	AE2-210 C O1	4.2087
941982	AE2-210 E O1	1.5831
942091	AE2-221 C	100.7514
942092	AE2-221 E	67.1676
942591	AE2-275 C O1	3.1697
942592	AE2-275 E O1	1.1923

Bus #	Bus	MW Impact
942891	AE2-308 C O1	5.3173
942892	AE2-308 E O1	1.9336
943111	AE2-339 C	1.4695
943112	AE2-339 E	0.7238
943201	AE2-318 C	5.0460
943202	AE2-318 E	2.4629
943771	AF1-045	2.0774
943863	AF1-054 BAT	3.0940
944521	AF1-117 C	3.6452
944522	AF1-117 E	1.1229
944621	AF1-127 C O2	1.5577
944622	AF1-127 E O2	0.7672
945681	AF1-233 C O2	6.3144
945682	AF1-233 E O2	3.1194
945861	AF1-251 C	4.4439
945862	AF1-251 E	2.9626
945911	AF1-256 C	2.0255
945912	AF1-256 E	1.3503
946021	AF1-267 C O2	0.9273
946022	AF1-267 E O2	0.4260
946171	AF1-282 C	25.7292
946172	AF1-282 E	17.1528
946181	AF1-283 C	33.4480
946182	AF1-283 E	22.2986
946511	AF1-315 C O1	1.5052
946512	AF1-315 E O1	1.0035
LGEE	LGEE	1.3658
CPLE	CPLE	0.3890
WEC	WEC	0.0343
CBM-W2	CBM-W2	7.4693
NY	NY	0.1886
TVA	TVA	1.7178
O-066	O-066	2.0698
CBM-S2	CBM-S2	4.3408
CBM-S1	CBM-S1	12.3029
G-007	G-007	0.3172
MEC	MEC	0.6706

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).

27 Contingency Descriptions

Contingency Name	Contingency Definition
DAY_P734569 34598 34524	CONTINGENCY 'DAY_P734569 34598 34524' OPEN BRANCH FROM BUS 249566 TO BUS 249578 CKT 1 / OPEN BRANCH FROM BUS 249566 TO BUS 253006 CKT 1 / 249566 08FOSTER 345 253006 09BATH 345 1 OPEN BRANCH FROM BUS 249566 TO BUS 253079 CKT 1 / 249566 08FOSTER 345 253079 09SUGRCK 345 1 END
DEOK_P2-3_C2 1493_RED BANK	CONTINGENCY 'DEOK_P2-3_C2 1493_RED BANK' OPEN BRANCH FROM BUS 249571 TO BUS 249573 CKT 1 / 249571 08REDBK1 345 249573 08SGROVE 345 1 OPEN BRANCH FROM BUS 249573 TO BUS 250097 CKT 1 / 249573 08SGROVE 345 250097 08SGROVE 138 1 OPEN BRANCH FROM BUS 249573 TO BUS 249577 CKT 1 / 249573 08SGROVE 345 249577 08ZIMER 345 1 OPEN BRANCH FROM BUS 249571 TO BUS 250092 CKT 1 / 249571 08REDBK1 345 250092 08REDBK1 138 1 END
DAY_P4_L34553-1	CONTINGENCY 'DAY_P4_L34553-1' OPEN LINE FROM BUS 253077 TO BUS 342838 CKT 1 /* 09STUART 345 - 7SPURLK 345 OPEN LINE FROM BUS 253077 TO BUS 253076 CKT 1 /* 09STUART 345 - 09STUART 138 END
AEP_P1-2_#714	CONTINGENCY 'AEP_P1-2_#714' OPEN BRANCH FROM BUS 244022 TO BUS 243457 CKT 1 / 244022 05COLE 345 243457 05HAYDEN 345 1 END
DAY_P1_894_B2	CONTINGENCY 'DAY_P1_894_B2' OPEN BRANCH FROM BUS 253038 TO BUS 253077 CKT 1 / 253038 09KILLEN 345 253077 09STUART 345 1 END
DAY_P4_L34526-3	CONTINGENCY 'DAY_P4_L34526-3' OPEN LINE FROM BUS 253027 TO BUS 253006 CKT 1 /* 09GREENE 345 - 09BATH 345 OPEN LINE FROM BUS 253027 TO BUS 253014 CKT 1 /* 09GREENE 345 - 09CLINTO 345 OPEN LINE FROM BUS 253014 TO BUS 253013 CKT 1 /* 09CLINTON 69 - 09CLINTO 345 OPEN LINE FROM BUS 253014 TO BUS 253013 CKT 2 /* 09CLINTON 69 - 09CLINTO 345 END
DAY_P1-2_#762	CONTINGENCY 'DAY_P1-2_#762' OPEN BRANCH FROM BUS 243453 TO BUS 253110 CKT 1 / 243453 05BEATTY 345 253110 09ADKINS 345 1 END

Contingency Name	Contingency Definition
AEP_P4_#3195_05BEATTY 345_304E	CONTINGENCY 'AEP_P4_#3195_05BEATTY 345_304E' OPEN BRANCH FROM BUS 243453 TO BUS 243454 CKT 1 / 243453 05BEATTY 345 243454 05BIXBY 345 1 OPEN BRANCH FROM BUS 243453 TO BUS 243468 CKT 4 / 243453 05BEATTY 345 243468 05BEATTX 138 4 END
EKPC_P4-6_SPUR N39-92T	CONTINGENCY 'EKPC_P4-6_SPUR N39-92T' /* SPURLOCK OPEN BRANCH FROM BUS 342622 TO BUS 342664 CKT 1 /* 342622 4MAYSVIL I T138.00 342664 4SPURLOCK 138.00 OPEN BRANCH FROM BUS 342622 TO BUS 342625 CKT 1 /* 342622 4MAYSVIL I T138.00 342625 4MAYSVIL IND138.00 OPEN BRANCH FROM BUS 342622 TO BUS 342634 CKT 1 /* 342622 4MAYSVIL I T138.00 342634 4PLUMVILLE 138.00 OPEN BRANCH FROM BUS 945910 TO BUS 342664 CKT 1 /* 945910 AF1-256 TAP 138.00 342664 4SPURLOCK 138.00 END
DAY_P7_34506 34542_1-B	CONTINGENCY 'DAY_P7_34506 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
EKPC_P2-4_SPUR N39-92T	CONTINGENCY 'EKPC_P2-4_SPUR N39-92T' /* SPURLOCK OPEN BRANCH FROM BUS 342622 TO BUS 342664 CKT 1 /* 342622 4MAYSVIL I T138.00 342664 4SPURLOCK 138.00 OPEN BRANCH FROM BUS 342622 TO BUS 342625 CKT 1 /* 342622 4MAYSVIL I T138.00 342625 4MAYSVIL IND138.00 OPEN BRANCH FROM BUS 342622 TO BUS 342634 CKT 1 /* 342622 4MAYSVIL I T138.00 342634 4PLUMVILLE 138.00 OPEN BRANCH FROM BUS 945910 TO BUS 342664 CKT 1 /* 945910 AF1-256 TAP 138.00 342664 4SPURLOCK 138.00 END
DAY_P7_34506 34542_1-A	CONTINGENCY 'DAY_P7_34506 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 945630 CKT 1 / 243453 05BEATTY 345 941510 AF1-228 TAP 345 1 END
DAY_P734541 34553	CONTINGENCY 'DAY_P734541 34553' OPEN BRANCH FROM BUS 249581 TO BUS 342838 CKT 1 /* 249581 08MELDAL 345.00 342838 7SPURLOCK 345.00 OPEN BRANCH FROM BUS 253077 TO BUS 342838 CKT 1 /* 253077 09STUART 345.00 342838 7SPURLOCK 345.00 END

Contingency Name	Contingency Definition
DEOK_P5-5_FOSTER345 BUS1+RELAYFAIL	CONTINGENCY 'DEOK_P5-5_FOSTER345 BUS1+RELAYFAIL' OPEN BRANCH FROM BUS 249566 TO BUS 250035 CKT 1 / 249566 08FOSTER 345 250035 08FTRM11 138 1 OPEN BRANCH FROM BUS 249566 TO BUS 249578 CKT 1 / 249566 08FOSTER 345 249578 08HILCRT 345 1 OPEN BRANCH FROM BUS 249566 TO BUS 253079 CKT 1 / 249566 08FOSTER 345 253079 09SUGRCK 345 1 END
AEP_P4_#2900_05MARQUI 345_D2	CONTINGENCY 'AEP_P4_#2900_05MARQUI 345_D2' OPEN BRANCH FROM BUS 242938 TO BUS 248003 CKT 1 / 242938 05MARQUI 345 248003 06DOE530 345 1 OPEN BRANCH FROM BUS 242938 TO BUS 253038 CKT 1 / 242938 05MARQUI 345 253038 09KILLEN 345 1 OPEN BRANCH FROM BUS 242938 TO BUS 243034 CKT 3 / 242938 05MARQUI 345 243034 05MARQUI 138 3 END
AEP_P4_#10715_05COLE 345_C	CONTINGENCY 'AEP_P4_#10715_05COLE 345_C' OPEN BRANCH FROM BUS 244022 TO BUS 243457 CKT 1 / 244022 05COLE 345 243457 05HAYDEN 345 1 OPEN BRANCH FROM BUS 244022 TO BUS 244023 CKT 1 / 244022 05COLE 345 244023 05COLE 138 1 END
DEOK_P2-2_C1 SILVER GROVE 345 BUS	CONTINGENCY 'DEOK_P2-2_C1 SILVER GROVE 345 BUS' OPEN BRANCH FROM BUS 249573 TO BUS 249577 CKT 1 / 249573 08SGROVE 345 249577 08ZIMER 345 1 OPEN BRANCH FROM BUS 249573 TO BUS 250097 CKT 1 / 249573 08SGROVE 345 250097 08SGROVE 138 1 OPEN BRANCH FROM BUS 249571 TO BUS 249573 CKT 1 / 249571 08REDBK1 345 249573 08SGROVE 345 1 END
DEOK_P7-1_C5 CIRCUIT1883&4545REDBANKSILGRVZIMMER	CONTINGENCY 'DEOK_P7-1_C5 CIRCUIT1883&4545REDBANKSILGRVZIMMER' OPEN BRANCH FROM BUS 249989 TO BUS 250080 CKT 1 / 249989 08BKJ246 138 250080 08NWTWN2 138 1 OPEN BRANCH FROM BUS 250079 TO BUS 250080 CKT Z1 / 250079 08NWTWN1 138 250080 08NWTWN2 138 Z1 OPEN BRANCH FROM BUS 250079 TO BUS 250092 CKT 1 / 250079 08NWTWN1 138 250092 08REDBK1 138 1 OPEN BRANCH FROM BUS 249573 TO BUS 249577 CKT 1 / 249573 08SGROVE 345 249577 08ZIMER 345 1 OPEN BRANCH FROM BUS 249573 TO BUS 250097 CKT 1 / 249573 08SGROVE 345 250097 08SGROVE 138 1 OPEN BRANCH FROM BUS 249571 TO BUS 249573 CKT 1 / 249571 08REDBK1 345 249573 08SGROVE 345 1 END
AEP_P4_#8094_05BIXBY 345_C	CONTINGENCY 'AEP_P4_#8094_05BIXBY 345_C' OPEN BRANCH FROM BUS 243453 TO BUS 243454 CKT 1 / 243453 05BEATTY 345 243454 05BIXBY 345 1 OPEN BRANCH FROM BUS 941520 TO BUS 243454 CKT 1 / 941520 AE2-149 TAP 345 243454 05BIXBY 345 1 END

Contingency Name	Contingency Definition
DEOK_P2-3_C2 816_SILVERGROVE	CONTINGENCY 'DEOK_P2-3_C2 816_SILVERGROVE' OPEN BRANCH FROM BUS 249573 TO BUS 250097 CKT 1 / 249573 08SGROVE 345 250097 08SGROVE 138 1 OPEN BRANCH FROM BUS 249988 TO BUS 250097 CKT 1 / 249988 08BKJ135 138 250097 08SGROVE 138 1 OPEN BRANCH FROM BUS 250042 TO BUS 250097 CKT 1 / 250042 08HANDS1 138 250097 08SGROVE 138 1 OPEN BRANCH FROM BUS 250052 TO BUS 250097 CKT 1 / 250052 08KYUNIV 138 250097 08SGROVE 138 1 OPEN BRANCH FROM BUS 250053 TO BUS 250097 CKT 1 / 250053 08LAFARG 138 250097 08SGROVE 138 1 OPEN BRANCH FROM BUS 249571 TO BUS 249573 CKT 1 / 249571 08REDBK1 345 249573 08SGROVE 345 1 OPEN BRANCH FROM BUS 249573 TO BUS 249577 CKT 1 / 249573 08SGROVE 345 249577 08ZIMER 345 1 END
DAY-P1-STU SPUR	CONTINGENCY 'DAY-P1-STU SPUR' DISCONNECT BRANCH FROM BUS 253077 TO BUS 342838 CKT 1 /* STU SPUR END
DEOK_P7-1_C5 4524FOSTRSUGRCRK34598FOSTERBATH	CONTINGENCY 'DEOK_P7-1_C5 4524FOSTRSUGRCRK34598FOSTERBATH' OPEN BRANCH FROM BUS 249566 TO BUS 253079 CKT 1 / 249566 08FOSTER 345 253079 09SUGRCK 345 1 OPEN BRANCH FROM BUS 249566 TO BUS 253006 CKT 1 / 249566 08FOSTER 345 253006 09BATH 345 1 END
Base Case	
AEP_P1-2_#713	CONTINGENCY 'AEP_P1-2_#713' OPEN BRANCH FROM BUS 243453 TO BUS 243454 CKT 1 / 243453 05BEATTY 345 243454 05BIXBY 345 1 END
DEOK_P2-3_C2 1349_FOSTER	CONTINGENCY 'DEOK_P2-3_C2 1349_FOSTER' OPEN BRANCH FROM BUS 249566 TO BUS 253006 CKT 1 / 249566 08FOSTER 345 253006 09BATH 345 1 OPEN BRANCH FROM BUS 249566 TO BUS 249578 CKT 1 / 249566 08FOSTER 345 249578 08HILCRT 345 1 END
EKPC_P7-1_SPUR 138 DBL-C	CONTINGENCY 'EKPC_P7-1_SPUR 138 DBL-C' /* SPURLOCK - PLUMVILLE 138 & SPURLOCK - GODDARD 138 OPEN BRANCH FROM BUS 342622 TO BUS 342664 CKT 1 /* 342622 4MAYSVIL I T138.00 342664 4SPURLOCK 138.00 OPEN BRANCH FROM BUS 342622 TO BUS 342625 CKT 1 /* 342622 4MAYSVIL I T138.00 342625 4MAYSVIL IND138.00 OPEN BRANCH FROM BUS 342622 TO BUS 342634 CKT 1 /* 342622 4MAYSVIL I T138.00 342634 4PLUMVILLE 138.00 OPEN BRANCH FROM BUS 945910 TO BUS 342664 CKT 1 /* 945910 AF1-256 TAP 138.00 342664 4SPURLOCK 138.00 END

Contingency Name	Contingency Definition
EKPC_P7-1_SPUR 138 DBL-B	CONTINGENCY 'EKPC_P7-1_SPUR 138 DBL-B' /* SPURLOCK - PLUMVILLE 138 & SPURLOCK - GODDARD 138 OPEN BRANCH FROM BUS 342622 TO BUS 342664 CKT 1 /* 342622 4MAYSVIL I T138.00 342664 4SPURLOCK 138.00 OPEN BRANCH FROM BUS 342622 TO BUS 342625 CKT 1 /* 342622 4MAYSVIL I T138.00 342625 4MAYSVIL IND138.00 OPEN BRANCH FROM BUS 342622 TO BUS 342634 CKT 1 /* 342622 4MAYSVIL I T138.00 342634 4PLUMVILLE 138.00 OPEN BRANCH FROM BUS 945680 TO BUS 945910 CKT 1 /* 945680 AF1-233 TAP 138.00 945910 AF1-256 TAP 138.00 END
DAY_P1-2_#764	CONTINGENCY 'DAY_P1-2_#764' OPEN BRANCH FROM BUS 242938 TO BUS 253038 CKT 1 / 242938 05MARQUI 345 253038 09KILLEN 345 1 END
DAY_P7_495	CONTINGENCY 'DAY_P7_495' OPEN BRANCH FROM BUS 249566 TO BUS 253006 CKT 1 / 249566 08FOSTER 345 253006 09BATH 345 1 OPEN BRANCH FROM BUS 253014 TO BUS 253027 CKT 1 / 253014 09CLINTO 345 253027 09GREENE 345 1 OPEN BRANCH FROM BUS 253014 TO BUS 253013 CKT 1 / 253014 09CLINTO 345 253013 09CLINTO 69.0 1 OPEN BRANCH FROM BUS 253014 TO BUS 253013 CKT 2 / 253014 09CLINTO 345 253013 09CLINTO 69.0 1 END
DEOK_P1-3_B3 SILVER GROVE 345/138 TB23*	CONTINGENCY 'DEOK_P1-3_B3 SILVER GROVE 345/138 TB23*' OPEN BRANCH FROM BUS 249573 TO BUS 250097 CKT 1 / 249573 08SGROVE 345 250097 08SGROVE 138 1 OPEN BRANCH FROM BUS 249571 TO BUS 249573 CKT 1 / 249571 08REDBK1 345 249573 08SGROVE 345 1 OPEN BRANCH FROM BUS 249573 TO BUS 249577 CKT 1 / 249573 08SGROVE 345 249577 08ZIMER 345 1 END
AEP_P1-2_#10137	CONTINGENCY 'AEP_P1-2_#10137' OPEN BRANCH FROM BUS 243453 TO BUS 244022 CKT 1 / 243453 05BEATTY 345 244022 05COLE 345 1 END
DAY_P1_AC1-085_ST_FSA-B	CONTINGENCY 'DAY_P1_AC1-085_ST_FSA-B' OPEN BRANCH FROM BUS 253014 TO BUS 942090 CKT 1 END
AEP_P4_#6774_05MARQUI 345_D	CONTINGENCY 'AEP_P4_#6774_05MARQUI 345_D' OPEN BRANCH FROM BUS 246888 TO BUS 242938 CKT 1 / 246888 05BIERSR 345 242938 05MARQUI 345 1 OPEN BRANCH FROM BUS 242938 TO BUS 253038 CKT 1 / 242938 05MARQUI 345 253038 09KILLEN 345 1 END

Contingency Name	Contingency Definition
AEP_P4_#3196_05BEATTY 345_302E	CONTINGENCY 'AEP_P4_#3196_05BEATTY 345_302E' OPEN BRANCH FROM BUS 243453 TO BUS 244022 CKT 1 / 243453 05BEATTY 345 244022 05COLE 345 1 OPEN BRANCH FROM BUS 243453 TO BUS 243468 CKT 4 / 243453 05BEATTY 345 243468 05BEATTX 138 4 END

Short Circuit

28 Short Circuit

The following Breakers are overduty

Bus Number	Bus Name	BREAKER	Type	Capacity (Amps)	Duty Percentage Post Queue	Duty Percentage Pre Queue

APPENDIX F

PJM Interconnection – System Impact Study

Via DocuSign

August 31, 2020

Tenaska, Inc.
14302 FNB Parkway
Omaha, Nebraska 68154

Dear Andrew Grieve,

RE: AF1-233 "Flemingsburg 138 kV" - System Impact Study Report and Facilities Study Agreement

NOTE: As further described below and in PJM Open Access Transmission Tariff ("PJM Tariff"), Part VI, section 206, in order to retain your project's Queue Position you must submit the following items to PJM on or before the due date of October 1, 2020

- **Executed Facilities Study Agreement via DocuSign**
- **Facilities Study Deposit of $ 100,000**
- **Provide PJM with any information specified in section 6 (Milestones) of the enclosed Facilities Study Agreement that has a due date matching the agreement's execution date**

Enclosed is a report documenting the results of the **AF1-233 "Flemingsburg 138 kV"** System Impact Study. The results of this study are predicated on a **2023** transmission system based upon PJM's best assumptions at the present time for load growth and connection of proposed new generation additions.

System Impact Studies are performed to determine the facilities required for interconnection and to define the estimated cost and timing for construction of attachment facilities and network upgrades required for the reliable interconnection of a generation project to the PJM system. The costs and associated timing described in the enclosed report are based upon estimates given to PJM by the affected Transmission Owner(s). The costs are your responsibility as the project developer.

The costs associated with the studies are being tabulated and you will receive a final statement/invoice electronically from PJM detailing your balance within 120 days.

Please be advised that all modeling will be completed consistent with Manual 3A. Market settlements cannot begin until these steps have been complete.

Note that Tariff 212.5 milestones require that you have all site permits, water and fuel agreements and associated right of way, and a memorandum of understanding for major equipment at the time you return your executed Interconnection Service Agreement (ISA). It is your responsibility to

ensure these requirements are met and if they cannot be met at the time of the return of the ISA, you must demonstrate your due diligence and propose dates when those milestones will be met.

Pursuant to Section 207 of the PJM Tariff, attached is a Facilities Study Agreement for your consideration. The Agreement must be executed via DocuSign within thirty days by (close of business on **October 1, 2020**) to maintain your projects' position in the queue. A refundable deposit in the amount of **$ 100,000** must accompany the agreement and be in PJM's possession by the deadline stated above. In addition, this and any other queue requests that you may have in the PJM queue must be in good financial standing, and all information requested in the Milestones (Section 6) portion of the Agreement are required to accompany the signed agreement. Failure to meet these requirements will result in the project's withdrawal from the PJM queue.

Please review and execute the Facilities Study Agreement as specified in DocuSign. Required with the signed agreement, per Section 3 of the enclosed Facilities Study Agreement is a refundable deposit of **$ 100,000**

Please send the required study deposit to:

Interconnection Projects Admin
PJM Interconnection, L.L.C.
2750 Monroe Blvd.
Audubon, PA 19403

The following information is provided for wire transfers:

Bank: PNC Bank, NA, New Jersey
ABA Number: 031-207-607
Account Number: 8013589826

Please e-mail PJM at SystemPlanning.Admin@pjm.com with the project name, queue number, date and amount of wire.

If you wish to discuss the results of the System Impact Study reports or the Facilities Study Agreement with me, please let me know. My office telephone number is 610-666-4306 and my email address is Komal.Patel@pjm.com.

Sincerely,

Komal Patel
Engineer
PJM Interconnection Projects

Attachments

PJM (w/attachments): Nathan Bradley – EKPC
Darrin Adams – EKPC

Noorgul Dada – PJM
Bernard O'Hara – PJM
Peter Kramp – PJM
File

ATTACHMENT N-2
FORM OF
FACILITIES STUDY AGREEMENT

(PJM Queue Position #AF1-233)

RECITALS

1. This Facilities Study Agreement ("Agreement"), dated as of _____, is entered into, by and between **Tenaska, Inc.** ("New Service Customer") and PJM Interconnection, L.L.C. ("Transmission Provider") pursuant to Part VI of the PJM Interconnection, L.L.C. Open Access Transmission Tariff ("PJM Tariff").

2. Pursuant to Section 36.2 or Section 205 of the PJM Tariff, Transmission Provider has completed a Generation or Transmission Interconnection Feasibility Study or an Initial Study (as applicable) and a System Impact Study and has provided the results of those studies to New Service Customer.

3. Transmission Provider has informed New Service Customer that the estimated date for completion of a Facilities Study pursuant to Section 206 of the PJM Tariff is **August 30, 2021** and that New Service Customer's estimated cost responsibility for such Facilities Study, subject to revision as provided in this Agreement, is **$ 100,000**

4. New Service Customer desires that Transmission Provider commence a Facilities Study for the New Service Request with Queue Position **AF1-233**

PREVIOUS SUBMISSIONS

5. Except as otherwise specifically set forth in an attachment to this Agreement, New Service Customer represents and warrants that the information provided in section 3 of the Feasibility Study Agreement, dated **October 4, 2019**, by and between New Service Customer and Transmission Provider, and to the extent supplemented as set forth in section 4 of the System Impact Study Agreement, dated **April 24, 2020**, by and between New Service Customer and Transmission Provider, is accurate and complete as of the date of execution of this Facilities Study Agreement.

MILESTONES

6. Pursuant to Section 206.1 of the PJM Tariff, the parties agree that New Service Customer must meet the following milestone dates relating to the development of its generation or merchant transmission project(s) or New Service Request, as applicable, in order to retain the assigned Queue Position of its New Service Request(s) (as established pursuant to Section 201 of the PJM Tariff) while Transmission Provider is completing the Facilities Study:

    1. Unless New Service Customer previously specified, in its initial drawing submitted to Transmission Provider, the location of the high-side of the generator step-up transformer, then on or before **November 30, 2020**, New Service Customer must provide evidence of an ownership interest in, or right to acquire or control the location which shall be on the high voltage side of the Customer Facility generator step-up transformer(s), or in the case of a Customer Facility with a single step-up transformer for multiple generators, the high voltage side of the facility step-up transformer. The evidence of site control shall be a deed, option agreement, lease, or other similar document acceptable to the Transmission Provider.
    2. To the extent New Service Customer intends to elect the Option to Build as provided in Appendix 2 to Attachment P of the Tariff, and to the extent any new or additional property is required to accommodate required Attachment Facilities and/or network substation, on or before **November 30, 2020**, New Service Customer must provide evidence of an ownership interest in, or right to acquire or control the location which shall be the location of the network substation which shall be built and subsequently transferred to the Interconnected Transmission Owner. The evidence of site control shall be a deed, option agreement, lease, or other similar document acceptable to the Transmission Provider.

Should New Service Customer fail to achieve any of the foregoing milestones, its New Service Request(s) shall be deemed to be withdrawn and terminated and it will have to resubmit its New Service Request(s) for reassignment of a Queue Position and re-initiation of the New Service Request study process.

PURPOSE AND SCOPE OF THE FACILITIES STUDY

7. Transmission Provider, in consultation with the affected Transmission Owner(s), shall commence a Facilities Study pursuant to Section 206 of the PJM Tariff to evaluate the Attachment Facilities, Local Upgrades and/or Network Upgrades necessary to accommodate New Service Customer's New Service Request assigned Queue Position **AF1-233**

    A. Scope of Facilities Study: The purpose of the Facilities Study is to provide, commensurate with any mutually agreed parameters regarding the scope and degree of specificity described in Schedule A attached to this agreement, conceptual engineering and, as appropriate, detailed design, plus cost estimates and project schedules, to implement the conclusions of the System Impact Study regarding the Attachment Facilities, Local Upgrades and Network Upgrades necessary to accommodate the New Service Customer's New Service Request(s). Cost estimates shall be determined in a manner consistent with Section 217 of the PJM Tariff. The nature and scope of the materials that Transmission Provider shall deliver to the New Service Customer

upon completion of the Facilities Study shall be described in the PJM Manuals.

B. Facilities Study Cost and Time Estimate: Transmission Provider's estimates of the date for completion of the Facilities Study and of New Service Customer's cost responsibility for the Facilities Study are stated in section 3 of this Agreement. In the event that Transmission Provider determines that it will be unable to complete the Facilities Study by the estimated completion date stated in section 3 of this Agreement, it shall notify New Service Customer and will explain the reasons for the delay. New Service Customer agrees that its estimated cost responsibility stated in section 3 is subject to revision as provided in sections 14, 15 and 16 of this Agreement.

8. The Facilities Study necessarily will employ various assumptions regarding New Service Customer's New Service Request(s), other pending New Service Requests, and PJM's Regional Transmission Expansion Plan at the time of the study. IN NO EVENT SHALL THIS AGREEMENT OR THE FACILITIES STUDY IN ANY WAY BE DEEMED TO OBLIGATE TRANSMISSION PROVIDER OR THE TRANSMISSION OWNERS TO CONSTRUCT ANY FACILITIES OR UPGRADES OR TO PROVIDE ANY TRANSMISSION OR INTERCONNECTION SERVICE TO OR ON BEHALF OF NEW SERVICE CUSTOMER EITHER AT THIS POINT IN TIME OR IN THE FUTURE.

