Feasibility Study Report

For

PJM Generation Interconnection Request Queue Position AD2-131

Latham-Kincaid

January 18, 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.

An Interconnection Customer entering the New Services Queue on or after October 1, 2018 (except those regulated by the United States Nuclear Regulatory Commission) shall provide primary frequency response in accordance with Section 4.7.2 of Appendix 2 to the Interconnection Service Agreement. See PJM Manual 14D Section 7.1.1 for more 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

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

Primary Point of Interconnection (Option-1)

The Interconnection Customer (IC) AD2-131, a 50MW battery storage facility, proposes to interconnect with the ComEd transmission system by connecting to the 345kV Interconnection Substation built by an earlier queue position AD2-100, 345kV Edinburg TSS.

Attachment Facilities

The IC AD2-131 generator lead would interconnect to the Interconnection Substation built by AD2-100, 345kV Edinburg TSS. This interconnection would require one 345kV line MOD, a dead-end structure and revenue metering as shown in the one-line diagram.

The cost for the attachment facilities is estimated at $1M.

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)	$1,000,000

Direct Connection Network Upgrades

In order to accommodate interconnection of AD2-131, the Interconnection Substation built by AD2-100, would be expanded to create a line position for AD2-131 generator lead.

The scope of work includes installation of one 345kV circuit breaker at the Edinburg Substation, as shown in the one-line diagram below. It should be noted that if AD2-100 drops out or does not build the Interconnection Substation, then AD2-131 would become responsible to build the Interconnection Substation and its scope for Direct Connection Network Upgrades would change.

The IC is responsible for constructing all of the facilities on the IC side of the point of interconnection outside of the substation.

The preliminary cost estimate for Direct Connection Network Upgrade is given in the following tables.

Scope of Work	Cost Estimate
Installation of one 345kV circuit breaker at the Edinburg TSS as described above	$ 3,000,000
Total Cost Estimate (see notes below on cost estimate)	$ 3,000,000

ComEd would take approximately 24-months to construct the substation and transmission line work after the ISA / ICSA are signed.

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 IC.

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 IC and the actual costs of ComEd's work may differ significantly from these estimates. Per the PJM Tariff, IC will be responsible for paying all actual costs of ComEd's work.

