Via DocuSign

July 26, 2019

Kensington PV I, LLC
200 Portland St, 5th Floor
Boston, Massachusetts 02114

Dear Matt Marino,

RE: AE2-194 "Congress-Toronto 138 kV" - Feasibility Study Report and System Impact Study Agreement

Enclosed is a report documenting the results of the AE2-194 "Congress-Toronto 138 kV" Feasibility Study. The results of this study are predicated on a 2022 transmission system based upon PJM's best assumptions at the present time for load growth and connection of proposed new generation additions.

Feasibility Studies are performed to provide an Interconnection Customer with preliminarily estimated reinforcement costs and information concerning attachment facilities and network upgrades. Since the analysis inherently has to include assumptions for future system conditions, the results should be used in this context. The costs and associated timing described in the enclosed report are based upon estimates given to PJM by the affected Transmission Owner(s). The costs are your responsibility as the project developer. More comprehensive estimates will be developed upon execution of a System Impact Study Agreement in accordance with Part VI of the PJM Tariff.

As a requirement for interconnection, the Interconnection Customer may be responsible for the cost of constructing 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 project may not be responsible for 100% of the identified network upgrade cost because other transmission network uses, e.g., another interconnection project, 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 System 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. In addition, the Feasibility Study estimates do not include any the costs associated with engineering and

constructing the equipment and facilities on the developer's side of the point of interconnection. These costs are the responsibility of the project developer.

The costs associated with the study are being tabulated and you will receive a final statement/invoice electronically from PJM detailing your balance within 120 days.

Please be advised that all modeling will be completed consistent with Manual 3A. Market settlements cannot begin until these steps have been complete.

Note that Tariff 212.5 milestones require that you have all site permits, water and fuel agreements and associated right of way, and a memorandum of understanding for major equipment at the time you return your executed Interconnection Service Agreement (ISA). It is your responsibility to ensure these requirements are met and if they cannot be met at the time of the return of the ISA, you must demonstrate your due diligence and propose dates when those milestones will be met.

Pursuant to Section 204.3 of the PJM Tariff, attached is a System Impact Study Agreement for your consideration. The Agreement must be executed via DocuSign within thirty days (by close of business on **August 26, 2019**) to maintain the project's position in the queue. At the same time, a study deposit in the amount of **$87,500** must be received by PJM by this date. In addition, your project's electrical data must be provided via Queue Point by the above date for the Impact Study Agreement to be considered complete. Failure to submit this data by the due date will result in the withdrawal of your project.

Please review and execute the Impact Study Agreement as specified in DocuSign. Required with the signed agreement, per Section 3 of the enclosed System Impact Study Agreement is a deposit of **$87,500**, 10% of which is non-refundable. Any unused non-refundable deposit monies shall be returned to the Interconnection Customer upon Initial Operation.

Please send the required study deposit to:

Jeannette Mittan
PJM Interconnection, L.L.C.
2750 Monroe Blvd.
Audubon, PA 19403

The following information is provided for wire transfers:

Bank: PNC Bank, NA, New Jersey
ABA Number: 031-207-607
Account Number: 8013589826

Please e-mail PJM at SystemPlanning.Admin@pjm.com with the project name, queue number, date and amount of wire.

In addition to the executed System Impact Study Agreement and deposit, you are responsible to ensure that all queue requests that you may have in the PJM queue are in good financial standing and that you meet the requirements of Tariff 204.3. Failure to meet the requirements of Tariff 204.3 or have your accounts in good standing will result in your project to be withdrawn from the queue. It is your responsibility to meet these requirements.

Costs for the Feasibility Study are being tabulated and you will receive an invoice in the near future. If you wish to discuss the Feasibility Study report or the Impact Study Agreement in more detail, please call me at 610.666.4561 and or email me at Lisa.Krizenoskas@pjm.com.

Sincerely,

Lisa Krizenoskas

Lisa R. Krizenoskas

Sr. Engineer
PJM Interconnection Projects

Generation Interconnection

Feasibility Study Report

for

Queue Project AE2-194

CONGRESS-TORONTO 138 KV

84 MW Capacity / 175 MW Energy

July 2019

Table Of Contents

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 Kensington PV I, LLC, the Interconnection Customer (IC), and PJM Interconnection, LLC (PJM), Transmission Provider (TP). The Interconnected Transmission Owner (ITO) is American Transmission Systems, Inc. (ATSI).

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.

