Exhibit F
PJM Interconnection Feasibility Study

1. **AF1-164 Generation Interconnection Feasibility Study Report January 2020**
2. **AF1-164 Generation Interconnection System Impact Study Report August 2020**

Exhibit F
PJM Interconnection Feasibility Study

1. AF1-164 Generation Interconnection Feasibility Study Report January 2020

DICKINSON WRIGHT PLLC

Feasibility Study

Via DocuSign

January 31, 2020

Lightsource Renewable Energy Development, LLC
400 Montgomery, Suite 8
San Francisco, California 94109

Dear Kevin Christy,

RE: AF1-164 "Southwest Lima 345 kV" - Feasibility Study Report and System Impact Study Agreement

NOTE: To retain the Queue Position, the following must be provided on or before the due date indicated below (see paragraph 8).

- **Executed System Impact Study Agreement**
- **System Impact Study Deposit (see paragraph 8)**
- **Project System Impact Study machine modeling data provided via Queue Point as detailed in PJM Manual 14-G, Attachment B.**
    - Data must be provided even if the information has not changed since the Feasibility data (Attachment N) submission. See PJM Open Access Transmission Tariff Part VI, Section 204.3.
    - If no data is submitted there is no cure period and the Interconnection Request will be withdrawn.

Enclosed is a report documenting the results of theAF1-164 "Southwest Lima 345 kV" Feasibility Study. The results of this study are predicated on a 2023 transmission system based upon PJM's best assumptions at the present time for load growth and connection of proposed new generation additions.

Feasibility Studies are performed to provide an Interconnection Customer with preliminarily estimated reinforcement costs and information concerning attachment facilities and network upgrades. Since the analysis inherently has to include assumptions for future system conditions, the results should be used in this context. The costs and associated timing described in the enclosed report are based upon estimates given to PJM by the affected Transmission Owner(s). The costs are your responsibility as the project developer. More comprehensive estimates will be developed upon execution of a System Impact Study Agreement in accordance with Part VI of the PJM Tariff.

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. In some instances a project may not be responsible for 100% of the identified network upgrade cost because other transmission network uses, e.g., another interconnection project, 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 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. In addition, the Feasibility Study estimates do not include any the costs associated with engineering and constructing the equipment and facilities on the developer's side of the point of interconnection. These costs are the responsibility of the project developer.

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

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

Note that Tariff 212.5 milestones require that you have all site permits, water and fuel agreements and associated right of way, and a memorandum of understanding for major equipment at the time you return your executed Interconnection Service Agreement (ISA). It is your responsibility to ensure these requirements are met and if they cannot be met at the time of the return of the ISA, you must demonstrate your due diligence and propose dates when those milestones will be met.

Pursuant to Section 204.3 of the PJM Tariff, attached is a System Impact Study Agreement for your consideration. The Agreement must be executed via DocuSign within thirty days (by close of business on **March 2, 2020**) to maintain the project's position in the queue. At the same time, a study deposit in the amount of **$150,000** must be received by PJM by this date. In addition, your project's electrical data must be provided via Queue Point by the above date for the Impact Study Agreement to be considered complete. Failure to submit this data by the due date will result in the withdrawal of your project.

Please review and execute the Impact Study Agreement as specified in DocuSign. Required with the signed agreement, per Section 3 of the enclosed System Impact Study Agreement is a deposit of $150,000, 10% of which is non-refundable. Any unused non-refundable deposit monies shall be returned to the Interconnection Customer upon Initial Operation.

Please send the required study deposit to:

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

The following information is provided for wire transfers:

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

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

In addition to the executed System Impact Study Agreement and deposit, you are responsible to ensure that all queue requests that you may have in the PJM queue are in good financial standing and that you meet the requirements of Tariff 204.3. Failure to meet the requirements of Tariff 204.3 or have your accounts in good standing will result in your project to be withdrawn from the queue. It is your responsibility to meet these requirements.

Costs for the Feasibility Study are being tabulated and you will receive an invoice in the near future. If you wish to discuss the Feasibility Study report or the Impact Study Agreement in more detail, please call me at 610-666-4306 and or email me at Komal.Patel@pjm.com.

Sincerely,
Komal Patel



Engineer
PJM Interconnection Projects

Attachments

PJM (w/attachments): Jonathan Riley – AEP
Pavani Edumala – AEP

Noorgul Dada – PJM
Bernard O'Hara – PJM
File

ATTACHMENT N-1
FORM OF
SYSTEM IMPACT STUDY AGREEMENT

(PJM Queue Position #AF1-164)

RECITALS

1. This System Impact Study Agreement, dated as of _____, is entered into, by and between **Lightsource Renewable Energy Development, LLC** ("New Service Customer") and PJM Interconnection, L.L.C. ("Transmission Provider") pursuant to Part VI of the PJM Interconnection, L.L.C. Open Access Transmission Tariff ("PJM Tariff").

2. The Transmission Provider has: (i) pursuant to Section 36.2 of the PJM Tariff, completed an Interconnection Feasibility Study and provided the results of that study to the New Service Customer; (ii) received a valid Upgrade Request; or (iii) pursuant to Section 19 or Section 32, as applicable, of the PJM Tariff, the Transmission Provider has completed a Firm Transmission Feasibility Study and provided the results of that study to the New Service Customer.