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

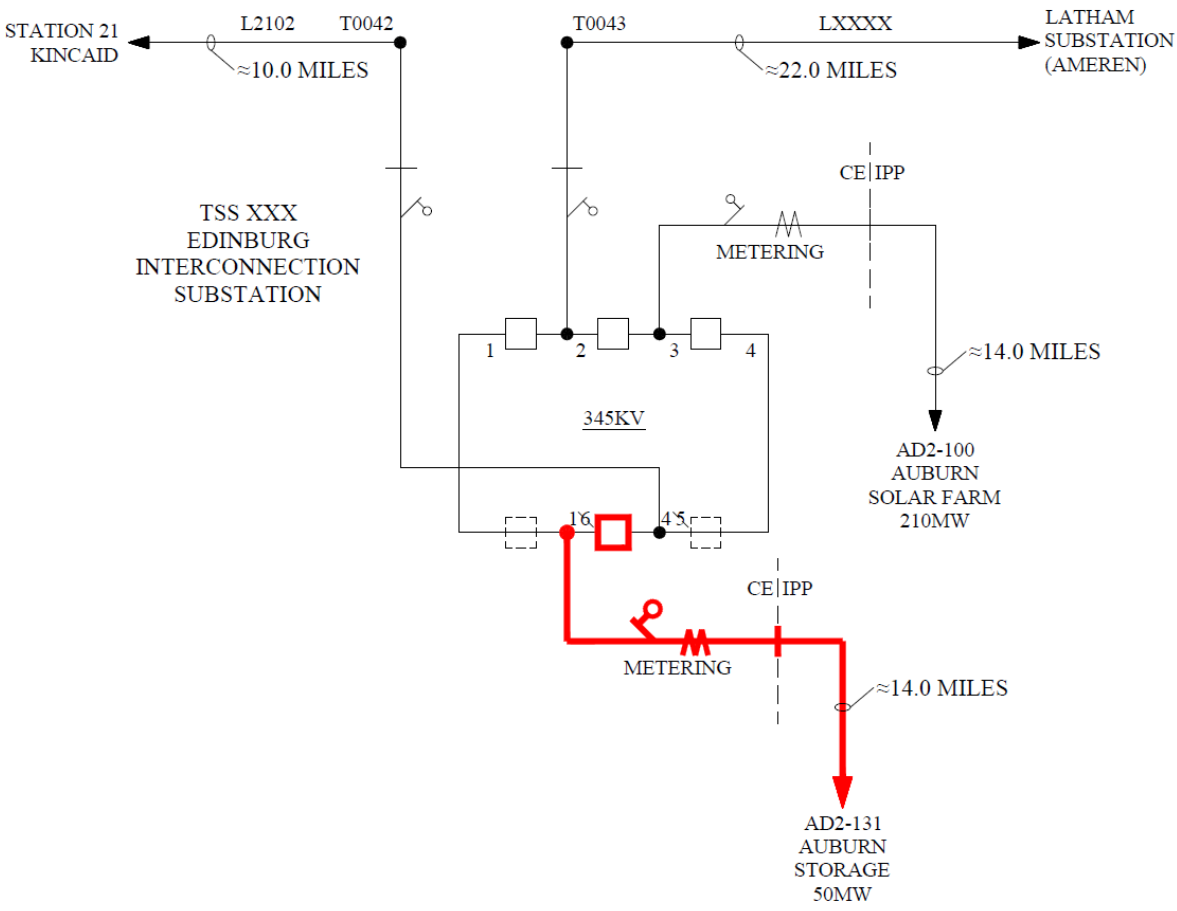

Figure 1. Single Line Diagram for Option 1

Network Impacts for Primary POI

The Queue Project AD2-131 was evaluated as a 50.0 MW (Capacity 0.0 MW) injection tapping the Latham to Kincaid; B 345 kV line in the ComEd area. Project AD2-131 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AD2-131 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. (CE - MISO AMIL) The KINCAID ; B-7AUSTIN 345 kV line (from bus 270796 to bus 347955 ckt 1) loads from 121.36% to 123.06% (**DC power flow**) of its emergency rating (956 MVA) for the line fault with failed breaker contingency outage of 'COMED_P4_080-45-BT4-5__'. This project contributes approximately 18.04 MW to the thermal violation.

```
CONTINGENCY 'COMED_P4_080-45-BT4-5__'
 TRIP BRANCH FROM BUS 270852 TO BUS 270668 CKT 1          / PONTI; B 345 BLUEM; B 345
 TRIP BRANCH FROM BUS 270852 TO BUS 270704 CKT 1          / PONTI; B 345 LORET; B 345
 END
```

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

2. (CE - MISO AMIL) The KINCAID ; B-7AUSTIN 345 kV line (from bus 270796 to bus 347955 ckt 1) loads from 119.79% to 121.55% (**DC power flow**) of its emergency rating (956 MVA) for the line fault with failed breaker contingency outage of 'COMED_P4_080-45-BT5-6__'. This project contributes approximately 17.88 MW to the thermal violation.

```
CONTINGENCY 'COMED_P4_080-45-BT5-6__'
 TRIP BRANCH FROM BUS 270852 TO BUS 270668 CKT 1          / PONTIAC ; B 345 BLUEMOUND; B 345
 TRIP BRANCH FROM BUS 270853 TO BUS 935000 CKT 1          / PONTIAC ; R 345 AD1-133 TAP 345
 TRIP BRANCH FROM BUS 275210 TO BUS 270853 CKT 1          / PONTIAC ;2M 138 PONTIAC ; R 345
 TRIP BRANCH FROM BUS 275210 TO BUS 272261 CKT 1          / PONTIAC ;2M 138 PONTIAC ; R 138
 TRIP BRANCH FROM BUS 275210 TO BUS 275310 CKT 1          / PONTIAC ;2M 138 PONTIAC ;2C 34.5
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CLOSE BRANCH FROM BUS 272260 TO BUS 272261 CKT 1          / PONTIAC ; B 138 PONTIAC ; R 138
END
```