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

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

PJM utilizes manufacturer models to ensure the performance of turbines is properly captured during the simulations performed for stability verification and, where applicable, for compliance with low voltage ride through requirements. Turbine manufacturers provide such models to their customers. The list of manufacturer models PJM has already validated is contained in Attachment B of Manual 14G. Manufacturer models may be updated from time to time, for various reasons such as to reflect changes to the control systems or to more accurately represent the capabilities turbines and controls which are currently available in the field. Additionally, as new turbine models are developed, turbine manufacturers provide such new models which must be used in the conduct of these studies. PJM needs adequate time to evaluate the new models in

order to reduce delays to the System Impact Study process timeline for the Interconnection Customer as well as other Interconnection Customers in the study group. Therefore, PJM will require that any Interconnection Customer with a new manufacturer model must supply that model to PJM, along with a $10,000 fully refundable deposit, no later than three (3) months prior to the starting date of the System Impact Study (See Section 4.3 for starting dates) for the Interconnection Request which shall specify the use of the new model. The Interconnection Customer will be required to submit a completed dynamic model study request form (Attachment B-1 of Manual 14G) in order to document the request for the study.

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

3 General

The Interconnection Customer (IC) has proposed a Solar generating facility located in Columbiana, OH. The installed facilities will have a total capability of 175 MW with 84 MW of this output being recognized by PJM as Capacity. The proposed in-service date for this project is 5/1/2022. This study does not imply a TO commitment to this in-service date.

Queue Number	**AE2-194**
Project Name	CONGRESS-TORONTO 138 KV
Interconnection Customer	Kensington PV I, LLC
State	OH
County	Columbiana
Transmission Owner	ATSI
MFO	175
MWE	175
MWC	84
Fuel	Solar
Basecase Study Year	2022

4 Point of Interconnection

4.1 Primary POI

The interconnection of the project at the Primary POI will be accomplished by constructing a new 138 kV three (3) breaker ring bus substation, looping the South Akron-Toronto 138 kV line into the new station, and extending a new line exit to the Primary POI. The new substation will be located approximately 20 miles from Toronto substation. The IC will be responsible for acquiring all easements, properties, and permits that may be required to construct both the new interconnection switching station and the associated facilities. The IC will also be responsible for the rough grade of the property and an access road to the proposed three breaker ring bus site. The project will also require non-direct connection upgrades at Toronto and South Akron substations.

Attachment 1 shows a one-line diagram of the proposed primary direct connection facilities for the AE2-194 generation project to connect to the FirstEnergy ("FE") transmission system. Attachment 2 provides the proposed location for the point of interconnection. IC will be responsible for constructing all of the facilities on its side of the POI, including the attachment facilities which connect the generator to the FE transmission system's direct connection facilities.

4.2 Secondary POI

The interconnection of the project at a Secondary POI can be accomplished by constructing a new 138 kV three (3) breaker ring bus substation, looping the Hagan-Sammis 138 kV line into the new station, and extending a new line exit to the Secondary POI. The new substation would be located approximately 4.8 miles from Sammis substation. A full scope of work or estimated cost is not provided for the proposed Secondary POI.

5 Cost Summary

The AE2-194 project will be responsible for the following costs:

Description	Total Cost
Attachment Facilities	$ 525,440
Direct Connection Network Upgrade	$ 4,728,960
Non Direct Connection Network Upgrades	$ 1,257,200
Total Costs	$ 6,511,600

In addition, the AE2-194 project may be responsible for a contribution to the following costs

Description	Total Cost
System Upgrades	$0

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

The costs provided above exclude the Contribution in Aid of Construction ("CIAC") Federal Income Tax Gross Up charge. If, at a future date, it is determined that the CIAC Federal Income Tax Gross charge is required, the Transmission Owner shall be reimbursed by the Interconnection Customer for such taxes.

The required Attachment Facilities and Direct and Non-Direct Connection work for the interconnection of the AE2-194 generation project to the FE Transmission System is detailed in the following sections. The associated one-line with the generation project Attachment Facilities and the Primary Direct and Non-Direct Connection facilities are shown in Attachment 1.

6 Transmission Owner Scope of Work

The interconnection of the project at the Primary POI will be accomplished by constructing a new 138 kV three (3) breaker ring bus substation, looping the South Akron-Toronto 138 kV line into the new station, and extending a new line exit to the Primary POI. The new substation will be located approximately 20 miles from Toronto substation. The IC will be responsible for acquiring all easements, properties, and permits that may be required to construct both the new interconnection switching station and the associated facilities. The IC will also be responsible for the rough grade of the property and an access road to the proposed three breaker ring bus site. The project will also require non-direct connection upgrades at Toronto and South Akron substations.

