Generation Interconnection

Feasibility Study Report

for

Queue Project AE1-210

DESOTO 345 KV

13 MW Capacity / 100 MW Energy

June, 2019

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 generation facility shall maintain meteorological data facilities as well as provide that meteorological data which is required per Schedule H to the Interconnection Service Agreement and Section 8 of Manual 14D.

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

PJM utilizes manufacturer models to ensure the performance of turbines is properly captured during the simulations performed for stability verification and, where applicable, for compliance with low voltage ride through requirements. Turbine manufacturers provide such models to their customers. The list of manufacturer models PJM has already validated is contained in Attachment B of Manual 14G. Manufacturer models may be updated from time to time, for various reasons such as to reflect changes to the control systems or to more accurately represent the capabilities turbines and controls which are currently available in the field. Additionally, as new turbine models are developed, turbine manufacturers provide such new models which must be used in the conduct of these studies. PJM needs adequate time to evaluate the new models in order to reduce delays to the System Impact Study process timeline for the Interconnection Customer as well as other Interconnection Customers in the study group. Therefore, PJM will require that any Interconnection Customer with a new manufacturer model must supply that model to PJM, along with a $10,000 fully refundable deposit, no later than three (3) months prior to the starting date of the System Impact Study (See Section 4.3 for starting dates) for the Interconnection Request which shall specify the use of the new model.

The Interconnection Customer will be required to submit a completed dynamic model study request form (Attachment B-1 of Manual 14G) in order to document the request for the study.

The Feasibility Study estimates do not include the feasibility, cost, or time required to obtain property rights and permits for construction of the required facilities. The project developer is responsible for the right of way, real estate, and construction permit issues. For properties currently owned by Transmission Owners, the costs may be included in the study.

General

The Interconnection Customer has proposed a Wind generating facility located in Randolph County, Indiana. The installed facilities will have a total capability of 100 MW with 13 MW of this output being recognized by PJM as Capacity. The proposed in-service date for this project is October, 2021. This study does not imply a TO commitment to this in-service date.

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

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 maintaining the reliability of the AEP transmission system. Stability analysis is not included as part of this study.

Queue Number	AE1-210
Project Name	DESOTO 345 KV
State	Indiana
County	Randolph
Transmission Owner	AEP
MFO	100
MWE	100
MWC	13
Fuel	Wind
Basecase Study Year	2022

Primary Point of Interconnection

AE1-210 proposes to interconnect with the AEP transmission system at the Desoto 345 KV substation utilizing, the gen lead proposed to be constructed, if the AE1-209 queue request proceeds to construction utilizing its secondary point of Interconnection.

To accommodate the Interconnection of either or both AE1-209 and AE1-210 at Desoto 345kV, one new circuit breaker will be installed at the Desoto 345kV. 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.

Cost Summary

The AE1-210 project will be responsible for the following costs:

Description	Total Cost
Attachment Facilities	$2,000,000
Direct Connection Network Upgrade	$ 300,000
Total Costs	$2,300,000

In addition, the AE1-210 project may be responsible for a contribution to the following costs

Description	Total Cost
System Upgrades	$ 255,120

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

Transmission Owner Scope of Work

Attachment Facilities

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

Description	Total Cost
▪ Install one new 345 circuit breaker at Desoto 345kV station. Installation of associated protection and control equipment, SCADA, and 345 kV revenue metering will also be required.	$ 2,000,000
Total Attachment Facility Costs	$ 2,000,000

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
▪ 345kV Revenue Metering	$ 300,000
Total Direct Connection Facility Costs	$300,000

Incremental Capacity Transfer Rights (ICTRs)

Will be determined at a later study phase

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.

Transmission Owner Analysis

None

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 Desoto 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.

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.

Revenue Metering and SCADA Requirements

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.