3. Pursuant to Sections 19.1, 32.1, 37, 110.2, 111.2, 204.1, 204.2, or 204.3, as applicable, of the PJM Tariff, the New Service Customer (i) requests that the Transmission Provider perform a System Impact Study, and (ii) agrees to submit a deposit of **$150,000** to the Transmission Provider which will be applied to the New Service Customer's cost responsibility for the System Impact Study, as set forth in Section 203 or 204 of the PJM Tariff.

PREVIOUS SUBMISSIONS

4. Except as otherwise specifically set forth in an attachment to this agreement, New Service Customer represents and warrants that the information provided in Section 3 of the Interconnection Feasibility Study Agreement dated **September 25, 2019** , for the project designated **AF1-164** by and between the New Service Customer and the Transmission Provider is accurate and complete as of the date of execution of this System Impact Study Agreement. New Service Customer further provides the following information and represents and warrants that said information is true and correct:

    1. Specify whether the generation to be interconnected to the Transmission System is to be a Capacity Resource or an Energy Resource.
    _____
    _____

    2. Identification of evidence of initial application for the necessary air permits (attach documentation separately):

_____

_____

3. Other information not previously provided that may be relevant to the study being conducted hereunder (attach generator data for stability study analysis):

_____

_____

PURPOSE OF THE SYSTEM IMPACT STUDY

5. Consistent with Section 205 of the PJM Tariff, the Transmission Provider, in consultation with the affected Transmission Owner(s), shall conduct a System Impact Study that identifies the system constraints relating to the New Service Requests being evaluated in the study and the Attachment Facilities, Local Upgrades, and Network Upgrades necessary to accommodate such New Service Requests. It is expected that the System Impact Study will be completed by **August 31, 2020**. In the event that the Transmission Provider is unable to complete the System Impact Study by that date, the Transmission Provider shall notify the New Service Customer and explain the reasons for the delay.

6. The System Impact Study conducted hereunder will provide more comprehensive estimates of the cost and length of time required to accommodate the New Service Customer's New Service Request than those developed through the Interconnection Feasibility Study, Upgrade Feasibility Study or Firm Transmission Feasibility Study, if applicable, performed for the New Service Customer. These estimates shall represent a good faith attempt to determine the cost of necessary facilities and upgrades to accommodate the New Service Customer's New Service Request, and the New Service Customer's cost responsibility for them, but shall not be deemed final or binding. The scope of the System Impact Study may include (a) an assessment of sub-area import deliverability, (b) an assessment of sub-area export deliverability, (c) an assessment of project related system stability issues, (d) an assessment of project related short circuit duty issues, (e) a contingency analysis consistent with NERC's and each Applicable Regional Entity's reliability criteria, (f) an assessment of regional transmission upgrades that most effectively meet identified needs, and (g) an analysis to determine cost allocation responsibility for required facilities and upgrades. Final estimates will be developed only upon execution of a Facilities Study Agreement in accordance with Part VI of the PJM Tariff. The System Impact Study necessarily will employ various assumptions regarding the New Service Request, other pending requests, and PJM's Regional Transmission Expansion Plan at the time of the study. IN NO EVENT SHALL THE SYSTEM IMPACT STUDY IN ANY WAY BE DEEMED TO OBLIGATE THE TRANSMISSION PROVIDER OR THE TRANSMISSION OWNERS THAT MAY INTERCONNECT WITH THE NEW SERVICE CUSTOMER TO CONSTRUCT ANY FACILITIES OR UPGRADES.

CONFIDENTIALITY

7. The New Service Customer agrees to provide all information requested by the Transmission Provider necessary to complete the System Impact Study. Subject to paragraph 8 of this System Impact Study Agreement and to the extent required by Section 222 of the PJM Tariff, information provided pursuant to this Section 7 shall be and remain confidential.

8. Until completion of the System Impact Study, the Transmission Provider shall keep confidential all information provided to it by the New Service Customer. Pursuant to Section 205.4 of the PJM Tariff, upon completion of the System Impact Study, the Transmission Provider shall provide a copy of the System Impact Study to all New Service Customers whose New Service Requests were evaluated in the System Impact Study along with all related work papers. Additionally, Transmission Provider shall post on Transmission Provider's website (i) the existence of the System Impact Study, (ii) the New Service Customers that had New Service Requests evaluated in the System Impact Study, (iii) the location and size in megawatts of each New Service Customer's generation project, if applicable, and (iv) each New Service Customer's Queue Position. Additionally, New Service Customer acknowledges and consents to such other disclosures as may be required under the PJM Tariff or the FERC's rules and regulations.

9. New Service Customer acknowledges that, consistent with Part VI of the PJM Tariff, the Transmission Owners will participate in the System Impact Study process and that the Transmission Provider may disseminate information to the Transmission Owners and rely upon them to conduct part or all of the System Impact Study.