CONFIDENTIALITY

9. New Service Customer agrees to provide all information requested by Transmission Provider necessary to complete the Facilities Study. Subject to section 10 of this Agreement and to the extent required by Section 222of the PJM Tariff, information provided pursuant to this section 9 shall be and remain confidential.

10. Until completion of the Facilities Study, Transmission Provider shall keep confidential all information provided to it by the New Service Customer. Upon completion of the Facilities Study, Transmission Provider shall provide a copy of the study to New Service Customer, and to all other New Service Customers whose New Service Requests were evaluated in the Facilities Study, along with (to the extent consistent with Transmission Provider's confidentiality obligations in Section 18.17 of the Operating Agreement) all related work papers. Transmission Provider also shall post on its website the existence of the Facilities Study. New Service Customer acknowledges and consents to such other, additional disclosures of information as may be required under the PJM Tariff or the FERC's rules and regulations.

11. New Service Customer acknowledges that, consistent with Part VI of the PJM Tariff, the affected Transmission Owner(s) will participate in the Facilities Study process and that Transmission Provider may disseminate information to the affected Transmission Owner(s) and may consult with them regarding part or all of the Facilities Study.

COST RESPONSIBILITY

12. A. New Service Customer shall reimburse Transmission Provider for all, or for an allocated portion of, the actual cost of the Facilities Study in accordance with its cost responsibility as determined under Section 206 of the PJM Tariff.

    B. Prior to initiating the Facilities Study, Transmission Provider shall bill New Service Customer for New Service Customer's share of the cost of work on the study that is scheduled to be completed during the first three months after work commences. Thereafter, on or before the 5th business day of every third month, Transmission Provider shall bill New Service Customer for New Service Customer's share of the cost of work expected to be completed on the Facilities Study during the ensuing three months. New Service Customer shall pay each bill within twenty (20) days after receipt thereof. In the event New Service Customer fails, other than as provided below regarding billing disputes, to make timely payment of any invoice for work on the Facilities Study, its New Service Request shall be deemed to be terminated and withdrawn as of the date when payment was due. Notwithstanding the foregoing, in the event that the total estimated cost of the Facilities Study does not exceed the amount of the deposit required under Section 206 of the PJM Tariff, Transmission Provider shall apply the deposit in payment of the invoices for the cost of the Facilities Study. Upon written request by the New Service Customer pursuant to Section 206.4.1.1 of the PJM Tariff, Transmission Provider may provide a quarterly cost reconciliation. Subject to the following sentence regarding the final cost reconciliation upon completion of the Facility Study, such a quarterly cost reconciliation will have a one-quarter lag, e.g., reconciliation of costs for the first calendar quarter of work will be provided at the start of the third calendar quarter of work. Within 120 days after Transmission Provider completes the Facilities Study, Transmission Provider shall provide a final invoice presenting an accounting of, and the appropriate party shall make any payment to the other that is necessary to resolve, any difference between (a) New Service Customer's cost responsibility under this Agreement and the PJM Tariff for the actual cost of the Facilities Study and (b) New Service Customer's aggregate payments hereunder, including its deposits.

    C. In the event of a billing dispute, Transmission Provider shall continue to perform its obligations under this Agreement so long as (1) New Service Customer continues to make all payments not in dispute, and (2) New Service Customer's aggregate deposits held by Transmission Provider under this Agreement while the dispute is pending exceeds the amount in dispute, or (3) New Service Customer pays to Transmission Provider or into an independent escrow account the portion of the invoice in dispute, pending resolution of such dispute. If New Service Customer fails to meet any of these requirements, then its New Service Request shall be deemed to be terminated and withdrawn as of the date when payment was due.

13. Concurrent with execution of this Agreement, New Service Customer will pay Transmission Provider a cash deposit, as provided by Section 206 of the PJM Tariff, equal to the greater of $100,000 or New Service Customer's estimated cost responsibility for the first three months of work on the Facilities Study. Notwithstanding the foregoing, an Interconnection Customer with a proposed Customer Facility that is: (a) equal to or less than 20 MW but greater than 2 MW shall

pay a refundable deposit in the amount of $50,000; or (b) equal to or less than 2 MW shall pay a refundable deposit in the amount of $15,000. New Service Customer's quarterly estimated cost responsibility shall equal its estimated cost responsibility for the work on the Facilities Study that is scheduled to be completed during each three-month period after such work commences. If New Service Customer fails timely to provide the deposit required by this section, its New Service Request shall be deemed terminated and withdrawn and this Agreement shall be null and void. New Service Customer acknowledges that it may become obligated to pay one or more additional deposits pursuant to sections 14 and 15 below. Except as otherwise provided in section 12.B above, Transmission Provider shall continue to hold the amounts on deposit under this agreement until settlement of the final invoice.

14. If the Facilities Study, as described in section 7.A of this Agreement, is to include evaluation of more than one New Service Request and one or more of those requests is terminated and withdrawn, subject to the terms of section 15 of this Agreement, Transmission Provider will redetermine and reallocate the costs of the Facilities Study among the remaining participating New Service Customers in accord with Section 206 of the PJM Tariff. In that event, and subject to the terms of section 15, within 30 days after the date for execution and return of Facilities Study Agreements as determined under Section 206 of the PJM Tariff, Transmission Provider will provide the New Service Customer with a written statement of the New Service Customer's revised responsibility for the estimated cost of the Facilities Study, determined in accordance with Section 206 of the PJM Tariff. In the event that New Service Customer's revised cost responsibility exceeds the sum of its previous deposits for the Facilities Study, it shall deliver to Transmission Provider, within 10 days after New Service Customer's receipt of its revised cost responsibility, an additional cash deposit equal to the amount of the excess. If New Service Customer fails timely to provide an additional deposit that is required under this section, its New Service Request shall be deemed terminated and withdrawn as of the date by which its additional deposit was due. In the event that New Service Customer's revised cost responsibility under the notice described in this section is less than the sum of its previous deposits for the Facilities Study, Transmission Provider shall return to New Service Customer, with its notice of the revised cost responsibility, the amount of the difference.

15. A. This section shall apply prior to commencement of the Facilities Study (1) if the Facilities Study is to include multiple New Service Requests; and (2) if, in Transmission Provider's reasonable judgment, the termination and withdrawal of one or more of those New Service Requests significantly changes the group of New Service Requests to be included in the Facilities Study from the group that was included in the System Impact Study. For the purposes of this section, a change to the group of New Service Requests to be included in the Facilities Study shall be significant if, in Transmission Provider's reasonable engineering judgment, the change is likely to cause the system constraints relating to, and/or the facilities and upgrades necessary to accommodate, the group of New Service Requests remaining to be included in the Facilities Study to differ materially from the system constraints relating to, and/or from the facilities and upgrades necessary to accommodate, the group of New Service Requests that the System Impact

Study evaluated.

B. In the event of a significant change to the group of New Service Requests that the System Impact Study evaluated, within 15 days after the date for execution and return of Facilities Study Agreements as determined under Section 206 of the PJM Tariff, Transmission Provider shall provide New Service Customer with an explanation of the nature and extent of the change in the affected group of New Service Requests and of the extent to which Transmission Provider has determined that it must re-assess the results of the System Impact Study. Within 30 days after it provides the explanation described in the preceding sentence, Transmission Provider shall provide New Service Customer with a revised estimate of the time needed, and of the likely cost, to complete the Facilities Study, and, if the study continues to include evaluation of more than one New Service Customer's New Service Request(s), New Service Customer's allocated share of the estimated cost of the revised Facilities Study, determined in accord with Section 206 of the PJM Tariff.

C. In the event that New Service Customer's revised cost responsibility exceeds the sum of its previous deposits for the Facilities Study, it shall deliver to Transmission Provider, within 10 days after New Service Customer's receipt of its revised cost responsibility, an additional cash deposit equal to the amount of the excess. If New Service Customer fails timely to provide an additional deposit that is required under this section, its New Service Request shall be deemed terminated and withdrawn as of the date by which its additional deposit was due. In the event that New Service Customer's revised cost responsibility under the notice described in this section is less than the sum of its previous deposits for the Facilities Study, Transmission Provider shall return to New Service Customer, with its notice of the revised cost responsibility, the amount of the difference.

16. A. If the Facilities Study includes New Service Customer's New Service Request(s) only, New Service Customer may terminate its participation in the study at any time by providing written notice of termination to Transmission Provider. New Service Customer's notice of termination (1) shall be effective as of the end of the Business Day following the day that Transmission Provider receives such notice and (2) concurrently shall have the effect of terminating and withdrawing New Service Customer's New Service Request(s). New Service Customer will be responsible for all costs of the Facilities Study that Transmission Provider incurred prior to the effective date of the notice of termination. Within thirty (30) days after the effective date of New Service Customer's notice of termination, Transmission Provider will deliver to New Service Customer a statement of New Service Customer's responsibility for the costs of the Facilities Study incurred up to the date of termination. In the event that New Service Customer's cost responsibility as of the date of termination exceeds the sum of its deposits then held by Transmission Provider for the Facilities Study, Transmission Provider's statement will include an invoice in the amount of such excess. New Service Customer will pay that invoice within ten (10) days after it receives it. In the event that New Service Customer does not pay the invoice within ten (10) days after receipt, New Service Customer shall owe the invoice amount plus interest at

the applicable rate prescribed in 18 C.F.R. 35.19a (a)(2)(iii), accrued from the day after the date payment was due until the date of payment. In the event that New Service Customer's cost responsibility as of the date of termination was less than the sum of its deposits for the Facilities Study, Transmission Provider's statement will include a payment to New Service Customer in the amount of the difference.

B. If the Facilities Study includes any New Service Request(s) other than that (those) of New Service Customer, termination and withdrawal of New Service Customer's New Service Request(s) at any time after Transmission Provider has commenced the Facilities Study will not alter New Service Customer's responsibility for the costs of the Facilities Study under this Agreement and the PJM Tariff.

DISCLAIMER OF WARRANTY, LIMITATION OF LIABILITY

17. In analyzing and preparing the Facilities Study, Transmission Provider, the Transmission Owners, and any other subcontractors employed by Transmission Provider shall have to rely on information provided by New Service Customer and possibly by third parties and may not have control over the accuracy of such information. Accordingly, NEITHER THE TRANSMISSION PROVIDER, THE TRANSMISSION OWNERS, NOR ANY OTHER SUBCONTRACTORS EMPLOYED BY TRANSMISSION PROVIDER MAKES ANY WARRANTIES, EXPRESS OR IMPLIED, WHETHER ARISING BY OPERATION OF LAW, COURSE OF PERFORMANCE OR DEALING, CUSTOM, USAGE IN THE TRADE OR PROFESSION, OR OTHERWISE, INCLUDING WITHOUT LIMITATION IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, WITH REGARD TO THE ACCURACY, CONTENT, OR CONCLUSIONS OF THE FACILITIES STUDY. New Service Customer acknowledges that it has not relied on any representations or warranties not specifically set forth herein and that no such representations or warranties have formed the basis of its bargain hereunder.

18. In no event will Transmission Provider, the Transmission Owners or other subcontractors employed by Transmission Provider be liable for indirect, special, incidental, punitive, or consequential damages of any kind including loss of profits, arising under or in connection with this Facilities Study Agreement or the Facilities Study, even if Transmission Provider, the Transmission Owners, or other subcontractors employed by Transmission Provider have been advised of the possibility of such a loss. Nor shall Transmission Provider, the Transmission Owners, or other subcontractors employed by Transmission Provider be liable for any delay in delivery, or for the non-performance or delay in performance, of Transmission Provider's obligations under this Agreement.

Without limitation of the foregoing, New Service Customer further agrees that the Transmission Owners and other subcontractors employed by Transmission Provider to prepare or assist in the preparation of any Facilities Study shall be deemed third party beneficiaries of this provision

entitled "Disclaimer of Warranty/Limitation of Liability."

MISCELLANEOUS

19. Any notice or request made to or by either party regarding this Facilities Study Agreement shall be made to the representative of the other party as indicated below.

Transmission Provider

PJM Interconnection, L.L.C.
2750 Monroe Blvd.
Audubon, PA 19403

New Service Customer

Tenaska, Inc.
14302 FNB Parkway
Omaha, Nebraska 68154

20. No waiver by either party of one or more defaults by the other in performance of any of the provisions of this Agreement shall operate or be construed as a waiver of any other or further default or defaults, whether of a like or different character.

21. This Agreement or any part thereof, may not be amended, modified, or waived other than by a writing signed by all parties hereto.

22. This Agreement shall be binding upon the parties hereto, their heirs, executors, administrators, successors, and assigns.

23. Neither this Agreement nor the Facility Study performed hereunder shall be construed as an application for service under Part II or Part III of the PJM Tariff.

24. The provisions of Part VI of the PJM Tariff are incorporated herein and made a part hereof.

25. Capitalized terms used but not otherwise defined herein shall have the meaning ascribed to them in the PJM Tariff.

26. This Facilities Study Agreement shall become effective on the date it is executed by all parties and shall remain in effect until the earlier of (a) the date on which the Transmission Provider tenders the completed Facilities Study and, as applicable, a proposed Interconnection Service Agreement or Upgrade Construction Service Agreement to New Service Customer pursuant to Section 212 or

Section 213, respectively, of the PJM Tariff, or (b) termination and withdrawal of the New Service Request(s) to which the Facilities Study hereunder relates.

27. No Third-Party Beneficiaries
    This Agreement is not intended to and does not create rights, remedies, or benefits of any character whatsoever in favor of any persons, corporations, associations, or entities other than the parties, and the obligations herein assumed are solely for the use and benefit of the parties, their successors in interest and where permitted, their assigns.

28. Multiple Counterparts
    This Agreement may be executed in two or more counterparts, each of which is deemed an original but all constitute one and the same instrument.

29. No Partnership
    This Agreement shall not be interpreted or construed to create an association, joint venture, agency relationship, or partnership between the parties or to impose any partnership obligation or partnership liability upon either party. Neither party shall have any right, power or authority to enter into any agreement or undertaking for, or act on behalf of, or to act as or be an agent or representative of, or to otherwise bind, the other party.

30. Severability
    If any provision or portion of this Agreement shall for any reason be held or adjudged to be invalid or illegal or unenforceable by any court of competent jurisdiction or other Governmental Authority, (1) such portion or provision shall be deemed separate and independent, (2) the parties shall negotiate in good faith to restore insofar as practicable the benefits to each party that were affected by such ruling, and (3) the remainder of this Agreement shall remain in full force and effect.

31. Governing Law, Regulatory Authority, and Rules
    For Interconnection Requests, the validity, interpretation and enforcement of this Agreement and each of its provisions shall be governed by the laws of the state of Kentucky (where the Point of Interconnection is located), without regard to its conflicts of law principles. This Agreement is subject to all Applicable Laws and Regulations. Each party expressly reserves the right to seek changes in, appeal, or otherwise contest any laws, orders, or regulations of a Governmental Authority.

32. Reservation of Rights
    The Transmission Provider shall have the right to make a unilateral filing with FERC to modify this Agreement with respect to any rates, terms and conditions, charges, classifications of service, rule or regulation under section 205 or any other applicable provision of the Federal Power Act and FERC's rules and regulations thereunder, and the Interconnection Customer shall have the right to make a unilateral filing with FERC to modify this Agreement under any applicable provision of the Federal Power Act and FERC's rules and regulations; provided that each party

shall have the right to protest any such filing by the other party and to participate fully in any proceeding before FERC in which such modifications may be considered. Nothing in this Agreement shall limit the rights of the parties or of FERC under sections 205 or 206 of the Federal Power Act and FERC's rules and regulations, except to the extent that the parties otherwise agree as provided herein.

IN WITNESS WHEREOF, Transmission Provider and the New Service Customer have caused this Facilities Study Agreement to be executed by their respective authorized officials.

Transmission Provider: PJM Interconnection, L.L.C.

By:_____ _____ _____

Name Title Date

_____

Printed Name

New Service Customer: Tenaska, Inc.

By:_____ _____ _____

Name Title Date

Andrew Grieve

_____

Printed Name

Schedule A
Details of Design and Cost Estimates/Quality
For the Facilities Study

PJM Queue Project AF1-233

TO	Upgrade Type	Scope of Facilities Study Work
EKPC	Attachment	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 Flemingsburg switching station, to accept the IC generator lead line/bus
EKPC	Direct Connection	Construct a new 138 kV switching station near the EKPC Flemingsburg distribution substation to facilitate connection of the IC solar generation project
EKPC	Non-Direct Connection	Construct facilities to loop the existing Spurlock-Flemingsburg-Goddard 138 kV line into the new Flemingsburg switching station
EKPC	Non-Direct Connection	Modify relays and/or settings at the Spurlock substation for the existing line to the new Flemingsburg switching station
EKPC	Non-Direct Connection	Modify relays and/or settings at Goddard substation for the existing line to the new Flemingsburg switching station
EKPC	Non-Direct Connection	Install OPGW on the Flemingsburg-Goddard 138 kV line.
EKPC	Non-Direct Connection	Reinforcement associated with 09ADKINS 345.0 kV - 05BEATTY 345.0 kV Ckt 1. Rebuild 13.0 miles of 2-983.1 ACAR 30/7 Rail 5 conductor on Beatty-Adkins circuit (3.7 miles of double circuit construction). Replace equipment at Adkins station formerly owned by DP&L that is now owned by AEP.
EKPC	Non-Direct Connection	Reinforcement associated with AE2-221 TAP 345.0 kV - 09CLINTO 345.0 kV Ckt 1. Replace Clinton 2000A wave trap with 3000A.
EKPC	Non-Direct Connection	Reinforcement associated with 05WLDCAT 138.0 kV - 05HILLSB 138.0 kV Ckt 1. Rebuild / reconductor 10 miles of ACSR ~ 477 ~ 26/7 ~ HAWK- Conductor Section 1.
EKPC	Non-Direct Connection	Reinforcement associated with 05BEATTY 345.0 kV - 05BIXBY 345.0 kV Ckt 1. Upgrade/Replace Three 345kV 1600A switches at Beatty

		station.
EKPC	Non-Direct Connection	Reinforcement associated with 2PLUMVILLE 69.0 kV - 2MURPHYSVIL 69.0 kV Ckt 1. Increase the maximum operating temperature of the 266 MCM ACSR conductor in the Murphysville-Plumville 69 kV line section to 266 degrees F. Rebuild the Plumville-Murphysville 69 kV line section using 795 MCM ACSR conductor at 212 degrees F. Replace the 4/0 copper bus and jumpers at the Murphysville substation using 750 MCM copper or equivalent. Replace the 4/0 copper bus and jumpers at the Plumville substation using 750 MCM copper or equivalent.
EKPC	Non-Direct Connection	Reinforcement associated with 05BEATTY 345.0 kV - 05COLE 345.0 kV Ckt 1. Upgrade/Replace Three 345kV 1600A switches at Beatty station.
EKPC	Non-Direct Connection	Reinforcement associated with 7SPURLOCK 345.0 kV - 09STUART 345.0 kV Ckt 1. Reconductor Stuart-Spurlock line with twin bundle 1033 Curlew ACCR conductor. Reconductor Stuart substation conductor with twin bundle 1033 Curlew ACCR conductor. Replace the 1500A interconnection metering CTs with 2000A equipment.
LG&E	Non-Direct Connection	LG&E Impacts to be determined in Facilities Study for the Reinforcement associated with: • 4SPUR-KENT-R 138.0 kV - 4KENTON 138.0 kV Ckt 1 • 4KENTON 138.0 kV - 05SARDINIA 138.0 kV Ckt 1
PJM	None	Stability and Reactive Power Assessment
PJM	None	Administrative work

Generation Interconnection

System Impact Study Report

for

Queue Project AF1-233

FLEMINGSBURG 138 KV

150.6 MW Capacity / 225 MW Energy

August, 2020

Table of Contents

1 Introduction

This System Impact Study has been prepared in accordance with the PJM Open Access Transmission Tariff, 205, as well as the System Impact Study Agreement between the Interconnection Customer (IC), and PJM Interconnection, LLC (PJM), Transmission Provider (TP). The Interconnected Transmission Owner (ITO) is EKPC.

2 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 an Interconnection Customer may not be responsible for 100% of the identified network upgrade cost because other transmission network uses, e.g. another generation interconnection or merchant transmission upgrade, may also contribute to the need for the same network reinforcement. 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 System 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.

3 General

The Interconnection Customer (IC), has proposed a Solar; Storage generating facility located in Fleming County, Kentucky. The installed facilities will have a total capability of 225 MW with 150.6 MW of this output being recognized by PJM as Capacity.

The proposed in-service date for this project is May 31, 2022. This study does not imply a TO commitment to this in-service date.

The objective of this System Impact Study is to determine budgetary cost estimates and approximate construction timelines for identified transmission facilities required to connect the proposed generating facilities to the ITO transmission system. These reinforcements include the Attachment Facilities, Local Upgrades, and Network Upgrades required for maintaining the reliability of the ITO transmission system.

Queue Number	**AF1-233**
Project Name	FLEMINGSBURG 138 KV
State	Kentucky
County	Fleming
Transmission Owner	EKPC
MFO	225
MWE	225
MWC	150.6
Fuel	Solar; Storage
Basecase Study Year	2023

Any new service customers who can feasibly be commercially operable prior to June 1st of the basecase study year are required to request interim deliverability analysis.

4 Point of Interconnection

AF1-233 will interconnect with the EKPC transmission system at the Flemingsburg 138 kV substation.

5 Cost Summary

The AF1-233 project will be responsible for the following costs:

Description	Total Cost
Attachment Facilities	$565,000
Direct Connection Network Upgrade	$5,520,000
Non Direct Connection Network Upgrades	$1,605,000
Allocation for New System Upgrades*	$8,619,000
Contribution to Previously Identified Upgrades*	$16,929,783
Total Costs	**$33,238,783**

*As your project progresses through the study process and other projects modify their request or withdraw, then your cost allocation could change.

This cost excludes a Federal Income Tax Gross Up charges. This tax may or may not be charged based on whether this project meets the eligibility requirements of IRS Notice 88-129. If at a future date it is determined that the Federal Income Tax Gross charge is required, the Transmission Owner shall be reimbursed by the Interconnection Customer for such taxes.

Note 1: PJM Open Access Transmission Tariff (OATT) section 217.3A outline cost allocation rules. The rules are further clarified in PJM Manual 14A Attachment B. The allocation of costs for a network upgrade will start with the first Queue project to cause the need for the upgrade. Later queue projects will receive cost allocation contingent on their contribution to the violation and are allocated to the queues that have not closed less than 5 years following the execution of the first Interconnection Service Agreement which identifies the need for this upgrade.

6 Transmission Owner Scope of Work

6.1 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 Flemingsburg 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**

6.2 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 near the EKPC Flemingsburg distribution substation to facilitate connection of the IC solar generation project (Estimated time to implement is 24 months)	$5,520,000
Total Direct Connection Facility Costs	**$5,520,000**

6.3 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 Spurlock-Flemingsburg-Goddard 138 kV line into the new Flemingsburg switching station (Estimated time to implement is 24 months)	$225,000
Modify relays and/or settings at the Spurlock substation for the existing line to the new Flemingsburg switching station (Estimated time to implement is 9 months)	$65,000
Modify relays and/or settings at Goddard substation for the existing line to the new Flemingsburg switching station (Estimated time to implement is 9 months)	$65,000
Install OPGW on the Flemingsburg-Goddard 138 kV line (9.2 miles) (Estimated time to implement is 16 months)	$1,250,000
Total Non-Direct Connection Facility Costs	**$1,605,000**

7 Incremental Capacity Transfer Rights (ICTRs)

None.

8 Interconnection Customer Requirements

It is understood that the Interconnection Customer is responsible for all costs associated with this interconnection. The costs above are reimbursable to the Interconnected Transmission Owner. The cost of the Interconnection Customer's generating plant and the costs for the line connecting the generating plant to the Interconnected Transmission Owner's Transmission circuit are not included in this report; these are assumed to be the Interconnection Customer's responsibility.

The Generation Interconnection Agreement does not in or by itself establish a requirement for the Interconnected Transmission Owner to provide power for consumption at the developer's facilities. A separate agreement may be reached with the local utility that provides service in the area to ensure that infrastructure is in place to meet this demand and proper metering equipment is installed. It is the responsibility of the developer to contact the local service provider to determine if a local service agreement is required.

Requirement from the PJM Open Access Transmission Tariff:

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 Section 8 of Attachment O.