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

Option 1

Network Impacts

The Queue Project AE1-210 was evaluated as a 100 MW (Capacity 13 MW) injection at the Desoto 345 kV substation in the AEP area. Project AE1-210 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AE1-210 was studied with a commercial probability of 53%. Potential network impacts were as follows:

Summer Peak Load Flow

Generation Deliverability

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

None

Multiple Facility Contingency

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

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
855601	243278	05DESOTO	AEP	243319	05JAY	AEP	1	AEP_P7-1_#11087	tower	393.0	99.2	100.19	DC	8.68

***855601:** The Current Desoto – Jay 138kV SE rating is 392 MVA. PJM Baseline project B3103 will raise the SE rating from 392 MVA to 409MVA. The projected ISD for B3103 is 12/10/21.

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).

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
855600	243278	05DESOTO	AEP	243319	05JAY	AEP	1	AEP_P7-1_#11019	tower	393.0	104.1	105.09	DC	8.66
245278	248001	06DEARB1	OVEC	248013	06PIERCE	OVEC	1	.345.DEO&K-AEP.C5 4504MFTANNERS4512EBTANNERS	tower	972.0	108.57	109.87	DC	12.39

***855600:** Desoto – Jay 138kV SE rating is 392 MVA. PJM Baseline project B3103 will raise the SE rating from 392 MVA to 409MVA. The projected ISD for B3103 is 12/10/21.

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

System Reinforcements

ID	Index	Facility	Upgrade Description	Cost
245278	2	**06DEARB1 345.0 kV - 06PIERCE 345.0 kV Ckt 1**	**OVEC** A sag study will be required on the 33.5 miles of 1414~ 62/19 ACSR/PE Conductor, to mitigate the overload. The new ratings after sag study and any required mitigation will be: S/N: 971 MVA, S/E: 1419 MVA. The estimated study cost is $135,000. The cost of any mitigation will depend on the outcome of the sag study.	$135,000
855600,855601	1	**05DESOTO 138.0 kV - 05JAY 138.0 kV Ckt 1**	**AEP** Description : Current AEP End Ratings are S/N :335MVA S/E: 392 MVA 1) Replace 2 risers(Sub cond 1590 AAC 61 Str) at Jay Station, Estimated Cost : $ 70,000. **Note:** Baseline Project B3103 will replace the Jay station risers with the projected ISD of 12/10/2021. 2) A Sag Study will be required on the 12.53 miles of ACSR ~ 556.5 ~ 26/7 ~ DOVE - Conductor section 1, to mitigate the overload. The new ratings after sag study will be: S/N: 410 MVA, S/E: 568 MVA, depending on the sag study results, the cost for this upgrade is expected to be between $50,120(no remediation required, just sag study) and $18.8 million (complete line Reconductor/rebuild).	$120,120
			TOTAL COST	**$255,120**

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.

Index 1

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
855600	243278	05DESOTO	AEP	243319	05JAY	AEP	1	AEP_P7-1_#11019	tower	393.0	104.1	105.09	DC	8.66

Bus #	Bus	MW Impact
247935	V3-007 E	13.23
247963	05HDWTR1G E	4.76
923881	AB2-028 C	1.66
923882	AB2-028 E	11.09
926881	AC1-175 C	5.78
926882	AC1-175 E	9.43
927182	AC1-212 E	1.35
932681	AC2-090 C	2.89
932682	AC2-090 E	4.71
933601	AC2-177 C O1	1.98
933602	AC2-177 E O1	13.23
939761	AE1-207 C	4.01
939762	AE1-207 E	5.54
939791	AE1-210 C O1	1.13
939792	AE1-210 E O1	7.54
939811	AE1-217 C O1	6.37
939812	AE1-217 E O1	8.8
CARR	CARR	0.04
CBM-S1	CBM-S1	2.29
CBM-S2	CBM-S2	0.46
CBM-W2	CBM-W2	20.16
CIN	CIN	4.38
CPLE	CPLE	0.14
DEARBORN	DEARBORN	0.63
G-007	G-007	0.09
IPL	IPL	3.78
LGEE	LGEE	0.81
MEC	MEC	1.67
O-066	O-066	0.31
RENSSELAER	RENSSELAER	0.03
WEC	WEC	0.06

Index 2

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
245278	248001	06DEARB1	OVEC	248013	06PIERCE	OVEC	1	.345.DEO&K-AEP.C5 4504MFTANNERS4512EBTANNERS	tower	972.0	108.57	109.87	DC	12.39

