Generation Interconnection

Revised System Impact Study Report

for

Queue Project AE2-174

Fremont Center – Tiffin Center #1 138 KV

34.85 MW Capacity / 198 MW Energy

August 2022

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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.

3 General

The Interconnection Customer (IC), has proposed a Wind generating facility located in Seneca County, Ohio. The installed facilities will have a total capability of 198 MW with 34.85 MW of this output being recognized by PJM as Capacity.

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

Queue Number	AE2-174
Project Name	Fremont Center – Tiffin Center 138 KV
State	Ohio
County	Seneca
Transmission Owner	AEP
MFO	198
MWE	198
MWC	34.85
Fuel	Wind
Basecase Study Year	2022

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

AE2-174 will interconnect with the AEP transmission system via a new station cut into the Fremont Center-South Tiffin #1 circuit.

To accommodate the interconnection on the Fremont Center- South Tiffin #1 circuit, a new three (3) circuit breaker 138 kV switching station physically configured and operated as a ring bus will be constructed (Attachment 1).

AEP will extend one span of 138 kV transmission line for the generation lead going to the AE2-174 site. Unless this span extends directly from within the AEP station at the POI to the IC collector station structure, AEP will build and own the first transmission line structure outside of the proposed station fence to which the AEP and AE2-174 transmission line conductors will attach.

5 Cost Summary

The AE2-174 project will be responsible for the following costs:

Description	Total Cost
Total Physical Interconnection Costs	$9,688,000
Allocation towards System Network Upgrade Costs (PJM Identified - Summer Peak)*	$4,108,000
Allocation towards System Network Upgrade Costs (PJM Identified - Light Load)*	$0
Allocation towards System Network Upgrade Costs (TO Identified)*	$0
Total Costs	**$13,796,000**

*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
138 kV Revenue Metering	$388,000
Generator lead first span exiting the POI station, including the first structure outside the fence	$400,000
Total Attachment Facility Costs	**$788,000**

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
New three (3) circuit breaker 138 kV switching station. Installation of associated protection and control equipment, 138 kV line risers, and SCADA will also be required.	$8,040,000
Total Direct Connection Facility Costs	**$8,040,000**

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
Fremont Center - South Tiffin #1 T-line cut in	$770,000
Review protection and control settings at the Fremont Center 138 kV Station	$45,000
Review protection and control settings at the South Tiffin 138 kV Station	$45,000
Total Non-Direct Connection Facility Costs	**$860,000**

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 Interconnection Customer Requirements

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

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

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

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

9 Revenue Metering and SCADA Requirements

9.1 PJM Requirements

The Interconnection Customer will be required to install equipment necessary to provide Revenue Metering (KWH, KVARH) and real time data (KW, KVAR) for IC's generating Resource. See PJM Manuals M-01 and M-14D, and PJM Tariff Section 8 of Attachment O.

9.2 Meteorological Data Reporting Requirements

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

- Back Panel temperature (Fahrenheit) - (Required for plants with Maximum Facility Output of 3 MW or higher)
- Irradiance (Watts/meter2) - (Required for plants with Maximum Facility Output of 3 MW or higher)
- Ambient air temperature (Fahrenheit) - (Accepted, not required)
- Wind speed (meters/second) - (Accepted, not required)
- Wind direction (decimal degrees from true north) - (Accepted, not required)

9.3 Interconnected Transmission Owner Requirements

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

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

10 Summer Peak Analysis

The Queue Project AE2-174 was evaluated as a 198.0 MW (Capacity 34.8 MW) injection tapping the Fremont Center to Tiffin 138kV line in the AEP area. Project AE2-174 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AE2-174 was studied with a commercial probability of 100%. Potential network impacts were as follows:

10.1 Generation Deliverability

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

None

10.2 Multiple Facility Contingency

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

1. (AEP - AEP) The 05MELMOR-05CHATFL 138 kV line (from bus 243039 to bus 242984 ckt 1) loads from 90.88% to 108.67% (AC power flow) of its emergency rating (167 MVA) for the line fault with failed breaker contingency outage of 'AEP_P4_#7110_05MELMOR 138_B'. This project contributes approximately 31.19 MW to the thermal violation.

CONTINGENCY 'AEP_P4_#7110_05MELMOR 138_B'
OPEN BRANCH FROM BUS 243006 TO BUS 243039 CKT 1 / 243006 05FOSTOR 138 243039 05MELMOR 138 1
OPEN BRANCH FROM BUS 243024 TO BUS 243039 CKT 1 / 243024 05HOWARD 138 243039 05MELMOR 138 1
END

Please refer to Appendix 1 for a table containing the generators having contribution to this flowgate.