7 Attachment Facilities

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

Description	Total Cost
Install line exit take-off structure, foundations, disconnect switch and associated equipment at ring bus substation	$525,440
Total Attachment Facility Costs	$525,440

8 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
Install a new 3-breaker ring bus on the South Akron-Toronto 138 kV Line roughly 20 miles from Toronto	$4,728,960
Total Direct Connection Facility Costs	$4,728,960

9 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
Loop the South Akron - Toronto 138kV Line into the new 3-breaker ring bus. @ South Akron - Toronto 138kV Line Loop	$717,200
Upgrade South Akron line relaying @ Toronto SS	$270,000
Upgrade Toronto line relaying @ South Akron SS	$270,000
Total Non-Direct Connection Facility Costs	$1,257,200

10 Schedule

Based on the scope of work for the Attachment Facilities and the Direct and Non-Direct Connection facilities, it is expected to take a minimum of 34 months after the signing of an Interconnection Construction Service Agreement to complete the installation. This includes the requirement for the IC to make a preliminary payment that compensates FE for the first three months of the engineering design work that is related to the construction of the interconnection substation. Full initial deposit is required for the Non-Direct Connection and Network Upgrade work. This assumes that there will be no environmental issues with any of the new properties associated with this project, that there will be no delays in acquiring the necessary permits for implementing the defined direct connection and network upgrades, and that all transmission system outages will be allowed when requested.

The schedule for the required Network Impact Reinforcements will be more clearly identified in future study phases. The estimate elapsed time to complete each of the required reinforcements is identified in the "System Reinforcements" section of the report.

11 Transmission Owner Analysis

11.1 Power Flow Analysis

FE performed an analysis of its underlying transmission <100 kV system. The AE2-194 project did not contribute to any overloads on the FE transmission system.

12 Interconnection Customer Requirements

12.1 System Protection

The IC must design its Customer Facilities in accordance with all applicable standards, including the standards in FE's "Requirements for Transmission Connected Facilities" document located at: http://www.pjm.com/planning/design-engineering/to-tech-standards/private-firstenergy.aspx. Preliminary Protection requirements will be provided as part of the Facilities Study. Detailed Protection Requirements will be provided once the project enters the construction phase.

12.2 Compliance Issues and Interconnection Customer Requirements

The proposed Customer Facilities must be designed in accordance with FE's "Requirements for Transmission Connected Facilities" document located at: http://www.pjm.com/planning/design-engineering/to-tech-standards/private-firstenergy.aspx. In particular, the IC is responsible for the following:

1. The purchase and installation of a fully rated 138 kV circuit breaker to protect the AE2-194 generator lead line. A single circuit breaker must be used to protect this line; if the project has several GSU transformers, the individual GSU transformer breakers cannot be used to protect this line.

2. The purchase and installation of the minimum required FE generation interconnection relaying and control facilities. This includes over/under voltage protection, over/under frequency protection, and zero sequence voltage protection relays.

3. The purchase and installation of supervisory control and data acquisition ("SCADA") equipment to provide information in a compatible format to the FE Transmission System Control Center.

4. Compliance with the FE and PJM generator power factor and voltage control requirements.

5. The execution of a back-up service agreement to serve the customer load supplied from the AE2-194 generation project metering point when the units are out-of-service. This assumes the intent of the IC is to net the generation with the load.

The IC will also be required to meet all PJM, ReliabilityFirst, and NERC reliability criteria and operating procedures for standards compliance. For example, the IC will need to properly locate and report the over and under voltage and over and under frequency system protection elements for its units as well as the submission of the generator model and protection data required to satisfy the PJM and ReliabilityFirst audits. Failure to comply with these requirements may result in a disconnection of service if the violation is found to compromise the reliability of the FE system.

12.3 Power Factor Requirements

The IC shall design its solar Customer Facility with the ability to maintain a power factor of at least 0.95 leading (absorbing VARs) to 0.95 lagging (supplying VARs) measured at the high-side of the facility substation transformer(s) connected to the FE transmission system.

13 Revenue Metering and SCADA Requirements

13.1 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.

13.2 ATSI Requirements

The IC will be required to comply with all FE revenue metering requirements for generation interconnection customers which can be found in FE's "Requirements for Transmission Connected Facilities" document located at: http://www.pjm.com/planning/design-engineering/to-tech-standards/private-firstenergy.aspx

14 Network Impacts – Primary Point of Interconnection

The Queue Project AE2-194 was evaluated as a 175 MW (Capacity 84 MW) injection at 20 miles from Toronto on the South Akron-Toronto 138 kV Line in the ATSI area. Project AE2-194 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AE2-194 was studied with a commercial probability of 53%. Potential network impacts were as follows:

