#### VERIFIED DIRECT TESTIMONY OF KEVIN PARZYCK

#### I. INTRODUCTION

- 1 Q1. Please state your name and business address.
- 2 A. My name is Kevin Parzyck, and my business address is 240 7<sup>th</sup> Avenue, La Grange, IL
- 3 60525.
- 4 Q2. By whom are you employed and in what capacity?
- A. I am employed by Global Energy Generation LLC as Senior Vice President Project
  Management. I have been delegated responsibility for the development of Phase 2 of the
  Mammoth Solar project (the "Project") by Starke Solar LLC d/b/a Mammoth Solar
  ("Petitioner").
- 9 Q3. What is your educational background?
- 10 A. I have a Bachelor of Science degree in Civil Engineering from the University of Michigan,
  11 Ann Arbor, and a Master of Engineering degree in Structural Engineering from the
  12 University of California, Berkeley.
- 13 Q4. Please describe your employment history.

A. I have over 35 years of experience in the development, design, and implementation of
large-scale infrastructure and building projects and over 12 years of experience developing
utility-scale renewable energy projects throughout the United States. I started working at
Global Energy Generation, LLC in June, 2019 and have been in my current position since

18 June, 2019.

19 Q5. Have you previously testified before government bodies or agencies?

CauseNo. 45586

1	А.	I have provided testimony before the Indiana Utility Regulatory Commission on behalf of			
2		Starke Solar, LLC d/b/a Mammoth Solar in Cause No. 45518 for Phase 1 of the Mammoth			
3		Solar project. I have also testified before numerous township, county and state zoning,			
4		permitting and regulatory bodies on behalf of renewable energy projects, and have met and			
5		consulted with federal regulatory agencies regarding renewable energy projects.			
6	Q6.	What is the purpose of your direct testimony in this proceeding?			
7	A.	The purpose of my direct testimony is to discuss the relief sought by Petitioner in this			
8		proceeding and to provide the Commission with information regarding the Petitioner and			
9		its proposed Project.			
10	Q7.	Please describe the Project's corporate structure.			
11	А.	The Project is owned by Petitioner Starke Solar, LLC d/b/a Mammoth Solar ("Mammoth			
12		Solar Phase 2"). Mammoth Solar Phase 2 is a wholly owned subsidiary of Global Energy			
13		Generation LLC ("GEG"), which is owned by Doral Group Ltd. ("Doral Group"), Clean			
14		Air Generation LLC ("Clean Air Generation"), and Migdal Insurance and Financial Holding			
15		Ltd ("Migdal"). GEG is a Delaware limited liability company specializing in the			
16		development of large-scale solar and wind facilities in the U.S. GEG is headquartered in			
17		Abington Twp., Pennsylvania. Doral Group is a leading international developer and owner-			
18		operator of over 400 energy facilities globally and is located in Tel Aviv, Israel. Clean Air			
19		Generation is a developer of utility-scale energy projects in the United States. Migdal is the			

- 20 largest insurance company in Israel with over \$90 billion in Assets Under Management
- 21 (AUM).

Starke Solar LLC Mammoth Solar Phase 2 Petitioner's Exhibit 1 Page 3 of 23

1	Q8.	What relief does Petitioner request of the Commission in this Cause?			
2	A.	Petitioner is requesting that the Commission decline to exercise jurisdiction pursuant to			
3		Ind. Code § 8-1-2.5-5 over Petitioner's construction, ownership, and operation of, and any			
4		other activity in connection with the Project, and to determine that the public interest will			
5		be served by the Commission's declining to exercise jurisdiction over Petitioner.			
6					
7		II. PROJECT DESCRIPTION AND PROJECT SITE			
8	Q9.	Please describe the Mammoth Solar project.			
9	А.	Mammoth Solar is a proposed solar generation facility that in total is anticipated to have			
10		the capability of generating up to approximately 1.3 gigawatts ("GW"). The project is being			
11		developed in phases, and this second phase ("Phase 2" or "Mammoth Solar South") is the			
12		subject of this proceeding. Phase 2 is anticipated to have the capability of generating up to			
13		approximately 300 megawatts ("MW") (nameplate capacity, alternating current) of			
14		electricity from approximately 740,460 solar panels. The Project is expected to have a Net			
15		Capacity Factor of approximately 20.7 percent. The Project will interconnect to American			
16		Electric Power Company, Inc.'s ("AEP") transmission system at the Olive-Reynolds 345			
17		kV circuit #2.			
18		The Project will be located across approximately 3,428 acres in Beaver, Jefferson,			
19		and Monroe Townships, Pulaski County, Indiana. Petitioner has consensually obtained			
20		land rights in Pulaski County. A preliminary site map depicting the approximate solar			
21		facility locations for the Project is attached as Petitioner's Attachment KP-1.			
22	Q10.	To whom will Petitioner sell the electricity generated by the Project?			

1	A.	Petitioner has fully negotiated a power purchase agreement ("PPA") with a creditworthy
2		counterparty to sell 100 percent of the Project's electrical output for a term of 15 years
3		beginning at the commercial operation date ("COD"). The PPA is expected to be finalized
4		by the end of August 2021. Petitioner agrees to update the Commission regarding the off-
5		taker as part of a late-filed exhibit or as part of a post-Order quarterly report in this
6		proceeding.
7	Q11.	Is the Project similar to other electric generating plants for which the Commission
8		has previously declined to exercise jurisdiction?
9	A.	Yes. The Commission also issued orders declining much of its jurisdiction pursuant to Ind.
10		Code § 8-1-2.5-5 over electric generating facilities proposed by several other renewable
11		project entities. See In the Matter of the Petition by NextEra Energy Bluff Point, LLC,
12		Cause No. 44299 (Apr. 3, 2013); In the Matter of the Petition by Headwaters Wind Farm,
13		LLC, Cause No. 44358 (Sept. 19, 2013); In the Matter of the Petition by Jordan Creek
14		Wind Farm, LLC, Cause No. 44978 (Dec. 20, 2017); In the Matter of the Petition by Bitter
15		Ridge Wind Farm, LLC, Cause No. 45165 (March 20, 2019); In the Matter of the Petition
16		by Speedway Solar, LLC, Cause No. 45230 (Sept. 18, 2019); In the Matter of the Petition
17		by Lone Oak Solar Energy LLC, Cause No. 45255 (Oct. 29, 2019); In the Matter of the
18		Petition by Fairbanks Solar Energy Center LLC, Cause No. 45254 (Oct. 29, 2019); In the
19		Matter of the Petition by Riverstart Solar Park LLC, Cause No. 45336 (June 3, 2020). The
20		proposed Project is similar to these electric generating facilities in the sense that it will be
21		a generator of electricity for sale in the wholesale power market, and it represents an
22		increase in the amount of electricity generated in Indiana.

Starke Solar LLC Mammoth Solar Phase 2 Petitioner's Exhibit 1 Page 5 of 23

1 Q12. How will the Project generate electricity?

2 A. The Project will generate electricity via solar modules (*i.e.*, panels) located within the 3 approximately 3.428-acre solar panel field. The solar field will include mounted photo voltaic ("PV") modules and inverters that will be configured in array blocks, as well as a 4 5 main power transformer to transform voltage from 34.5 kV to 345 kV. The PV modules will be constructed primarily of non-metallic materials such as silicon, monocrystalline 6 7 glass, composite film, plastic, and epoxies, with an anodized aluminum frame. The panels 8 will measure approximately 94 inches by 43 inches. The PV modules will be mounted on 9 single-axis horizontal tracker mounting systems generally six to seven feet off the ground. 10 The panels, at their highest point, will be up to approximately 20 feet off the ground. The 11 module arrays will be arranged in north-south oriented rows, and drive motors will rotate 12 the horizontally mounted solar panels from east to west to follow the sun (on a single axis) 13 throughout the day. The highest point for a horizontal tracker will be achieved during the 14 morning and evening hours when the trackers are tilted at their maximum angle.

Each array block will have Power Conversion Stations ("PCS") containing inverters and medium voltage transformers as well as other electrical equipment. Each PCS will also contain electrical and communication equipment to power and communicate with the tracker units. All electrical equipment will be housed in their respective protective enclosures on concrete pads or precast vaults, or on posts. The collection system will transport the electricity from each array block to an onsite collector substation via underground 34.5 kV cabling. From there, the electricity will be stepped up to 345 kV.

1		The Project will then interconnect to AEP's 345 kV transmission system via a new
2		switching station cut into the Olive – Reynolds 345 kV transmission line.
3	Q13.	Have the component pieces to construct the Project been secured?
4	A.	No. Petitioner has not yet selected a final supplier and does not plan to do so until closer to
5		the construction start date. Petitioner plans to procure panels and other equipment from
6		established, tier 1 vendors with strong warranties and other provisions.
7	Q14.	What evaluation has Petitioner undertaken to demonstrate the appropriateness of the
8		Project site?
9	A.	Based upon our due diligence and permitting work to date, no environmental issues are
10		foreseen that would delay or prevent the permitting and construction of the Project within
11		the timeline listed herein. Petitioner contracted with Lochmueller Group to perform a Phase
12		1 Environmental Site Assessment ("ESA"). The ESA was performed in general
13		conformance with the scope and limitations of ASTM Practice E1527-13. The ESA
14		consisted of a site reconnaissance, completed on February 2, 2021, a review of historical
15		and governmental records, and interviews. The ESA did not identify any areas of concern
16		with the Project's footprint. A copy of the Phase 1 ESA is provided as Petitioner's
17		Attachment KP-2. Petitioner contracted with Lochmueller Group to perform a Preliminary
18		Archaeological Records Review ("Archaeological Review") of the Project site. The
19		purpose of the Archaeological Review was to (1) confirm or deny the presence of
20		previously recorded archaeological resources within the Mammoth Solar South project
21		area, and (2) to provide information regarding the eligibility of these resources (if any) for
22		inclusion in the National Register of Historic Places (NRHP) based on the

Starke Solar LLC Mammoth Solar Phase 2 Petitioner's Exhibit 1 Page 7 of 23

1		recommendations within existing archaeological site reports. The Archaeological Review			
2		is provided as Petitioner's Attachment KP-3. Petitioner contracted with Terracon			
3		Consultants, Inc. to perform a Geotechnical Report for the Project site. The Geotechnical			
4		Report is provided as Petitioner's Attachment KP-4. Petitioner contracted with			
5		Lochmueller Group to perform a field wetland study. The field wetland analysis has been			
6		completed, and the field wetland study is expected to be completed in the near future.			
7		Petitioner agrees to provide a completed field wetland study once it is available as either a			
8		late-filed attachment or as part of the quarterly reporting to which Petitioner agrees in this			
9		Cause.			
10	Q15.	Will the Project use water and will there be any impact on local water supplies?			
11	A.	The Project will not use water in any significant quantities, and it will have negligible or			
12		no impact on local water supplies. Water will be used during construction, reconstruction			
13		and removal of Project facilities, primarily for dust control. After construction is			
14		completed, water may be used for panel washing, if necessary.			
15	Q16.	Will the Project have any substantial negative impact on any groundwater rights and			
16		obligations, or any streams and wetlands?			
17	A.	No. The Project will not have any substantial negative impacts on any groundwater rights,			
18		streams, or wetlands.			
19					
20		III. PUBLIC UTILITY STATUS AND PERMITTING ISSUES			
21	Q17.	Will Petitioner qualify as a public utility under Indiana law?			

Starke Solar LLC Mammoth Solar Phase 2 Petitioner's Exhibit 1 Page 8 of 23

A. The Indiana Legislature has defined "public utility" to include any entity that owns, 1 2 operates, manages or controls any plant or equipment within the State for the production 3 of electricity. As described above, Petitioner intends to develop, own, and operate an 4 electric generating facility. Thus, even though Petitioner does not intend to sell electricity 5 directly to retail customers, it may fall within this very broad definition of "public utility" under Indiana law. As a public utility, Petitioner would then also meet the definition of an 6 7 "energy utility" for purposes of Ind. Code § 8-1-2.5-5. This Indiana Code section permits 8 an energy utility electing to be subject to this section to request the Commission to decline 9 to exercise its jurisdiction with respect to the energy utility, which prompted the Petition 10 in this case.

# Q18. Has Petitioner applied for and obtained, or will Petitioner apply for and obtain, all necessary federal, state, and local permits needed for construction and operation of the Project?

14 A. Yes.

#### 15 Q19. What local permits are required for the Project?

A. Pulaski County, Indiana requires a special exception from the Pulaski County Board of
Zoning Appeals ("BZA"). Petitioner has received two special exception approvals from
the BZA for the Mammoth Solar project, a portion of which is applicable to Mammoth
Solar South. On August 24, 2020, the BZA unanimously granted a special exception for
4,511 acres, of which 1,567 acres is applicable to Mammoth Solar South. On March 15,
2021, the BZA unanimously granted a special exception for 4,692 acres, of which 1,861

- acres applies to Mammoth Solar South. The BZA findings of fact for both approvals are
   attached as <u>Attachments KP-5</u> and <u>KP-6</u>.
- 3 Q20. Will the Project require an Improvement Location Permit?
- 4 A. Yes, an Improvement Location Permit is required prior to the commencement of
  5 construction in Pulaski County.
- 6 Q21. Will the Project have a decommissioning plan?
- A. Yes. Pulaski County requires that an executed decommissioning plan be in place prior to
  the start of construction in accordance with Pulaski County's Unified Development
  Ordinance.
- 10 Q22. What is the purpose of a decommissioning plan?
- 11 A. In general, a decommissioning plan provides assurance that the Project facilities are 12 properly decommissioned at the end of the Project's useful life or upon facility abandonment. Petitioner will provide a cost estimate for demolition and removal of the 13 14 Project facilities. To guard against the unlikely and worst-case possibility that Petitioner 15 would be unable to meet its obligation to remove the Project, Petitioner anticipates that it 16 will provide a decommissioning security (a performance or surety bond). The 17 decommissioning security is intended primarily to cover the cost of removing project 18 infrastructure and for restoring the leased premises to their preconstruction condition. 19 Detail regarding the type and amount of the security and method for calculating it will be 20 specified in the decommissioning plan approved by the county.
- 21 Q23. What State permits are required for the Project?
- 22 A. State requirements for this Project include the following:

- 1 A National Pollutant Discharge Elimination System ("NPDES") general permit is ٠ 2 required under Title 327 of the Indiana Administrative Code for the discharge of 3 construction-related storm water ("Rule 5 permit"). Petitioner will submit a written 4 construction plan to the local county Soil and Water Conservation District office. Once 5 the plan is approved, Petitioner will submit a Notice of Intent to the Indiana Department 6 of Environmental Management ("IDEM") at least 48 hours prior to starting land-7 disturbing activities. After IDEM determines that Petitioner's activity is covered by 8 Rule 5, it will issue a public notice that a Rule 5 permit will be issued.
- Permits, as needed, from the Indiana Department of Transportation ("INDOT") to allow Project electric lines and other facilities to cross state highways for driveways, road exits, etc. Petitioner will apply for these permits as they become necessary.
- Isolated wetlands are regulated by the IDEM under the State Isolated Wetlands Law and development activities conducted within the floodway of any waterway of the State are regulated by the Indiana Department of Natural Resources ("IDNR") under the Flood Control Act and the Floodplain Management Rule. The Project is being designed to avoid or minimize impacts to isolated wetlands and floodways. However, if construction within isolated wetlands or floodways cannot be avoided, Petitioner will obtain appropriate permits, if necessary, for the Project.
- 19 **Q24.** What federal requirements apply to the Project?
- 20 A. The Project will comply with the following federal requirements:
- Petitioner intends to self-certify as an exempt wholesale generator and apply for market-based rate authority under Federal Energy Regulatory Commission ("FERC")
   rules and regulations.
  - If federal spill prevention, control and countermeasure ("SPCC") plan requirements for oil spills apply, Petitioner will prepare an SPCC plan.
- Development activities that affect wetlands and surface water features in the State of Indiana are regulated by the U.S. Army Corps of Engineers ("USACE"). A Water Quality Certification from IDEM is also required when applying for a federal permit.
   The Project is being designed to avoid impacts to wetlands and surface water features.
   If necessary, a USACE Nationwide Permit will be obtained in the event impacts to wetlands and surface water features cannot be avoided.
- 32

24

25

- 33 IV. <u>INTERCONNECTION</u>
- 34 Q25. How will the Project interconnect with the wholesale electric transmission grid?

Starke Solar LLC Mammoth Solar Phase 2 Petitioner's Exhibit 1 Page 11 of 23

A. The Project is sited near existing electric utility infrastructure - the Olive - Reynolds 345 1 2 kV transmission line located in Pulaski County, Indiana. Solar panels will be installed on 3 single-axis trackers. Structures supporting the PV modules will consist of steel piles (e.g., 4 cylindrical pipes, H-beams, or similar). The proposed design is laid out primarily in 5 approximately 4.68 MW increments (blocks), each 4.68 MW block will include an inverter-transformer station constructed on a pad that is to be generally located on the 6 7 interior perimeters of each block. Cables will be installed to convey the direct current (DC) 8 electricity from the panels to the inverters to convert the DC to alternating current (AC), 9 which will then be carried to a substation located onsite which will transform voltage to 10 345 kV. The Project's substation will interconnect to AEP's transmission system via a new 11 switching station cut into the Olive (AEP) – Reynolds (NIPSCO) 345 kV circuit #2.

#### 12 Q26. What studies have been done regarding the interconnection with AEP?

A. The Project's queue position with PJM Interconnection ("PJM") is AF2-133. PJM completed a Feasibility Study in July 2020. Attached as Petitioner's <u>Attachment KP-7</u> is the Feasibility Study. PJM completed a System Impact Study in February 2021. Attached as Petitioner's <u>Attachment KP-8</u> is the System Impact Study. Petitioner anticipates having a completed Facilities Study by November 2021. Petitioner agrees to submit the PJM Facilities Study as either a late-filed exhibit or as an attachment to a quarterly report as part of the reporting requirements to which Petitioner agrees in this proceeding.

#### 20 Q27. Has the Petitioner entered into an Interconnection Service Agreement?

A. The Interconnection Service Agreement is expected to be completed by March 2022.
Petitioner agrees to submit a copy of the Interconnection Service Agreement once

1		executed, as either a late-filed exhibit or an attachment to a quarterly report as part of the					
2		reporting requirements to which Petitioner agrees in this proceeding.					
3	Q28.	Can the Project be interconnected without negatively impacting system					
4		performance?					
5	A.	Yes. The interconnection studies associated with the interconnection requests to PJM show					
6		that the Project's interconnection with AEP's transmission system will not negatively					
7		impact system performance.					
8							
9		V. <u>THE PROJECT WILL SERVE THE PUBLIC INTEREST</u>					
10	Q29.	Is there a need for electricity generated by the Project?					
11	A.	Yes. As I discussed above, Petitioner is close to finalizing an off-taker for the electricity					
12		produced by the Project. Additionally, according to the most recent forecast of Indiana's					
13		future electricity requirements issued in November 2019 by the State Utility Forecasting					
14		Group ("SUFG") at Purdue University for the Commission, Indiana Electricity					
15		Projections: The 2019 Forecast, the electricity generated by the Project is needed. Table					
16		3-4 of this report projects future electricity requirements for the period 2018-2037. The					
17		SUFG's base case provides that approximately 1,292 MW of additional resources will be					
18		required by 2024 and approximately 13,921 MW of additional resources will be required					
19		by 2037. Table 3-4 of the report is attached as Petitioner's Attachment KP-9. The Project					
20		may assist in addressing this resource deficiency in Indiana, and it would do so without					
21		producing harmful emissions, without being subject to volatile fossil fuel commodity					
22		prices, and without being subject to the risk of future emissions or carbon taxes. The Project					

will contribute to the 1,292 MW needed by 2024 and the 13,921 MW needed during the
 first several years of the Project's life.

3 Q30. Will the development of additional generating capacity serve the public interest?

4 A. Yes, the public interest will be served in a number of important respects by the addition of 5 the electric generating capacity represented by the Project. First, the public needs electricity. Second, the Project represents one of the most environmentally friendly means 6 7 of generating electricity. Solar energy helps reduce the negative effects of electricity 8 generation on the environment by being a source of clean power. Solar generation facilities 9 do not release any pollutants, such as  $SO_2$  (which may cause acid rain),  $NO_x$  (which may 10 cause smog), mercury (which may cause neurological damage in fetuses and children), or 11  $CO_2$  (a greenhouse gas that may contribute to global climate change). Third, the public in 12 Indiana also may benefit from the efficiencies that flow from proximity to the source of 13 generation; that is, because of the high cost of transmitting power over long distances, it is 14 generally advantageous for load not to be located too far from its source. Fourth, 15 landowners in the area of the Project will receive economic benefits from the placement of 16 solar generation facilities on their properties. Fifth, local taxing bodies will receive new tax 17 revenues. Sixth, approximately 400 temporary construction jobs and approximately six to 18 10 full-time operations and maintenance jobs will be created by the Project. Finally, solar 19 energy provides greater energy security. It will diversify the region's and Indiana's 20 electricity generation portfolio, protecting against volatile price spikes and risks from 21 relying too heavily on just a few sources of generation. Solar energy is a domestic source of fuel, harnessed in this case within Indiana, and not subject to the geopolitical 22

1		complexities of foreign energy sources. Solar energy's renewable nature will help protect			
2		future generations from the risks of dwindling energy supplies.			
3	Q31.	In past Commission orders declining, in part, jurisdiction over renewable generation			
4		facilities, petitioners have waived the right to use eminent domain and to be exempt			
5		from local zoning, but retained the right to the use the public right-of-way, correct?			
6	A.	Yes.			
7	Q32.	Does Petitioner seek or need the power of eminent domain?			
8	A.	No.			
9	Q33.	Does Petitioner seek or need the power to be exempt from local zoning?			
10	A.	No.			
11	Q34.	Does Petitioner seek to retain the right to use public rights-of-way?			
12	A.	Yes, in a limited manner. Petitioner seeks to retain the right to use the public right-of-way			
13		within the Project area. Retention of the use of the public right-of-way will allow Petitioner			
14		to place certain of its collector lines and transmission lines in the public right-of-way.			
15		Additionally, retention of this right will clarify issues surrounding use of the public right-			
16		of-way for road crossings. I understand this is similar treatment given to other renewable			
17		energy projects in Indiana.			
18	Q35.	Is Petitioner asking this Commission to designate a service territory or establish			
19		electric rates?			
20	A.	No. By limiting its activities to the generation of electricity for sale in the wholesale market,			
21		Petitioner will not have any retail customers, nor will its sales be constrained by geography			
22		to the extent technology and the presence of transmission capacity allow. To the extent			

1		wholesale rates are not determined by the marketplace, they are regulated by FERC, which				
2		preempts the jurisdiction of state regulatory bodies to regulate wholesale rates for				
3		electricity.				
4						
5		VI. PROJECT TIMELINE AND CONSTRUCTION				
6	Q36.	What is the Project's planning timeline (after receiving all required regulatory				
7		approvals)?				
8	A.	The Project is anticipated to achieve COD by June 2024.				
9	Q37.	Will Petitioner advise the Commission through notice of any change in the in-service				
10		date, which the Commission may use to refine its integrated resource planning for				
11		Indiana retail utilities?				
12	A.	Yes.				
13	Q38.	Does Petitioner have the ability to construct the Project?				
14	A.	Yes.				
15	Q39.	Who will have construction responsibility?				
16	A.	Petitioner is responsible for the construction of the Project, and it will hire an experienced				
17		contractor to perform engineering, procurement, and construction activities.				
18						
19		VII. <u>PROJECT OWNERSHIP AND OPERATION</u>				
20	Q40.	Will Petitioner own the Project?				
21	A.	Yes.				

1	Q41.	Has Petitioner's owner, GEG, or any of its other affiliates constructed or operated			
2		other electric generating facilities?			
3	A.	Yes. Petitioner's parent company GEG has substantial experience financing, developing			
4		owning, and operating renewable energy assets in the United States. GEG's portfolio of			
5		renewable energy projects in operation or in development currently includes more than 175			
6		MW of wind and 300 MW of solar projects in the U.S. GEG's parent company Doral Group			
7		has more than 500 projects in commercial operation and more than 3,500 MW under			
8		construction worldwide. A description of GEG's projects can be found at the following			
9		website: <u>https://gegrenewables.com/projects/</u>			
10	Q42.	Will Petitioner operate the Project in a commercially reasonable manner and in			
11		accordance with good utility practice?			
12	A.	Yes. GEG is committed to operating its generating facilities, including solar facilities, in			
13		commercially reasonable manner and in accordance with good utility practice.			
14	Q43.	Does Petitioner have the ability to finance the Project?			
15	А.	Yes. The Project will be financed under traditional tax equity non-recourse finance			
16		standards. GEG's owners and the owners' institutional investors plan to provide sponsor			
17		equity financing. Petitioner has obtained a financial advisor that specializes in utility scale			
18		project finance transactions to assist in the financing of the Project.			
19	Q44.	Will Petitioner have all the necessary financial, technical and managerial expertise to			
20		construct and operate the Project?			
21	A.	Yes.			
22	Q45.	What does Petitioner request with respect to any future transfer of its assets?			

Starke Solar LLC Mammoth Solar Phase 2 Petitioner's Exhibit 1 Page 17 of 23

Petitioner requests that this Commission grant it treatment similar to that which the 1 A. 2 Commission has afforded in other similar declination of jurisdiction orders, *i.e.*, decline to 3 require prior Commission approval of any transfers of ownership of Project assets or 4 ownership interests in Petitioner involving: (1) the grant of a security interest, mortgage, 5 deed of trust or other encumbrance to a bank or other lender or collateral agent, administrative agent or other security representative, or a trustee on behalf of bondholders 6 7 in connection with any financing or refinancing (including any lease financing), or any 8 investor, guarantor, equipment supplier or financing entity; (2) Petitioner, or an affiliate, 9 becoming a debtor in possession; (3) a foreclosure (or deed in lieu of foreclosure) on the 10 property owned by Petitioner; or (4) a transfer of all or a part of the ownership of Mammoth 11 Solar Phase 2 or its assets to an affiliate of Petitioner.

# Q46. Will Petitioner inform the Commission and the OUCC if and when Petitioner becomes an affiliate of a regulated Indiana retail utility?

14 A. Yes.

Q47. Will Petitioner establish and maintain a form of security to ensure that funds will be
 available in the event of abandonment, financial failure, and/or bankruptcy to return
 the Project site to its current condition?

A. Yes. As I noted earlier in my testimony, Petitioner is required by Pulaski County to provide
 a decommissioning plan for the Project. The decommissioning plans must include a
 contractor estimate for removal of the Project. A form of security for decommissioning the
 Project will be established in the event of abandonment, financial failure, and/or
 bankruptcy.

Starke Solar LLC Mammoth Solar Phase 2 Petitioner's Exhibit 1 Page 18 of 23

2		VIII. <u>DECLINATION OF JURISDICTION</u>
3	Q48.	With regard to the requirements of Ind. Code § 8-1-2.5-5, do technological or
4		operating conditions, competitive forces, or the extent of regulation by other state or
5		federal regulatory bodies render the exercise, in whole or in part, of jurisdiction over
6		Petitioner by the Commission unnecessary or wasteful?
7	A.	Yes. The requirements imposed by Pulaski County, the rules and regulations of the FERC,
8		and other federal, state and local regulatory agencies adequately address concerns the
9		Commission may otherwise have and protect the public interest regarding the future
10		operation and wholesale transactions involving the Project. In addition, competitive forces
11		in the wholesale power markets serve as an adequate check on these activities, particularly
12		on the wholesale power price. Also, PJM is responsible for the safe and reliable operation
13		and planning, including generation interconnection planning, of the electric transmission
14		systems under their functional control, which includes the AEP transmission system to
15		which the Project will interconnect. Further regulation of these matters by the Commission
16		would be unnecessary and wasteful of the Commission's resources, and burdensome for
17		Petitioner.
18	Q49.	Will the Commission's declining to exercise, in whole or in part, its jurisdiction be
19		beneficial for Petitioner, Petitioner's customers or Indiana, and promote the
20		efficiency of Petitioner?
21	A.	Yes. Petitioner would benefit from the ability to devote its efforts and resources to
22		complying fully with the requirements of the federal, local, and other state regulatory

1

Starke Solar LLC Mammoth Solar Phase 2 Petitioner's Exhibit 1 Page 19 of 23

agencies with jurisdiction over its operations, as well as the requirements of PJM, which 1 2 would promote the efficiency of Petitioner's ongoing development and operation of the 3 Project. Indiana will benefit from the generation of electric power from solar power 4 generally, and this Project specifically. The exercise of jurisdiction by the Commission 5 would encumber Petitioner with duplicative requirements that are unnecessary in view of other regulatory requirements. Moreover, because Petitioner will be competing with other 6 7 generators to sell its electricity, energy utility efficiency will be promoted as more efficient 8 projects will better be able to compete and will offer lower prices for the sale of their 9 electrical output.

# Q50. Would the exercise of Commission jurisdiction inhibit Petitioner in competing with other providers of functionally similar energy services or equipment?

12 Yes. Should the Commission exercise jurisdiction over Petitioner, the Commission would A. 13 be placing Petitioner at a disadvantage with respect to other independent power producers 14 such as wind projects over whom the Commission has declined to exercise jurisdiction. 15 Such regulation would expose Petitioner to the risk of regulatory lag and hinder the quick 16 implementation of business decisions in a highly competitive market, which would create 17 a significant competitive disadvantage for Petitioner. In addition, the Commission's 18 exercise of jurisdiction may compel Petitioner publicly to disclose proprietary information, 19 to its disadvantage.