COST RESPONSIBILITY

10. The New Service Customer shall reimburse the Transmission Provider for the actual cost of the System Impact Study in accordance with its cost responsibility as determined under Sections 110.2, 111.2, 112.2, or 203 of the PJM Tariff. The refundable portion of the deposit described in Section 3 of this Agreement, paid by the New Service Customer pursuant to Sections 110.2, 111.2, 112.2, or 204.3A of the PJM Tariff, shall be applied toward the New Service Customer's System Impact Study cost responsibility. Pursuant to Section 204.3 of the PJM Tariff, during the acceptance review of this Agreement, in the event that the Transmission Provider anticipates that the New Service Customer's study cost responsibility will substantially exceed the refundable portion of the deposit, the Transmission Provider shall provide the New Service Customer with an estimate of the additional study costs and the New Service Customer's cost responsibility. The estimated additional study costs are non-binding, and additional actual study costs may exceed the estimated additional study cost increases provided by the Transmission Provider. Regardless of whether the Transmission Provider provides the New Service Customer with notification of estimated additional study costs, the New Service Customer is responsible for and must pay all actual study costs. If the Transmission Provider provides the New Service Customer with notification of estimated additional study costs, the New Service Customer must pay such estimated additional study costs within ten business days of Transmission Provider sending the New Service Customer notification of such estimated additional study costs. If the New Service Customer fails to pay such estimated additional study costs within ten business days of

Transmission Provider sending the New Service Customer notification of such estimated additional study costs, then the New Service Request shall be deemed to be withdrawn and terminated.

DISCLAIMER OF WARRANTY, LIMITATION OF LIABILITY

11. In analyzing and preparing the System Impact Study, the Transmission Provider, the Transmission Owner(s), and any other subcontractors employed by the Transmission Provider shall have to rely on information provided by the New Service Customer and possibly by third parties and may not have control over the accuracy of such information. Accordingly, NEITHER THE TRANSMISSION PROVIDER, THE TRANSMISSION OWNER(S), NOR ANY OTHER SUBCONTRACTORS EMPLOYED BY THE TRANSMISSION PROVIDER MAKES ANY WARRANTIES, EXPRESS OR IMPLIED, WHETHER ARISING BY OPERATION OF LAW, COURSE OF PERFORMANCE OR DEALING, CUSTOM, USAGE IN THE TRADE OR PROFESSION, OR OTHERWISE, INCLUDING WITHOUT LIMITATION IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE WITH REGARD TO THE ACCURACY, CONTENT, OR CONCLUSIONS OF THE SYSTEM IMPACT STUDY. The New Service Customer acknowledges that it has not relied on any representations or warranties not specifically set forth herein and that no such representations or warranties have formed the basis of its bargain hereunder. Neither this System Impact Study Agreement nor the System Impact Study prepared hereunder is intended, nor shall either be interpreted, to constitute agreement by the Transmission Provider or the Transmission Owner(s) to provide any transmission or interconnection service to or on behalf of the New Service Customer either at this point in time or in the future.

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

Without limitation of the foregoing, the New Service Customer further agrees that Transmission Owner(s) and other subcontractors employed by the Transmission Provider to prepare or assist in the preparation of any System Impact Study shall be deemed third party beneficiaries of this provision entitled "Disclaimer of Warranty/Limitation of Liability."

MISCELLANEOUS

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

Transmission Provider

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

New Service Customer

Lightsource Renewable Energy Development, LLC
400 Montgomery, Suite 8
San Francisco, California 94109

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

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

16. This System Impact Study Agreement shall be binding upon the parties hereto, their heirs, executors, administrators, successors, and assigns.

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

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

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

20. This System Impact Study Agreement shall become effective on the date it is executed by all parties and shall remain in effect until the earlier of (a) the date on which the Transmission Provider tenders the completed System Impact Study and a proposed Facilities Study Agreement to New Service Customer pursuant to Section 206 of the PJM Tariff, or (b) termination and withdrawal of the New Service Request(s) to which the System Impact Study hereunder relates.

21. No Third-Party Beneficiaries : This System Impact Study Agreement is not intended to and does not create rights, remedies, or benefits of any character whatsoever in favor of any persons,

corporations, associations, or entities other than the parties, and the obligations herein assumed are solely for the use and benefit of the parties, their successors in interest and where permitted, their assigns.

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

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

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

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

26. Reservation of Rights : The Transmission Provider shall have the right to make a unilateral filing with FERC to modify this System Impact Study Agreement with respect to any rates, terms and conditions, charges, classifications of service, rule or regulation under section 205 or any other applicable provision of the Federal Power Act and FERC's rules and regulations thereunder, and the Interconnection Customer shall have the right to make a unilateral filing with FERC to modify this System Impact Study Agreement under any applicable provision of the Federal Power Act and FERC's rules and regulations; provided that each party shall have the right to protest any such filing by the other party and to participate fully in any proceeding before FERC in which such modifications may be considered. Nothing in this System Impact Study Agreement shall limit the rights of the parties or of FERC under sections 205 or 206 of the Federal Power Act and FERC's rules and regulations, except to the extent that the parties otherwise agree as provided herein.

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

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

By:_____ _____ _____

Name Title Date

_____

Printed Name

New Service Customer: Lightsource Renewable Energy Development, LLC

By: DocuSigned by: Kevin Christy D019DAB52295416... COO, North America 2/2/2020

Name Title Date

Kevin Christy

Printed Name

Generation Interconnection

Feasibility Study Report

for

Queue Project AF1-164

SOUTHWEST LIMA 345 KV

185 MW Capacity / 300 MW Energy

January, 2020

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1 Preface

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

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

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

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

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.

