Generation Interconnection Feasibility Study Report

For

PJM Generation Interconnection Request Queue Position AD1-118

Lemoyne 345kV

April 2018

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. 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 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 (IC), has proposed an uprate to an existing Natural gas generating facility located in Luckey, Ohio. This projects requests an increase to the install capability of 70 MW with 70 MW of this output being recognized by PJM as capacity. The installed facilities will have a total capability of 710 MW with 710 MW of this output being recognized by PJM as capacity. The proposed in-service date for this project is September 1, 2018. **This study does not imply a ATIS commitment to this in-service date.**

Point of Interconnection

AD1-118 will interconnect with the ATSI Transmission system at the Lemoyne 345kV Substation.

Cost Summary

The AD1-118 project will be responsible for the following costs:

Description	Total Cost
Attachment Facilities	$ 0
Direct Connection Network Upgrades	$ 0
Non Direct Connection Network Upgrades	$ 0
Total Costs	**$ 0**

In addition, the AD1-118 project may be responsible for a contribution to the following costs:

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Description	Total Cost
New System Upgrades	$ 0
Previously Identified Upgrades	$ 610,700
Total Costs	**$ 610,700**

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

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Attachment Facilities

No Attachment Facilities are required to support this interconnection request.

Direct Connection Cost Estimate

No Direct Connection Facilities are required to support this interconnection request.

Non-Direct Connection Cost Estimate

No Non-Direct Connection Facilities are required to support this interconnection request.

Transmission Owner Scope of Work

Because AD1-118 is an increase to an existing facility, no new interconnection facilities are required to accommodate the increased output.

FE Facility Upgrades and Costs

Several of the identified criteria violations can be solved with an existing PJM Baseline projects (b2897 and b2896) but may not be able to be accelerated to meet the Interconnection Customer's requested in-service date of September 1, 2018. Additional criteria violations impact another electric utility in the area and will require additional analysis and confirmation from that electric utility by PJM.

Interconnection Customer Requirements

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.

3. The existing 600 MW portion of the Customer's Facility shall maintain a power factor or at least .95 leading to .90 lagging measured at the generator terminals.

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The remaining existing 40 MW portion of the Customer's Facility and the increase of 70 MW proposed for project AD1-118 shall be designed with the ability to maintain a power factor of at least 1.0 (unity) to 0.90 lagging (supplying VARs) measured at the generator's terminals.

Short Circuit and Protection Analysis

The Developer has indicated that no changes to the electrical characteristics of the generation facility will be made for this project. This includes no changes to:

- Power equipment at the delivery voltage or interconnecting substation on-line
- Any protective relay application, relay scheme design or relay settings.
- Short circuit characteristics of the facility and short circuit contribution to the transmission system.

FirstEnergy will therefore require no changes to its transmission protection schemes and a short circuit / breaker duty study is not required. PJM will be responsible to provide the results of the dynamics analysis as part of the System Impact Study.

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 Sections 24.1 and 24.2.

ATSI Requirements

The Interconnection Customer will be required to comply with all FE Revenue Metering Requirements for Generation Interconnection Customers. The Revenue Metering Requirements may be found within the "FirstEnergy Requirements for Transmission Connected Facilities" document located at the following links:

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

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Network Impacts

The Queue Project AD1-118 was evaluated as a 70.0 MW (Capacity 70.0 MW) uprate to the Facility in the ATSI area. Project AD1-118 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AD1-118 was studied with a commercial probability of 53%. Potential network impacts were as follows:

Summer Peak Analysis - 2021

Contingency Descriptions

The following contingencies resulted in overloads:

Contingency Name	Description
AEP_P4_#517	CONTINGENCY 'AEP_P4_#517' OPEN BRANCH FROM BUS 241901 TO BUS 242936 CKT 1 / 241901 02LALLENDORF 345 242936 05FOSTOR 345 1 OPEN BRANCH FROM BUS 238889 TO BUS 242936 CKT 1 / 238889 02LEMOYN 345 242936 05FOSTOR 345 1 END
ATSI-P2-3-CEI-345-001	CONTINGENCY 'ATSI-P2-3-CEI-345-001' /* BREAKER FAILURE ON S145 BREAKER AT AVON 345KV DISCONNECT BRANCH FROM BUS 239725 TO BUS 238551 CKT 1 /* 02LAKEAVE 345 02AVON 345 DISCONNECT BRANCH FROM BUS 239725 TO BUS 238551 CKT 2 /* 02LAKEAVE 345 02AVON 345 END
ATSI-P7-1-CEI-345-001	CONTINGENCY 'ATSI-P7-1-CEI-345-001' /* AVON-BEAVER #1 AND #2 345KV LINE OUTAGES DISCONNECT BRANCH FROM BUS 238551 TO BUS 239725 CKT 1 /* 02AVON 345 02LAKEAVE 345 DISCONNECT BRANCH FROM BUS 238551 TO BUS 239725 CKT 2 /* 02AVON 345 02LAKEAVE 345 END