2. (AEP - AEP) The 05MELMOR-05FOSTOR 138 kV line (from bus 243039 to bus 243006 ckt 1) loads from 80.22% to 105.98% (AC power flow) of its emergency rating (167 MVA) for the line fault with failed breaker contingency outage of 'AEP_P4_#7112_05MELMOR 138_C'. This project contributes approximately 43.27 MW to the thermal violation.

CONTINGENCY 'AEP_P4_#7112_05MELMOR 138_C'
OPEN BRANCH FROM BUS 242953 TO BUS 243110 CKT 1 / 242953 05AIRCO8 138 243110 05STIFFI 138 1
OPEN BRANCH FROM BUS 242953 TO BUS 243137 CKT 1 / 242953 05AIRCO8 138 243137 05W.END 138 1

OPEN BRANCH FROM BUS 242984 TO BUS 243039 CKT 1 / 242984 05CHATFL 138 243039 05MELMOR 138 1
OPEN BRANCH FROM BUS 243039 TO BUS 243110 CKT 1 / 243039 05MELMOR 138 243110 05STIFFI 138 1
OPEN BRANCH FROM BUS 243110 TO BUS 245630 CKT 1 / 243110 05STIFFI 138 245630 05S TIFFIN 69.0 1
END

Please refer to Appendix 2 for a table containing the generators having contribution to this flowgate.

3. (AEP - AEP) The 05MELMOR-05FOSTOR 138 kV line (from bus 243039 to bus 243006 ckt 1) loads from 65.8% to 103.62% (AC power flow) of its emergency rating (167 MVA) for the bus fault outage of 'AEP_P2-2_#7725_05FREMCT 138_1'. This project contributes approximately 63.43 MW to the thermal violation.

CONTINGENCY 'AEP_P2-2_#7725_05FREMCT 138_1'
OPEN BRANCH FROM BUS 243008 TO BUS 243009 CKT 1 / 243008 05FREMCT 138 243009 05FRMNT 138 1
OPEN BRANCH FROM BUS 243008 TO BUS 940150 CKT 1 / 243008 05FREMCT 138 940150 V4-010 TAP 138 1
OPEN BRANCH FROM BUS 243008 TO BUS 243130 CKT 2 / 243008 05FREMCT 138 243130 05TIFFIN 138 2
OPEN BRANCH FROM BUS 243008 TO BUS 245614 CKT 1 / 243008 05FREMCT 138 245614 05FREMNT C 69.0 1
OPEN BRANCH FROM BUS 243008 TO BUS 245614 CKT 3 / 243008 05FREMCT 138 245614 05FREMNT C 69.0 3
REMOVE SWSHUNT FROM BUS 243008 / 243008 05FREMCT 138
END

4. (AEP - AEP) The 05MELMOR-05FOSTOR 138 kV line (from bus 243039 to bus 243006 ckt 1) loads from 65.8% to 103.62% (AC power flow) of its emergency rating (167 MVA) for the line fault with failed breaker contingency outage of 'AEP_P4_#7725_05FREMCT 138_M'. This project contributes approximately 63.43 MW to the thermal violation.

CONTINGENCY 'AEP_P4_#7725_05FREMCT 138_M'
OPEN BRANCH FROM BUS 243008 TO BUS 243009 CKT 1 / 243008 05FREMCT 138 243009 05FRMNT 138 1
OPEN BRANCH FROM BUS 243008 TO BUS 940150 CKT 1 / 243008 05FREMCT 138 940150 V4-010 TAP 138 1

OPEN BRANCH FROM BUS 243008 TO BUS 243130 CKT 2 / 243008 05FREMCT 138 243130 05TIFFIN 138 2
OPEN BRANCH FROM BUS 243008 TO BUS 245614 CKT 1 / 243008 05FREMCT 138 245614 05FREMNT C 69.0 1
OPEN BRANCH FROM BUS 243008 TO BUS 245614 CKT 3 / 243008 05FREMCT 138 245614 05FREMNT C 69.0 3
REMOVE SWSHUNT FROM BUS 243008 / 243008 05FREMCT 138
END

5. (AEP - AEP) The AC2-015 TAP-05HOWARD 138 kV line (from bus 932050 to bus 243024 ckt 1) loads from 99.6% to 116.02% (AC power flow) of its emergency rating (167 MVA) for the line fault with failed breaker contingency outage of 'AEP_P4_#7110_05MELMOR 138_B'. This project contributes approximately 29.02 MW to the thermal violation.