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2 General

The Interconnection Customer (IC), has proposed a Solar generating facility located in Allen County, Ohio. The installed facilities will have a total capability of 300 MW with 185 MW of this output being recognized by PJM as Capacity. The proposed in-service date for this project is 6/30/2022. This study does not imply a TO commitment to this in-service date.

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

The Feasibility Study includes Short Circuit and Peak Load steady state power flow analyses. The conduct of power flow studies at other load levels, stability analysis, and coordination with non-PJM Transmission Planners, as required under the PJM planning process, is not performed during the Generation Interconnection Feasibility Study phase of the PJM study process. Additional reinforcement requirements for this Interconnection Request may be defined during the conduct of these additional analyses which shall be performed following execution of the System Impact Study agreement.

Queue Number	AF1-164
Project Name	SOUTHWEST LIMA 345 KV
State	Ohio
County	Allen
Transmission Owner	AEP
MFO	300
MWE	300
MWC	185
Fuel	Solar
Basecase Study Year	2023

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2.1 Point of Interconnection

AF1-164 will interconnect with the AEP transmission system via a direct connection to the Southwest Lima 345 kV station.

To accommodate the interconnection at the Southwest Lima 345 kV substation, the substation will have to be expanded requiring the extension of the 345 kV bus, installation of one (1) 345 kV circuit breaker (see Figure 1). Installation of associated protection and control equipment, 345 kV line risers, SCADA, and 345 kV revenue metering will also be required.

2.2 Cost Summary

The AF1-164 project will be responsible for the following costs:

Description	Total Cost
Attachment Facilities	$350,000
Direct Connection Network Upgrade	$2,500,000
Non Direct Connection Network Upgrades	$
Total Costs	$2,850,000

In addition, the AF1-164 project may be responsible for a contribution to the following costs

Description	Total Cost
System Upgrades	$0

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

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3 Transmission Owner Scope of Work

4 Attachment Facilities

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

Description	Total Cost
345 kV Revenue Metering	$350,000
Total Attachment Facility Costs	$350,000

5 Direct Connection Cost Estimate

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

Description	Total Cost
Installation of one (1) circuit breaker and associated protection and control equipment, 345 kV line risers, and SCADA equipment	$2,500,000
Total Direct Connection Facility Costs	$2,500,000

6 Non-Direct Connection Cost Estimate

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

Description	Total Cost
Total Non-Direct Connection Facility Costs	$0

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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 is responsible for all costs associated with this interconnection. The costs above are reimbursable to AEP. The cost of the Interconnection Customer's generating plant and the costs for the line connecting the generating plant to the Southwest Lima 345 kV station are not included in this report; these are assumed to be the Interconnection Customer 's responsibility.

The Generation Interconnection Agreement does not in or by itself establish a requirement for American Electric Power 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.

In addition, if the Interconnection Customer considers use of the Option to Build, they should consult the guidance AEP has posted at:
https://www.aep.com/assets/docs/requiredpostings/TransmissionStudies/docs/2019/MerchantGenerationGuidelinesPJMoptiontoBuild.pdf

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 AEP Requirements

The Interconnection Customer will be required to comply with all AEP Revenue Metering Requirements for Generation Interconnection Customers. The Revenue Metering Requirements may be found within the "Requirements for Connection of New Facilities or Changes to Existing Facilities Connected to the AEP Transmission System" document located at the following link:

http://www.pjm.com/~/media/planning/plan-standards/private-aep/aep-interconnection-requirements.ashx

In addition, if the Interconnection Customer considers use of the Option to Build, they should consult the guidance AEP has posted at:

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https://www.aep.com/assets/docs/requiredpostings/TransmissionStudies/docs/2019/MerchantGenerationGuidelinesPJMoptiontoBuild.pdf

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10 Network Impacts – Option 1

The Queue Project AF1-164 was evaluated as a 300.0 MW (Capacity 185.0 MW) injection at the Southwest Lima 345 kV Substation in the AEP area. Project AF1-164 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AF1-164 was studied with a commercial probability of 0.53. Potential network impacts were as follows:

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Summer Peak Load Flow

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11 Generation Deliverability