Bus #	Bus	MW Impact
243795	05HDWTR1G C	0.62
247264	05LAWG1A	7.65
247265	05LAWG1B	7.65
247266	05LAWG1S	12.21
247267	05LAWG2A	7.65
247268	05LAWG2B	7.65
247269	05LAWG2S	12.21
247543	V3-007 C	0.62
247914	05WLD G1 E	8.02
247929	S-071 E	8.58
247935	V3-007 E	26.87
247958	05WLD G2 E	8.41
247963	05HDWTR1G E	9.67
247968	Z2-115 E	0.16
915662	Y3-099 E	0.2
915672	Y3-100 E	0.2
916182	Z1-065 E	0.38
920501	AA2-148 C O1	3.54
920502	AA2-148 E O1	23.7
923881	AB2-028 C	2.91
923882	AB2-028 E	19.49
925242	AB2-178 E	1.98
926691	AC1-152	15.73
926851	AC1-172	15.73
926881	AC1-175 C	11.74
926882	AC1-175 E	19.15
932681	AC2-090 C	5.87
932682	AC2-090 E	9.57
932841	AC2-111 C O1	2.77
932842	AC2-111 E O1	4.52
933591	AC2-176 C O1	1.52
933592	AC2-176 E O1	10.16
933601	AC2-177 C O1	4.01
933602	AC2-177 E O1	26.87
934161	AD1-043 C O1	4.47
934162	AD1-043 E O1	7.3
934961	AD1-128 C O1	5.63
934962	AD1-128 E O1	9.19
936561	AD2-071 C	5.95
936562	AD2-071 E	2.93

Bus #	Bus	MW Impact
936681	AD2-087 C O1	3.17
936682	AD2-087 E O1	14.86
938061	AE1-008 C	0.69
938062	AE1-008 E	1.13
939761	AE1-207 C	5.97
939762	AE1-207 E	8.24
939771	AE1-208 C	5.25
939772	AE1-208 E	7.16
939781	AE1-209 C O1	1.28
939782	AE1-209 E O1	8.59
939791	AE1-210 C O1	1.61
939792	AE1-210 E O1	10.78
939811	AE1-217 C O1	7.96
939812	AE1-217 E O1	11.0
950161	J401	1.31
954711	J851 C	0.49
954712	J851 E	2.64
AB2-013	AB2-013	5.62
AE1-033	AE1-033	5.7
CARR	CARR	0.32
CATAWBA	CATAWBA	0.08
CBM-S1	CBM-S1	4.35
CBM-W1	CBM-W1	17.14
CBM-W2	CBM-W2	71.42
CIN	CIN	13.7
G-007	G-007	0.92
HAMLET	HAMLET	0.37
IPL	IPL	12.58
LGEE	LGEE	1.1
MEC	MEC	15.46
MECS	MECS	7.27
O-066	O-066	3.1
RENSSELAER	RENSSELAER	0.25
WEC	WEC	2.44
Z1-043	Z1-043	9.8

Affected Systems

LG&E

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

MISO

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

TVA

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

Duke Energy Progress

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

NYISO

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

Contingency Name	Contingency Definition
AEP_P7-1_#11019	CONTINGENCY 'AEP_P7-1_#11019' OPEN BRANCH FROM BUS 243218 TO BUS 243232 CKT 2 / 243218 05DESOTO 345 243232 05SORENS 345 2 OPEN BRANCH FROM BUS 243225 TO BUS 243232 CKT 1 / 243225 05KEYSTN 345 243232 05SORENS 345 1 END
AEP_P7-1_#11087	CONTINGENCY 'AEP_P7-1_#11087' OPEN BRANCH FROM BUS 243218 TO BUS 243225 CKT 1 / 243218 05DESOTO 345 243225 05KEYSTN 345 1 OPEN BRANCH FROM BUS 243218 TO BUS 243232 CKT 2 / 243218 05DESOTO 345 243232 05SORENS 345 2 END
.345.DEO&K-AEP.C5 4504MFTANNERS4512EBTANNERS	CONTINGENCY '.345.DEO&K-AEP.C5 4504MFTANNERS4512EBTANNERS' OPEN BRANCH FROM BUS 243233 TO BUS 249567 CKT 1 OPEN BRANCH FROM BUS 243233 TO BUS 249565 CKT 1 END

