Feasibility Study Report

For

PJM Generation Interconnection Request Queue Position AD2-159

TSS95 Chestnut

June 14, 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 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 item 5.iv. of Schedule H to the Interconnection Service Agreement.

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.

PJM utilizes manufacturer models to ensure the performance of turbines is properly captured during the simulations performed for stability verification. Turbine manufacturers provide such models to their customers. The list of manufacturer models PJM has already validated is contained in Attachment B-2 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 2.2.2. of Manual 14A 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

Queue AD2-159 project is a proposal to connect a 187.5 MW Energy, 33.0 MW Capacity, wind facility to be located in Macon Counties, IL. It is proposed in the Interconnection Request (Attachment N) that the primary point of interconnection to be studied the 345kV bus at TSS95 Chestnut.

The IC has proposed a service date for this project of September 15, 2021.

Impacts on the MISO member transmission systems are not included in this analysis, but will be included in the System Impact Study Phase.

This Generation Interconnection Feasibility Study provides analysis results to aid the IC in assessing the practicality and cost of incorporating the facility into the PJM system. This study was limited to load flow analyses of probable contingencies. If the IC elects to pursue a System Impact Study, a more comprehensive analysis will be performed.

Point of Interconnection

The Interconnection Customer (IC) AD2-159 proposes to interconnect 187.5 MW windfarm to ComEd transmission system by connecting to Chestnut TSS 95 345kV bus.

Attachment Facilities

The IC AD2-159 generator lead will interconnect to a 345kV Interconnection Substation. This interconnection would require one 345kV line MOD, a dead-end structure and revenue metering as shown in the one-line diagram.

The estimated cost for the attachment facilities is given below.

Scope of Work	Cost Estimate
Installation of one 345kV line MOD, one dead-end structure and one set of revenue metering (see notes below on cost estimate)	$1.0M

Direct Connection Network Upgrades

It is proposed to interconnect developer's generator lead to 345kV bus at Chestnut TSS 95.

The scope of work includes installation of one 345kV circuit breaker at Chestnut TSS 95, to create a line position for IC's generator lead, as shown in the one-line diagram below.

The Interconnection Customer is responsible for constructing all the facilities on the Interconnection Customer side of the point of interconnection outside of the Interconnection.

The estimated cost for Direct Connection Network Upgrade is given below.

Scope of Work	Cost Estimate
Installation of one 345kV circuit breaker at Chestnut TSS 95 and relay/protection work	$3,000,000
Total Cost Estimate (see notes below on cost estimate)	$3,000,000

Normally, it takes about 24-months to engineer, design, procure material and construct 345kV facilities after ISA/ICSA are signed.