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

None

12 Multiple Facility Contingency

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

None

13 Contribution to Previously Identified Overloads

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

None

14 Potential Congestion due to Local Energy Deliverability

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

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

None

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15 Flow Gate Details

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

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Affected Systems

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16 Affected Systems

16.1 LG&E

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

16.2 MISO

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

16.3 TVA

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

16.4 Duke Energy Progress

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

16.5 NYISO

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

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Short Circuit

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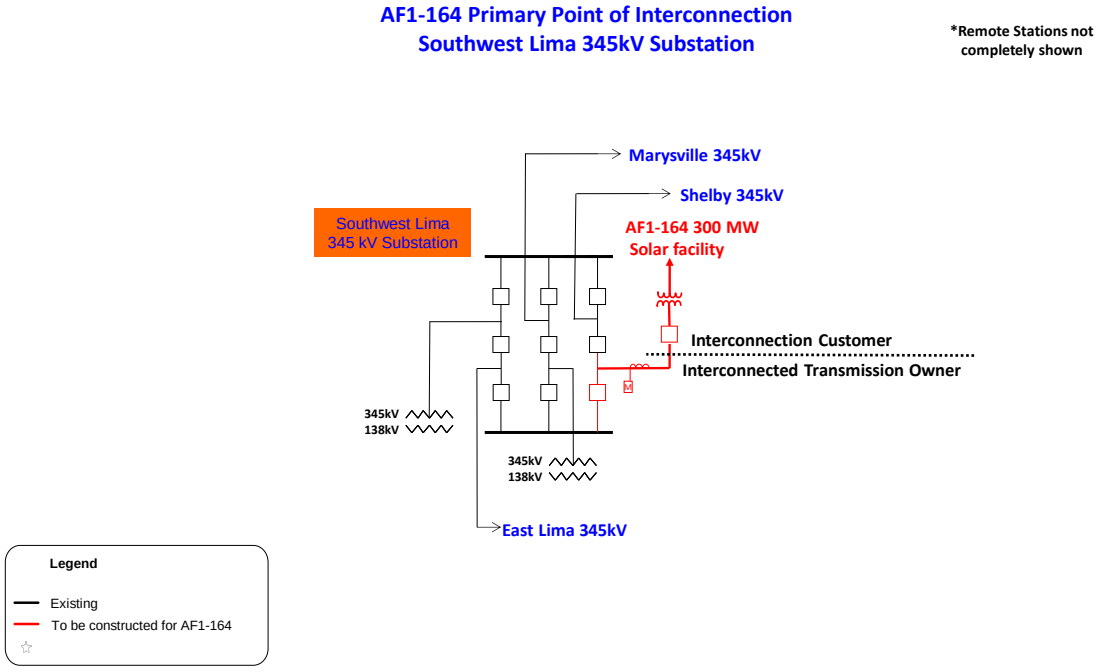
17 Short Circuit

The following Breakers are overduty

None

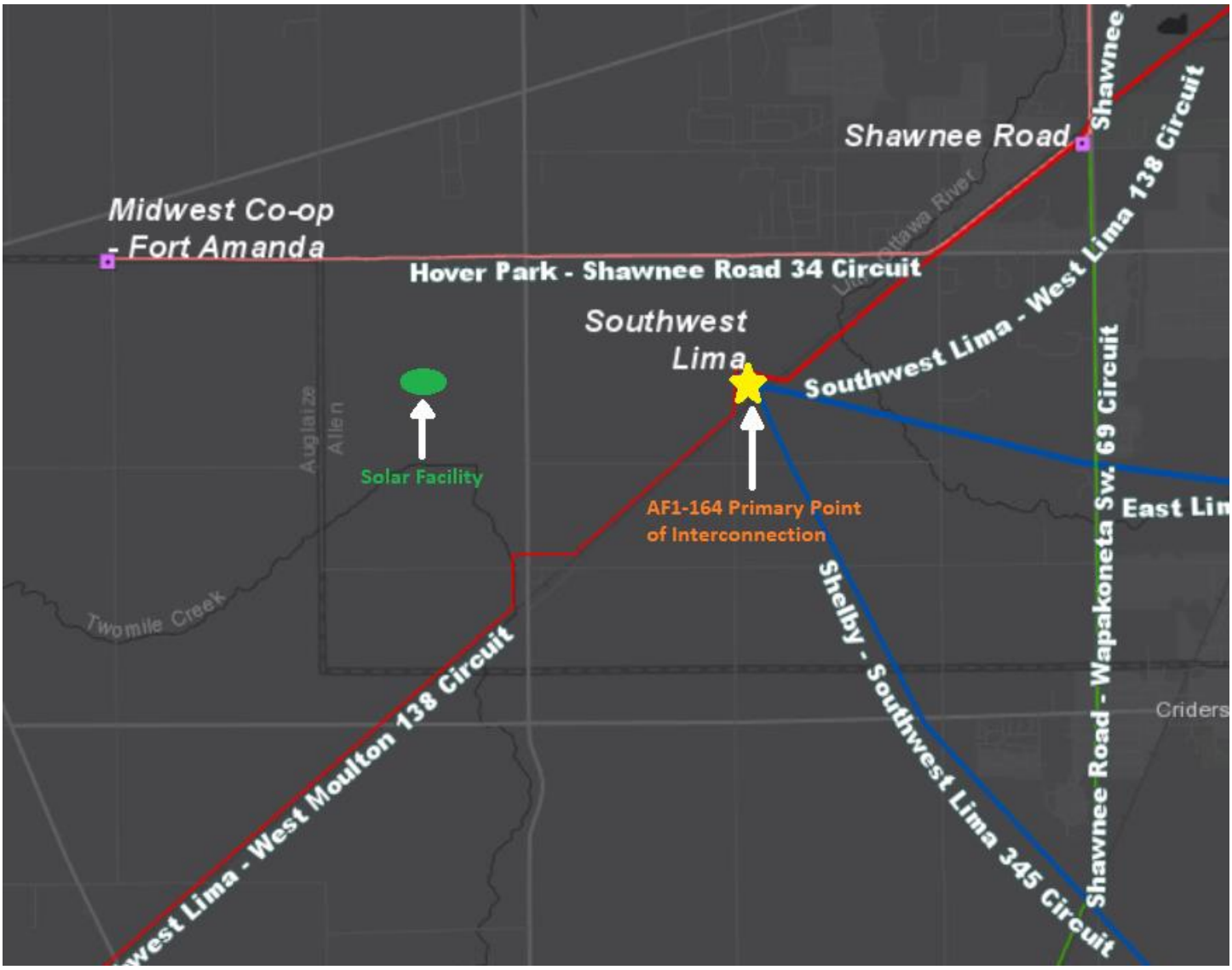
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Figure 1: AF1-164 Primary Point of Interconnection (Southwest Lima 345 kV) Single-Line Diagram



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Figure 2: AF1-164 Primary Point of Interconnection (Southwest Lima 345 kV)



17.1 Secondary Point of Interconnection

AF1-164 will interconnect with the AEP transmission system via a new station cut into the AEP-owned portion of the Southwest Lima – Marysville 345kV circuit.