# Q51. Does Petitioner agree to the same reporting requirements as have been established for other renewable generation facilities in Indiana?

Starke Solar LLC Mammoth Solar Phase 2 Petitioner's Exhibit 1 Page 20 of 23

1	А.	Yes. I	Yes. Petitioner agrees to the following reporting obligations, which have generally been			
2		requir	required of other renewable energy developers:			
3 4		(a)	<u>Initia</u> to the	<b><u>l Report.</u></b> Petitioner agrees to file an initial quarterly report that will provide, extent such information is known and available, the following:		
5			(1)	Project ownership and name(s) of the Solar Facility;		
6 7			(2)	Name, title, address, and phone number(s) for primary contact person(s) for the Solar Facility;		
8			(3)	Number and location of solar panels deployed;		
9			(4)	Anticipated total output of the Solar Facility;		
10 11			(5)	Manufacturer, model number and operational characteristics of solar panels;		
12			(6)	Connecting utility(s);		
13			(7)	Copy of any Interconnection System Impact Studies prepared by PJM;		
14			(8)	Expected in-service date (COD);		
15 16			(9)	An estimate of the engineering/construction timeline and critical milestones for the Solar Facility;		
17			(10)	The status of the Interconnection Service Agreement with PJM; and		
18 19			(11)	The information listed below in the Subsequent Reports section to the extent such information is available.		
20 21 22 23 24		(b)	Subse days comm filing annua	equent Reports. Petitioner agrees to file subsequent reports within thirty (30) of the end of each calendar quarter until the quarter that occurs after nercial operation is achieved and that immediately precedes the annual report date of April 30th of each year. Thereafter, Petitioner will file reports on an al basis in this Cause.		
25			(1)	Any changes of the information provided in the Initial Report;		
26 27			(2)	Any reports of Interconnection System Impact Studies not previously submitted to the Commission;		

Starke Solar LLC Mammoth Solar Phase 2 Petitioner's Exhibit 1 Page 21 of 23

1		(3)	Copy of the Interconnection Service Agreement as filed with FERC;			
2 3		(4)	Notice of the establishment of an independent financial instrument, including its form and amount;			
4 5 6 7 8		(5)	Achievement of construction milestones described in the Interconnection Service Agreement and such events as the procurement of major equipment, the receipt of major permits material to the construction and operation of the Solar Facility, construction start-up, initial energization and commercial operation; and			
9 10 11 12 13		(6)	When commercial operation is achieved, the nameplate existing for utility sales, contingency plans (if any) detailing response plans to emergency conditions as required by state or local units of government, the interconnecting transmission owner and/or PJM, and the Project's certified (or accredited) dependable capacity rating.			
14	Q52.	Does Petitio	ner also agree to the additional requirements concerning a material			
15		change in Project output or project modification or suspension under the terms of the				
16		Interconnect	tion Service Agreement?			
17	A.	Yes. Petition	er agrees to the following additional requirements: In the event that Petitioner			
18		intends to materially increase or decrease or otherwise materially change the Project's				
19		capacity or o	capacity or operation, the owner must obtain the Commission's prior approval. Petitioner			
20		considers a n	naterial change to include: an increase or decrease of greater than 3 MW in			
21		the Project's	capacity; a change in operating entities; a transfer of ownership or assets,			
22		other than the	e activities identified in Q45 above; and changes identified in subsequent case			
23		law as consti	tuting a material change. Petitioner will notify the Commission in the event			
24		that it modif	ies or suspends the Project under the terms of the Interconnection Service			
25		Agreement a	nd does not reinstitute work within three years following commencement of			
26		such suspensi	ion. The Commission may, following notice to the Petitioner, proceed to issue			

Starke Solar LLC Mammoth Solar Phase 2 Petitioner's Exhibit 1 Page 22 of 23

1	an Order terminating the declination of jurisdiction set forth herein, if the Commission
2	determines that the Petitioner has: (a) failed to enter into an agreement pursuant to PJM
3	generator interconnection procedures; (b) suspended the project under the terms of the
4	Interconnection Service Agreement and has not reinstated work within three years
5	following commencement of such suspension; or (c) has otherwise suspended its efforts to
6	complete the project within three years of this Order.

### 7 Q53. Does this conclude your direct testimony?

8 A. Yes, it does.

Starke Solar, LLC Mammoth Solar Phase 2 Petitioner's Exhibit 1

#### **VERIFICATION**

I affirm under the penalties of perjury that the foregoing representations are true to the

best of my knowledge, information and belief.

B Kevin Parzyck

#### **LIST OF ATTACHMENTS**

- Attachment KP-1 Preliminary Site Map
- Attachment KP-2 Phase 1 ESA
- Attachment KP-3 Archaeological Review
- Attachment KP-4 Geotechnical Report
- Attachment KP-5 Special Exception Findings of Fact for 1,567 Acres
- Attachment KP-6 Special Exception Findings of Facts for 1,861 Acres
- Attachment KP-7 PJM Feasibility Study
- Attachment KP-8 PJM System Impact Study
- Attachment KP-9 Indiana Electricity Projections: The 2019 Forecast: Table 3-4



			REVISIONS					CUSTOMER
		REV	DESCRIPTION DE	В	СВ	DATE		
		A	PROPOSAL JP	>	CA	09-JUNE-21	terabase	
PRELIMINARY NOT FOR CONSTRUCTION	-						Terabase Energy, Inc.BERKELEY, CA 94708 USA+1 (415) 763-7181info@terabase.energy	/
	ENGINEER'S STAMP						THIS DOCUMENT CONTAINS PROPRIETARY INFORMATION. REPRODUCTIO DISCLOSURE, OR USE WITHOUT SPECIFIC WRITTEN AUTHORIZATION OF TERABA ENERGY, INC. IS STRICTLY FORBIDDEN.	N, SE

# ATTACHMENT KP-1



# LEGEND

 BOUNDARY AREA
 PUBLIC ROAD
DITCH
 OVERHEAD LINE
FORESTED AREA
EXCLUSION AREAS

SUBSTATION LOCATION
WETLANDS
SITE PRIMARY DWELLING

SYSTEM SPECIFICATIONS:

TOTAL MODULES : 740,460 CAPACITY : 300MW at POI BUILDABLE AREA : 2,140.89 ACRES

SITE MAMMOTH - SOUTH		0	1"	
STARKE SOLAR	IF BAR IS NOT ONE INCH, DRAWING IS NOT TO SCALE			
PULASKI COUNTY, INDIANA -	OPPORTUNITY	DATE	DESIGNED B	Y CHECKED BY
EXHIBIT FOR INDIANA	2021-00157	09-JUNE-21	JPA	CA
UTILITY REGULATORY COMMISSION	-	ARCH-E	)	AL003

# Phase 1 Environmental Site Assessment Mammoth Solar Project South Area

February 2021 Pulaski County Prepared for: Starke Solar LLC Prepared by: Angela R. Kattmann, LPG

Project No.: 119-0089



Lochmueller Group, Inc. 3502 Woodview Trace, Suite 150 Indianapolis, Indiana 46268

### **TABLE OF CONTENTS**

EXECUTIVE SUMMARY	.3
INTRODUCTION	.4
Purpose	4
Detailed Scope of Services	4
Significant Assumptions	4
Limitations and Exceptions	5
Deviations	5
User Reliance	5
	E
Location and Legal Description	.5
Site and Vicinity General Characteristics	
Physical Setting Sources	0
	_
	.7
RECORDS REVIEW	.7
Standard Environmental Record Sources	7
Additional Environmental Record Sources	9
Historical Use Research	9
Historical Aerial Photographs	9
Fire Insurance Maps	10
Historical Topographic Maps	11
City Directories	11
Previous Environmental Reports	11
Data Gaps and Data Failures	11
Historical Use Summary - Project	12
Historical Use Summary – Surrounding Area	12
SITE RECONNAISSANCE	12
Methodology and Limiting Conditions	12
General Observations	12
Storage Tanks	13
Other Hazardous Substances and/or Petroleum Products	13
Polychlorinated Biphenyls (PCBs)	13
Wastes	13
Waste Water	13
Wells	13
Current Uses of Adjoining Properties	14
Interviews	14
Interview with Owners	14
Interviews with Local Government Officials	15
Findings and Opinions	16
CONCLUSIONS AND RECOMMENDATIONS	17
REFERENCES	18
SIGNATURES OF ENVIRONMENTAL PROFESSIONAL	19

#### **Appendices**

Exhibits Exhibit 1 – General Location Map Exhibit 2 – Photographs

Definitions and Acronyms

Historical Research Documentation Historic Aerial Photographs EDR Aerial Photo Decade Package EDR Historical Topographic Map Report EDR Certified Sanborn Map Report

Regulatory Records Review EDR Area/Corridor Report

### **EXECUTIVE SUMMARY**

A Phase I Environmental Site Assessment (ESA) was performed in general conformance with the scope and limitations of ASTM Practice E1527-13 of the planned project located at the Mammoth Solar Project, South Area, Pulaski County, Indiana (the Project). The ESA consisted of a site reconnaissance, completed on February 2, 2021, a review of historical and governmental records, and interviews. Any exceptions to, or deletions from, ASTM Practice E1527-13 are described in the Deviations Section of this Report. The purpose of this report is to convey the findings, conclusions, and recommendations of the ESA.

The Project consists of agricultural building and property, residential buildings and property, forested areas, public roadways, and associated existing right-of-way (ROW) areas within approximately 12,380 acres of Pulaski County, Indiana. The Project Area is bounded by County Road (CR) 600 S, CR 600 W, CR 400 S, S CR 500 W, W CR 300 S, S CR 400 W, CR 200 S, S CR 800 W, W CR 300 S, State Road (SR) 39, W CR 500 S and S CR 800 W. An exhibit showing the Project is included in the Appendix - Exhibit 1 – General Location Map.

This ESA has revealed no evidence of *recognized environmental conditions* in connection with the Project.

Lochmueller Group understands that the proposed Project will consist of the installation of solar fields and electrical supply support equipment. Lochmueller Group did not identify *recognized environmental conditions* to the Project which might adversely impact the scope of work, schedule, and/or budget of the proposed project.

### Introduction

#### Purpose

The purpose of this Phase I ESA is to identify *recognized environmental conditions* as defined by the ASTM International: E1527-13 - *Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process,* and the United States Environmental Protection Agency (USEPA) 40 CFR Part 312 – Standards and Practices for All Appropriate Inquiry (AAI).

A recognized environmental condition is the presence or likely presence of any hazardous substances or petroleum products in, on, or at a Property: (1) due to any release to the environment; (2) under conditions indicative of a release to the environment; or (3) under conditions that pose a material threat of a future release to the environment. De minimis conditions are not recognized environmental conditions.

#### Detailed Scope of Services

The scope of work for this investigation included the following:

- A site reconnaissance of the Project Area to identify potential indications of present or past activities that have or could have contaminated the Project Area and for signs of *recognized environmental conditions*
- A records review of reasonably ascertainable state and federal governmental databases within ASTM-approximate minimum search distances, provided by Environmental Data Resources, Inc. (EDR) of Milford, Connecticut
- A review of standard historical sources to identify historical use of the Project Area and surrounding area. Standard sources may include aerial photographs, fire insurance maps, United States Geological Survey (USGS) topographic maps, city directories, building department records, zoning land use records, and previous reports (if provided)
- A review of standard geologic, hydrogeologic, and topographic sources, such as United States Department of Agricultural (USDA) Soil Surveys, geological maps, and USGS topographic maps
- Interviews with local government officials who may have information indicating potential recognized environmental conditions, such as the local fire department and county health department
- Interviews with knowledgeable persons (owners, previous owners, tenants, and/or managers) to evaluate present and past land uses (if contact information is provided)

#### Significant Assumptions

Lochmueller Group, Inc. assumes all published materials reviewed and materials furnished to Lochmueller Group, including governmental database information, previous reports, tax records, legal descriptions, maps, etc., are true and correct unless otherwise stated within this report. Lochmueller Group assumes no responsibility for the accuracy of this information. Lochmueller Group assumes no responsibility for the accuracy of the subject Project assessed or the title thereto, nor does Lochmueller Group render any opinion as to the title(s), which is assumed to be good and marketable.

Lochmueller Group assumes that the Project Area is responsibly managed and in compliance with all local, state, and federal laws and regulations. By submitting this report, Lochmueller Group assumes none of the obligations or responsibilities of the owner(s) or any other entity in responsible control of the Project Area, which is the subject of this report. Any information, conclusions, and/or recommendations provided within the Project Area ESA are not to be construed, applied, or intended as legal advice.

#### Limitations and Exceptions

This report is bound by the limitations stated in ASTM E1527-13 and 40 CFR Part 312. For instance, no ESA can wholly eliminate uncertainty regarding the potential for *recognized environmental conditions*. This ESA is not an exhaustive assessment of the Project Area. Unless otherwise specified in the report, the ESA was prepared based on an above-grade visual inspection and references researched. No sampling, field instrumentation, or chemical analyses were conducted for this ESA. In preparing this ESA, Lochmueller Group has applied generally accepted professional practices and standards and exercised its professional judgment, skill, and care in a manner consistent with that of other professionals performing similar work under similar conditions. Data gaps and data failures are discussed in the Data Gaps and Data Failures Section of this report.

#### Deviations

The Project Area includes some public roadways and associated ROW; therefore, a Chain of Title and Environmental Liens/Activity and Use Limitation search report do not apply to sections of the Project Area.

Building Department records were not requested for the Project Area.

Field reconnaissance was conducted from public roadways. Properties were not traversed.

No other known deviations to ASTM E1527-13 Standard Practice are associated with this assessment, unless described elsewhere in this report.

#### **User Reliance**

This Phase I ESA was prepared for the User, Starke Solar, LLC. Lochmueller Group understands that the User, its lenders, and each of their assigns will materially rely on the final report. The findings of this Phase I ESA are valid for 180 days from the first dated research conducted as part of this investigation per ASTM E1527-13. This report may not be used for any purpose by any person, other than the User, its lenders, and each of their assigns, without the previous written consent of the User and Lochmueller Group.

# **Project Area Description**

#### Location and Legal Description

The Project consists of agricultural building and property, residential buildings and property, forested areas, public roadways, and associated existing ROW areas within approximately 12,380 acres of Pulaski County, Indiana. The Project Area is bounded by CR 600 S, CR 600 W, CR 400 S, S CR 500 W, W CR 300 S, S CR 400 W, CR 200 S, S CR 800 W, W CR 300 S, SR 39, W CR 500 S and S CR 800 W.

#### Site and Vicinity General Characteristics

The area of the Project in Pulaski County, Indiana, currently includes active and fallow agricultural land and associated agricultural buildings, residential buildings and outbuildings, forested lots, natural and manmade water channels, publicly owned State and County Roads, and associated ROW.

A General Location Map is provided in the Appendix - Exhibit 1 – General Location Map.

The Indiana Department of Natural Resources (IDNR) Water Well Records Web Viewer was searched on January 29, 2021 for potential water wells located within the Project Area. There were 37 water wells identified within the Project Area. They include boreholes drilled into the bedrock, unconsolidated wells, unspecified well types, and significant withdraw wells.

#### Physical Setting Sources

The USDA Soil Conservation Survey, Soil Survey for Pulaski County, the Indiana Geological Survey (IGS) GIS website, and the IGS Pulaski County Geologic Map were reviewed to identify the physical setting of the Project Area. This information is summarized in the following table.

Soil Type(s)	BrvA – Brady fine sandy loam, 0 to 1 percent slopes BstB – Brems loamy fine sand, 1 to 4 percent slopes BswA – Brems-Morocco loamy fine sands, 0 to 1 percent slopes CjfC – Chelsea fine sand, 6 to 12 percent slopes DbsA – Denham fine sand, 0 to 1 percent slopes HtbAN – Houghton muck, drained, 0 to 1 HtbAU – Houghton muck, undrained, 0 to 1 MgyA - Maumee-Gilford complex, 0 to 1 MhaA – Maumee loamy fine sand, 0 to 1 MhbA – Maumee nucky loamy fine sand, 0 to 1 MtpA – Moon-Selfridge complex, 0 to 1 MupA – Morocco loamy fine sand, 0 to 2 MwzAN – Muskego muck, drained, 0 to 1 NofA – Newton-Morocco loamy fine sands, 0 to 1 OacB – Oakville-Denham fine sands, 1 to 5 OaeC – Oakville fine sand, 12 to 18
Soil Characteristics (Hydric Rating)	Predominantly Hydric (100-66 rating) – HtbAN, HtbAU, MgyA, MhaA, MhbA, MwzAN Partially Hydric (66-33 rating) – NofA Predominantly Nonhydric (33-1) – BrvA, BswA, MupA Nonhydric (0) – BstB, CjfC, DbsA, OacB, OaeC, OaeD

#### **Physical Settings**

Unconsolidated Material Depth	Approximately 500 feet below surface
Bedrock Type	Devonian, typical dolomite, limestone, sandstone, gypsum
Site Elevation	685 to 705 feet above mean sea level
Physiographic Region	Kankakee Arch
Site Topography	Mostly flat with natural and manmade drainage
Area Topography	Generally flat
Expected depth to groundwater	Less than 10 feet below ground surface
Presumed groundwater flow direction	West-northwest

The above table is based on a review of reliable published sources and provided reports. Exact subsurface and groundwater conditions affecting the Project Area and surrounding area can only be determined by substantial subsurface investigation, such as the installation of monitoring wells, which was beyond the scope of this ESA.

# **User Provided Information**

The User is Starke Solar LLC. No environmental information or additional reports were provided by the User. State government environmental record information was collected via publicly available State record systems including the Indiana Department of Environmental Management (IDEM) Virtual File Cabinet (VFC), and other publicly available Indiana State sources. Information collected via these sources is discussed in applicable sections of this report.

According to the scope of work, the reason for performing the ESA in anticipation of the proposed installation of solar fields and electrical supply support equipment. Lochmueller Group assumes that this ESA was prepared as a source of information for project related decisions.

# **Records Review**

#### Standard Environmental Record Sources

EDR was contracted to provide a regulatory database search of standard governmental records. A copy of the EDR report is provided in the Appendix – Regulatory Records Review.

Standard environmental record sources were researched within the ASTM-designated approximate minimum search distances (AMSDs). The following table lists the databases searched, associated AMSD,

and number of sites listed for each database. An explanation of each acronym is provided in the Appendix – Definitions and Acronyms. A description of each database along with the type of information each database contains is provided in the EDR report included in the Appendix - Regulatory Records Review.

Database	AMSD	Number of Sites
NPL	1.0 mile	0
Delisted NPL	0.5 mile	0
CERCLIS	0.5 mile	0
CERCLIS NFRAP	0.5 mile	0
RCRA CORRACTS	1.0 mile	0
RCRA TSD	0.5 mile	0
RCRA SQG	Site and adjoining	0
RCRA LQG	Site and adjoining	0
IC/EC	Site only	0
ERNS	Site only	0
SHWS	1.0 mile	0
State Cleanup (SCP)	0.5 mile	0
SLF/SWDF	0.5 mile	0
LUST	0.5 mile	0
UST	Site and adjoining	0
State IC/EC (AUL)	Site only	0
VRP	0.5 mile	0
Brownfields	0.5 mile	0

Standard Environmental Record Sources

Note: Applicable government database listings in the EDR were reviewed for accuracy; therefore, the site quantities of the above table may not mirror listings of the EDR included in the Appendix – Regulatory Records Review.

No sites were identified within the Project Area on the above listed federal/state databases.

#### Additional Environmental Record Sources

EDR proprietary databases, including the EDR Historical Auto Stations database and the EDR Historical Cleaners database, were reviewed. A description of each database, the acronym, and the information the database contains is provided in the EDR report included in the Appendix – Regulatory Records Review. The following potential environmental concerns were identified in the EDR proprietary records:

- FINDS (Facility Index System/Facility Registry System)
  - Ritches Automotive Sales & Service, 5495 N CR 700 W, Registry #110058588773
  - o Denham Shallow Main, CR 600 N & CR 700 W, Registry #110070116304
- ECHO (Enforcement & Compliance History Information)
  - o Denham Shallow Main, CR 600 N & CR 700 W, Registry #110070116304
- NPDES (National Pollutant Discharge Elimination Systems Permit Listings)
  - Denham Shallow Main, CR 600 N & CR 700 W, NPDES ID #INR10N478,
- OISC (Office of Indiana State Chemist Database)
  - o Andrew Scott Fritz, 2503 S 600 W
  - o Chris W Nuest, 3844 S 800 W
  - Eric D Stotler, 7070 W 400 S
  - o Riley Michelle Cerve, 4492 S SR 39
  - Timothy J Kuhn, 7260 W CR 550 S

#### Historical Use Research

Historical uses for the Project Area and surrounding area were researched using standard historical sources including historical aerial photographs, fire insurance maps, historical topographic maps, city directories, and any previous reports. Summaries of historical sources reviewed are listed below.

#### Historical Aerial Photographs

Aerial photographs were reviewed from the IndianaMap, the Indiana Historical Aerial Photo Index and the EDR Aerial Photo Decade Package. A summary of the photograph review is provided in the following table. Copies of the reviewed aerial photographs are included in the Appendix - Historical Research Documentation.

Year / Comment (if any)	Interpretation
<b>1952</b> Fair Quality	The Project Area is mainly agricultural land and outbuildings with scattered residences. Natural and man-made waterways cross the area as well as State Roads and County Roads. An oval track is also within the Project Area.

#### **Historical Aerial Photograph Review**

#### **Historical Aerial Photograph Review**

Year / Comment (if any)	Interpretation
<b>1971</b> Fair Quality	No significant changes from the 1952 aerial photograph were noted except some waterways were added or reconfigured. Additional agricultural out buildings and residential buildings were constructed. The oval track is no longer visible. Forested lots have been reduced in size.
<b>1977</b> Good Quality	No significant changes from the 1971 aerial photograph were noted except some residential and agricultural buildings were added or reconfigured. Forested lots have been reduced in size and number.
<b>1981</b> Good Quality	No significant changes from the 1977 aerial photograph were noted except artificial red colors were added, may indicate forested or wet areas. Some residential and agricultural buildings were added and reconfigured. Forested areas have been reduced.
<b>1988</b> Poor Quality	No significant changes from the 1981 aerial photograph were noted except evidence of irrigation was identified. Some forested areas have been reduced in size and number.
<b>1998/1999</b> Good Quality	No significant changes from the 1988 aerial photograph were noted except some residential and agricultural buildings have been added and/or reconfigured.
<b>2008</b> Good Quality	No significant changes from the 1998/1999 aerial photograph were noted except that some forested areas have been further reduced in size and number.
<b>2012</b> Good Quality	No significant changes from the 2008 aerial photograph were noted except that some forested areas have been reduced in size and number.
<b>2016</b> Good Quality	No significant changes from the 2012 aerial photograph were noted.

Data Gap?

no

#### Fire Insurance Maps

yes🖂

Sanborn Fire Insurance Maps were requested from EDR; however, none were available for the Project Area.

Data Gap? yes

no
#### Historical Topographic Maps

A historical topographic map report was requested from EDR, topographic maps from 2013, 1979, and 1962 were included in the report. A copy of the historical topographic map report is included in the Appendix - Historical Research Documentation. A summary of the maps is provided in the following table.

Year / Comment (if any)	Interpretation
<b>1962</b> Good Quality	The Project Area and surrounding area appear to be primarily agricultural land with secondary highways and light duty roads. There are intermittent vegetative areas, natural and manmade waterways, wetlands, and little elevation change. A few gravel pits are denoted.
<b>1979</b> Good Quality	No significant changes from the 1962 topographic map were noted; although only 1 page was included in the EDR report for the Project Area.
<b>2013</b> Good Quality	No significant changes from the 1979 or 1962 topographic maps were noted except a reduction in forested areas. The elevation change in the agricultural fields was less pronounced. A gravel pits are no longer identified.

#### **Historical Topographic Map Review**

Data Gap? yes no

#### City Directories

A City Directory Report was requested from EDR; however, no coverage was available for this area.

Data Gap?	ves	no
Data Gap:	y C J	

#### Previous Environmental Reports

No previous environmental reports were provided by the User.

Data Gap? yes no

#### Data Gaps and Data Failures

Data gaps and/or data failures, if any, are summarized in the following table. If the data gap or failure is *significant* (i.e. likely affects the ability to identify *recognized environmental conditions*), it is noted below.

#### Summary of Data Gaps and/or Data Failures

Source	Gap or Failure?	Description	Significant?
Aerial Photographs	Gap	Aerial photographs in 5-year intervals were not reasonably ascertainable or do not exist.	No, historical use of the Project Area was established by other sources.

Source	Gap or Failure?	Description	Significant?
Fire Insurance Maps	Gap	Fire insurance maps in 5-year intervals do not exist.	No, historical use of the Project Area was established by other sources
Topographic Maps	Gap	Topographic maps do not exist in 5-year intervals	No, historical use of the Project Area was established by other sources.
City Directories	Gap	City directories were not available in the EDR city directory search.	No, historical use of the Project Area was established by other sources.
All	Failure	Historical use of the Corridor was not traced back in 5 year intervals to first use.	No, historical use of the Project Area has not changed in over 50 years.

## Summary of Data Gaps and/or Data Failures

## Historical Use Summary – Project Area

Based on the historical records reviewed, the Project Area was historically agriculture, residential, roadway, and associated ROW since at least 1952.

## Historical Use Summary – Surrounding Area

Based on historical records reviewed, the adjoining parcels were a mix of agricultural, residential, and roadways since 1962. Adjoining properties are primarily agricultural with single family residential areas and agricultural outbuildings scattered within the area.

# Site Reconnaissance

General site conditions were described in the Project Area Description Section of this document. This section describes specific observations and conditions material to identifying *recognized environmental conditions*. Site photographs are included in the Appendix - Exhibit 2 - Photographs.

## Methodology and Limiting Conditions

Angela Kattmann, LPG, Environmental Geologist of Lochmueller Group, drove the Project Area on February 2, 2021. The weather was overcast and approximately 20 degrees Fahrenheit with adequate visibility; however, the ground was covered with approximately 3 inches of snow. The Project drive-through consisted of a visual inspection of properties adjoining the Project Area, and visible from the roadway. Photographs taken during site reconnaissance were taken on foot. No buildings were entered, and visual observations were only made from the public ROW.

#### General Observations

During the Project reconnaissance, the presence or absence of certain conditions that can be material to identifying *recognized environmental conditions* were noted. These observations are summarized in the following table.

Summary	of General	Observations
---------	------------	--------------

Condition	Present?	Discussion (if present)
Unusual Odors (i.e. noxious, pungent, etc.)	No	
Corrosion	No	
Exterior staining (soil or pavement)	No	
Stressed vegetation	No	
Pits, Ponds, Sumps, or Pools of Liquid	Yes	Natural and manmade ponds filled with water were identified.
Unknown substance containers	Yes	Above ground tanks visible at various locations.
Evidence of on-site fill or solid waste disposal	No	
Back-up Power Generator	No	
Rail Spurs	No	

## Storage Tanks

Visual evidence of ASTs or USTs, such as vent pipes, fill ports, slumped pavement, saddles, etc., was encountered during this investigation within the Project Area at various locations. Photographs are included in the Appendix - Exhibit 2 - Photographs.

#### Other Hazardous Substances and/or Petroleum Products

No visual evidence of the current historical use or storage of hazardous substances or petroleum products on the Project Area was noted during this investigation.

## Polychlorinated Biphenyls (PCBs)

Several potential PCB-containing, pole mounted transformers were identified during the site reconnaissance. No other potential PCB-containing equipment, such as hydraulic lifts or presses, was observed during the site reconnaissance.

#### Wastes

No waste generation within the Project Area (other than minor liter) was observed onsite during the site reconnaissance.

#### Waste Water

Storm water is handled within the Project Area by overland flow.

#### Wells

Evidence of irrigation wells was found; however, evidence of potable wells or monitoring wells was not observed during the site reconnaissance.

# Current Uses of Adjoining Properties

Adjoining properties consist of single family homes and agricultural facilities.

# Interviews

#### Interview with Owners

The Project is primarily agricultural, residential, public roadway, and associated ROW managed by Pulaski County and the State of Indiana. The following property owners were contacted, their comments are listed.

Interviews			
Owner	Address	Comments	
Jared & Josh Brown		Not Available	
Buczek – DJ Farms		Has owned the property since the 1989. The land has been used as farmland. Is unaware of any fuel tanks or spills.	
Buczek – DJB Land		Has owned the property since the 1989. The land has been used as farmland. Is unaware of any fuel tanks or spills.	
Andrew S. Frit	2503 S CR 600 W	Has owned the property since the 1980's. The land is used as farmland. Reports one diesel tank but is unaware of any spills.	
Karen L. Fritz		Has owned the property since the 1980's. The land is used as farmland. Reports one diesel tank but is unaware of any spills.	
Scott E. & Karen L. Fritz		Has owned the property since the 1980's. The land is used as farmland. Reports one diesel tank but is unaware of any spills.	
Scott E. Fritz		Has owned the property since the 1980's. The land is used as farmland. Reports one diesel tank but is unaware of any spills.	

