# Generation Interconnection

# Feasibility Study Report

# for

# Queue Project AG1-448

# OLIVE-UNIVERSITY PARK 345 KV

# 55 MW Capacity / 55 MW Energy

January 2021

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# 1 Introduction

This Feasibility Study has been prepared in accordance with the PJM Open Access Transmission Tariff, 36.2, as well as the Feasibility Study Agreement between the Interconnection Customer (IC), and PJM Interconnection, LLC (PJM), Transmission Provider (TP). The Interconnected Transmission Owner (ITO) is AEP.

# 2 Preface

The intent of the 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.

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.

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.

## 3 General

The Interconnection Customer (IC) has proposed an uprate to a planned/existing Storage generating facility located in LaPorte, Indiana. This project is an increase to the Interconnection Customer's AF2-359, AG1-436, and AG1-447 projects, which will share the same point of interconnection. The AG1-448 queue position is a 55 MW uprate (55 MW Capacity uprate) to the previous project. The total installed facilities will have a capability of 360 MW with 260 MW of this output being recognized by PJM as Capacity.

The proposed in-service date for this uprate project is December 31, 2023. This study does not imply a TO commitment to this in-service date.

| Queue Number | AG1-448 |
|---|---|
| Project Name | OLIVE-UNIVERSITY PARK 345 KV |
| State | Indiana |
| County | LaPorte |
| Transmission Owner | AEP |
| MFO | 360 |
| MWE | 55 |
| MWC | 55 |
| Fuel | Storage |
| Basecase Study Year | 2024 |

Any new service customers who can feasibly be commercially operable prior to June 1st of the basecase study year are required to request interim deliverability analysis.

## 4 Point of Interconnection

AG1-448 will interconnect with the AEP transmission system via a direct connection to the AF2-359 proposed 345 kV switching station as an uprate to the PJM projects AF2-359, AG1-436, and AG1-447.

Note: It is assumed that the existing 345 kV revenue metering system, generation lead and Protection & Control Equipment that will be installed for AF2-359, AG1-436, and AG1-447 will be adequate for the increased generation of AG1-448.Depending on the timing of the completion of the AF2-359, AG1-436, and AG1-447 interconnection construction relative to the AG1-448 completion, there may (or may not) be a need to review and revise the relay settings for the increased generation of AG1-448.

## 5 Cost Summary

The AG1-448 project will be responsible for the following costs:

| Description | Total Cost |
|---|---|
| **Total Physical Interconnection Costs** | $45,000 |
| **Total System Network Upgrade Costs** | $14,962,440 |
| **Total Costs** | **$15,007,440** |

This cost excludes a Federal Income Tax Gross Up charges. This tax may or may not be charged based on whether this project meets the eligibility requirements of IRS Notice 2016-36, 2016-25 I.R.B. (6/20/2016). If at a future date it is determined that the Federal Income Tax Gross charge is required, the Transmission Owner shall be reimbursed by the Interconnection Customer for such taxes.

Cost allocations for any System Upgrades will be provided in the System Impact Study Report.

The estimates provided in this report are preliminary in nature, as they were determined without the benefit of detailed engineering studies. Final estimates will require an on-site review and coordination to determine final construction requirements. In addition, Stability analysis will be completed during the Facilities Study stage. It is possible that a need for additional upgrades could be identified by these studies.

# 6 Transmission Owner Scope of Work

The total physical interconnection costs is given in the table below:

## 6.1 Attachment Facilities

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

| Description | Total Cost |
|---|---|
| None | $0 |
| **Total Attachment Facility Costs** | **$0** |

## 6.2 Direct Connection Cost Estimate

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

| Description | Total Cost |
|---|---|
| None | $0 |
| **Total Direct Connection Facility Costs** | **$0** |

## 6.3 Non-Direct Connection Cost Estimate

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

| Description | Total Cost |
|---|---|
| Review line protection and control settings at the AF2-359 proposed 345 kV switching station | $45,000 |
| **Total Non-Direct Connection Facility Costs** | **$45,000** |