To accommodate the interconnection on the AEP-owned portion of the Southwest Lima – Marysville 345kV circuit, a new three (3) circuit breaker 345 kV switching station physically configured in a breaker and a half bus arrangement but operated as a ring-bus will be constructed (see Figure 3). 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.

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18 Network Impacts – Option 2

The Queue Project AF1-164 was evaluated as a 300.0 MW (Capacity 185.0 MW) injection at the Southwest Lima – Marysville 345kV circuit in the AEP area. Project AF1-164 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AF1-164 was studied with a commercial probability of 0.53. Potential network impacts were as follows:

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Summer Peak Load Flow

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19 Generation Deliverability

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

None

20 Multiple Facility Contingency

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

None

21 Contribution to Previously Identified Overloads

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

None

22 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.

None

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23 Flow Gate Details

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

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Affected Systems

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24 Affected Systems

24.1 LG&E

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

24.2 MISO

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

24.3 TVA

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

24.4 Duke Energy Progress

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

24.5 NYISO

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

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Short Circuit

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25 Short Circuit

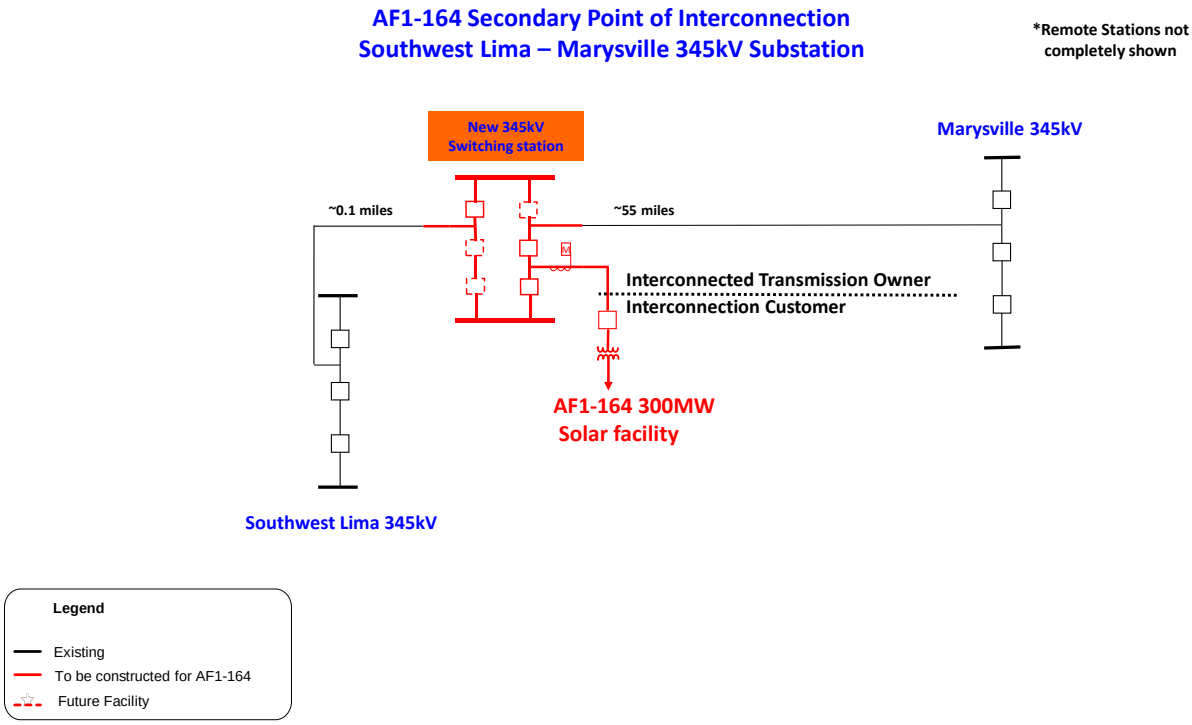
The following Breakers are overduty

None

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Figure 3: AF1-164 Secondary Point of Interconnection (Southwest Lima – Marysville 345 kV)

Single Line Diagram



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Figure 4: AF1-164 Secondary Point of Interconnection (Southwest Lima - Marysville 345 kV)



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Exhibit F
PJM Interconnection Feasibility Study

2. AF1-164 Generation Interconnection System Impact Study Report August 2020

DICKINSON WRIGHT PLLC

System Impact Study

Generation Interconnection

System Impact Study Report

for

Queue Project AF1-164

SOUTHWEST LIMA 345 KV

195 MW Capacity / 300 MW Energy

August, 2020

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16 Attachment 1: One-Line Diagram and Point of Interconnection Map 14

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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.