Marsha Lynn Fritz		Has owned the property since the 1980's. The land is used as farmland. Reports one diesel tank but is unaware of any spills.
Joy Gimple		Not Available
Curt & Leman Family		Has owned the property for 10-15 years. The land has been used as farmland. Is unaware of any fuel tanks or spills.
Larry & Pamela Leman	400 S SR 39	Has owned the property for 49 years. The land has been used as farmland. Is unaware of any fuel tanks or spills.
James B. Nicolas, Denise L. Beckner & Katherine A.		Has owned the property for 60-70 years, but property has been in his family for 3 generations. The land has been used as farmland. Is unaware of any fuel tanks or spills.
Douglass & Cheryl Podell		Not Available
Robert C. Schmicker		Not Available
Eric D & Barbara A. Stotler		Not Available
Norman Welker		Has owned the property since 1966 but added a portion 2 years ago. The land has been used as farmland. Reports one small gas tank but is unaware of any spills.
Donna Wuethrich		Not Available

## Interviews with Local Government Officials

The Pulaski County Sheriff's Office was contacted on February 2, 2021 via phone regarding records of storage tanks, hazardous material responses, or environmental concerns associated with the Project and the surrounding area. They were not able to provide any information.

# **Findings and Opinions**

The Project consists of agricultural building and property, residential buildings and property, forested areas, public roadways, and associated existing ROW areas within approximately 12,380 acres of Pulaski County, Indiana. The Project Area is bounded by CR 600 S, CR 600 W, CR 400 S, S CR 500 W, W CR 300 S, S CR 400 W, CR 200 S, S CR 800 W, W CR 300 S, SR 39, W CR 500 S and S CR 800 W.

No sites identified warranted additional investigations. No sites were identified as *recognized environmental conditions*.

# **Conclusions and Recommendations**

We have performed a Phase I ESA in conformance with the scope and limitations of ASTM Practice E1527-13 of the Project Area in Pulaski County, Indiana. The Project consists of agricultural buildings and property, residential buildings and property, forested areas, public roadways, and associated existing ROW areas within approximately 12,380 acres of Pulaski County, Indiana. The Project Area is bounded by CR 600 S, CR 600 W, CR 400 S, S CR 500 W, W CR 300 S, S CR 400 W, CR 200 S, S CR 800 W, W CR 300 S, S R 39, W CR 500 S and S CR 800 W.

Any exceptions to, or deletions from, this practice are described in the Deviations Section of this report. This assessment has revealed no evidence of *recognized environmental conditions* in connection with the Project.

Lochmueller Group understands that the proposed Project will consist of the installation of solar fields and electrical supply support equipment. Lochmueller Group did not identify any *recognized environmental conditions* to the Project, which might adversely impact the scope of work, schedule, and/or budget of the proposed Project.

# References

- American Society of Testing and Materials (ASTM). (2013). *Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process*. Designation: E1527-13. West Conshohocken, PA: ASTM International
- Environmental Data Resources, Inc. (2021). Certified Sanborn Map Report Mammoth Solar Project, South Area. Milford, CT
- Environmental Data Resources, Inc. (2021). EDR Aerial Photo Decade Package Mammoth Solar Project, South Area. Milford, CT
- Environmental Data Resources, Inc. (2021). *EDR Area/Corridor Report Mammoth Solar Project, South Area.* Milford, CT
- Environmental Data Resources, Inc. (2021). *Historical Topo Map Report Mammoth Solar Project, South Area*. Milford, CT
- Indiana Department of Natural Resources (IDNR). (n.d.). *Enhanced Water Well Web Viewer* [GIS map]. Retrieved from website: (<u>http://www.in.gov/dnr/water/6604.htm</u>)
- Indiana Geological Information Council. (n.d.). *IndianaMap* [GIS map]. Various layered data, Retrieved from website: (<u>http://inmap.indiana.edu/viewer.htm</u>)
- Indiana Historical Aerial Photo Index website, Retrieved January 13, 2021 from (<u>http://igws.indiana.edu/IHAPI/</u>)
- United States Department of Agriculture, Natural Resources Conservation Service. (n.d.) Web Soil Survey. Various reports, retrieved from website: (https://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm)

# **Signatures of Environmental Professional**

This report was prepared by Angela R. Kattmann, LPG, Lochmueller Group Environmental Geologist, under the direction of Chad Costa, Lochmueller Group Environmental Manager, who reviewed this report.

I declare that, to the best of my professional knowledge and belief, I meet the definition of *Environmental Professional* as defined in §312.10 of 40 CFR 312. I have the specific qualifications based on education, training, and experience to assess a Project of the nature, history, and setting of the subject Project. I have developed and performed the all appropriate inquires in conformance with the standards and practices set forth in 40 CFR Part 312.

Prepared by:

Angela R. Kattmann, LPG

lak fatta

(signature)

February 8, 2021 (date)

Reviewed by:

Chad Costa

(signature)

February 8, 2021 (date)

# **EXHIBITS**

Exhibit 1 –General Location Map Exhibit 2 - Photographs

# **Appendices Removed**

# Preliminary Archaeological Records Review Proposed Mammoth Solar South

Pulaski County, Indiana



**Prepared February 5, 2021 for:** 

Starke Solar, LLC



Gary Francis Quigg, M.A., R.P.A.

From February 1 through February 5, 2021, Lochmueller Group completed a limited virtual, remote archaeological records review of the Mammoth Solar South project area located in Beaver, Jefferson, and Monroe Townships in Pulaski County, Indiana. This investigation was conducted upon the request of Starke Solar, LLC as a preliminary review for guidance in avoiding previously recorded archaeological resources.

The area reviewed lies within the Kankakee Sand Section Natural Region of the Tippecanoe River watershed (Gray 2000). This part of Indiana has a rich cultural sequence from the prehistoric through historic eras defined by variation in settlement and subsistence practices, technology and social organization dominated by Native American and Euro-American occupation.

The goals of this investigation were to (1) confirm or deny the presence of previously recorded archaeological resources within the Mammoth Solar South project area, and (2) to provide information regarding the eligibility of these resources (if any) for inclusion in the National Register of Historic Places (NRHP) based on the recommendations within existing archaeological site reports. The investigation consisted of a remote, desktop, virtual review which utilized archaeological site records, maps, and other materials available on the Indiana Division of Historic Preservation and Archaeology's (DHPA) computerized database. This repository is known as the State Historic Architectural and Archaeological Research Database (SHAARD), and its Archaeology and Structures Application Map is accessible only by qualified professional archaeologists.

Indiana state law regarding the protection of archaeological sites is a part of the Indiana Historic Preservation and Archaeology Act (IHPAA), the primary provision of which is the protection of archaeological sites that date before December 31, 1870. For the purposes of this study, a site is defined as, "a place where past human occupation, habitation, or activities occurred, indicated by the presence of one or more artifacts' including "non-portable evidence of past human behavior or activity found on or in the ground (Indiana Code 14-21-1-2)." It is important to note that it is unlawful to share archaeological site location information (such as that contained within this report) publicly. The site location information provided must be kept strictly confidential.

Three (3) previously documented archaeological sites are located within the Mammoth Solar South project area:

. Three (3) additional previously recorded archaeological sites are located within **of** the Mammoth Solar South project area limits.

None of the six (6) sites within or outside the Mammoth Solar South project area limits were recommended eligible for the NRHP at the time of their respective investigations. However, avoidance of all sites is recommended.

A Phase 1A archaeological field reconnaissance was not performed, nor was any on-site field review performed as a part of this virtual investigation. It is anticipated that additional, undocumented archaeological resources may be located within the Mammoth Solar South project area during a Phase 1A archaeological reconnaissance. A Phase 1A archaeological reconnaissance, and/or additional archaeological investigations, may be required if any federal funding or involvement is necessary to construct the Mammoth Solar South project. This limited virtual, remote, archaeological records review does not clear the project under Section 106 of the National Historic Preservation Act.



Mammoth Solar

Pulaski and Starke Counties, Indiana

Lochmueller Group Evansville, Indiana

Terracon Project No. GR205686 January 15, 2020

Your Stage1 Representative:



V. John Romano Client Service Manager VJRomano@terracon.com

# GEOTECHNICAL SITE RATING

Site rating is based on expected subsurface conditions and the project, or in the event the project is not known, general constructability.

Conventional construction methods likely suitable. No obvious geotechnical and/or geologic constraints.







# YOUR SITE

## DEVELOPMENT DESCRIPTION

The project consists of development of a photovoltaic (PV) solar power facility. The north parcels contain approximately 3,843 acres, the central parcels contain approximately 5,273 acres and the south parcels contain approximately 3,288 acres.



See INFORMATION SOURCES for a detailed list of sources used to generate this figure.

## HISTORICAL AERIAL IMAGES SUMMARY

LOCATION	DESCRIPTION
Site	1998-2017: The sites are depicted as primarily agricultural fields. Residential and agricultural structures are located within the boundaries, along with roadways. A rail line also traverses the north parcels. Airports are in operation within the North and Central Parcel areas.



# **GEOTECHNICAL CONSIDERATIONS**

The EXPECTED LITHOLOGY noted below is subject to the CONFIDENCE ESTIMATE noted on the following page. The opinions of subsurface conditions are very preliminary in nature. These opinions must be validated with site-specific exploration and testing. See METHODOLOGY AND LIMITATIONS for additional clarification regarding the limitations to the following opinions and methods used to derive these opinions.

# EXPECTED LITHOLOGY Area Represented: Northern Parcels



The EXPECTED LITHOLOGY was prepared as a part of this Stage1 report. It should not be utilized or distributed outside of this report. COMMENTS include, but are not limited to, potential variability of geology, lithology, and groundwater as noted.



# EXPECTED LITHOLOGY Area Represented: Central Parcels



The EXPECTED LITHOLOGY was prepared as a part of this Stage1 report. It should not be utilized or distributed outside of this report. COMMENTS include, but are not limited to, potential variability of geology, lithology, and groundwater as noted.



# EXPECTED LITHOLOGY Area Represented: Southern Parcels



The EXPECTED LITHOLOGY was prepared as a part of this Stage1 report. It should not be utilized or distributed outside of this report. COMMENTS include, but are not limited to, potential variability of geology, lithology, and groundwater as noted.



# CONFIDENCE ESTIMATE

We have used a weighted average approach, please refer to METHODOLOGY AND LIMITATIONS.



DECREASED CONFIDENCE	
	1

AVERAGE CONFIDENCE near the project areas. Available public data is consistent with

We examined 8 historical projects

INCREASED CONFIDENCE

Practitioner has local experience in excess of 7 years.

our understanding of the area.

# SITE RATING

The site was evaluated for the presence or potential presence of the following geotechnical challenges: Shallow bedrock, soft soils, expansive soils, variable topography, previous site usage, seismicity, and underlying geologic conditions such as karst or the presence of loess. Based on this evaluation we have assigned the Site a Site Rating as shown below. Please refer to our METHODOLOGY AND LIMITATIONS for more information about SITE RATING determination.



Geotechnical concerns for the parcels include the presence of peat and soils with high organic content, as well as shallow groundwater. As such we consider this Site to have average constructability concerns and have assigned a Site Rating of 2.

# PILE DRIVING

CONSIDERATIONS		
Pile installation via conventional methods likely	Yes	
Pile driving refusal anticipated	No	
Anticipated pile embedment depths	15 to 17 feet	
Adfreeze stress based on frost heave	1,000 - 1,500 psf	
Potential stress based on expansive soil heave (acting over box perimeter of the pile:):	N/A	
Anticipated Seismic Site Class	E	



# SITE AND CONSTRUCTION CONSIDERATIONS

CONSIDERATIONS		
Anticipated excavation equipment:	Conventional	
Anticipated frost embedment depth:	24 inches	
Concern for karst:	The site is mapped with carbonate karst with carbonate rocks buried under >50 ft of glacially derived insoluble sediments in a humid climate. Based on our knowledge of the area, we do not anticipate bedrock in the upper 100 feet; therefore, karst should not be a concern for this site.	
Concern for organic matter	Muck (Artung, Adrian, Edwards, Houghton, Madaus, Muskego, Toto) is mapped within the proposed parcels. These muck soils are anticipated to include organic matter ranging from 0.5% to 75%.	
NRCS mapped potential for concrete corrosion due to on-site soils	Primarily moderate to high	
NRCS mapped potential for steel corrosion due to on-site soils	Primarily high	
Mapped Faults on Site	No	
Mapped Faults within 0.5-mile of Site	No	
Mapped mines on Site	No	
Mapped loess on Site	No	

## SITE AND CONSTRUCTION CONSIDERATIONS NOTES

- Based on publicly available topography maps published by the USGS, the site topography in the northern parcels ranges from approximately elevation 710 feet to 740 feet, in the central parcels from approximately elevations 690 to 715 feet and in the south parcels from approximately elevation 695 to 715 feet.
- A cursory review of the (publicly available) historical images indicated that the site has primarily been used for agricultural purposes. Agricultural activities disturb upper material resulting in soft/loose material, likely requiring stabilization. Some portions of the site were previously developed. In our experience, there is an increased risk of encountering deleterious or unsuitable materials on a previously developed site.

GEOTECHNICAL CONSIDERATIONS and corresponding NEXT STEPS prepared by:

Tanner Hill, P.E. Project Engineer Tanner.Hill@terracon.com

Reviewed by Terracon Authorized Project Reviewer: Rick Olson, P.E. and Subject Matter Expert: James (Jimmy) M. Jackson, P.E. (FL).



# NEXT STEPS

# GEOTECHNICAL

In order to characterize the subsurface conditions, we recommend geotechnical explorations and a geophysical survey of the site. Geotechnical explorations will provide the necessary sampling and testing to provide design parameter recommendations while a geophysical survey reduces the potential number of necessary explorations, thus reducing our impact on any given site. Additionally, the results of the geophysical survey can be used to more broadly characterize the presence of the muck soils. The locations of our planned geotechnical explorations will be determined when a site plan is available.

## GEOPHYSICAL SURVEY

- Shear wave velocity testing should be performed to determine the seismic site class.
- A geophysical field survey should include Seismic Refraction testing by Refraction Microtremor (ReMi) methods to measure S wave velocity.
- 2-Dimensional Electrical Resistivity Imaging to evaluate potential muck areas.
- Ground Penetrating Radar (GPR) allows the identification of conditions beneath an entire area, as opposed to drilling and sampling soil borings which provide a finite extent of subgrade data at discrete locations. Locations of borings should be re-evaluated after the GPR data is reviewed.

## GEOTECHNICAL EXPLORATION

- Based on our experience within proximity to the project site, we recommend that the geotechnical explorations on site include SPT borings AND/OR CPT soundings in a phased approach as follows:
  - 1 boring/test pit/CPT per 25 acres to a depth of about 20 feet
  - 1 field electrical resistivity test per 50 acres
  - 1 pair of sacrificial load test piles to estimate axial and lateral pile capacity per 50 acres.
  - Additional explorations will be required in the substation(s) once a site plan is developed.
- Laboratory testing of the soils obtained during field exploration will be required. Laboratory testing should include, but not be limited to:
  - Corrosion testing
  - Thermal resistivity
  - California Bearing Ratio (CBR)
  - Grain size distribution
  - Atterberg limit determinations
  - Loss on ignition (LOI)
- We recommend completing a Phase I ESA for the site if one has not already been performed.

To complete the corresponding Next Steps for Geotechnical Services please contact Tanner Hill at <u>tanner.hill@terracon.com</u>.



# **INFORMATION SOURCES**









TERRACON DATA	Terracon has 44 combined historical geotechnical projects within 5-miles of the parcels. Of those, the local practitioner reviewed select exploration projects to gain a better understanding of potential subsurface conditions. The geotechnical project locations are illustrated on the <u>Client Portal</u> .
PUBLICLY AVAILABLE GIS DATA	Indiana Map
AERIAL IMAGERY	Terracon reviewed the following readily available historical aerial images and street view images available on December 21, 2020, to develop a limited history of previous Site usage: Aerial Images Google Earth Pro™ Street View Images Google Maps. Google Earth Pro™
	The use of available aerial imagery resources is intended to help understand previous Site usage. These images are widely spaced in time. They should not be considered appropriate for identifying Site activities which may have impacted subsurface conditions. A more comprehensive review of aerial imagery and/or site interviews would be required to further evaluate previous Site usage.
OTHER SOURCES	Indiana Department of Natural Resources Borehole and Well Logs



# **METHODOLOGY AND LIMITATIONS**

# LIMITATIONS

This report provides very preliminary opinions of siting and construction challenges that may be associated with the stated project plans for the stated property. Confirmation of opinions stated in this document is essential. Absence of a mapped resource does not mean that it is not present. Confirmation should include performing a site-specific evaluation consistent with the guidelines set forth in NEXT STEPS.

All parties are advised that any decisions or actions taken by any party based on the information contained herein, including decisions with financial implications are done solely at the risk of that party. By providing this information in this preliminary form, Terracon expressly disclaims any duties or obligations associated with the usage of this information for decision-making or design purposes.

In the event that changes to the nature, design, or location of the project, as outlined in this report, are planned, the preliminary conclusions and recommendations contained in this report shall not be used unless Terracon reviews the changes and either verifies or modifies the conclusions of this report in writing. As the project moves into the design phase, Terracon should be retained to develop and complete a scope of work that includes site-specific explorations as noted in NEXT STEPS.

Terracon and Lochmueller Group recognize we have entered into an agreement that may contain certain confidential or nondisclosure obligations relating to our services. Lochmueller Group recognizes, however, that although such confidentiality obligations may be in place, those obligations do not create an exclusive relationship between the parties nor do those obligations create an exclusive ownership right to Lochmueller Group relating to the data in question. Terracon has the unfettered ability to provide similar services to any other party and use any public or previously available data for the service of others, even if included as part of this report, but Terracon will refrain from disclosing confidential information of Lochmueller Group which is provided by Lochmueller Group to the extent required by any applicable non-disclosure agreement.

Terracon does not represent the imagery reviewed to be a complete historical record of previous Site usage, nor does Terracon validate the accuracy and sufficiency of the public domain sources that have been utilized.

# METHODOLOGY

## CONFIDENCE ESTIMATE OF EXPECTED LITHOLOGY

Terracon has assigned confidence estimates for the datasets based on upon the engineer's local practice in the vicinity of the Site. The engineer assigned a subjective confidence opinion of decreased, average, or increased for each of the following categories:

- Historical Project Data
- Local Experience
- Public Data

Using a weighted averaging approach, we derived an overall confidence interval in which historical project data was weighted more heavily than local experience which was weighted more heavily than public data. Decreased confidence implies that the level of available data and/or consistency is such that little confidence can be placed in the Geotechnical Considerations. Conversely, an increased confidence ranking implies that sufficient data and consistency exists to derive a high confidence in the statement of expected lithology.

Regardless of the confidence ranking, actual conditions may vary significantly from the predicted conditions, and the expected conditions must be confirmed with site-specific exploration data, and significant variations from the expected conditions are possible.



## GEOTECHNICAL SITE RATING

The site was evaluated for the presence or potential presence of the following geotechnical challenges: Shallow Rock, Soft Soil, Expansive Soil, Variable Topography, Previous Site Usage, Seismicity, and Underlying Geologic conditions such as Karst or the presence of Loess.

Conventional construction methods likely suitable. No obvious geotechnical and/or geologic constraints.

Project contains average constructability concerns. Typical construction for this project type is expected with some contingency for variation as described within this report.

 1
 2
 3

 Better Suited
 Less Suited

 1
 2
 3

 Better Suited
 Less Suited

Project contains above average constructability concerns. Geotechnical and or geologic constraints likely present that warrant further studies and/or mitigation beyond what is typical.



Terracon Consultants, Inc. 7770 W New York St Indianapolis IN 46214 (317) 273-1690 terracon.com

#### **ATTACHMENT KP-5** FINDINGS OF FACT FOR SPECIAL-EXCEPTION REQUESTS

for the

# PULASKI COUNTY BOARD OF ZONING APPEALS

# Final Board Documentation Accompanying Determination Regarding the Application

Petitioner:	Mammoth Solar
Parcel number(s):	Multiple
Parcel location(s):	<u>Franklin, Rich Grove, Monroe, Jefferson, and Beaver Townships</u>
Total acreage:	~4.511 acres: ~2.944 in southwestern Franklin, southeastern and south- central Rich Grove, and northwestern Monroe; ~1.567 in south-central Jefferson and north-central Beaver

1. Is the proposed special-exception use compatible with the current comprehensive plan for Pulaski County (http://gov.pulaskionline.org/comp-plan/) and with the current conditions and character of its vicinity?

х Yes No Comment/defense of determination:

#### SEE ATTACHED EXHIBIT "A"

2. Would the use intended for the proposed special exception provide for the most desirable use for which the land in this zoning district is adapted?

> х Yes No

Comment/defense of determination:

#### SEE ATTACHED EXHIBIT "A"

3. Would the proposed special exception likely have a positive, neutral, or negative impact on property values throughout the jurisdiction?

> Yes No

Comment/defense of determination:

х

#### SEE ATTACHED EXHIBIT "A"

## FINDINGS OF FACT FOR SPECIAL-EXCEPTION REQUESTS for the PULASKI COUNTY BOARD OF ZONING APPEALS

#### Final Board Documentation Accompanying Determination Regarding the Application

4. Does the proposed special exception allow for responsible development and growth, or the opposite? Consider the following: potential economic impact, availability of adequate public facilities and services (utilities and drainage, roads and traffic, public safety, *et c.* — as necessary), adverse environmental effects, and similar issues.

Yes

□ No

Comment/defense of determination:

SEE ATTACHED EXHIBIT "A"

х

5. Does the nature of the proposed special exception require the imposition of any particular conditions to ameliorate any potential harmful impacts upon neighboring properties, infrastructure, or the community?

x Yes No Conditions required and comment/justification, if any:

#### SEE ATTACHED EXHIBIT "A"

6. Are there any written commitments that the applicant should make, pursuant to IC 36-7-4-1015, as a condition to the approval of the special exception request?

x Yes

□ No

Commitments required and comment/justification, if any:

SEE ATTACHED EXHIBIT "A"

#### Pulaski County Board of Zoning Appeals Docket #07272020-01, Mammoth Solar Findings of Facts – Final Determination: Conditions and Commitments EXHIBIT "A"

## ATTACHED TO FINDING OF FACTS FOR SPECIAL-EXCEPTION REQUEST

#### <u>Conditions</u>

1. Each site development shall occur in such a manner as to limit the volume of sounds emanating from an operating solar-energy site to 50 decibels at the nearest, non-participating property line during normal operations, which is 30 decibels lower than the level mandated by the Pulaski County Unified Development Ordinance (UDO). This condition is not expected to be met during project construction or during short-term periods of repair and maintenance, including groundskeeping, such as mowing, so long as transgressions of this limit do not occur between 8:00 p.m. and 8:00 a.m. Third-party-study evidence of the project's ability to comply with this condition shall be provided prior to issuance of improvement-location and building permits.

The Board of Zoning Appeals requires this condition.

X Yes

🗆 No

2. For the purposes of enforcing UDO 7.14.C.3.a.1, regarding visual screening of a solar-energy site, the term 'neighbor' shall be construed to refer to any residential property within one mile of a solar-energy site with a solar-energy site within the property's viewshed, unless the owner of said property has signed any form of contract with the developer of the project.

While evergreen trees are understood to be the default form of screening, topographical concerns, homeowner preference, the developer's willingness to accede to requests made by homeowner or County preferences, and the County plan administrator's preference or approval may lead to alternate forms of visual screening, such as aesthetically acceptable opaque fencing, deciduous trees, an earthen berm, or some combination any of these options. In any case, the height of fencing, berm, or tree and the density and layout of trees must be sufficient to screen the solar site immediately; *i.e.*, planting of trees young enough that the objectives of the ordinance and this condition cannot be met by the time the project is operational is not acceptable. If an individual homeowner would prefer the use of deciduous trees, then the developer would not be held responsible for the presence of the solar site in the homeowner's viewshed during periods of time in which said trees had shed their leaves; this exception does not relieve the developer of the obligation to replace any deciduous trees that may lose their ability to grow leaves as the result of disease, damage, or other harm.

Precise layout of screening elements shall be determined on a site-by-site basis to ensure the maximum screening based on angle and distance relative to point of observation and each site's topography, with reasonable consideration given by the County plan administrator to the impact of layout decisions on necessary site access, including for public safety.

The Board of Zoning Appeals requires this condition.

X Yes

□ No

3. For the purposes of fulfilling the requirements of UDO 7.14.C.1, regarding perimeter fencing, the site shall be developed with deer fencing, or of great quality than deer fencing, or other administrator-approved material that presents a less-industrial appearance than chain-link fencing.

#### Pulaski County Board of Zoning Appeals Docket #07272020-01, Mammoth Solar Findings of Facts – Final Determination: Conditions and Commitments EXHIBIT "A"

#### ATTACHED TO FINDING OF FACTS FOR SPECIAL-EXCEPTION REQUEST

Precise layout of screening elements shall be determined on a site-by-site basis to ensure the maximum screening based on angle and distance relative to point of observation and each site's topography, with reasonable consideration given by the County plan administrator to the impact of layout decisions on necessary site access, including for public safety.

The Board of Zoning Appeals requires this condition.

X Yes

□ No

4. Site development shall include the planting of low-growing native perennials, with an emphasis on pollinators; consultation with (a) biologist(s) and/or other relevant experts approved by the administrator shall be part of the development process to ensure that plantings and tracker/panel layout on solar-energy sites accomplish the following:

- a. minimize the "lake effect" impact on birds flying overhead to the greatest extent practicable as judged by a qualified professional;
- b. encourage nesting grassland birds;
- c. limit the number of times the property is mowed during the year to the fewest number of times reasonable as judged by a qualified professional;
- d. induce frequenting of the sites by bees for pollination; and
- e. in conjunction with required screening measures, ensure that the properties' appearance relative to nearby environs creates as little contrast as possible.

This condition should not be construed as to discourage the dual use of any solar-energy sites, when possible, for the purpose of allowing livestock grazing, apiaries, or other compatible, agricultural uses. Additionally, plantings within any 75' setback to a ditch shall comply with USDA Farm Service Agency guidelines for appropriate plantings for filter strips.

The Board of Zoning Appeals requires this condition. X Yes

□ No

5. The developer will pay for 100% of costs-incurred by Pulaski County in the use of third-party consultants to conduct an analysis for, to draft, and to negotiate an Economic Development Agreement pursuant to UDO 7.18.A.2.a., the Drainage Agreement pursuant to UDO 7.18.A.2.b., and the Road Use and Maintenance Agreement pursuant to UDO 7.18.A.2.c. In the event that the County refuses with finality to issue a building permit for the project, this shall be limited to 50% of costs incurred.

The Board of Zoning Appeals requires this condition.

X Yes

🗆 No

6. The developer will meet, on as many occasions as are necessary, with representatives of the Francesville, Medaryville-White Post Township, Winamac, Van Buren Township, Monterey, Buffalo-Liberty Township, North Judson-Wayne Township, San Pierre, and Bass Lake Fire Departments to

Page | 2

Pulaski County Board of Zoning Appeals Docket #07272020-01, Mammoth Solar Findings of Facts - Final Determination: Conditions and Commitments EXHIBIT "A"

#### ATTACHED TO FINDING OF FACTS FOR SPECIAL-EXCEPTION REQUEST

address concerns about fire safety and emergency response, to coordinate safety planning, and to discuss the potential need for any specialized equipment for extinguishing solar-panel/equipment fires. If any fire department in Pulaski County recommends that a listed area department be removed or one not listed be included, project developer shall agree to such amendment of this condition. Costs incurred by departments providing coverage in Pulaski County for the purposes of solar-energy fire-suppression training shall be incurred by the developer. Any costs relating to new equipment to be purchased by fire departments for such purposes will be discussed with the developer and departments as part of the negotiation of the Economic Development Agreement, but shall not be a consideration for this condition of the special exception.

The Board of Zoning Appeals requires this condition.

Х Yes

No

7. While it is preferred that as many components of the solar-energy equipment used in this project be made in the United States, the difficulties of this are recognized. As such, while preferential treatment for American companies is preferred, it is not required, but MSDS for all equipment and evidence of the suitability of all proposed equipment with respect to environmental- and publicsafety concerns and comparability to similar American products shall be provided prior to the issuance of required local permits.

The Board of Zoning Appeals requires this condition. Х Yes 

No

#### **Commitments**

Commitments are to be recorded with the Pulaski County Recorder's Office. As recorded commitments. they apply to each and every parcel for which the special exception is granted, for as long as the special-exception use continues, regardless of any transfer of ownership of any parcel or the development or any part thereof. The developer must provide either the landowner's signed acceptance of the commitments hereunder or the landowner's signed designation of his/her right to accept the commitments hereunder to the developer. Therefore, any reference to the developer hereunder shall be construed to refer both to the original project developer and to any successor-owner of the project.

Additionally, this list of commitments is not exhaustive. Any commitment offered by the developer prior to or otherwise outside of this document remains valid and shall be recorded in the same manner as those explicitly included herein.

1. Conditions 1-4, regarding noise levels, visual screening, perimeter buffers, and native plantings on solar-energy sites, shall be enforced throughout the life of any solar-energy project on the included parcels. Similarly, condition 7, regarding the appropriateness with respect to safety of components used shall be enforced with respect to replacement components during the life of the project.