## 7 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 signing Agreement execution.

## 8 Interconnection Customer Requirements

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

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

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

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

# 9 Revenue Metering and SCADA Requirements

## 9.1 PJM Requirements

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

## 9.2 Meteorological Data Reporting Requirements

## 9.3 Interconnected Transmission Owner Requirements

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

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

## 10 Summer Peak - Load Flow Analysis

The Queue Project AG1-448 was evaluated as a 55.0 MW (Capacity 55.0 MW) injection tapping the Olive to University Park 345 kV line in the AEP area. Project AG1-448 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AG1-448 was studied with a commercial probability of 53.0 %. Potential network impacts were as follows:

## 10.1 Generation Deliverability

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

None

## 10.2 Multiple Facility Contingency

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

None

## 10.3 Contribution to Previously Identified Overloads

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

| ID | FROM BUS# | FROM BUS | kV | FROM BUS AREA | TO BUS# | TO BUS | kV | TO BUS AREA | CKT ID | CONT NAME | Type | Rating MVA | PRE PROJECT LOADING % | POST PROJECT LOADING % | AC\|DC | MW IMPACT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **17004027 4** | 960680 | AF2-359 TAP | 345.0 | CE | 243229 | 05OLIVE | 345.0 | AEP | 1 | COMED_P1-2_765-L11215__-S | single | 971.0 | 151.03 | 154.35 | DC | 47.04 |
| **17004027 5** | 960680 | AF2-359 TAP | 345.0 | CE | 243229 | 05OLIVE | 345.0 | AEP | 1 | AEP_P1-2_#695_1681 | single | 971.0 | 151.03 | 154.35 | DC | 47.04 |

## 10.4 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 | kV | FROM BUS AREA | TO BUS# | TO BUS | kV | TO BUS AREA | CKT ID | CONT NAME | Type | Rating MVA | PRE PROJECT LOADING % | POST PROJECT LOADING % | AC\|DC | MW IMPACT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **17004027 2** | 960680 | AF2-359 TAP | 345.0 | CE | 243229 | 05OLIVE | 345.0 | AEP | 1 | AEP_P1-2_#695_1681 | operation | 971.0 | 161.64 | 164.73 | DC | 47.04 |
| **17004027 3** | 960680 | AF2-359 TAP | 345.0 | CE | 243229 | 05OLIVE | 345.0 | AEP | 1 | COMED_P1-2_765-L11215__-S | operation | 971.0 | 161.64 | 164.73 | DC | 47.04 |

## 10.5 System Reinforcements - Summer Peak Load Flow - Primary POI

| ID | Idx | Facility | Upgrade Description | Cost |
|---|---|---|---|---|
| 170040274,170040275 | 1 | AF2-359 TAP 345.0 kV - 05OLIVE 345.0 kV Ckt 1 | **AEP**<br>**n4057 (371) : A Sag Study will be required on the 40.64 miles of ACSR/PE 1414 62/19 conductor to mitigate the overload. The new ratings after sag study will be: S/N: 971 MVA, S/E: 1419 MVA, Depending on the sag study results, the cost for this upgrade is expected to be between $162,560 (no remediation required, just sag study) and $81.28 million (complete line Reconductor/rebuild). Time Estimate: a) Sag Study: 6-12 months b) Rebuild: The standard time required for construction differs from state to state. An approximate construction time would be 24 to 36 months after signing an interconnection agreement.**<br>**Project Type : FAC**<br>**Cost : $162,440**<br>**Time Estimate : 6-12 Months**<br><br>**AEP**<br>**AEPI0068a (447) : Replace 5 Jumpers (Sub cond 2156 ACSR 84/19 STD at Olive station, estimated cost : $175,000**<br>**Project Type : FAC**<br>**Cost : $175,000**<br>**Time Estimate : 6-12 Months**<br><br>**AEP**<br>**AEPI0068b (448) : An engineering study will need to be conducted to determine if the Olive Compliance Thermal limits 2293 Amps settings can be adjusted to mitigate the overload.**<br>**Project Type : FAC**<br>**Cost : $25,000**<br>**Time Estimate : 6-12 Months**<br><br>**AEP**<br>**AEPI0068c (449) : Rebuild 7.3 miles of ACSR/PE 1414 62/19 conductor to mitigate the overload. The cost for this upgrade is expected to be $81.28 million (complete line Reconductor/rebuild). Time Estimate: The standard time required for construction differs from state to state. An approximate construction time would be 24 to 36 months after signing an interconnection agreement.**<br>**Project Type : FAC**<br>**Cost : $14,600,000**<br>**Time Estimate : 24-36 Months**<br><br>**Not a violation for ComEd portion (700) : Not a violation for ComEd portion**<br>**Project Type : FAC**<br>**Cost : $0**<br>**Time Estimate : 0.0 Months** | $14,962,440 |
| | | | **TOTAL COST** | **$14,962,440** |