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3 General

The Interconnection Customer (IC) has proposed a Solar generating facility located in Allen, Ohio. The installed facilities will have a total capability of 300 MW with 195 MW of this output being recognized by PJM as Capacity.

The proposed in-service date for this project is June 30, 2022. This study does not imply a TO commitment to this in-service date.

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

Queue Number	AF1-164
Project Name	SOUTHWEST LIMA 345 KV
State	Ohio
County	Allen
Transmission Owner	AEP
MFO	300
MWE	300
MWC	195
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.

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4 Point of Interconnection

AF1-164 will interconnect with the AEP transmission system via a direct connection to the Southwest Lima 345 kV station.

To accommodate the interconnection at the Southwest Lima 345 kV substation, the substation will have to be expanded requiring the extension of the 345 kV bus, installation of one (1) 345 kV circuit breaker (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.

5 Cost Summary

The AF1-164 project will be responsible for the following costs:

Description	Total Cost
Attachment Facilities	$1,109,000
Direct Connection Network Upgrade	$2,390,000
Non Direct Connection Network Upgrades	$45,000
Allocation to New System Upgrades*	$0
Contribution to Previously Identified Upgrades*	$0
Total Costs	**$3,544,000**

*As your project progress through the study process, as things withdraw, then this may result in changes to your cost allocation.

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 total 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.

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

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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.

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6 Transmission Owner Scope of Work

6.1 Attachment Facilities

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

Description	Total Cost
345 kV Revenue Metering	$458,000
Generator lead first span exiting the POI station, including the first structure outside the fence	$651,000
Total Attachment Facility Costs	$1,109,000

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
The Southwest Lima 345 kV substation will have to be expanded requiring the extension of the 345 kV bus, installation of one (1) 345 kV circuit breaker. Installation of associated protection and control equipment, 345 kV line risers, SCADA, and 345 kV revenue metering will also be required.	$2,390,000
Total Direct Connection Facility Costs	$2,390,000

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
Review and revise protections and controls at the Southwest Lima 345 kV station	$45,000
Total Non-Direct Connection Facility Costs	$45,000

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7 Incremental Capacity Transfer Rights (ICTRs)

None

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 Agreement execution.

9 Interconnection Customer Requirements

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

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

Requirement from the PJM Open Access Transmission Tariff:

1. An Interconnection Customer entering the New Services Queue on or after October 1, 2012 with a proposed new Customer Facility that has a Maximum Facility Output equal to or greater than 100 MW shall install and maintain, at its expense, phasor measurement units (PMUs). See Section 8.5.3 of Appendix 2 to the Interconnection Service Agreement as well as section 4.3 of PJM Manual 14D for additional information.
2. The Interconnection Customer may be required to install and/or pay for metering as necessary to properly track real time output of the facility as well as installing metering which shall be used for billing purposes. See Section 8 of Appendix 2 to the Interconnection Service Agreement as well as Section 4 of PJM Manual 14D for additional information.

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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

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

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

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/

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11 Summer Peak Analysis

The Queue Project AF1-164 was evaluated as a 300.0 MW (Capacity 195.0 MW) injection at the Southwest Lima 345 kV substation in the AEP area. Project AF1-164 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AF1-164 was studied with a commercial probability of 100.0 %. 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)

None

11.4 Steady-State Voltage Requirements

None

11.5 Potential Congestion due to Local Energy Deliverability

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

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.

None

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11.6 System Reinforcements

None

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12 Light Load Analysis

Not Required

13 Short Circuit Analysis

The following Breakers are overdutied

None

14 Stability and Reactive Power Requirements for Low Voltage Ride Through

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

To be evaluated during the Facilities Study Phase

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

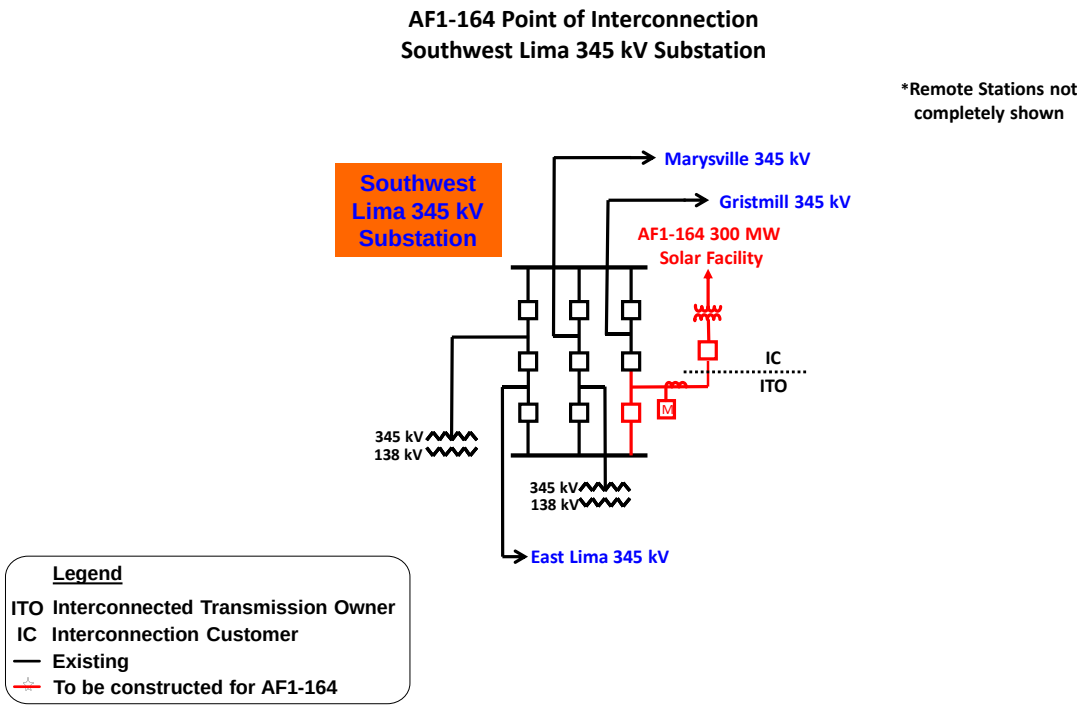
MISO Impacts to be determined during later study phases (as applicable).