Non-Direct Connection Cost Estimate

None

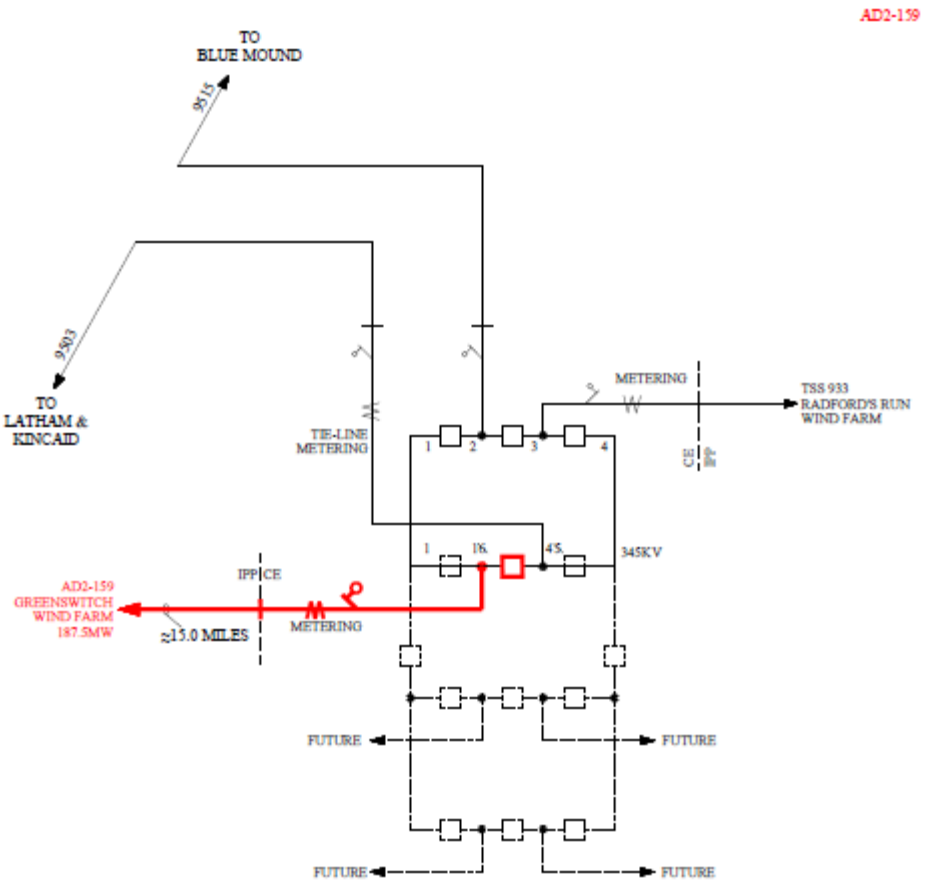
Notes on Cost Estimate:

1) These estimates are Order-of-Magnitude estimates of the costs that ComEd would bill to the customer for this interconnection. These estimates are based on a one-line electrical diagram of the project and the information provided by the Interconnection Customer.

2) There were no site visits performed for these estimates. There may be costs related to specific site related issues that are not identified in these estimates. The site reviews will be performed during the Facilities Study or during detailed engineering.

3) These estimates are not a guarantee of the maximum amount payable by the Interconnection Customer and the actual costs of ComEd's work may differ significantly from these estimates. Per the PJM Tariff, Interconnection Customer will be responsible for paying all actual costs of ComEd's work.

4) The Interconnection Customer is responsible for all engineering, procurement, testing and construction of all equipment on the Interconnection Customer’s side of the Point of Interconnection (POI).



TSS 95
CHESTNUT

Network Impacts

The Queue Project AD2-159 was evaluated as a 187.5 MW (Capacity 33.0 MW) injection at W4-005 TAP which is tapping the BlueMound; B to Latham; T 345kV line in the ComEd area. Project AD2-159 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AD2-159 was studied with a commercial probability of 53%. Potential network impacts were as follows:

Summer Peak Analysis - 2021

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)

1. (MISO AMIL - AEP) The 7CASEY-05SULLIVAN 345 kV line (from bus 346809 to bus 247712 ckt 1) loads from 136.2% to 137.99% (**DC power flow**) of its emergency rating (1466 MVA) for the line fault with failed breaker contingency outage of 'AEP_P4_#3128_05EUGENE 345'. This project contributes approximately 26.32 MW to the thermal violation.

```
CONTINGENCY 'AEP_P4_#3128_05EUGENE 345'
 OPEN BRANCH FROM BUS 243221 TO BUS 249504 CKT 1          / 243221 05EUGENE 345 249504 08CAYSUB 345 1
 OPEN BRANCH FROM BUS 243221 TO BUS 348885 CKT 1          / 243221 05EUGENE 345 348885 7BUNSONVILLE 345 1
 END
```

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

Steady-State Voltage Requirements
(Results of the steady-state voltage studies should be inserted here)

To be determined

Short Circuit
(Summary of impacted circuit breakers)

No issues identified.

Affected System Analysis & Mitigation

MISO Impacts:

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

Delivery of Energy Portion of Interconnection Request

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.
Only the most severely overloaded conditions are listed. 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 will study all overload conditions associated with the overloaded element(s) identified.