## 10.6 Flow Gate Details

The following indices contain additional information about each facility presented in the body of the report. For each index, a description of the flowgate and its contingency was included for convenience. The intent of the indices is to provide more details 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 indices. Please note that there may be contributors that are subsequently queued after the queue under study that are not listed in the indices. 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 are Full MW Impact contributions which are also noted in the indices column named "Full MW Impact", whereas the loading percentages reported in the body of the report, take into consideration the PJM Generator Deliverability Test rules such as commercial probability of each project as well as the ramping impact of "Adder" contributions. The MW Impact found and used in the analysis is shown in the indices column named "Gendeliv MW Impact".

### 10.6.1 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **170040275** | 960680 | AF2-359 TAP | CE | 243229 | 05OLIVE | AEP | 1 | AEP_P1-2_#695_1681 | single | 971.0 | 151.03 | 154.35 | DC | 47.04 |

| Bus # | Bus | Gendeliv MW Impact | Type | Full MW Impact |
|---|---|---|---|---|
| **272364** | ESS H440N ;R | 1.8535 | Adder | 2.18 |
| **274654** | BRAIDWOOD;1U | 21.0569 | 80/20 | 21.0569 |
| **274655** | BRAIDWOOD;2U | 20.5935 | 80/20 | 20.5935 |
| **274658** | DRESDEN ;2U | 81.3459 | Adder | 95.7 |
| **274659** | DRESDEN ;3U | 77.2821 | Adder | 90.92 |
| **274660** | LASCO STA;1U | 19.6084 | 80/20 | 19.6084 |
| **274661** | LASCO STA;2U | 19.6916 | 80/20 | 19.6916 |
| **274675** | JOLIET 29;7U | 8.9537 | 80/20 | 8.9537 |
| **274802** | UNIV PARK;5U | 1.2023 | 80/20 | 1.2023 |
| **274803** | UNIV PARK;6U | 1.2023 | 80/20 | 1.2023 |
| **274805** | UNIV PK N;1U | 1.4335 | 80/20 | 1.4335 |
| **274806** | UNIV PK N;2U | 1.4190 | 80/20 | 1.4190 |
| **274807** | UNIV PK N;3U | 1.4423 | 80/20 | 1.4423 |
| **274808** | UNIV PK N;4U | 1.4364 | 80/20 | 1.4364 |
| **274809** | UNIV PK N;5U | 1.4219 | 80/20 | 1.4219 |
| **274810** | UNIV PK N;6U | 1.4364 | 80/20 | 1.4364 |
| **274811** | UNIV PK N;7U | 1.4423 | 80/20 | 1.4423 |
| **274812** | UNIV PK N;8U | 1.4306 | 80/20 | 1.4306 |
| **274813** | UNIV PK N;9U | 1.4306 | 80/20 | 1.4306 |
| **274814** | UNIV PK N;0U | 1.4248 | 80/20 | 1.4248 |
| **274815** | UNIV PK N;XU | 1.4335 | 80/20 | 1.4335 |
| **274816** | UNIV PK N;YU | 1.4423 | 80/20 | 1.4423 |
| **274891** | OTTER CRK;1U | 0.3473 | 80/20 | 0.3473 |
| **904201** | W3-134 | 0.1846 | 80/20 | 0.1846 |
| **915011** | Y3-013 1 | 2.6199 | Adder | 3.08 |
| **915021** | Y3-013 2 | 2.6199 | Adder | 3.08 |
| **915031** | Y3-013 3 | 2.6199 | Adder | 3.08 |
| **924472** | AB2-096 CT1 | 13.3049 | Adder | 15.65 |
| **924473** | AB2-096 CT2 | 13.3049 | Adder | 15.65 |
| **924474** | AB2-096 CT3 | 13.3049 | Adder | 15.65 |
| **926331** | AC1-110 1 | 1.3291 | Adder | 1.56 |
| **926341** | AC1-110 2 | 1.3291 | Adder | 1.56 |
| **927451** | AC1-142A 1 | 3.5059 | 80/20 | 3.5059 |
| **927461** | AC1-142A 2 | 2.9787 | Adder | 3.5 |
| **930482** | AB1-089 CT | 25.5466 | Adder | 30.05 |
| **930483** | AB1-089 ST | 20.3105 | Adder | 23.89 |
| **930501** | AB1-091 CT | 27.5572 | Adder | 32.42 |
| **930502** | AB1-091 ST | 21.9090 | Adder | 25.78 |
| **930761** | AB1-122 CT1 | 48.1272 | Adder | 56.62 |
| **930771** | AB1-122 CT2 | 51.7537 | Adder | 60.89 |
| **933411** | AC2-154 C | 1.7460 | Adder | 2.05 |