Short Circuit

Short Circuit

The following Breakers are over duty

None

Secondary Point of Interconnection

If proceeding via the secondary POI, the AE1-210 request will interconnect with the AEP transmission system via a proposed switching station cut into the Modoc – Desoto 138kV section of the College Corner – Desoto 138kV circuit, proposed to be constructed for PJM project #AD1-128.Following this plan of connection, the AE1-210 generation would share the gen lead proposed to be constructed if the AE1-209 queue request proceeds utilizing its Primary point of Interconnection.

Note:
1) It is assumed that the 138 kV revenue metering and gen lead installed for #AE1-209 will be adequate for the additional generation.
2)PJM Supplemental Project s1610 contains plans to retire the Delaware 138kV station exits toward College Corner and Selma Parker and re-terminate them into Desoto 138kV Station. The projected in service date is 06/2019.

Option 2

Network Impacts

The Queue Project AE1-210 was evaluated as a 100 MW (Capacity 13 MW) injection tapping the Desoto to Selma Parker138 kV line in the AEP area. Project AE1-210 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AE1-210 was studied with a commercial probability of 53%. Potential network impacts were as follows:

Summer Peak Load Flow

Generation Deliverability

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

None

Multiple Facility Contingency

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

None

Contribution to Previously Identified Overloads

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

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
200517	243262	05COLLCO	AEP	250001	08COLINV	DEO&K	1	AEP_P4_#10527_05BLUFFP 138_E2	breaker	167.0	115.48	122.0	DC	10.89
201479	243262	05COLLCO	AEP	250001	08COLINV	DEO&K	1	.345.DEO&K-AEP.C5 4504MFTANNERS4512EBTANNERS	tower	167.0	120.06	126.25	DC	10.34
829859	243262	05COLLCO	AEP	250001	08COLINV	DEO&K	1	AEP_P4_#10527_05BLUFFP 138_E2	breaker	167.0	115.48	122.0	DC	10.89
831130	243262	05COLLCO	AEP	250001	08COLINV	DEO&K	1	.345.DEO&K-AEP.C5 4504MFTANNERS4512EBTANNERS	tower	167.0	120.06	126.25	DC	10.34
201582	248001	06DEARB1	OVEC	248013	06PIERCE	OVEC	1	.345.DEO&K-AEP.C5 4504MFTANNERS4512EBTANNERS	tower	972.0	109.4	109.87	DC	9.88

Potential Congestion due to Local Energy Deliverability

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

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

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
201143	243262	05COLLCO	AEP	250001	08COLINV	DEO&K	1	AEP_P1-2_#6372A	operation	167.0	113.35	120.32	DC	11.63
201144	243262	05COLLCO	AEP	250001	08COLINV	DEO&K	1	.138.DEO&K-AEP-DAY.B2 TODHUNTER JCT 138	operation	167.0	113.35	120.32	DC	11.63
830640	243262	05COLLCO	AEP	250001	08COLINV	DEO&K	1	.138.DEO&K-AEP-DAY.B2 TODHUNTER JCT 138	operation	167.0	113.35	120.32	DC	11.63
830641	243262	05COLLCO	AEP	250001	08COLINV	DEO&K	1	AEP_P1-2_#6372A	operation	167.0	113.35	120.32	DC	11.63
830501	934960	AD1-128 TAP	AEP	243275	05DELAWR	AEP	1	AEP_P1-2_#5489-B	operation	185.0	81.08	135.14	DC	100.0
830505	934960	AD1-128 TAP	AEP	243344	05MODOC	AEP	1	AEP_P1-2_#5489-A	operation	185.0	81.08	135.14	DC	100.0
830915	936560	AD2-071 TAP	AEP	246763	05PIPECK	AEP	1	AEP_P1-2_#362	operation	205.0	99.68	100.86	DC	5.37

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.