3. (CE - MISO AMIL) The KINCAID ; B-7AUSTIN 345 kV line (from bus 270796 to bus 347955 ckt 1) loads from 118.6% to 120.29% (**DC power flow**) of its emergency rating (956 MVA) for the line fault with failed breaker contingency outage of 'COMED_P4_080-45-BT7-8__'. This project contributes approximately 17.2 MW to the thermal violation.

```
CONTINGENCY 'COMED_P4_080-45-BT7-8__'
 TRIP BRANCH FROM BUS 270853 TO BUS 917500 CKT 1          / PONTIAC ; R 345 Z2-087 TAP 345
 TRIP BRANCH FROM BUS 270853 TO BUS 935000 CKT 1          / PONTIAC ; R 345 AD1-133 TAP 345
 TRIP BRANCH FROM BUS 275210 TO BUS 270853 CKT 1          / PONTIAC ;2M 138 PONTIAC ; R 345
 TRIP BRANCH FROM BUS 275210 TO BUS 272261 CKT 1          / PONTIAC ;2M 138 PONTIAC ; R 138
 TRIP BRANCH FROM BUS 275210 TO BUS 275310 CKT 1          / PONTIAC ;2M 138 PONTIAC ;2C 34.5
 CLOSE BRANCH FROM BUS 272260 TO BUS 272261 CKT 1          / PONTIAC ; B 138 PONTIAC ; R 138
 END
```

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)

None 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 - MISO AMIL) The KINCAID ; B-7AUSTIN 345 kV line (from bus 270796 to bus 347955 ckt 1) loads from 107.72% to 109.38% (**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 16.78 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 - MISO AMIL) The KINCAID ; B-7AUSTIN 345 kV line (from bus 270796 to bus 347955 ckt 1) loads from 106.48% to 108.49% (**DC power flow**) of its normal rating (797 MVA) for non-contingency condition. This project contributes approximately 15.98 MW to the thermal violation.

3. (CE - CE) The KINCAID ; B-AD2-100 TAP 345 kV line (from bus 270796 to bus 936770 ckt 1) loads from 100.27% to 101.87% (**DC power flow**) of its emergency rating (1334 MVA) for the single line contingency outage of '"270673'. This project contributes approximately 29.32 MW to the thermal violation.

```
CONTINGENCY '270673'                          BROKAW ; T 345 348847 7BROKAW 345 1
 OPEN BRANCH FROM BUS 270673 TO BUS 348847 CKT 1
 END
```

4. (CE - MISO AMIL) The LATHAM ; T-7LATHAM 345 kV line (from bus 270804 to bus 348856 ckt 1) loads from 111.33% to 112.95% (**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 15.16 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
```

5. (LGEE - OVEC) The 7TRIMBLE-06CLIFTY 345 kV line (from bus 324114 to bus 248000 ckt 1) loads from 183.12% to 183.23% (**DC power flow**) of its emergency rating (1370 MVA) for the single line contingency outage of 'AEP_P1-2_#363'. This project contributes approximately 2.77 MW to the thermal violation.

```
CONTINGENCY 'AEP_P1-2_#363'
 OPEN BRANCH FROM BUS 243208 TO BUS 243209 CKT 1          / 243208 05JEFRSO 765 243209 05ROCKPT 765 1
 END
```

6. (CE - CE) The AB2-070 TAP-BROKAW ; T 345 kV line (from bus 924260 to bus 270673 ckt 1) loads from 114.66% to 115.89% (**DC power flow**) of its emergency rating (1327 MVA) for the single line contingency outage of 'COMED_P1-2_SPS-2102&2106_W4-005-FSA_A'. This project contributes approximately 16.41 MW to the thermal violation.