15.4 LG&E

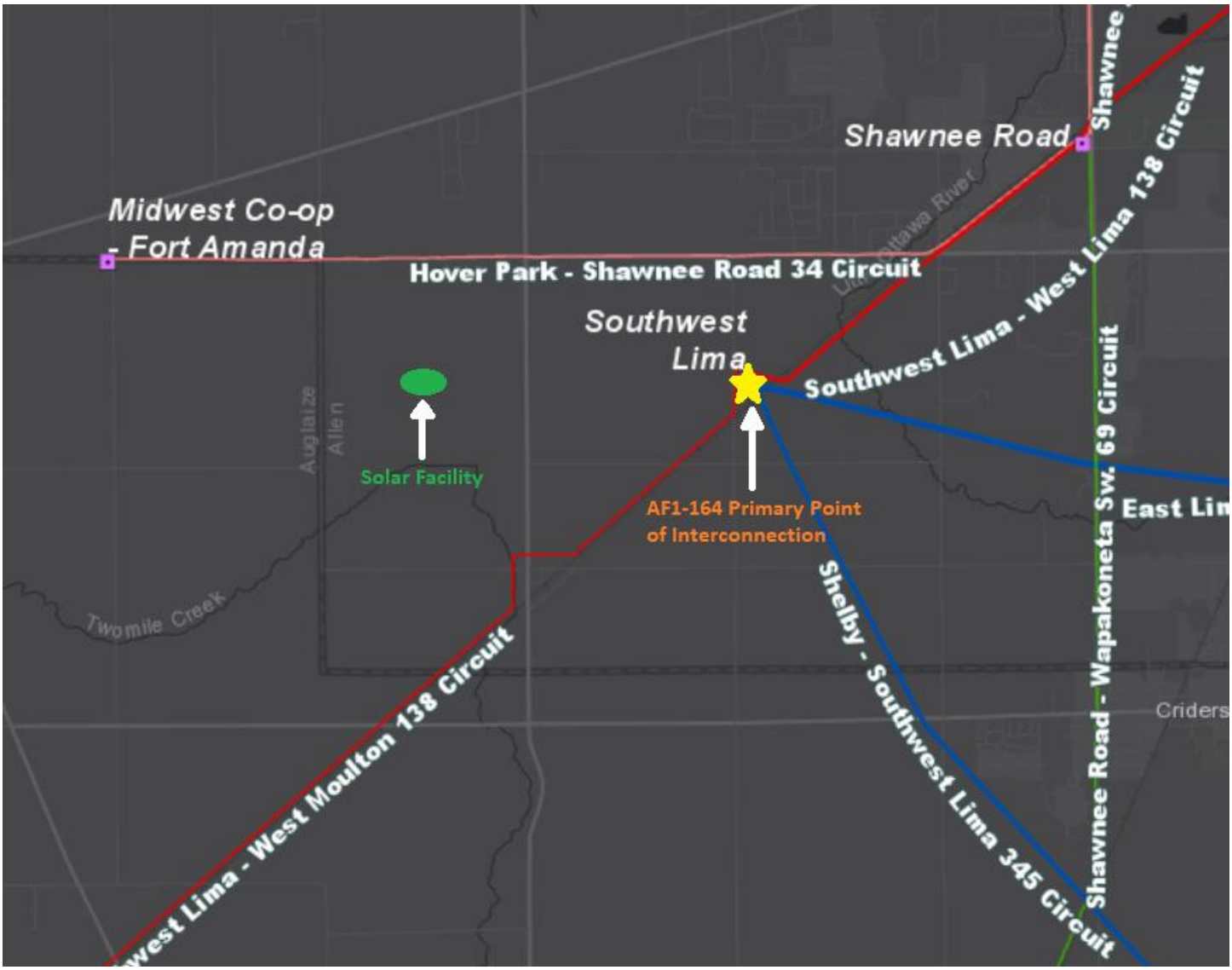
LG&E Impacts to be determined during later study phases (as applicable).

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16 Attachment 1: One-Line Diagram and Point of Interconnection Map



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Summary: Application - 11 of 31 (Exhibit F – PJM Interconnection Studies) electronically filed by Christine M.T. Pirik on behalf of Birch Solar 1, LLC