Further, if a currently undeveloped property would be developed for residential purposes after the completion of the project, it shall be at the County plan administrator's discretion whether new

#### Pulaski County Board of Zoning Appeals Docket #07272020-01, Mammoth Solar Findings of Facts – Final Determination: Conditions and Commitments EXHIBIT "A"

## ATTACHED TO FINDING OF FACTS FOR SPECIAL-EXCEPTION REQUEST

visual screening shall be required to protect this homeowner's viewshed based on the administrator's visual inspection of the solar-energy site(s) within the viewshed.

The Board of Zoning Appeals requires this commitment.

- X Yes
- □ No

2. A property-value guarantee (PVG) shall be afforded to non-participating, presently constructed property for properties where a boundary of which is within 1 miles of a parcel upon which a solarenergy site is built so long as they meet the following stipulations:

- a. The property owner must apply to participate in the PVG program no later than the start of construction of the solar site nearest to the property in question. The PVG shall expire 12 years after the start of construction.
- b. The PVG applies only to the original applicant-owner and to structures in place at the time of registration in the PVG program. Persons who purchase property in the affected area knowing that a solar-energy system will be developed, is under development, or is operational, are not eligible for the PVG, nor are structures built after construction has begun of the solar-energy project.
- c. The PVG shall apply only to buildings. Land committed to plant-agricultural production, forests, or pasture or left fallow shall not be included except in such cases in which incontrovertible evidence may be provided that noxious externalities created by the project have negatively impacted the usability of such land, regardless of the distance between a solar-energy site and the property in question. In these cases, determination of loss of value shall be based on real-time comparisons to comparable properties not in the vicinity of a solar-energy site or its range of impact.
- d. The benefits of the PVG shall be enjoyed only upon the sale of the property.
  - i. At the time of registration in the PVG program, an appraisal of the subject property shall be conducted by a certified appraiser of the County plan administrator's choosing and at the developer's cost. If the homeowner is not satisfied by the appraised value, they may hire another appraiser, at their own cost, to conduct a second appraisal. If the second appraised value is higher than the first, the average of the two shall be used as the accepted fair market value (FMV). If the second appraised value is lower than the first, than it shall be discarded, and the first, higher value shall be used as the accepted FMV for the homestead.

Alternatively, a PVG program applicant-homeowner may submit an existing appraisal, performed by a certified appraisal, no more than 18 months old.

ii. If, at the time of sale, a participant-homeowner is unable to secure a sale price at least equal to the accepted FMV, then the solar-energy-system developer shall be responsible for reimbursing the participant for the

Page | 4

Pulaski County Board of Zoning Appeals Docket #07272020-01, Mammoth Solar Findings of Facts – Final Determination: Conditions and Commitments EXHIBIT "A"

#### ATTACHED TO FINDING OF FACTS FOR SPECIAL-EXCEPTION REQUEST

difference between the accepted FMV and the final sale price. At the time of any such sale, determination shall be made as to whether the accepted FMV should be upward or downward on account of inflation or deflation.

iii. If the applicant-homeowner receives no offers on the home within 12 months, due to no fault of theirs or their heirs own, then the solar-energy-system developer shall purchase the home for the accepted FMV, as determined by the original appraisal which was completed at the time of registration in the PVG program.

The Board of Zoning Appeals requires this commitment.

X Yes

□ No

3. Developer shall agree to allowing that the decommissioning plan for the proposed project will require that any land-reclamation costs required, as determined by a third-party soil specialist employed by a governmental agricultural agency such as NRCS, to make the land suitable for a return to agricultural production at the end of the project shall be incurred by the developer or its successor operating the solar-energy sites at the time of decommissioning, except in any case in which the developer's contract with a landowner explicitly contradicts this requirement and places such cost obligation with the landowner.

The Board of Zoning Appeals requires this commitment.

Х	Yes	
	No	

#### FINDINGS OF FACT FOR SPECIAL-EXCEPTION REQUESTS for the PULASKI COUNTY BOARD OF ZONING APPEALS Final Board Documentation Accompanying Determination Regarding the Application

Having heard all relevant testimony from Board staff, the applicant, and the public in a public hearing for which all notification requirements were met and appropriate procedures were followed, we, the undersigned members of the Pulaski County, Indiana, Board of Zoning Appeals hereby

GRANT DENY circle one)

the

#### SPECIAL EXCEPTION PROVIDED

ATTACHED EXHIBIT "A" CONDITIONS & COMMITMENTS ARE ACCOMPLISHED

	Ŋ	<u>Mammoth So</u> (applice	requested t <u>blar</u> as Docke <i>ant)</i>	y t # <u>07272020-01</u> (docket)	_,	
or	1 this	_24th	day of	August	, 2020.	
	AYE				NAY	
Derrick W. St	n SL talbaum, (	<b>the Chairman/B</b>	) oard of Comr	aissioner's citiz	en appointee	
Phillip O. Woolery, Vice-Chairman/Plan Commission's appointee						
Mart T Kelsey, Board of Commissioner's citizen appointee						
Abbigail M. I	Ju- Dickey, Bo	ard of Comr	 nissioner's Pl	an Commission	appointee	
·		K				

Jeremy M. Wentz, County Council's citizen appointee

Karla A. Pemberton, Administrative Secretary to the Board

Filed 8/28/2020

#### FINDINGS OF FACT FOR SPECIAL-EXCEPTION REQUESTS for the PULASKI COUNTY BOARD OF ZONING APPEALS

#### ADDENDUM TO THE INITIAL FINDINGS-OF-FACT STAFF REPORT for the CONTINUATION OF THE ORIGINAL PUBLIC HEARING

Petitioner:	Mammoth Solar
Parcel number(s):	Multiple
Parcel location(s):	Franklin. Rich Grove, Monroe. Jefferson, and Beaver Townships
Total acreage:	<u>~4,511 acres: ~2,944 in southwestern Franklin, southeastern and south</u> <u>central Rich Grove, and northwestern Monroe: ~1.567 in south-central</u> <u>Jefferson and north-central and northwestern Beaver</u>

1. Is the proposed special-exception use compatible with the current comprehensive plan for Pulaski County (<u>http://gov.pulaskionline.org/comp-plan/</u>) and with the current conditions and character of its vicinity? **AND**, **RELATEDLY**, 2. Would the use intended for the proposed special exception provide for the most desirable use for which the land in this zoning district is adapted?

#### Further considerations.

It was noted in the original staff report that much of the farmland proposed for inclusion in this project could be considered good-to-great. Relatedly, it has been argued that prime farmland should be protected, and *Pulaski County Comprehensive Plan: Plan for Smart Growth* has as an objective "Protect prime agricultural land because of its importance to the economy and the character of Pulaski County" (page 52). To what extent this objective should be weighted relative to the *Plan's* objective of encouraging renewable-energy development should, perhaps, be based on the following consideration.

- Taking this land out of production would end the use of irrigation that taps water resources not required by the proposed alternative use for the parcels
- Ending irrigation would reduce electrical demand
- The proposed project would claim no more than 2% of the arable land in the county
- American agriculture is arguably overproducing; we're certainly seeing record corn carryover and close-to-record soybean carryover:
  - <u>https://blogs.wsj.com/economics/2018/02/05/u-s-farmers-are-producing-too-much-food-heres-why-they-cant-stop/</u> (Behind paywall.)
  - <u>https://www.world-grain.com/articles/13691-usda-record-corn-crop-larger-soybean-supplies-on-tap-for-2020-21#:~:text=The%20USDA%20forecast%20the%20carryover.4.259%20billion%20bushels%20in%201988.</u>

>>The USDA projected domestic use of corn in 2020-21 at a record 12.650 billion bushels, up 595 million bushels, or 5%, from a forecast 12.055 billion bushels in 2019-20. Feed and residual use of corn in 2020-

#### FINDINGS OF FACT FOR SPECIAL-EXCEPTION REQUESTS for the PULASKI COUNTY BOARD OF ZONING APPEALS

#### ADDENDUM TO THE INITIAL FINDINGS-OF-FACT STAFF REPORT for the CONTINUATION OF THE ORIGINAL PUBLIC HEARING

21 was forecast at 6.05 billion bushels, up 350 million bushels from a projected 5.7 billion bushels in the current year.<<

>>"With larger stocks relative to use, the season average farm price is projected at \$3.20 per bushel, down  $40\phi$  from 2019-20 and the lowest since 2006-07," the USDA said.<<

>> The USDA projected the carryover of soybeans on Sept. 1, 2021, at 405 million bushels, down 175 million bushels, or 30%, from 580 million bushels as forecast for 2019-20. As forecast, the 2021 carryover would be the smallest since 302 million bushels in 2017.

[...]

The USDA forecast the average farm price of soybeans in 2020-21 at \$8.20 a bushel, down  $30\phi$  from the projection for the current year at \$8.50 a bushel.<<

<u>https://www.usatoday.com/story/news/nation/2020/08/12/derecho-storm-damages-crops-corn-iowa-thousands-power-outages-midwest/3354939001/</u>

https://farmpolicynews.illinois.edu/2020/08/derecho-damage-begins-tounfold-estimated-37-7-million-acres-of-farmland-impacted/

The recent derecho that caused significant damage across the Midwest destroyed more than 10-million acres of crops in the fields of Iowa (as high as nearly 14-million), as well as destroying bins containing stored grain. This destruction ruined an estimated 43% of Iowa's crop. Iowa is the top corn-producing state in the nation. Nationwide, the damage is estimated at 37.7-million acres lost or affected. Despite a brief spike in commodity prices after the storm, these numbers have come back down partially. As the second article quotes the Des Moines *Register*: "At the same time, corn and soybean prices, which had fallen in anticipation of a large harvest, remain below the cost of production for many farmers."

There are potential negative economic impacts to be considered (Criterion 4, below.) regarding the indirect/broader effects of transitioning this land from agriculture to solar energy, but in addressing this question specifically, it is probably most appropriate to consider, in addition to evidence already presented and perhaps still to be presented at the hearing, the weak commodity-crop market and how a new use for such land may be more productive under these current circumstances. (Of course, what the commodity market may look like in the future relative to today's numbers is hard to forecast too far out, and we don't have crystal balls.

3. Would the proposed special exception likely have a positive, neutral, or negative impact on property values throughout the jurisdiction?

#### Further considerations.

It was noted in the original report that, although the extent to which it would be the case is difficult to determine because of the lack of studies on comparably sized solar-energy

# FINDINGS OF FACT FOR SPECIAL-EXCEPTION REQUESTS for the PULASKI COUNTY BOARD OF ZONING APPEALS

#### ADDENDUM TO THE INITIAL FINDINGS-OF-FACT STAFF REPORT for the CONTINUATION OF THE ORIGINAL PUBLIC HEARING

projects, available data suggest that negative impacts on, at least, residential properties in the vicinity would occur. It was further noted that the new assessed value of the sites included in the project would more than negate these losses — even, narrowly, if all 220 residential properties within one mile lost every cent of their cumulative assessment. You have received additional information from both the developer and project opponents offering contradictory information with respect to the impact of this project on property values.

From homeowners' point of view, the proposed property-value-guarantee (PVG) commitment would negate any negative impact in the case of attempted sales of homes within the area covered by the proposed commitment. (It would not, however, protect them in cases in which they sought to borrow against the value of their homes.)

This PVG, however, would not protect the County from losses to assessed value as they affect tax rates; however, again, as noted, even at the 30%-of-cost floor on personalproperty assessed value, the proposed investment in this project should more than outweigh those losses to the County.

What is less clear is what impact, if any, this project would have any impact on agricultural land — whether in the negative (risk of potential chemical contamination in the event that leakage from damaged panels would infiltrate local water systems) or in the positive (an increase in demand for land still in production). Evidence of the latter has been presented; the possibility of the former has been suggested. The PVG does cover agricultural property in the limited case in which conclusive evidence could be provided that any kind of chemical run-off from a solar-energy site had negatively impacted the health of soil elsewhere.

4. Does the proposed special exception allow for responsible development and growth, or the opposite? Consider the following: potential economic impact, availability of adequate public facilities and services (utilities and drainage, roads and traffic, public safety, *et c.* — as necessary), adverse environmental effects, and similar issues.

#### Further considerations.

It was noted in the original report that the project would have a positive economic impact on Pulaski County between increased property-tax and/or PILOT revenues, shortterm construction-related jobs, and a small number of long-term jobs that may be held by residents. It was previously noted that environmental concerns are minimal. The extent to which these opinions are valid constitute the primary lingering questions to be considered.

#### Environmental/Ecological --- wildlife impact

Briefly, let it be noted that while concerns about impacts on animal habits and migratory paths are not invalid, the developer is required to consult with the Indiana Department of Natural Resources and/or other appropriate agencies regarding wildlife impact, and documentation of this consultation and any requirements emanating therefrom must be provided to the Building & Zoning staff prior to issuance of the building permit. If the administrator is not satisfied with the developer's plans — or if DNR does not sanction such plans —, then this matter would lead to a refusal to issue the required local permits. Additionally, a proposed condition pertaining to planting specific plants at the solar-energy sites further addresses these concerns.

Environmental/Ecological --- noise
#### ADDENDUM TO THE INITIAL FINDINGS-OF-FACT STAFF REPORT for the CONTINUATION OF THE ORIGINAL PUBLIC HEARING

It is absolutely the case that staff and the Plan Commission were mistaken in allowing a maximum volume of 80 decibels; this problem is proposed to be addressed by Conditions & Commitment documents. Beyond that, with the qualification that, at 26 acres and 3.48 megawatts, the facility is miniscule relative to what is proposed by this project, NPO visited the Rensselaer 2 Solar Park operated by the Indiana Municipal Power Agency, located on the north side of that city, due east of U.S. 231 behind a commercial strip and due west of an elementary school. He heard two distinct noises. First, the very brief sound of every single panel moving on its tracker to adjust to the sun's travel. This took less than a minute, and the sound was barely louder than ambient noise in the environment. Second was the constant hum of the inverter. The inverter sits about 12', give or take, from the fence, which is only maybe 15' or 20' from the property line, if I remember correctly. Our ordinance requires inverters to be 100' from any non-participating property line. The hum was constant, but no louder than a household vacuum. NPO took a video of it, but even mild wind proved to be louder than the sound as NPO's phone's microphone could pick up audio. By the time he was roughly 75'-80' from the inverter, he could no longer hear it at all. Multiple inverters, of course, are louder than one inverter, but their combined sounds increase cumulative volume by a few decibels, not by the sum of the number of decibels provided by each machine. After leaving the premises, he drove over to the west-side parking lot of the school to the east. He could hear traffic on U.S. 231, but couldn't hear any sounds coming from the solar plant (which, admittedly, was roughly 500' away).

Environmental/Ecological --- glare

Project opponents have expressed concern about glare from the panel surfaces. In addition to technology improvements that reduce glare in the name of increased efficiency, this concern should largely be mitigated by the required berm/fence/tree screening.

Environmental/Ecological — radiation/electromagnetic fields

This information comes from "Solar Panel Radiation Guide", an article/page on the website *BeatEMF* (<u>https://beatemf.com/solar-panel-radiation/</u>)

\* \* \*

The solar panels themselves do not emit radiation; and if they do, they only produce a very small amount. As long as you practice 2 of the 3 tenets of EMF protection – distance and duration – you should be fine.

Instead, it is the solar panel systems, particularly the smart meters and inverters of the solar panel that are responsible for radiation emissions. These two components can emit large amounts of EMF and dirty electricity, which are the real threats to your health. Let's take a closer look at that. [...]

If these solar inverters pose a threat to our health, what's the safe distance away from it? The answers vary. Some people say being just 3 feet away can cut the damage of exposure. Others think it's better safe than sorry and recommend staying 10 feet away. One reader shared his measurements

#### ADDENDUM TO THE INITIAL FINDINGS-OF-FACT STAFF REPORT for the <u>CONTINUATION OF</u> THE ORIGINAL PUBLIC HEARING

of magnetic fields and noted that they were as high as 10 mG at 2 feet away from the inverter.

To put that in perspective, the safety range for magnetic fields is less than 2 mG. At 9 feet away, levels dropped back down to an acceptable range. Since the inverter is the key problem with solar panels, here's some more info via video: <u>https://youtu.be/\_mVIfsp8Fl0</u>.

Here're what are most worth considering from and about these passages: 1) Smart meters will not be in play, because this is a commercial project uploading power to the grid, not a personal-use system running from a backyard to a house, with a smart meter being used to monitor generation, consumption, and excess power being put back on to the grid. 2) Inverters, as noted above, have to be a minimum of 100' from any non-participating property line. According to this particular source, 10' is a safe distance away from long-term/ consistent exposure.

\* \* \*

This information comes from an article/page called "Solar Panel Radiation – The Complete Guide" from the website *EMF Academy* (<u>https://emfacademy.com/solar-panel-radiation/</u>).

\* \* \*

#### Dirty Electricity From Solar Panel Inverters

Now it's time to talk about the more pervasive radiation risk that results from solar panel systems: dirty electricity. If you want to read a full guide on dirty electricity, you can do that here, but I'll cover the basics.

Essentially, dirty electricity is un-usable electricity that gets trapped in your electrical wiring. The wiring in your home is likely 60 hertz AC if you live in the United States, and 50 hertz if you live in Europe. This system worked well when most electrical devices used this type of electricity.

However, as modern technology was developed, devices required more, less, or varying amounts of electricity that this system couldn't support. So, when these devices try to use the electricity in a way it wasn't intended, the result is something called high-frequency voltage transients. These result from the erratic surges of power, and they become unusable.

This unusable electricity then gets stuck in your electrical system, radiating EMFs into your home or office.

Dirty electricity is usually generated when devices try to use 60/50 hertz electrical systems in one of a few ways:

1. Converting the 60 Hertz AC (alternating current) into a low-voltage DC (direct current) or

2. Higher voltage AC

3. Drawing power intermittently in short bursts by turning the electrical current on and off, sometimes thousands of times per second.

#### ADDENDUM TO THE INITIAL FINDINGS-OF-FACT STAFF REPORT for the CONTINUATION OF THE ORIGINAL PUBLIC HEARING

So, when the electricity from your solar panels is converted into electricity for your home, it often results in dirty electricity. Some inverters are better at mitigating this than others, but nearly all will still result in some dirty electricity.

The process of converting the low voltage DC from the panels to usable electricity for the home constantly puts dirty electricity into your lines. Over time, this builds up to significant levels and can expose you to large amounts of EMF radiation.

The radiation emitted from these wires can be measured up to 6 feet away from the wiring and outlets. If you are electrically sensitive, this is even more of a concern.

It is very possible that the concern of "dirty electricity" and the radiation it causes is real. However, again, as this article notes, the concern comes from close proximity. The project that you are considering is for commercial transmission and distribution, not hyperlocalized use. "Dirty electricity" likely will be pumped into the grid, but it will not be directed toward local facilities and may well dissipate as it travels across transmission and distribution lines to its end users.

\* \* \*

Also, consider this link: <u>https://www.electrosmogprevention.org/public-health-alerts-solar-panel-systems/health-risks-of-solar-panels/</u>. Again, it's focusing on personal-use/small-scale solar, but the author does contend that the distance of threat is greater than 10', with those with great sensitivity to EMFs not being safe even if a neighbor has solar. (It also indicates that these localized radiation/EMF concerns can, in fact, be remediated in the home.)

Also, you've already been provided this link, as it was cited in the original staff report, but here's a paper on health/safety impacts of PV solar from North Carolina State Extension: <u>https://content.ces.ncsu.edu/health-and-safety-impacts-of-solar-photovoltaics</u>.

Environmental/ecological - toxic chemicals

From the original staff report, public comment, and evidence submitted, you have already been provided information about the toxic chemicals used in the production of solar panels, how the construction of panels is such that it locks these chemicals safely inside the assembly, and that the risk of adverse environmental impacts is limited to situations in which sufficient damage to a panel is done to crack it open, allowing these materials to leak to the ground below. How likely such an event is is impossible to determine, but, while such an occurrence cannot be prevented, the condition regarding plantings at solar-energy sites, particularly along ditches to act as filter strips; the stipulation in the commitment regarding the property-value guarantee pertaining to agricultural land; and the commitment requiring that land in project areas be reclaimed for agriculture use at the developer's expense at the end of the lifetime of the project. should serve to *mitigate* this potential problem.

Again, questions may linger, however, about appropriately safe and responsible removal/replacement of modules at end of service; to what extent this should be considered, given the long-term nature of it and the potential for innovations in materials handling between now and panel end of life is up to each of you individually.

#### ADDENDUM TO THE INITIAL FINDINGS-OF-FACT STAFF REPORT for the CONTINUATION OF THE ORIGINAL PUBLIC HEARING

Economic - evidence of positive impacts: general and from the developer directly

The developer has claimed that up to 40 jobs would be created by this project for the long-term operation of the solar-energy system. It seems unlikely that this is not an inflated estimate. It does, however, seem likely that at least a handful of jobs would be created; whether these would be held by existing residents, new residents, or commuters remains to be seen. As previously noted and reiterated by the developer, local contractors would play roles in the construction of the project, regardless of the long-term job creation of the project. Revenue-stream benefits for the County and other units, non-resident landowners, and resident landowners have also been addressed previously.

Following this section, you will encounter evidence of potentially drastic negative impacts from this project. In encountering a mention of it presently, you are specifically encouraged to consider that *if* the project were to cause the loss of any agricultural jobs, those persons very likely could and would find new employment in our understaffed manufacturing sector, alleviating production limitations that some of our employers face for whatever this information may be worth to you.

The David G. Loomis (Illinois State University professor of economics and president of Strategic Economic Research, LLC: see below), et al., article from the journal Renewable Energy (provided by the developer) analyzes job-creation potential in Illinois related to PVsolar development. For a total expected development of 2,292 megawatts, they forecast the gross creation of approximately 41 long-term jobs attributable to operations and maintenance of solar-energy sites. Adjusted directly to Mammoth's proposed 738.111 megawatts, this translates to approximately 13 gross new jobs.

In this particular situation, because most of the involved landowners farm their own land, are tenants of others who also have land in the project, or have a tenant who is retiring, the direct job-loss impact of taking this land out of production will likely be minimal, if anything. That said, as the Madison County study, below, shows taking ground out of production can have indirect and induced negative effects: specifically, in this context, the loss of jobs due to lost business in sales, service, and the like. The extent to which a twopercent reduction in tillable acreage would have significant negative impacts seems minimal, though not non-existent. Further, to what extent participating landowners would find other ways to spend their increased income from the project in the local economy is speculative, but surely not an unreasonable thing to consider.

#### <u>Economic – evidence of positive impacts: available literature</u>

"Economic Impacts of the Cherrywood Solar Farm on Caroline County and the State of Maryland" (<u>http://www.jacob-france-institute.org/wp-content/uploads/Cherrywood-Solar-Impact-Analysis-4-19-2018.pdf</u>), produced by Kenneth Stanton at the Jacob France Institute at the University of Baltimore, estimates 29.6 *net* new jobs (direct, indirect, and induced, with 12 being direct) in Caroline County, Maryland, for a 150-megawatt project. Adjusted directly to Mammoth's proposed 738.111 megawatts, this translates to approximately 127 cumulative *net new jobs* — about 52 direct. This is higher than the number offered by GEG/Mammoth, but indicative that it's not entirely unrealistic to expect measurable job creation — even if Mammoth's forecast, too, is bloated.

Peter Philips's "Environmental and Economic Benefits of Building Solar in California" (<u>https://laborcenter.berkeley.edu/pdf/2014/building-solar-ca14.pdf</u>), published by the Donald Vial Center on Employment in the Green Economy at the Institute for Research on Labor and Employment at the University of California, Berkeley, estimates that the construction of 3,350 megawatts' worth of PV-solar sites translated into 136 new gross jobs.

#### ADDENDUM TO THE INITIAL FINDINGS-OF-FACT STAFF REPORT for the CONTINUATION OF THE ORIGINAL PUBLIC HEARING

Adjusted to the proposed 738.111 megawatts, this comes to an estimated 24 new long-term jobs for operations and maintenance.

Finally, "Economic Impact Analysis of the Badger State Solar Project" [Ranger Power, LLC, in Jefferson County, Wisconsin]

(https://static1.squarespace.com/static/5c2d62f05417fc4c91d24293/t/5d6a9c2a14ca9400017bb dc5/1567267908232/Badger+State+Solar+Economic+Impact+Analysis.pdf), conducted by Strategic Economic Research, Inc. (David G. Loomis; see above), estimates 8.8 new long-term jobs for Jefferson County from a 149-megawatt project. Again, adjusted directly to 738.111 megawatts, this forecasts roughly 43 new long-term jobs for the proposed Mammoth Project. This report also explores the needed increases to commodity-crop market prices to match the projected revenue from solar.

It is important to note that no two projects are so precisely similar that it is safe to assume that a direct megawatt-to-megawatt/jobs-to-jobs adjustment is accurate, but the above information provides a degree of guidance for the potential impact could be.

Economic – evidence of negative impacts: Madison County study

Project opponents have provided a third-party summary of an economic-impact assessments conducted by the Center for Economic Analysis at Michigan State University (MSU CEA) for the proposed Lone Oak solar project in Madison County, Indiana, an 850acre, 120-megawatt project. This summary informs the reader that the Lone Oak study forecasts a negative annual impact of \$2.34-million, based on direct, indirect, and induced effects. Project opponents extrapolate forecasted annual losses for Pulaski County in the vicinity of more than \$16-million for a 738-megwatt development. This is a grim picture.

However, with only a third-party summary of the study, we are left unable to review the totality of the data and the study's methodology. The projected losses may be just as substantial as proposed, or may reflect bad data, sloppy work, other errors, or any combination of these. If staff obtains a copy of the original study and its methodology report (as has been requested), it will be provided to BZA members with any necessary commentary, but without the study in hand, the following red flags at least appear to appear:

> The forecasted direct losses — that is, the actual loss in crop sales — appears to be more than twice the amount one would expect based on the 2017 Census of Agriculture's data for farm size and per-farm sales in Madison County (https://www.nass.usda.gov/Publications/AgCensus/2017/Full Report/Volume 1. Chapter 2 County Level/Indiana/st18 2 0001 0001.pdf; .pdf page 9/Census page 239): 850 acres divided by 312-acre average farm equals 2.744 farm-equivalents times \$194,097 in per-farm sale equals \$532,602 in total lost sales, compared to \$1,038,051 asserted by the report/summary thereof. (Additionally, this Census figure includes livestock sales, which may or may not measurably be affected by the removal of crop production, although given the overproduction surplus discussed above, this seems to be a minor issue.)

Furthermore, the third-party summary states that "[t]he analysis is based on the typical crop rotation for Madison County and commodity expenditures and revenue profiles developed at Purdue University to estimate the economic direct effects of forgone agricultural production", while the \$194,097 *Census* number above only reflects sales; once government payments (income) and production expenses are accounted for by the *Census*, the *net* average income from farm operations in Madison County is \$40,789.

#### ADDENDUM TO THE INITIAL FINDINGS-OF-FACT STAFF REPORT for the CONTINUATION OF THE ORIGINAL PUBLIC HEARING

- Indirect and induced costs in the impact study combine to exceed the direct losses. However, because these numbers are derived from the direct-effect losses, which appear as if, as forecasted, they may be suspect at present. Again, without the report's methodology at hand, determining whether the direct-effect losses or the calculations for the indirect- and induced-effect losses are reasonable and can cleanly be applied, at scale, to the proposed Mammoth Solar project.
- The lack of the full report and its methodology make it unclear if any of the predicted losses account for potential increases to cash-rent payments to resident landowners; for the securing of new employment, whether with a local manufacturer in desperate need of additional employees, or otherwise, by the 5+ persons expected to lose their jobs due to the Lone Oak project; or for whether these persons' transitions from agricultural/ag-related jobs to jobs in (an)other sector(s) would create additional indirect and induced economic benefits of their own, just as the report suggests that the loss of agricultural-production ground and jobs would have a number of second- and third-tier impacts.
- Finally, the report's estimated \$99-million losses over 35 years not only include the annual estimated-loss figures discussed above, but also \$16.5-million attributable to decommissioning costs and land-reclamation costs (for the purposes of restoring the project land to a state suitable for agricultural production at the end of the lifespan of the project). The UDO already establishes that the decommissioning plan will require that the developer or its successor-operator will be responsible for decommissioning costs; a proposed commitment tied to the special exception requires that the developer or its successor-operator will be responsible for costs incurred for acceptable land reclamation as part of project decommissioning.

Again, it needs to be understood clearly that this assessment of the Madison County study is based on the absence of the complete report and its methodology and on available Census of Agriculture data; if the report is obtained, BZA members will be updated appropriately. It may prove to be troublingly accurate. Project opponents have enquired about the completion of a similar study for Mammoth Solar by the MSU CEA, but whether it is completed at all, completed timely, and provided to staff or the BZA directly remains to be seen. Because of the questions lingering here, this is the findings criterion that appears to be the most unsettled.