Summer Peak Load Flow

14.1 Generation Deliverability

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

None

14.2 Multiple Facility Contingency

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

None

14.3 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	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
1612722	239092	02SAMMIS	ATSI	253902	15BVRVAL	DLCO	S1	DLC_P22_BV_35_345_SB	bus	1195.0	132.96	133.48	DC	13.67
1612723	239092	02SAMMIS	ATSI	253902	15BVRVAL	DLCO	S1	DLC_P22_BV_46_345_SB	bus	1195.0	132.87	133.39	DC	13.66
1613242	239092	02SAMMIS	ATSI	253902	15BVRVAL	DLCO	S1	DLC_P23_BV_316_SB	breaker	1195.0	132.96	133.48	DC	13.67
1613243	239092	02SAMMIS	ATSI	253902	15BVRVAL	DLCO	S1	DLC_P23_BV_310_SB	breaker	1195.0	132.87	133.39	DC	13.66
1613244	239092	02SAMMIS	ATSI	253902	15BVRVAL	DLCO	S1	DLC_P23_BV_318_3_SB	breaker	1195.0	131.68	132.19	DC	13.37
1613245	239092	02SAMMIS	ATSI	253902	15BVRVAL	DLCO	S1	DLC_P23_BV_GEN_1_3_SB	breaker	1195.0	131.56	132.08	DC	13.67
1613246	239092	02SAMMIS	ATSI	253902	15BVRVAL	DLCO	S1	DLC_P23_BV_GEN_2_5_SB	breaker	1195.0	131.56	132.08	DC	13.67

14.4 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.

None

14.5 System Reinforcements

ID	Index	Facility	Upgrade Description	Cost
1612722,1612723,7160847,7160846,1613242,1613243,1613246,1613245	1	02SAMMIS 345.0 kV - 15BVRVAL 345.0 kV Ckt S1	**ATSI** ATSI Rating Correction: [Rate A: 1413, Rate B: 1743, Rate C: 1743] **DL*** **b3061** : PJM Baseline Upgrade b3061. Reconductor the West Mifflin - Dravosburg (Z-73) and Dravosburg - Elrama (Z-75) 138 kV lines. The baseline project has a projected in-service date of 06/01/2021. Cost : $0 **b3062** : PJM Baseline Upgrade b3062. Install 138 kV tie breaker at West Mifflin. The baseline project has a projected in-service date of 06/01/2021. Cost : $0 **b3063** : PJM Baseline Upgrade b3063. Reconductor the Wilson - Dravosburg (Z-72) 138 kV line (~5 miles). The baseline project has a projected in-service date of 06/01/2021. Cost : $0 **b3064** : PJM Baseline Upgrade b3064. Expand Elrama 138 kV substation to loop in the existing USS Steel Clariton - Piney Fork 138 kV line. The baseline project has a projected in-service date of 06/01/2021. Cost : $0 **b3065** : PJM Baseline Upgrade b3065. Install 138 kV tie breaker at Wilson. The baseline project has a projected in-service date of 06/01/2021. Cost : $0 **b3012.1** : PJM Baseline Upgrade b3012.1. Construct two new 138 kV ties with the single structure from APS's new substation to DUQ's new substation. The estimated line length is approximately 4.7 miles. The line is planned to use multiple ACSS conductors per phase. The baseline project has a projected in-service date of 06/01/2021. Cost : $0 **b3012.2** : PJM Baseline Upgrade b3012.2. Construct two new ties from a new First Energy substation to a new Duquesne substation by using two separate structures - Duquesne portion. The baseline project has a projected in-service date of 06/01/2021. Cost : $0 **b3012.3** : PJM Baseline Upgrade b3012.3. Construct a new Elrama - Route 51 138 kV No.3 line: reconductor 4.7 miles of the existing line, and construct 1.5 miles of a new line to the reconductored portion. Install a new line terminal at APS Route 51 substation. The baseline project has a projected in-service date of 06/01/2021. Cost : $0 **b3012.4** : PJM Baseline Upgrade b3012.4. Establish the new tie line in place of the existing Elarama - Mitchell 138 kV line. The baseline project has a projected in-service date of 06/01/2021. Cost : $0 * Note: *The baseline reinforcements identified may resolve the overload violations but have not been tested in the Feasibility Study phase. PJM will analyze if these baseline projects alleviate the identified overload violations in the System Impact phase. If these baseline projects do not resolve the overload, then new system reinforcement(s) may be required and will be specified in the System Impact Study report.*	$0
			TOTAL COST	**$0**

14.6 Flow Gate Details

The following appendices contain additional information about each flowgate presented in the body of the report. For each appendix, a description of the flowgate and its contingency was included for convenience. However, the intent of the appendix section is to provide more information on which projects/generators have contributions to the flowgate in question. Although this information is not used "as is" for cost allocation purposes, it can be used to gage other generators impact. It should be noted the generator contributions presented in the appendices sections are full contributions, whereas in the body of the report, those contributions take into consideration the commercial probability of each project.