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Contingency Name	Description
ATSI-P7-1-TE-345-024T	CONTINGENCY 'ATSI-P7-1-TE-345-024T' /* Y1-069-FOSTORIA/LEMOYNE-FOSTORIA 345 DISCONNECT BRANCH FROM BUS 241901 TO BUS 242936 CKT 1 /* 02_Y1-069 345 05FOSTOR 345 DISCONNECT BRANCH FROM BUS 238889 TO BUS 242936 CKT 1 /* 02LEMOYN 345 05FOSTOR 345 END

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Generator 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)

	Contingency		Affected		Bus			Power	Loading %		Rating		MW	
#	Type	Name	Area	Facility Description	From	To	Circuit	Flow	Initial	Final	Type	MVA	Contribution	Ref
1	LFFB	ATSI-P2-3-CEI-345-001	FE - FE	02AD Q-2-02AVON 138 kV line	238524	238552	1	DC	104.9	105.53	ER	316	4.4	1
2	DCTL	ATSI-P7-1-CEI-345-001	FE - FE	02AD Q-2-02AVON 138 kV line	238524	238552	1	DC	104.9	105.53	ER	316	4.4	
3	LFFB	AEP_P4_#517	FE - FE	02LEMOYN-02WOOD+ 138 kV line	238890	239176	1	DC	104.98	106.57	ER	223	7.83	2
4	DCTL	ATSI-P7-1-TE-345-024T	FE - FE	02LEMOYN-02WOOD+ 138 kV line	238890	239176	1	DC	104.98	106.57	ER	223	7.83	
5	LFFB	ATSI-P2-3-CEI-345-001	FE - FE	02LRN Q2-02AD Q-2 138 kV line	238915	238524	1	DC	104.93	105.56	ER	316	4.4	3
6	DCTL	ATSI-P7-1-CEI-345-001	FE - FE	02LRN Q2-02AD Q-2 138 kV line	238915	238524	1	DC	104.93	105.56	ER	316	4.4	
7	LFFB	ATSI-P2-3-CEI-345-001	FE - FE	02BLKRVR-02USSTEEL 138 kV line	239728	239734	1	DC	111.18	111.72	ER	500	5.97	4

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#	Contingency Type	Contingency Name	Affected Area	Facility Description	Bus From	Bus To	Circuit	Power Flow	Loading % Initial	Loading % Final	Rating Type	Rating MVA	MW Contribution	Ref
8	DCTL	ATSI-P7-1-CEI-345-001	FE - FE	02BLKRVR-02USSTEEL 138 kV line	239728	239734	1	DC	111.18	111.72	ER	500	5.97	
9	LFFB	ATSI-P2-3-CEI-345-001	FE - FE	02USSTEEL-02LRN Q2 138 kV line	239734	238915	1	DC	104.88	105.42	ER	500	5.97	5
10	DCTL	ATSI-P7-1-CEI-345-001	FE - FE	02USSTEEL-02LRN Q2 138 kV line	239734	238915	1	DC	104.88	105.42	ER	500	5.97	

Note: Please see Attachment 1 for projects providing impacts to flowgate violations. The values in the Reference column correspond to the proper table in the Attachment.

Short Circuit

(Summary of impacted circuit breakers)

None.

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.

None.

Steady-State Voltage Requirements

(Results of the steady-state voltage studies should be inserted here)
To be determined

Affected System Analysis & Mitigation

MISO Impacts:

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

Light Load Analysis - 2021

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Light Load Studies to be conducted during later study phases (as required by PJM Manual 14B).

Stability and Reactive Power Requirement

(Results of the dynamic studies should be inserted here)

To be determined

New System Reinforcements

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

None.