| Bus # | Bus | Gendeliv MW Impact | Type | Full MW Impact |
|---|---|---|---|---|
| **933431** | AC2-156 C O1 | 0.6683 | Adder | 0.79 |
| **933911** | AD1-013 C | 1.2991 | Adder | 1.53 |
| **933931** | AD1-016 C | 0.6476 | Adder | 0.76 |
| **934101** | AD1-039 1 | 4.7165 | Adder | 5.55 |
| **934111** | AD1-039 2 | 5.0719 | Adder | 5.97 |
| **934701** | AD1-098 C O1 | 4.8418 | Adder | 5.7 |
| **934721** | AD1-100 C | 13.4627 | Adder | 15.84 |
| **934871** | AD1-116 C | 0.8580 | 80/20 | 0.8580 |
| **934971** | AD1-129 C | 0.6304 | Adder | 0.74 |
| **936291** | AD2-038 C O1 | 1.7986 | Adder | 2.12 |
| **936371** | AD2-047 C O1 | 3.1244 | Adder | 3.68 |
| **936461** | AD2-060 | 1.8379 | Adder | 2.16 |
| **936511** | AD2-066 C O1 | 5.9456 | Adder | 6.99 |
| **937001** | AD2-134 C | 1.9237 | Adder | 2.26 |
| **937401** | AD2-194 1 | 5.4830 | Adder | 6.45 |
| **937411** | AD2-194 2 | 5.4800 | Adder | 6.45 |
| **938511** | AE1-070 1 | 6.4389 | Adder | 7.58 |
| **938521** | AE1-070 2 | 5.8942 | Adder | 6.93 |
| **938851** | AE1-113 C O1 | 5.6998 | Adder | 6.71 |
| **939321** | AE1-163 C O1 | 4.5194 | Adder | 5.32 |
| **939351** | AE1-166 C O1 | 3.7940 | Adder | 8.42 |
| **941131** | AE2-107 C | 4.5969 | Adder | 5.41 |
| **941551** | AE2-152 C O1 | 4.3776 | Adder | 9.72 |
| **941561** | AE2-153 C O1 | 3.8942 | 80/20 | 3.8942 |
| **942421** | AE2-255 C O1 | 2.1590 | Adder | 2.54 |
| **942651** | AE2-281 C O1 | 0.6456 | Adder | 0.76 |
| **942991** | AE2-321 C | 5.7132 | Adder | 6.72 |
| **943121** | AE2-341 C | 8.9213 | Adder | 10.5 |
| **943591** | AF1-030 C O1 | 5.9327 | Adder | 6.98 |
| **943801** | AF1-048 C | 2.6707 | Adder | 3.14 |
| **944041** | AF1-072 | 1.5057 | Adder | 1.77 |
| **944911** | AF1-156 C | 9.9567 | 80/20 | 9.9567 |
| **945351** | AF1-200 FTIR | 215.8321 | Merchant Transmission | 215.8321 |
| **946661** | AF1-330 C | 1.3992 | Adder | 1.65 |
| **946671** | AF1-331 | 1.6871 | Adder | 1.98 |
| **957331** | AF2-027 C | 1.7466 | Adder | 2.05 |
| **957401** | AF2-034 C | 0.9732 | Adder | 1.14 |
| **957471** | AF2-041 C | 14.9466 | Adder | 17.58 |
| **958011** | AF2-095 C O1 | 12.4952 | Adder | 14.7 |
| **958021** | AF2-096 C | 28.2565 | 80/20 | 28.2565 |
| **958481** | AF2-142 C | 10.1601 | 80/20 | 10.1601 |
| **958491** | AF2-143 C | 8.3010 | Adder | 9.77 |
| **959081** | AF2-199 C | 4.9822 | Adder | 5.86 |
| **959091** | AF2-200 C O1 | 9.9644 | Adder | 11.72 |
| **959351** | AF2-226 C | 1.7017 | Adder | 2.0 |
| **960281** | AF2-319 C | 1.7017 | Adder | 2.0 |
| **960381** | AF2-329 | 4.6291 | Adder | 5.45 |
| **960581** | AF2-349 C | 15.1960 | Adder | 17.88 |
| **960591** | AF2-350 C O1 | 5.5131 | Adder | 6.49 |
| **960601** | AF2-351 C O1 | 0.7351 | Adder | 0.86 |
| **960681** | AF2-359 C | 64.1422 | 80/20 | 64.1422 |
| **960721** | AF2-363 C O1 | 4.1294 | Adder | 4.86 |