9.2 Meteorological Data Reporting Requirements

The solar generation facility shall provide the Transmission Provider with site-specific meteorological data including:

- Back Panel temperature (Fahrenheit)
- Irradiance (Watts/meter^2)
- Ambient air temperature (Fahrenheit) – (Accepted, not required)
- Wind speed (meters/second) – (Accepted, not required)
- Wind direction (decimal degrees from true north) – (Accepted, not required)

9.3 Interconnect Transmission Owner Requirements

The IC will be required to comply with all Interconnected Transmission Owner's revenue metering requirements for generation interconnection customers located at the following link:

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

10 Summer Peak Analysis

The Queue Project AF1-233 was evaluated as a 225.0 MW (Capacity 150.6 MW) injection at the Flemingsburg 138 kV substation in the EKPC area. Project AF1-233 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AF1-233 was studied with a commercial probability of 100.0 %. Potential network impacts were as follows:

10.1 Generation Deliverability

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

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
4132694 2	25311 0	09ADKIN S	345. 0	DAY	24345 3	05BEATT Y	345. 0	AEP	1	Base Case	singl e	1233. 0	99.69	100.69	AC	12.15

10.2 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
435516 26	2434 53	05BEATTY	345. 0	AEP	2440 22	05COLE	345. 0	AEP	1	AEP_P4_#8094_05BIXBY 345_C	breaker	1203. 0	99.02	100.39	AC	19.39
439289 52	2468 00	05SARDINIA	138. 0	AEP	2470 34	05EMERSS	138. 0	AEP	1	DAY_P734541 34553	tower	185.0	99.85	109.31	AC	20.61
439289 53	2470 34	05EMERS S	138. 0	AEP	2469 46	05WLDCAT	138. 0	AEP	1	DAY_P734541 34553	tower	185.0	98.7	108.17	AC	20.61
410398 25	3420 91	2PLUMVILLE	69.0	EKPC	3419 23	2MURPHYSVIL	69.0	EKPC	1	DAY_P734541 34553	tower	63.0	86.88	104.34	AC	12.94
416435 26	3420 91	2PLUMVILLE	69.0	EKPC	3419 23	2MURPHYSVIL	69.0	EKPC	1	EKPC_P4-6_SPURN39-92T	breaker	63.0	51.65	132.1	AC	52.56
410398 44	3426 64	4SPURLOCK	138. 0	EKPC	3426 61	4SPUR-KENT-R	138. 0	EKPC	1	DAY_P734541 34553	tower	291.0	97.5	103.9	AC	20.4
427745 00	9420 90	AE2-221 TAP	345. 0	DAY	2530 14	09CLINTO	345. 0	DAY	1	DAY_P734569 34598 34524	tower	1374. 0	99.59	100.87	AC	20.96

10.3 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
43551 565	2434 53	05BEATTY	345 .0	AEP	2434 54	05BIXBY	345 .0	AEP	1	AEP_P4_#3196_05BEATTY 345_302E	breaker	1203 .0	113.69	115.33	AC	23.14
43551 566	2434 53	05BEATTY	345 .0	AEP	2434 54	05BIXBY	345 .0	AEP	1	AEP_P4_#10715_05COLE 345_C	breaker	1203 .0	111.29	112.86	AC	22.28
43551 625	2434 53	05BEATTY	345 .0	AEP	2440 22	05COLE	345 .0	AEP	1	AEP_P4_#3195_05BEATTY 345_304E	breaker	1203 .0	100.22	101.61	AC	19.67
43928 168	2469 46	05WLDCAT	138 .0	AEP	2430 19	05HILLSB	138 .0	AEP	1	DAY_P4_L34553-1	breaker	185. 0	114.45	120.57	AC	13.32
43928 856	2469 46	05WLDCAT	138 .0	AEP	2430 19	05HILLSB	138 .0	AEP	1	DAY_P734541 34553	tower	185. 0	151.82	161.29	AC	20.61

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
41039687	253110	09ADKINS	345.0	DAY	243453	05BEATTY	345.0	AEP	1	DAY_P7_495	tower	1372.0	110.0	111.29	AC	20.89
41643719	253110	09ADKINS	345.0	DAY	243453	05BEATTY	345.0	AEP	1	DAY_P4_L34526-3	breaker	1372.0	107.16	108.41	AC	20.43
43552225	324267	4KENTON	138.0	LGEE	246800	05SARDINIA	138.0	AEP	1	DAY_P734541 34553	tower	185.0	102.57	112.04	AC	20.61
41039730	342559	4BOONE CO	138.0	EKPC	250054	08LONGBR	138.0	DEO&K	1	DAY_P734541 34553	tower	284.0	110.29	118.82	AC	24.81
41039806	342661	4SPUR-KENT-R	138.0	EKPC	324267	4KENTON	138.0	LGEE	1	DAY_P734541 34553	tower	281.0	100.97	107.6	AC	20.4
41039697	342838	7SPURLOCK	345.0	EKPC	253077	09STUART	345.0	DAY	1	DEOK_P7-1_C5 CIRCUIT1883&4545REDBANKSILGRVZIMMER	tower	1532.0	114.08	120.34	AC	94.2
41326846	342838	7SPURLOCK	345.0	EKPC	253077	09STUART	345.0	DAY	1	Base Case	single	1240.0	112.82	117.63	AC	58.4
41326847	342838	7SPURLOCK	345.0	EKPC	253077	09STUART	345.0	DAY	1	DEOK_P1-3_B3 SILVER GROVE 345/138 TB23*	single	1532.0	108.82	113.05	AC	63.04
41643705	342838	7SPURLOCK	345.0	EKPC	253077	09STUART	345.0	DAY	1	DEOK_P2-3_C2 816_SILVERGROVE	breaker	1532.0	114.31	120.58	AC	94.25
41643706	342838	7SPURLOCK	345.0	EKPC	253077	09STUART	345.0	DAY	1	DEOK_P2-3_C2 1493_RED BANK	breaker	1532.0	114.26	120.53	AC	94.19
41863140	342838	7SPURLOCK	345.0	EKPC	253077	09STUART	345.0	DAY	1	DEOK_P2-2_C1 SILVER GROVE 345 BUS	bus	1532.0	114.14	120.41	AC	94.19

10.4 Steady-State Voltage Requirements

None

10.5 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
43551917	243453	05BEATTY	345.0	AEP	243454	05BIXBY	345.0	AEP	1	AEP_P1-2_#714	operation	1203.0	104.08	105.57	AC	21.13
43928623	246946	05WLDCAT	138.0	AEP	243019	05HILLSB	138.0	AEP	1	DAY-P1-STU SPUR	operation	185.0	114.01	120.14	AC	13.34
41326939	253110	09ADKINS	345.0	DAY	243453	05BEATTY	345.0	AEP	1	DAY_P1_AC1-085_ST_FSA-B	operation	1372.0	107.05	108.29	AC	20.34
41326941	253110	09ADKINS	345.0	DAY	243453	05BEATTY	345.0	AEP	1	Base Case	operation	1233.0	102.03	103.29	AC	18.15
41326844	342838	7SPURLOCK	345.0	EKPC	253077	09STUART	345.0	DAY	1	Base Case	operation	1240.0	114.75	121.82	AC	87.25

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
41326845	342838	7SPURLOCK	345.0	EKPC	253077	09STUART	345.0	DAY	1	DEOK_P1-3_B3 SILVER GROVE 345/138 TB23*	operation	1532.0	114.14	120.41	AC	94.19

10.6 System Reinforcements

<table>
<tr><th>ID</th><th>Idx</th><th>Facility</th><th>Upgrade Description</th><th>Cost</th><th>Cost Allocated to AF1-233</th><th>Upgrade Number</th></tr>
<tr><td>41039687,41643719,41326942</td><td>1</td><td>09ADKINS 345.0 kV - 05BEATTY 345.0 kV Ckt 1</td><td>Rebuild 13.0 miles of 2-983.1 ACAR 30/7 Rail 5 conductor on Beatty-Adkins circuit (3.7 miles of double circuit construction). Bare minimum conductor is 2-1024.5 ACAR 30/7 Rail1 which provide no additional margin. Upgrade other elements previously rated by DP&L. Ratings validation of this equipment is currently underway. This will require relay upgrades at Beatty and Adkins. Cost estimate $55 M. Time estimate 24-36 months. New expected ratings 1233/1523 MVA SN/SE. PJM Network Upgrade N6401.1.

The cost allocation is as follows:

<table>
<tr><th>Queue</th><th>MW contribution</th><th>Percentage of Cost</th><th>$ cost ($55 M)</th></tr>
<tr><td>AE2-319</td><td>27.5</td><td>13.19%</td><td>7.252</td></tr>
<tr><td>AE2-320</td><td>53.7</td><td>25.75%</td><td>14.161</td></tr>
<tr><td>AF1-117</td><td>106.5</td><td>51.05%</td><td>28.078</td></tr>
<tr><td>AF1-233</td><td>20.9</td><td>10.02%</td><td>5.509</td></tr>
</table>

Replace equipment at Adkins station formerly owned by DP&L that is now owned by AEP. Further investigation is required to see exactly what equipment is to be replaced and whether it can be simply re-rated according to AEP's standards. Cost estimate $1 M. Time estimate 36-48 months. New expected ratings 1740/2034 MVA SN/SE. PJM Network Upgrade N6401.2.

AF1-233 is responsible for this cost.</td><td>$55 M + $1 M</td><td>$5.509 M + $1 M</td><td>N6401.1
N6401.2</td></tr>
<tr><td>41039844</td><td>10</td><td>4SPURLOCK 138.0 kV - 4SPUR-KENT-R 138.0 kV Ckt 1</td><td>EKPC:
2021 Baseline Upgrade B2827: Upgrade Spurlock-KU Kenton 138kv series reactor from 1200A at 5% impedance to 1600A at 6.5% impedance.

PJM Network Upgrade N6041 will increase the reactor to 7.5% impedance. $0 cost estimate.

N6041 is needed for a prior queue cycle.</td><td>$0</td><td>$0</td><td>B2827
N6041</td></tr>
</table>

ID	Idx	Facility	Upgrade Description	Cost	Cost Allocated to AF1-233	Upgrade Number
41039730	15	**4BOONE CO 138.0 kV - 08LONGBR 138.0 kV Ckt 1**	Line is 100% owned by EKPC. No DEOK upgrade required. EKPC: Increase MOT of Boone-Longbranch 138kV line section 954 MCM conductor to 275F (~2.25 miles). Time estimate 6 months. New SE rating to be 296 MVA. Cost 200K. PJM Network Upgrade N6463.1 Upgrade bus and jumpers associated with Boone 138 kV bus using 2-500 MCM 37 CU conductor or equivalent. Time estimate 6 months. New SE rating to be 354 MVA. Cost 20K. PJM Network Upgrade N6463.2 N6463.1 and N6463.2 are driven in a prior queue cycle.	$200 K + $20 K +	$0 + $0 +	N6463.1 N6463.2
42774501,42774500	11	**AE2-221 TAP 345.0 kV - 09CLINTO 345.0 kV Ckt 1**	Replace Clinton 2000A wave trap with 3000A. Estimated cost is $100K. Time Estimate: 12 Months. PJM Network Upgrade N6775. New Ratings: 1263 MVA SN, 1390 MVA SE. AF1-233 is responsible for this cost.	$100 K	$100 K	N6775

<table>
<tr><th>ID</th><th>Idx</th><th>Facility</th><th>Upgrade Description</th><th>Cost</th><th>Cost Allocated to AF1-233</th><th>Upgrade Number</th></tr>
<tr><td>43928168,43928856</td><td>13</td><td>05WLDCAT 138.0 kV - 05HILLSB 138.0 kV Ckt 1</td><td>(N5472) A sag check will be required for the ACSR ~ 477 ~ 26/7 ~ HAWK - Conductor Section 1 to determine if the line section can be operated above its emergency rating of 185 MVA. The sag study results show that a distribution circuit crossing underneath structures 37-58 and 37-59 will need to be relocated to allow the line to be operated at its MOT. An approximate time for the sag study is 6 to 12 months after signing an interconnection agreement. The new expected SE rating following the sag study will be 256 MVA SE.

This constraint, and N5472, is driven by a prior queue cycle.

(N5857) Rebuild / reconductor 10 miles of ACSR ~ 477 ~ 26/7 ~ HAWK- Conductor Section 1.
$15,040,000.
Time Estimate: 24-36 Months.
New Ratings: Rate A: 383 MVA Rate B: 449 MVA

The cost allocation is as follows:

<table>
<tr><th>Queue</th><th>MW contribution</th><th>Percentage of Cost</th><th>$ cost ($15.04 M)</th></tr>
<tr><td>AD2-048</td><td>5.9</td><td>9.781</td><td>1.471</td></tr>
<tr><td>AE1-144</td><td>11.6</td><td>19.297</td><td>2.902</td></tr>
<tr><td>AE2-038</td><td>7.8</td><td>12.865</td><td>1.935</td></tr>
<tr><td>AE2-138</td><td>14.4</td><td>23.906</td><td>3.595</td></tr>
<tr><td>AF1-233</td><td>20.6</td><td>34.151</td><td>5.136</td></tr>
</table>
</td><td>$186 K + $15.04 M</td><td>$0 + $5.136 M</td><td>N5472
N5857</td></tr>
</table>

<table>
<tr><th>ID</th><th>Idx</th><th>Facility</th><th>Upgrade Description</th><th>Cost</th><th>Cost Allocated to AF1-233</th><th>Upgrade Number</th></tr>
<tr><td>43551565,43551566</td><td>12</td><td>05BEATTY 345.0 kV - 05BIXBY 345.0 kV Ckt 1</td><td>N6741.1: Upgrade/Replace Three 345kV 1600A switches at Beatty station.
Cost : $ 1,500,000
Time Estimate : 12-18 Months
New Expected SE rating to be 1409 MVA.

The cost allocation is as follows:

<table><tr><th>Queue</th><th>MW contribution</th><th>Percentage of Cost</th><th>$ cost ($1.5 M)</th></tr><tr><td>AF1-078</td><td>3.4</td><td>1.84%</td><td>0.028</td></tr><tr><td>AF1-117</td><td>68.4</td><td>36.91%</td><td>0.554</td></tr><tr><td>AF1-221</td><td>14.2</td><td>7.69%</td><td>0.115</td></tr><tr><td>AF1-228</td><td>76.0</td><td>41.06%</td><td>0.616</td></tr><tr><td>AF1-233</td><td>23.1</td><td>12.50%</td><td>0.187</td></tr></table></td><td>$1.5 M</td><td>$187 K</td><td>N6741.1</td></tr>
</table>

<table>
<tr><th>ID</th><th>Idx</th><th>Facility</th><th>Upgrade Description</th><th>Cost</th><th>Cost Allocated to AF1-233</th><th>Upgrade Number</th></tr>
<tr>
<td>41643526,41039825</td>
<td>6</td>
<td>2PLUMVILLE 69.0 kV - 2MURPHYSVIL 69.0 kV Ckt 1</td>
<td>Increase the maximum operating temperature of the 266 MCM ACSR conductor in the Murphysville-Plumville 69 kV line section to 266 degrees F (9.9 miles). Time estimate: 9 months. Cost estimate $650 K. New SN/SE rating 53/66 MVA. PJM Network Upgrade N6480.

Rebuild the Plumville-Murphysville 69 kV line section using 795 MCM ACSR conductor at 212 degrees F (9.9 miles). Cost estimate $8.14 M. Time estimate 20 months. New SN/SE rating 53/66 MVA. PJM Network Upgrade N6480.1.

Replace the 4/0 copper bus and jumpers at the Murphysville substation using 750 MCM copper or equivalent. Cost estimate $120 K. Time estimate 6 months. New SN/SE rating 53/66 MVA. PJM Network Upgrade N6480.2.

The cost allocation is as follows for N6480, N6480.1, N6480.2:
<table>
<tr><th>Queue</th><th>MW contribution</th><th>Percentage of Cost</th><th>$ cost ($8.91 M)</th></tr>
<tr><td>AE2-038</td><td>3.2</td><td>5.74%</td><td>0.511</td></tr>
<tr><td>AF1-233</td><td>52.6</td><td>94.26%</td><td>8.399</td></tr>
</table>

Replace the 4/0 copper bus and jumpers at the Plumville substation using 750 MCM copper or equivalent. Cost estimate $120 K. Time estimate 6 months. New SN/SE rating 77/90 MVA. PJM Network Upgrade N6480.3.

AF1-233 is responsible for this cost.</td>
<td>$650 K +
$8.14 M +
$120 K +
$120 K +</td>
<td>$8.399 M +
$120 K</td>
<td>N6480
N6480.1
N6480.2
N6480.3</td>
</tr>
</table>

<table>
<tr><th>ID</th><th>Idx</th><th>Facility</th><th>Upgrade Description</th><th>Cost</th><th>Cost Allocated to AF1-233</th><th>Upgrade Number</th></tr>
<tr><td>43551626,43551625</td><td>2</td><td>05BEATTY 345.0 kV - 05COLE 345.0 kV Ckt 1</td><td>N6769.1: Upgrade/Replace Three 345kV 1600A switches at Beatty station.
Cost : $ 1,500,000
Time Estimate : 12-18 Months
New Expected SE rating to be 1409 MVA.

The cost allocation is as follows:
<table><tr><th>Queue</th><th>MW contribution</th><th>Percentage of Cost</th><th>$ cost ($1.5 M)</th></tr><tr><td>AF1-228</td><td>63.8</td><td>76.42%</td><td>1.146</td></tr><tr><td>AF1-233</td><td>19.7</td><td>23.58%</td><td>0.354</td></tr></table></td><td>$1.5 M</td><td>$354 K</td><td>N6769.1</td></tr>
</table>

<table>
<tr>
<td>41643705,41863140,41326846,41326847,41643706,41039697</td>
<td>17</td>
<td>7SPURLOCK 345.0 kV - 09STUART 345.0 kV Ckt 1</td>
<td>DAYTON (N5780): Reconductor Stuart-Spurlock line with twin bundle 1033 Curlew ACCR conductor.
Cost : $ 17,100,000
Time Estimate : 18 Months
New Expected Ratings: Rate A: 1339 MVA Rate B: 1556 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>12.99%</td><td>$2,220,977</td></tr>
<tr><td>AE2-038</td><td>32.12</td><td>8.66%</td><td>$1,480,344</td></tr>
<tr><td>AE2-138</td><td>84.73</td><td>22.84%</td><td>$3,905,029</td></tr>
<tr><td>AE2-210</td><td>29.33</td><td>7.91%</td><td>$1,351,759</td></tr>
<tr><td>AE2-275</td><td>21.24</td><td>5.72%</td><td>$978,907</td></tr>
<tr><td>AE2-308</td><td>35.33</td><td>9.52%</td><td>$1,628,286</td></tr>
<tr><td>AF1-127</td><td>25.84</td><td>6.96%</td><td>$1,190,912</td></tr>
<tr><td>AF1-233</td><td>94.25</td><td>25.40%</td><td>$4,343,786</td></tr>
</table>

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

A prior queue cycle is driving the need for N5780.1.

DAYTON (N5780.2) Reconductor Stuart substation conductor with twin bundle 1033 Curlew ACCR conductor. Cost estimate is $0.250 M. Estimated time to complete is 12 months. New ratings 1852/2062 MVA.

AF1-233 is reponsible for this cost.

EKPC:
EKPC end ratings are 1792/1792 MVA SN/SE.

EKPC (N5780.3) Replace the 1500A interconnection metering CTs with 2000A equipment. Cost estimate is $150 K. Time estimate is 9 months. New expected ratings to be 1821/1877 MVA SN/SE.</td>
<td>$17.1 M + $100 K + $250 K + $150 K</td>
<td>$4.343786 M + $0 + $250 K + $150 K</td>
<td>N5780
N5780.1
N5780.2
N5780.3</td>
</tr>
</table>

ID	Idx	Facility	Upgrade Description	Cost	Cost Allocated to AF1-233	Upgrade Number
			AF1-233 is reponsible for this cost.			
41039806	16	**4SPUR-KENT-R 138.0 kV - 4KENTON 138.0 kV Ckt 1**	EKPC: 2021 Baseline Upgrade B2827: Upgrade Spurlock-KU Kenton 138kv series reactor from 1200A at 5% impedance to 1600A at 6.5% impedance. PJM Network Upgrade N6041 will increase the reactor to 7.5% impedance. $0 cost estimate. N6041 is needed for a prior queue cycle. LG&E: The LG&E-end SE rating on the 4SPUR-KENT-R-4KENTON 138 kV line is 306 MVA. LG&E will need to evaluate their end of the line with an affected system study.	$0	$0	B2827 N6041
43552225	14	**4KENTON 138.0 kV - 05SARDINIA 138.0 kV Ckt 1**	AEP: Perform sag study on AEP's portion of Wildcat-Kenton 138kV circuit, 23.5 miles 477 ACSR 26/7 Hawk conductor. Cost estimate is $94K. 12 month time estimate. Total rebuild, if needed, cost estimate is $35.25 M. New AEP-end ratings are 185/257 SN/SE. PJM Network Upgrade N6461. This overload and N6461 is driven by a prior queue cycle. LG&E: Impacts to be determined in Facilities Study.	$94 K	$0	N6461
43928953	5	**05EMERSS 138.0 kV - 05WLDCAT 138.0 kV Ckt 1**	Same as upgrade listed above for: **4KENTON 138.0 kV - 05SARDINIA 138.0 kV Ckt 1**	N/A	$0	N6461
43928952	4	**05SARDINIA 138.0 kV - 05EMERSS 138.0 kV Ckt 1**	Same as upgrade listed above for: **4KENTON 138.0 kV - 05SARDINIA 138.0 kV Ckt 1**	N/A	$0	N6461
			Total Cost	**$101,270,000**	**$25,548,786**	

Note : For customers with System Reinforcements listed: If your present cost allocation to a System Reinforcement indicates $0, then please be aware that as changes to the interconnection process occur, such as prior queued projects withdrawing from the queue, reducing in size, etc, the cost responsibilities can

change and a cost allocation may be assigned to your project. In addition, although your present cost allocation to a System Reinforcement is presently $0, your project may need this system reinforcement completed to be deliverable to the PJM system. If your project comes into service prior to completion of the system reinforcement, an interim deliverability study for your project will be required.

10.7 Flow Gate Details

The following indices contain additional information about each facility presented in the body of the report. For each index, a description of the flowgate and its contingency was included for convenience. The intent of the indices is to provide more details on which projects/generators have contributions to the flowgate in question. All New Service Queue Requests, through the end of the Queue under study, that are contributors to a flowgate will be listed in the indices. Please note that there may be contributors that are subsequently queued after the queue under study that are not listed in the indices. Although this information is not used "as is" for cost allocation purposes, it can be used to gage the impact of other projects/generators. It should be noted the project/generator MW contributions presented in the body of the report are Full MW Impact contributions which are also noted in the indices column named "Full MW Impact", whereas the loading percentages reported in the body of the report, take into consideration the PJM Generator Deliverability Test rules such as commercial probability of each project as well as the ramping impact of "Adder" contributions. The MW Impact found and used in the analysis is shown in the indices column named "Gendeliv MW Impact".

10.7.1 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
41039687	253110	09ADKINS	DAY	243453	05BEATTY	AEP	1	DAY_P7_495	tower	1372.0	110.0	111.29	AC	20.89

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
253110	09ADKINS	62.7784	50/50	62.7784
342960	1SPURLK2G	10.3055	50/50	10.3055
342966	1SPURLK4G	5.4154	50/50	5.4154
923522	AB1-169 C OP	160.2590	50/50	160.2590
925921	AC1-068 C	18.7541	50/50	18.7541
925922	AC1-068 E	8.7703	50/50	8.7703
925931	AC1-069 C	18.7541	50/50	18.7541
925932	AC1-069 E	8.7703	50/50	8.7703
926061	AC1-085 C	22.1449	50/50	22.1449
926062	AC1-085 E	36.1311	50/50	36.1311
926791	AC1-165 C	18.5334	50/50	18.5334
926792	AC1-165 E	8.9909	50/50	8.9909
926801	AC1-166 C	18.5334	50/50	18.5334
926802	AC1-166 E	8.9909	50/50	8.9909
930062	AB1-014 E	5.7786	Adder	6.8
932381	AC2-055 C	1.5111	Adder	1.78
932382	AC2-055 E	2.4655	Adder	2.9
932421	AC2-060 C	5.3579	Adder	6.3
932422	AC2-060 E	3.0138	Adder	3.55
932462	AC2-066 E	3.4671	Adder	4.08
932661	AC2-088 C O1	3.3182	Adder	3.9
932662	AC2-088 E O1	2.7306	Adder	3.21
934491	AD1-073 C	1.1051	Adder	1.3
934492	AD1-073 E	0.5693	Adder	0.67
935031	AD1-136 C	0.4666	Adder	0.55
935032	AD1-136 E	0.3975	Adder	0.47
936251	AD2-031 C O1	1.4180	Adder	1.67
936252	AD2-031 E O1	2.3135	Adder	2.72
938271	AE1-040 C O1	4.0334	50/50	4.0334
938272	AE1-040 E O1	2.0295	50/50	2.0295
938921	AE1-120	3.2807	Adder	3.86
939141	AE1-144 C O1	6.2287	Adder	7.33
939142	AE1-144 E O1	3.0910	Adder	3.64
940531	AE2-038 C O1	4.1551	Adder	4.89
940532	AE2-038 E O1	2.0581	Adder	2.42
941411	AE2-138 C	12.2788	Adder	14.45
941412	AE2-138 E	4.5415	Adder	5.34
941981	AE2-210 C O1	4.2310	Adder	4.98
941982	AE2-210 E O1	1.5915	Adder	1.87
942091	AE2-221 C	26.2242	50/50	26.2242
942092	AE2-221 E	17.4828	50/50	17.4828
942981	AE2-320 C O1	36.9014	50/50	36.9014
942982	AE2-320 E O1	18.2576	50/50	18.2576

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
943191	AE2-319 C O1	36.9014	50/50	36.9014
943192	AE2-319 E O1	18.2576	50/50	18.2576
943201	AE2-318 C	4.2429	Adder	4.99
943202	AE2-318 E	2.0709	Adder	2.44
943771	AF1-045	1.9762	Adder	2.32
943773	AF1-045 E	1.3196	Adder	1.55
944521	AF1-117 C	81.3994	50/50	81.3994
944522	AF1-117 E	25.0746	50/50	25.0746
944621	AF1-127 C O1	3.3878	Adder	3.99
944622	AF1-127 E O1	1.6686	Adder	1.96
944941	AF1-159	0.8209	Adder	0.97
945681	AF1-233 C	11.8832	Adder	13.98
945682	AF1-233 E	5.8706	Adder	6.91
945861	AF1-251 C	8.4464	Adder	9.94
945862	AF1-251 E	5.6309	Adder	6.62
945911	AF1-256 C	3.8087	Adder	4.48
945912	AF1-256 E	2.5391	Adder	2.99
946102	AF1-275 BAT	3.7880	Merchant Transmission	3.7880
946171	AF1-282 C	8.7414	50/50	8.7414
946172	AF1-282 E	5.8276	50/50	5.8276
946181	AF1-283 C	11.3638	50/50	11.3638
946182	AF1-283 E	7.5759	50/50	7.5759
946511	AF1-315 C O1	2.3381	Adder	2.75
946512	AF1-315 E O1	1.5588	Adder	1.83
WEC	WEC	0.2107	Confirmed LTF	0.2107
LGEE	LGEE	1.8364	Confirmed LTF	1.8364
CPLE	CPLE	0.2242	Confirmed LTF	0.2242
CBM-W2	CBM-W2	11.4824	Confirmed LTF	11.4824
NY	NY	0.5049	Confirmed LTF	0.5049
TVA	TVA	2.0440	Confirmed LTF	2.0440
O-066	O-066	5.9002	Confirmed LTF	5.9002
CBM-S2	CBM-S2	3.3813	Confirmed LTF	3.3813
CBM-S1	CBM-S1	15.2252	Confirmed LTF	15.2252
G-007	G-007	0.9100	Confirmed LTF	0.9100
MEC	MEC	1.5016	Confirmed LTF	1.5016
CBM-W1	CBM-W1	4.6162	Confirmed LTF	4.6162

10.7.2 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
4355162 5	24345 3	05BEATT Y	AEP	24402 2	05COL E	AEP	1	AEP_P4_#3195_05BEATT Y 345_304E	breake r	1203. 0	100.22	101.61	AC	19.67

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
247964	Y1-063 BAT	0.3049	Merchant Transmission	0.3049
250164	08BKJDB1	0.1227	Adder	0.14
250165	08BKJDB2	0.1227	Adder	0.14
251827	WILLYESP	0.3881	Adder	0.46
251828	CLNTESP1	0.4060	Adder	0.48
251829	CLNTESP2	0.2706	Adder	0.32
253110	09ADKINS	32.1377	50/50	32.1377
253261	09MON D	0.2608	50/50	0.2608
904722	V4-073 E	0.1615	Adder	0.19
913222	Y1-054 E	1.2716	Adder	1.5
918802	AA1-099 E	0.2706	Adder	0.32
923522	AB1-169 C OP	110.1430	Adder	129.58
925921	AC1-068 C	10.4968	50/50	10.4968
925922	AC1-068 E	4.9088	50/50	4.9088
925931	AC1-069 C	10.4968	50/50	10.4968
925932	AC1-069 E	4.9088	50/50	4.9088
925981	AC1-074 C O1	3.4548	Adder	4.06
925982	AC1-074 E O1	1.4806	Adder	1.74
926011	AC1-078 C O1	4.7758	Adder	5.62
926012	AC1-078 E O1	7.9597	Adder	9.36
926061	AC1-085 C	20.0594	50/50	20.0594
926062	AC1-085 E	32.7286	50/50	32.7286
926101	**AC1-089 C O1 (Suspended)**	**3.6778**	**Adder**	**4.33**
926102	**AC1-089 E O1 (Suspended)**	**6.0007**	**Adder**	**7.06**
926791	AC1-165 C	10.3733	50/50	10.3733
926792	AC1-165 E	5.0323	50/50	5.0323
926801	AC1-166 C	10.3733	50/50	10.3733
926802	AC1-166 E	5.0323	50/50	5.0323
930062	AB1-014 E	6.7818	Adder	7.98
932381	AC2-055 C	1.7415	Adder	2.05
932382	AC2-055 E	2.8414	Adder	3.34
932421	AC2-060 C	6.1749	Adder	7.26
932422	AC2-060 E	3.4734	Adder	4.09
932431	AC2-061 C	3.7399	Adder	4.4
932432	AC2-061 E	3.7914	Adder	4.46
932462	AC2-066 E	4.0691	Adder	4.79
932481	AC2-068 C	2.4631	Adder	2.9
932482	AC2-068 E	4.0339	Adder	4.75
932551	AC2-075 C	0.8205	Adder	0.97
932552	AC2-075 E	0.4133	Adder	0.49

