

Bright Mountain Solar Project

Case No. 2022-00274



TAB 9

TAB 9 EFFECT ON THE ELECTRIC TRANSMISSION SYSTEM IN KENTUCKY

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

In order to interconnect new generation facilities to the electric transmission grid, a facility owner must obtain approval from PJM, which is a regional transmission organization that coordinates the movement of wholesale electricity in most of the eastern half of Kentucky and all or parts of nearby states. The interconnection process includes completion of studies by PJM that determine the transmission upgrades required for a project to reliably interconnect to the PJM grid. These studies are completed in a series. The Feasibility Study, the System Impact Study, and the Facilities Study are designed to provide developers with increasingly refined information regarding the scope of required upgrades, completion deadlines, and implementation costs.

The Facility will be capable of generating up to 80 MW of renewable energy and will interconnect with the Kentucky Power transmission system. Kentucky Power is a wholly-owned subsidiary of American Electric Power, Inc., which provides electricity to 20 counties in eastern Kentucky, as well as 10 other states in the eastern and southern U.S.

The Facility initiated a queue position with PJM on July 30, 2020, and was assigned the queue number AG1-066. To date, PJM has completed both the Feasibility Study and the System Impact Study for the Facility interconnection. The PJM Feasibility Study and System Impact Study are included with this Tab as Attachment H.

Bright Mountain Solar Project
Application Tab 9
Case No. 2022-00274



Attachment H – PJM Feasibility and
System Impact Studies



**Generation Interconnection
Feasibility Study Report
for
Queue Project AG1-066
BONNYMAN 69 KV
48 MW Capacity / 80 MW Energy**

January 2021

Table of Contents

1	Introduction.....	4
2	Preface.....	4
3	General.....	5
4	Point of Interconnection.....	6
5	Cost Summary.....	6
6	Transmission Owner Scope of Work.....	7
6.1	Attachment Facilities.....	7
6.2	Direct Connection Cost Estimate.....	7
6.3	Non-Direct Connection Cost Estimate.....	7
7	Transmission Owner Analysis.....	8
8	Schedule.....	8
9	Interconnection Customer Requirements.....	8
10	Revenue Metering and SCADA Requirements.....	9
10.1	PJM Requirements.....	9
10.2	Meteorological Data Reporting Requirements.....	9
10.3	Interconnected Transmission Owner Requirements.....	9
11	Summer Peak - Load Flow Analysis - Primary POI.....	10
11.1	Generation Deliverability.....	11
11.2	Multiple Facility Contingency.....	11
11.3	Contribution to Previously Identified Overloads.....	11
11.4	Potential Congestion due to Local Energy Deliverability.....	11
11.5	System Reinforcements - Summer Peak Load Flow - Primary POI.....	12
11.6	Flow Gate Details - Primary POI.....	13
11.7	Queue Dependencies.....	14
11.8	Contingency Descriptions - Primary POI.....	15
12	Short Circuit Analysis - Primary POI.....	16
13	Summer Peak - Load Flow Analysis - Secondary POI.....	17
13.1	Generation Deliverability.....	18
13.2	Multiple Facility Contingency.....	18
13.3	Contribution to Previously Identified Overloads.....	18
13.4	Potential Congestion due to Local Energy Deliverability.....	18

13.5	Flow Gate Details - Secondary POI.....	19
13.6	Contingency Descriptions - Secondary POI.....	20
14	Affected Systems	21
14.1	TVA.....	21
14.2	Duke Energy Progress.....	21
14.3	MISO	21
14.4	LG&E.....	21

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.

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.

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 Perry County, Kentucky. The installed facilities will have a total capability of 80 MW with 48 MW of this output being recognized by PJM as Capacity. The proposed in-service date for this project is October 02, 2024. This study does not imply a TO commitment to this in-service date.

Queue Number	AG1-066
Project Name	BONNYMAN 69 KV
State	Kentucky
County	Perry
Transmission Owner	AEP
MFO	80
MWE	80
MWC	48
Fuel	Solar
Basecase Study Year	2024

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

AG1-066 will interconnect with the AEP transmission system at the Bonnyman 69 kV substation.

To accommodate the interconnection to the Bonnyman 69 kV substation, one (1) new 69 kV circuit breaker will be installed (see Attachment 1). Installation of associated protection and control equipment, 69 kV line risers, SCADA, and 69 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 AG1-066 project will be responsible for the following costs:

Description	Total Cost
Total Physical Interconnection Costs	\$1,091,000
Total System Network Upgrade Costs	\$0
Total Costs	\$1,091,000

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.