CONTINGENCY 'AEP_P4_#7110_05MELMOR 138_B'
OPEN BRANCH FROM BUS 243006 TO BUS 243039 CKT 1 / 243006 05FOSTOR 138 243039 05MELMOR 138 1
OPEN BRANCH FROM BUS 243024 TO BUS 243039 CKT 1 / 243024 05HOWARD 138 243039 05MELMOR 138 1
END

Please refer to Appendix 3 for a table containing the generators having contribution to this flowgate.

10.3 Contribution to Previously Identified Overloads

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

None

10.4 Steady-State Voltage Requirements

None

10.5 Potential Congestion due to Local Energy Deliverability

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

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

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

1. (AEP - AEP) The 05MELMOR-05CHATFL 138 kV line (from bus 243039 to bus 242984 ckt 1) loads from 93.16% to 106.87% (AC power flow) of its emergency rating (167 MVA) for the single line contingency outage of 'AEP_P1-2_#7105'. This project contributes approximately 24.25 MW to the thermal violation.

CONTINGENCY 'AEP_P1-2_#7105'
OPEN BRANCH FROM BUS 243024 TO BUS 243039 CKT 1 / 243024 05HOWARD 138 243039 05MELMOR 138 1
END

2. (AEP - AEP) The AC2-015 TAP-05HOWARD 138 kV line (from bus 932050 to bus 243024 ckt 1) loads from 97.28% to 110.43% (AC power flow) of its emergency rating (167 MVA) for the single line contingency outage of 'AEP_P1-2_#7105'. This project contributes approximately 23.19 MW to the thermal violation.

CONTINGENCY 'AEP_P1-2_#7105'
OPEN BRANCH FROM BUS 243024 TO BUS 243039 CKT 1 / 243024 05HOWARD 138 243039 05MELMOR 138 1
END

3. (AEP - AEP) The AC2-015 TAP-05HOWARD 138 kV line (from bus 932050 to bus 243024 ckt 1) loads from 89.95% to 100.21% (AC power flow) of its normal rating (136 MVA) for non-contingency condition. This project contributes approximately 16.4 MW to the thermal violation.

4. (AEP - AEP) The AC2-015 TAP-05HOWARD 138 kV line (from bus 932050 to bus 243024 ckt 1) loads from 89.95% to 100.21% (AC power flow) of its normal rating (136 MVA) for non-contingency condition. This project contributes approximately 16.4 MW to the thermal violation.

5. (AEP - AEP) The AE1-146 TAP-05EBERSO 138 kV line (from bus 939160 to bus 247172 ckt 2) loads from 99.87% to 104.8% (AC power flow) of its emergency rating (245 MVA) for the single line contingency outage of 'AEP_P1-2_#7757'. This project contributes approximately 14.2 MW to the thermal violation.

CONTINGENCY 'AEP_P1-2_#7757'
OPEN BRANCH FROM BUS 247172 TO BUS 243006 CKT 1 / 247172 05EBERSO 138 243006 05FOSTOR 138 1
END

10.6 System Reinforcements – Summer Peak

New System Reinforcements

(Upgrades required to mitigate reliability criteria violations, i.e. Network Impacts, initially caused by the addition of this project generation)

Facility	Upgrade Description	Cost	Cost Allocation	Upgrade Number
05MELMOR-05CHATFL 138 kV line (from bus 243039 to bus 242984 ckt 1) **AC2-015 TAP-05HOWARD 138 kV line (from bus 932050 to bus 243024 ckt 1)**	**AEP** AEP SE rating is 167 MVA. **AEP Reinforcement** **N6295.2:** Relocate either the Fostor line or Howard line termination at Melmore 138 kV to the open breaker position in the AD2-136 breaker bay (or other available breaker bay positions if can be created) to eliminate the stuck breaker contingency involving the loss of the Fostor and Howard lines at Melmore. Cost estimate is $4M. An approximate construction time would be 24 to 36 months after signing an interconnection agreement. Project Type : CON Cost : $ 4,000,000 Time Estimate : 24-36 Months AE2-174 is the driver for the reinforcement.	$4,000,000	$4,000,000	N6295.2
05MELMOR-05FOSTOR 138 kV line (from bus 243039 to bus 243006 ckt 1)	**AEP** AEP SE rating is 167 MVA. **AEP Reinforcement** **N7920.1:** Perform a Sag Study on the 18 miles of Conductor Section 1. New expected SE rating to be 245 MVA. Project Type : FAC Cost : $ 108,000 Time Estimate: 6-12 Months New Ratings: Rate B: 245 MVA AE2-174 is the driver for the reinforcement.	$108,000	$108,000	N7920.1
	Total	**$4,108,000**	**$4,108,000**	