14.7 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
1613243	239092	02SAMMIS	ATSI	253902	15BVRVAL	DLCO	S1	DLC_P23_BV_310_SB	breaker	1195.0	132.87	133.39	DC	13.66

Bus #	Bus	MW Impact
239085	02SAMMG1	13.1
239086	02SAMMG2	12.74
239087	02SAMMG3	43.59
239088	02SAMMG4	42.89
239089	02SAMMG5	67.9
239090	02SAMMG6	139.85
239091	02SAMMG7	139.85
239292	02SAM-EMD	0.94
919011	AA1-123	21.45
920251	AA2-121 O1	48.74
924551	AB2-104	4.62
925351	AC1-003	5.69
930301	AB1-069 C	84.31
930302	AB1-069 E	3.81
931152	AB1-166 E	2.57
938202	AE1-029 E	0.39
938583	AE1-079 CBAT	0.07
938584	AE1-079 EBAT	0.18
938591	AE1-080 C	7.1
939973	AE1-237 C2	0.07
939974	AE1-237 EBAT	0.11
940513	AE2-036 EBAT	0.18
941891	AE2-194 C O1	6.56
941892	AE2-194 E O1	7.11
CARR	CARR	0.14
CBM-S1	CBM-S1	1.11
CBM-S2	CBM-S2	0.78
CBM-W2	CBM-W2	6.6
CIN	CIN	0.55
CPLE	CPLE	0.33
G-007	G-007	0.11
IPL	IPL	0.36
LGEE	LGEE	0.2
MEC	MEC	0.9
O-066	O-066	0.44
RENSSELAER	RENSSELAER	0.09
WEC	WEC	0.09

Affected Systems

14.8 Affected Systems

14.8.1 LG&E

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

14.8.2 MISO

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

14.8.3 TVA

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

14.8.4 Duke Energy Progress

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

14.8.5 NYISO

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

14.9 Contingency Descriptions

Contingency Name	Contingency Definition
DLC_P23_BV_310_SB	CONTINGENCY 'DLC_P23_BV_310_SB' OPEN BRANCH FROM BUS 253902 TO BUS 253903 CKT 2 OPEN BRANCH FROM BUS 253902 TO BUS 238941 CKT 2 OPEN BRANCH FROM BUS 253902 TO BUS 238781 CKT 1 CLOSE BRANCH FROM BUS 253902 TO BUS 238781 CKT S1 OPEN BRANCH FROM BUS 253902 TO BUS 253936 CKT 1 CLOSE BRANCH FROM BUS 253902 TO BUS 253936 CKT S1 OPEN BRANCH FROM BUS 253902 TO BUS 239092 CKT 1 CLOSE BRANCH FROM BUS 253902 TO BUS 239092 CKT S1 OPEN BRANCH FROM BUS 253902 TO BUS 253931 CKT 1 CLOSE BRANCH FROM BUS 253902 TO BUS 253931 CKT S1 END
DLC_P23_BV_GEN_2_5_SB	CONTINGENCY 'DLC_P23_BV_GEN_2_5_SB' OPEN BUS 253901 OPEN BRANCH FROM BUS 253902 TO BUS 253903 CKT 1 OPEN BRANCH FROM BUS 253902 TO BUS 238941 CKT 1 OPEN BRANCH FROM BUS 253902 TO BUS 238781 CKT 1 CLOSE BRANCH FROM BUS 253902 TO BUS 238781 CKT S1 OPEN BRANCH FROM BUS 253902 TO BUS 253936 CKT 1 CLOSE BRANCH FROM BUS 253902 TO BUS 253936 CKT S1 OPEN BRANCH FROM BUS 253902 TO BUS 239092 CKT 1 CLOSE BRANCH FROM BUS 253902 TO BUS 239092 CKT S1 OPEN BRANCH FROM BUS 253902 TO BUS 253931 CKT 1 CLOSE BRANCH FROM BUS 253902 TO BUS 253931 CKT S1 END
DLC_P22_BV_46_345_SB	CONTINGENCY 'DLC_P22_BV_46_345_SB' OPEN BRANCH FROM BUS 253903 TO BUS 253902 CKT 2 OPEN BRANCH FROM BUS 253902 TO BUS 238941 CKT 2 OPEN BRANCH FROM BUS 253902 TO BUS 253931 CKT 1 CLOSE BRANCH FROM BUS 253902 TO BUS 253931 CKT S1 OPEN BRANCH FROM BUS 253902 TO BUS 239092 CKT 1 CLOSE BRANCH FROM BUS 253902 TO BUS 239092 CKT S1 OPEN BRANCH FROM BUS 253902 TO BUS 253936 CKT 1 CLOSE BRANCH FROM BUS 253902 TO BUS 253936 CKT S1 OPEN BRANCH FROM BUS 253902 TO BUS 238781 CKT 1 CLOSE BRANCH FROM BUS 253902 TO BUS 238781 CKT S1 END
DLC_P22_BV_35_345_SB	CONTINGENCY 'DLC_P22_BV_35_345_SB' OPEN BRANCH FROM BUS 253903 TO BUS 253902 CKT 1 OPEN BRANCH FROM BUS 253902 TO BUS 238941 CKT 1 OPEN BRANCH FROM BUS 253902 TO BUS 253931 CKT 1 CLOSE BRANCH FROM BUS 253902 TO BUS 253931 CKT S1 OPEN BRANCH FROM BUS 253902 TO BUS 239092 CKT 1 CLOSE BRANCH FROM BUS 253902 TO BUS 239092 CKT S1 OPEN BRANCH FROM BUS 253902 TO BUS 253936 CKT 1 CLOSE BRANCH FROM BUS 253902 TO BUS 253936 CKT S1 OPEN BRANCH FROM BUS 253902 TO BUS 238781 CKT 1 CLOSE BRANCH FROM BUS 253902 TO BUS 238781 CKT S1 END