Economic - evidence of negative impact: other information from opponents

The letter provided by Craig Stevenson, a land broker/advisor with Geswein Farm & Land, raises a number of potential concerns regarding the impact of a commercial solarenergy system on nearby land values, which primarily goes to criterion 3, above. However, it is worth noting that he remarks, "A property with a negative aspect has a reduced pool of buyers" — negative aspects specifically considered being panels themselves, fencing, increased traffic, and noise. Outside of the construction period, the extent to which traffic would be an issue seems debatable. Condition 3, if approved, requires the use of a lessindustrial type of fearing, like deer fencing, that while still be present, likely would partially

#### ADDENDUM TO THE INITIAL FINDINGS-OF-FACT STAFF REPORT for the CONTINUATION OF THE ORIGINAL PUBLIC HEARING

mitigate this concern. Specific site-layout plans may further reduce this problem if evergreen planting occurs outside, and not inside, of the required fence. Likewise, the presence of fencing and screening should significantly mitigate the aesthetic concerns regarding the panels themselves, although intangible and health-related concerns, whether factual or not, may remain. Condition 1, if approved, requires such a minimal maximum volume at the property line that this shouldn't be a factor.

Mr. Stevenson reports that farmland will likely see an *increase* in value as a result of reduced supply, which would have a positive gross impact on the County's revenue collections, as well as an increase in cash rent, but points out the very real downside of this: "[these increases] will negatively impact local farmers who are not leasing land to the solar panel company. They will be at a competitive disadvantage when it comes to bidding on farmland to buy or rent. [...] Those unable to compete will likely be forced to end their farming operation or only to be able to continue on owned land." This is an indisputably unfortunate, and probably unavoidable, impact; considering whether its being unfortunate is enough of a problem to justify rejecting the requested special exception seems to push the limits of this decision criterion, *unless the shuttering of farming operations may lead to certain farmers' leaving the county entirely*. If they remain in Pulaski County and seek employment elsewhere, it is, again, undeniably unfortunate, but an economic adjustment that is, though never previously the result of solar development, not at all unfamiliar or unprecedented.

Mr. Stevenson further contends that the disruption of animal habitats and migratory paths, as well as the development of the project generally, could have negative impacts on Pulaski County's hunting-tourism industry and ability to attract new and/or younger families. While the argument regarding attracting hunters and campers is probably accurate, the land within the project area and two miles therefrom constitutes less than 10% of Pulaski County's landmass; significant area for hunting, camping, and similar activities remains available in the county even with the development of these 4,511 acres, so while there will surely be some impact, it affects a small part of the county's rural land. Likewise, subtracting the area within the project and two miles therefrom still leaves all that remains undeveloped of the remaining 90% of the community available for new homes in urban, suburban, and rural settings.

Project opponents contend that this project would negatively impact tourism and quality of life, specifically mentioning the Tippecanoe River and Riverside Rentals. While it has been conceded that there likely would be quality-of-life and tourism impacts, specific conditions have been proposed to mitigate most of them to some degree, and the area in which they would be felt on account of this project is limited to, at most, 10 percent of the county; how the proposed project would impact river-oriented tourism, generally, or Riverside Rentals' business, specifically, is unclear, given that the nearest any part of this proposed project comes to the river is more than two miles away, with a mix of farmland and wooded areas between the closest corner of a solar-energy site and the nearest bend of the Tippecanoe. Excepting the southernmost parts of the Winamac Fish & Wildlife Area and Sandy Prairie Hunt Club (owned by a project supporter and *included in the project area*), no marketed tourism attraction in Pulaski County (besides the river) falls within two miles of a project site. Given distance, features within the two-plus-mile distances, and required screening, the impact on existing tourism attractions in the county seems minimal.

Opponents further contend that residents have threatened to leave if this project is developed. This very may well happen, in which case, if the relevant commitment is adopted, the property-value guarantee will protect them as they seek to sell their homes, and without

# FINDINGS OF FACT FOR SPECIAL-EXCEPTION REQUESTS for the PULASKI COUNTY BOARD OF ZONING APPEALS ADDENDUM TO THE INITIAL FINDINGS-OF-FACT STAFF REPORT

# <u>for the</u> <u>CONTINUATION OF THE ORIGINAL PUBLIC HEARING</u>

a crystal ball, we can know neither how many of them will vacate the county, versus simply relocating within the county; how many of their homes would be purchased by an incoming non-resident or by a resident whose home has been sold to an income non-resident, versus by the developer; whether the presence of Mammoth Solar would discourage the purchase of homes elsewhere in the county, or just within a few miles of the project sites; nor what the impacts of any particular family's departure would be depending on their household income, how they spend their money, where they spend their money, where family members are employed and/or enrolled in school, et c. <u>It absolutely could be an economic threat</u>, but how great of one, and how great relative to the positive economic impacts of the project, remain to be seen.

In short, the possibility of negative economic impacts is not unreal, but without sounder evidence that the third-party summary of the MSU CEA study and the study itself are reasonably accurate even in light of the *Census of Agriculture* data presented above, little sound proof of a problematic impact on the local economy has thus far presented. *That said, again, if the complete Madison County study is obtained (or a Pulaski County study is completed and obtained!) and proves to be as damning as the third-party summary suggests it is, this may prove to be much more of an issue than we <u>currently</u> have to believe. So, again, <i>because of the questions lingering here, this is the findings criterion that appears to be the most unsettled.* 

5. Does the nature of the proposed special exception require the imposition of any particular conditions to ameliorate any potential harmful impacts upon neighboring properties, infrastructure, or the community?

#### See separate Conditions and Commitments document.

6. Are there any written commitments that the applicant should make, pursuant to IC 36-7-4-1015, as a condition to the approval of the special exception request?

#### See separate Conditions and Commitments document.

Petitioner:	Mammoth Solar
Parcel number(s):	Multiple
Parcel location(s):	Franklin, Rich Grove, Monroe and Jefferson Townships
Total acreage:	Approximately 4,692.04 acres
	Northern approx. 347.78 acres, Central- approx. 2,483.54 acres, South- approx. 1,860.716

1. Is the proposed special-exception use compatible with the current comprehensive plan for Pulaski County (<u>http://gov.pulaskionline.org/comp-plan/</u>) and with the current conditions and character of its vicinity? And, relatedly;

2. Would the use intended for the proposed special exception provide for the most desirable use for which the land in this zoning district is adapted?

Further considerations for question 1 and question 2-

It shall be noted that much of the farmland proposed for inclusion in this project could be considered good-to-great. Relatedly, it has been argued that prime farmland should be protected, and *Pulaski County Comprehensive Plan: Plan for Smart Growth* has as an objective "Protect prime agricultural land because of its importance to the economy and the character of Pulaski County" (page 52). To what extent this objective should be weighted relative to the *Plan's* objective of encouraging renewable-energy development should, perhaps, be based on the following consideration.

- Taking this land out of production would end the use of irrigation that taps water resources not required by the proposed alternative use for the parcels
- Ending irrigation would reduce electrical demand
- The proposed project would claim no more than 2% of the arable land in the county
- American agriculture is arguably overproducing; we're certainly seeing record corn carryover and close-to-record soybean carryover:

Farmers are producing too much wheat and corn, dragging down economic growth and pushing some farmers out of business.

Farming has unique challenges. Start-up and expansion costs are large, investments take years to mature and the nation's vast network of farmers is too disjointed to cooperate on production cuts. This can result in an economic enigma: rising output amid falling prices. "We call this the irreversible supply curve," said Chris Hurt, an agriculture economist at Purdue University. "You get a period of higher prices where there becomes a feeling among producers that it's a new era, and they're willing to make big investments. It is the big fixed cost once you have invested in [new land or equipment], and you can't reverse it." Global prices of wheat and corn have tumbled since 2014. That's squeezed many farmer's profits and dented economic growth in 23 U.S. states. <sup>(1)</sup>

ſ	EXHIBIT
tabbies	С
L	

The USDA projected domestic use of corn in 2020-21 at a record 12.650 billion bushels, up 595 million bushels, or 5%, from a forecast 12.055 billion bushels in 2019-20. Feed and residual use of corn in 2020-21 was forecast at 6.05 billion bushels, up 350 million bushels from a projected 5.7 billion bushels in the current year.

"With larger stocks relative to use, the season average farm price is projected at \$3.20 per bushel, down  $40\phi$  from 2019-20 and the lowest since 2006-07," the USDA said. The USDA projected the carryover of soybeans on Sept. 1, 2021, at 405 million bushels, down 175 million bushels, or 30%, from 580 million bushels as forecast for 2019-20. As forecast, the 2021 carryover would be the smallest since 302 million bushels in 2017. [...]

The USDA forecast the average farm price of soybeans in 2020-21 at \$8.20 a bushel, down  $30\phi$  from the projection for the current year at \$8.50 a bushel. <sup>(2)</sup>

The recent derecho that caused significant damage across the Midwest destroyed more than 10-million acres of crops in the fields of Iowa (as high as nearly 14-million), as well as destroying bins containing stored grain. This destruction ruined an estimated 43% of Iowa's crop. Iowa is the top corn-producing state in the nation. Nationwide, the damage is estimated at 37.7-million acres lost or affected. Despite a brief spike in commodity prices after the storm, these numbers have come back down partially. Quoted from the Des Moines *Register*; "At the same time, corn and soybean prices, which had fallen in anticipation of a large harvest, remain below the cost of production for many farmers." <sup>(3)</sup> (4)

There are potential negative economic impacts to be considered (Criterion 4) regarding the indirect/broader effects of transitioning this land from agriculture to solar energy, but in addressing this question specifically, it is appropriate to consider, in addition to evidence already presented and potentially still to be presented at the hearing, the weak commodity-crop market and how a new use for such land may be more productive under these current circumstances. Of course, what the commodity market may look like in the future relative to today's numbers is hard to forecast too far out, since we can't see in to the future.

3. Would the proposed special exception likely have a positive, neutral, or negative impact on property values throughout the jurisdiction?

#### Further considerations-

Although the extent is difficult to determine because of the lack of studies on comparably sized solar-energy projects, available data suggest that negative impacts on, at least, residential properties in the vicinity would occur. It was further noted that the new assessed value of the sites included in the project would more than negate these losses — even, narrowly, if all approximate 226 residential properties within one mile lost every cent of their cumulative assessment. You have received additional information from both the developer and project opponents offering contradictory information with respect to the impact of this project on property values.

From homeowners' point of view, the proposed property-value-guarantee (PVG) commitment would negate any negative impact in the case of attempted sales of homes

within the area covered by the proposed commitment. (It would not protect them in cases in which they sought to borrow against the value of their homes.)

This PVG, however, would not protect the County from losses to assessed value as they affect tax rates; however, again, as noted, even at the 30%-of-cost floor on personalproperty assessed value, the proposed investment in this project should more than outweigh those losses to the County.

What is less clear is what impact, if any, this project would have any impact on agricultural land — whether in the negative (risk of potential chemical contamination in the event that leakage from damaged panels would infiltrate local water systems) or in the positive (an increase in demand for land still in production). Evidence of the latter has been presented; the possibility of the former has been suggested. The PVG does cover agricultural property in the limited case in which conclusive evidence could be provided that any kind of chemical run-off from a solar-energy site had negatively impacted the health of soil elsewhere.

4. Does the proposed special exception allow for responsible development and growth, or the opposite? Consider the following: potential economic impact, availability of adequate public facilities and services (utilities and drainage, roads and traffic, public safety, *etc*-as necessary), adverse environmental effects, and similar issues.

#### Further considerations-

The project would have a positive economic impact on Pulaski County between increased property-tax and/or PILOT revenues, short-term construction-related jobs, and a small number of long-term jobs that may be held by residents. It has been noted that environmental concerns are minimal. The extent to which these opinions are valid constitute the primary lingering questions to be considered.

#### Environmental/Ecological — wildlife impact

Let it be noted that while concerns about impacts on animal habits and migratory paths are not invalid, the developer is required to consult with the Indiana Department of Natural Resources and/or other appropriate agencies regarding wildlife impact, and documentation of this consultation and any requirements emanating therefrom must be provided to the Building & Zoning staff prior to issuance of the building permit. If the administrator is not satisfied with the developer's plans — or if DNR does not sanction such plans —, then this matter would lead to a refusal to issue the required local permits. Additionally, a proposed condition pertaining to planting specific plants at the solar-energy sites further addresses these concerns.

#### Environmental/Ecological — noise

OSHA requires employers to implement a hearing conservation program when noise exposure is at or above 85 decibels averaged over 8 working hours, or an 8-hour timeweighted average (TWA).

Noise Sources and the effects from a Purdue University study (5)

Noise Source	Decibel level
Garbage disposal, dishwasher, average factory, freight train (at 15 meters).	89
Car wash at 20'	89
Food blender, propeller plane flyover at 1000'	88

milling machine	85
diesel truck 40 mph at 50'	84
diesel train at 45 mph at 100'	83
garbage disposal	80
(2 times as loud as 70 dB. Possible damage in 8 h exposure)	
waki r	
Quiet suburb, conversation at home, large electric transformer at 100' (One-fourth as loud as 70 dB)	50
Bird calls	44
Library, lowest limit of urban ambient sound	40
(One-eighth as loud as 70 dB)	

Environmental/Ecological --- glare

Project opponents have expressed concern about glare from the panel surfaces. In addition to technology improvements that reduce glare in the name of increased efficiency, this concern should largely be mitigated by the required berm/fence/tree screening.

#### Environmental/Ecological — radiation/electromagnetic fields (6)

The solar panels themselves do not emit radiation; and if they do, they only produce a very small amount. As long as you practice 2 of the 3 tenets of EMF protection – distance and duration – you should be fine. It is the solar panel systems, particularly the smart meters and inverters of the solar panel that are responsible for radiation emissions. These two components can emit large amounts of EMF and dirty electricity, which are the real threats to your health.

If these solar inverters pose a threat to our health, what's the safe distance away from it? The answers vary. Some people say being just 3 feet away can cut the damage of exposure. Others think it's better safe than sorry and recommend staying 10 feet away. One reader shared his measurements of magnetic fields and noted that they were as high as 10 mG at 2 feet away from the inverter.

To put that in perspective, the safety range for magnetic fields is less than 2 mG. At 9 feet away, levels dropped back down to an acceptable range. Since the inverter is the key problem with solar panels, more information can be learned via a YouTube video.<sup>(7)</sup>

What is most worth considering from these passages: 1) Smart meters will not be in play, because this is a commercial project uploading power to the grid, not a personal-use system running from a backyard to a house, with a smart meter being used to monitor generation, consumption, and excess power being put back on to the grid. 2) Inverters, as noted above, have to be a minimum of 100' from any non-participating property line. According to this particular source, 10' is a safe distance away from long-term/ consistent exposure. <sup>(3)</sup>

#### \* \* \*

<u>Dirty Electricity From Solar Panel Inverters</u>

Dirty electricity is un-usable electricity that gets trapped in your electrical wiring. The wiring in your home is likely 60 hertz AC if you live in the United States and 50 hertz if

you live in Europe. This system worked well when most electrical devices used this type of electricity.

As modern technology was developed, devices required more, less, or varying amounts of electricity that this system couldn't support. So, when these devices try to use the electricity in a way it wasn't intended, the result is something called high-frequency voltage transients. These result from the erratic surges of power, and they become unusable.

This unusable electricity then gets stuck in your electrical system, radiating EMFs into your home or office.

Dirty electricity is usually generated when devices try to use 60/50 hertz electrical systems in ways such as:

- 1. Converting the 60 Hertz AC (alternating current) into a low-voltage DC (direct current)
- 2. Higher voltage AC
- 3. Drawing power intermittently in short bursts by turning the electrical current on and off, sometimes thousands of times per second.

When the electricity from a solar panel is converted into electricity for your home, it often results in dirty electricity. Some inverters are better at mitigating this than others, but nearly all will still result in some dirty electricity.

The process of converting the low voltage DC from the panels to usable electricity for the home constantly puts dirty electricity into your lines. Over time, this builds up to significant levels and can expose you to large amounts of EMF radiation.

The radiation emitted from these wires can be measured up to 6 feet away from the wiring and outlets. If you are electrically sensitive, this is even more of a concern.

It is very possible that the concern of "dirty electricity" and the radiation it causes is real. As noted, the concern comes from close proximity. The project that you are considering is for commercial transmission and distribution, not hyper-localized use. "Dirty electricity" likely will be pumped into the grid, but it will not be directed toward local facilities and may well dissipate as it travels across transmission and distribution lines to its end users.

The director of the *Center for Electrosmog Prevention* focuses on personal-use/smallscale solar. In the writing, the author does contend that the distance of threat is greater than 10', with those with great sensitivity to EMFs not being safe even if a neighbor has solar. It also indicates that these localized radiation/EMF concerns can be remediated in the home. <sup>(9)</sup>

A document on health and safety impacts of PV solar from North Carolina State Extension Questions about the potential health and environmental impacts from the use of this PV technology are related to the concern that these panels contain cadmium, a toxic heavy metal. However, scientific studies have shown that cadmium telluride differs from cadmium due to its high chemical and thermal stability. Research has shown that the tiny amount of cadmium in these panels does not pose a health or safety risk. Further, there are compelling reasons to welcome its adoption due to reductions in unhealthy pollution associated with burning coal.

Similar to silicon-based PV panels; CdTe panels are constructed of a tempered glass front, one instead of two clear plastic encapsulation layers, and a rear heat strengthened glass backing (together >98% by weight). The final product is built to withstand exposure to the elements without significant damage for over 25 years. While not representative of

damage that may occur in the field or even at a landfill, laboratory evidence has illustrated that when panels are ground into a fine power, very acidic water is able to leach portions of the cadmium and tellurium; similar to the process used to recycle CdTe Panels. Like many

silicon - based panels, CdTe panels are reported (as far back as 1998) to pass the EPA's Toxic Characteristic Leaching Procedure (TCLP) test, which tests the potential for crushed panels in a landfill to leach hazardous substances into ground water. Passing this test means they are classified as non-hazardous waste, and can be deposited in landfills.

Concerns over solar fire hazards should be limited because only a small portion of materials in the panels are flammable, and those components cannot self-support a significant fire. <sup>(10)</sup>

#### Environmental/ecological - toxic chemicals

You have already been provided information about the toxic chemicals used in the production of solar panels, how the construction of panels locks these chemicals safely inside the assembly, and that the risk of adverse environmental impacts is limited to situations in which sufficient damage to a panel is done to crack it open, allowing these materials to leak to the ground below. How likely such an event is impossible to determine, but, while such an occurrence cannot be prevented, the condition regarding plantings at solar-energy sites, particularly along ditches to act as filter strips; the stipulation in the commitment regarding the property-value guarantee pertaining to agricultural land; and the commitment requiring that land in project areas be reclaimed for agriculture use at the developer's expense at the end of the lifetime of the project should serve to *mitigate* this potential problem.

Questions may linger about appropriately safe and responsible removal and replacement of modules at end of service and to what extent this should be considered, given the long-term nature of it and the potential for innovations in materials handling between now and panel end of life is up to each of you individually.

Economic - evidence of positive impacts: general and from the developer directly

The developer has claimed that up to 40 jobs would be created by this project for the long-term operation of the solar-energy system. It seems unlikely that this is not an inflated estimate. It does seem likely that at least a handful of jobs would be created; whether these would be held by existing residents, new residents, or commuters remains to be seen. As previously noted and reiterated by the developer, local contractors would play roles in the construction of the project, regardless of the long-term job creation of the project. Revenuestream benefits for the County and other units, non-resident landowners, and resident landowners have also been addressed previously.

Following this section, you will encounter evidence of potentially drastic negative impacts from this project. In encountering a mention of it presently, you are specifically encouraged to consider that *if* the project were to cause the loss of any agricultural jobs, those persons very likely could and would find new employment in our understaffed manufacturing sector, alleviating production limitations that some of our employers face

The David G. Loomis (Illinois State University professor of economics and president of Strategic Economic Research, LLC: see below), et al., article from the journal Renewable Energy (provided by the developer) analyzes job-creation potential in Illinois related to PVsolar development. For a total expected development of 2,292 megawatts, they forecast the gross creation of approximately 41 long-term jobs attributable to operations and maintenance of solar-energy sites. Adjusted directly to Starke Solar LLC/Mammoth Solar proposed total projected 900 megawatts, this translates to approximately 16 gross new jobs.

In this particular situation, because most of the involved landowners farm their own land, are tenants of others who also have land in the project, or have a tenant who is retiring, the direct job-loss impact of taking this land out of production will likely be minimal, if anything. That said, as the Madison County study, below, shows taking ground out of production can have indirect and induced negative effects: specifically, in this context, the

loss of jobs due to lost business in sales, service, and the like. The extent to which a twopercent reduction in tillable acreage would have significant negative impacts seems minimal, though not non-existent. Further, to what extent participating landowners would find other ways to spend their increased income from the project in the local economy is speculative, but surely not an unreasonable thing to consider.

#### Economic - evidence of positive impacts: available literature

"Economic Impacts of the Cherrywood Solar Farm on Caroline County and the State of Maryland," produced by Kenneth Stanton at the Jacob France Institute at the University of Baltimore, estimates 29.6 *net* new jobs (direct, indirect, and induced, with 12 being direct) in Caroline County, Maryland, for a 150-megawatt project. Adjusted directly to Mammoth's proposed 900 total megawatts, this translates to approximately 178 cumulative *net new jobs* — about 73 direct. This is higher than the number offered by Starke Solar/Mammoth but indicative that it's not entirely unrealistic to expect measurable job creation — even if Starke Solar's forecast, too, is bloated. <sup>(11)</sup>

Peter Philips's "Environmental and Economic Benefits of Building Solar in California", published by the Donald Vial Center on Employment in the Green Economy at the Institute for Research on Labor and Employment at the University of California, Berkeley, estimates that the construction of 3,350 megawatts' worth of PV-solar sites translated into 136 new gross jobs. Adjusted to the proposed 900 total megawatts, this comes to an estimated 37 new long-term jobs for operations and maintenance. <sup>(12)</sup>

Finally, "Economic Impact Analysis of the Badger State Solar Project" [Ranger Power, LLC, in Jefferson County, Wisconsin] (), conducted by Strategic Economic Research, Inc. (David G. Loomis; see above), estimates 8.8 new long-term jobs for Jefferson County from a 149-megawatt project. Again, adjusted directly to 900 total megawatts, this forecasts approximately 53 new long-term jobs for the proposed Mammoth Project. This report also explores the needed increases to commodity-crop market prices to match the projected revenue from solar. <sup>(19)</sup>

It is important to note that no two projects are so precisely similar that it is possible to assume a direct megawatt-to-megawatt/jobs-to-jobs adjustment is accurate, but the above information provides a degree of guidance for what the potential impact could be.

#### Economic - evidence of negative impacts: Madison County study

Project opponents previously provided a third-party summary of an economic-impact assessment conducted by the Center for Economic Analysis at Michigan State University (MSU CEA) for the proposed Lone Oak solar project in Madison County, Indiana, an 850acre, 120-megawatt project. This summary informs the reader that the Lone Oak study forecasts a negative annual impact of \$2.34-million, based on direct, indirect, and induced effects. Project opponents extrapolate forecasted annual losses for Pulaski County in the vicinity of more than \$16-million for a 738-megwatt development. This is a grim picture.

However, with only a third-party summary of the study, we are left unable to review the totality of the data and the study's methodology. The projected losses may be just as substantial as proposed, or may reflect bad data, poor workmanship, other errors, or any combination of these. If staff obtains a copy of the original study and its methodology report

(as has been requested), it will be provided to BZA members with any necessary commentary, but without the study in hand, the following red flags appear:

• The forecasted direct losses —actual loss in crop sales, which appears to be more than twice the amount one would expect based on the 2017 *Census of Agriculture*'s data for farm size and per-farm sales in Madison County (page 9/*Census* page 239): 850 acres divided by 312-acre average farm equals 2.744

farm-equivalents times \$194,097 in per-farm sale equals \$532,602 in total lost sales, compared to \$1,038,051 asserted by the report/summary thereof. (Additionally, this *Census* figure includes livestock sales, which may or may not measurably be affected by the removal of crop production, although given the overproduction surplus discussed above, this seems to be a minor issue.)

The third-party summary states "the analysis is based on the typical crop rotation for Madison County and commodity expenditures and revenue profiles developed at Purdue University to estimate the economic direct effects of forgone agricultural production", while the \$194,097 *Census* number above only reflects sales; once government payments (income) and production expenses are accounted for by the *Census*, the *net* average income from farm operations in Madison County is \$40,789.<sup>(14)</sup>

- Indirect and induced costs in the impact study combine to exceed the direct losses. Because these numbers are derived from the direct-effect losses, which appear as if, as forecasted, they may be suspect at present. Again, without the report's methodology at hand, determining whether the direct-effect losses or the calculations for the indirect- and induced-effect losses are reasonable and can cleanly be applied, at scale, to the proposed Mammoth Solar project.
- The lack of the full report and its methodology make it unclear if any of the predicted losses account for potential increases to cash-rent payments to resident landowners; for the securing of new employment, whether with a local manufacturer in desperate need of additional employees, or otherwise, by the 5+ persons expected to lose their jobs due to the Lone Oak project; or for whether these persons' transitions from agricultural or ag-related jobs to jobs in another sector would create additional indirect and induced economic benefits of their own, just as the report suggests that the loss of agricultural-production ground and jobs would have a number of second- and third-tier impacts.
- The report's estimated \$99-million losses over 35 years not only include the annual estimated-loss figures discussed above, but also \$16.5-million attributable to decommissioning costs and land-reclamation costs (for the purposes of restoring the project land to a state suitable for agricultural production at the end of the lifespan of the project). The UDO already establishes that the decommissioning plan will require that the developer or its successor-operator will be responsible for decommissioning costs; a proposed commitment tied to the special exception requires that the developer allow for the decommissioning plan also to stipulate that the developer or its successor-operator will be responsible for acceptable land reclamation as part of project decommissioning.

Again, it needs to be understood clearly that this assessment of the Madison County study is based on the absence of the complete report and its methodology and on available Census of Agriculture data; if the report is obtained, BZA members will be updated appropriately. It may prove to be troublingly accurate. Project opponents have enquired about the completion of a similar study for Mammoth Solar by the MSU CEA, but whether it is completed at all, completed timely, and provided to staff or the BZA directly remains to be seen. Because of the questions lingering here, this is the findings criterion that appears to be the most unsettled.

#### Economic - evidence of negative impact: other information from opponents

A letter provided by Craig Stevenson, a land broker/advisor with Geswein Farm & Land, raises a number of potential concerns regarding the impact of a commercial solarenergy system on nearby land values, which primarily goes to criterion 3. However, it is worth noting that he remarks, "A property with a negative aspect has a reduced pool of buyers" — negative aspects specifically considered being panels themselves, fencing, increased traffic, and noise. Outside of the construction period, the extent to which traffic would be an issue seems debatable. Condition 3, if approved, requires the use of a lessindustrial type of fencing, like deer fencing, that while still be present, likely would partially mitigate this concern. Specific site-layout plans may further reduce this problem when evergreen plantings occur outside of the required fence. Likewise, the presence of fencing and screening should significantly mitigate the aesthetic concerns regarding the panels themselves, although intangible and health-related concerns, whether factual or not, may remain. Condition 1, if approved, requires such a minimal maximum volume at the property line that this shouldn't be a factor.

Mr. Stevenson reports that farmland will likely see an *increase* in value as a result of reduced supply, which would have a positive gross impact on the County's revenue collections, as well as an increase in cash rent, but points out the very real downside of this: "these increases will negatively impact local farmers who are not leasing land to the solar panel company. They will be at a competitive disadvantage when it comes to bidding on farmland to buy or rent. [...] Those unable to compete will likely be forced to end their farming operation or only to be able to continue on owned land." This is an indisputably unfortunate, and probably unavoidable, impact; considering whether it's being unfortunate is enough of a problem to justify rejecting the requested special exception seems to push the limits of this decision criterion, *unless the shuttering of farming operations may lead to certain farmers' leaving the county entirely.* If they remain in Pulaski County and seek employment elsewhere, it is unfortunate, but an economic adjustment that is, though never previously the result of solar development, not at all unfamiliar or unprecedented.

Mr. Stevenson further contends that the disruption of animal habitats and migratory paths, as well as the development of the project generally, could have negative impacts on Pulaski County's hunting-tourism industry and ability to attract new and/or younger families. While the argument regarding attracting hunters and campers is probably accurate, the land within the project area and two miles therefrom constitutes less than 10% of Pulaski County's landmass; significant area for hunting, camping, and similar activities remains available in the county even with the development of these 4,692 acres, so while there will surely be some impact, it affects a small part of the county's rural land. Likewise, subtracting the area within the project and two miles therefrom still leaves all that remains undeveloped of the remaining 90% of the community available for new homes in urban, suburban, and rural settings.

Project opponents contend that this project would negatively impact tourism and quality of life, previously, they specifically mentioning the Tippecanoe River and Riverside Rentals. While it has been conceded that there likely would be quality-of-life and tourism impacts, specific conditions have been proposed to mitigate most of them to some degree, and the area in which they would be felt on account of this project is limited to, at most, 10 percent of the county; how the proposed project would impact river-oriented tourism, generally is unclear, given that the nearest any part of this proposed project comes to the river is more than two miles away, with a mix of farmland and wooded areas between the

closest corner of a solar-energy site and the nearest bend of the Tippecanoe. Excepting the southernmost parts of the Winamac Fish & Wildlife Area and Sandy Prairie Hunt Club (owned by a project supporter and *included in the project area*), no marketed tourism attraction in Pulaski County, besides the river, falls within two miles of a project site. Given distance, features within the two-plus-mile distances, and required screening, the impact on existing tourism attractions in the county seems minimal.