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
932661	AC2-088 C O1	3.4295	Adder	4.03
932662	AC2-088 E O1	2.8222	Adder	3.32
934491	AD1-073 C	1.2736	Adder	1.5
934492	AD1-073 E	0.6561	Adder	0.77
934561	AD1-081 C	0.9552	Adder	1.12
934562	AD1-081 E	0.4921	Adder	0.58
935031	AD1-136 C	0.4823	Adder	0.57
935032	AD1-136 E	0.4108	Adder	0.48
935041	AD1-140 C O1	8.4215	Adder	9.91
935042	AD1-140 E O1	6.9622	Adder	8.19
936251	AD2-031 C O1	2.3938	50/50	2.3938
936252	AD2-031 E O1	3.9057	50/50	3.9057
936381	AD2-048 C	2.8461	Adder	3.35
936382	AD2-048 E	1.4200	Adder	1.67
938051	AE1-007 C	0.7064	Adder	0.83
938052	AE1-007 E	1.1525	Adder	1.36
938271	AE1-040 C O1	4.3178	50/50	4.3178
938272	AE1-040 E O1	2.1726	50/50	2.1726
938921	AE1-120	3.8503	Adder	4.53
939141	AE1-144 C O1	5.8994	Adder	6.94
939142	AE1-144 E O1	2.9276	Adder	3.44
940531	AE2-038 C O1	3.9354	Adder	4.63
940532	AE2-038 E O1	1.9493	Adder	2.29
941411	AE2-138 C	12.0110	Adder	14.13
941412	AE2-138 E	4.4424	Adder	5.23
941511	AE2-148 C	154.5537	50/50	154.5537
941512	AE2-148 E	69.9051	50/50	69.9051
941981	AE2-210 C O1	4.1387	Adder	4.87
941982	AE2-210 E O1	1.5567	Adder	1.83
942061	AE2-218 C	8.0153	Adder	9.43
942062	AE2-218 E	5.4444	Adder	6.41
942091	AE2-221 C	24.9876	50/50	24.9876
942092	AE2-221 E	16.6584	50/50	16.6584
942521	AE2-267 C O1	2.2375	Adder	2.63
942522	AE2-267 E O1	1.3831	Adder	1.63
942951	AE2-315	2.4483	Adder	2.88
942981	AE2-320 C O1	20.6540	50/50	20.6540
942982	AE2-320 E O1	10.2190	50/50	10.2190
943111	AE2-339 C	1.5541	Adder	1.83
943112	AE2-339 E	0.7654	Adder	0.9
943191	AE2-319 C O1	20.6540	50/50	20.6540
943192	AE2-319 E O1	10.2190	50/50	10.2190
943201	AE2-318 C	5.5504	Adder	6.53
943202	AE2-318 E	2.7091	Adder	3.19
943771	AF1-045	2.5852	Adder	3.04
943773	AF1-045 E	1.7262	Adder	2.03
944521	AF1-117 C	44.0169	50/50	44.0169
944522	AF1-117 E	13.5591	50/50	13.5591
944621	AF1-127 C O1	3.3395	Adder	3.93
944622	AF1-127 E O1	1.6449	Adder	1.94
944941	AF1-159	1.3859	50/50	1.3859
945631	AF1-228 C	38.2509	50/50	38.2509

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
945632	AF1-228 E	25.5006	50/50	25.5006
945681	AF1-233 C	11.1919	Adder	13.17
945682	AF1-233 E	5.5291	Adder	6.5
945841	AF1-249 C	1.0045	Adder	1.18
945842	AF1-249 E	0.3731	Adder	0.44
945861	AF1-251 C	8.2916	Adder	9.75
945862	AF1-251 E	5.5277	Adder	6.5
945911	AF1-256 C	3.5831	Adder	4.22
945912	AF1-256 E	2.3887	Adder	2.81
946102	AF1-275 BAT	18.6545	50/50	18.6545
946171	AF1-282 C	7.9182	50/50	7.9182
946172	AF1-282 E	5.2788	50/50	5.2788
946181	AF1-283 C	10.2937	50/50	10.2937
946182	AF1-283 E	6.8624	50/50	6.8624
946511	AF1-315 C O1	2.9960	Adder	3.52
946512	AF1-315 E O1	1.9974	Adder	2.35
WEC	WEC	0.4256	Confirmed LTF	0.4256
LGEE	LGEE	2.6340	Confirmed LTF	2.6340
CPLE	CPLE	0.2765	Confirmed LTF	0.2765
CBM-W2	CBM-W2	18.1900	Confirmed LTF	18.1900
NY	NY	0.6885	Confirmed LTF	0.6885
TVA	TVA	2.8420	Confirmed LTF	2.8420
O-066	O-066	8.1715	Confirmed LTF	8.1715
CBM-S2	CBM-S2	4.3581	Confirmed LTF	4.3581
CBM-S1	CBM-S1	21.3937	Confirmed LTF	21.3937
G-007	G-007	1.2594	Confirmed LTF	1.2594
MEC	MEC	2.6552	Confirmed LTF	2.6552
CBM-W1	CBM-W1	11.9470	Confirmed LTF	11.9470

10.7.3 Index 3

None

10.7.4 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
43928952	246800	05SARDINIA	AEP	247034	05EMERSS	AEP	1	DAY_P734541 34553	tower	185.0	99.85	109.31	AC	20.61

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
251831	Z1-080 BAT	0.5184	Merchant Transmission	0.5184
918803	AA1-099 BAT	0.3456	Merchant Transmission	0.3456
925981	AC1-074 C O1	2.6689	Adder	3.14
925982	AC1-074 E O1	1.1438	Adder	1.35
932551	AC2-075 C	0.6339	Adder	0.75
932552	AC2-075 E	0.3193	Adder	0.38
936381	AD2-048 C	3.0978	Adder	3.64
936382	AD2-048 E	1.5456	Adder	1.82
939141	AE1-144 C O1	6.3821	Adder	7.51
939142	AE1-144 E O1	3.1672	Adder	3.73
940531	AE2-038 C O1	4.2574	Adder	5.01
940532	AE2-038 E O1	2.1088	Adder	2.48
941411	AE2-138 C	8.9441	Adder	10.52
941412	AE2-138 E	3.3081	Adder	3.89
941981	AE2-210 C O1	3.0819	Adder	3.63
941982	AE2-210 E O1	1.1593	Adder	1.36
943111	AE2-339 C	1.1513	Adder	1.35
943112	AE2-339 E	0.5671	Adder	0.67
944621	AF1-127 C O1	2.4848	Adder	2.92
944622	AF1-127 E O1	1.2239	Adder	1.44
945681	AF1-233 C	11.7232	Adder	13.79
945682	AF1-233 E	5.7915	Adder	6.81
945861	AF1-251 C	6.1721	Adder	7.26
945862	AF1-251 E	4.1147	Adder	4.84
945911	AF1-256 C	3.7324	Adder	4.39
945912	AF1-256 E	2.4883	Adder	2.93
WEC	WEC	0.0630	Confirmed LTF	0.0630
LGEE	LGEE	0.9248	Confirmed LTF	0.9248
CPLE	CPLE	0.1409	Confirmed LTF	0.1409
CBM-W2	CBM-W2	4.5127	Confirmed LTF	4.5127
NY	NY	0.0774	Confirmed LTF	0.0774
TVA	TVA	1.0164	Confirmed LTF	1.0164
O-066	O-066	0.8736	Confirmed LTF	0.8736
CBM-S2	CBM-S2	1.8149	Confirmed LTF	1.8149
CBM-S1	CBM-S1	7.6084	Confirmed LTF	7.6084
G-007	G-007	0.1342	Confirmed LTF	0.1342
MADISON	MADISON	1.9233	Confirmed LTF	1.9233
MEC	MEC	0.5307	Confirmed LTF	0.5307
CBM-W1	CBM-W1	1.7889	Confirmed LTF	1.7889

10.7.5 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
43928953	247034	05EMERSS	AEP	246946	05WLDCAT	AEP	1	DAY_P73454134553	tower	185.0	98.7	108.17	AC	20.61

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
251831	Z1-080 BAT	0.5184	Merchant Transmission	0.5184
918803	AA1-099 BAT	0.3456	Merchant Transmission	0.3456
925981	AC1-074 C O1	2.6689	Adder	3.14
925982	AC1-074 E O1	1.1438	Adder	1.35
932551	AC2-075 C	0.6339	Adder	0.75
932552	AC2-075 E	0.3193	Adder	0.38
936381	AD2-048 C	3.0978	Adder	3.64
936382	AD2-048 E	1.5456	Adder	1.82
939141	AE1-144 C O1	6.3821	Adder	7.51
939142	AE1-144 E O1	3.1672	Adder	3.73
940531	AE2-038 C O1	4.2574	Adder	5.01
940532	AE2-038 E O1	2.1088	Adder	2.48
941411	AE2-138 C	8.9441	Adder	10.52
941412	AE2-138 E	3.3081	Adder	3.89
941981	AE2-210 C O1	3.0819	Adder	3.63
941982	AE2-210 E O1	1.1593	Adder	1.36
943111	AE2-339 C	1.1513	Adder	1.35
943112	AE2-339 E	0.5671	Adder	0.67
944621	AF1-127 C O1	2.4848	Adder	2.92
944622	AF1-127 E O1	1.2239	Adder	1.44
945681	AF1-233 C	11.7232	Adder	13.79
945682	AF1-233 E	5.7915	Adder	6.81
945861	AF1-251 C	6.1721	Adder	7.26
945862	AF1-251 E	4.1147	Adder	4.84
945911	AF1-256 C	3.7324	Adder	4.39
945912	AF1-256 E	2.4883	Adder	2.93
WEC	WEC	0.0630	Confirmed LTF	0.0630
LGEE	LGEE	0.9248	Confirmed LTF	0.9248
CPLE	CPLE	0.1409	Confirmed LTF	0.1409
CBM-W2	CBM-W2	4.5127	Confirmed LTF	4.5127
NY	NY	0.0774	Confirmed LTF	0.0774
TVA	TVA	1.0164	Confirmed LTF	1.0164
O-066	O-066	0.8736	Confirmed LTF	0.8736
CBM-S2	CBM-S2	1.8149	Confirmed LTF	1.8149
CBM-S1	CBM-S1	7.6084	Confirmed LTF	7.6084
G-007	G-007	0.1342	Confirmed LTF	0.1342
MADISON	MADISON	1.9233	Confirmed LTF	1.9233
MEC	MEC	0.5307	Confirmed LTF	0.5307
CBM-W1	CBM-W1	1.7889	Confirmed LTF	1.7889

10.7.6 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
41643526	342091	2PLUMVILLE	EKPC	341923	2MURPHYSVIL	EKPC	1	EKPC_P4-6_SPUR N39-92T	breaker	63.0	51.65	132.1	AC	52.56

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
939141	AE1-144 C O1	23.9269	50/50	23.9269
939142	AE1-144 E O1	11.8739	50/50	11.8739
940531	AE2-038 C O1	15.9612	50/50	15.9612
940532	AE2-038 E O1	7.9060	50/50	7.9060
945681	AF1-233 C	35.1787	50/50	35.1787
945682	AF1-233 E	17.3791	50/50	17.3791
945911	AF1-256 C	11.2123	50/50	11.2123
945912	AF1-256 E	7.4749	50/50	7.4749
NEWTON	NEWTON	0.0505	Confirmed LTF	0.0505
CPLE	CPLE	0.0351	Confirmed LTF	0.0351
FARMERCITY	FARMERCITY	0.0014	Confirmed LTF	0.0014
G-007A	G-007A	0.0432	Confirmed LTF	0.0432
VFT	VFT	0.1161	Confirmed LTF	0.1161
PRAIRIE	PRAIRIE	0.0672	Confirmed LTF	0.0672
TVA	TVA	0.0560	Confirmed LTF	0.0560
COFFEEN	COFFEEN	0.0086	Confirmed LTF	0.0086
EDWARDS	EDWARDS	0.0161	Confirmed LTF	0.0161
CBM-S2	CBM-S2	0.3295	Confirmed LTF	0.3295
CBM-S1	CBM-S1	0.0767	Confirmed LTF	0.0767
TILTON	TILTON	0.0378	Confirmed LTF	0.0378
MADISON	MADISON	0.2782	Confirmed LTF	0.2782
GIBSON	GIBSON	0.0399	Confirmed LTF	0.0399
BLUEG	BLUEG	0.1910	Confirmed LTF	0.1910
TRIMBLE	TRIMBLE	0.0646	Confirmed LTF	0.0646

10.7.7 Index 7

None

10.7.8 Index 8

None

10.7.9 Index 9

None

10.7.10 Index 10

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
41039844	342664	4SPURLOCK	EKPC	342661	4SPUR-KENT-R	EKPC	1	DAY_P734541 34553	tower	291.0	97.5	103.9	AC	20.4

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
342957	1SPURLK1G	8.2304	50/50	8.2304
342960	1SPURLK2G	11.9747	50/50	11.9747
342963	1SPURLK3G	6.2926	50/50	6.2926
342966	1SPURLK4G	6.2926	50/50	6.2926
925981	AC1-074 C O1	2.4462	Adder	2.88
925982	AC1-074 E O1	1.0484	Adder	1.23
932551	AC2-075 C	0.5810	Adder	0.68
932552	AC2-075 E	0.2927	Adder	0.34
939141	AE1-144 C O1	5.2641	Adder	6.19
939142	AE1-144 E O1	2.6124	Adder	3.07
940531	AE2-038 C O1	3.5116	Adder	4.13
940532	AE2-038 E O1	1.7394	Adder	2.05
941411	AE2-138 C	11.1511	Adder	13.12
941412	AE2-138 E	4.1244	Adder	4.85
941981	AE2-210 C O1	3.8424	Adder	4.52
941982	AE2-210 E O1	1.4453	Adder	1.7
943111	AE2-339 C	1.1399	Adder	1.34
943112	AE2-339 E	0.5614	Adder	0.66
944621	AF1-127 C O1	2.9892	Adder	3.52
944622	AF1-127 E O1	1.4723	Adder	1.73
945681	AF1-233 C	11.6079	Adder	13.66
945682	AF1-233 E	5.7346	Adder	6.75
945861	AF1-251 C	7.5679	Adder	8.9
945862	AF1-251 E	5.0453	Adder	5.94
945911	AF1-256 C	3.8160	Adder	4.49
945912	AF1-256 E	2.5440	Adder	2.99
WEC	WEC	0.0057	Confirmed LTF	0.0057
LGEE	LGEE	0.3240	Confirmed LTF	0.3240
CPLE	CPLE	0.0622	Confirmed LTF	0.0622
CBM-W2	CBM-W2	2.1458	Confirmed LTF	2.1458
NY	NY	0.0796	Confirmed LTF	0.0796
TVA	TVA	0.6104	Confirmed LTF	0.6104
O-066	O-066	0.9072	Confirmed LTF	0.9072
CBM-S2	CBM-S2	0.9479	Confirmed LTF	0.9479
CBM-S1	CBM-S1	3.9192	Confirmed LTF	3.9192
G-007	G-007	0.1404	Confirmed LTF	0.1404
MADISON	MADISON	1.0806	Confirmed LTF	1.0806
MEC	MEC	0.1796	Confirmed LTF	0.1796

10.7.11 Index 11

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
42774500	942090	AE2-221 TAP	DAY	253014	09CLINTO	DAY	1	DAY_P734569 34598 34524	tower	1374.0	99.59	100.87	AC	20.96

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
250166	HLCRST AB114	1.1081	50/50	1.1081
251830	BIOENGRY	0.1049	50/50	0.1049
342957	1SPURLK1G	5.6673	50/50	5.6673
342960	1SPURLK2G	10.7246	50/50	10.7246
342963	1SPURLK3G	5.6357	50/50	5.6357
342966	1SPURLK4G	5.6357	50/50	5.6357
923522	AB1-169 C OP	174.0640	50/50	174.0640
925981	AC1-074 C O1	3.1492	Adder	3.7
925982	AC1-074 E O1	1.3497	Adder	1.59
926061	AC1-085 C	65.1943	50/50	65.1943
926062	AC1-085 E	106.3697	50/50	106.3697
927181	AC1-212 C	-0.1206	Adder	-0.14
927183	AC1-212 BAT	1.4861	Merchant Transmission	1.4861
930062	AB1-014 E	10.2083	50/50	10.2083
932461	AC2-066 C	0.6649	50/50	0.6649
932462	AC2-066 E	6.1250	50/50	6.1250
932481	AC2-068 C	-2.8258	Adder	-3.32
932551	AC2-075 C	0.7479	Adder	0.88
932552	AC2-075 E	0.3768	Adder	0.44
932661	AC2-088 C O1	4.7366	50/50	4.7366
932662	AC2-088 E O1	3.8979	50/50	3.8979
935031	AD1-136 C	0.6661	50/50	0.6661
935032	AD1-136 E	0.5674	50/50	0.5674
936381	AD2-048 C	2.5147	Adder	2.96
936382	AD2-048 E	1.2546	Adder	1.48
938921	AE1-120	5.7957	50/50	5.7957
939141	AE1-144 C O1	6.2239	Adder	7.32
939142	AE1-144 E O1	3.0887	Adder	3.63
940531	AE2-038 C O1	4.1519	Adder	4.88
940532	AE2-038 E O1	2.0565	Adder	2.42
941411	AE2-138 C	12.2320	Adder	14.39
941412	AE2-138 E	4.5242	Adder	5.32
941981	AE2-210 C O1	4.2148	Adder	4.96
941982	AE2-210 E O1	1.5854	Adder	1.87
942091	AE2-221 C	100.7694	50/50	100.7694
942092	AE2-221 E	67.1796	50/50	67.1796
942591	AE2-275 C O1	3.1742	Adder	3.73
942592	AE2-275 E O1	1.1940	Adder	1.4
942891	AE2-308 C O1	5.3239	Adder	6.26
942892	AE2-308 E O1	1.9360	Adder	2.28
943111	AE2-339 C	1.4718	Adder	1.73

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
943112	AE2-339 E	0.7249	Adder	0.85
943201	AE2-318 C	5.0517	Adder	5.94
943202	AE2-318 E	2.4657	Adder	2.9
943771	AF1-045	2.3529	Adder	2.77
943773	AF1-045 E	1.5711	Adder	1.85
943863	AF1-053 BAT	3.0900	Merchant Transmission	3.0900
944521	AF1-117 C	6.8894	Adder	8.11
944522	AF1-117 E	2.1223	Adder	2.5
944621	AF1-127 C O1	3.3605	Adder	3.95
944622	AF1-127 E O1	1.6552	Adder	1.95
945681	AF1-233 C	11.9267	Adder	14.03
945682	AF1-233 E	5.8921	Adder	6.93
945861	AF1-251 C	8.3970	Adder	9.88
945862	AF1-251 E	5.5980	Adder	6.59
945911	AF1-256 C	3.8254	Adder	4.5
945912	AF1-256 E	2.5503	Adder	3.0
946021	AF1-267 C	1.7549	Adder	2.06
946022	AF1-267 E	0.8063	Adder	0.95
946171	AF1-282 C	25.7346	50/50	25.7346
946172	AF1-282 E	17.1564	50/50	17.1564
946181	AF1-283 C	33.4550	50/50	33.4550
946182	AF1-283 E	22.3033	50/50	22.3033
946511	AF1-315 C O1	2.8430	Adder	3.34
946512	AF1-315 E O1	1.8954	Adder	2.23
WEC	WEC	0.0375	Confirmed LTF	0.0375
LGEE	LGEE	1.3715	Confirmed LTF	1.3715
CPLE	CPLE	0.3982	Confirmed LTF	0.3982
CBM-W2	CBM-W2	7.6249	Confirmed LTF	7.6249
NY	NY	0.1720	Confirmed LTF	0.1720
TVA	TVA	1.7346	Confirmed LTF	1.7346
O-066	O-066	1.8413	Confirmed LTF	1.8413
CBM-S2	CBM-S2	4.4217	Confirmed LTF	4.4217
CBM-S1	CBM-S1	12.4051	Confirmed LTF	12.4051
G-007	G-007	0.2818	Confirmed LTF	0.2818
MEC	MEC	0.6880	Confirmed LTF	0.6880

10.7.12 Index 12

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
4355156 5	243453	05BEATTY	AEP	243454	05BIXBY	AEP	1	AEP_P4_#3196_05BEATTY 345_302E	breaker	1203.0	113.69	115.33	AC	23.14

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
250164	08BKJDB1	0.1469	Adder	0.17
250165	08BKJDB2	0.1469	Adder	0.17
251827	WILLYESP	0.4712	Adder	0.55
251828	CLNTESP1	0.4769	Adder	0.56
251829	CLNTESP2	0.3179	Adder	0.37
253110	09ADKINS	38.2293	50/50	38.2293
253261	09MON D	0.3295	50/50	0.3295
904722	V4-073 E	0.2008	Adder	0.24
913222	Y1-054 E	1.5361	Adder	1.81
918802	AA1-099 E	0.3179	Adder	0.37
923522	AB1-169 C OP	129.0580	Adder	151.83
925921	AC1-068 C	12.4613	50/50	12.4613
925922	AC1-068 E	5.8275	50/50	5.8275
925931	AC1-069 C	12.4613	50/50	12.4613
925932	AC1-069 E	5.8275	50/50	5.8275
925981	AC1-074 C O1	4.1045	Adder	4.83
925982	AC1-074 E O1	1.7591	Adder	2.07
926011	AC1-078 C O1	7.9028	Adder	9.3
926012	AC1-078 E O1	13.1713	Adder	15.5
926061	AC1-085 C	23.9993	50/50	23.9993
926062	AC1-085 E	39.1567	50/50	39.1567
926101	**AC1-089 C O1 (Suspended)**	**4.2282**	**Adder**	**4.97**
926102	**AC1-089 E O1 (Suspended)**	**6.8987**	**Adder**	**8.12**
926791	AC1-165 C	12.3147	50/50	12.3147
926792	AC1-165 E	5.9741	50/50	5.9741
926801	AC1-166 C	12.3147	50/50	12.3147
926802	AC1-166 E	5.9741	50/50	5.9741
927181	AC1-212 C	0.1259	Adder	0.15
927182	AC1-212 E	1.1923	Adder	1.4
930062	AB1-014 E	8.0743	Adder	9.5
932381	AC2-055 C	1.8563	Adder	2.18
932382	AC2-055 E	3.0287	Adder	3.56
932421	AC2-060 C	6.5819	Adder	7.74
932422	AC2-060 E	3.7023	Adder	4.36
932431	AC2-061 C	4.2970	Adder	5.06
932432	AC2-061 E	4.3562	Adder	5.12
932462	AC2-066 E	4.8446	Adder	5.7
932481	AC2-068 C	3.1055	Adder	3.65
932482	AC2-068 E	5.0860	Adder	5.98
932551	AC2-075 C	0.9748	Adder	1.15

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
932552	AC2-075 E	0.4911	Adder	0.58
932661	AC2-088 C O1	4.0545	Adder	4.77
932662	AC2-088 E O1	3.3365	Adder	3.93
932841	AC2-111 C O1	2.0631	Adder	2.43
932842	AC2-111 E O1	3.3661	Adder	3.96
934491	AD1-073 C	1.3575	Adder	1.6
934492	AD1-073 E	0.6993	Adder	0.82
934561	AD1-081 C	1.5806	Adder	1.86
934562	AD1-081 E	0.8142	Adder	0.96
935031	AD1-136 C	0.5702	Adder	0.67
935032	AD1-136 E	0.4857	Adder	0.57
935041	AD1-140 C O1	11.5451	Adder	13.58
935042	AD1-140 E O1	9.5446	Adder	11.23
936251	AD2-031 C O1	2.4102	Adder	2.84
936252	AD2-031 E O1	3.9325	Adder	4.63
936381	AD2-048 C	3.3765	Adder	3.97
936382	AD2-048 E	1.6846	Adder	1.98
938051	AE1-007 C	0.8906	Adder	1.05
938052	AE1-007 E	1.4531	Adder	1.71
938271	AE1-040 C O1	4.0682	Adder	4.79
938272	AE1-040 E O1	2.0470	Adder	2.41
938921	AE1-120	4.5841	Adder	5.39
939141	AE1-144 C O1	6.9404	Adder	8.17
939142	AE1-144 E O1	3.4442	Adder	4.05
940531	AE2-038 C O1	4.6298	Adder	5.45
940532	AE2-038 E O1	2.2933	Adder	2.7
941411	AE2-138 C	14.2422	Adder	16.76
941412	AE2-138 E	5.2677	Adder	6.2
941511	AE2-148 C	184.5141	50/50	184.5141
941512	AE2-148 E	83.4563	50/50	83.4563
941941	AE2-206 C O1	2.6857	Adder	3.16
941942	AE2-206 E O1	3.7088	Adder	4.36
941981	AE2-210 C O1	4.9075	Adder	5.77
941982	AE2-210 E O1	1.8459	Adder	2.17
942051	AE2-217 C	9.8217	Adder	11.55
942052	AE2-217 E	6.5478	Adder	7.7
942061	AE2-218 C	10.6381	Adder	12.52
942062	AE2-218 E	7.2259	Adder	8.5
942091	AE2-221 C	30.1482	50/50	30.1482
942092	AE2-221 E	20.0988	50/50	20.0988
942521	AE2-267 C O1	2.7190	Adder	3.2
942522	AE2-267 E O1	1.6806	Adder	1.98
942621	AE2-278 C	6.8019	Adder	8.0
942622	AE2-278 E	4.5371	Adder	5.34
942951	AE2-315	3.0438	Adder	3.58
942981	AE2-320 C O1	24.5195	50/50	24.5195
942982	AE2-320 E O1	12.1315	50/50	12.1315
943111	AE2-339 C	1.8479	Adder	2.17
943112	AE2-339 E	0.9102	Adder	1.07
943191	AE2-319 C O1	24.5195	50/50	24.5195
943192	AE2-319 E O1	12.1315	50/50	12.1315
943201	AE2-318 C	6.6299	Adder	7.8

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
943202	AE2-318 E	3.2360	Adder	3.81
943771	AF1-045	3.0880	Adder	3.63
943773	AF1-045 E	2.0620	Adder	2.43
943943	AF1-062 BAT	20.4660	Merchant Transmission	20.4660
944031	AF1-071 C	0.5158	Adder	0.61
944032	AF1-071 E	0.8415	Adder	0.99
944101	AF1-078 C	1.2208	Adder	1.44
944102	AF1-078 E	1.6858	Adder	1.98
944521	AF1-117 C	52.2505	50/50	52.2505
944522	AF1-117 E	16.0955	50/50	16.0955
944621	AF1-127 C O1	3.9619	Adder	4.66
944622	AF1-127 E O1	1.9514	Adder	2.3
944941	AF1-159	1.3954	Adder	1.64
945561	AF1-221 C O1	9.3053	Adder	10.95
945562	AF1-221 E O1	2.7970	Adder	3.29
945631	AF1-228 C	45.6212	50/50	45.6212
945632	AF1-228 E	30.4141	50/50	30.4141
945681	AF1-233 C	13.1671	Adder	15.49
945682	AF1-233 E	6.5049	Adder	7.65
945841	AF1-249 C	1.2139	Adder	1.43
945842	AF1-249 E	0.4509	Adder	0.53
945861	AF1-251 C	9.8343	Adder	11.57
945862	AF1-251 E	6.5562	Adder	7.71
945911	AF1-256 C	4.2155	Adder	4.96
945912	AF1-256 E	2.8103	Adder	3.31
946171	AF1-282 C	9.4734	50/50	9.4734
946172	AF1-282 E	6.3156	50/50	6.3156
946181	AF1-283 C	12.3154	50/50	12.3154
946182	AF1-283 E	8.2103	50/50	8.2103
946511	AF1-315 C O1	3.5762	Adder	4.21
946512	AF1-315 E O1	2.3841	Adder	2.8
WEC	WEC	0.7421	Confirmed LTF	0.7421
LGEE	LGEE	3.2353	Confirmed LTF	3.2353
CPLE	CPLE	0.2375	Confirmed LTF	0.2375
CBM-W2	CBM-W2	24.2915	Confirmed LTF	24.2915
NY	NY	0.9329	Confirmed LTF	0.9329
TVA	TVA	3.5490	Confirmed LTF	3.5490
O-066	O-066	11.0880	Confirmed LTF	11.0880
CBM-S2	CBM-S2	4.5720	Confirmed LTF	4.5720
CBM-S1	CBM-S1	26.5654	Confirmed LTF	26.5654
G-007	G-007	1.7098	Confirmed LTF	1.7098
MEC	MEC	4.0853	Confirmed LTF	4.0853
CBM-W1	CBM-W1	23.0059	Confirmed LTF	23.0059

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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
43928856	246946	05WLDCAT	AEP	243019	05HILLSB	AEP	1	DAY_P734541 34553	tower	185.0	151.82	161.29	AC	20.61