| Bus # | Bus | Gendeliv MW Impact | Type | Full MW Impact |
|---|---|---|---|---|
| **960731** | AF2-364 C O1 | 4.2946 | Adder | 5.05 |
| **960751** | AF2-366 C | 4.8728 | Adder | 5.73 |
| **962691** | AG1-118 C O1 | 8.4901 | Adder | 18.85 |
| **962701** | AG1-119 C | 8.0879 | Adder | 17.95 |
| **962711** | AG1-120 C O1 | 3.1897 | Adder | 7.08 |
| **962781** | AG1-127 C | 2.8593 | Adder | 6.35 |
| **962791** | AG1-128 C O1 | 2.3063 | Adder | 5.12 |
| **963681** | AG1-220 C O1 | 4.0707 | Adder | 9.04 |
| **964461** | AG1-309 FTIR | 166.5727 | Merchant Transmission | 166.5727 |
| **965061** | AG1-371 | 1.3203 | Adder | 2.93 |
| **965071** | AG1-372 | 0.8802 | Adder | 1.95 |
| **965081** | AG1-373 | 0.4401 | Adder | 0.98 |
| **965141** | AG1-379 C | 6.2798 | Adder | 13.94 |
| **965551** | AG1-423 C O1 | 5.5860 | Adder | 12.4 |
| **965681** | AG1-436 C | 64.1422 | 80/20 | 64.1422 |
| **965791** | AG1-447 | 47.0376 | 80/20 | 47.0376 |
| **965801** | AG1-448 | 47.0376 | 80/20 | 47.0376 |
| **966081** | AG1-477 C | 0.7475 | Adder | 1.66 |
| **966091** | AG1-478 C | 0.7712 | Adder | 1.71 |
| **966101** | **AG1-479 C (Withdrawn : 12/03/2020)** | **0.7475** | **Adder** | **1.66** |
| **966431** | AG1-512 C | 3.6634 | 80/20 | 3.6634 |
| **966441** | AG1-513 C | 0.1886 | Adder | 0.42 |
| **WEC** | WEC | 3.0779 | Confirmed LTF | 3.0779 |
| **CBM-W2** | CBM-W2 | 16.3699 | Confirmed LTF | 16.3699 |
| **NY** | NY | 0.8699 | Confirmed LTF | 0.8699 |
| **TVA** | TVA | 1.2096 | Confirmed LTF | 1.2096 |
| **SIGE** | SIGE | 0.1444 | Confirmed LTF | 0.1444 |
| **CHEOAH** | CHEOAH | 0.0075 | Confirmed LTF | 0.0075 |
| **CBM-S1** | CBM-S1 | 0.2109 | Confirmed LTF | 0.2109 |
| **HAMLET** | HAMLET | 0.3921 | Confirmed LTF | 0.3921 |
| **MEC** | MEC | 10.7655 | Confirmed LTF | 10.7655 |
| **GIBSON** | GIBSON | 0.0966 | Confirmed LTF | 0.0966 |
| **BLUEG** | BLUEG | 1.5537 | Confirmed LTF | 1.5537 |
| **TRIMBLE** | TRIMBLE | 0.5292 | Confirmed LTF | 0.5292 |
| **LAGN** | LAGN | 3.2287 | Confirmed LTF | 3.2287 |
| **CATAWBA** | CATAWBA | 0.2002 | Confirmed LTF | 0.2002 |
| **CBM-W1** | CBM-W1 | 55.3089 | Confirmed LTF | 55.3089 |