Index 1

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
831130	243262	05COLLCO	AEP	250001	08COLINV	DEO&K	1	.345.DEO&K-AEP.C5 4504MFTANNERS4512EBTANNERS	tower	167.0	120.06	126.25	DC	10.34

Bus #	Bus	MW Impact
243415	05WWVSTA	2.4
247288	05RICHG1	0.8
247289	05RICHG2	0.8
247929	S-071 E	6.98
932841	AC2-111 C O1	7.06
932842	AC2-111 E O1	11.53
934961	AD1-128 C O1	5.89
934962	AD1-128 E O1	9.62
936681	AD2-087 C O1	3.81
936682	AD2-087 E O1	17.83
938061	AE1-008 C	1.77
938062	AE1-008 E	2.88
939791	AE1-210 C O2	1.34
939792	AE1-210 E O2	9.0
CARR	CARR	0.03
CATAWBA	CATAWBA	0.01
CBM-S1	CBM-S1	0.45
CBM-W1	CBM-W1	3.26
CBM-W2	CBM-W2	10.89
CIN	CIN	2.06
G-007	G-007	0.09
HAMLET	HAMLET	0.04
IPL	IPL	1.76
LGEE	LGEE	0.01
MEC	MEC	2.73
MECS	MECS	1.58
O-066	O-066	0.32
RENSSELAER	RENSSELAER	0.03
WEC	WEC	0.46

Index 2

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
201582	248001	06DEARB1	OVEC	248013	06PIERCE	OVEC	1	.345.DEO&K-AEP.C5 4504MFTANNERS4512EBTANNERS	tower	972.0	109.4	109.87	DC	9.88

Bus #	Bus	MW Impact
243795	05HDWTR1G C	0.62
247264	05LAWG1A	7.65
247265	05LAWG1B	7.65
247266	05LAWG1S	12.21
247267	05LAWG2A	7.65
247268	05LAWG2B	7.65
247269	05LAWG2S	12.21
247543	V3-007 C	0.62
247914	05WLD G1 E	8.02
247929	S-071 E	8.58
247935	V3-007 E	26.87
247958	05WLD G2 E	8.41
247963	05HDWTR1G E	9.67
247968	Z2-115 E	0.16
915662	Y3-099 E	0.2
915672	Y3-100 E	0.2
916182	Z1-065 E	0.38
920501	AA2-148 C O1	3.54
920502	AA2-148 E O1	23.7
923881	AB2-028 C	2.91
923882	AB2-028 E	19.49
925242	AB2-178 E	1.98
926691	AC1-152	15.73
926851	AC1-172	15.73
926881	AC1-175 C	11.74
926882	AC1-175 E	19.15
932681	AC2-090 C	5.87
932682	AC2-090 E	9.57
932841	AC2-111 C O1	2.77
932842	AC2-111 E O1	4.52
933591	AC2-176 C O1	1.52
933592	AC2-176 E O1	10.16
933601	AC2-177 C O1	4.01
933602	AC2-177 E O1	26.87
934161	AD1-043 C O1	4.47
934162	AD1-043 E O1	7.3
934961	AD1-128 C O1	5.63
934962	AD1-128 E O1	9.19
936561	AD2-071 C	5.95
936562	AD2-071 E	2.93

Bus #	Bus	MW Impact
936681	AD2-087 C O1	3.17
936682	AD2-087 E O1	14.86
938061	AE1-008 C	0.69
938062	AE1-008 E	1.13
939761	AE1-207 C	5.97
939762	AE1-207 E	8.24
939771	AE1-208 C	5.25
939772	AE1-208 E	7.16
939781	AE1-209 C O2	1.61
939782	AE1-209 E O2	10.78
939791	AE1-210 C O2	1.28
939792	AE1-210 E O2	8.59
939811	AE1-217 C O2	7.91
939812	AE1-217 E O2	10.92
950161	J401	1.31
954711	J851 C	0.49
954712	J851 E	2.64
AB2-013	AB2-013	5.62
AE1-033	AE1-033	5.7
CARR	CARR	0.32
CATAWBA	CATAWBA	0.08
CBM-S1	CBM-S1	4.35
CBM-W1	CBM-W1	17.14
CBM-W2	CBM-W2	71.42
CIN	CIN	13.7
G-007	G-007	0.92
HAMLET	HAMLET	0.37
IPL	IPL	12.58
LGEE	LGEE	1.1
MEC	MEC	15.46
MECS	MECS	7.27
O-066	O-066	3.1
RENSSELAER	RENSSELAER	0.25
WEC	WEC	2.44
Z1-043	Z1-043	9.8