1. (CE - CE) The BLUEMOUND; B-PONTIAC ; B 345 kV line (from bus 270668 to bus 270852 ckt 1) loads from 139.17% to 144.37% (**DC power flow**) of its emergency rating (1528 MVA) for the single line contingency outage of 'COMED_P1-2_345-L8001___-S-A'. This project contributes approximately 79.35 MW to the thermal violation.

```
CONTINGENCY 'COMED_P1-2_345-L8001___-S-A'
 TRIP BRANCH FROM BUS 270853 TO BUS 917500 CKT 1            / PONTI; R 345 Z2-087 TAP 345
 END
```

2. (CE - CE) The BLUEMOUND; B-PONTIAC ; B 345 kV line (from bus 270668 to bus 270852 ckt 1) loads from 97.36% to 102.73% (**DC power flow**) of its normal rating (1334 MVA) for non-contingency condition. This project contributes approximately 79.37 MW to the thermal violation.

3. (CE - CE) The LORETTO ; B-AD1-100 TAP 345 kV line (from bus 270704 to bus 934720 ckt 1) loads from 207.77% to 211.79% (**DC power flow**) of its emergency rating (1528 MVA) for the single line contingency outage of 'COMED_P1-2_345-L8014_T_-S-B'. This project contributes approximately 64.22 MW to the thermal violation.

```
CONTINGENCY 'COMED_P1-2_345-L8014_T_-S-B'
 TRIP BRANCH FROM BUS 935000 TO BUS 270717 CKT 1            / AD1-133 TAP 345 DRESDEN ; R 345
 END
```

4. (CE - CE) The LORETTO ; B-AD1-100 TAP 345 kV line (from bus 270704 to bus 934720 ckt 1) loads from 156.06% to 159.15% (**DC power flow**) of its normal rating (1364 MVA) for non-contingency condition. This project contributes approximately 44.16 MW to the thermal violation.

5. (CE - CE) The DRESDEN ; R-COLLINS ; R 345 kV line (from bus 270717 to bus 270697 ckt 1) loads from 110.31% to 110.78% (**DC power flow**) of its emergency rating (1528 MVA) for

the single line contingency outage of 'COMED_P1-2_345-L1223_TR-S'. This project contributes approximately 15.65 MW to the thermal violation.

```
CONTINGENCY 'COMED_P1-2_345-L1223_TR-S'
 TRIP BRANCH FROM BUS 270717 TO BUS 270731 CKT 1          / DRESD; R 345 ELECT;4R 345
 TRIP BRANCH FROM BUS 275180 TO BUS 270717 CKT 1          / DRESD;3M 138 DRESD; R 345
 TRIP BRANCH FROM BUS 275180 TO BUS 271336 CKT 1          / DRESD;3M 138 DRESD; B 138
 TRIP BRANCH FROM BUS 275180 TO BUS 275280 CKT 1          / DRESD;3M 138 DRESD;3C 34.5
 END
```

6. (CE - CE) The DRESDEN ; R-ELWOOD ; R 345 kV line (from bus 270717 to bus 270737 ckt 1) loads from 135.2% to 135.65% (**DC power flow**) of its emergency rating (1479 MVA) for the single line contingency outage of 'COMED_P1-2_345-L1223_TR-S'. This project contributes approximately 16.63 MW to the thermal violation.

```
CONTINGENCY 'COMED_P1-2_345-L1223_TR-S'
 TRIP BRANCH FROM BUS 270717 TO BUS 270731 CKT 1          / DRESD; R 345 ELECT;4R 345
 TRIP BRANCH FROM BUS 275180 TO BUS 270717 CKT 1          / DRESD;3M 138 DRESD; R 345
 TRIP BRANCH FROM BUS 275180 TO BUS 271336 CKT 1          / DRESD;3M 138 DRESD; B 138
 TRIP BRANCH FROM BUS 275180 TO BUS 275280 CKT 1          / DRESD;3M 138 DRESD;3C 34.5
 END
```

7. (CE - CE) The DRESDEN ; R-ELWOOD ; R 345 kV line (from bus 270717 to bus 270737 ckt 1) loads from 102.22% to 102.55% (**DC power flow**) of its normal rating (1201 MVA) for non-contingency condition. This project contributes approximately 12.52 MW to the thermal violation.