```
CONTINGENCY 'COMED_P1-2_SPS-2102&2106_W4-005-FSA_A'
 TRIP BRANCH FROM BUS 270804 TO BUS 905080 CKT 1          / LATHAM TAP W4-005
 TRIP BRANCH FROM BUS 270804 TO BUS 936770 CKT 1          / LATHA; T 345 AD2-100 TAP 345
 TRIP BRANCH FROM BUS 270804 TO BUS 348856 CKT 1          / LATHA; T 345 7LATHAM 345
 TRIP BRANCH FROM BUS 270796 TO BUS 347955 CKT 1          / KINCA; B 345 AUSTIN 345 (THE)
 TRIP BRANCH FROM BUS 270668 TO BUS 905080 CKT 1          / BLUEM; B 345 W4-005
 END
```

7. (CE - CE) The AC1-053 TAP-AB2-070 TAP 345 kV line (from bus 925770 to bus 924260 ckt 1) loads from 104.12% to 105.36% (**DC power flow**) of its emergency rating (1327 MVA) for the single line contingency outage of 'COMED_P1-2_SPS-2102&2106_W4-005-FSA_A'. This project contributes approximately 16.41 MW to the thermal violation.

```
CONTINGENCY 'COMED_P1-2_SPS-2102&2106_W4-005-FSA_A'
 TRIP BRANCH FROM BUS 270804 TO BUS 905080 CKT 1          / LATHAM TAP W4-005
```

```
TRIP BRANCH FROM BUS 270804 TO BUS 936770 CKT 1          / LATHA; T 345 AD2-100 TAP 345
TRIP BRANCH FROM BUS 270804 TO BUS 348856 CKT 1          / LATHA; T 345 7LATHAM 345
TRIP BRANCH FROM BUS 270796 TO BUS 347955 CKT 1          / KINCA; B 345 AUSTIN 345 (THE)
TRIP BRANCH FROM BUS 270668 TO BUS 905080 CKT 1          / BLUEM; B 345 W4-005
END
```

8. (CE - CE) The AD2-100 TAP-LATHAM ; T 345 kV line (from bus 936770 to bus 270804 ckt 1) loads from 106.4% to 107.87% (**DC power flow**) of its emergency rating (1334 MVA) for the single line contingency outage of 'COMED_P1-2_345-L9201___-S_W2-048-FSA-A'. This project contributes approximately 20.68 MW to the thermal violation.

```
CONTINGENCY 'COMED_P1-2_345-L9201___-S_W2-048-FSA-A'
 TRIP BRANCH FROM BUS 270673 TO BUS 348847 CKT 1          / BROKA; T 345 7BROKAW T1 345
 TRIP BRANCH FROM BUS 270673 TO BUS 924260 CKT 1          / BROKA; T 345 AB2-070 TAP 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 identified

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. (CE - MISO AMIL) The KINCAID ; B-7AUSTIN 345 kV line (from bus 270796 to bus 347955 ckt 1) loads from 121.36% to 123.06% (**DC power flow**) of its emergency rating (956

MVA) for the line fault with failed breaker contingency outage of 'COMED_P4_080-45-BT4-5__'. This project contributes approximately 18.04 MW to the thermal violation.

ComEd:
ComEd 345kV L2106 SSTE rating is 1667 MVA. No upgrade is required.

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

2. (CE - MISO AMIL) The KINCAID ; B-7AUSTIN 345 kV line (from bus 270796 to bus 347955 ckt 1) loads from 119.79% to 121.55% (**DC power flow**) of its emergency rating (956 MVA) for the line fault with failed breaker contingency outage of 'COMED_P4_080-45-BT5-6__'. This project contributes approximately 17.88 MW to the thermal violation.