Contingency Name	Contingency Definition
DLC_P23_BV_318_3_SB	CONTINGENCY 'DLC_P23_BV_318_3_SB' OPEN BRANCH FROM BUS 253902 TO BUS 253936 CKT 1 OPEN BRANCH FROM BUS 253902 TO BUS 253903 CKT 1 OPEN BRANCH FROM BUS 253902 TO BUS 238941 CKT 1 OPEN BRANCH FROM BUS 253902 TO BUS 238781 CKT 1 CLOSE BRANCH FROM BUS 253902 TO BUS 238781 CKT S1 OPEN BRANCH FROM BUS 253902 TO BUS 239092 CKT 1 CLOSE BRANCH FROM BUS 253902 TO BUS 239092 CKT S1 OPEN BRANCH FROM BUS 253902 TO BUS 253931 CKT 1 CLOSE BRANCH FROM BUS 253902 TO BUS 253931 CKT S1 END
DLC_P23_BV_GEN_1_3_SB	CONTINGENCY 'DLC_P23_BV_GEN_1_3_SB' OPEN BUS 253900 OPEN BRANCH FROM BUS 253902 TO BUS 253903 CKT 1 OPEN BRANCH FROM BUS 253902 TO BUS 238941 CKT 1 OPEN BRANCH FROM BUS 253902 TO BUS 238781 CKT 1 CLOSE BRANCH FROM BUS 253902 TO BUS 238781 CKT S1 OPEN BRANCH FROM BUS 253902 TO BUS 253936 CKT 1 CLOSE BRANCH FROM BUS 253902 TO BUS 253936 CKT S1 OPEN BRANCH FROM BUS 253902 TO BUS 239092 CKT 1 CLOSE BRANCH FROM BUS 253902 TO BUS 239092 CKT S1 OPEN BRANCH FROM BUS 253902 TO BUS 253931 CKT 1 CLOSE BRANCH FROM BUS 253902 TO BUS 253931 CKT S1 END
DLC_P23_BV_316_SB	CONTINGENCY 'DLC_P23_BV_316_SB' OPEN BRANCH FROM BUS 253902 TO BUS 253903 CKT 1 OPEN BRANCH FROM BUS 253902 TO BUS 238941 CKT 1 OPEN BRANCH FROM BUS 253902 TO BUS 238781 CKT 1 CLOSE BRANCH FROM BUS 253902 TO BUS 238781 CKT S1 OPEN BRANCH FROM BUS 253902 TO BUS 253936 CKT 1 CLOSE BRANCH FROM BUS 253902 TO BUS 253936 CKT S1 OPEN BRANCH FROM BUS 253902 TO BUS 239092 CKT 1 CLOSE BRANCH FROM BUS 253902 TO BUS 239092 CKT S1 OPEN BRANCH FROM BUS 253902 TO BUS 253931 CKT 1 CLOSE BRANCH FROM BUS 253902 TO BUS 253931 CKT S1 END

Short Circuit

14.10 Short Circuit

The following Breakers are overduty:

15 Network Impacts – Secondary Point of Interconnection

The Queue Project AE2-194 was evaluated as a 175.0 MW (Capacity 84.0 MW) injection tapping the Hagan to Sammis 138kV line in the ATSI area. Project AE2-194 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AE2-194 was studied with a commercial probability of 53%. Potential network impacts were as follows:

Summer Peak Load Flow

15.1 Generation Deliverability

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

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
14602260	941890	AE2-194 TAP	ATSI	239372	02HAGAN	ATSI	1	ATSI-P1-2-SYS-345-877	single	189.0	82.17	109.52	DC	51.68
14602261	941890	AE2-194 TAP	ATSI	239372	02HAGAN	ATSI	1	ATSI-P1-2-OEE-138-055	single	189.0	77.14	104.65	DC	52.01

15.2 Multiple Facility Contingency

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

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
14602746	239093	02SAMMIS	ATSI	239369	02TORONTO	ATSI	1	ATSI-P7-1-OEE-138-012-B	tower	339.0	70.31	113.43	DC	146.19

15.3 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)