8. (CE - MISO AMIL) The KINCAID ; B-7AUSTIN 345 kV line (from bus 270796 to bus 347955 ckt 1) loads from 114.95% to 118.13% (**DC power flow**) of its emergency rating (956 MVA) for the single line contingency outage of 'COMED_P1-2_345-L8001___-S-A'. This project contributes approximately 32.3 MW to the thermal violation.

```
CONTINGENCY 'COMED_P1-2_345-L8001___-S-A'
 TRIP BRANCH FROM BUS 270853 TO BUS 917500 CKT 1          / PONTI; R 345 Z2-087 TAP 345
 END
```

9. (CE - MISO AMIL) The KINCAID ; B-7AUSTIN 345 kV line (from bus 270796 to bus 347955 ckt 1) loads from 112.84% to 116.89% (**DC power flow**) of its normal rating (797 MVA) for non-contingency condition. This project contributes approximately 32.31 MW to the thermal violation.

10. (CE - MISO AMIL) The LATHAM ; T-7LATHAM 345 kV line (from bus 270804 to bus 348856 ckt 1) loads from 112.95% to 123.94% (**DC power flow**) of its emergency rating (908 MVA) for the single line contingency outage of 'COMED_P1-2_345-L8002___-S'. This project contributes approximately 103.46 MW to the thermal violation.

```
CONTINGENCY 'COMED_P1-2_345-L8002___-S'
 TRIP BRANCH FROM BUS 270852 TO BUS 270668 CKT 1                / PONTI; B 345
BLUEM; B 345
 END
```

11. (CE - CE) The PONTIAC ; B-LORETTO ; B 345 kV line (from bus 270852 to bus 270704 ckt 1) loads from 195.38% to 199.51% (**DC power flow**) of its emergency rating (1528 MVA) for the single line contingency outage of 'COMED_P1-2_345-L8014_T_-S-B'. This project contributes approximately 64.28 MW to the thermal violation.

```
CONTINGENCY 'COMED_P1-2_345-L8014_T_-S-B'
 TRIP BRANCH FROM BUS 935000 TO BUS 270717 CKT 1              / AD1-133 TAP 345 DRESDEN ; R 345
 END
```

12. (CE - CE) The PONTIAC ; B-LORETTO ; B 345 kV line (from bus 270852 to bus 270704 ckt 1) loads from 143.76% to 146.71% (**DC power flow**) of its normal rating (1364 MVA) for non-contingency condition. This project contributes approximately 44.22 MW to the thermal violation.

13. (CE - CE) The PONTIAC ; R-AD1-133 TAP 345 kV line (from bus 270853 to bus 935000 ckt 1) loads from 181.83% to 185.34% (**DC power flow**) of its emergency rating (1528 MVA) for the single line contingency outage of 'COMED_P1-2_345-L11212_B-S-B'. This project contributes approximately 58.8 MW to the thermal violation.

```
CONTINGENCY 'COMED_P1-2_345-L11212_B-S-B'
 TRIP BRANCH FROM BUS 934720 TO BUS 270704 CKT 1              / AD1-100 TAP 345 LORET; B 345
 END
```

14. (CE - CE) The PONTIAC ; R-AD1-133 TAP 345 kV line (from bus 270853 to bus 935000 ckt 1) loads from 121.41% to 123.75% (**DC power flow**) of its normal rating (1334 MVA) for non-contingency condition. This project contributes approximately 35.11 MW to the thermal violation.

