Generation Interconnection Feasibility Study Report Web Version

For

PJM Generation Interconnection Request Queue Position X3-022

Hunterstown-Jackson 230kV Project

February 2012

Feasibility Study Report

Hunterstown 230 kV Generation Project

Introduction

This Feasibility Study report provides the documentation of a system assessment performed by PJM Interconnection, L.L.C. (PJM) and FirstEnergy (FE) in response to a request made by Interconnection Customer (IC) for the connection of a solar power project with a total capability of 100 MW to the Met-Ed Transmission network. This assessment was accomplished by: 1. Evaluating the reliability impact of the proposed facilities and connection on the interconnected transmission system by the performance of a power flow study; 2. Ensuring compliance with the NERC, ReliabilityFirst, PJM and FE Reliability Standards by identifying the system reinforcements that will need to be installed for an interconnection of the proposed project; 3. Coordinating and cooperating with the PJM staff and IC. by conducting meetings and issuing this report as a part of the PJM study process; 4. Performing a Steady State, Short-Circuit and Dynamics Study as necessary; 5. Conducting all studies in accordance with the PJM Manuals and the "FE Requirements for Transmission Connected Facilities" documents to assure that the assessment performed incorporates study assumptions, follows the documented system performance procedures, considers alternative connection and reinforcement plans, and jointly coordinates the study recommendations.

Connection Facilities

In compliance with the PJM protocol, Interconnection Customer has submitted a "Form of Generation Interconnection Feasibility Study Agreement" to PJM that identifies its plan to construct a Hunterstown-Jackson 230 kV Generation Project comprised of photo-voltaic solar panels and inverters on two plots of land along Swift Run Road and Red Bridge Rd near Gettysburg, PA (see Attachment 1). The installed facilities will have a total capability of 100 MW with 38 MW of this output being recognized by PJM as capacity. This means that the remaining 62 MW will be subject to curtailment should a system reliability constraint occur. The proposed in-service date for this Hunterstown-Jackson 230 kV Project is Dec 31, 2014.

As defined by the Interconnection Customer and as shown in Attachment 1, the proposed Hunterstown-Jackson 230 kV Project site will be located about 1.25 mile east of the Hunterstown 230 kV substation. The requested primary point of connection (POI) is chosen to be at a point on the Hunterstown – Jackson (1053) 230 kV line. The Interconnection Customer will be responsible for constructing a radial attachment line from the X3-022 230 kV solar collector bus to the chosen point of interconnection. The Interconnection Customer may not install above ground equipment within any FirstEnergy right-of-way unless permission to do so is expressly granted by FirstEnergy. The Interconnection Customer will also be responsible for

constructing as a minimum requirement, a three breaker ring bus substation along the Hunterstown – Jackson (1053) 230 kV line.
Attachment 2 shows a conceptual one-line diagram of the three breaker ring bus interconnection substation to accommodate the attachment of the Hunterstown-Jackson 230 kV Project as the primary option.

Interconnection Customer will be responsible for constructing all of the facilities on its side of the point of interconnection including the attachment line. A summary of the FE facilities required for the primary Hunterstown-Jackson 230 kV connection and their cost estimate is shown on Attachment 3.

PJM Interconnection Study Results

The following is the report describing the results of the analysis performed by PJM engineers with respect to the transmission system impacts.

Network Impacts

Queue project X3-022 was studied as a(n) 100.0 MW (38.0 MW of which was Capacity) injection into ME's system at the 50.0% tap between Jackson 1 and Hunterstown 2 Split Bus230.0 kV line. Project X3-022 was evaluated for compliance with reliability criteria for summer peak conditions in 2015.

Potential transmission network impacts are as follows:

Generator Deliverability

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

No violations identified.

Multiple Facility Contingency

(Double Circuit Tower Line contingencies only with full energy output. Stuck Breaker and Bus Fault contingencies will be applied during the Impact Study)

No violations identified.

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.)

No violations identified.

New System Reinforcements

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

None required.

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.)

None required.

Short Circuit
(Report over-dutied breakers.)

None

Energy Portion of Interconnection Request
PJM also studied the delivery of the energy portion of the surrounding generation. Any potential 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 Transmission Interconnection request.
Note: *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 analyzes all overload conditions associated with the overloaded element(s) identified. As a result of the aggregate energy resources in the area, the following violations were identified*.

1. (PL/BG&E) The Otter Creek Switchyard-Conastone 230 kV line (from bus 208048 to bus 220963 ckt 1) loads from 157.57% to 157.92% (DC power flow) of its emergency rating (531 MVA) for the operational contingency 'PJM17'. This project contributes approximately 12.81 MW to the thermal violation.

CONTINGENCY 'PJM17'
DISCONNECT BRANCH FROM BUS 200004 TO BUS 200013 CKT 1 /* CNASTONE PEACHBTM 500 500
END

2. (METED/PL) The Yorkana-Otter Creek Switchyard 230 kV line (from bus 204515 to bus 208048 ckt 1) loads from 100.67% to 101.82% (DC power flow) of its emergency rating (793 MVA) for the operational contingency 'PJM17'. This project contributes approximately 19.70 MW to the thermal violation.