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

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.

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
69 kV Revenue Metering	\$293,000
Generator lead first span exiting the POI station, including the first structure outside the fence	\$320,000
Total Attachment Facility Costs	\$613,000

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
One (1) new 69 kV circuit breaker will be installed at the Bonnyman 69 kV substation. Installation of associated protection and control equipment, 69 kV line risers, and SCADA will also be required.	\$433,000
Total Direct Connection Facility Costs	\$433,000

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 line protection and control settings at the Bonnyman 69 kV substation	\$45,000
Total Non-Direct Connection Facility Costs	\$45,000

7 Transmission Owner Analysis

AEP conducted load flow analysis to identify potential Sub-Transmission impacts for the two scenarios below:

- Dispatched the capacity portion of output with N-1 contingencies – No overloads were identified
- Dispatched the MFO at the base case – No overloads were identified

A more detailed load flow and short circuit analysis will be conducted for the Sub-Transmission System in the System Impact 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 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

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)

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 AG1-066 was evaluated as a 80.0 MW (Capacity 48.0 MW) injection at the Bonnyman 69 kV substation in the AEP area. Project AG1-066 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AG1-066 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)

None

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.

None

11.5 System Reinforcements - Summer Peak Load Flow - Primary POI

None

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".

11.7 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.

None

11.8 Contingency Descriptions - Primary POI

None

12 Short Circuit Analysis - Primary POI

The following Breakers are overdutied

None

13 Summer Peak - Load Flow Analysis - Secondary POI

The Queue Project AG1-066 was evaluated as a 80.0 MW (Capacity 48.0 MW) injection tapping the Chavies to Bonnyman 69 kV line in the AEP area. Project AG1-066 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AG1-066 was studied with a commercial probability of 53.0 %. Potential network impacts were as follows:

13.1 Generation Deliverability

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

None

13.2 Multiple Facility Contingency

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

None

13.3 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

13.4 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.

None

13.5 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".

13.6 Contingency Descriptions - Secondary POI

None

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).



**Generation Interconnection
System Impact Study Report
for
Queue Project AG1-066
BONNYMAN 69 KV
48 MW Capacity / 80 MW Energy**

August 2021

Table of Contents

1	Introduction.....	4
2	Preface.....	4
3	General.....	5
4	Point of Interconnection.....	6
5	Cost Summary	6
6	Transmission 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	Schedule.....	9
8	Transmission Owner Analysis.....	9
9	Interconnection Customer Requirements.....	9
10	Revenue Metering and SCADA Requirements	10
10.1	PJM Requirements.....	10
10.2	Meteorological Data Reporting Requirements.....	10
10.3	Interconnected Transmission Owner Requirements.....	10
11	Summer Peak Analysis	11
11.1	Generation Deliverability	11
11.2	Multiple Facility Contingency	11
11.3	Contribution to Previously Identified Overloads.....	11
11.4	Steady-State Voltage Requirements.....	11
11.5	Potential Congestion due to Local Energy Deliverability.....	11
11.6	System Reinforcements.....	12
12	Light Load Analysis.....	13
13	Short Circuit Analysis.....	13
14	Stability and Reactive Power	13
15	Affected Systems	14
15.1	TVA.....	14
15.2	Duke Energy Progress.....	14
15.3	MISO	14
15.4	LG&E.....	14

16 Attachment 1: One Line Diagram and Project Site Location.....15

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.

3 General

The Interconnection Customer (IC), has proposed a Solar generating facility located in Perry County, Kentucky. The installed facilities will have a total capability of 80 MW with 48 MW of this output being recognized by PJM as Capacity.

The proposed in-service date for this project is October 02, 2024. This study does not imply a TO commitment to this in-service date.

Queue Number	AG1-066
Project Name	BONNYMAN 69 KV
State	Kentucky
County	Perry
Transmission Owner	AEP
MFO	80
MWE	80
MWC	48
Fuel	Solar
Basecase Study Year	2024

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

AG1-066 will interconnect with the AEP transmission system via a direct connection to the Bonnyman 69 kV Station.

To accommodate the interconnection to the Bonnyman 69 kV Station, one (1) new 69 kV circuit breaker will be installed (Attachment 1). Installation of associated protection and control equipment, line risers, SCADA, jumpers, switches and 69 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 69 kV transmission line for the generation lead going to the AG1-066 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 Bonnyman 69 kV Station fence to which the AEP and AG1-066 transmission line conductors will attach.