Contribution to Previously Identified System Reinforcements

(Overloads initially caused by prior Queue positions with additional contribution to overloading by this project. This project may have a % allocation cost responsibility which will be calculated and reported for the Impact Study)

(Summary form of Cost allocation for transmission lines and transformers will be inserted here if any)

None

Note : For customers with System Reinforcements listed: If your present cost allocation to a System Reinforcement indicates $0, then please be aware that as changes to the interconnection process occur, such as prior queued projects withdrawing from the queue, reducing in size, etc, the cost responsibilities can change and a cost allocation may be assigned to your project. In addition, although your present cost allocation to a System Reinforcement is presently $0, your project may need this system reinforcement completed to be deliverable to the PJM system. If your project comes into service prior to completion of the system reinforcement, an interim deliverability study for your project will be required.

10.7 Appendices

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. All New Service Queue Requests, through the end of the Queue under study, that are contributors to a flowgate will be listed in the Appendices. Please note that there may be contributors that are subsequently queued after the queue under study that are not listed in the Appendices. 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 and appendices sections are full contributions, whereas the loading percentages reported in the body of the report, take into consideration the commercial probability of each project as well as the ramping impact of "Adder" contributions.

Appendix 1

(AEP - AEP) The 05MELMOR-05CHATFL 138 kV line (from bus 243039 to bus 242984 ckt 1) loads from 90.88% to 108.67% (AC power flow) of its emergency rating (167 MVA) for the line fault with failed breaker contingency outage of 'AEP_P4_#7110_05MELMOR 138_B'. This project contributes approximately 31.19 MW to the thermal violation.

CONTINGENCY 'AEP_P4_#7110_05MELMOR 138_B'
OPEN BRANCH FROM BUS 243006 TO BUS 243039 CKT 1 / 243006 05FOSTOR 138 243039 05MELMOR 138 1
OPEN BRANCH FROM BUS 243024 TO BUS 243039 CKT 1 / 243024 05HOWARD 138 243039 05MELMOR 138 1
END

Bus Number	*Bus Name*	*Full Contribution*
934251	*AD1-052 C1*	*0.78*
934261	*AD1-052 C2*	*0.78*
937021	*AD2-136 C O1*	*11.5*
937022	*AD2-136 E O1*	*76.93*
941741	*AE2-174 C*	*5.49*
941742	*AE2-174 E*	*25.7*
LTF	*CALDERWOOD*	*0.02*
LTF	*CARR*	*0.04*
LTF	*CATAWBA*	*0.03*
LTF	*CBM-S1*	*0.08*
LTF	*CBM-W1*	*3.62*
LTF	*CBM-W2*	*2.57*
LTF	*CHEOAH*	*0.02*
LTF	*CHILHOWEE*	*< 0.01*
LTF	*CIN*	*0.38*
LTF	*G-007*	*0.15*
LTF	*HAMLET*	*0.06*
LTF	*IPL*	*0.23*
LTF	*LGEE*	*0.03*
LTF	*MEC*	*1.03*
LTF	*MECS*	*5.02*
LTF	*O-066*	*0.98*
LTF	*RENSSELAER*	*0.04*
LTF	*SANTEETLA*	*< 0.01*
LTF	*WEC*	*0.2*

Appendix 2

(AEP - AEP) The 05MELMOR-05FOSTOR 138 kV line (from bus 243039 to bus 243006 ckt 1) loads from 80.22% to 105.98% (AC power flow) of its emergency rating (167 MVA) for the line fault with failed breaker contingency outage of 'AEP_P4_#7112_05MELMOR 138_C'. This project contributes approximately 43.27 MW to the thermal violation.

CONTINGENCY 'AEP_P4_#7112_05MELMOR 138_C'
OPEN BRANCH FROM BUS 242953 TO BUS 243110 CKT 1 / 242953 05AIRCO8 138 243110 05STIFFI 138 1
OPEN BRANCH FROM BUS 242953 TO BUS 243137 CKT 1 / 242953 05AIRCO8 138 243137 05W.END 138 1
OPEN BRANCH FROM BUS 242984 TO BUS 243039 CKT 1 / 242984 05CHATFL 138 243039 05MELMOR 138 1
OPEN BRANCH FROM BUS 243039 TO BUS 243110 CKT 1 / 243039 05MELMOR 138 243110 05STIFFI 138 1
OPEN BRANCH FROM BUS 243110 TO BUS 245630 CKT 1 / 243110 05STIFFI 138 245630 05S TIFFIN 69.0 1
END