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)

Violation #	Overloaded Facility	Upgrade Description	Network Upgrade Number	Upgrade Cost
#1, 2, 5, 6	02AD Q-2-02AVON 138 kV line	ATSI: Existing PJM baseline project to reconductor line (b2897). This project has a 2021 ISD. If a 2018 project in-service is required and feasible, then the IC may be responsible for the cost of accelerating the project to 2018.		**$ 0**
#3, 4	02LEMOYN-02WOOD+ 138 kV line	ATSI: Reconductor the existing 477 ACSR on the Lemoyne-Woodville Tap 138 kV line with 477 ACSS (approx. 0.4miles). The increased emergency rating will be 365 MVA. Estimated Cost: $610,700. Estimated Schedule: 6 months.		**$ 610,700**
#7, 8, 9, 10	02BLKRVR-02USSTEEL 138 kV line	ATSI: Existing PJM baseline project to reconductor line (b2896). This project has a 2021 ISD. If a 2018 project in-service is required and feasible, then the IC may be responsible for the cost of accelerating the project to 2018.		**$ 0**
			Total New Network Upgrades	**$ 610,700**

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Attachment 1. Flowgate Details

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. 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.

Appendix 1

(FE - FE) The 02AD Q-2-02AVON 138 kV line (from bus 238524 to bus 238552 ckt 1) loads from 104.9% to 105.53% (**DC power flow**) of its emergency rating (316 MVA) for the line fault with failed breaker contingency outage of 'ATSI-P2-3-CEI-345-001'. This project contributes approximately 4.4 MW to the thermal violation.

Bus Number	Bus Name	Full Contribution
238564	02BAYSG1	8.97
238572	02BEAVGB	1.6
240968	02BG2 GEN	0.45
240969	02BG4 G1	0.11
240970	02BG4 G2&3	0.23
240971	02BG4 G4&5	0.23
240950	02BG5	1.38
240973	02BG6 AMPO	2.01
239276	02COLLW 11	-2.18
239297	02CPPW41	-2.81
238979	02NAPMUN	2.12
240975	02PGE GEN	3.11
239175	02WLORG-6	2.53
932791	AC2-103 C	3.73
932792	AC2-103 E	24.99
934251	AD1-052 C1	0.49
934261	AD1-052 C2	0.49
934461	AD1-070 C O1	1.83
934462	AD1-070 E O1	8.6
934761	AD1-103 C O1	6.28
934762	AD1-103 E O1	42.02
934891	AD1-118	4.4
LTF	CARR	0.9

Bus Number	Bus Name	Full Contribution
LTF	CBM-W2	27.32
LTF	CIN	4.37
LTF	CPLE	0.29
LTF	G-007	1.12
LTF	IPL	2.81
LTF	LGEE	0.8
LTF	MEC	8.63
LTF	MECS	16.34
LTF	O-066	3.81
LTF	RENSSELAER	0.7
LTF	ROSETON	5.06
247551	U4-028 C	0.71
247940	U4-028 E	4.72
247552	U4-029 C	0.71
247941	U4-029 E	4.72
247548	V4-010 C	1.52
247947	V4-010 E	10.19
LTF	WEC	1.39
907062	X1-027A E1	10.5
907065	X1-027A E2	10.5
907067	X1-027A E3	10.5
907069	X1-027A E4	10.5
LTF	Y3-032	13.61

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Bus Number	Bus Name	Full Contribution
LTF	CBM-S1	3.89
LTF	CBM-S2	1.64
LTF	CBM-W1	31.43

Bus Number	Bus Name	Full Contribution
931951	AB1-107 1	17.55
931961	AB1-107 2	38.52

Appendix 2

(FE - FE) The 02LEMOYN-02WOOD+ 138 kV line (from bus 238890 to bus 239176 ckt 1) loads from 104.98% to 106.57% (**DC power flow**) of its emergency rating (223 MVA) for the line fault with failed breaker contingency outage of 'AEP_P4_#517'. This project contributes approximately 7.83 MW to the thermal violation.

Bus Number	Bus Name	Full Contribution
238564	02BAYSG1	11.68
240968	02BG2 GEN	0.88
240969	02BG4 G1	0.21
240970	02BG4 G2&3	0.42
240971	02BG4 G4&5	0.42
240950	02BG5	2.76
240973	02BG6 AMPO	3.87
238979	02NAPMUN	3.79
240975	02PGE GEN	6.12
932791	AC2-103 C	1.95
932792	AC2-103 E	13.06
934761	AD1-103 C O1	3.28
934762	AD1-103 E O1	21.95
934891	AD1-118	7.83
LTF	BAYOU	0.1
LTF	BIG_CAJUN1	0.19
LTF	BIG_CAJUN2	0.37
LTF	BLUEG	0.51
LTF	CALDERWOOD	0.15
LTF	CANNELTON	0.05
LTF	CATAWBA	0.11
LTF	CBM-N	0.03
LTF	CBM-W1	22.37
LTF	CELEVELAND	0.31
LTF	CHEOAH	0.14
LTF	CHILHOWEE	0.05
LTF	CHOCTAW	0.16
LTF	CLIFTY	3.42
LTF	COTTONWOOD	0.37
LTF	ELMERSMITH	0.14
LTF	G-007	0.12
LTF	GIBSON	0.04