Affected Systems

LG&E

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

MISO

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

TVA

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

Duke Energy Progress

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

NYISO

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

Contingency Name	Contingency Definition
AEP_P1-2_#6372A	CONTINGENCY 'AEP_P1-2_#6372A' OPEN BRANCH FROM BUS 243262 TO BUS 250106 CKT 1 / 243262 05COLLCO 138 250106 08TODHJT 138 1 END
AEP_P4_#10527_05BLUFFP 138_E2	CONTINGENCY 'AEP_P4_#10527_05BLUFFP 138_E2' OPEN BRANCH FROM BUS 243253 TO BUS 243319 CKT 1 / 243253 05BLUFFP 138 243319 05JAY 138 1 OPEN BRANCH FROM BUS 243253 TO BUS 246014 CKT 1 / 243253 05BLUFFP 138 246014 05BLUFFPNT 69.0 1 END
AEP_P1-2_#5489-B	CONTINGENCY 'AEP_P1-2_#5489-B' OPEN BRANCH FROM BUS 246085 TO BUS 243344 CKT 1 / 246085 05MODOC EQ 999 243344 05MODOC 138 1 OPEN BRANCH FROM BUS 246085 TO BUS 246083 CKT 1 / 246085 05MODOC EQ 999 246083 05MODOC 69.0 1 OPEN BRANCH FROM BUS 246085 TO BUS 246084 CKT 1 / 246085 05MODOC EQ 999 246084 05MODOC L 12.0 1 OPEN BRANCH FROM BUS 243259 TO BUS 243262 CKT 1 / 243259 05CNTRVL 138 243262 05COLLCO 138 1 OPEN BRANCH FROM BUS 243259 TO BUS 243344 CKT 1 / 243259 05CNTRVL 138 243344 05MODOC 138 1 OPEN BRANCH FROM BUS 934960 TO BUS 243344 CKT 1 / 934960 AD1-128 TAP 138 243344 05MODOC 138 1 OPEN BRANCH FROM BUS 243259 TO BUS 250345 CKT 1 / 243259 05CNTRVL 138 250345 08CENTVL 69.0 1 OPEN BRANCH FROM BUS 246080 TO BUS 246083 CKT 1 / 246080 05HUNTSVIL 69.0 246083 05MODOC 69.0 1 END
AEP_P1-2_#5489-A	CONTINGENCY 'AEP_P1-2_#5489-A' OPEN BRANCH FROM BUS 243275 TO BUS 934960 CKT 1 / 243275 05DELAWR 138 934960 AD1-128 TAP 138 1 END
.345.DEO&K-AEP.C5 4504MFTANNERS4512EBTANNERS	CONTINGENCY '.345.DEO&K-AEP.C5 4504MFTANNERS4512EBTANNERS' OPEN BRANCH FROM BUS 243233 TO BUS 249567 CKT 1 OPEN BRANCH FROM BUS 243233 TO BUS 249565 CKT 1 END
.138.DEO&K-AEP-DAY.B2 TODHUNTER JCT 138	CONTINGENCY '.138.DEO&K-AEP-DAY.B2 TODHUNTER JCT 138' OPEN BUS 250106 END
AEP_P1-2_#362	CONTINGENCY 'AEP_P1-2_#362' OPEN BRANCH FROM BUS 243207 TO BUS 243208 CKT 1 / 243207 05GRNTWN 765 243208 05JEFRSO 765 1 END

Short Circuit

Short Circuit

The following Breakers are over duty

None