15. (MISO AMIL - AEP) The 7CASEY-05SULLIVAN 345 kV line (from bus 346809 to bus 247712 ckt 1) loads from 130.6% to 132.24% (**DC power flow**) of its normal rating (1451 MVA) for the single line contingency outage of 'AEP_P1-2_#286'. This project contributes approximately 26.06 MW to the thermal violation.

```
CONTINGENCY 'AEP_P1-2_#286'
 OPEN BRANCH FROM BUS 243221 TO BUS 348885 CKT 1              / 243221 05EUGENE 345 348885 7BUNSONVILLE 345 1
 END
```

16. (MISO AMIL - AEP) The 7CASEY-05SULLIVAN 345 kV line (from bus 346809 to bus 247712 ckt 1) loads from 107.63% to 108.78% (**DC power flow**) of its normal rating (1451 MVA) for non-contingency condition. This project contributes approximately 20.03 MW to the thermal violation.

17. (MISO AMIL - CE) The 7BROKAW-AD2-153 TAP 345 kV line (from bus 348847 to bus 937160 ckt 1) loads from 152.95% to 155.74% (**DC power flow**) of its emergency rating (1528 MVA) for the single line contingency outage of 'COMED_P1-2_345-L8002___-S'. This project contributes approximately 42.54 MW to the thermal violation.

```
CONTINGENCY 'COMED_P1-2_345-L8002___-S'
 TRIP BRANCH FROM BUS 270852 TO BUS 270668 CKT 1              / PONTI; B 345 BLUEM; B 345
 END
```

18. (CE - CE) The W4-005 TAP-BLUEMOUND; B 345 kV line (from bus 905080 to bus 270668 ckt 1) loads from 141.24% to 146.69% (**DC power flow**) of its emergency rating (1334 MVA) for the single line contingency outage of 'COMED_P1-2_345-L8001___-S-A'. This project contributes approximately 79.43 MW to the thermal violation.

```
CONTINGENCY 'COMED_P1-2_345-L8001___-S-A'
 TRIP BRANCH FROM BUS 270853 TO BUS 917500 CKT 1              / PONTI; R 345 Z2-087 TAP 345
 END
```

19. (CE - CE) The Z2-087 TAP-PONTIAC ; R 345 kV line (from bus 917500 to bus 270853 ckt 1) loads from 180.55% to 182.97% (**DC power flow**) of its emergency rating (1528 MVA) for the single line contingency outage of 'COMED_P1-2_345-L8002___-S'. This project contributes approximately 42.54 MW to the thermal violation.

```
CONTINGENCY 'COMED_P1-2_345-L8002___-S'
 TRIP BRANCH FROM BUS 270852 TO BUS 270668 CKT 1              / PONTI; B 345 BLUEM; B 345
 END
```

20. (CE - CE) The AB2-047 TAP-Z2-087 TAP 345 kV line (from bus 924040 to bus 917500 ckt 1) loads from 171.72% to 174.07% (**DC power flow**) of its emergency rating (1528 MVA) for the single line contingency outage of 'COMED_P1-2_345-L8002___-S'. This project contributes approximately 42.54 MW to the thermal violation.

```
CONTINGENCY 'COMED_P1-2_345-L8002___-S'
 TRIP BRANCH FROM BUS 270852 TO BUS 270668 CKT 1              / PONTI; B 345 BLUEM; B 345
 END
```

21. (CE - CE) The AD1-100 TAP-AD2-137 TAP 345 kV line (from bus 934720 to bus 937030 ckt 1) loads from 161.05% to 163.46% (**DC power flow**) of its emergency rating (1528 MVA) for the single line contingency outage of '"934725'. This project contributes approximately 36.93 MW to the thermal violation.

```
CONTINGENCY '934725'                          AD1-100 JNT 345 934730 AD1-100 TAP 345 1
 OPEN BRANCH FROM BUS 934725 TO BUS 934730 CKT 1
 END
```

22. (CE - CE) The AD1-100 TAP-AD2-137 TAP 345 kV line (from bus 934720 to bus 937030 ckt 1) loads from 128.74% to 130.26% (**DC power flow**) of its normal rating (1364 MVA) for non-contingency condition. This project contributes approximately 22.54 MW to the thermal violation.