Opponents further contend that residents have threatened to leave if this project is developed. This may very well happen, in which case, if the relevant commitment is adopted, the property-value guarantee will protect them as they seek to sell their homes. Without knowing the future of our local or national economy, we can know neither how many of them will vacate the county, versus simply relocating within the county; how many of their homes would be purchased by an incoming non-resident or by a resident whose home has been sold to an income non-resident, versus by the developer; whether the presence of Starke Solar/Mammoth Solar would discourage the purchase of homes elsewhere in the county, or just within a few miles of the project sites; nor what the impacts of any particular family's departure would be depending on their household income, how they spend their money, where they spend their money, where family members are employed and/or enrolled in school, etc. It could be an economic threat, but how great of one, and how great relative to the positive economic impacts of the project, remain to be seen.

In short, the possibility of negative economic impacts is not unreal, but without sounder evidence that the third-party summary of the MSU CEA study and the study itself are reasonably accurate even in light of the *Census of Agriculture* data presented above, little sound proof of a problematic impact on the local economy has thus far presented.

5. Does the nature of the proposed special exception require the imposition of any particular conditions to ameliorate any potential harmful impacts upon neighboring properties, infrastructure, or the community?

See separate Conditions and Commitments document.

6. Are there any written commitments that the applicant should make, pursuant to IC 36-7-4-1015, as a condition to the approval of the special exception request?

See separate Conditions and Commitments document.

Final Board Documentation Accompanying Determination Regarding the Application

Petitioner:	Starke Solar, LLC d/b/a Mammoth Solar
Parcel number(s):	Multiple
Parcel location(s):	Franklin, Jefferson, Monroe & Rich Grove Townships
Total Acreage:	4,692.04 acres
	North: 847.78 acres Franklin Township;
	Central: 2,483.54 acres Franklin, Jefferson, Monroe & Rich Grove
	Townships;
	South: 1,860.716 acres Jefferson Township

1. Is the proposed special exception use compatible with the current comprehensive plan for Pulaski County (<u>http://gov.pulaskionline.org/comp-plan/</u>) and with the current conditions and character of its vicinity?

X Yes □ No

Comment/defense of determination:

See attached Exhibit "A"

2. Would the use intended for the proposed special exception provide for the most desirable use for which the land in this zoning district is adapted?

X Yes

Comment/defense of determination:

See attached Exhibit "A"

3. Would the proposed special exception likely have a positive, neutral, or negative impact on property values throughout the jurisdiction?

Yes D No

Comment/defense of determination:

See attached Exhibit "A"

Final Board Documentation Accompanying Determination Regarding the Application

4. Does the proposed special exception allow for responsible development and growth, or the opposite? Consider the following: potential economic impact, availability of adequate public facilities and services (utilities and drainage, roads and traffic, public safety, etc-as necessary), adverse environmental effects, and similar issues.

A Yes

□ No

Comment/defense of determination:

See attached Exhibit "A"

5. Does the nature of the proposed special exception require the imposition of any particular conditions to ameliorate any potential harmful impacts upon neighboring properties, infrastructure, or the community?

X Yes □ No

Comment/defense of determination:

See attached Exhibit "A"

6. Are there written commitments that the application should make, pursuant to IC 36-7-4-1015, as a condition to the approval of the special exception request?

•

凶 Yes No

Comment/defense of determination:

See attached Exhibit "A"

#### Final Board Documentation Accompanying Determination Regarding the Application

Having heard all relevant testimony from Board staff, the applicant, and the public in a public hearing for which all notification requirements were met and appropriate procedures were followed, we, the undersigned members of the Pulaski County, Indiana, Board of Zoning Appeals hereby

# GRANT DENY

#### The

#### SPECIAL EXCEPTION PROVIDED

ATTACHED EXHIBIT "A" CONDITIONS AND COMMITMENTS ARE ACCOMPLISHED

Requested by

Starke Solar LLC, d/b/a Mammoth Solar as Docket #03152021-01

on this 15<sup>th</sup> day of March, 2021.

AYE

NAY

Derrick/W. Stalbaum, Chairman/Board of Commissioner's citizen appointee

Matthew T. Kelsey, Vice-Chairman/Board of Commissioner's citizen appointee

Abbigail M. Dickey, Board of Commissioner's Plan Commission appointee

Robert Keller, Plan Commission appointee

Darin Gudeman, County Council citizen appointee

Karla A. Redweik-Pemberton, Administration to the Board

#### APPENDIX

#### Finding of Facts 1 & Finding of Facts 2

(1) <u>https://blogs.wsj.com/economics/2018/02/05/u-s-farmers-are-producing-too-much-food-heres-why-they-cant-stop/</u>

(2) <u>https://www.world-grain.com/articles/13691-usda-record-corn-crop-larger-soybean-supplies-on-tap-for-2020-21#:~:text=The%20USDA%20forecast%20the%20carryover,4,259%20billion%20bushels%20in%201988</u>

(3) <u>https://www.usatoday.com/story/news/nation/2020/08/12/derecho-storm-damages-crops-corn-iowa-thousands-power-outages-midwest/3354939001/</u>

(4) <u>https://farmpolicynews.illinois.edu/2020/08/derecho-damage-begins-to-unfold-estimated-37-7-</u> million-acres-of-farmland-impacted/

#### Finding of Facts 4

(5) https://www.chem.purdue.edu/chemsafety/Training/PPETrain/dblevels.htm

(6) https://beatemf.com/solar-panel-radiation/

(7) https://youtu.be/ mVIfsp8Fl0

(8) https://emfacademy.com/solar-panel-radiation/

(9) <u>https://www.electrosmogprevention.org/public-health-alert/health-alerts-solar-panel-systems/health-risks-of-solar-panels/</u>

(10) https://content.ces.ncsu.edu/health-and-safety-impacts-of-solar-photovoltaics

(11) http://www.jacob-france-institute.org/wp-content/uploads/Cherrywood-Solar-Impact-Analysis-4-19-2018.pdf

(12) https://laborcenter.berkeley.edu/pdf/2014/building-solar-ca14.pdf

(18)

https://static1.squarespace.com/static/5c2d62f05417fc4c91d24293/t/5d6a9c2a14ca9400017bbdc5/1567 267908232/Badger+State+Solar+Economic+Impact+Analysis.pdf

(14)

https://www.nass.usda.gov/Publications/AgCensus/2017/Full Report/Volume 1. Chapter 2 County\_ Level/Indiana/st18 2 0001 0001.pdf

#### Pulaski County Board of Zoning Appeals Docket #03152021-01 Starke Solar LLC d/b/a Mammoth Solar <u>CONDITIONS AND COMMITMENTS FOR SPECIAL-EXCEPTION REQUEST</u> EXHIBIT "A"

#### **Conditions**

1. Each site development shall occur in such a manner as to limit the volume of sounds emanating from an operating solar-energy site to 50 decibels at the nearest, non-participating property line during normal operations, which is 30 decibels lower than the level mandated by the Pulaski County Unified Development Ordinance (UDO). This condition is not expected to be met during project construction or during short-term periods of repair and maintenance, including grounds keeping, such as mowing, so long as transgressions of this limit do not occur between 8:00 p.m. and 8:00 a.m. Third-party-study evidence of the project's ability to comply with this condition shall be provided prior to issuance of improvement-location and building permits.

The Board of Zoning Appeals requires this condition. X Yes

□ No

2. For the purposes of enforcing UDO 7.14.C.3.a.1, regarding visual screening of a solar-energy site, the term 'neighbor' shall be construed to refer to any residential property within one mile of a solar-energy site within the property's viewshed, unless the owner of said property has signed any form of contract with the developer of the project.

While evergreen trees are understood to be the default form of screening, topographical concerns, homeowner preference, the developer's willingness to accede to requests made by homeowner or County preferences, and the County plan administrator's preference or approval may lead to alternate forms of visual screening, such as deciduous trees, an earthen berm, or a combination of these options. In any case, the height of fencing, berm, or tree and the density and layout of trees must be sufficient to screen the solar site immediately; *i.e.*, planting of trees young enough that the objectives of the ordinance and this condition cannot be met by the time the project is operational is not acceptable. If an individual homeowner would prefer the use of deciduous trees, then the developer would not be held responsible for the presence of the solar site in the homeowner's viewshed during periods of time in which said trees had shed their leaves; this exception does not relieve the developer of the obligation to replace any deciduous trees that may lose their ability to grow leaves as the result of disease, damage, or other harm.

Precise layout of screening elements shall be determined on a site-by-site basis to ensure the maximum screening based on angle and distance relative to point of observation and each site's topography, with reasonable consideration given by the County plan administrator to the impact of layout decisions on necessary site access, including for public safety.

The Board of Zoning Appeals requires this condition.

X Yes

□ No

3. For the purposes of fulfilling the requirements of UDO 7.14.C.1, regarding perimeter fencing, the site shall be developed with deer fencing, or other administrator-approved material that presents a less-industrial appearance than chain-link fencing.

Precise layout of screening elements shall be determined on a site-by-site basis to ensure the maximum screening based on angle and distance relative to point of observation and each site's

#### Pulaski County Board of Zoning Appeals Docket #03152021-01 Starke Solar LLC d/b/a Mammoth Solar <u>CONDITIONS AND COMMITMENTS FOR SPECIAL-EXCEPTION REQUEST</u>

#### EXHIBIT "A"

topography, with reasonable consideration given by the County plan administrator to the impact of layout decisions on necessary site access, including for public safety.

The Board of Zoning Appeals requires this condition.

X Yes

□ No

4. Site development shall include the planting of low-growing native perennials, with an emphasis on pollinators; consultation with (a) biologist(s) and/or other relevant experts approved by the administrator shall be part of the development process to ensure that plantings and tracker/panel layout on solar-energy sites accomplish the following:

- a. minimize the "lake effect" impact on birds flying overhead to the greatest extent practicable as judged by a qualified professional;
- b. encourage nesting grassland birds;
- c. limit the number of times the property is mowed during the year to the fewest number of times reasonable as judged by a qualified professional;
- d. induce frequenting of the sites by bees for pollination; and
- e. in conjunction with required screening measures, ensure that the properties' appearance relative to nearby environs creates as little contrast as possible.

This condition should not be construed as to discourage the dual use of any solar-energy sites, when possible, for the purpose of allowing livestock grazing, apiaries, or other compatible, agricultural uses. Additionally, plantings within any 75' setback to a ditch shall comply with USDA Farm Service Agency guidelines for appropriate plantings for filter strips.

The Board of Zoning Appeals requires this condition.

X Yes

□ No

5. The developer will pay for 100% of costs-incurred by Pulaski County in the use of third-party consultants to conduct an analysis for, to draft, and to negotiate an Economic Development Agreement pursuant to UDO 7.18.A.2.a., the Drainage Agreement pursuant to UDO 7.18.A.2.b., and the Road Use and Maintenance Agreement pursuant to UDO 7.18.A.2.c. In the event that the County refuses with finality to issue a building permit for the project, this shall be limited to 50% of costs incurred.

The Board of Zoning Appeals requires this condition.

- X Yes
- □ No

6. The developer agrees to coordinate a fire-protection and safety plan for the construction and operation of CSES facility, which includes emergency access to the site. The developer will meet, as required, with township representatives such as trustees, Pulaski County EMS and/or its successor and any and all fire departments providing services and/or mutual aid to address concerns about fire safety and emergency response and coordinate safety planning and potential need of specialized equipment for extinguishing solar-panel/equipment fires. Financial obligations incurred by departments providing coverage in Pulaski County for solar-energy fire-suppression training

#### Pulaski County Board of Zoning Appeals Docket #03152021-01 Starke Solar LLC d/b/a Mammoth Solar CONDITIONS AND COMMITMENTS FOR SPECIAL-EXCEPTION REQUEST

#### EXHIBIT "A"

purposes shall be negotiated as part of development of this plan and any such costs incurred by the development may be considered during development of Economic Development Agreement.

The Board of Zoning Appeals requires this condition.

X Yes

🗆 No

7. While it is preferred that as many components of the solar-energy equipment used in this project be made in the United States, the difficulties of this are recognized. As such, while preferential treatment for American companies is preferred, it is not required, but MSDS for all equipment and evidence of the suitability of all proposed equipment with respect to environmental- and publicsafety concerns and comparability to similar American products shall be provided prior to the issuance of required local permits.

The Board of Zoning Appeals requires this condition.

X Yes

□ No

#### **Commitments**

Commitments are to be recorded with the Pulaski County Recorder's Office. As recorded commitments, they apply to each and every parcel for which the special exception is granted, for as long as the special-exception use continues, regardless of any transfer of ownership of any parcel or the development or any part thereof. The developer must provide either the landowner's signed acceptance of the commitments hereunder or the landowner's signed designation of his/her right to accept the commitments hereunder to the developer. Therefore, any reference to the developer hereunder shall be construed to refer both to the original project developer and to any successor-owner of the project.

Additionally, this list of commitments is not exhaustive. Any commitment offered by the developer prior to or otherwise outside of this document remains valid and shall be recorded in the same manner as those explicitly included herein.

1. Conditions 1-4, regarding noise levels, visual screening, perimeter buffers, and native plantings on solar-energy sites, shall be enforced throughout the life of any solar-energy project on the included parcels. Similarly, condition 7, regarding the appropriateness with respect to safety of components used shall be enforced with respect to replacement components during the life of the project.

Further, if a currently undeveloped property would be developed for residential purposes after the completion of the project, it shall be at the County plan administrator's discretion whether new visual screening shall be required to protect this homeowner's viewshed based on the administrator's visual inspection of the solar-energy site(s) within the viewshed.

The Board of Zoning Appeals requires this commitment.

X Yes

□ No

## Pulaski County Board of Zoning Appeals Docket #03152021-01 Starke Solar LLC d/b/a Mammoth Solar CONDITIONS AND COMMITMENTS FOR SPECIAL-EXCEPTION REQUEST

#### EXHIBIT "A"

2. A property-value guarantee (PVG) shall be afforded to non-participating, presently constructed property for properties where a boundary of which is within 1 mile of a parcel upon which a solarenergy site is built so long as they meet the following stipulations:

- The property owner must apply to participate in the PVG program no later than the start a. of construction of the solar site nearest to the property in question. The PVG shall expire 12 years after the start of construction.
- The PVG applies only to the original applicant-owner and to structures in place at the b. time of registration in the PVG program, Persons who purchase property in the affected area knowing that a solar-energy system will be developed, is under development, or is operational, are not eligible for the PVG, nor are structures built after construction has begun of the solar-energy project.
- The PVG shall apply only to buildings. Land committed to plant-agricultural production, c. forests, or pasture or left fallow shall not be included except in such cases in which incontrovertible evidence may be provided that noxious externalities created by the project have negatively impacted the usability of such land, regardless of the distance between a solar-energy site and the property in question. In these cases, determination of loss of value shall be based on real-time comparisons to comparable properties not in the vicinity of a solar-energy site or its range of impact.
- The benefits of the PVG shall be enjoyed only upon the sale of the property. d.
  - At the time of registration in the PVG program, an appraisal of the subject i. property shall be conducted by a certified appraiser of the County plan administrator's choosing and at the developer's cost. If the homeowner is not satisfied by the appraised value, they may hire another appraiser, at their own cost, to conduct a second appraisal. If the second appraised value is higher than the first, the average of the two shall be used as the accepted fair market value (FMV). If the second appraised value is lower than the first, than it shall be discarded, and the first, higher value shall be used as the accepted FMV for the homestead.

Alternatively, a PVG program applicant-homeowner may submit an existing appraisal, performed by a certified appraisal, no more than 18 months old.

- ü. If, at the time of sale, a participant-homeowner is unable to secure a sale price at least equal to the accepted FMV, then the solar-energy-system developer shall be responsible for reimbursing the participant for the difference between the accepted FMV and the final sale price. At the time of any such sale, determination shall be made as to whether the accepted FMV should be upward or downward on account of inflation or deflation.
- If the applicant-homeowner receives no offers on the home within 12 months, iii. due to no fault of theirs or their heirs own, then the solar-energy-system developer shall purchase the home for the accepted FMV, as determined by the original appraisal which was completed at the time of registration in the PVG program.

#### Pulaski County Board of Zoning Appeals Docket #03152021-01 Starke Solar LLC d/b/a Mammoth Solar <u>CONDITIONS AND COMMITMENTS FOR SPECIAL-EXCEPTION REQUEST</u> EXHIBIT "A"

The Board of Zoning Appeals requires this commitment.

X Yes

🗆 No

3. Developer shall agree to allowing that the decommissioning plan for the proposed project will require that any land-reclamation costs required, as determined by a third-party soil specialist employed by a governmental agricultural agency such as NRCS, to make the land suitable for a return to agricultural production at the end of the project shall be incurred by the developer or its successor operating the solar-energy sites at the time of decommissioning, except in any case in which the developer's contract with a landowner explicitly contradicts this requirement and places such cost obligation with the landowner.

The Board of Zoning Appeals requires this commitment.

X Yes

□ No

\*The above conditions and commitments may be amended by the Building Inspector's discretion subject to compliance within the parameters of governing rules and regulations of the Pulaski County Unified Development Ordinance in place at the time of any amendments.



# Generation Interconnection Feasibility Study Report for Queue Project AF2-133 REYNOLDS-OLIVE #2 345 KV 180 MW Capacity / 300 MW Energy

July 2020

# **Table of Contents**

1	In	ntroduction	4
2	Pı	Preface	4
3	Ge	eneral	5
4	Po	oint of Interconnection	6
5	Сс	lost Summary	6
6	Tı	ransmission Owner Scope of Work	
6.	1	Attachment Facilities	
6.	2	Direct Connection Cost Estimate	
6.	3	Non-Direct Connection Cost Estimate	
7	In	ncremental Capacity Transfer Rights (ICTRs)	9
8	Sc	chedule	9
9	In	nterconnection Customer Requirements	9
10		Revenue Metering and SCADA Requirements	9
10	0.1	1 PJM Requirements	9
10	0.2	2 Meteorological Data Reporting Requirements	10
1(	0.3	3 Interconnected Transmission Owner Requirements	10
11		Summer Peak - Load Flow Analysis – Primary POI	11
11	1.1	1 Generation Deliverability	12
11	1.2	2 Multiple Facility Contingency	12
11	1.3	3 Contribution to Previously Identified Overloads	12
11	1.4	4 Potential Congestion due to Local Energy Deliverability	12
11	1.5	5 System Reinforcements - Summer Peak Load Flow - Primary POI	13
11	1.6	6 Flow Gate Details - Primary POI	14
	11	1.6.1 Index 1	15
11	1.7	7 Queue Dependencies	
11	1.8	8 Contingency Descriptions - Primary POI	19
12		Light Load Analysis	20
13		Short Circuit Analysis	20
14		Stability and Reactive Power Assessment	20
15		Affected Systems	20
15	5.1	1 TVA	20

15.2	Duke Energy Progress	20
15.3	MISO	20
15.4	LG&E	20
15	Summer Peak – Load Flow Analysis – Secondary POI	21
15.1	Generation Deliverability	
15.2	2 Multiple Facility Contingency	22
15.3	8 Contribution to Previously Identified Overloads	22
15.4	Potential Congestion due to Local Energy Deliverability	22
15.5	Flow Gate Details - Secondary POI	23
15	5.5.1 Index 1	24
15.6	Contingency Descriptions - Secondary POI	
16 Li	ght Load Analysis – Secondary POI	
17 Sł	nort Circuit Analysis – Secondary POI	
18 St	ability and Reactive Power Assessment – Secondary POI	
19 A	ffected Systems – Secondary POI	
19.1	TVA	
19.2	Duke Energy Progress	
19.3	MISO	
19.4	LG&E	
20	Attachment 1: One Line Diagram and Site Location – Primary POI	
21	Attachment 2: One Line Diagram - Secondary POI	

# **1** Introduction

This Feasibility Study has been prepared in accordance with the PJM Open Access Transmission Tariff, 36.2, as well as the Feasibility Study Agreement between the Interconnection Customer (IC), and PJM Interconnection, LLC (PJM), Transmission Provider (TP). The Interconnected Transmission Owner (ITO) is AEP.

# 2 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.

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.

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.

# 3 General

The Interconnection Customer (IC), has proposed a Solar generating facility located in Pulaski County, Indiana. The installed facilities will have a total capability of 300 MW with 180 MW of this output being recognized by PJM as Capacity. The proposed in-service date for this project is May 31, 2021. This study does not imply a TO commitment to this in-service date.

Queue Number	AF2-133
Project Name	REYNOLDS-OLIVE #2 345 KV
State	Indiana
County	Pulaski
Transmission Owner	AEP
MFO	300
MWE	300
MWC	180
Fuel	Solar
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

AF2-133 will interconnect with the AEP transmission system along one of the following points of interconnection:

Primary POI: Olive – Reynolds (NIPSCO) 345 kV circuit #2.

To accommodate the interconnection on the Olive – Reynolds (NIPSCO) 345 kV circuit #2, a new three (3) circuit breaker 345 kV switching station physically configured in a breaker and half bus arrangement but operated as a ring-bus will be constructed (see Attachment 1). Installation of associated protection and control equipment, 345 kV line risers, SCADA, and 345 kV revenue metering will also be required. AEP reserves the right to specify the final acceptable configuration considering design practices, future expansion, and compliance requirements.

Installation of the generator lead first span exiting the POI station, including the first structure outside the AEP fence, will also be included in AEP's scope. In the case where the generator lead is a single span, the structure in the customer station will be the customer's responsibility.

Secondary POI: Olive – Reynolds (NIPSCO) 345 kV circuit #1.

To accommodate the interconnection on the Olive – Reynolds (NIPSCO) 345 kV circuit #2, a new three (3) circuit breaker 345 kV switching station physically configured in a breaker and half bus arrangement but operated as a ring-bus will be constructed (see Attachment 2). Installation of associated protection and control equipment, 345 kV line risers, SCADA, and 345 kV revenue metering will also be required. AEP reserves the right to specify the final acceptable configuration considering design practices, future expansion, and compliance requirements.

# 5 Cost Summary

The AF2-133 project will be responsible for the following costs:

Description	Total Cost
Total Physical Interconnection Costs	\$19,777,000
Total System Network Upgrade Costs	\$ 2,020,000
Total Costs	\$21,797,000

The estimates provided in this report are preliminary in nature, as they were determined without the benefit of detailed engineering studies. Final estimates will require an onsite review and coordination to determine final construction requirements. In addition, Stability analysis will be completed during the Facilities Study stage. It is possible that a need for additional upgrades could be identified by these studies.

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.

Cost allocations for any System Upgrades will be provided in the System Impact Study Report.

# 6 Transmission Owner Scope of Work

The total physical interconnection costs is given in the tables below:

# 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
345 kV Revenue Metering	\$431,000
Generator lead first span exiting the POI station, including the first structure outside the fence	
Total Attachment Facility Costs	\$1,081,000

# 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
A new three (3) circuit breaker 345 kV switching station physically configured in a breaker and half bus arrangement but operated as a ring-bus will be constructed (see Attachment 1). Installation of associated protection and control equipment, 345 kV line risers, and SCADA will also be required.	\$17,440,000
Total Direct Connection Facility Costs	\$17,440,000

# 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
Olive – Reynolds T-Line Cut in	\$1,210,000
Protection and Control settings review at Olive 345 kV substation	\$45,000
Total Non-Direct Connection Facility Costs	\$1,255,000

# 7 Incremental Capacity Transfer Rights (ICTRs)

Will be determined at a later study phase

# 8 Schedule

It is anticipated that the time between receipt of executed Agreements and Commercial Operation may range from 12 to 18 months if no line work is required. If line work is required, construction time would generally be between 24 to 36 months after signing Agreement execution.

# 9 Interconnection Customer Requirements

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

The Generation Interconnection Agreement does not in or by itself establish a requirement for the 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.

- 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.

# **10** Revenue Metering and SCADA Requirements

# **10.1 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.
#### **10.2 Meteorological Data Reporting Requirements**

Solar generation facilities shall provide the Transmission Provider with site-specific meteorological data including:

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

#### **10.3 Interconnected 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/

#### 11 Summer Peak - Load Flow Analysis – Primary POI

The Queue Project AF2-133 was evaluated as a 300.0 MW (Capacity 180.0 MW) injection tapping the Reynolds to Olive 345kV line, ckt. 2 in the AEP area. Project AF2-133 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AF2-133 was studied with a commercial probability of 53.0 %. Potential network impacts were as follows:

#### **11.1 Generation Deliverability**

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

None

#### **11.2 Multiple Facility Contingency**

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

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)

ID	FROM BUS#	FROM BUS	kV	FRO M BUS ARE A	TO BUS#	TO BUS	kV	TO BUS ARE A	СК Т ID	CONT NAME	Туре	Ratin g MVA	PRE PROJEC T LOADIN G %	POST PROJEC T LOADIN G %	AC D C	MW IMPAC T
952849 97	24286 5	05JEFRS O	345. 0	AEP	24800 0	06CLIF TY	345. 0	OVE C	Z1	AEP_P4_#6189_05H ANG R 765_D1	break er	2354. 0	106.55	107.37	DC	39.03

#### **11.4 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	FRO M BUS AREA	TO BUS#	TO BUS	kV	TO BUS ARE A	СК Т ID	CONT NAME	Туре	Rating MVA	PRE PROJECT LOADIN G %	POST PROJECT LOADIN G %	AC D C	MW IMPAC T
9528541 1	24286 5	05JEFRS O	345. 0	AEP	24800 0	06CLIFT Y	345. 0	OVE C	Z1	AEP_P1 - 2_#709	operatio n	2354. 0	105.12	105.93	DC	39.1

# **11.5** System Reinforcements - Summer Peak Load Flow - Primary POI

ID	ldx	Facility	Upgrade Description	Cost
95284997	1	05JEFRSO 345.0 kV - 06CLIFTY 345.0 kV Ckt Z1	AEP AEPI0045a (1681) : Replace 4 Clifty Switches Project Type : FAC Cost : \$2,000,000 Time Estimate : 12-18 Months AEPI0045b (1682) : A Sag Study will be required on the 0.75 mile section of ACSR ~ 2156 ~ 64/19 ~ BLUEBIRD line to mitigate the overload . New Rating after the Sag Study: S/N: 2354 MVA S/E: 3212 MVA. Depending on the sag study results, cost for this upgrade is expected to be between \$20,000 (No remediations required just sag study) and 1.96 million (complete line reconductor/rebuild required). 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 : \$20,000 Time Estimate : 6-12 Months	\$2,020,000
			TOTAL COST	\$2,020,000

#### **11.6 Flow Gate Details - Primary POI**

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".