5 Cost Summary

The AG1-066 project will be responsible for the following costs:

Description	Total Cost
Total Physical Interconnection Costs	\$1,091,000
Allocation towards System Network Upgrade Costs (PJM Identified - Summer Peak)*	\$0
Allocation towards System Network Upgrade Costs (PJM Identified - Light Load)*	\$0
Allocation towards System Network Upgrade Costs (TO Identified)*	\$0
Total Costs	\$1,091,000

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

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 88-129. If at a future date it is determined that the Federal Income Tax Gross charge is required, the Transmission Owner shall be reimbursed by the Interconnection Customer for such taxes.

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

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 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
69 kV Revenue Metering	\$293,000
Generator lead first span exiting the POI station, including the first structure outside the fence	\$320,000
Total Attachment Facility Costs	\$613,000

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
None	\$0
Total Direct Connection Facility Costs	\$0

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
One (1) new 69 kV circuit breaker will be installed at the Bonnyman 69 kV substation. Installation of associated protection and control equipment, 69 kV line risers, and SCADA will also be required.	\$433,000
Review line protection and control settings at the Bonnyman 69 kV substation	\$45,000
Total Non-Direct Connection Facility Costs	\$478,000

7 Schedule

Based on the scope of work for the interconnection facilities, it is expected to take a minimum of 12 to 18 months after the signing of an Interconnection Construction Service Agreement (or "Interconnection Agreement" if non-FERC) and construction kickoff call to complete the installation of the physical connection work. This assumes that there will be no environmental issues with any of the new properties associated with this project, that there will be no delays in acquiring the necessary permits for implementing the defined interconnection work, and that all system outages will be allowed when requested.

The schedule for any required Network Impact Reinforcements will be more clearly identified in future study phases. The estimated time to complete each of the required reinforcements is identified in the "System Reinforcements" section of the report.

8 Transmission Owner Analysis

AEP did not find any sub-transmission overloads with the interconnection of AG1-066.

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

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)

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 Analysis

The Queue Project AG1-066 was evaluated as a 80.0 MW (Capacity 48.00 MW) injection at the Bonnyman 69 kV substation in the AEP area. Project AG1-066 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AG1-066 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

11.6 System Reinforcements

ID	Idx	Facility	Upgrade Description	Cost	Cost Allocated to AG1-066	Upgrade Number
			TOTAL COST	\$0	\$0	

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.

12 Light Load Analysis

Not applicable.

13 Short Circuit Analysis

The following Breakers are overdutied:

None.

14 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.

15 Affected Systems

15.1 TVA

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

15.2 Duke Energy Progress

None

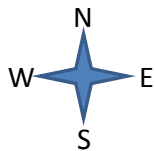
15.3 MISO

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

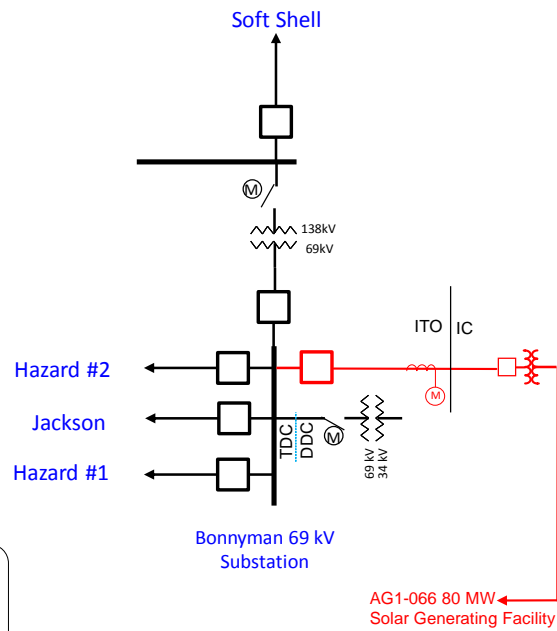
15.4 LG&E

None

16 Attachment 1: One Line Diagram and Project Site Location



AG1-066 Point of Interconnection Bonnyman 69 kV *(Remote Stations Not Completely Shown)*



Legend	
—	Existing
—	To be constructed for AG1-066
ITO-	Interconnected Transmission Owner
IC-	Interconnection Customer