23. (CE - CE) The AD1-133 TAP-DRESDEN ; R 345 kV line (from bus 935000 to bus 270717 ckt 1) loads from 193.9% to 197.57% (**DC power flow**) of its emergency rating (1528 MVA) for the single line contingency outage of 'COMED_P1-2_345-L11212_B-S-B'. This project contributes approximately 58.8 MW to the thermal violation.

```
CONTINGENCY 'COMED_P1-2_345-L11212_B-S-B'
 TRIP BRANCH FROM BUS 934720 TO BUS 270704 CKT 1              / AD1-100 TAP 345 LORET; B 345
 END
```

24. (CE - CE) The AD1-133 TAP-DRESDEN ; R 345 kV line (from bus 935000 to bus 270717 ckt 1) loads from 133.39% to 135.89% (**DC power flow**) of its normal rating (1334 MVA) for

non-contingency condition. This project contributes approximately 35.11 MW to the thermal violation.

25. (CE - CE) The AD2-137 TAP-WILTON ; B 345 kV line (from bus 937030 to bus 270926 ckt 1) loads from 165.16% to 166.97% (**DC power flow**) of its emergency rating (1528 MVA) for the single line contingency outage of '"934725'. This project contributes approximately 36.93 MW to the thermal violation.

```
CONTINGENCY '934725'                    AD1-100 JNT 345 934730 AD1-100 TAP 345 1
 OPEN BRANCH FROM BUS 934725 TO BUS 934730 CKT 1
 END
```

26. (CE - CE) The AD2-137 TAP-WILTON ; B 345 kV line (from bus 937030 to bus 270926 ckt 1) loads from 135.47% to 136.96% (**DC power flow**) of its normal rating (1364 MVA) for non-contingency condition. This project contributes approximately 22.54 MW to the thermal violation.

27. (CE - CE) The AD2-153 TAP-AB2-047 TAP 345 kV line (from bus 937160 to bus 924040 ckt 1) loads from 163.04% to 165.8% (**DC power flow**) of its emergency rating (1528 MVA) for the single line contingency outage of 'COMED_P1-2_345-L8002___-S'. This project contributes approximately 42.54 MW to the thermal violation.

```
CONTINGENCY 'COMED_P1-2_345-L8002___-S'
 TRIP BRANCH FROM BUS 270852 TO BUS 270668 CKT 1          / PONTI; B 345 BLUEM; B 345
 END
```

Light Load Analysis - 2021

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

System Reinforcements

Short Circuit

(Summary form of Cost allocation for breakers will be inserted here if any)

None.

Stability and Reactive Power Requirement

(Results of the dynamic studies should be inserted here)

To be determined

Summer Peak Load Flow Analysis Reinforcements

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

1. (MISO AMIL - AEP) The 7CASEY-05SULLIVAN 345 kV line (from bus 346809 to bus 247712 ckt 1) loads from 136.2% to 137.99% (**DC power flow**) of its emergency rating (1466 MVA) for the line fault with failed breaker contingency outage of 'AEP_P4_#3128_05EUGENE 345'. This project contributes approximately 26.32 MW to the thermal violation.

AEP:

1. **Rebuild 0.82 mile of the ACAR ~ 1024.5 ~ 30/7 ~ RAIL1 conductor section 5. Estimated Cost is $1.64 Million.**
2. **Rebuild 0.82 mile of the ACAR ~ 1024.5 ~ 30/7 ~ RAIL1 conductor section 6. Estimated Cost is $1.64 Million.**
3. **Rebuild 1.0 mile of the ACSR/PE ~ 1414 ~ 62/19 ~ conductor section 2. Estimated Cost is $2 Million.**

An approximate construction time would be 24 to 36 months after signing an interconnection agreement

MISO:
The external (i.e. Non-PJM) Transmission Owner, MISO, will not evaluate this violation until the impact study phase.