Bus Number	Bus Name	Full Contribution
LTF	HAMLET	0.35
940041	J308 C	2.96
940042	J308 E	11.83
940121	J392	11.19
940241	J419	6.31
981121	J444	13.86
970371	J537 C	2
970372	J537 E	8.01
951331	J601 C	1.02
951332	J601 E	4.1
981022	J646 E	0.08
LTF	MEC	1.27
LTF	MECS	19.79
LTF	MORGAN	0.31
LTF	NYISO	0.46
LTF	O-066	0.4
LTF	ROWAN	0.22
LTF	SANTEETLA	0.04
LTF	SMITHLAND	0.01
LTF	TRIMBLE	0.1
LTF	TVA	0.14
LTF	UNIONPOWER	0.17
LTF	WEC	0.31
907062	X1-027A E1	5.49
907065	X1-027A E2	5.49
907067	X1-027A E3	5.49
907069	X1-027A E4	5.49
LTF	Y3-032	18.11
931951	AB1-107 1	23.22
931961	AB1-107 2	45.58
926941	AC1-181	0.29

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Appendix 3

(FE - FE) The 02LRN Q2-02AD Q-2 138 kV line (from bus 238915 to bus 238524 ckt 1) loads from 104.93% to 105.56% (**DC power flow**) of its emergency rating (316 MVA) for the line fault with failed breaker contingency outage of 'ATSI-P2-3-CEI-345-001'. This project contributes approximately 4.4 MW to the thermal violation.

Bus Number	Bus Name	Full Contribution
238564	02BAYSG1	8.97
238572	02BEAVGB	1.6
240968	02BG2 GEN	0.45
240969	02BG4 G1	0.11
240970	02BG4 G2&3	0.23
240971	02BG4 G4&5	0.23
240950	02BG5	1.38
240973	02BG6 AMPO	2.01
239276	02COLLW 11	-2.18
239297	02CPPW41	-2.81
238979	02NAPMUN	2.12
240975	02PGE GEN	3.11
239175	02WLORG-6	2.53
932791	AC2-103 C	3.73
932792	AC2-103 E	24.99
934251	AD1-052 C1	0.49
934261	AD1-052 C2	0.49
934461	AD1-070 C O1	1.83
934462	AD1-070 E O1	8.6
934761	AD1-103 C O1	6.28
934762	AD1-103 E O1	42.02
934891	AD1-118	4.4
LTF	CARR	0.9
LTF	CBM-S1	3.89
LTF	CBM-S2	1.64
LTF	CBM-W1	31.43

Bus Number	Bus Name	Full Contribution
LTF	CBM-W2	27.32
LTF	CIN	4.37
LTF	CPLE	0.29
LTF	G-007	1.12
LTF	IPL	2.81
LTF	LGEE	0.8
LTF	MEC	8.63
LTF	MECS	16.34
LTF	O-066	3.81
LTF	RENSSELAER	0.7
LTF	ROSETON	5.06
247551	U4-028 C	0.71
247940	U4-028 E	4.72
247552	U4-029 C	0.71
247941	U4-029 E	4.72
247548	V4-010 C	1.52
247947	V4-010 E	10.19
LTF	WEC	1.39
907062	X1-027A E1	10.5
907065	X1-027A E2	10.5
907067	X1-027A E3	10.5
907069	X1-027A E4	10.5
LTF	Y3-032	13.61
931951	AB1-107 1	17.55
931961	AB1-107 2	38.52

Appendix 4

(FE - FE) The 02BLKRVR-02USSTEEL 138 kV line (from bus 239728 to bus 239734 ckt 1) loads from 111.18% to 111.72% (**DC power flow**) of its emergency rating (500 MVA) for the line fault with failed breaker contingency outage of 'ATSI-P2-3-CEI-345-001'. This project contributes approximately 5.97 MW to the thermal violation.