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
251831	Z1-080 BAT	0.5184	Merchant Transmission	0.5184
918803	AA1-099 BAT	0.3456	Merchant Transmission	0.3456
925981	AC1-074 C O1	2.6689	Adder	3.14
925982	AC1-074 E O1	1.1438	Adder	1.35
926101	**AC1-089 C O1 (Suspended)**	**40.2722**	**50/50**	**40.2722**
926102	**AC1-089 E O1 (Suspended)**	**65.7073**	**50/50**	**65.7073**
932551	AC2-075 C	0.6339	Adder	0.75
932552	AC2-075 E	0.3193	Adder	0.38
936381	AD2-048 C	3.0978	Adder	3.64
936382	AD2-048 E	1.5456	Adder	1.82
939141	AE1-144 C O1	6.3821	Adder	7.51
939142	AE1-144 E O1	3.1672	Adder	3.73
940531	AE2-038 C O1	4.2574	Adder	5.01
940532	AE2-038 E O1	2.1088	Adder	2.48
941411	AE2-138 C	8.9441	Adder	10.52
941412	AE2-138 E	3.3081	Adder	3.89
941981	AE2-210 C O1	3.0819	Adder	3.63
941982	AE2-210 E O1	1.1593	Adder	1.36
943111	AE2-339 C	1.1513	Adder	1.35
943112	AE2-339 E	0.5671	Adder	0.67
944621	AF1-127 C O1	2.4848	Adder	2.92
944622	AF1-127 E O1	1.2239	Adder	1.44
945681	AF1-233 C	11.7232	Adder	13.79
945682	AF1-233 E	5.7915	Adder	6.81
945861	AF1-251 C	6.1721	Adder	7.26
945862	AF1-251 E	4.1147	Adder	4.84
945911	AF1-256 C	3.7324	Adder	4.39
945912	AF1-256 E	2.4883	Adder	2.93
WEC	WEC	0.0630	Confirmed LTF	0.0630
LGEE	LGEE	0.9248	Confirmed LTF	0.9248
CPLE	CPLE	0.1409	Confirmed LTF	0.1409
CBM-W2	CBM-W2	4.5127	Confirmed LTF	4.5127
NY	NY	0.0774	Confirmed LTF	0.0774
TVA	TVA	1.0164	Confirmed LTF	1.0164
O-066	O-066	0.8736	Confirmed LTF	0.8736
CBM-S2	CBM-S2	1.8149	Confirmed LTF	1.8149
CBM-S1	CBM-S1	7.6084	Confirmed LTF	7.6084
G-007	G-007	0.1342	Confirmed LTF	0.1342
MADISON	MADISON	1.9233	Confirmed LTF	1.9233
MEC	MEC	0.5307	Confirmed LTF	0.5307

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
CBM-W1	CBM-W1	1.7889	Confirmed LTF	1.7889

10.7.14 Index 14

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
43552225	324267	4KENTON	LGEE	246800	05SARDINIA	AEP	1	DAY_P734541 34553	tower	185.0	102.57	112.04	AC	20.61

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
251831	Z1-080 BAT	0.5184	Merchant Transmission	0.5184
918803	AA1-099 BAT	0.3456	Merchant Transmission	0.3456
925981	AC1-074 C O1	2.6689	Adder	3.14
925982	AC1-074 E O1	1.1438	Adder	1.35
932551	AC2-075 C	0.6339	Adder	0.75
932552	AC2-075 E	0.3193	Adder	0.38
936381	AD2-048 C	3.0978	Adder	3.64
936382	AD2-048 E	1.5456	Adder	1.82
939141	AE1-144 C O1	6.3821	Adder	7.51
939142	AE1-144 E O1	3.1672	Adder	3.73
940531	AE2-038 C O1	4.2574	Adder	5.01
940532	AE2-038 E O1	2.1088	Adder	2.48
941411	AE2-138 C	8.9441	Adder	10.52
941412	AE2-138 E	3.3081	Adder	3.89
941981	AE2-210 C O1	3.0819	Adder	3.63
941982	AE2-210 E O1	1.1593	Adder	1.36
943111	AE2-339 C	1.1513	Adder	1.35
943112	AE2-339 E	0.5671	Adder	0.67
944621	AF1-127 C O1	2.4848	Adder	2.92
944622	AF1-127 E O1	1.2239	Adder	1.44
945681	AF1-233 C	11.7232	Adder	13.79
945682	AF1-233 E	5.7915	Adder	6.81
945861	AF1-251 C	6.1721	Adder	7.26
945862	AF1-251 E	4.1147	Adder	4.84
945911	AF1-256 C	3.7324	Adder	4.39
945912	AF1-256 E	2.4883	Adder	2.93
WEC	WEC	0.0630	Confirmed LTF	0.0630
LGEE	LGEE	0.9248	Confirmed LTF	0.9248
CPLE	CPLE	0.1409	Confirmed LTF	0.1409
CBM-W2	CBM-W2	4.5127	Confirmed LTF	4.5127
NY	NY	0.0774	Confirmed LTF	0.0774
TVA	TVA	1.0164	Confirmed LTF	1.0164
O-066	O-066	0.8736	Confirmed LTF	0.8736
CBM-S2	CBM-S2	1.8149	Confirmed LTF	1.8149
CBM-S1	CBM-S1	7.6084	Confirmed LTF	7.6084
G-007	G-007	0.1342	Confirmed LTF	0.1342
MADISON	MADISON	1.9233	Confirmed LTF	1.9233
MEC	MEC	0.5307	Confirmed LTF	0.5307
CBM-W1	CBM-W1	1.7889	Confirmed LTF	1.7889

10.7.15 Index 15

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
41039730	342559	4BOONE CO	EKPC	250054	08LONGBR	DEO&K	1	DAY_P734541 34553	tower	284.0	110.29	118.82	AC	24.81

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
342957	1SPURLK1G	6.5424	50/50	6.5424
342960	1SPURLK2G	10.2739	50/50	10.2739
342963	1SPURLK3G	5.3988	50/50	5.3988
342966	1SPURLK4G	5.3988	50/50	5.3988
925981	AC1-074 C O1	9.2590	50/50	9.2590
925982	AC1-074 E O1	3.9682	50/50	3.9682
932551	AC2-075 C	2.1990	50/50	2.1990
932552	AC2-075 E	1.1078	50/50	1.1078
936381	AD2-048 C	6.0757	50/50	6.0757
936382	AD2-048 E	3.0313	50/50	3.0313
936571	AD2-072 C O1	2.9492	Adder	3.47
936572	AD2-072 E O1	1.4460	Adder	1.7
939141	AE1-144 C O1	8.7939	50/50	8.7939
939142	AE1-144 E O1	4.3641	50/50	4.3641
940531	AE2-038 C O1	5.8663	50/50	5.8663
940532	AE2-038 E O1	2.9057	50/50	2.9057
941411	AE2-138 C	14.2422	Adder	16.76
941412	AE2-138 E	5.2677	Adder	6.2
941981	AE2-210 C O1	4.9075	Adder	5.77
941982	AE2-210 E O1	1.8459	Adder	2.17
942411	AE2-254 C O1	1.4107	Adder	1.66
942412	AE2-254 E O1	0.9404	Adder	1.11
942591	AE2-275 C O1	4.0281	Adder	4.74
942592	AE2-275 E O1	1.5151	Adder	1.78
942891	AE2-308 C O1	6.9302	Adder	8.15
942892	AE2-308 E O1	2.5201	Adder	2.96
943111	AE2-339 C	2.1012	Adder	2.47
943112	AE2-339 E	1.0349	Adder	1.22
944621	AF1-127 C O1	4.0553	Adder	4.77
944622	AF1-127 E O1	1.9974	Adder	2.35
945541	AF1-219 C O1	0.9336	Adder	1.1
945542	AF1-219 E O1	0.4393	Adder	0.52
945681	AF1-233 C	16.6052	50/50	16.6052
945682	AF1-233 E	8.2033	50/50	8.2033
945861	AF1-251 C	9.9432	Adder	11.7
945862	AF1-251 E	6.6288	Adder	7.8
945911	AF1-256 C	5.3198	50/50	5.3198
945912	AF1-256 E	3.5466	50/50	3.5466
946021	AF1-267 C	2.2204	Adder	2.61
946022	AF1-267 E	1.0202	Adder	1.2
WEC	WEC	0.0362	Confirmed LTF	0.0362
LGEE	LGEE	1.7092	Confirmed LTF	1.7092

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
CPLE	CPLE	0.2831	Confirmed LTF	0.2831
CBM-W2	CBM-W2	6.3063	Confirmed LTF	6.3063
NY	NY	0.0664	Confirmed LTF	0.0664
TVA	TVA	1.6226	Confirmed LTF	1.6226
O-066	O-066	0.6451	Confirmed LTF	0.6451
CBM-S2	CBM-S2	3.3408	Confirmed LTF	3.3408
CBM-S1	CBM-S1	12.7885	Confirmed LTF	12.7885
G-007	G-007	0.0978	Confirmed LTF	0.0978
MADISON	MADISON	3.7780	Confirmed LTF	3.7780
MEC	MEC	0.5752	Confirmed LTF	0.5752
CBM-W1	CBM-W1	0.7506	Confirmed LTF	0.7506

10.7.16 Index 16

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
41039806	342661	4SPUR-KENT-R	EKPC	324267	4KENTON	LGEE	1	DAY_P734541 34553	tower	281.0	100.97	107.6	AC	20.4

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
342957	1SPURLK1G	8.2304	50/50	8.2304
342960	1SPURLK2G	11.9747	50/50	11.9747
342963	1SPURLK3G	6.2926	50/50	6.2926
342966	1SPURLK4G	6.2926	50/50	6.2926
925981	AC1-074 C O1	2.4462	Adder	2.88
925982	AC1-074 E O1	1.0484	Adder	1.23
932551	AC2-075 C	0.5810	Adder	0.68
932552	AC2-075 E	0.2927	Adder	0.34
939141	AE1-144 C O1	5.2641	Adder	6.19
939142	AE1-144 E O1	2.6124	Adder	3.07
940531	AE2-038 C O1	3.5116	Adder	4.13
940532	AE2-038 E O1	1.7394	Adder	2.05
941411	AE2-138 C	11.1511	Adder	13.12
941412	AE2-138 E	4.1244	Adder	4.85
941981	AE2-210 C O1	3.8424	Adder	4.52
941982	AE2-210 E O1	1.4453	Adder	1.7
943111	AE2-339 C	1.1399	Adder	1.34
943112	AE2-339 E	0.5614	Adder	0.66
944621	AF1-127 C O1	2.9892	Adder	3.52
944622	AF1-127 E O1	1.4723	Adder	1.73
945681	AF1-233 C	11.6079	Adder	13.66
945682	AF1-233 E	5.7346	Adder	6.75
945861	AF1-251 C	7.5679	Adder	8.9
945862	AF1-251 E	5.0453	Adder	5.94
945911	AF1-256 C	3.8160	Adder	4.49
945912	AF1-256 E	2.5440	Adder	2.99
WEC	WEC	0.0057	Confirmed LTF	0.0057
LGEE	LGEE	0.3240	Confirmed LTF	0.3240
CPLE	CPLE	0.0622	Confirmed LTF	0.0622
CBM-W2	CBM-W2	2.1458	Confirmed LTF	2.1458
NY	NY	0.0796	Confirmed LTF	0.0796
TVA	TVA	0.6104	Confirmed LTF	0.6104
O-066	O-066	0.9072	Confirmed LTF	0.9072
CBM-S2	CBM-S2	0.9479	Confirmed LTF	0.9479
CBM-S1	CBM-S1	3.9192	Confirmed LTF	3.9192
G-007	G-007	0.1404	Confirmed LTF	0.1404
MADISON	MADISON	1.0806	Confirmed LTF	1.0806
MEC	MEC	0.1796	Confirmed LTF	0.1796

10.7.17 Index 17

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
41863140	342838	7SPURLOCK	EKPC	253077	09STUART	DAY	1	DEOK_P2-2_C1 SILVER GROVE 345 BUS	bus	1532.0	114.14	120.41	AC	94.19

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
251968	08ZIMRHP	49.8782	50/50	49.8782
251969	08ZIMRLP	27.3143	50/50	27.3143
251970	08MELDL1	2.5265	50/50	2.5265
251971	08MELDL2	2.5265	50/50	2.5265
251972	08MELDL3	2.5332	50/50	2.5332
342942	1JKCT 10G	3.7167	50/50	3.7167
342957	1SPURLK1G	25.6387	50/50	25.6387
342960	1SPURLK2G	48.7814	50/50	48.7814
342963	1SPURLK3G	25.6341	50/50	25.6341
342966	1SPURLK4G	25.6341	50/50	25.6341
925921	AC1-068 C	-3.5298	Adder	-4.15
925931	AC1-069 C	-3.5298	Adder	-4.15
925981	AC1-074 C O1	15.7259	50/50	15.7259
925982	AC1-074 E O1	6.7397	50/50	6.7397
926061	AC1-085 C	-25.3852	Adder	-29.86
926101	**AC1-089 C O1 (Suspended)**	**4.0960**	**Adder**	**4.82**
926102	**AC1-089 E O1 (Suspended)**	**6.6829**	**Adder**	**7.86**
926791	AC1-165 C	-3.4883	Adder	-4.1
926801	AC1-166 C	-3.4883	Adder	-4.1
926951	AC1-182	1.1876	50/50	1.1876
932551	AC2-075 C	3.7349	50/50	3.7349
932552	AC2-075 E	1.8815	50/50	1.8815
932661	AC2-088 C O1	-5.5638	Adder	-6.55
935031	AD1-136 C	-0.7824	Adder	-0.92
936381	AD2-048 C	10.8038	Adder	12.71
936382	AD2-048 E	5.3903	Adder	6.34
936571	AD2-072 C O1	8.5377	Adder	10.04
936572	AD2-072 E O1	4.1861	Adder	4.92
939131	AE1-143 C	6.3940	Adder	7.52
939132	AE1-143 E	3.1671	Adder	3.73
939141	AE1-144 C O1	32.8796	50/50	32.8796
939142	AE1-144 E O1	16.3168	50/50	16.3168
940531	AE2-038 C O1	21.9334	50/50	21.9334
940532	AE2-038 E O1	10.8642	50/50	10.8642
941411	AE2-138 C	63.1635	50/50	63.1635
941412	AE2-138 E	23.3619	50/50	23.3619
941981	AE2-210 C O1	21.7645	50/50	21.7645
941982	AE2-210 E O1	8.1866	50/50	8.1866

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
942411	AE2-254 C O1	4.2894	Adder	5.05
942412	AE2-254 E O1	2.8596	Adder	3.36
942591	AE2-275 C O1	13.4989	Adder	15.88
942592	AE2-275 E O1	5.0776	Adder	5.97
942891	AE2-308 C O1	22.6242	Adder	26.62
942892	AE2-308 E O1	8.2270	Adder	9.68
943111	AE2-339 C	7.4488	50/50	7.4488
943112	AE2-339 E	3.6688	50/50	3.6688
943701	AF1-038 C	3.2112	Adder	3.78
943702	AF1-038 E	2.1408	Adder	2.52
943772	AF1-045 BAT	4.6782	Merchant Transmission	4.6782
943821	AF1-050 C	2.8538	Adder	3.36
943822	AF1-050 E	1.9025	Adder	2.24
944151	AF1-083 C O1	2.9988	Adder	3.53
944152	AF1-083 E O1	1.9992	Adder	2.35
944511	AF1-116 C	7.1708	Adder	8.44
944512	AF1-116 E	4.7805	Adder	5.62
944621	AF1-127 C O1	17.2967	50/50	17.2967
944622	AF1-127 E O1	8.5193	50/50	8.5193
945541	AF1-219 C O1	2.7723	Adder	3.26
945542	AF1-219 E O1	1.3046	Adder	1.53
945681	AF1-233 C	63.0427	50/50	63.0427
945682	AF1-233 E	31.1446	50/50	31.1446
945861	AF1-251 C	43.2947	50/50	43.2947
945862	AF1-251 E	28.8631	50/50	28.8631
945911	AF1-256 C	20.2296	50/50	20.2296
945912	AF1-256 E	13.4864	50/50	13.4864
946021	AF1-267 C	7.4395	Adder	8.75
946022	AF1-267 E	3.4181	Adder	4.02
WEC	WEC	0.3701	Confirmed LTF	0.3701
LGEE	LGEE	4.6621	Confirmed LTF	4.6621
CPLE	CPLE	0.4809	Confirmed LTF	0.4809
LGE-0012019	LGE-0012019	6.2964	LTF	6.2964
CBM-W2	CBM-W2	24.6765	Confirmed LTF	24.6765
NY	NY	0.7532	Confirmed LTF	0.7532
TVA	TVA	5.2444	Confirmed LTF	5.2444
O-066	O-066	8.7696	Confirmed LTF	8.7696
CBM-S2	CBM-S2	7.5776	Confirmed LTF	7.5776
CBM-S1	CBM-S1	38.9279	Confirmed LTF	38.9279
G-007	G-007	1.3520	Confirmed LTF	1.3520
MADISON	MADISON	3.2800	Confirmed LTF	3.2800
MEC	MEC	2.9746	Confirmed LTF	2.9746
CBM-W1	CBM-W1	9.5451	Confirmed LTF	9.5451

10.8 Queue Dependencies

The Queue Projects below are listed in one or more indices for the overloads identified in your report. These projects contribute to the loading of the overloaded facilities identified in your report. The percent overload of a facility and cost allocation you may have towards a particular reinforcement could vary depending on the action of these earlier projects. The status of each project at the time of the analysis is presented in the table. This list may change as earlier projects withdraw or modify their requests.

Queue Number	Project Name	Status
AA1-099	Clinton Co. 34.5kV	In Service
AB1-014	Hillcrest 138kV	Under Construction
AB1-169	Stuart 345kV	Engineering and Procurement
AB2-083	Delano 138kV	Active
AB2-085	Adams 138kV	Active
AC1-001	Delano 138kV	Active
AC1-068	Atlanta 69kV I	Engineering and Procurement
AC1-069	Atlanta 69kV II	Engineering and Procurement
AC1-074	Jacksonville-Renaker 138kV I	Active
AC1-078	Beatty-London 138kV	Active
AC1-085	Stuart-Clinton 345kV	Engineering and Procurement
AC1-089	Hillsboro-Wildcat 138kV	Suspended
AC1-165	Atlanta 69kV III	Engineering and Procurement
AC1-166	Atlanta 69kV IV	Engineering and Procurement
AC1-182	W.H. Zimmer Station 345kV	In Service
AC1-194	Elk 138kV	Active
AC1-212	Minster 69kV	Engineering and Procurement
AC2-029	Circleville 138kV	Active
AC2-055	Buckskin 69kV	Active
AC2-059	Biers Run-Circleville 138kV	Active
AC2-060	Buckskin 69kV	Active
AC2-061	Hillsboro-Clinton 138kV	Active
AC2-066	Hillcrest 138kV	Under Construction
AC2-068	Camden-Crystal II 69kV	Engineering and Procurement
AC2-075	Great Blue Heron Solar	Active
AC2-088	S. Bethel-Brown 69kV	Engineering and Procurement
AC2-111	College Corner 138kV	Active
AD1-072	Biers Run-Circleville 138 kV	Active
AD1-073	Buckskin 69 kV	Active
AD1-081	Beatty-London 138 kV	Active
AD1-136	South Bethel-Brown 69 kV	Engineering and Procurement
AD1-140	Greene-Clark 138 kV	Active
AD2-016	Biers Run-Circleville 138 kV	Active
AD2-031	Martinsville-Wilmington 69 kV	Active
AD2-048	Cynthia-Headquarters 69 kV	Active
AD2-072	Van Arsdell-Mercer Industrial 69kV	Active
AD2-162	Biers Run-Circleville 138kV	Active
AE1-007	Camden-Crystal III 69 kV	Active
AE1-040	Greenfield 69 kV	Active

Queue Number	Project Name	Status
AE1-093	Elk 138 kV	Active
AE1-120	Hillcrest 138 kV	Engineering and Procurement
AE1-143	Marion County 161 kV	Active
AE1-144	Goddard-Plumville 138 kV	Active
AE2-038	Goddard-Plumsville 138 kV II	Active
AE2-138	Avon-North Clark 345 kV	Active
AE2-148	Beatty-Greene 345 kV	Active
AE2-149	Biers Run-Bixby 345 kV	Active
AE2-206	East Sidney-Quincy 138 kV	Active
AE2-210	Avon-North Clark 345 kV	Active
AE2-214	Cole 345 kV	Active
AE2-217	East Springfield-London 138 kV	Active
AE2-218	Eldean 138 kV	Active
AE2-221	Clinton-Stuart 345 kV	Active
AE2-254	Garrard County-Tommy-Gooch 69 kV	Active
AE2-267	Woodsdale 345 kV	Active
AE2-275	JK Smith-Fawkes 138 kV	Active
AE2-278	Urbana 138 kV	Active
AE2-302	East Beaver-Lick 138 kV	Active
AE2-308	Three Forks-Dale 138 kV	Active
AE2-315	Yankee Tap 69 kV	Active
AE2-318	Ford-Cedarville 138 kV	Active
AE2-319	Atlanta 69kV I	Active
AE2-320	Atlanta 69 kV II	Active
AE2-339	Avon 138 kV	Active
AF1-038	Sewellton Jct-Webbs Crossroads 69 kV	Active
AF1-045	Cedarville-Ford 138 kV	Active
AF1-050	Summer Shade - Green County 161 kV	Active
AF1-053	Givens-Mechanicsburg 138 kV	Active
AF1-062	Jug Street 138 kV	Active
AF1-071	College Corner 138 kV	Active
AF1-078	East Sidney-Quincy 138 kV	Active
AF1-083	Green County-Saloma 161 kV	Active
AF1-116	Marion County 161 kV	Active
AF1-117	Atlanta-Stuart 345 kV	Active
AF1-127	Avon 345 kV	Active
AF1-159	Martinsville-Wilmington 69 kV	Active
AF1-219	Hunt Farm 69 kV	Active
AF1-221	College Corner-Drewersburg 138 kV	Active
AF1-228	Beatty-Greene 345 kV	Active
AF1-233	Flemingsburg 138 kV	Active
AF1-249	Nickel 12.47 kV	Active
AF1-251	Avon-North Clark 345 kV	Active
AF1-256	Flemingsburg-Spurlock 138 kV	Active
AF1-267	Union City Tap 138 kV	Active
AF1-275	Cole 345 kV	Active
AF1-282	Stuart-Clinton 345 kV	Active
AF1-283	Stuart-Clinton 345 kV	Active
AF1-315	Cedarville-Ford 138 kV	Active
V4-073	Yankee 12.5kV	In Service
Y1-054	Rochelle 138kV	In Service
Y1-063	Trenton 34.5kV	In Service

Queue Number	Project Name	Status
Z1-080	Clinton County 34.5kV	In Service

10.9 Contingency Descriptions

Contingency Name	Contingency Definition
DAY_P734569 34598 34524	CONTINGENCY 'DAY_P734569 34598 34524' OPEN BRANCH FROM BUS 249566 TO BUS 249578 CKT 1 / OPEN BRANCH FROM BUS 249566 TO BUS 253006 CKT 1 / 249566 08FOSTER 345 253006 09BATH 345 1 OPEN BRANCH FROM BUS 249566 TO BUS 253079 CKT 1 / 249566 08FOSTER 345 253079 09SUGRCK 345 1 END
DEOK_P2-3_C2 1493_RED BANK	CONTINGENCY 'DEOK_P2-3_C2 1493_RED BANK' OPEN BRANCH FROM BUS 249571 TO BUS 249573 CKT 1 / 249571 08REDBK1 345 249573 08SGROVE 345 1 OPEN BRANCH FROM BUS 249573 TO BUS 250097 CKT 1 / 249573 08SGROVE 345 250097 08SGROVE 138 1 OPEN BRANCH FROM BUS 249573 TO BUS 249577 CKT 1 / 249573 08SGROVE 345 249577 08ZIMER 345 1 OPEN BRANCH FROM BUS 249571 TO BUS 250092 CKT 1 / 249571 08REDBK1 345 250092 08REDBK1 138 1 END
DEOK_P7-1_C5 4524FOSTRSUGRCRK34598FOSTERBATH	CONTINGENCY 'DEOK_P7-1_C5 4524FOSTRSUGRCRK34598FOSTERBATH' OPEN BRANCH FROM BUS 249566 TO BUS 253079 CKT 1 / 249566 08FOSTER 345 253079 09SUGRCK 345 1 OPEN BRANCH FROM BUS 249566 TO BUS 253006 CKT 1 / 249566 08FOSTER 345 253006 09BATH 345 1 END
Base Case	
EKPC_P1-2_SPUR-GODD 138-B	CONTINGENCY 'EKPC_P1-2_SPUR-GODD 138-B' /* SPURLOCK - GODDARD OPEN BRANCH FROM BUS 945910 TO BUS 342664 CKT 1 /* 945910 AF1-256 TAP 138.00 342664 4SPURLOCK 138.00 END
DAY_P4_L34526-3	CONTINGENCY 'DAY_P4_L34526-3' OPEN LINE FROM BUS 253027 TO BUS 253006 CKT 1 /* 09GREENE 345 - 09BATH 345 OPEN LINE FROM BUS 253027 TO BUS 253014 CKT 1 /* 09GREENE 345 - 09CLINTO 345 OPEN LINE FROM BUS 253014 TO BUS 253013 CKT 1 /* 09CLINTON 69 - 09CLINTO 345 OPEN LINE FROM BUS 253014 TO BUS 253013 CKT 2 /* 09CLINTON 69 - 09CLINTO 345 END

Contingency Name	Contingency Definition
DAY_P1-2_#762	CONTINGENCY 'DAY_P1-2_#762' OPEN BRANCH FROM BUS 243453 TO BUS 253110 CKT 1 / 243453 05BEATTY 345 253110 09ADKINS 345 1 END
AEP_P4_#3195_05BEATTY 345_304E	CONTINGENCY 'AEP_P4_#3195_05BEATTY 345_304E' OPEN BRANCH FROM BUS 243453 TO BUS 243454 CKT 1 / 243453 05BEATTY 345 243454 05BIXBY 345 1 OPEN BRANCH FROM BUS 243453 TO BUS 243468 CKT 4 / 243453 05BEATTY 345 243468 05BEATTX 138 4 END
EKPC_P1-2_SPUR-GODD 138-A	CONTINGENCY 'EKPC_P1-2_SPUR-GODD 138-A' /* SPURLOCK - GODDARD OPEN BRANCH FROM BUS 342583 TO BUS 945680 CKT 1 /* 342583 4FLEMINGSBRG138.00 945680 AF1-233 TAP 138.00 OPEN BRANCH FROM BUS 342583 TO BUS 342589 CKT 1 /* 342583 4FLEMINGSBRG138.00 342589 4GODDARD 138.00 END
EKPC_P4-6_SPUR N39-92T	CONTINGENCY 'EKPC_P4-6_SPUR N39-92T' /* SPURLOCK OPEN BRANCH FROM BUS 342622 TO BUS 342664 CKT 1 /* 342622 4MAYSVIL I T138.00 342664 4SPURLOCK 138.00 OPEN BRANCH FROM BUS 342622 TO BUS 342625 CKT 1 /* 342622 4MAYSVIL I T138.00 342625 4MAYSVIL IND138.00 OPEN BRANCH FROM BUS 342622 TO BUS 342634 CKT 1 /* 342622 4MAYSVIL I T138.00 342634 4PLUMVILLE 138.00 OPEN BRANCH FROM BUS 945910 TO BUS 342664 CKT 1 /* 945910 AF1-256 TAP 138.00 342664 4SPURLOCK 138.00 END
DAY_P734541 34553	CONTINGENCY 'DAY_P734541 34553' OPEN BRANCH FROM BUS 249581 TO BUS 342838 CKT 1 /* 249581 08MELDAL 345.00 342838 7SPURLOCK 345.00 OPEN BRANCH FROM BUS 253077 TO BUS 342838 CKT 1 /* 253077 09STUART 345.00 342838 7SPURLOCK 345.00 END
AEP_P4_#10715_05COLE 345_C	CONTINGENCY 'AEP_P4_#10715_05COLE 345_C' OPEN BRANCH FROM BUS 244022 TO BUS 243457 CKT 1 / 244022 05COLE 345 243457 05HAYDEN 345 1 OPEN BRANCH FROM BUS 244022 TO BUS 244023 CKT 1 / 244022 05COLE 345 244023 05COLE 138 1 END