## 10.7 Queue Dependencies

The Queue Projects below are listed in one or more indices for the overloads identified in your report. These projects contribute to the loading of the overloaded facilities identified in your report. The percent overload of a facility and cost allocation you may have towards a particular reinforcement could vary depending on the action of these earlier projects. The status of each project at the time of the analysis is presented in the table. This list may change as earlier projects withdraw or modify their requests.

| Queue Number | Project Name | Status |
|---|---|---|
| **AB1-089** | Byron-Wayne 345kV #1 | Active |
| **AB1-091** | Davis Creek 345kV | Active |
| **AB1-122** | Kendall-Tazewell & Dresden-Mole Creek | Engineering and Procurement |
| **AB2-096** | Silver Lake-Cherry Valley | Active |
| **AC1-110** | Aurora 138kV | Active |
| **AC1-142A** | Joliet | In Service |
| **AC2-154** | Davis Creek 138kV | Active |
| **AC2-156** | Sandwich 34.5kV | Active |
| **AD1-013** | Twombly Road 138kV | Active |
| **AD1-016** | Marengo | Active |
| **AD1-039** | Kendall-Tazewell & Dresden-Mole Creek | Active |
| **AD1-098** | Dixon-McGirr | Active |
| **AD1-100** | Loretto-Wilton & Braidwood-Davis Creek | Active |
| **AD1-116** | Nevada 345 kV | Active |
| **AD1-129** | Belvidere 34 kV | Active |
| **AD2-038** | Powerton | Active |
| **AD2-047** | Davis Creek 138 kV | Active |
| **AD2-060** | Davis Creek 138kV | Active |
| **AD2-066** | Mazon-Crescent Ridge | Active |
| **AD2-134** | Shady Oaks | Active |
| **AD2-194** | Elwood | Active |
| **AE1-070** | Elwood 345 kV | Active |
| **AE1-113** | Mole Creek 345 kV | Active |
| **AE1-163** | Powerton-Nevada 345 kV | Active |
| **AE1-166** | Loretto-Wilton & Braidwood-Davis Creek | Active |
| **AE2-107** | Haumesser Road 138 kV | Active |
| **AE2-152** | Loretto-Wilton & Braidwood-Davis Creek | Active |
| **AE2-153** | Braidwood-Davis Creek | Active |
| **AE2-255** | Molecreek 345 kV | Active |
| **AE2-281** | Powerton-Nevada 345 kV | Active |
| **AE2-321** | Belvidere-Marengo 138 kV | Active |
| **AE2-341** | Sandwich-Plano | Active |
| **AF1-030** | Plano-R 138 kV | Active |
| **AF1-048** | Belvidere-Marengo | Active |
| **AF1-072** | Rocky Road | Active |
| **AF1-156** | Braidwood-Davis Creek | Active |
| **AF1-200** | Plano 345 kV | Active |
| **AF1-330** | Marengo | Active |
| **AF1-331** | Twombley Road | Active |