Same as Contribution to Previously Identified #1

3. (CE - MISO AMIL) The KINCAID ; B-7AUSTIN 345 kV line (from bus 270796 to bus 347955 ckt 1) loads from 118.6% to 120.29% (**DC power flow**) of its emergency rating (956 MVA) for the line fault with failed breaker contingency outage of 'COMED_P4_080-45-BT7-8__'. This project contributes approximately 17.2 MW to the thermal violation.

Same as Contribution to Previously Identified #1

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

(CE - MISO AMIL) The KINCAID ; B-7AUSTIN 345 kV line (from bus 270796 to bus 347955 ckt 1) loads from 121.36% to 123.06% (**DC power flow**) of its emergency rating (956 MVA) for the line fault with failed breaker contingency outage of 'COMED_P4_080-45-BT4-5__'. This project contributes approximately 18.04 MW to the thermal violation.

```
CONTINGENCY 'COMED_P4_080-45-BT4-5__'
 TRIP BRANCH FROM BUS 270852 TO BUS 270668 CKT 1          / PONTI; B 345 BLUEM; B 345
 TRIP BRANCH FROM BUS 270852 TO BUS 270704 CKT 1          / PONTI; B 345 LORET; B 345
 END
```

Bus Number	*Bus Name*	*Full Contribution*
935141	*AD1-148*	*11.34*
936771	*AD2-100 C*	*45.47*
936772	*AD2-100 E*	*30.31*
936972	*AD2-131 E*	*18.04*
937161	*AD2-153 C O1*	*3.54*
937162	*AD2-153 E O1*	*16.59*
937171	*AD2-154 C O1*	*3.54*
937172	*AD2-154 E O1*	*16.59*
937211	*AD2-159 C*	*8.77*
937212	*AD2-159 E*	*41.05*
LTF	*AMIL*	*0.25*
LTF	*BAYOU*	*2.87*
LTF	*BIG_CAJUN1*	*4.14*
LTF	*BIG_CAJUN2*	*8.36*
LTF	*CALDERWOOD*	*0.66*
LTF	*CANNELTON*	*0.04*
LTF	*CARR*	*0.05*
LTF	*CATAWBA*	*0.29*
LTF	*CELEVELAND*	*0.86*
LTF	*CHEOAH*	*0.6*
LTF	*CHILHOWEE*	*0.22*
LTF	*CHOCTAW*	*2.39*
LTF	*CIN*	*1.83*
LTF	*COTTONWOOD*	*11.72*
LTF	*EDWARDS*	*1.56*
LTF	*ELMERSMITH*	*0.25*
LTF	*FARMERCITY*	*1.87*
LTF	*G-007*	*0.21*
LTF	*HAMLET*	*0.87*
LTF	*IPL*	*0.81*
960026	*J196 E*	*3.12*
983101	*J339*	*8.19*
951151	*J474 C*	*4.47*