Contingency Name	Contingency Definition
DEOK_P2-2_C1 SILVER GROVE 345 BUS	CONTINGENCY 'DEOK_P2-2_C1 SILVER GROVE 345 BUS' OPEN BRANCH FROM BUS 249573 TO BUS 249577 CKT 1 / 249573 08SGROVE 345 249577 08ZIMER 345 1 OPEN BRANCH FROM BUS 249573 TO BUS 250097 CKT 1 / 249573 08SGROVE 345 250097 08SGROVE 138 1 OPEN BRANCH FROM BUS 249571 TO BUS 249573 CKT 1 / 249571 08REDBK1 345 249573 08SGROVE 345 1 END
DEOK_P7-1_C5 CIRCUIT1883&4545REDBANKSILGRVZIMMER	CONTINGENCY 'DEOK_P7-1_C5 CIRCUIT1883&4545REDBANKSILGRVZIMMER' OPEN BRANCH FROM BUS 249989 TO BUS 250080 CKT 1 / 249989 08BKJ246 138 250080 08NWTWN2 138 1 OPEN BRANCH FROM BUS 250079 TO BUS 250080 CKT Z1 / 250079 08NWTWN1 138 250080 08NWTWN2 138 Z1 OPEN BRANCH FROM BUS 250079 TO BUS 250092 CKT 1 / 250079 08NWTWN1 138 250092 08REDBK1 138 1 OPEN BRANCH FROM BUS 249573 TO BUS 249577 CKT 1 / 249573 08SGROVE 345 249577 08ZIMER 345 1 OPEN BRANCH FROM BUS 249573 TO BUS 250097 CKT 1 / 249573 08SGROVE 345 250097 08SGROVE 138 1 OPEN BRANCH FROM BUS 249571 TO BUS 249573 CKT 1 / 249571 08REDBK1 345 249573 08SGROVE 345 1 END
AEP_P4_#8094_05BIXBY 345_C	CONTINGENCY 'AEP_P4_#8094_05BIXBY 345_C' OPEN BRANCH FROM BUS 243453 TO BUS 243454 CKT 1 / 243453 05BEATTY 345 243454 05BIXBY 345 1 OPEN BRANCH FROM BUS 941520 TO BUS 243454 CKT 1 / 941520 AE2-149 TAP 345 243454 05BIXBY 345 1 END
DEOK_P2-3_C2 816_SILVERGROVE	CONTINGENCY 'DEOK_P2-3_C2 816_SILVERGROVE' OPEN BRANCH FROM BUS 249573 TO BUS 250097 CKT 1 / 249573 08SGROVE 345 250097 08SGROVE 138 1 OPEN BRANCH FROM BUS 249988 TO BUS 250097 CKT 1 / 249988 08BKJ135 138 250097 08SGROVE 138 1 OPEN BRANCH FROM BUS 250042 TO BUS 250097 CKT 1 / 250042 08HANDS1 138 250097 08SGROVE 138 1 OPEN BRANCH FROM BUS 250052 TO BUS 250097 CKT 1 / 250052 08KYUNIV 138 250097 08SGROVE 138 1 OPEN BRANCH FROM BUS 250053 TO BUS 250097 CKT 1 / 250053 08LAFARG 138 250097 08SGROVE 138 1 OPEN BRANCH FROM BUS 249571 TO BUS 249573 CKT 1 / 249571 08REDBK1 345 249573 08SGROVE 345 1 OPEN BRANCH FROM BUS 249573 TO BUS 249577 CKT 1 / 249573 08SGROVE 345 249577 08ZIMER 345 1 END
DAY-P1-STU SPUR	CONTINGENCY 'DAY-P1-STU SPUR' DISCONNECT BRANCH FROM BUS 253077 TO BUS 342838 CKT 1 /* STU SPUR END

Contingency Name	Contingency Definition
DAY_P4_L34553-1	CONTINGENCY 'DAY_P4_L34553-1' OPEN LINE FROM BUS 253077 TO BUS 342838 CKT 1 /* 09STUART 345 - 7SPURLK 345 OPEN LINE FROM BUS 253077 TO BUS 253076 CKT 1 /* 09STUART 345 - 09STUART 138 END
AEP_P1-2_#714	CONTINGENCY 'AEP_P1-2_#714' OPEN BRANCH FROM BUS 244022 TO BUS 243457 CKT 1 / 244022 05COLE 345 243457 05HAYDEN 345 1 END
AEP_P1-2_#713	CONTINGENCY 'AEP_P1-2_#713' OPEN BRANCH FROM BUS 243453 TO BUS 243454 CKT 1 / 243453 05BEATTY 345 243454 05BIXBY 345 1 END
342583 4FLEMINGSBRG 138 945680 AF1-233 TAP 138 1	CONTINGENCY '342583 4FLEMINGSBRG 138 945680 AF1-233 TAP 138 1' OPEN BRANCH FROM BUS 342583 TO BUS 945680 CKT 1 END
DAY_P7_495	CONTINGENCY 'DAY_P7_495' OPEN BRANCH FROM BUS 249566 TO BUS 253006 CKT 1 / 249566 08FOSTER 345 253006 09BATH 345 1 OPEN BRANCH FROM BUS 253014 TO BUS 253027 CKT 1 / 253014 09CLINTO 345 253027 09GREENE 345 1 OPEN BRANCH FROM BUS 253014 TO BUS 253013 CKT 1 / 253014 09CLINTO 345 253013 09CLINTO 69.0 1 OPEN BRANCH FROM BUS 253014 TO BUS 253013 CKT 2 / 253014 09CLINTO 345 253013 09CLINTO 69.0 1 END
DEOK_P1-3_B3 SILVER GROVE 345/138 TB23*	CONTINGENCY 'DEOK_P1-3_B3 SILVER GROVE 345/138 TB23*' OPEN BRANCH FROM BUS 249573 TO BUS 250097 CKT 1 / 249573 08SGROVE 345 250097 08SGROVE 138 1 OPEN BRANCH FROM BUS 249571 TO BUS 249573 CKT 1 / 249571 08REDBK1 345 249573 08SGROVE 345 1 OPEN BRANCH FROM BUS 249573 TO BUS 249577 CKT 1 / 249573 08SGROVE 345 249577 08ZIMER 345 1 END
DAY_P1_AC1-085_ST_FSA-B	CONTINGENCY 'DAY_P1_AC1-085_ST_FSA-B' OPEN BRANCH FROM BUS 253014 TO BUS 942090 CKT 1 END

Contingency Name	Contingency Definition
AEP_P4_#3196_05BEATTY 345_302E	CONTINGENCY 'AEP_P4_#3196_05BEATTY 345_302E' OPEN BRANCH FROM BUS 243453 TO BUS 244022 CKT 1 / 243453 05BEATTY 345 244022 05COLE 345 1 OPEN BRANCH FROM BUS 243453 TO BUS 243468 CKT 4 / 243453 05BEATTY 345 243468 05BEATTX 138 4 END

11 Light Load Analysis

The Queue Project AF1-233 was evaluated as a 37.6 MW injection/withdrawal (battery) at the Flemingsburg 138 kV substation in the EKPC area. Project AF1-233 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AF1-233 was studied with a commercial probability of 100.0 %. Potential network impacts were as follows:

11.1 Generation Deliverability

(Single or N-1 contingencies)

None

11.2 Multiple Facility Contingency

(Double Circuit Tower Line, Fault with a Stuck Breaker, and Bus Fault contingencies)

None

11.3 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)

None

11.4 Steady-State Voltage Requirements

None

11.5 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.

None

11.6 System Reinforcements

ID	Idx	Facility	Upgrade Description	Cost	Cost Allocated to AF1-233	Upgrade Number
			TOTAL COST	**$0**	**$0**	

12 Short Circuit Analysis

The following Breakers are overdutied

None.

13 Stability and Reactive Power

To be determined in the Facilities Study Phase.

14 Affected Systems

14.1 TVA

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

14.2 Duke Energy Progress

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

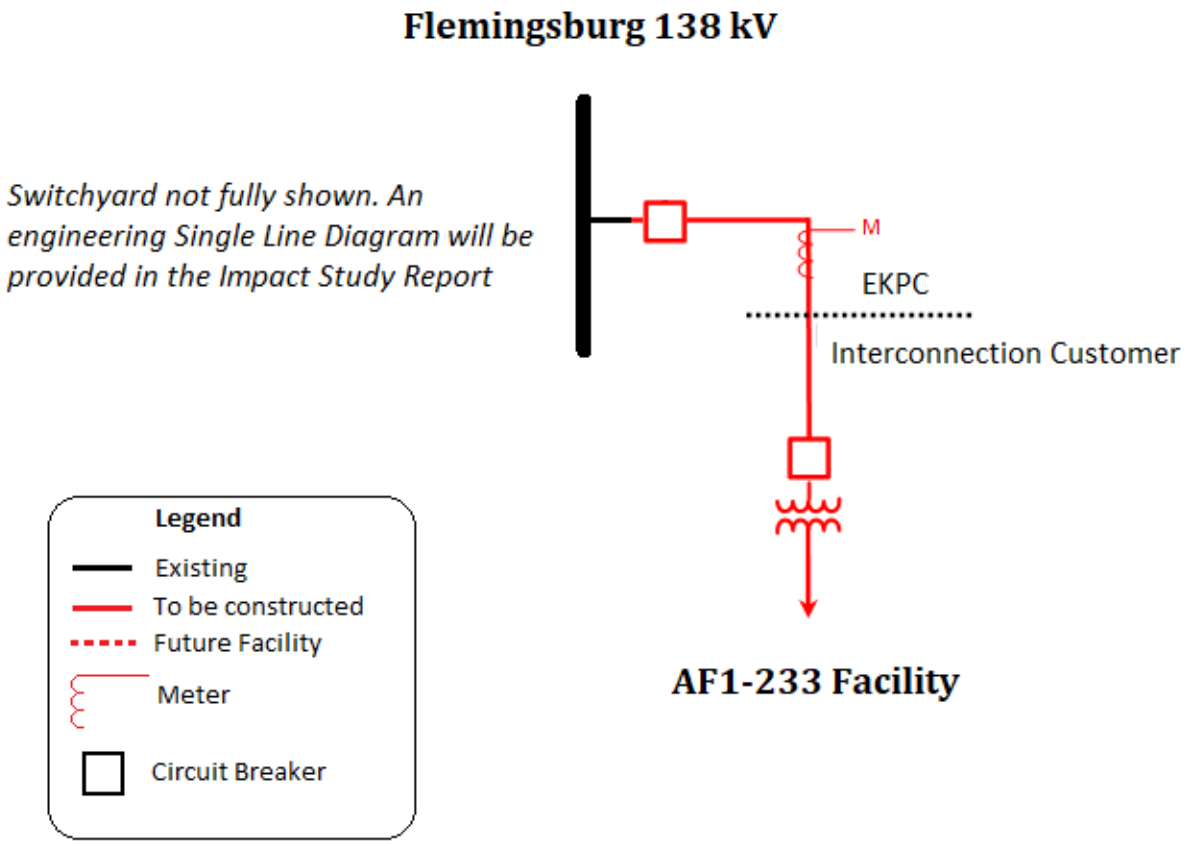
14.3 MISO

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

14.4 LG&E

An LG&E Affected System Study will be required. PJM has identified EKPC-LG&E tie line constraints. LG&E will need to determine if LG&E upgrades are required.

15 Attachment 1: One-Line Diagram



APPENDIX G

Economic Impact Report

Economic Impact and Land Use Analysis of Fleming 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 Fleming Solar Project in Fleming County, Kentucky. The purpose of this report is to aid decision makers in evaluating the economic impact of this project on Fleming 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.

Fleming Solar is a 188 MW solar project using single-axis tracking panels. The project represents an investment in excess of $190million. The total development is anticipated to result in the following:

Economic Impact

Jobs - all jobs numbers are full-time equivalents

- 245 new local jobs during construction for Fleming County
- 543 new local jobs during construction for the Commonwealth of Kentucky
- Over 17.6 new local long-term jobs for Fleming County
- Over 22 new local long-term jobs for the Commonwealth of Kentucky

Earnings

- Over $17 million in new local earnings during construction for Fleming County
- Over $39.4 million in new local earnings during construction for the Commonwealth of Kentucky
- Over $678 thousand in new local long-term earnings for Fleming County annually
- Over $1.4 million in new local long-term earnings for the Commonwealth of Kentucky annually

Output

- Over $25.7 million in new local output during construction for Fleming County
- Over $61.6 million in new local output during construction for the Commonwealth of Kentucky
- Over $1.7 million in new local long-term output for Fleming County annually
- Over $2.8 million in new local long-term output for the Commonwealth of Kentucky annually

Property Taxes

- Over $9.3 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.
- Fleming County:
  - The price of corn would need to rise to $16.78 per bushel or yields for corn would need to rise to 311.2 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 $47.83 per bushel or yields for soybeans would need to rise to 119.9 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 $831.45 per ton or yields for hay would need to rise to 7.1 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 the 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 135 bushels per acre, 40.5 bushels per acre, and 2.3 tons per acre respectively.

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

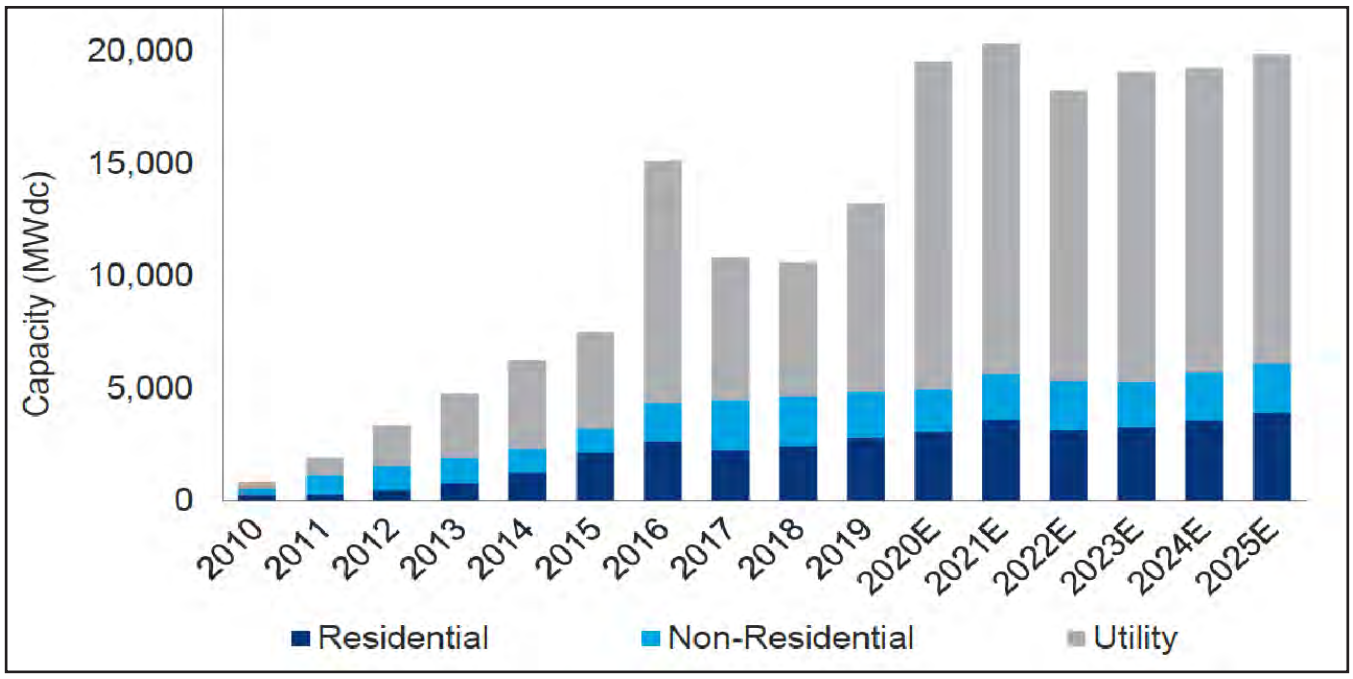
a. U.S. Solar PV Industry Growth

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 Fleming 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.

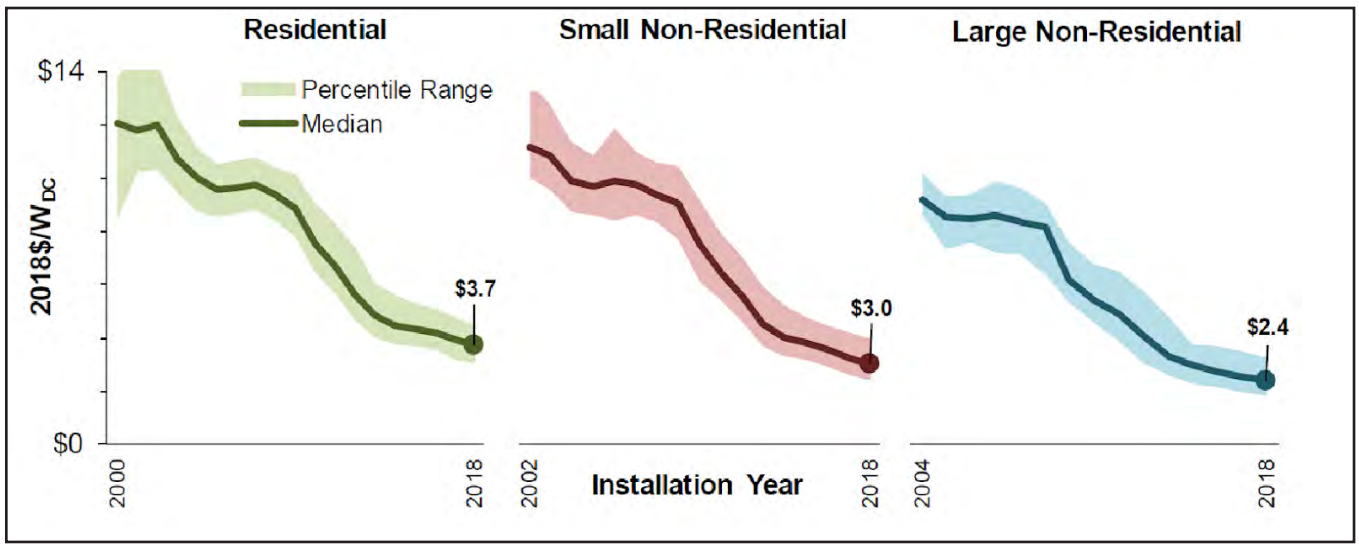
[1] There was a dramatic increase in 2016 because the industry was expecting the expiration of the federal investment tax credit and rushed to complete as many projects as possible before the expected expiration. This rush effectively pulled projects that were originally slated for 2017 and 2018 forward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



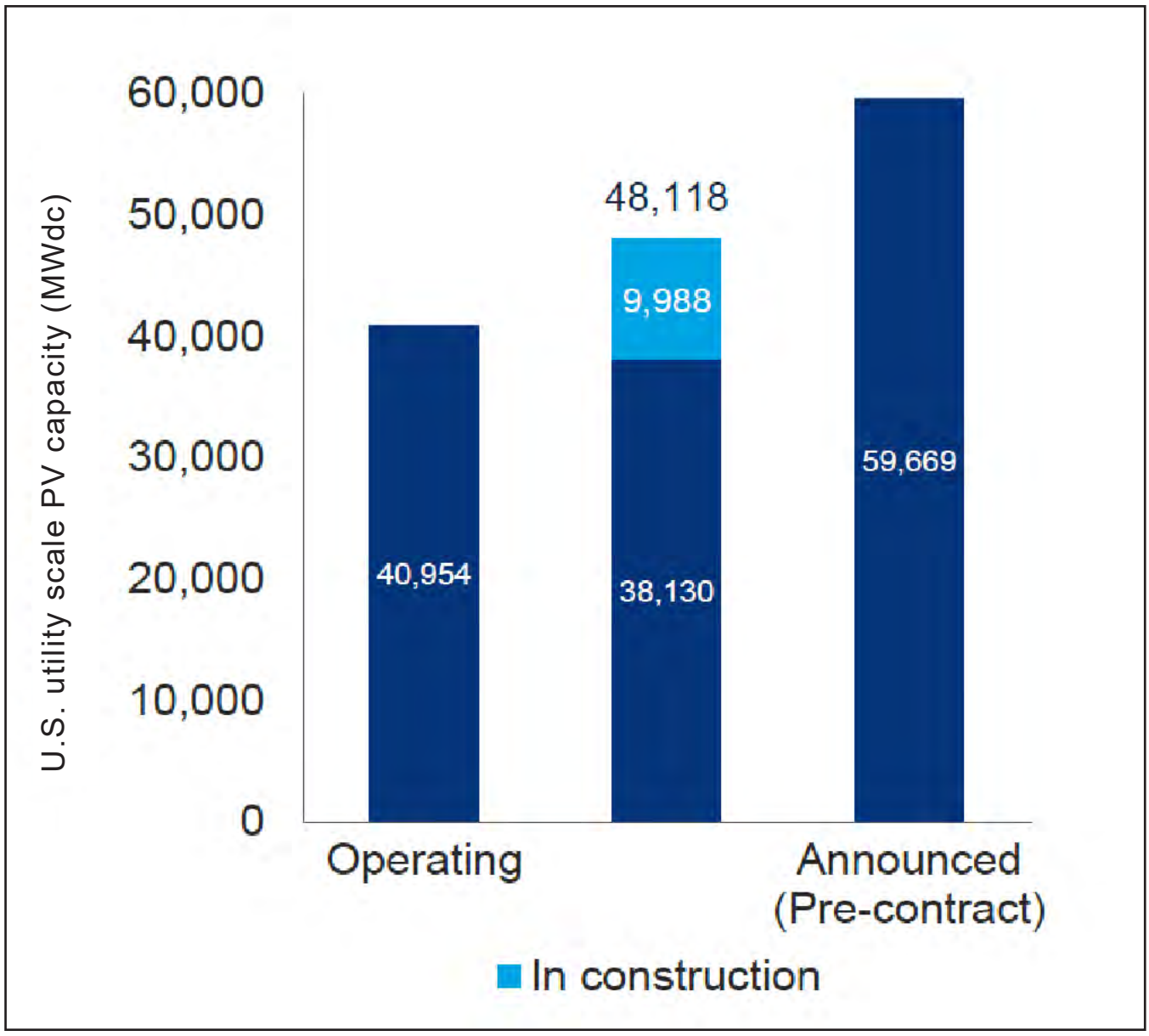
Solar Energy Industries Association, Solar Market Insight Report 2019 Year in review

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.

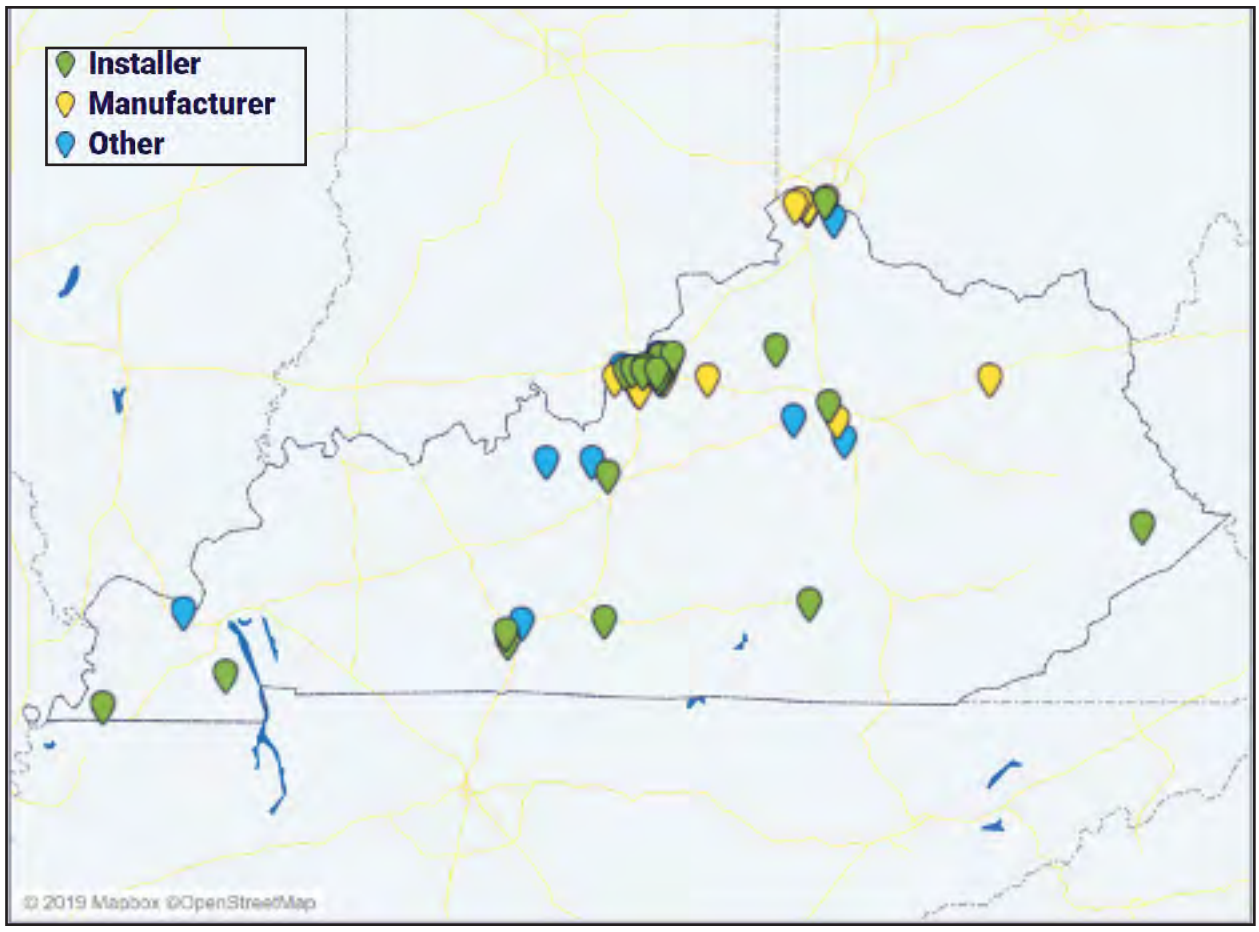
Kentucky has great potential to expand its solar installations. Kentucky's three largest solar farms in operation are: Cooperative Solar One is a 8.5 MW installation; General Motors has a 0.85 MW installation in Bowling Green, KY; and the Crittenden Solar Facility is a 2 MW installation. The 188 MW Fleming 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.

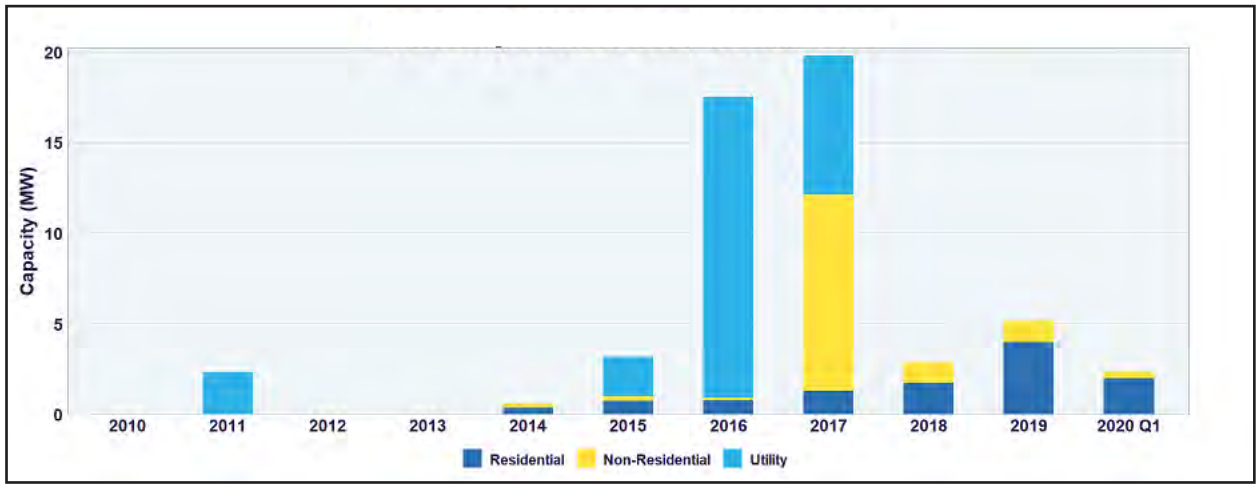
[2] "Other" includes Sales and Distribution, Project Management, and Engineering.