#### 11.6.1 Index 1

ID	FROM BUS#	FROM BUS	FRO M	TO BUS#	TO BUS	TO BUS	CK T	CONT NAME	Туре	Rating MVA	PRE PROJECT	POST PROJECT	AC D C	MW IMPAC			
			BUS AREA			ARE A	ID				LOADIN G %	LOADIN G %		т			
9528499 7	24286	05JEFRS	AEP	24800 0	06CLIFT Y	OVE	Z1	AEP_P4_#6189_05HA	N breake	2354.	106.55	107.37	DC	39.03			
	5	5		Ŭ		0		0.000_01									
	Bus #			Bus			Gende	liv MW Impact		Туре		Full MW Impact					
	243441			05CKG	62	_		21.5468		50/50		21.5468					
	243442			05RKC	1 `2			/1./661		50/50		/	1.7661				
	243443			05ER-11	60	-		0.6787		50/50	_	/	0.6787				
	243862			05FR-12	GC			0.4471		50/50			0.4471				
	243864			05FR-21	GC			0.4772		50/50			0.4772				
	243866			05FR-22	G C			0.4564	50/50				0.4564				
	243870			05FR-3	G C			0.9243		50/50			0.9243				
	243873			05FR-40	GC			0.7158		50/50			0.7158				
	244130			05ST.JOE	CTR			12.4444		50/50		1	2.4444				
	246909			05MDL-2	lg C			0.9511		50/50			0.9511				
	246910			05MDL-2	2G C			0.4708		50/50			0.4708				
	246976			05MDL-3	3G C			0.4803		50/50			0.4803				
	246979			05MDL-4	1G C			0.4684		50/50			0.4684				
	247556			T-127	С			0.4755		50/50			0.4755				
	247900			05FR-11	.G E			10.5157		50/50		1	.0.5157				
	247901			05FR-12	G E			10.3411		50/50		1	.0.3411				
	247902			05FR-21	.G E			11.0529		50/50		1	1.0529				
	247903			05FR-22	GE	_		10.5828		50/50		1	.0.5828				
	247904			05FR-3	GE	_		21.4343		50/50		2	1.4343				
	247905			05FR-40	G E	_		16.7875		50/50		1	.6.7875				
	247906			05MDL-				22.0130		50/50		1	1.0272				
	24/90/			05MDL-2G E			USMDL-2G E 11.0272 50/50								1	1.0272	
	24/912							11.0272		50/50		1	1.0272				
	247913			T-127	F			11.0272		50/50		1	1 0272				
	250163			Y3-0991	RAT			0 2470		50/50			0 2470				
	250167			Y3-100	BAT			0.2470		50/50			0.2470				
	251823			Z1-065 I	ЗАТ			0.6559		50/50			0.6559				
	274775			LINCOLN	;6U			1.3730		50/50			1.3730				
	274776			LINCOLN	;7U			1.3730		50/50			1.3730				
	274777			LINCOLN	;8U			1.3730		50/50			1.3730				
	922912			AB1-08	30			0.7374		50/50			0.7374				
	930041			AB1-00	6 C			0.6182		50/50			0.6182				
	930042			AB1-00	6 E			23.9842		50/50		2	3.9842				
	930461			AB1-08	37			93.7805		50/50		9	3.7805				
	930471			AB1-08	38			93.7805	50/50			93.7805					
	932601			AC2-080	C 01			3.4757		50/50		3.4757					
	932602			AC2-080	E 01			23.2603	50/50			2	23.2603				
	933281			AC2-14	0 C			4.1348	50/50			· · · ·	4.1348				
	933282			AC2-14	0 E			0.2176	50/50			0.2176					
	933441			AC2-15	7 C			12.9588		50/50		12.9588					

Bus #	Bus	Gendeliv MW Impact	Туре	Full MW Impact
933442	AC2-157 E	21.1432	50/50	21.1432
937041	AD2-138 C	4.7055	50/50	4.7055
937042	AD2-138 E	22.0305	50/50	22.0305
940581	AE2-045 C O1	15.7742	50/50	15.7742
940582	AE2-045 E O1	21.6562	50/50	21.6562
941341	AE2-130 C	151.2912	50/50	151.2912
941342	AE2-130 E	100.8608	50/50	100.8608
941571	AE2-154 C	4.4798	50/50	4.4798
941572	AE2-154 E	29.9802	50/50	29.9802
942601	AE2-276	8.5255	50/50	8.5255
944201	AF1-088 FTIR	170.5100	50/50	170.5100
945391	AF1-204 C O1	6.7014	50/50	6.7014
945392	AF1-204 E O1	20.1042	50/50	20.1042
945421	AF1-207 C	4.7318	50/50	4.7318
945422	AF1-207 E	20.3188	50/50	20.3188
945501	AF1-215 C O1	22.2516	50/50	22.2516
945502	AF1-215 E O1	14.8344	50/50	14.8344
946581	AF1-322 C	11.5786	50/50	11.5786
946582	AF1-322 E	15.9894	50/50	15.9894
957141	AF2-008 FTIR	85.2550	50/50	85.2550
957142	AF2-008 NFTI	170.5100	50/50	170.5100
957403	AF2-034 BAT	2.2148	50/50	2.2148
957841	AF2-078 C O1	16.7004	50/50	16.7004
957842	AF2-078 E O1	11.1336	50/50	11.1336
958381	AF2-132 C	23.0184	50/50	23.0184
958382	AF2-132 E	15.3456	50/50	15.3456
958391	AF2-133 C	23.4162	50/50	23.4162
958392	AF2-133 E	15.6108	50/50	15.6108
958401	AF2-134 C	7.4172	50/50	7.4172
958402	AF2-134 E	4.9448	50/50	4.9448
958971	AF2-188 C O1	9.3643	50/50	9.3643
958972	AF2-188 E O1	6.2429	50/50	6.2429
958981	AF2-189 C O1	13.5756	50/50	13.5756
958982	AF2-189 E O1	9.0504	50/50	9.0504
958991	AF2-190 C	20.0460	50/50	20.0460
958992	AF2-190 E	13.3640	50/50	13.3640
959141	AF2-205 C	15.8016	50/50	15.8016
959142	AF2-205 E	10.5344	50/50	10.5344
960621	AF2-353 C	176.5064	50/50	176.5064
960622	AF2-353 E	75.6456	50/50	75.6456
960681	AF2-359 C	7.9995	50/50	7.9995
960682	AF2-359 E	5.3330	50/50	5.3330
WEC	WEC	3.0105	Confirmed LTF	3.0105
CALDERWOOD	CALDERWOOD	1.0064	Confirmed LTF	1.0064
LGE-0012019	LGE-0012019	6.3129	LTF	6.3129
CBM-W2	CBM-W2	25.5446	Confirmed LTF	25.5446
NY	NY	1.1386	Confirmed LTF	1.1386
CBM-W1	CBM-W1	84.7928	Confirmed LTF	84.7928
O-066	O-066	12.7882	Confirmed LTF	12.7882
CHEOAH	CHEOAH	1.0105	Confirmed LTF	1.0105
G-007	G-007	1.9822	Confirmed LTF	1.9822
MADISON	MADISON	36.3807	Confirmed LTF	36.3807

Bus #	Bus	Gendeliv MW Impact	Туре	Full MW Impact
MEC	MEC	12.0955	Confirmed LTF	12.0955
BLUEG	BLUEG	29.7030	Confirmed LTF	29.7030
TRIMBLE	TRIMBLE	10.3576	Confirmed LTF	10.3576
CATAWBA	CATAWBA	0.7238	Confirmed LTF	0.7238

#### **11.7 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
AB1-006	Meadow Lake 345kV	In Service
AB1-080	Dumont-Olive 345kV	In Service
AB1-087	Sullivan 345kV #1	Active
AB1-088	Sullivan 345kV #2	Active
AC2-080	Olive-Reynolds 345kV	Active
AC2-140	DC Cook Unit 2	Engineering and Procurement
AC2-157	Sullivan 345 kV	Active
AD2-138	Olive-Reynolds 345kV	Active
AE2-045	Olive-Reynolds 345 kV	Active
AE2-130	Rockport 765 kV	Active
AE2-154	Meadow Lake 345 kV (MLV VIII)	Active
AE2-276	Sullivan 345kV	Active
AF1-088	Sullivan 345 kV	Active
AF1-204	Eugene 345 kV	Active
AF1-207	Reynolds–Olive #1 345 kV	Active
AF1-215	Reynolds-Olive 345 kV	Active
AF1-322	Meadow Lake 345 kV	Active
AF2-008	Sullivan 345 kV	Active
AF2-034	Kendall	Active
AF2-078	Reynolds-Olive #1 345 kV	Active
AF2-132	Reynolds-Olive #1 345 kV	Active
AF2-133	Reynolds-Olive #2 345 kV	Active
AF2-134	Reynolds-Olive #2 345 kV	Active
AF2-188	Reynolds-Meadow Lake #1 345 kV	Active
AF2-189	Greentown 138 kV	Active
AF2-190	Olive-Reynolds #2 345 kV	Active
AF2-205	Olive-Reynolds #2 345 kV	Active
AF2-353	Rockport 765 kV	Active
AF2-359	Olive-University Park 345 kV	Active
Y3-099	Beckjord 2 MW-1	In Service
Y3-100	Beckjord 2 MW-2	In Service
Z1-065	Wiley 34.5kV	In Service

# **11.8 Contingency Descriptions - Primary POI**

Contingency Name	Contingency Definition	
AEP_P1-2_#709	CONTINGENCY 'AEP_P1-2_#709' OPEN BRANCH FROM BUS 242924 TO BUS 243208 CKT 1 243208 05JEFRSO 765 1 END	/ 242924 05HANG R 765
AEP_P4_#6189_05HANG R 765_D1	CONTINGENCY 'AEP_P4_#6189_05HANG R 765_D1' OPEN BRANCH FROM BUS 242921 TO BUS 242924 CKT 1 242924 05HANG R 765 1 OPEN BRANCH FROM BUS 242924 TO BUS 243208 CKT 1 243208 05JEFRSO 765 1 OPEN BRANCH FROM BUS 242921 TO BUS 242934 CKT 1 242934 05CORNU 345 1 REMOVE UNIT 1A FROM BUS 247245 /2 REMOVE UNIT 1B FROM BUS 247246 /2 REMOVE UNIT 1S FROM BUS 247247 /2 REMOVE UNIT 1S FROM BUS 247248 /2 REMOVE UNIT 2A FROM BUS 247249 /2 REMOVE UNIT 2B FROM BUS 247250 /2 REMOVE UNIT 2S FROM BUS 247250 /2 END	/ 242921 05CORNU 765 / 242924 05HANG R 765 / 242921 05CORNU 765 247245 05HRKG1A 18.0 247246 05HRKG1B 18.0 247247 05HRKG1S 18.0 247248 05HRKG2A 18.0 247249 05HRKG2B 18.0 247250 05HRKG2S 18.0

#### **12 Light Load Analysis**

Light Load Studies (As applicable)

No Applicable.

#### **13 Short Circuit Analysis**

The following Breakers are overdutied:

To be determined during later study phases.

#### **14 Stability and Reactive Power Assessment**

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

To be determined during later study phases.

#### **15 Affected Systems**

#### 15.1 TVA

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

#### **15.2 Duke Energy Progress**

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

#### 15.3 MISO

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

#### 15.4 LG&E

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

#### 15 Summer Peak – Load Flow Analysis – Secondary POI

The Queue Project AF2-133 was evaluated as a 300.0 MW (Capacity 180.0 MW) injection tapping the Reynolds to Olive 345 kV line, ckt. 1 in the AEP area. Project AF2-133 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AF2-133 was studied with a commercial probability of 53.0 %. Potential network impacts were as follows:

#### **15.1 Generation Deliverability**

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

None

#### **15.2 Multiple Facility Contingency**

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

None

#### **15.3 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	FRO M BUS ARE A	TO BUS#	TO BUS	kV	TO BUS ARE A	СК Т ID	CONT NAME	Туре	Ratin g MVA	PRE PROJEC T LOADIN G %	POST PROJEC T LOADIN G %	AC D C	MW IMPAC T
952849 97	24286 5	05JEFRS O	345. 0	AEP	24800 0	06CLIF TY	345. 0	OVE C	Z1	AEP_P4_#6189_05H ANG R 765_D1	break er	2354. 0	106.54	107.37	DC	39.06

#### 15.4 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	FRO M BUS AREA	TO BUS#	TO BUS	kV	TO BUS ARE A	СК Т ID	CONT NAME	Туре	Rating MVA	PRE PROJECT LOADIN G %	POST PROJECT LOADIN G %	AC D C	MW IMPAC T
9528541 1	24286 5	05JEFRS O	345. 0	AEP	24800 0	06CLIFT Y	345. 0	OVE C	Z1	AEP_P1 - 2_#709	operatio n	2354. 0	105.12	105.93	DC	39.14

#### 15.5 Flow Gate Details - Secondary POI

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".

#### 15.5.1 Index 1

ID	FROM	FROM	FRO	TO BUS#	TO BUS	TO	СК	CONT NAME	Туре	Rating	PRE	POST	AC D	MW				
	B03#	803	BUS AREA	803#		ARE A	ч ID			WIVA	LOADIN G %	LOADIN G %	Ľ	T				
9528499	24286	05JEFRS	AEP	24800	06CLIFT	OVE	Z1	AEP_P4_#6189_05HAN	l breake	2354.	106.54	107.37	DC	39.06				
7	5	0		0	Y	C		G R 765_D1	r	0								
	Bus #			Bus		(	Gende	liv MW Impact		Туре		Full N	/W Impa	act				
	243441			05CKG	62			21.5468		50/50		21.5468						
	243442			05RKG	61			71.7661		50/50		7	1.7661					
	243443			05RKG	62			70.6787		50/50		7	0.6787					
	243859			05FR-11	GC			0.4541		50/50		(	0.4541					
	243862			05FR-12	G C			0.4471		50/50		(	0.4471					
	243864			05FR-21	G C			0.4772	50/50			(	0.4772					
	243866			05FR-22	G C			0.4564	•	50/50			0.4564					
	243870			05FR-3	GC			0.9243		50/50			0.9243					
	243873			05FR-40	GC	_		0./158		50/50		(	0./158					
	244130							12.4444	-	50/50		1	2.4444					
	246909					-		0.9511		50/50			J.9511					
	240910							0.4708	•	50/50			0.4708					
	240370					-		0.4803		50/50			0.4603					
	247556			T-127	<u>د</u>			0.4755		50/50			0.4755					
	247900			05FR-11	GE			10.5157		50/50		1	0.5157					
	247901			05FR-12	GE			10.3411	50/50		50/50		50/50			10.341		
	247902			05FR-21	.G E			11.0529		50/50		1	1.0529					
	247903			05FR-22	G E			10.5828		, 50/50		1	0.5828					
	247904			05FR-3	G E			21.4343		50/50		2	1.4343					
	247905			05FR-4	G E			16.7875		50/50		1						
	247906			05MDL-2	lg e			22.0130		50/50		22.0130						
	247907			05MDL-2	2G E			11.0272		50/50		1	1.0272					
	247912			05MDL-3G E 11.0272 50/50						50/50			1.0272					
	247913			05MDL-4	4G E			11.0272		50/50		1	1.0272					
	247943			T-127	E			11.0272	-	50/50		1	1.0272					
	250163			Y3-099 I	BAT	_		0.2470	-	50/50			0.2470					
	250167			Y3-100	BAI			0.2470	-	50/50		(	0.2470					
	251823					-		0.0559		50/50			J.0559					
	274775				;00			1.3730		50/50			1.3730					
	274770				.811	-		1.3730		50/50			1 3730					
	922912			AB1-0	,00 R0			0 7374		50/50			1 7374					
	930041			AB1-00	6 C			0.6182		50/50			0.6182					
	930042			AB1-00	6 E			23.9842	50/50			2	3.9842					
	930461			AB1-08	37		93.7805			50/50		9	3.7805					
	930471			AB1-08	38	93.7805				50/50		93.7805						
	932601			AC2-080	C 01	3.4757				50/50		3.4757						
	932602			AC2-080	E 01	23.2603				50/50		23.2603						
	933281			AC2-14	AC2-140 C 4.1348					50/50			4.1348					
	933282			AC2-14	0 E			0.2176		50/50		0.2176						
933441			AC2-157 C					12.9588		50/50		12.9588						

Bus #	Bus	Gendeliv MW Impact	Туре	Full MW Impact
933442	AC2-157 E	21.1432	50/50	21.1432
937041	AD2-138 C	4.7055	50/50	4.7055
937042	AD2-138 E	22.0305	50/50	22.0305
940581	AE2-045 C O1	15.7742	50/50	15.7742
940582	AE2-045 E O1	21.6562	50/50	21.6562
941341	AE2-130 C	151.2912	50/50	151.2912
941342	AE2-130 E	100.8608	50/50	100.8608
941571	AE2-154 C	4.4798	50/50	4.4798
941572	AE2-154 E	29.9802	50/50	29.9802
942601	AE2-276	8.5255	50/50	8.5255
944201	AF1-088 FTIR	170.5100	50/50	170.5100
945391	AF1-204 C O1	6.7014	50/50	6.7014
945392	AF1-204 E O1	20.1042	50/50	20.1042
945421	AF1-207 C	4.7318	50/50	4.7318
945422	AF1-207 E	20.3188	50/50	20.3188
945501	AF1-215 C O1	22.2516	50/50	22.2516
945502	AF1-215 E O1	14.8344	50/50	14.8344
946581	AF1-322 C	11.5786	50/50	11.5786
946582	AF1-322 E	15.9894	50/50	15.9894
957141	AF2-008 FTIR	85.2550	50/50	85.2550
957142	AF2-008 NFTI	170.5100	50/50	170.5100
957403	AF2-034 BAT	2.2148	50/50	2.2148
957841	AF2-078 C O2	16.7220	50/50	16.7220
957842	AF2-078 E O2	11.1480	50/50	11.1480
958381	AF2-132 C O2	22.9896	50/50	22.9896
958382	AF2-132 E O2	15.3264	50/50	15.3264
958391	AF2-133 C O2	23.4378	50/50	23.4378
958392	AF2-133 E O2	15.6252	50/50	15.6252
958401	AF2-134 C O2	7.4310	50/50	7.4310
958402	AF2-134 E O2	4.9540	50/50	4.9540
958971	AF2-188 C O2	9.3630	50/50	9.3630
958972	AF2-188 E O2	6.2420	50/50	6.2420
958981	AF2-189 C O2	13.4838	50/50	13.4838
958982	AF2-189 E O2	8.9892	50/50	8.9892
958991	AF2-190 C O2	19.5172	50/50	19.5172
958992	AF2-190 E O2	13.0114	50/50	13.0114
959141	AF2-205 C	15.8016	50/50	15.8016
959142	AF2-205 E	10.5344	50/50	10.5344
960621	AF2-353 C	176.5064	50/50	176.5064
960622	AF2-353 E	75.6456	50/50	75.6456
960681	AF2-359 C O2	8.1983	50/50	8.1983
960682	AF2-359 E O2	5.4655	50/50	5.4655
WEC	WEC	3.0105	Confirmed LTF	3.0105
CALDERWOOD	CALDERWOOD	1.0064	Confirmed LTF	1.0064
LGE-0012019	LGE-0012019	6.3129	LTF	6.3129
CBM-W2	CBM-W2	25.5446	Confirmed LTF	25.5446
NY	NY	1.1386	Confirmed LTF	1.1386
CBM-W1	CBM-W1	84.7928	Confirmed LTF	84.7928
O-066	0-066	12.7882	Confirmed LTF	12.7882
CHEOAH	CHEOAH	1.0105	Contirmed LTF	1.0105
G-007	G-007	1.9822	Contirmed LTF	1.9822
MADISON	MADISON	36.3807	Confirmed LTF	36.3807

Bus #	Bus	Gendeliv MW Impact	Туре	Full MW Impact		
MEC	MEC	12.0955	Confirmed LTF	12.0955		
BLUEG	BLUEG	29.7030	Confirmed LTF	29.7030		
TRIMBLE	TRIMBLE	10.3576	Confirmed LTF	10.3576		
CATAWBA	CATAWBA	0.7238	Confirmed LTF	0.7238		

# 15.6 Contingency Descriptions - Secondary POI

Contingency Name	Contingency Definition	
AEP_P1-2_#709	CONTINGENCY 'AEP_P1-2_#709' OPEN BRANCH FROM BUS 242924 TO BUS 243208 CKT 1 243208 05JEFRSO 765 1 END	/ 242924 05HANG R 765
AEP_P4_#6189_05HANG R 765_D1	CONTINGENCY 'AEP_P4_#6189_05HANG R 765_D1' OPEN BRANCH FROM BUS 242921 TO BUS 242924 CKT 1 242924 05HANG R 765 1 OPEN BRANCH FROM BUS 242924 TO BUS 243208 CKT 1 243208 05JEFRSO 765 1 OPEN BRANCH FROM BUS 242921 TO BUS 242934 CKT 1 242934 05CORNU 345 1 REMOVE UNIT 1A FROM BUS 247245 // REMOVE UNIT 1B FROM BUS 247246 // REMOVE UNIT 1S FROM BUS 247247 // REMOVE UNIT 1S FROM BUS 247248 // REMOVE UNIT 2A FROM BUS 247249 // REMOVE UNIT 2B FROM BUS 247250 // REMOVE UNIT 2S FROM BUS 247250 // END	/ 242921 05CORNU 765 / 242924 05HANG R 765 / 242921 05CORNU 765 247245 05HRKG1A 18.0 247246 05HRKG1B 18.0 247247 05HRKG1S 18.0 247248 05HRKG2A 18.0 247249 05HRKG2B 18.0 247250 05HRKG2S 18.0

#### 16 Light Load Analysis – Secondary POI

Light Load Studies (As applicable)

Not applicable.

#### 17 Short Circuit Analysis – Secondary POI

The following Breakers are overdutied:

To be determined during later study phases.

#### 18 Stability and Reactive Power Assessment – Secondary POI

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

To be determined during later study phases.

#### **19 Affected Systems – Secondary POI**

#### 19.1 TVA

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

#### **19.2 Duke Energy Progress**

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

#### 19.3 MISO

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

#### 19.4 LG&E

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



#### 20 Attachment 1: One Line Diagram and Site Location – Primary POI





#### 21 Attachment 2: One Line Diagram - Secondary POI



# Generation Interconnection System Impact Study Report for Queue Project AF2-133 REYNOLDS-OLIVE #2 345 KV 180 MW Capacity / 300 MW Energy

February 2021

# **Table of Contents**

1	In	troduction	4
2	Pr	eface	4
3	Ge	eneral	5
4	Рс	pint of Interconnection	6
5	Сс	ost Summary	6
6	Tr	ansmission Owner Scope of Work	8
	6.1	Attachment Facilities	8
	6.2	Direct Connection Cost Estimate	8
	6.3	Non-Direct Connection Cost Estimate	8
7	Sc	hedule	9
8	In	terconnection Customer Requirements	9
9	Re	evenue Metering and SCADA Requirements	.10
	9.1	PJM Requirements	.10
	9.2	Meteorological Data Reporting Requirements	.10
	9.3	Interconnected Transmission Owner Requirements	.10
10	)	Summer Peak Analysis	.11
	10.1	Generation Deliverability	.11
	10.2	Multiple Facility Contingency	.11
	10.3	Contribution to Previously Identified Overloads	.11
	10.4	Steady-State Voltage Requirements	.11
	10.5	Potential Congestion due to Local Energy Deliverability	.11
	10.6	System Reinforcements	.13
	10.7	Flow Gate Details	.15
	10	).7.1 Index 1	.16
	10	).7.2 Index 2	.19
	10.8	Queue Dependencies	.23
	10.9	Contingency Descriptions	.25
11	-	Light Load Analysis	.26
12	2	Short Circuit Analysis	.26
13	6	Stability and Reactive Power	.26
14	ŀ	Affected Systems	.27

14.1	TVA	27
14.2	2 Duke Energy Progress	27
14.3	8 MISO	27
14.4	LG&E	27
15	Attachment 1: One Line Diagram and Project Site Location	28

#### **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 AEP.

#### 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 generating facility located in Pulaski County, Indiana. The installed facilities will have a total capability of 300 MW with 180 MW of this output being recognized by PJM as Capacity.

The proposed in-service date for this project is May 31, 2021. This study does not imply a TO commitment to this in-service date.

Queue Number	AF2-133
Project Name	REYNOLDS-OLIVE #2 345 KV
State	Indiana
County	Pulaski
Transmission Owner	AEP
MFO	300
MWE	300
MWC	180
Fuel	Solar
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

AF2-133 will interconnect with the AEP transmission system via a new switching station cut into the Olive (AEP) – Reynolds (NIPSCO) 345kVcircuit #2

To accommodate the interconnection on the Olive (AEP) – Reynolds (NIPSCO) 345 kV circuit #2, a new three (3) circuit breaker 345 kV switching station physically configured and operated as a ring-bus will be constructed (see Attachment 1). Installation of associated protection and control equipment, line risers, SCADA, jumpers, switches, and 345 kV revenue metering will also be required. AEP reserves the right to specify the final acceptable configuration considering design practices, future expansion, and compliance requirements.

AEP will extend one span of 345 kV transmission line for the generation-leads going to the AF2-133 site. Unless this span extends directly from within the AEP station at the POI to the IC collector station structure, AEP will build and own the first transmission line structure outside of the proposed 345 kV station fence to which the AEP and AF2-133 transmission line conductors will attach.

## 5 Cost Summary

The AF2-133 project will be responsible for the following costs:

Description	Total Cost
Total Physical Interconnection Costs	\$19,777,000**
Allocation towards System Network Upgrade Costs*	\$8,061,200
Total Costs	\$27,838,200**

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

\*\*Additional Physical Interconnection Costs (Non-Direct) to be determined by NIPSCO.

The estimates provided in this report are preliminary in nature, as they were determined without the benefit of detailed engineering studies. Final estimates will require an on-site review and coordination to determine final construction requirements. In addition, Stability analysis will be completed during the Facilities Study stage. It is possible that a need for additional upgrades could be identified by these studies.

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 2016-36, 2016-25 I.R.B. (6/20/2016). 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.

#### **ATTACHMENT KP-8**

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.

Note 2: 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.

# 6 Transmission Owner Scope of Work

The total physical interconnection costs is given in the table below:

## 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
345 kV Revenue Metering	\$431,000
Generator lead first span exiting the POI station, including the first structure outside the fence	\$651,000
Total Attachment Facility Costs	\$1,082,000

# 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
A new three (3) circuit breaker 345 kV switching station physically configured and operated as a ring bus will be constructed (see Attachment 1). Installation of associated protection and control	\$17,440,000
equipment, 345 kV line risers, and SCADA will also be required.	
Total Direct Connection Facility Costs	\$17,440,000

# 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
Olive (AEP) – Reynolds (NIPSCO) circuit #2 345kV T-Line Cut In	\$1,210,000
Review Protection and Control Settings at the Olive (AEP) 345 kV station	\$45,000
Review Protection and Control Settings at the Reynolds (NIPSCO) 345 kV station	TBD by NIPSCO**
Total Non-Direct Connection Facility Costs	\$1,255,000

#### 7 Schedule

It is anticipated that the time between receipt of executed Agreements and Commercial Operation may range from 12 to 18 months if no line work is required. If line work is required, construction time would generally be between 24 to 36 months after Agreement execution.

#### 8 Interconnection Customer Requirements

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

The Generation Interconnection Agreement does not in or by itself establish a requirement for the 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.

- 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) (Required for plants with Maximum Facility Output of 3 MW or higher)
- Irradiance (Watts/meter2) (Required for plants with Maximum Facility Output of 3 MW or higher)
- 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 Interconnected 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 AF2-133 was evaluated as a 300.0 MW (Capacity 180.0 MW) injection into a tap of the Reynolds to Olive 345kV line, ckt. 2 (specifically the AF1-205 Tap to AF1-215 Tap line segment) in the AEP area. Project AF2-133 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AF2-133 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)

#### None

#### **10.2 Multiple Facility Contingency**

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

#### None

#### **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	FRO M BUS#	FROM BUS	kV	FRO M BUS ARE A	TO BUS#	TO BUS	kV	TO BUS ARE A	CK T ID	CONT NAME	Туре	Ratin g MVA	PRE PROJEC T LOADI NG %	POST PROJEC T LOADI NG %	AC D C	MW IMPA CT
952849 97	2428 65	05JEFRS O	345. 0	AEP	2480 00	06CLIFTY	345. 0	OVE C	Z1	AEP_P4_#6189_05H ANG R 765_D1	break er	2354. 0	100.51	101.15	AC	39.32
987125	2646	19MON	345.	ІТСТ	2419	02LALLEND	345.	ATSI	1	ATSI-P7-1-TE-138-	tower	1702.	112.28	112.29	AC	19.35
85	12	12	0		01	ORF	0			025T-A		0				

#### **10.4 Steady-State Voltage Requirements**

To be determined

#### **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.

# ATTACHMENT KP-8

ID	FROM BUS#	FROM BUS	kV	FRO M	TO BUS#	TO BUS	kV	TO BUS	СК Т	CONT NAME	Туре	Rating MVA	PRE PROJECT	POST PROJECT	AC D C	MW IMPAC
				BUS AREA				ARE A	ID				LOADIN G %	LOADIN G %		т
9528541 1	24286 5	05JEFRS O	345. 0	AEP	24800 0	06CLIFT Y	345. 0	OVE C	Z1	AEP_P1 - 2_#709	operatio n	2354. 0	98.87	99.5	AC	39.4

# **10.6 System Reinforcements**

ID	ldx	Facility	Upgrade	Description				Cost	Cost Allocated to AF2-133	Upgrade Number
98712585	2	19MON12 345.0 kV - 02LALLENDORF 345.0 kV Ckt 1	MISO endupgrades January 3 ATSI end ATSI end ATSI upg Recondu Monroe 3 Replace 9 Traps, Bi Lallendo Emergen Cost esti N6292. The cost Queu e AF2- 096 AF2- 132 AF2- 133 Note: the in the Fa	d SE rating i s #13814 an 2022. This d SE rating in grade: actor the exi 345kV line visual substation of itronics Met rf substation acy rating to mate is \$26 allocation i MW contribu- tion 23.7 19.7 19.4 e tower con- cilities Stud	is 1975 M nd #1587 rating is s 1824 M sting 6.5 with bun conducto ter for th n to incr o at least .095 M. s: Sum mer/ Light Load Sum mer Sum mer Sum mer Sum mer	4VA once MT 78 are compl sufficient. IVA. IVA. Miles of Lall dled (2) 795 r, Line Drop, e Monroe 34 ease the Sum 2578 MVA for PJM Network PJM Network PJM Network 37.74% 31.37% 30.89% Should be re St and ITC.	EP eted by endorf- 26/7 ACSS. Wave 5kV exit at imer or ATSI. c Upgrade \$ cost (\$26.095 M) 9.8480 8.1859 8.0612 -confirmed	\$26.095 M	\$8.0612 M	MTEP # 13814 MTEP # 15878 N6292

# **ATTACHMENT KP-8**

ID	ldx	Facility	Upgrade Description	Cost	Cost Allocated to AF2-133	Upgrade Number
95284997	1	05JEFRSO 345.0 kV - 06CLIFTY 345.0 kV Ckt Z1	<ul> <li>(N4106.1) Replace 4 Clifty switches. \$2M. 12-18 months.</li> <li>(N4106.3) A sag check will be required for the ACSR ~ 2156 ~ 84/19 ~ BLUEBIRD Conductor Section 1 to determine if the line section can be operated above its emergency rating. Past/preliminary sag study results (from Z1-070 Facilities Study): Jefferson – Clifty Creek 345 kV line work will include one location of grading to remediate clearance location of concern in span 1 to 2. Cost is \$244 K. 6-12 months. New SE rating on line expected to be 2826 MVA.</li> <li>If rebuild needed (N4106.4), rebuild the 0.75 mile ACSR ~ 2156 ~ 84/19 ~ BLUEBIRD @ 284 F - Conductor section 1. \$1.96M. New conductor SE rating to be 3212 MVA SE. New SE rating on line expected to be 2826 MVA.</li> <li>These upgrades are driven by prior queue cycles. The overload on the line seen in prior queue cycles is for a different contingency than the contingency listed in this AF2-205 report.</li> </ul>	\$2 M \$244 K \$1.96 M	\$0	N4106.1 N4106.3 N4106.4
			Total Cost	620 200 000	CO 0C1 200	