| Queue Number | Project Name | Status |
|---|---|---|
| **AF2-027** | Zion Energy Center 345 kV | Active |
| **AF2-034** | Kendall | Active |
| **AF2-041** | Nelson-Electric Junction 345 kV | Active |
| **AF2-095** | Wilmington-Davis Creek | Active |
| **AF2-096** | Braidwood-East Frankfort 345 kV | Active |
| **AF2-142** | Nevada 345 kV | Active |
| **AF2-143** | Powerton-Nevada 345 kV | Active |
| **AF2-199** | Nelson-Electric Junction 345 kV | Active |
| **AF2-200** | Nelson-Electric Junction 345 kV | Active |
| **AF2-226** | Katydid Road 345 kV | Active |
| **AF2-319** | Katydid Road 345 kV | Active |
| **AF2-329** | Sandwich-Plano 138 kV | Active |
| **AF2-349** | Garden Prairie-Silver Lake 345 kV | Active |
| **AF2-350** | Kensington 138 kV | Active |
| **AF2-351** | Kensington 138 kV | Active |
| **AF2-359** | Olive-University Park 345 kV | Active |
| **AF2-363** | Glidden 138 kV | Active |
| **AF2-364** | Wayne Red 138 kV | Active |
| **AF2-366** | Glidden-Waterman 138 kV | Active |
| **AG1-118** | Sugar Grove 138 kV | Active |
| **AG1-119** | Wayne-Byron 345 kV | Active |
| **AG1-120** | Glidden-Cherry Valley 138 kV | Active |
| **AG1-127** | Glidden-Waterman 138 kV | Active |
| **AG1-128** | Shady Oaks 138 kV | Active |
| **AG1-220** | West Dekalb 138 kV | Active |
| **AG1-309** | Byron 345 kV | Active |
| **AG1-371** | Nelson-Electric Junction 345 kV | Active |
| **AG1-372** | Nelson-Electric Junction 345 kV | Active |
| **AG1-373** | Nelson-Electric Junction 345 kV | Active |
| **AG1-379** | Minonk 345 kV | Active |
| **AG1-423** | Wayne 345 kV | Active |
| **AG1-436** | Olive-University Park 345 kV | Active |
| **AG1-447** | Olive-University Park 345 kV | Active |
| **AG1-448** | Olive-University Park 345 kV | Active |
| **AG1-477** | Grundy County 34.5 kV | Active |
| **AG1-478** | Will County 34.5 kV | Active |
| **AG1-479** | Grundy County 34.5 kV II | Withdrawn |
| **AG1-512** | University Park North 345 kV | Active |
| **AG1-513** | Aurora 138 kV | Active |
| **W3-134** | South Joliet 34.5kV | Under Construction |
| **Y3-013** | Zion Energy Center | In Service |

## 10.8 Contingency Descriptions

| Contingency Name | Contingency Definition |
|---|---|
| **AEP_P1-2_#695_1681** | CONTINGENCY 'AEP_P1-2_#695_1681'<br>OPEN BRANCH FROM BUS 243206 TO BUS 270644 CKT 1 / 243206 05DUMONT 765 270644 WILTON ; 765 1<br>END |
| **COMED_P1-2_765-L11215__-S** | CONTINGENCY 'COMED_P1-2_765-L11215__-S' / CONTINGENCY # 199<br>TRIP BRANCH FROM BUS 270644 TO BUS 243206 CKT 1 / WILTON ; 765 05DUMONT 765<br>REMOVE SHUNT 1 FROM BUS 270644 / WILTON ; 765<br>END |

## 11 Short Circuit Analysis

The following Breakers are overdutied:

None.

# 12 Affected Systems

## 12.1 TVA

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

## 12.2 Duke Energy Progress

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

## 12.3 MISO

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

## 12.4 LG&E

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