Bus Number	*Bus Name*	*Full Contribution*
932051	*AC2-015 C*	*6.92*
932052	*AC2-015 E*	*8.19*
934251	*AD1-052 C1*	*0.82*
934261	*AD1-052 C2*	*0.82*
937021	*AD2-136 C O1*	*16.1*
937022	*AD2-136 E O1*	*107.75*
941741	*AE2-174 C*	*7.62*
941742	*AE2-174 E*	*35.65*
LTF	*BLUEG*	*1.83*
LTF	*CALDERWOOD*	*0.12*
LTF	*CANNELTON*	*0.11*
LTF	*CATAWBA*	*0.05*
LTF	*CBM-N*	*0.15*
LTF	*CHEOAH*	*0.11*
LTF	*CHILHOWEE*	*0.04*
LTF	*COFFEEN*	*0.22*
LTF	*COTTONWOOD*	*0.62*
LTF	*DUCKCREEK*	*0.53*
LTF	*EDWARDS*	*0.24*
LTF	*FARMERCITY*	*0.14*
LTF	*G-007A*	*0.38*
LTF	*GIBSON*	*0.08*

LTF	*HAMLET*	*0.06*
LTF	*NEWTON*	*0.56*
LTF	*NYISO*	*0.65*
LTF	*PRAIRIE*	*0.99*
LTF	*SANTEETLA*	*0.03*
LTF	*SMITHLAND*	*0.07*
LTF	*TILTON*	*0.28*
LTF	*TRIMBLE*	*0.2*
LTF	*TVA*	*0.47*
LTF	*UNIONPOWER*	*0.21*
900041	*V4-011*	*-0.33*
LTF	*VFT*	*1.04*

Appendix 3

(AEP - AEP) The AC2-015 TAP-05HOWARD 138 kV line (from bus 932050 to bus 243024 ckt 1) loads from 99.6% to 116.02% (AC power flow) of its emergency rating (167 MVA) for the line fault with failed breaker contingency outage of 'AEP_P4_#7110_05MELMOR 138_B'. This project contributes approximately 29.02 MW to the thermal violation.

CONTINGENCY 'AEP_P4_#7110_05MELMOR 138_B'
OPEN BRANCH FROM BUS 243006 TO BUS 243039 CKT 1 / 243006 05FOSTOR 138 243039 05MELMOR 138 1
OPEN BRANCH FROM BUS 243024 TO BUS 243039 CKT 1 / 243024 05HOWARD 138 243039 05MELMOR 138 1
END

Bus Number	*Bus Name*	*Full Contribution*
932051	*AC2-015 C*	*27.04*
932052	*AC2-015 E*	*32.03*
934251	*AD1-052 C1*	*0.73*
934261	*AD1-052 C2*	*0.73*
937021	*AD2-136 C O1*	*9.88*
937022	*AD2-136 E O1*	*66.12*
941741	*AE2-174 C*	*5.11*
941742	*AE2-174 E*	*23.91*
LTF	*CALDERWOOD*	*0.01*
LTF	*CARR*	*0.04*
LTF	*CATAWBA*	*0.03*
LTF	*CBM-S1*	*0.1*
LTF	*CBM-W1*	*3.53*
LTF	*CBM-W2*	*2.69*
LTF	*CHEOAH*	*0.01*
LTF	*CHILHOWEE*	*< 0.01*
LTF	*CIN*	*0.39*
LTF	*G-007*	*0.15*
LTF	*HAMLET*	*0.05*
LTF	*IPL*	*0.24*
LTF	*LGEE*	*0.04*
LTF	*MEC*	*1.04*
LTF	*MECS*	*4.84*
LTF	*O-066*	*0.96*
LTF	*RENSSELAER*	*0.04*
LTF	*SANTEETLA*	*< 0.01*
LTF	*WEC*	*0.2*

11 Light Load Analysis

The Queue Project AE2-174 was evaluated as a 198.0 MW (Capacity 34.8 MW) injection tapping the Fremont Center to Tiffin 138kV line in the AEP area. Project AE2-174 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AE2-174 was studied with a commercial probability of 100%. Potential network impacts were as follows:

11.1 Light Load 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 – Light Load

None

12 Short Circuit Analysis

The following Breakers are overdutied:

None.

13 Stability and Reactive Power

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

To be determined in the Facilities Study Phase.

14 Affected Systems

14.1 TVA

None

14.2 Duke Energy Progress

None

14.3 MISO

None

14.4 LG&E

None

15 Attachment 1: One Line Diagram and Project Site Location