951152	*J474 E*	*17.9*
981031	*J734*	*6.88*
981361	*J756 C*	*3.62*
981362	*J756 E*	*14.49*
938741	*J802 C*	*9.71*
938742	*J802 E*	*38.85*
938841	*J826*	*13.1*
938941	*J845 C*	*2.61*
938942	*J845 E*	*10.44*
939261	*J884*	*16.26*
274650	*KINCAID ;1U*	*41.63*
274651	*KINCAID ;2U*	*41.84*
LTF	*LGEE*	*< 0.01*
LTF	*MECS*	*0.67*
LTF	*MORGAN*	*3.38*
LTF	*NEWTON*	*1.16*
LTF	*O-066*	*1.33*
LTF	*PRAIRIE*	*10.57*
296308	*R-030 C1*	*3.36*
296271	*R-030 C2*	*3.36*
296125	*R-030 C3*	*3.4*
296309	*R-030 E1*	*13.45*
296272	*R-030 E2*	*13.45*
296128	*R-030 E3*	*13.61*
LTF	*RENSSELAER*	*0.04*
LTF	*ROSETON*	*0.3*
LTF	*ROWAN*	*0.52*
290261	*S-027 C*	*1.96*
290265	*S-028 C*	*1.96*
LTF	*SANTEETLA*	*0.17*
LTF	*SMITHLAND*	*0.45*
LTF	*TATANKA*	*2.78*
LTF	*TVA*	*1.43*
274853	*TWINGROVE;U1*	*42.09*
274854	*TWINGROVE;U2*	*42.09*
LTF	*UNIONPOWER*	*1.29*
276150	*W2-048 E*	*3.12*
905081	*W4-005 C*	*2.25*
905082	*W4-005 E*	*81.14*
909052	*X2-022 E*	*43.38*
917501	*Z2-087 C*	*2.64*
917502	*Z2-087 E*	*17.7*
924041	*AB2-047 C O1*	*3.41*
924042	*AB2-047 E O1*	*22.8*
924261	*AB2-070 C O1*	*5.31*

924262	*AB2-070 E O1*	*35.51*
925771	*AC1-053 C*	*5.53*
925772	*AC1-053 E*	*37.03*

Secondary Point of Interconnection (Option-2)

Under this option, the IC AD2-131, a 50MW battery storage facility, proposes to interconnect with the ComEd transmission system by connecting to the Interconnection Substation built by an earlier queue position AD2-100 (Option-2), 345kV Taylorville TSS.

Attachment Facilities

The IC AD2-131 generator lead would interconnect to the Interconnection Substation built by AD2-100 (Option-2), 345kV Taylorville TSS. This interconnection would require one 345kV line MOD, a dead-end structure and revenue metering as shown in the one-line diagram.

The cost for the attachment facilities is estimated at $1M.

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)	$1,000,000

Direct Connection Network Upgrades

In order to accommodate interconnection of AD2-131, the Interconnection Substation built by AD2-100 (Option-2), 345kV Taylorville TSS, would be expanded to create a line position for AD2-131 generator lead.

The scope of work to install AD2-131 includes installation of one 345kV circuit breaker at the Taylorville TSS, as shown in the one-line diagram below.

The IC is responsible for constructing all of the facilities on the IC side of the point of interconnection outside of the substation.

The preliminary cost estimate for Direct Connection Network Upgrade is given in the following tables.

Scope of Work	Cost Estimate
Installation of one 345kV circuit breaker at the Edinburg TSS as described above	$ 3,000,000
Total Cost Estimate (see notes below on cost estimate)	$ 3,000,000

ComEd would take approximately 24-months to construct the substation and transmission line work after the ISA / ICSA are signed.

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 IC.

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 IC and the actual costs of ComEd's work may differ significantly from these estimates. Per the PJM Tariff, IC will be responsible for paying all actual costs of ComEd's work.