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

(MISO AMIL - AEP) The 7CASEY-05SULLIVAN 345 kV line (from bus 346809 to bus 247712 ckt 1) loads from 136.2% to 137.99% (**DC power flow**) of its emergency rating (1466 MVA) for the line fault with failed breaker contingency outage of 'AEP_P4_#3128_05EUGENE 345'. This project contributes approximately 26.32 MW to the thermal violation.

```
CONTINGENCY 'AEP_P4_#3128_05EUGENE 345'
 OPEN BRANCH FROM BUS 243221 TO BUS 249504 CKT 1          / 243221 05EUGENE 345 249504 08CAYSUB 345 1
 OPEN BRANCH FROM BUS 243221 TO BUS 348885 CKT 1          / 243221 05EUGENE 345 348885 7BUNSONVILLE 345 1
 END
```

Bus Number	*Bus Name*	*Full Contribution*
933341	*AC2-147 C*	*0.54*
933342	*AC2-147 E*	*0.89*
934051	*AD1-031 C O1*	*2.37*
934052	*AD1-031 E O1*	*3.87*
934421	*AD1-066*	*0.87*
LTF	*AD1-092*	*9.6*
LTF	*AD1-093*	*16.1*
LTF	*AD1-094*	*2.91*
934881	*AD1-117 C*	*3.34*
934882	*AD1-117 E*	*2.23*
935001	*AD1-133 C O1*	*14.35*
935002	*AD1-133 E O1*	*9.57*
935141	*AD1-148*	*7.48*
936771	*AD2-100 C*	*21.17*
936772	*AD2-100 E*	*14.11*
936972	*AD2-131 E*	*8.4*
937161	*AD2-153 C O1*	*3.24*
937162	*AD2-153 E O1*	*15.15*
937171	*AD2-154 C O1*	*3.24*
937172	*AD2-154 E O1*	*15.15*
937211	*AD2-159 C*	*4.63*
937212	*AD2-159 E*	*21.69*
937531	*AD2-214 C*	*3.23*
937532	*AD2-214 E*	*1.52*
274832	*ANNAWAN ; 1U*	*8.72*
LTF	*BLUEG*	*5.63*
294401	*BSHIL;1U E*	*7.13*
294410	*BSHIL;2U E*	*7.13*
LTF	*CANNELTON*	*1.2*
LTF	*CARR*	*0.33*
274890	*CAYUG;1U E*	*10.29*
274891	*CAYUG;2U E*	*10.29*
LTF	*CBM-S1*	*9.31*

LTF	*CBM-S2*	*2.76*
LTF	*CBM-W1*	*56.04*
LTF	*CBM-W2*	*138.78*
LTF	*CLIFTY*	*18.96*
LTF	*CPLE*	*0.38*
274849	*CRESCENT ;1U*	*3.95*
LTF	*DEARBORN*	*0.59*
274859	*EASYR;U1 E*	*6.86*
274860	*EASYR;U2 E*	*6.86*
LTF	*ELMERSMITH*	*3.21*
LTF	*G-007*	*0.83*
960018	*G997 E*	*-2.86*
LTF	*GIBSON*	*1.43*
960026	*J196 E*	*5.39*
940291	*J291*	*3.23*
983101	*J339*	*6.2*
938571	*J467 C*	*3.57*
938572	*J467 E*	*14.26*
940541	*J468 C*	*7.15*
940542	*J468 E*	*28.62*
951151	*J474 C*	*2.63*
951152	*J474 E*	*10.54*
951641	*J641 C*	*8.28*
951642	*J641 E*	*2.16*
951661	*J644*	*9.66*
981031	*J734*	*5.2*
939811	*J750 C*	*2.74*
939812	*J750 E*	*10.97*
981361	*J756 C*	*3.21*
981362	*J756 E*	*12.84*
981581	*J757 C*	*5.26*
981582	*J757 E*	*21.02*
938331	*J797*	*18.82*
938391	*J808*	*8.79*
938411	*J811*	*17.92*
939761	*J813*	*43.43*
938791	*J815*	*32.44*
938811	*J817*	*10.29*
938841	*J826*	*10.81*
938891	*J835 C*	*3.46*
938892	*J835 E*	*13.85*
938941	*J845 C*	*2.27*
938942	*J845 E*	*9.07*
938971	*J848 C*	*6.82*
938972	*J848 E*	*27.27*