None

15.4 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	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
14602254	941890	AE2-194 TAP	ATSI	239372	02HAGAN	ATSI	1	ATSI-P1-2-SYS-345-877	operation	189.0	82.17	139.14	DC	107.67
14602259	941890	AE2-194 TAP	ATSI	239372	02HAGAN	ATSI	1	Base Case	operation	185.0	67.13	125.32	DC	107.66

15.5 Flow Gate Details

The following appendices contain additional information about each flowgate presented in the body of the report. For each appendix, a description of the flowgate and its contingency was included for convenience. However, the intent of the appendix section is to provide more information on which projects/generators have contributions to the flowgate in question. Although this information is not used "as is" for cost allocation purposes, it can be used to gage other generators impact. It should be noted the generator contributions presented in the appendices sections are full contributions, whereas in the body of the report, those contributions take into consideration the commercial probability of each project.

15.6 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
14602260	941890	AE2-194 TAP	ATSI	239372	02HAGAN	ATSI	1	ATSI-P1-2-SYS-345-877	single	189.0	82.17	109.52	DC	51.68

Bus #	Bus	MW Impact
239085	02SAMMG1	20.95
239086	02SAMMG2	20.37
239292	02SAM-EMD	1.5
941891	AE2-194 C O2	51.68
BLUEG	BLUEG	1.05
CALDERWOOD	CALDERWOOD	0.07
CANNELTON	CANNELTON	0.06
CATAWBA	CATAWBA	0.03
CBM-N	CBM-N	0.11
CHEOAH	CHEOAH	0.07
CHILHOWEE	CHILHOWEE	0.02
COFFEEN	COFFEEN	0.11
COTTONWOOD	COTTONWOOD	0.35
DUCKCREEK	DUCKCREEK	0.26
EDWARDS	EDWARDS	0.12
ELMERSMITH	ELMERSMITH	0.11
FARMERCITY	FARMERCITY	0.07
G-007A	G-007A	0.46
GIBSON	GIBSON	0.04
HAMLET	HAMLET	0.03
NEWTON	NEWTON	0.3
NYISO	NYISO	0.47
PRAIRIE	PRAIRIE	0.52
SANTEETLA	SANTEETLA	0.02
SMITHLAND	SMITHLAND	0.04
TATANKA	TATANKA	0.14
TILTON	TILTON	0.14
TRIMBLE	TRIMBLE	0.12
TVA	TVA	0.28
UNIONPOWER	UNIONPOWER	0.12
VFT	VFT	1.25

15.7 Index 2

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
14602746	239093	02SAMMIS	ATSI	239369	02TORONTO	ATSI	1	ATSI-P7-1-OEE-138-012-B	tower	339.0	70.31	113.43	DC	146.19

Bus #	Bus	MW Impact
239085	02SAMMG1	151.2
239086	02SAMMG2	147.02
239292	02SAM-EMD	10.86
941891	AE2-194 C O2	70.17
941892	AE2-194 E O2	76.02
BLUEG	BLUEG	0.03
CALDERWOOD	CALDERWOOD	0.01
CANNELTON	CANNELTON	0.0
CATAWBA	CATAWBA	0.01
CBM-N	CBM-N	0.01
CBM-W1	CBM-W1	0.11
CHEOAH	CHEOAH	0.01
CHILHOWEE	CHILHOWEE	0.0
COFFEEN	COFFEEN	0.0
COTTONWOOD	COTTONWOOD	0.03
ELMERSMITH	ELMERSMITH	0.0
FARMERCITY	FARMERCITY	0.0
G-007	G-007	0.02
GIBSON	GIBSON	0.0
HAMLET	HAMLET	0.02
MECS	MECS	0.19
NEWTON	NEWTON	0.0
NYISO	NYISO	0.04
O-066	O-066	0.13
PRAIRIE	PRAIRIE	0.01
SANTEETLA	SANTEETLA	0.0
SMITHLAND	SMITHLAND	0.0
TRIMBLE	TRIMBLE	0.0
TVA	TVA	0.03
UNIONPOWER	UNIONPOWER	0.01
WEC	WEC	0.0