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. Fleming Solar Project Description and Location

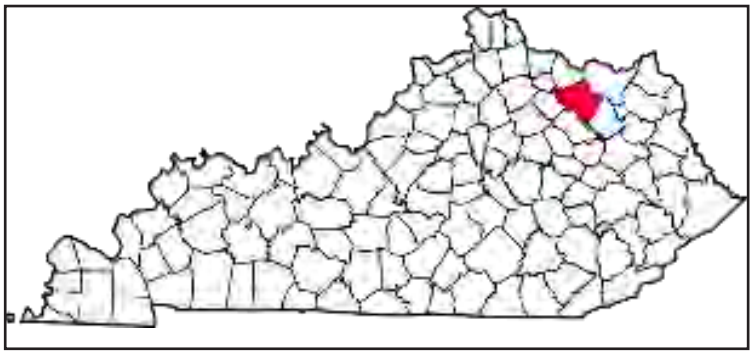
a. Fleming Solar Project Description

Fleming Solar will be constructed on certain properties located near the Flemingsburg community in Fleming County. The Project will consist of approximately 1,500 acres of solar photovoltaic panels and associated racking (approximately 188MW), 53 inverters, and a project substation transformer which will connect to East Kentucky Power Cooperatives Flemingsburg - Spurlock 138kv transmission line.

b. Fleming County, Kentucky

Fleming County is located in the Northeastern part of Kentucky (see Figure 6). It has a total area of 351 square miles and the U.S. Census estimates that the 2010 population was 14,348 with 6,120 housing units. The county has a population density of 42 (persons per square mile) compared to 110 for the Commonwealth of Kentucky. Median household income in the county was $33,141.

Figure 6. — Location of Fleming County, Kentucky



https://en.wikipedia.org/wiki/Fleming_County,_Kentucky#/media/File:Map_of_Kentucky_highlighting_Fleming_County.svg

As shown in Table 1, the largest industry is "Agriculture, Forestry, Fishing and Hunting" followed by "Administrative Government," "Retail Trade" and "Health Care and Social Assistance." These data for Table 1 come from IMPLAN covering the year 2018 (the latest year available).

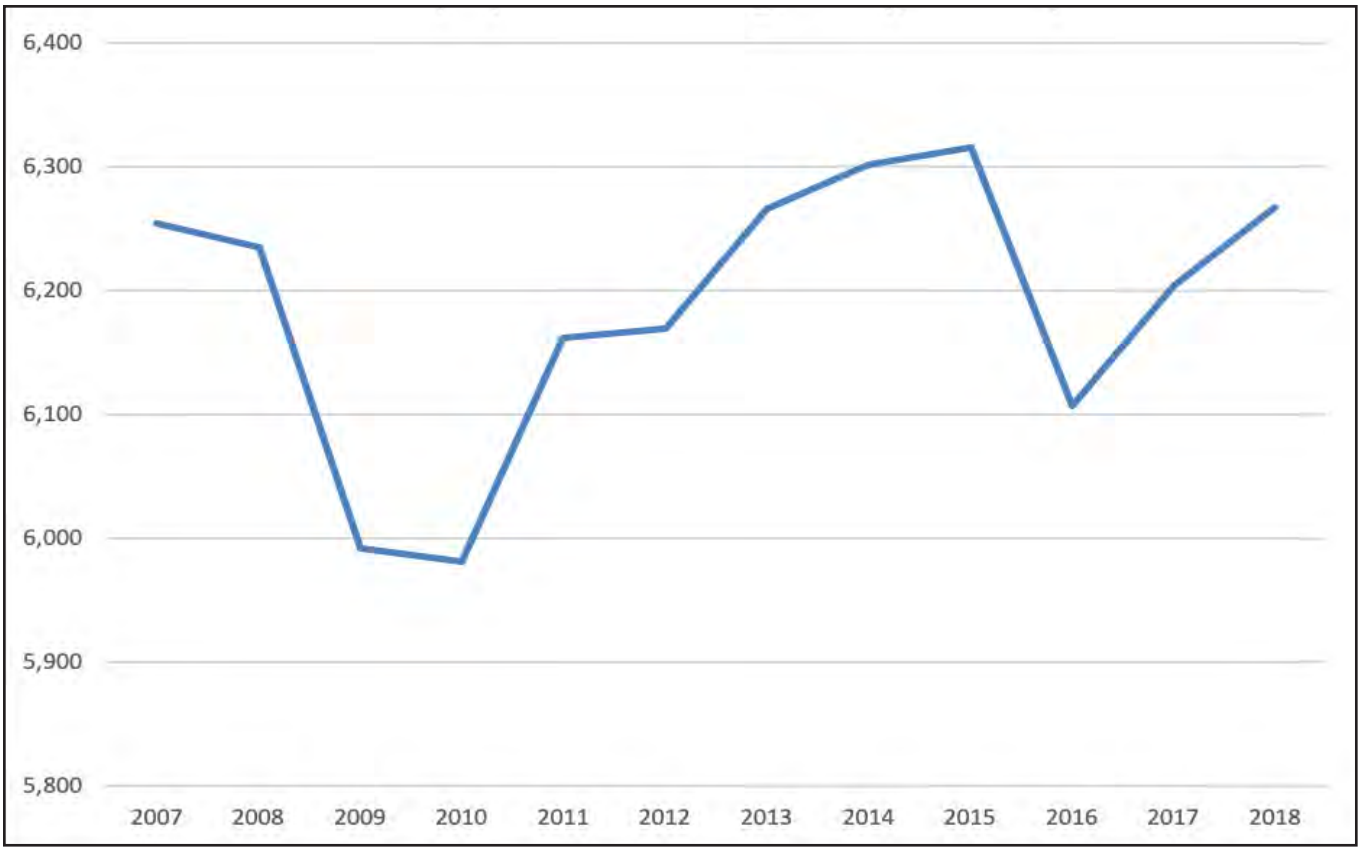
Table 1. — Employment by Industry in Fleming County

Industry	Number	Percent
Agriculture, Forestry, Fishing and Hunting	922	15.9%
Administrative Government	673	11.6%
Retail Trade	603	10.4%
Health Care and Social Assistance	590	10.2%
Construction	588	10.1%
Manufacturing	516	8.9%
Other Services (except Public Administration)	340	5.8%
Accommodation and Food Services	269	4.6%
Real Estate and Rental and Leasing	250	4.3%
Finance and Insurance	219	3.8%
Wholesale Trade	155	2.7%
Professional, Scientific, and Technical Services	132	2.3%
Transportation and Warehousing	130	2.2%
Administrative and Support and Waste Management and Remediation Services	121	2.1%
Utilities	87	1.5%
Mining, Quarrying, and Oil and Gas Extraction	71	1.2%
Educational Services	49	0.8%
Government Enterprises	39	0.7%
Arts, Entertainment, and Recreation	31	0.5%
Information	28	0.5%
Management of Companies and Enterprises	0	0.0%

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 Fleming County was at its lowest at 5,981 in 2010 and its highest at 6,316 in 2015.

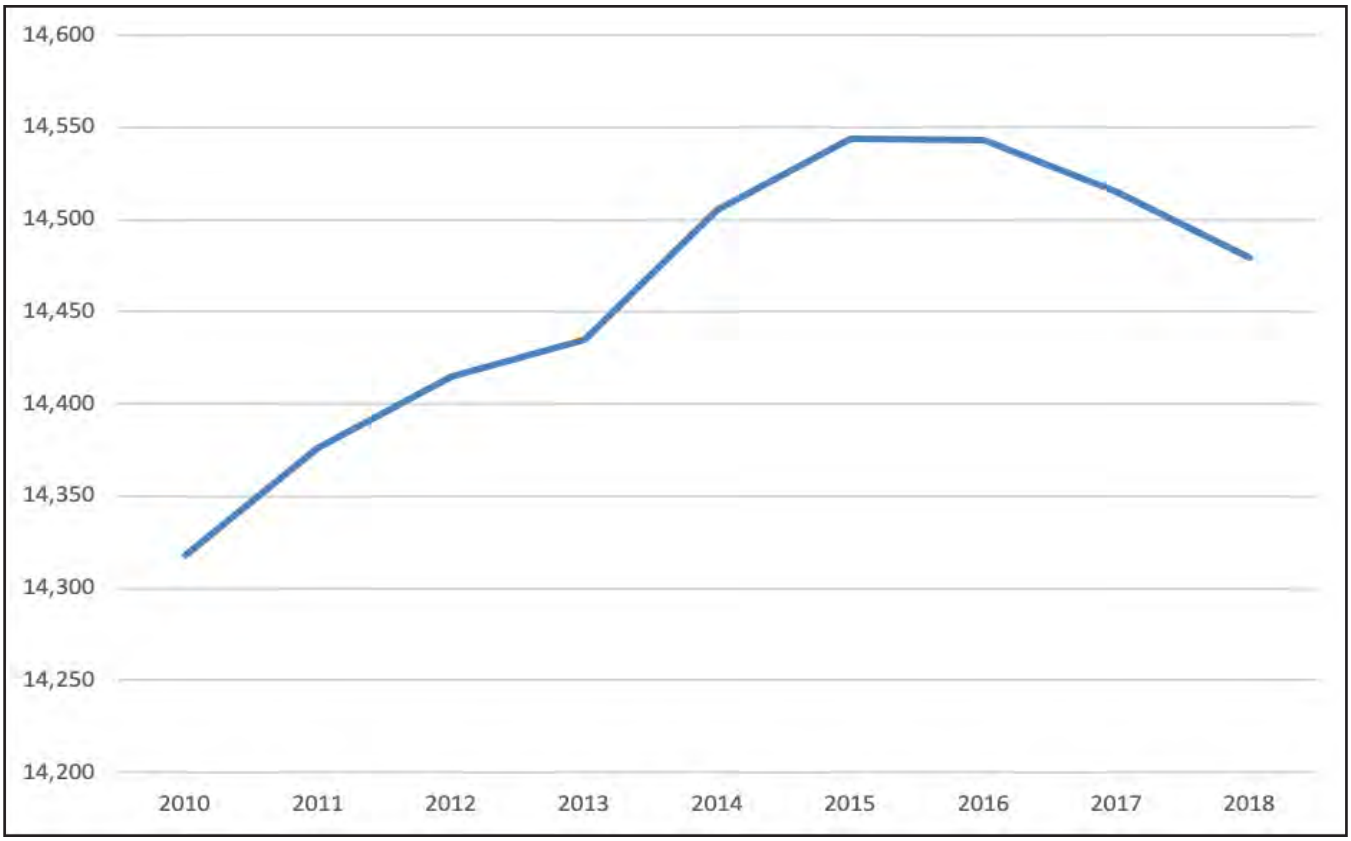
Figure 7. — Total Employment in Fleming County from 2007 to 2018



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

Similar to the trend of employment, the overall population in the county has fluctuated over the years as shown in Figure 8. Fleming County population was 14,318 in 2010 and 14,479 in 2018, a gain of 161. The average annual population increase over this time period was 20.

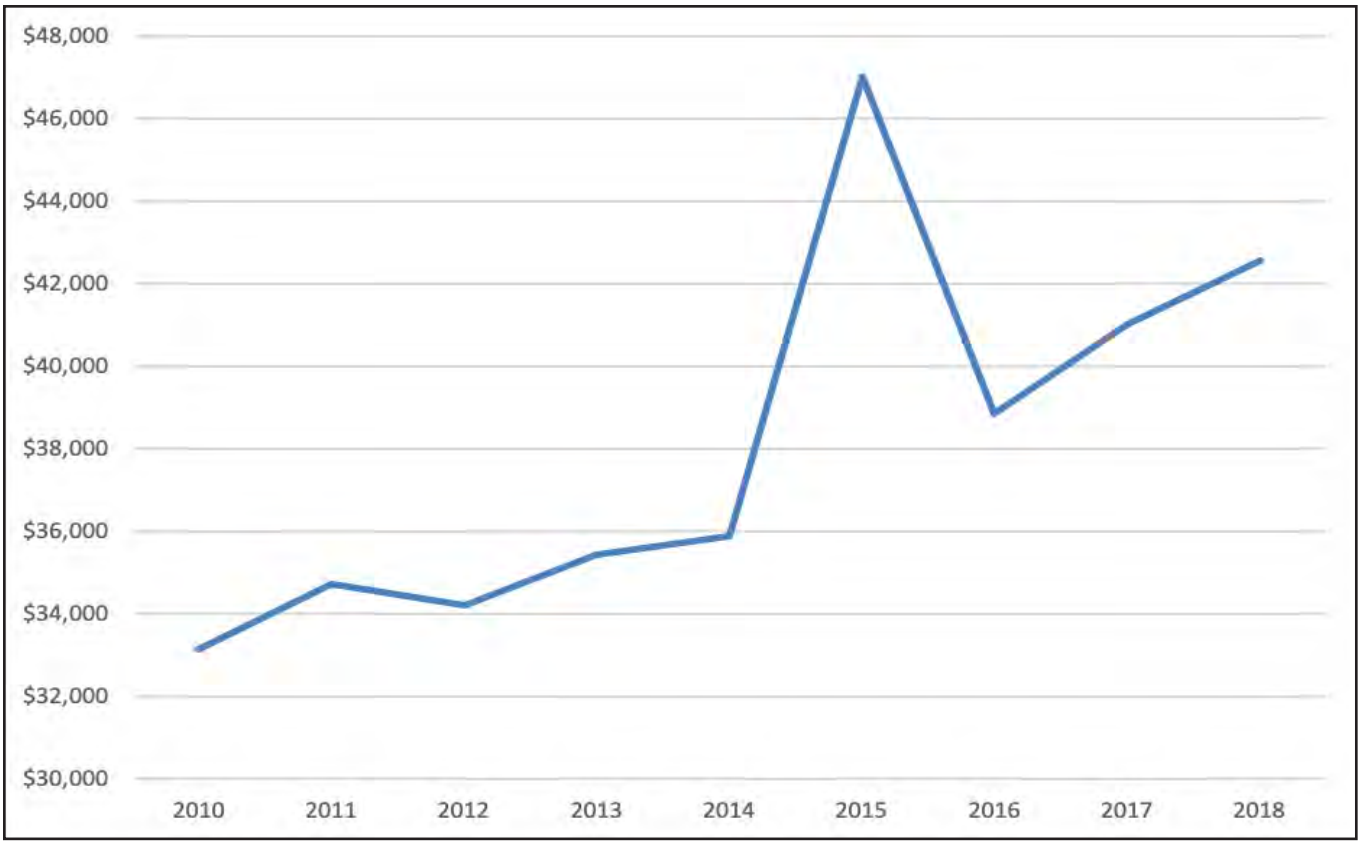
Figure 8. — Population in Fleming County 2010-2018



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

Household income was trending upward in Fleming County until 2015. Figure 9 shows the median household income in Fleming County from 2010 to 2018. Household income was at its lowest at $33,141 in 2010 and its highest at $47,030 in 2015.

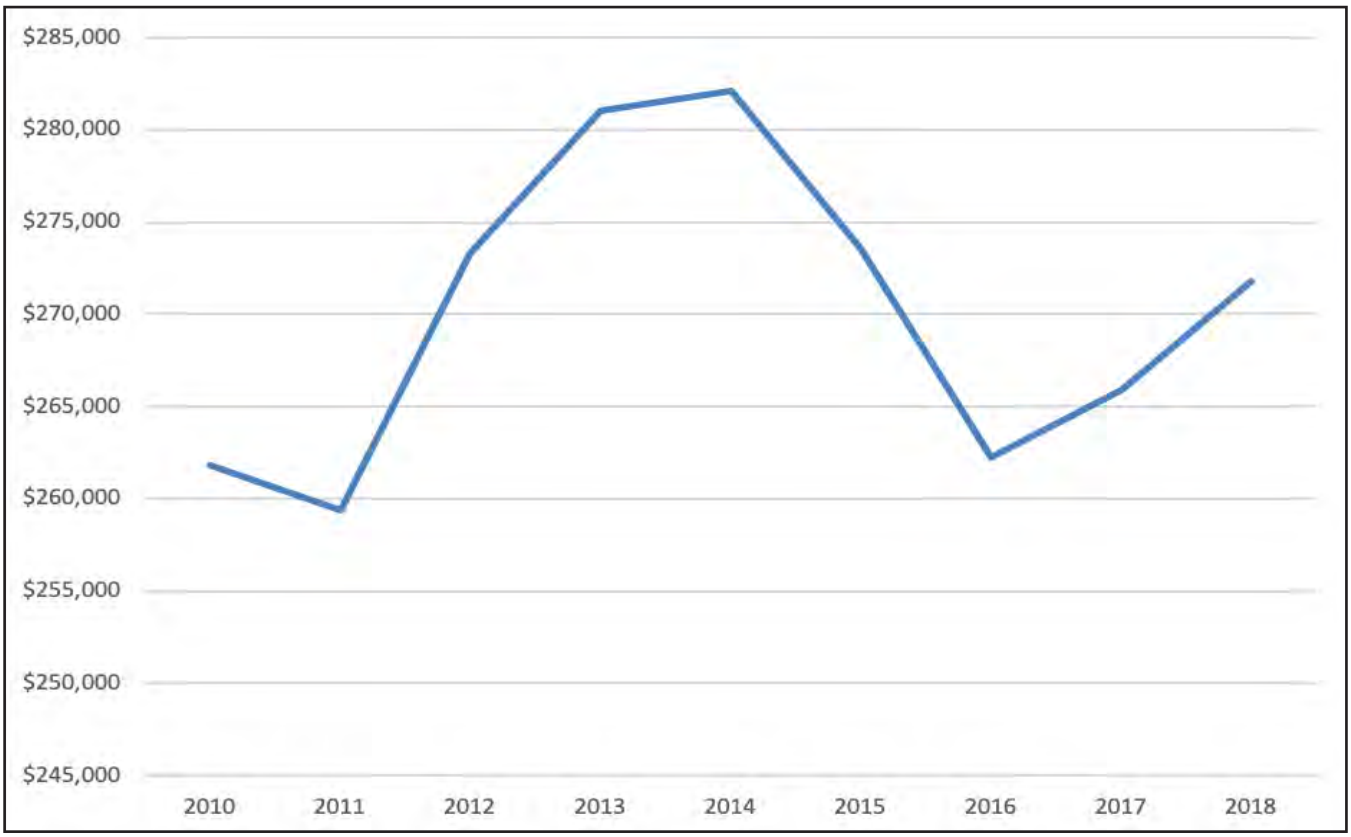
Figure 9. — Median Household Income in Fleming County from 2010 to 2018



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 Fleming County has fluctuated since 2010, as shown in Figure 10.

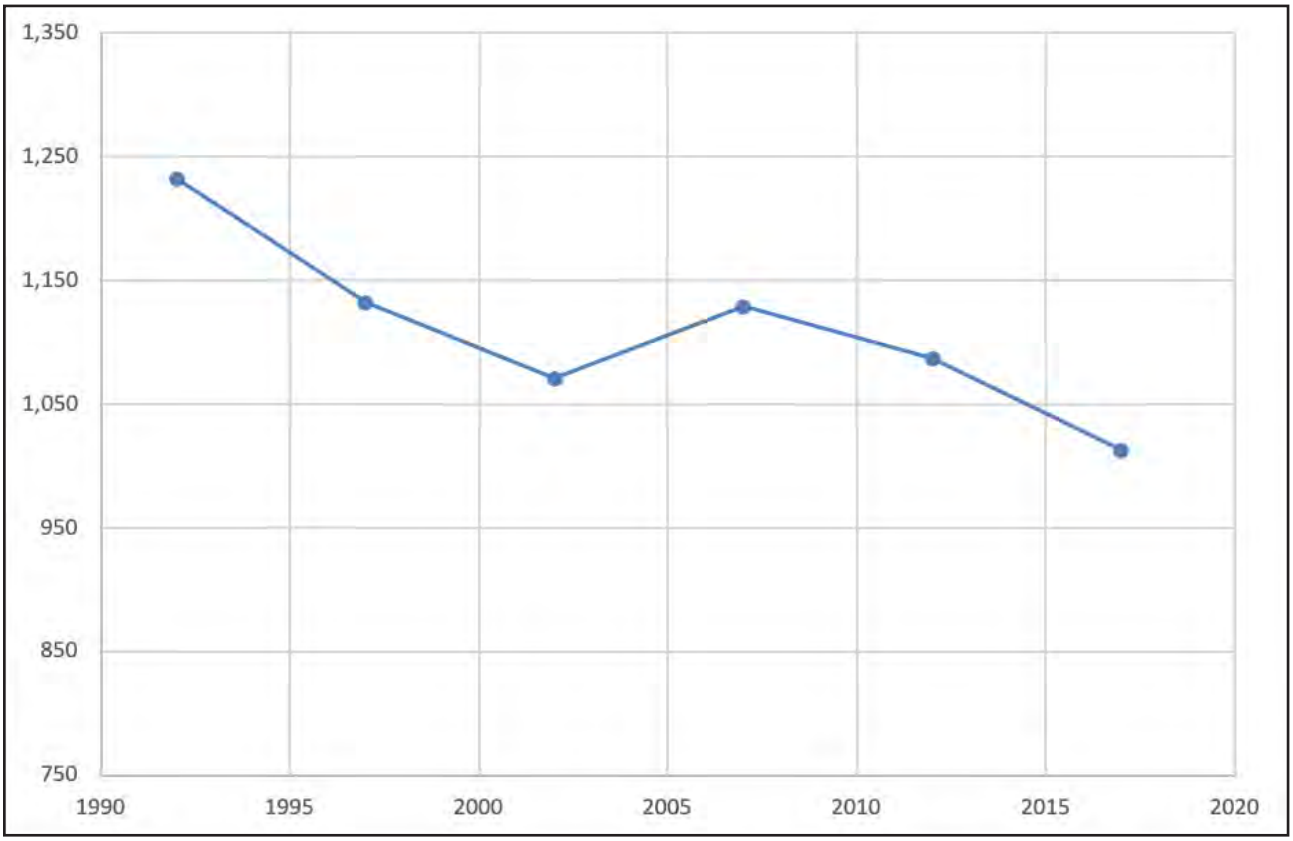
Figure 10. — Real Gross Domestic Product (GDP) in Fleming County from 2010-2018



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

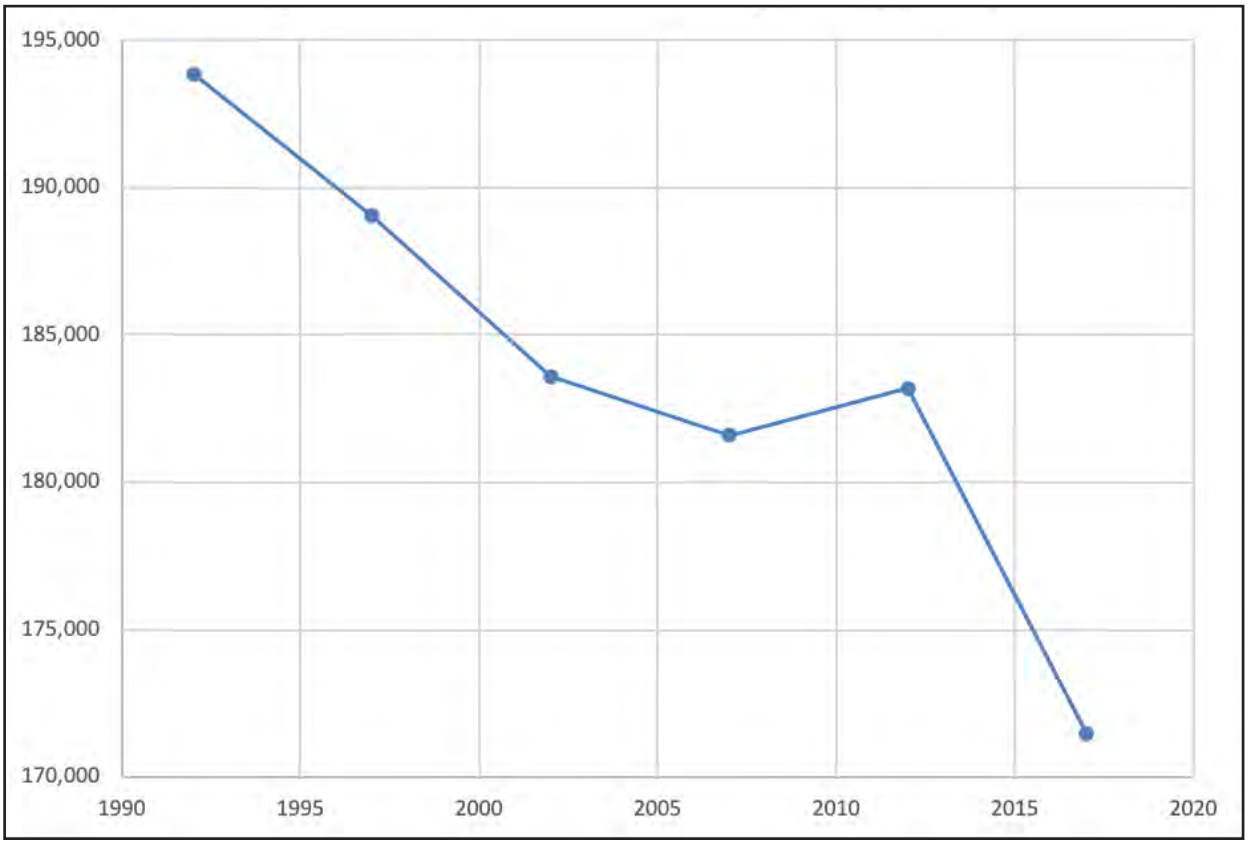
The farming industry has decreased in Fleming County. As shown in Figure 11, the number of farms has decreased from 1,232 in 1992 to 1,013 in 2017. The amount of land in farms has also decreased. The county farmland hit a low of 171,481 acres in 2017, according to Figure 12.

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



Source: Census of Agriculture, 1992-2017

Figure 12. — Land in Farms in Fleming 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, Fleming County had 1,013 farms covering 171,481 acres for an average farm size of 169 acres (Census, 2017). The total market value of products sold was $48.7 million, with 62 percent coming from livestock sales and 38 percent coming from crop sales (Census, 2017). The average net cash farm income of operations was $6,862 (Census, 2017).

The 1,500 acres planned to be used by the Fleming Solar Project represents just 0.8% of the acres used for farming in Fleming 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)

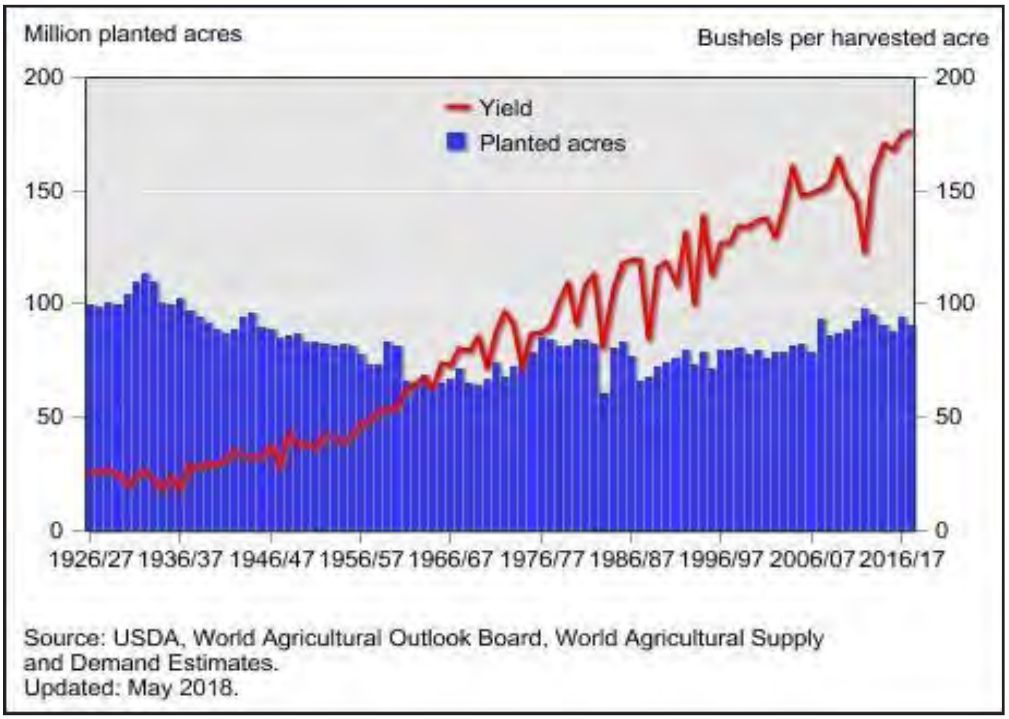
In finance, an option is a contract which gives the holder the right but not the obligation to buy or sell an underlying asset. A real option value is a choice made with business investment opportunities, referred to as "real" because it typically references a tangible asset instead of financial instrument. 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 initial term of the solar easements for this Project is thirty years with possible extensions after that. 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.