Bus Number	Bus Name	Full Contribution
238564	02BAYSG1	12.16
238572	02BEAVGB	2.15
240968	02BG2 GEN	0.61

Bus Number	Bus Name	Full Contribution
LTF	CPLE	0.37
LTF	G-007	1.55
LTF	IPL	3.76

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Bus Number	Bus Name	Full Contribution
240969	02BG4 G1	0.15
240970	02BG4 G2&3	0.31
240971	02BG4 G4&5	0.31
240950	02BG5	1.87
240973	02BG6 AMPO	2.72
239276	02COLLW 11	-2.84
239297	02CPPW41	-3.58
238979	02NAPMUN	2.87
240975	02PGE GEN	4.21
239175	02WLORG-6	3.41
932051	AC2-015 C	3.48
932052	AC2-015 E	4.06
932791	AC2-103 C	5.07
932792	AC2-103 E	33.91
934251	AD1-052 C1	0.67
934261	AD1-052 C2	0.67
934461	AD1-070 C O1	2.48
934462	AD1-070 E O1	11.65
934761	AD1-103 C O1	8.52
934762	AD1-103 E O1	57
934891	AD1-118	5.97
LTF	CARR	1.22
LTF	CBM-S1	5.17
LTF	CBM-S2	2.13
LTF	CBM-W1	42.35
LTF	CBM-W2	36.44
LTF	CIN	5.84

Bus Number	Bus Name	Full Contribution
LTF	LGEE	1.07
LTF	MEC	11.55
LTF	MECS	22.11
LTF	O-066	5.26
LTF	RENSSELAER	0.95
LTF	ROSETON	6.88
247542	U4-001 C	1.52
247934	U4-001 E	10.14
247551	U4-028 C	0.96
247940	U4-028 E	6.4
247552	U4-029 C	0.96
247941	U4-029 E	6.4
247567	V2-006 C	1.01
247961	V2-006 E	6.74
247548	V4-010 C	2.07
247947	V4-010 E	13.83
LTF	WEC	1.86
907062	X1-027A E1	14.25
907065	X1-027A E2	14.25
907067	X1-027A E3	14.25
907069	X1-027A E4	14.25
LTF	Y3-032	18.43
931951	AB1-107 1	23.8
931961	AB1-107 2	52.22
925751	AC1-051 C	0.5
925752	AC1-051 E	3.32
926941	AC1-181	0.32

Appendix 5

(FE - FE) The 02USSTEEL-02LRN Q2 138 kV line (from bus 239734 to bus 238915 ckt 1) loads from 104.88% to 105.42% (**DC power flow**) of its emergency rating (500 MVA) for the line fault with failed breaker contingency outage of 'ATSI-P2-3-CEI-345-001'. This project contributes approximately 5.97 MW to the thermal violation.

Bus Number	Bus Name	Full Contribution
238564	02BAYSG1	12.16
238572	02BEAVGB	2.15
240968	02BG2 GEN	0.61
240969	02BG4 G1	0.15
240970	02BG4 G2&3	0.31
240971	02BG4 G4&5	0.31
240950	02BG5	1.87
240973	02BG6 AMPO	2.72
239276	02COLLW 11	-2.84

Bus Number	Bus Name	Full Contribution
LTF	CPLE	0.37
LTF	G-007	1.55
LTF	IPL	3.76
LTF	LGEE	1.07
LTF	MEC	11.55
LTF	MECS	22.11
LTF	O-066	5.26
LTF	RENSSELAER	0.95
LTF	ROSETON	6.88

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Bus Number	Bus Name	Full Contribution
239297	02CPPW41	-3.58
238979	02NAPMUN	2.87
240975	02PGE GEN	4.21
239175	02WLORG-6	3.41
932051	AC2-015 C	3.48
932052	AC2-015 E	4.06
932791	AC2-103 C	5.07
932792	AC2-103 E	33.91
934251	AD1-052 C1	0.67
934261	AD1-052 C2	0.67
934461	AD1-070 C O1	2.48
934462	AD1-070 E O1	11.65
934761	AD1-103 C O1	8.52
934762	AD1-103 E O1	57
934891	AD1-118	5.97
LTF	CARR	1.22
LTF	CBM-S1	5.17
LTF	CBM-S2	2.13
LTF	CBM-W1	42.35
LTF	CBM-W2	36.44
LTF	CIN	5.84

Bus Number	Bus Name	Full Contribution
247542	U4-001 C	1.52
247934	U4-001 E	10.14
247551	U4-028 C	0.96
247940	U4-028 E	6.4
247552	U4-029 C	0.96
247941	U4-029 E	6.4
247567	V2-006 C	1.01
247961	V2-006 E	6.74
247548	V4-010 C	2.07
247947	V4-010 E	13.83
LTF	WEC	1.86
907062	X1-027A E1	14.25
907065	X1-027A E2	14.25
907067	X1-027A E3	14.25
907069	X1-027A E4	14.25
LTF	Y3-032	18.43
931951	AB1-107 1	23.8
931961	AB1-107 2	52.22
925751	AC1-051 C	0.5
925752	AC1-051 E	3.32
926941	AC1-181	0.32

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