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

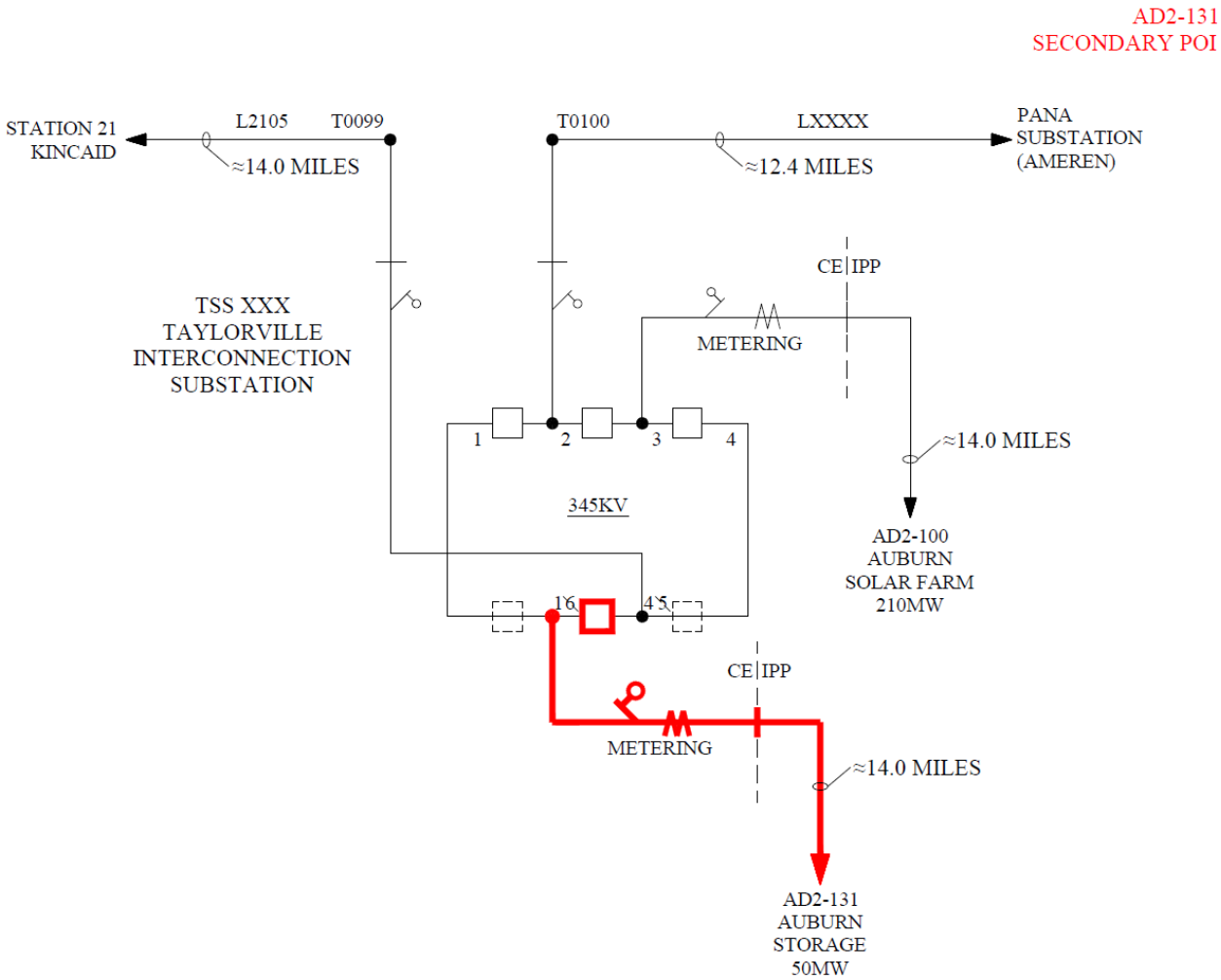

Figure 2. Single Line Diagram for Option 2

Network Impacts for Secondary POI
The Queue Project AD2-131 was evaluated as a 50.0 MW (Capacity 0.0 MW) injection tapping the Kincaid; R to Pana (Ameren) 345kV line in the ComEd area. Project AD2-131 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AD2-131 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)

None

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. (LGEE - OVEC) The 7TRIMBLE-06CLIFTY 345 kV line (from bus 324114 to bus 248000 ckt 1) loads from 183.14% to 183.26% (**DC power flow**) of its emergency rating (1370 MVA) for the single line contingency outage of 'AEP_P1-2_#363'. This project contributes approximately 3.04 MW to the thermal violation.

```
CONTINGENCY 'AEP_P1-2_#363'
 OPEN BRANCH FROM BUS 243208 TO BUS 243209 CKT 1              / 243208 05JEFRSO 765 243209 05ROCKPT 765 1
 END
```

Light Load Analysis - 2021

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