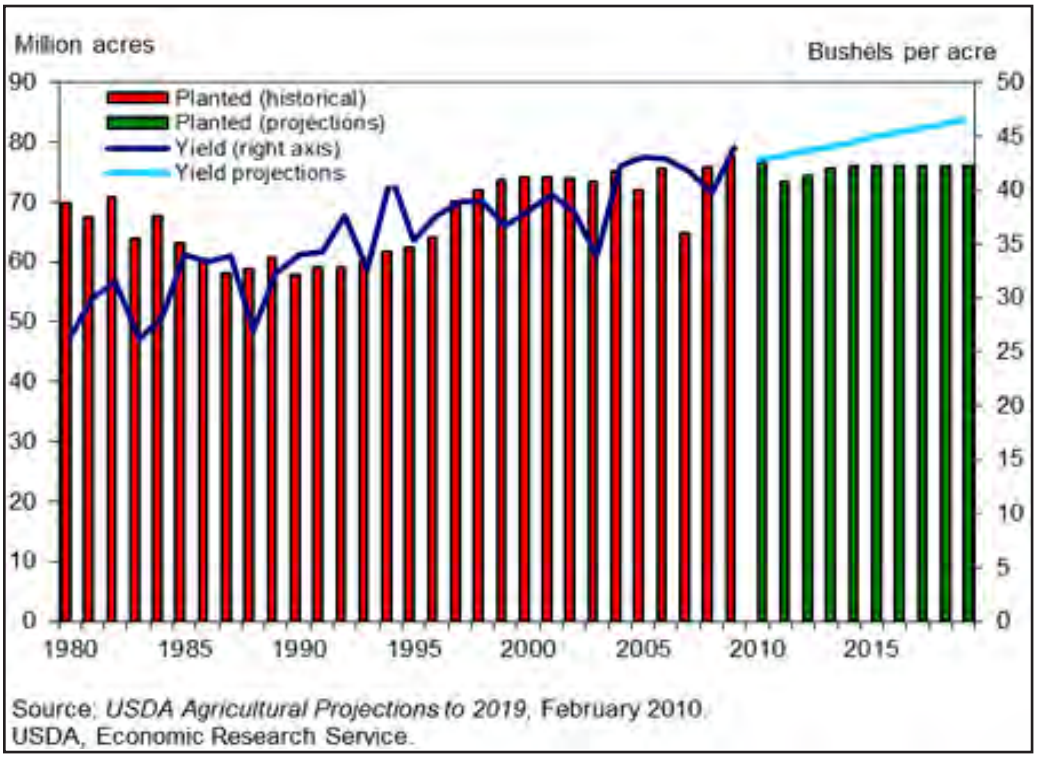
Farmland has gotten more productive over the years with better farming equipment and techniques resulting in higher yields on the same amount of land. Corn production has risen due to improvements in seed varieties, fertilizers, pesticides, machinery, reduced tillage, irrigation, crop rotations and pest 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 Fleming 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 Fleming County, Kentucky

	1992	1997	2002	2007	2012	2017
Total Farm Income Per Farm	NA	NA	$3,884	$6,325	$8,369	$9,279
Total Farm Production Expenses (average/farm)	$21,954	$21,100	$25,376	$28,577	$45,732	$45,160
Average Farm Size (acres)	157	167	171	161	169	169
Net Cash Income per Farm[3]	$10,506	$11,626	$9,355	$6,010	$7,079	$6,862
Average Market Value of Machinery Per Farm	$24,851	$31,659	$46,176	$54,062	$62,407	$71,101

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 Fleming County, Kentucky

	1992	1997	2002	2007	2012	2017
Average Market Value Machinery Per Farm	$24,851	$31,659	$46,176	$54,062	$62,407	$71,101
Annual Machinery Depreciation over 30 years - Straight Line (Market Value divided by 30)	$828	$1,055	$1,539	$1,802	$2,080	$2,370
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 Fleming County, Kentucky

	1992	1997	2002	2007	2012	2017
Net Cash Income per Farm	$10,506	$11,626	$9,355	$6,010	$7,079	$6,862
Machinery Depreciation	($828)	($1,055)	($1,539)	($1,802)	($2,080)	($2,370)
Opportunity Cost of Farmer's Time	($2,151)	($2,445)	($3,040)	($3,184)	($3,286)	($4,038)
Profit	$7,527	$8,126	$4,776	$1,024	$1,712	$454
Average Farm Size (Acres)	157	167	171	161	169	169
Profit Per Acre in 2012 Dollars	$47.94	$48.66	$27.93	$6.36	$10.13	$2.68
CPI	141.9	161.3	180.9	210.036	229.601	246.524
Profit Per Acre in 2017 Dollars	$83.29	$74.37	$38.06	$7.46	$10.88	$2.68

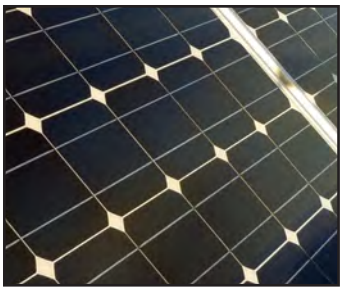
[4] We will use the Consumer Price Index for All Urban Consumers (CPI-U) which is the most common CPI used in calculations. For simplicity, we will just use the CPI abbreviation.

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 $2.68 which adjusts to $2.82 after counting for inflation in Fleming 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:

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

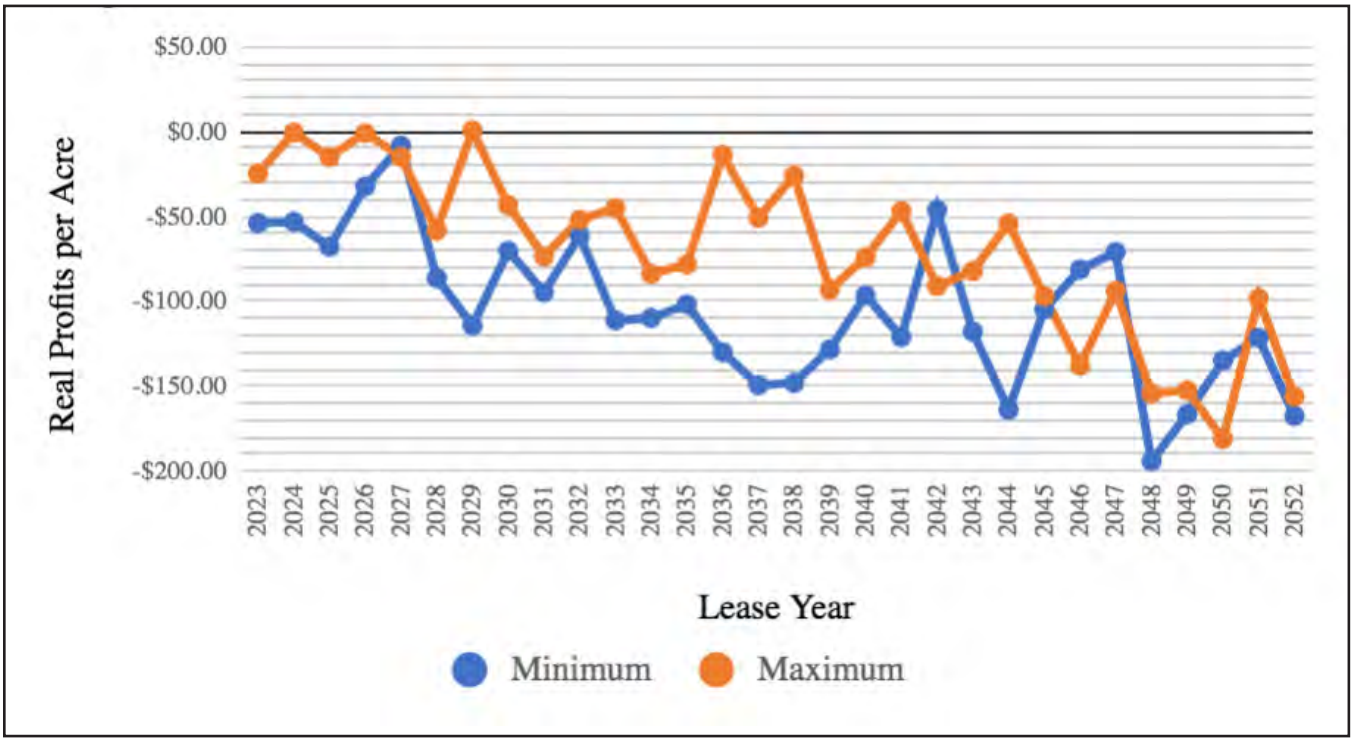
Where π_t is the farming profit in year t; α is intercept; β is the trend and time is a simple time trend starting at 1 and increasing by 1 each time period.

Using the Census of Agriculture data from 1992 to the present, the intercept is $84.27 with a standard error of $10.13. The time trend is $-3.57 with a standard error of 0.63. This means that agriculture profits are expected to decline by $3.57 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.



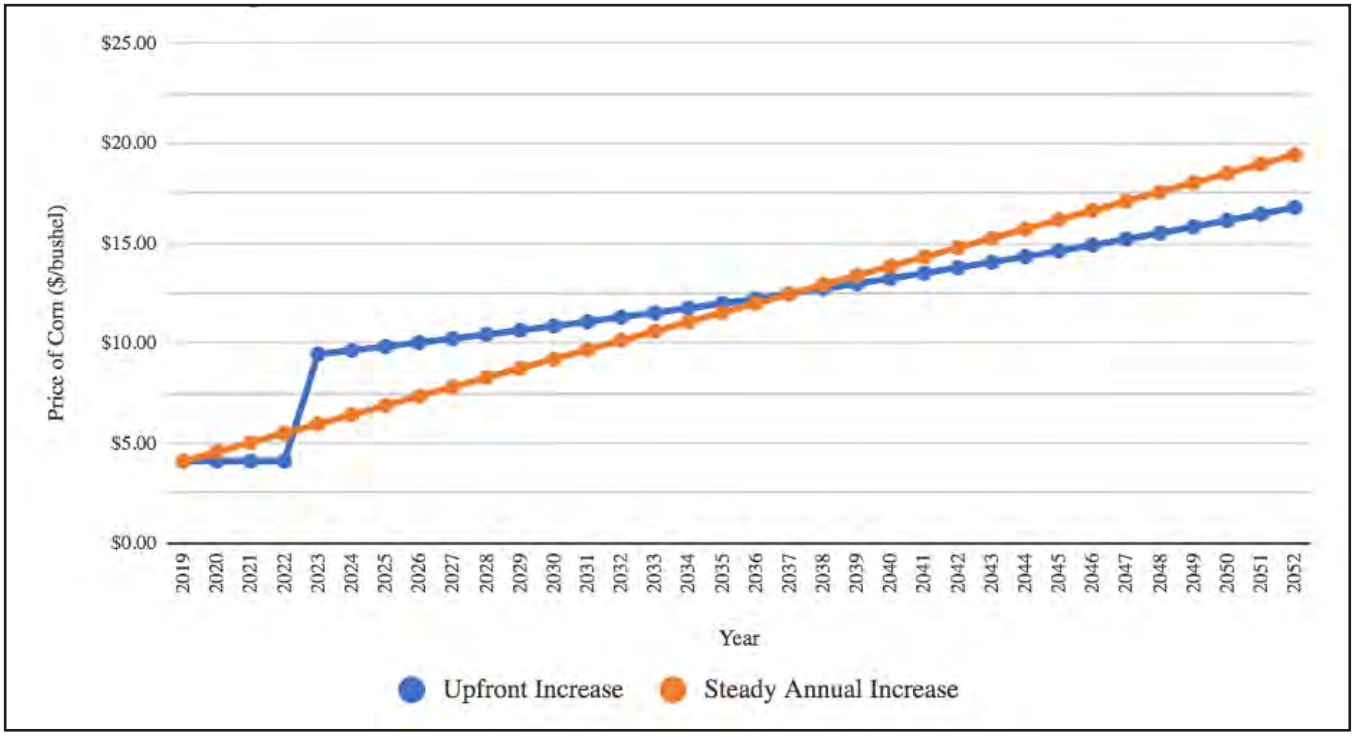
Over the period from 2017 to 2052, we assume that the profit per acre follows the equation above but allows for the random fluctuations. Because of this randomness, we can simulate multiple futures using Monte Carlo simulation. We assume that the solar farm will begin operation in 2023 and operate through 2052. Using 500 different simulations, the real profit per acre never exceeds $46 in any single year. Overall, the maximum average annual profit over the 30 years is $-86 and the minimum average annual profit is $-104. 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



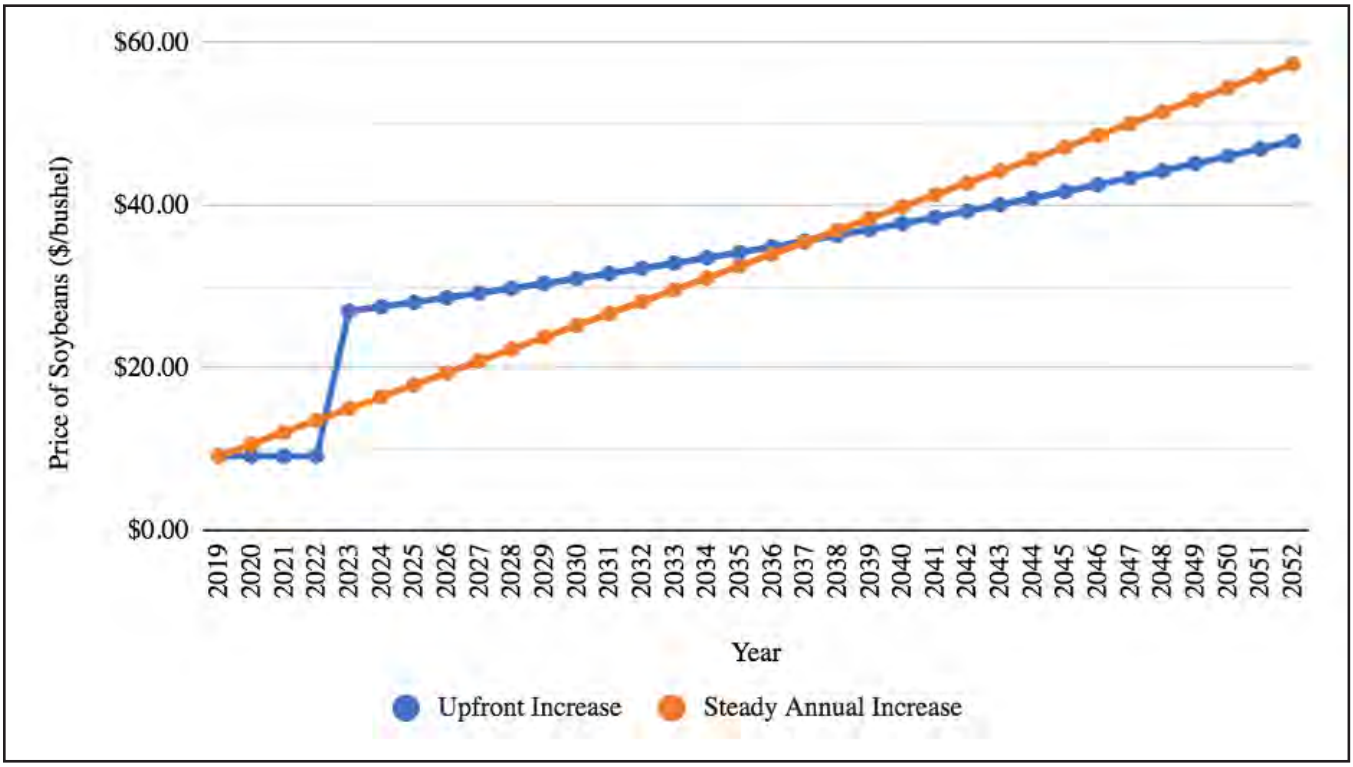
Another way to look at this problem would be to ask: How high would the price of corn have to rise to make farming more profitable than the solar lease? Below we assume that the yields on the land and all other input costs stay the same. In this case, the price of corn would have to rise from $4.10 per bushel in 2019 to $9.45 in 2022 and rise to $16.78 per bushel by 2052 as shown in Figure 16. Alternatively, the price of corn would need to rise by $0.46 per bushel each year from 2019 to 2052 when it would reach $19.42 per bushel.

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



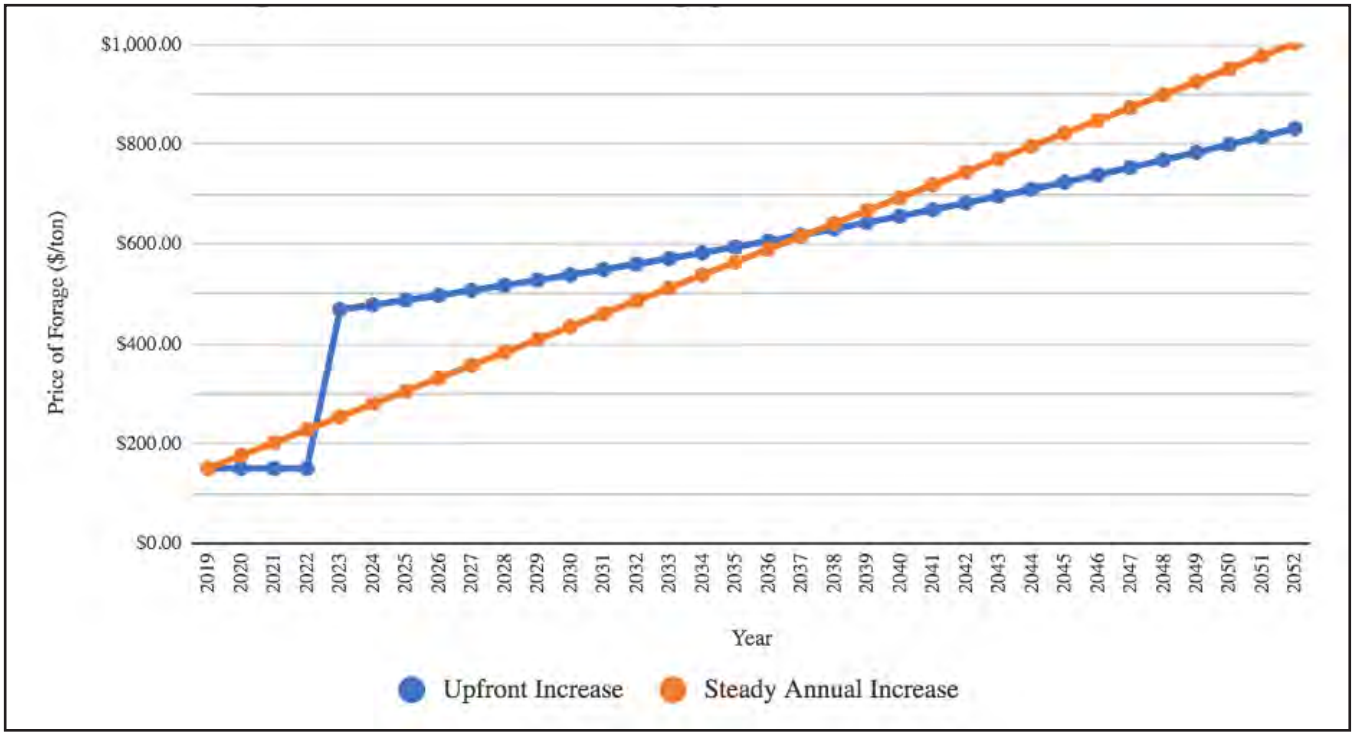
Now let's turn our attention to soybeans. If we assume the yields and input costs stay the same, the price of soybeans would have to rise from $9.10 per bushel in 2019 to $26.93 per bushel in 2022 and rise to $47.83 by 2052 as shown in Figure 17. For a linear increase, the price of soybeans would need to rise by $1.46 per bushel each year from 2019 to 2052 when it would reach $57.32 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 $468.20 in 2022 and rise to $831.45 per ton by 2052 as shown in Figure 18. Alternatively, the price of hay would need to rise by $25.84 per ton each year from 2019 to 2052 when it would reach $1,002.59 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 135 bushels per acre in 2019 to 311.2 bushels per acre in 2023 and stay at that level until 2052. The yields for soybeans would need to rise from 40.5 bushels per acre in 2019 to 119.9 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 7.1 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 Fleming County and the Commonwealth of Kentucky.

Two separate JEDI models were produced to show the economic impact of the Fleming Solar Project. The first JEDI model used the 2018 Fleming 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 Fleming Solar Project for Fleming 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 Fleming SolarProject

	Fleming County Jobs	Commonwealth of Kentucky
Construction		
Project Development and Onsite Labor Impacts (direct)	166	302
Module and Supply Chain Impacts (indirect)	62	142
Induced Impacts	17	99
New Local Jobs during Construction	245	543
Operations (Annual)		
Onsite Labor Impacts (direct)	8.5	8.5
Local Revenue and Supply Chain Impacts (indirect)	7.1	8.0
Induced Impacts	1.9	5.4
New Local Long-Term Jobs	17.6	22.0

The results from the JEDI model show significant employment impacts from the Fleming 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 166 new direct jobs during construction in Fleming County, though the construction of the solar center could involve closer to 332 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 245 for Fleming County, and 543 for the Commonwealth of Kentucky. New local long-term jobs created from the Fleming Solar Project total 17.6 for Fleming County and 22 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 Fleming Solar Project, which are categorized by construction impacts and operations impacts. The new local earnings during construction total over $17 million for Fleming County and over $39.4 million for the Commonwealth of Kentucky. The new local long-term earnings total over $678 thousand for Fleming County and over $1.4 million 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 Fleming County, average earnings for project development and onsite jobs is $86,224 and the average earnings overall during operations is $57,876.

Table 6. — Total Earnings Impact from Fleming Solar Project

	Fleming County	Commonwealth of Kentucky
Construction		
Project Development and Onsite Earnings Impacts	$14,295,404	$29,575,361
Module and Supply Chain Impacts	$2,184,923	$5,981,519
Induced Impacts	$544,553	$3,857,499
New Local Earnings during Construction	$17,024,880	$39,414,380
Operations (Annual)		
Onsite Labor Impacts	$421,706	$841,624
Local Revenue and Supply Chain Impacts	$197,410	$349,794
Induced Impacts	$59,481	$219,474
New Local Long-Term Earnings	$678,597	$1,410,891

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 $25.7 million for Fleming County and over $61.6 million for the Commonwealth of Kentucky. The new local long-term output totals over $1.7 million for Fleming County and over $2.8 million for the Commonwealth of Kentucky.

Table 7. — Total Output Impact from Fleming Solar Project

	Fleming County	Commonwealth of Kentucky
Construction		
Project Development and Onsite Jobs Impacts on Output	$17,026,530	$32,867,173
Module and Supply Chain Impacts	$6,625,946	$16,955,971
Induced Impacts	$2,077,292	$11,876,501
New Local Output during Construction	$25,729,769	$61,699,645
Operations (Annual)		
Onsite Labor Impacts	$421,673	$841,624
Local Revenue and Supply Chain Impacts	$1,066,915	$1,327,297
Induced Impacts	$225,074	$673,764
New Local Long-Term Output	$1,713,662	$2,842,685

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.

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[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 Fleming 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 $150.7 million, the first-year tangible personal property value is $14.9 million, and the first-year real property value is $9.4 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 0.62% 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 $482 thousand but declines due to depreciation. The expected total property taxes paid over the lifetime of the Project is over $9.3 million and the average annual property taxes paid will be $311,602.

Table 8. — Property Tax Revenue from Fleming Solar Project

Tax Year	Manufacturing Machinery Taxes	Tangible Personal Property Taxes	Real Personal Property Taxes	Total
2024	$226,073	$159,195	$97,057	$482,324
2025	$217,030	$148,417	$97,785	$463,231
2026	$208,349	$138,369	$98,518	$445,236
2027	$200,015	$129,002	$99,257	$428,273
2028	$192,014	$120,268	$100,001	$412,284
2029	$184,333	$112,126	$100,751	$397,211
2030	$176,960	$104,535	$101,507	$383,002
2031	$169,882	$97,458	$102,268	$369,608
2032	$163,086	$90,860	$103,035	$356,982
2033	$156,563	$84,709	$103,808	$345,080
2034	$150,300	$78,974	$104,587	$333,861
2035	$144,288	$73,628	$105,371	$323,287
2036	$138,517	$68,643	$106,161	$313,321
2037	$132,976	$63,996	$106,957	$303,930
2038	$127,657	$59,663	$107,760	$295,080
2039	$122,551	$55,624	$108,568	$286,743
2040	$117,649	$51,858	$109,382	$278,889
2041	$112,943	$48,348	$110,202	$271,493
2042	$108,425	$45,074	$111,029	$264,529
2043	$104,088	$42,023	$111,862	$257,973
2044	$99,925	$39,178	$112,701	$251,803
2045	$95,928	$36,526	$113,546	$245,999
2046	$92,091	$34,053	$114,397	$240,541
2047	$88,407	$31,839	$115,255	$235,501
2048	$84,871	$31,839	$116,120	$232,829
2049	$81,476	$31,839	$116,991	$230,306
2050	$78,217	$31,839	$117,868	$227,924
2051	$75,088	$31,839	$118,752	$225,679
2052	$72,085	$31,839	$119,643	$223,566
2053	$69,201	$31,839	$120,540	$221,580
TOTAL	$3,990,987	$2,105,401	$3,251,680	$9,348,067
30 YR AVG	$133,033	$70,180	$108,389	$311,602

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X. Curriculum Vita - David Loomis

David G. Loomis
Illinois State University
Department of Economics
Campus Box 4200
Normal, IL 61790-4200
(815) 905-2750
dloomis@ilstu.edu

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.

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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.

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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.

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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.

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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.

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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.

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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.

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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
Fleming Solar Project

APPENDIX H

Site Assessment Report

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

APPENDIX I

Certificate of Authority

1072352.06 vmiller ADD

Alison Lundergan Grimes
Kentucky Secretary of State
Received and Filed:
9/24/2019 12:03 PM
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)
- ☐ business trust (KRS 386).
- ☐ limited partnership (KRS 362).
- ☐ non-profit llc (KRS 275)
- ☐ nonprofit corporation (KRS 273)
- ☒ limited liability company (KRS 275)
- ☐ ltd cooperative assn. (KRS)
- ☐ cooperative assn. (KRS)
- ☐ professional service corporation (KRS 274)
- ☐ professional limited liability company (KRS 275)
- ☐ statutory trust

2. The name of the entity is Tenaska Solar XIII, 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				
Name	Street or P.O. Box	City	State	Zip Code
Name	Street or P.O. Box	City	State	Zip Code

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: Fleming.

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

X Drew J. Fossum	Drew 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	Asst Vice President	09-23-19
Signature of Registered Agent	Printed Name	Title	Date

(05/17)

EXHIBIT A

TENASKA SOLAR XIII, 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

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Alison Lundergan Grimes
Kentucky Secretary of State
Received and Filed:
10/16/2019 11:28 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 XIII, 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 Fleming 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: Fleming

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			

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
Drew J. Fagan	Drew J. Fagan	Sr. VP & General Counsel	10/15/19

(05/17)