Total Cost \$30,299,000 \$8,061,200

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	FRO M BUS AREA	TO BUS#	TO BUS	TO BUS ARE A	CK T ID	CONT NAME	Туре	Rating MVA	PRE PROJECT LOADIN G %	POST PROJECT LOADIN G %	AC D C	MW IMPAC T
9528499	24286	05JEFRS	AEP	24800	06CLIFT	OVE	Z1	AEP_P4_#6189_05HAN	N breake	2354.	100.51	101.15	AC	39.32
7	5	0		0	Y	C	C G K 765_D1		r	0				
	Bus #			Bus			Gende	liv MW Impact		Туре		Full N	/W Impa	act
	243441			05CKG	i2			21.1833	50/50			21.1833		
	243442			05RKG	i1			70.1345		, 50/50		7	0.1345	
	243443			05RKG	i2			69.0719		50/50		6	9.0719	
	243859			05FR-11	GC			0.4456		50/50		(	0.4456	
	243862			05FR-12	G C			0.4388		50/50		(	0.4388	
	243864			05FR-21	G C			0.4684		50/50		(	0.4684	
	243866			05FR-22	GC			0.4479		50/50		(	0.4479	
	243870			05FR-30	ЭC			0.9072		50/50		(	0.9072	
	243873			05FR-40	ЭC			0.7025		50/50		(	0.7025	
	244130			05ST.JOE	CTR			12.2353		50/50		1	2.2353	
	246909			05MDL-2	lg C			0.9332		50/50		(	0.9332	
	246910			05MDL-2	2G C			0.4619		50/50		(	0.4619	
	246976			05MDL-3	BG C			0.4712		50/50		(	0.4712	
	246979			05MDL-4	ig c			0.4596		50/50		(	0.4596	
	247556			T-127 C 0.4666		0.4666	50/50			0.4666				
	247900			05FR-11	G E	E 10.5940		10.5940	50/50			10.5940		
	247901			05FR-12	G E			10.4181	50/50			1	0.4181	
	247902			05FR-21	G E			11.1352	50/50			1	1.1352	
	247903			05FR-22	G E			10.6616	50/50			10.6616		
	247904			05FR-3	GE			21.5939	50/50			21.5939		
	247905			05FR-4	GE			16.9125	50/50			16.9125		
	247906			05MDL-2	LG E			22.1712		50/50		22.1712		
	247907			05MDL-2	2G E	_		11.1064		50/50		11.1064		
	247912			05MDL-3	BG E			11.1064	50/50			11.1064		
	247913			05MDL-4		_		11.1064		50/50		11.1064		
	247943			1-127				11.1064		50/50		1	1.1064	
	250163			¥3-0991				0.2450		50/50			J.2450	
	250107			71 065 1				0.2450		50/50			0.2450	
	251625							1 2502		50/50			1 2502	
	274775				.00			1.3503		50/50		· · · ·	1 3503	
	274777				·811			1.3503		50/50			1 3503	
	913222			V1_05/	,80 F			-1 9596		Adder			-2 31	
	922912			ΔB1-02	R0			0.7251		50/50			1 7251	
	930041			AB1-00	6 C			0.6066		50/50			0.6066	
	930042			AB1-00	6 E			24.1564		50/50		2	4.1564	
	930461			AB1-08	37			94.3305		50/50		q	4.3305	
	930471			AB1-08	38			94.3305		50/50		9	4.3305	
	932601			AC2-080	C 01			3.5017		50/50		3,5017		
	932602			AC2-080	E 01			23.4343		50/50		2	3.4343	
	933281			AC2-14	0 C			4.1728		50/50			4.1728	
	933282			AC2-14	0 E			0.2196		50/50		(	0.2196	

Bus #	Bus	Gendeliv MW Impact	Туре	Full MW Impact
933441	AC2-157 C	13.0348	50/50	13.0348
933442	AC2-157 E	21.2672	50/50	21.2672
937041	AD2-138 C	4.7407	50/50	4.7407
937042	AD2-138 E	22.1953	50/50	22.1953
939641	AE1-194 C	2.8023	Adder	3.3
939642	AE1-194 E	18.7537	Adder	22.06
939651	AE1-195 C	5.7477	Adder	6.76
939652	AE1-195 E	38.4651	Adder	45.25
939681	AE1-198 C	17.0661	Adder	20.08
939682	AE1-198 E	14.5018	Adder	17.06
940581	AE2-045 C O1	11.3508	50/50	11.3508
940582	AE2-045 E O1	15.5852	50/50	15.5852
941341	AE2-130 C	151.7712	50/50	151.7712
941342	AE2-130 E	101.1808	50/50	101.1808
941571	AE2-154 C	4.5120	50/50	4.5120
941572	AE2-154 E	30.1955	50/50	30.1955
942601	AE2-276	8.5755	50/50	8.5755
944201	AF1-088 FTIR	171.5100	50/50	171.5100
945391	AF1-204 C O1	6.7651	50/50	6.7651
945392	AF1-204 E O1	20.2954	50/50	20.2954
945421	AF1-207 C	4.7658	50/50	4.7658
945422	AF1-207 E	20 4648	50/50	20 4648
945501	AF1-215 C O1	22 4298	50/50	22 4298
945502	AF1-215 E O1	14 9532	50/50	14 9532
946581	AF1-322 C	11 6617	50/50	11 6617
946582	ΔF1-322 E	16 1043	50/50	16 1043
957141	AF2-008 FTIR	85 7550	50/50	85 7550
957142	AF2-008 NFTI	85.7550	50/50	85,7550
957393	AF2-033 BAT	2,1964	50/50	2,1964
957841	AF2-078 C O1	16.8204	50/50	16.8204
957842	AF2-078 F 01	11.2136	50/50	11,2136
958381	AF2-132 C O1	23.1984	50/50	23.1984
958382	AF2-132 E O1	15.4656	50/50	15.4656
958391	AF2-133 C O1	23.5944	50/50	23.5944
958392	AF2-133 E O1	15.7296	50/50	15.7296
958401	AF2-134 C O1	7.4766	50/50	7.4766
958402	AF2-134 E O1	4.9844	50/50	4.9844
958971	AF2-188 C O1	9.4315	50/50	9.4315
958972	AF2-188 E O1	6.2877	50/50	6.2877
958981	AF2-189 C O1	13.6656	50/50	13.6656
958982	AF2-189 E O1	9.1104	50/50	9.1104
959141	AF2-205 C	15.9216	50/50	15.9216
959142	AF2-205 E	10.6144	50/50	10.6144
960681	AF2-359 C	8.0625	50/50	8.0625
960682	AF2-359 E	5.3750	50/50	5.3750
BLUEG	BLUEG	29.5294	Confirmed LTF	29.5294
CBM-W2	CBM-W2	26.3636	Confirmed LTF	26.3636
NY	NY	1.0795	Confirmed LTF	1.0795
WEC	WEC	3.0416	Confirmed LTF	3.0416
O-066	O-066	12.0355	Confirmed LTF	12.0355
CHEOAH	CHEOAH	0.9605	Confirmed LTF	0.9605
G-007	G-007	1.8658	Confirmed LTF	1.8658

## ATTACHMENT KP-8

Bus #	Bus	Gendeliv MW Impact	Туре	Full MW Impact
MADISON	MADISON	36.3807	Confirmed LTF	36.3807
MEC	MEC	12.2544	Confirmed LTF	12.2544
CALDERWOOD	CALDERWOOD	0.9567	Confirmed LTF	0.9567
TRIMBLE	TRIMBLE	10.3025	Confirmed LTF	10.3025
LGE-GI-0012019	LGE-GI-0012019	20.3643	LTF	20.3643
CATAWBA	CATAWBA	0.6885	Confirmed LTF	0.6885
CBM-W1	CBM-W1	85.9812	Confirmed LTF	85.9812

#### 10.7.2 Index 2

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	СКТ ID	CONT NAME	Туре	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC DC	MW IMPACT
98712585	264612	19MON12	ITCT	241901	02LALLENDORF	ATSI	1	ATSI- P7-1- TE-138- 025T-A	tower	1702.0	112.28	112.29	AC	19.35

Bus #	Bus	Bus Gendeliv MW Impact Type		Full MW Impact
244357	05GRANGER EL	-0.1886	Adder	-0.22
244412	05WTRV SLR C	0.0400	50/50	0.0400
247528	05COVRT1	5.0703	50/50	5.0703
247529	05COVRT2	5.0703	50/50	5.0703
247530	05COVRT3	5.0703	50/50	5.0703
247531	05COVRT4	3.0431	50/50	3.0431
247532	05COVRT5	3.0431	50/50	3.0431
247533	05COVRT6	3.0431	50/50	3.0431
247604	X1-042	0.0537	50/50	0.0537
247966	05WTRV SLR E	0.2383	50/50	0.2383
247967	050LIV SLR E	0.1700	Adder	0.2
247969	Z2-116 E	0.0911	Adder	0.11
274788	SE CHICAG;5U	2.1081	Adder	2.48
	(Deactivation :			
	01/06/2020)			
274789	SE CHICAG;6U	2.1137	Adder	2.49
	(Deactivation :			
274700	01/06/2020)	2 4 4 4 5	Aulidau	2.52
2/4/90	SE CHICAG;/U	2.1415	Adder	2.52
	(Deactivation :			
274791	SE CHICAG:81	2 1415	Adder	2 52
2/4/51	(Deactivation :	2.1415	Adder	2.32
	01/06/2020)			
274792	SE CHICAG;9U	2.1458	Adder	2.52
	(Deactivation :			
	01/06/2020)			
274793	SE CHICAG;0U	2.1458	Adder	2.52
	(Deactivation :			
	01/06/2020)			
274794	SE CHICAG;1U	2.1458	Adder	2.52
	(Deactivation :			
274705	01/06/2020)	2.4450	ê dalan	2.52
274795	SE CHICAG;20	2.1458	Adder	2.52
	(Deactivation .			
274881		7 5410	Adder	8.87
275149	KELLYCK :1F	7.5410	Adder	8.87
276169	Z1-107 F	1.0639	Adder	1.25
910542	X3-005 E	0.3072	Adder	0.36
925961	AC1-072	0.4703	50/50	0.4703
927451	AC1-142A 1	1.7038	Adder	2.0

Bus #	Bus	Bus Gendeliv MW Impact Type		Full MW Impact	
927461	AC1-142A 2	1.7038	Adder	2.0	
930501	AB1-091 O1	29.6442	Adder	34.88	
931951	AB1-107 1 (Suspended)	-33.9403	Adder	-39.93	
931961	AB1-107 2 (Suspended)	-110.4147	Adder	-129.9	
932601	AC2-080 C O1	1.3835	Adder	1.63	
932602	AC2-080 E O1	9.2585	Adder	10.89	
932791	AC2-103 C	-3.7441	Adder	-4.4	
932931	AC2-117	2.5446	Adder	2.99	
933281	AC2-140 C	2.3731	Adder	2.79	
933282	AC2-140 E	0.1249	Adder	0.15	
933411	AC2-154 C	1.0234	Adder	1.2	
933412	AC2-154 E	1.6698	Adder	1.96	
934252	AD1-052 E1	-0.5412	Adder	-0.64	
934262	AD1-052 E2	-0.5412	Adder	-0.64	
936141	AD2-020 C O1	4.9990	Adder	5.88	
936142	AD2-020 E O1	3.0769	Adder	3.62	
936371	AD2-047 C O1	1.8314	Adder	2.15	
936372	AD2-047 E O1	8.9415	Adder	10.52	
936461	AD2-060	1.0773	Adder	1.27	
936601	AD2-075	20.2928	50/50	20.2928	
936631	AD2-079 C O1	0.8396	Adder	0.99	
936632	AD2-079 E O1	0.5597	Adder	0.66	
937041	AD2-138 C	1.8730	Adder	2.2	
937042	AD2-138 E	8.7690	Adder	10.32	
938261	AE1-039	0.0851	50/50	0.0851	
939351	AE1-166 C O1	4.1570	Adder	4.89	
939352	AE1-166 E O1	3.8372	Adder	4.51	
939391	AE1-170 C O1	4.8447	Adder	5.7	
939392	AE1-170 E O1	6.6903	Adder	7.87	
939631	AE1-193 C	3.6564	Adder	4.3	
939632	AE1-193 E	24.4701	Adder	28.79	
939641	AE1-194 C	3.6564	Adder	4.3	
939642	AE1-194 E	24.4701	Adder	28.79	
939651	AE1-195 C	3.6564	Adder	4.3	
939652	AE1-195 E	24.4701	Adder	28.79	
939681	AE1-198 C	10.8568	Adder	12.77	
939682	AE1-198 E	9.2255	Adder	10.85	
940581	AE2-045 C O1	4.4845	Adder	5.28	
940582	AE2-045 E O1	6.1575	Adder	7.24	
940752	AE2-062 E	0.0532	Adder	0.06	
941551	AE2-152 C O1	4.7966	Adder	5.64	
941552	AE2-152 E O1	3.1977	Adder	3.76	
941561	AE2-153 C O1	1.8900	Adder	2.22	
941562	AE2-153 E O1	8.8489	Adder	10.41	
943001	AE2-323 C	3.8875	Adder	4.57	
943002	AE2-323 E	1.9061	Adder	2.24	
943021	AE2-325 C	2.5318	Adder	2.98	
943022	AE2-325 E	1.6838	Adder	1.98	
943781	AF1-046 C	1.8146	Adder	2.13	
943782	AF1-046 E	1.2097	Adder	1.42	
944161	AF1-084 C	4.5217	Adder	5.32	
944162	AF1-084 E	2.5826	Adder	3.04	

944911   AF1-156 C   4.8325   Adder   5.69     944912   AF1-156 E   3.2217   Adder   3.79     944931   AF1-158 C 01   6.1590   Adder   7.25     944932   AF1-158 C 01   4.1060   Adder   4.83     944961   AF1-161 C   2.0190   Adder   2.38	
944912   AF1-156 E   3.2217   Adder   3.79     944931   AF1-158 C O1   6.1590   Adder   7.25     944932   AF1-158 E O1   4.1060   Adder   4.83     944961   AF1-161 C   2.0190   Adder   2.38	
944931   AF1-158 C 01   6.1590   Adder   7.25     944932   AF1-158 E 01   4.1060   Adder   4.83     944961   AF1-161 C   2.0190   Adder   2.38	
944932   AF1-158 E O1   4.1060   Adder   4.83     944961   AF1-161 C   2.0190   Adder   2.38	
944961 AF1-161 C 2.0190 Adder 2.38	
944962 AF1-161 E 2.0190 Adder 2.38	
945111 AF1-176 C O1 11.7203 Adder 13.79	)
945112 AF1-176 E O1 10.8651 Adder 12.78	3
945501 AF1-215 C O1 10.3856 Adder 12.22	2
945502 AF1-215 E O1 6.9238 Adder 8.15	
<b>950351</b> J466 7.2780 PJM External (MISO) 7.278 <sup>1</sup>	0
950791 J201 C 0.8594 PJM External (MISO) 0.859	4
950792 J201 E 3.4378 PJM External (MISO) 3.437	8
950942 J325 E 1.0038 PJM External (MISO) 1.003	8
952312 J646 E 0.4413 PJM External (MISO) 0.441	3
<b>952401</b> J752 C 3.6970 PJM External (MISO) 3.697	0
952402 J752 E 20.0020 PJM External (MISO) 20.002	20
952971 J793 362.9287 PJM External (MISO) 362.92	87
953271 J701 C 1.7987 PJM External (MISO) 1.798	7
953272 J701 E 9.7315 PJM External (MISO) 9.731	5
953291 I796 47.7116 PIM External (MISO) 47.711	6
953321 I799 53 3377 PIM External (MISO) 53 337	77
953781 1833 27 3810 PIM External (MISO) 27 381	10
955781 I1062 37 7295 PIM External (MISO) 37 729	95
956011 I1088 4 4873 PIM External (MISO) 4 487	3
956021 I1089 33 5971 PIM External (MISO) 33 597	5 71
956741 11172 10 9020 PIM External (MISO) 10 902	20
<b>957371</b> AF2-031 C O1 0.4444 Adder 0.52	-
957372 AF2-031 E O1 0.6666 Adder 0.78	
<b>957891</b> AF2-083 C O1 7.5539 Adder 8.89	
<b>957892</b> AF2-083 E O1 3.7770 Adder 4.44	
<b>958011</b> AF2-095 C O1 7.3256 Adder 8.62	
<b>958012</b> AF2-095 E O1 3.4473 Adder 4.06	
<b>958021</b> AF2-096 C 13.6878 Adder 16.1	
<b>958022</b> AF2-096 E 6.4413 Adder 7.58	
<b>958381</b> AF2-132 C O1 10.0429 Adder 11.82	2
958382 AF2-132 E O1 6.6953 Adder 7.88	
958391 AF2-133 C O1 9.8670 Adder 11.61	L
958392 AF2-133 E O1 6.5780 Adder 7.74	
958401 AF2-134 C 01 3.4619 Adder 4.07	
958402 AF2-134 E O1 2.3079 Adder 2.72	
959001 AF2-191 C 01 4.4925 Adder 5.29	
959002 AF2-191 E O1 2.9950 Adder 3.52	
959141 AF2-205 C 6.4923 Adder 7.64	
959142 AF2-205 E 4.3282 Adder 5.09	
960591 AF2-350 C O1 3.2319 Adder 3.8	
960592 AF2-350 E O1 2.1546 Adder 2.53	
960601 AF2-351 C O1 0.4309 Adder 0.51	
960602 AF2-351 E O1 0.6464 Adder 0.76	
960681 AF2-359 C 4.8106 Adder 5.66	
960682 AF2-359 E 3.2071 Adder 3.77	
960981 AF2-389 C 2.2662 Adder 2.67	

Bus #	Bus	Gendeliv MW Impact	Туре	Full MW Impact
960982	AF2-389 E	1.5108	Adder	1.78
961051	AF2-396 O1	15.7352	Adder	18.51
961501	AF2-441 C O1	4.4044	Adder	5.18
961502	AF2-441 E O1	6.6065	Adder	7.77
LGEE	LGEE	1.4804	Confirmed LTF	1.4804
CPLE	CPLE	0.3129	Confirmed LTF	0.3129
CBM-W2	CBM-W2	27.7641	Confirmed LTF	27.7641
NY	NY	1.0136 Confirmed LTF		1.0136
TVA	TVA	3.2774 Confirmed LTF		3.2774
WEC	WEC	1.8736	Confirmed LTF	1.8736
O-066	O-066	10.8797	Confirmed LTF	10.8797
CBM-S2	CBM-S2	4.7916	Confirmed LTF	4.7916
CBM-S1	CBM-S1	20.3458	Confirmed LTF	20.3458
G-007	G-007	1.6713	Confirmed LTF	1.6713
MADISON	MADISON	6.6044	Confirmed LTF	6.6044
MEC	MEC	7.8957	Confirmed LTF	7.8957
CBM-W1	CBM-W1	183.8845	Confirmed LTF	183.8845

#### **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		
AB1-006	Meadow Lake 345kV	In Service		
AB1-080	Dumont-Olive 345kV	In Service		
AB1-087	Sullivan 345kV #1	Active		
AB1-088	Sullivan 345kV #2	Active		
AB1-091	Davis Creek 345kV	Active		
AB1-107	Bayshore-GM Powertrain 138 kV & Lallendorf 345kV	Suspended		
AC1-072	Segreto (Covert) 345kV	In Service		
AC1-142A	Joliet	Active		
AC2-080	Olive-Reynolds 345kV	Active		
AC2-103	Beaver-Davis Besse 345 kV I	Engineering and Procurement		
AC2-117	University Park North	Engineering and Procurement		
AC2-140	DC Cook Unit 2	In Service		
AC2-154	Davis Creek 138kV	Active		
AC2-157	Sullivan 345 kV	Active		
AD1-052	Freemont Energy Center	Under Construction		
AD2-020	Valley 138 kV	Active		
AD2-047	Davis Creek 138 kV	Active		
AD2-060	Davis Creek 138kV	Active		
AD2-075	Segreto 345kV	Active		
AD2-079	Capitol Ave 34.5kV	Active		
AD2-138	Olive-Reynolds 345kV	Active		
AE1-039	West Street (Orchard Hills) 12.47 kV	In Service		
AE1-166	Loretto-Wilton & Braidwood-Davis Creek	Active		
AE1-170	Kenzie Creek-Colby 138 kV	Active		
AE1-193	Crete 345 kV	Active		
AE1-194	Crete 345 kV	Active		
AE1-195	Crete 345 kV	Active		
AE1-198	Crete 345 kV	Active		
AE2-045	Olive-Reynolds 345 kV	Active		
AE2-062	Romeoville 12 kV	Active		
AE2-130	Rockport 765 kV	Active		
AE2-152	Loretto-Wilton & Braidwood-Davis Creek	Active		
AE2-153	Braidwood-Davis Creek	Active		
AE2-154	Meadow Lake 345 kV (MLV VIII)	Active		
AE2-276	Sullivan 345kV	Active		
AE2-323	Twin Branch-Guardian 138 kV	Active		
AE2-325	Valley 138 kV	Active		
AF1-046	Twin Branch-Guardian 138 kV	Active		

Queue Number	Project Name	Status			
AF1-084	East Hartford-Murch 69 kV	Active			
AF1-088	Sullivan 345 kV	Active			
AF1-156	Braidwood-Davis Creek	Active			
AF1-158	Edison-Gravel Pit 138 kV	Active			
AF1-161	Valley 138 kV	Active			
AF1-176	Corey 138 kV	Active			
AF1-204	Eugene 345 kV	Active			
AF1-207	Reynolds–Olive #1 345 kV	Active			
AF1-215	Reynolds-Olive 345 kV	Active			
AF1-322	Meadow Lake 345 kV	Active			
AF2-008	Sullivan 345 kV	Active			
AF2-031	River E.C.	Active			
AF2-033	Miami Fort GT 138 kV	Active			
AF2-078	Revnolds-Olive #1 345 kV	Active			
AF2-083	Ed Lowe-Kenzie Creek 138 kV	Active			
AF2-095	Wilmington-Davis Creek	Active			
AF2-096	Braidwood-East Frankfort 345 kV	Active			
AF2-132	Revnolds-Olive #1 345 kV	Active			
AF2-133	Reynolds-Olive #2 345 kV	Active			
AF2-134	Beynolds-Olive #2 345 kV	Active			
AF2-188	Revnolds-Meadow Lake #1 345 kV	Active			
AF2-189	Greentown 138 kV	Active			
AF2-191	New Carlisle 138 kV	Active			
AF2-205	Olive-Reynolds #2 345 kV	Active			
AF2-350	Kensington 138 kV	Active			
AF2-351	Kensington 138 kV	Active			
AF2-359	Olive-University Park 345 kV	Δctive			
ΔΕ2-389	Pokagon-Corey 69 kV	Δctive			
AF2-396	Stinger 138 kV	Active			
AF2-441	Burnham 138kV	Active			
X1-042	Watervliet	In Service			
X3-005	Wildwood 12kV				
Y1-054	Rochelle 138kV	In Service			
Y3-099	Beckjord 2 MW-1	In Service			
Y3-100	Beckjord 2 MW-2				
Z1-065	Wiley 34.5kV	In Service			
Z1-107	Joliet 34kV	In Service			
Z2-116	Twin Branch 12.47kV	In Service			
J1062	MISO	MISO			
J1088	MISO	MISO			
J1089	MISO	MISO			
J1172	MISO	MISO			
J201	MISO	MISO			
1325	MISO	MISO			
1466	MISO	MISO			
1646	MISO	MISO			
J701	MISO	MISO			
1752	MISO	MISO			
1793	MISO	MISO			
1796	MISO	MISO			
1799	MISO	MISO			
1822	MISO	MISO			
3033	IVIISO	ULIN			

# **10.9 Contingency Descriptions**

Contingency Name	Contingency Definition
ATSI-P7-1-TE-138-025T-A	CONTINGENCY 'ATSI-P7-1-TE-138-025T-A' /* ALLEN-MAJ-MONROE & LEMO- MAJESTIC 345KV DISCONNECT BRANCH FROM BUS 264594 TO BUS 256583 CKT 1 /* 19LULU 345 18LENAWEE 345 DISCONNECT BRANCH FROM BUS 264594 TO BUS 264839 CKT 1 /* 19LULU 345 19MILAN 345 DISCONNECT BRANCH FROM BUS 264594 TO BUS 955720 CKT 1 /* 19LULU 345 J1056 TAP 345 DISCONNECT BRANCH FROM BUS 238889 TO BUS 955620 CKT 1 /* 02LEMOYN 345 19MAJTC 345 END
AEP_P1-2_#709	CONTINGENCY 'AEP_P1-2_#709' OPEN BRANCH FROM BUS 242924 TO BUS 243208 CKT 1 / 242924 05HANG R 765 243208 05JEFRSO 765 1 END
AEP_P4_#6189_05HANG R 765_D1	CONTINGENCY 'AEP_P4_#6189_05HANG R 765_D1' / 242921 05CORNU 765   OPEN BRANCH FROM BUS 242921 TO BUS 242924 CKT 1 / 242921 05CORNU 765   242924 05HANG R 765 1 / 242924 05HANG R 765   OPEN BRANCH FROM BUS 242924 TO BUS 243208 CKT 1 / 242924 05HANG R 765   243208 05JEFRSO 765 1 / 242921 05CORNU 765   OPEN BRANCH FROM BUS 242921 TO BUS 242934 CKT 1 / 242921 05CORNU 765   242934 05CORNU 345 1 / 247245 05HRKG1A 18.0   REMOVE UNIT 1A FROM BUS 247245 / 247245 05HRKG1A 18.0   REMOVE UNIT 1B FROM BUS 247246 / 247246 05HRKG1B 18.0   REMOVE UNIT 1S FROM BUS 247247 / 247247 05HRKG1S 18.0   REMOVE UNIT 2A FROM BUS 247248 / 247249 05HRKG2A 18.0   REMOVE UNIT 2B FROM BUS 247249 / 247240 05HRKG2B 18.0   REMOVE UNIT 2S FROM BUS 247250 / 247250 05HRKG2S 18.0   END END

### **11 Light Load Analysis**

Not applicable.

## **12 Short Circuit Analysis**

The following Breakers are overdutied:

None.

### **13 Stability and Reactive Power**

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

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

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

### **15** Attachment 1: One Line Diagram and Project Site Location





Year	Peak Demand <sup>1</sup>	Existing/	Incremental	Required Additional	Additional Selected Resources <sup>5</sup>				Reserve Margin <sup>6</sup>	
	Demand	Resources <sup>2</sup>	Resources <sup>3</sup>	Resources <sup>4</sup>	СТ	CC	Wind	Solar	Total	(percent)
2018	19,444	25,271		0	0	0	0	0	0	30
2019	19,314	25,175	-96	0	0	0	0	0	0	30
2020	19,326	25,429	254	0	0	0	0	0	0	32
2021	19,184	25,500	71	0	0	0	0	0	0	33
2022	19,138	25,645	145	0	0	0	0	0	0	34
2023	19,105	24,315	-1,329	0	0	23	0	0	23	27
2024	19,169	22,014	-2,301	818	211	1,081	0	0	1,292	22
2025	19,376	22,015	1	1,063	578	1,566	1,000	0	3,144	25
2026	19,417	21,189	-826	1,938	584	2,164	2,000	0	4,748	24
2027	19,572	21,190	0	2,123	922	2,330	2,323	0	5,575	26
2028	19,711	20,065	-1,124	3,413	1,172	2,344	2,323	0	5,839	21
2029	19,862	18,442	-1,623	5,215	2,130	2,853	2,323	0	7,306	19
2030	20,139	18,243	-199	5,745	2,265	3,248	2,323	0	7,836	19
2031	20,346	18,131	-112	6,103	2,265	3,605	2,323	0	8,193	19
2032	20,562	17,719	-412	6,772	2,637	3,902	2,323	0	8,862	19
2033	20,787	16,009	-1,710	8,750	3,009	5,509	2,323	0	10,841	19
2034	20,997	14,799	-1,210	10,211	3,425	6,554	2,323	0	12,301	19
2035	21,296	14,589	-210	10,777	3,425	6,595	2,323	750	13,092	19
2036	21,521	14,539	-50	11,095	3,425	6,681	2,323	1,081	13,510	19
2037	21,781	14,514	-25	11,430	3,425	6,837	2,323	1,337	13,921	19

Table 3-4. Indiana Resource Plan in MW (SUFG Base)

1 Peak demand reflects utility-sponsored energy efficiency programs but is not adjusted for demand response loads.

2 Existing/approved resources include installed capacity plus approved new capacity plus demand response plus firm purchases minus firm sales. 3 Incremental change in resources is the change in existing/approved resources from the previous year. The change is due to new, approved capacity becoming operational, retirements of existing capacity, changes in available demand response loads, and changes in firm purchases and sales.

4 Required additional resources represent the amount of additional resources that are needed to meet the target statewide reserve margin. 5 Additional selected resources are the cumulative amount of additional resources chosen by the optimization model to meet future demand at least

cost.

6 The reserve margin reflects existing and approved resources plus additional selected resources, after adjusting for the expected availability of intermittent resources at the time of peak demand.