Affected Systems

15.8 Affected Systems

15.8.1 LG&E

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

15.8.2 MISO

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

15.8.3 TVA

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

15.8.4 Duke Energy Progress

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

15.8.5 NYISO

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

15.9 Contingency Descriptions

Contingency Name	Contingency Definition
ATSI-P7-1-OEE-138-012-B	CONTINGENCY 'ATSI-P7-1-OEE-138-012-B' /* SAMMIS-HAGAN & SAMMIS-PIDGEON 138KV DISCONNECT BRANCH FROM BUS 941890 TO BUS 239372 CKT 1 /* AE2-194 TAP 138 02HAGAN 138 DISCONNECT BRANCH FROM BUS 239042 TO BUS 239093 CKT 1 /* 02PIDGON 138 02SAMMIS 138 END
Base Case	
ATSI-P1-2-SYS-345-877	CONTINGENCY 'ATSI-P1-2-SYS-345-877' /* LINE TORONTO TO 02SAMMIS 345 CK 1 DISCONNECT BRANCH FROM BUS 239368 TO BUS 239092 CKT 1 /* 02TORONTO 345 02SAMMIS 345 END
ATSI-P1-2-OEE-138-055	CONTINGENCY 'ATSI-P1-2-OEE-138-055' /* PIDGEON-SAMMIS 138KV DISCONNECT BRANCH FROM BUS 239093 TO BUS 239042 CKT 1 /* 02SAMMIS 138 02PIDGON 138 END

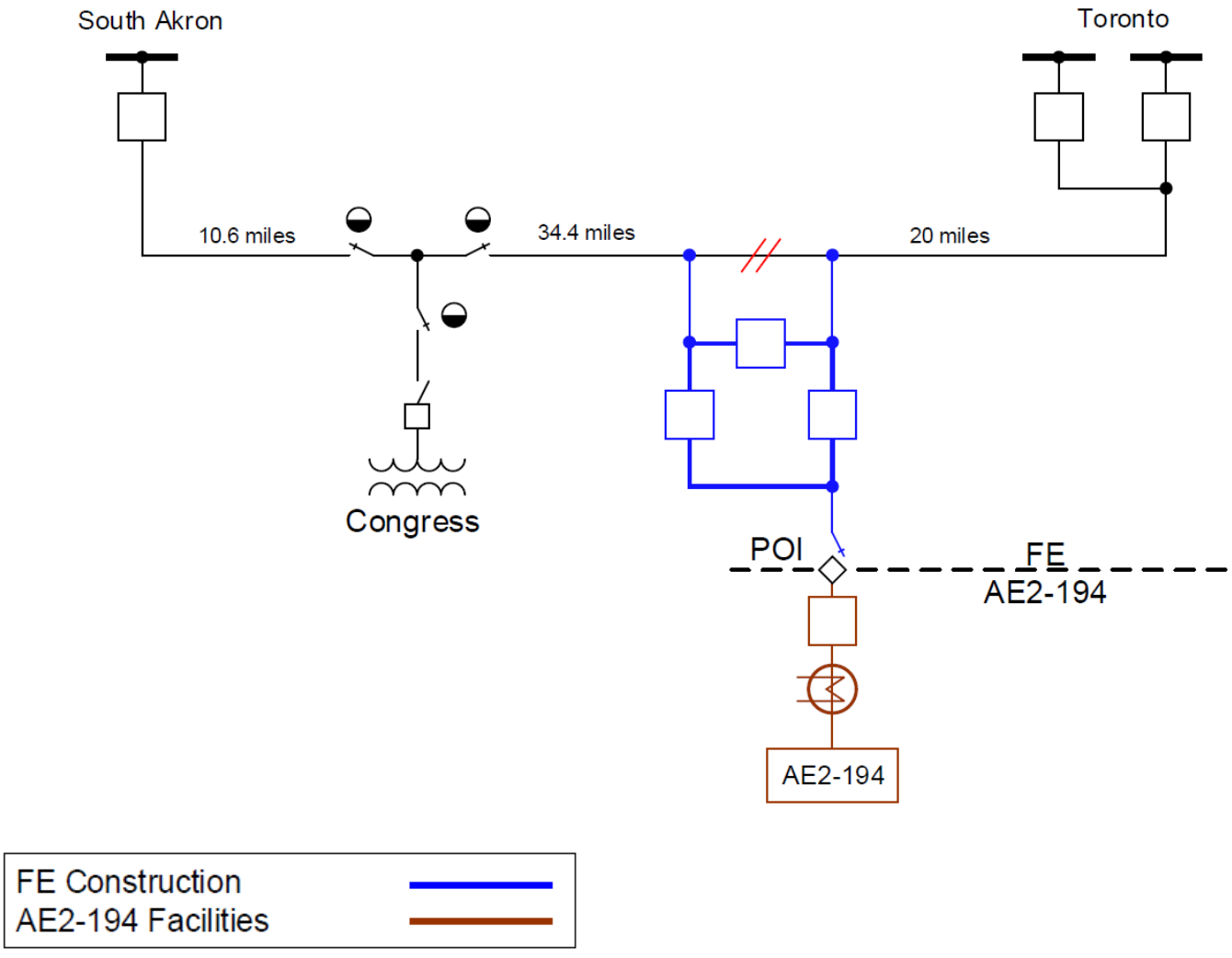
Short Circuit

15.10 Short Circuit

The following Breakers are overduty:

None.

16 Attachment 1 – One Line (Primary POI)



17 Attachment 2 – Project Location (Primary POI)