939171	*J872 C*	*5.75*
939172	*J872 E*	*22.99*
939261	*J884*	*7.9*
939481	*J912*	*14.37*
939741	*J949*	*39.25*
274650	*KINCAID ;1U*	*17.96*
274651	*KINCAID ;2U*	*17.89*
990901	*L-005 E*	*11.23*
LTF	*MEC*	*44.96*
293516	*O-009 E1*	*6.44*
293517	*O-009 E2*	*3.27*
293518	*O-009 E3*	*3.6*
293715	*O-029 E*	*6.89*
293716	*O-029 E*	*3.78*
293717	*O-029 E*	*3.47*
293771	*O-035 E*	*5.23*
LTF	*O-066*	*5.35*
296308	*R-030 C1*	*3.34*
296271	*R-030 C2*	*3.34*
296125	*R-030 C3*	*3.38*
296309	*R-030 E1*	*13.35*
296272	*R-030 E2*	*13.35*
296128	*R-030 E3*	*13.51*
LTF	*RENSSELAER*	*0.26*
LTF	*ROSETON*	*1.86*
290261	*S-027 C*	*0.91*
290265	*S-028 C*	*0.91*
LTF	*TRIMBLE*	*1.09*
274853	*TWINGROVE;U1*	*19.52*
274854	*TWINGROVE;U2*	*19.52*
276150	*W2-048 E*	*2.06*
903433	*W3-046*	*16.12*
905081	*W4-005 C*	*1.19*
905082	*W4-005 E*	*42.87*
905471	*W4-084*	*0.29*
274874	*WALNR;2U*	*1.53*
294502	*WALNR;2U E*	*6.11*
LTF	*WEC*	*4.2*
909052	*X2-022 E*	*28.64*
LTF	*Z1-043*	*22.26*
917501	*Z2-087 C*	*2.62*
917502	*Z2-087 E*	*17.54*
919221	*AA1-146*	*11.73*
919581	*AA2-030*	*11.73*
919621	*AA2-039 C*	*1.74*

919622	*AA2-039 E*	*11.64*
LTF	*AB2-013*	*13.42*
924041	*AB2-047 C O1*	*3.34*
924042	*AB2-047 E O1*	*22.37*
924261	*AB2-070 C O1*	*3.86*
924262	*AB2-070 E O1*	*25.84*
925161	*AB2-173*	*2.09*
925581	*AC1-033 C*	*1.17*
925582	*AC1-033 E*	*7.82*
925771	*AC1-053 C*	*3.9*
925772	*AC1-053 E*	*26.07*
926821	*AC1-168 C*	*0.84*
926822	*AC1-168 E*	*5.65*
926841	*AC1-171 C*	*1.14*
926842	*AC1-171 E*	*7.61*
927531	*AC1-185 1*	*0.43*
927541	*AC1-185 2*	*0.43*
927551	*AC1-185 3*	*0.43*
927561	*AC1-185 4*	*0.43*
927571	*AC1-185 5*	*0.43*
927581	*AC1-185 6*	*0.43*
927591	*AC1-185 7*	*0.43*
927601	*AC1-185 8*	*0.43*
927201	*AC1-214 C*	*1.68*
927202	*AC1-214 E*	*4.46*