CONTINGENCY 'PJM17'
DISCONNECT BRANCH FROM BUS 200004 TO BUS 200013 CKT 1 /* CNASTONE PEACHBTM 500 500
END

3. (PL/BG&E) The Safe Harbor Units 3-4 Tap-Graceton 230 kV line (from bus 208071 to bus 220964 ckt 1) loads from 153.19% to 153.5% (DC power flow) of its emergency rating (485 MVA) for the operational contingency 'PJM17'. This project contributes approximately 9.19 MW to the thermal violation.

CONTINGENCY 'PJM17'

DISCONNECT BRANCH FROM BUS 200004 TO BUS 200013 CKT 1 /* CNASTONE PEACHBTM 500 500
END

Transmission Owner's Analysis Results

The following is the report generated by the Transmission Owner (TO) based upon its analysis of the project's impacts on the lower voltage system and the costs and schedules for any transmission and distribution system upgrades.

A Power Flow study was conducted to determine the reliability impact of the proposed Hunterstown-Jackson 230 kV Project on the FE Transmission System. This study was completed using a 2015 summer peak load power flow that contains a detailed representation of the Met-Ed transmission networks in the area of the proposed Hunterstown-Jackson 230 kV Project. The findings and the recommendations from this analysis are based on a contingency review that was performed to identify the facility loadings and/or voltage conditions that violate the ReliabilityFirst, PJM or FE Planning Criteria and are attributable to this project. Note that in accordance with PJM study procedures, this queue project under study and earlier active queue projects are considered to be in service. All active queue projects after (X3-022) are considered not in service.

For the selected choice of interconnection (see Attachment 2), the Hunterstown-Jackson 230 kV is in service for a total of 100 MW (38 MW capacity) connected to the three breaker ring bus along the Hunterstown – Jackson (1053) 230 kV line. The results of the FE analysis show that there are no network upgrades required for the Hunterstown-Jackson 230 kV Project to deliver generation to the Met-Ed transmission system. The results from the Power Flow Analysis showing a comparison of the FE and PJM contingency study results is detailed on Attachment 4. As shown, there are no required reinforcements defined for previous projects for which this project will have an impact, and there are no new upgrades required for the Hunterstown-Jackson 230 kV Project.

The Power Flow Analysis did indicate that there were a minimum of three (3) criteria violations which will have an impact on network congestion based on the local energy deliverability case, but PJM does not mandate network reinforcements to mitigate these violations. The criteria violations are identified on Attachment 4 under the Potential Network Congestion heading. Interconnection Customer will likely be subjected to operational restrictions in order to mitigate these violations. Interconnection Customer can proceed with network upgrades to eliminate the operational restrictions to the Hunterstown-Jackson 230 kV Project.

Voltage criteria violations such as high voltage under light load conditions and high and low voltages caused by swings in MW output of the attached generation may result in curtailment of the energy portion of the Hunterstown-Jackson 230 kV Projects at times. This will be studied further in the System Impact Study.

It may be necessary for the Hunterstown-Jackson 230 kV Project to have a range of dynamic reactive capability that supports its operation from a .95 lead to .95 lag power factor. Without a continuous regulation, the FE studies have shown that the addition of solar projects can cause voltage swings as their output oscillates with moving clouds and system voltages may exceed the established limits. Further studies will be done during the System Impact Study to determine whether dynamic reactive capability is required.

Short Circuit and Dynamics Analysis

A short circuit analysis was conducted by PJM and confirmed by the FE Protection staff. An assumption of this study was that solar generation projects will contribute no appreciable fault current to the breakers on the FE transmission system. As defined by EPRI: "Inverters are generally designed to limit fault currents to 130% or less of rated current. Thus they can usually be disregarded when conducting fault studies."[1] Based on this fact, the results of the FE analysis showed that no FE circuit breaker will exceed its interrupting capability with the implementation of the Hunterstown-Jackson 230 kV Project. Therefore no circuit breaker reinforcements will be required.

Note that stability studies will be conducted by the PJM staff should this project proceed to the Impact Study stage of the PJM study process.

System Protection Analysis

An analysis was conducted to assess the impact of the Hunterstown-Jackson 230 kV Project on the system protection requirements in the area. The results of this review have identified the following:

New X3-022 Substation (Install the following equipment)

Line to Jackson:

Protection
- SEL - 311C Prim Primary Protection (Carrier) DCB
- SEL - 321 Backup Line
- SEL - 352 Breaker Failure

Communication and metering equipment
- Wave Trap (Tuned to 73 kHz carrier & 127 kHz DTT freq)
- Line Tuner
- RFL 9785 (For DCB carrier) Include Carrier Checkback module
- RFL 9780 (TX/TX DTT and BF at X3-022 to Jackson)
- Set of 230kV CCVT's (Sync Check and Carrier Signal)
- SATEC meter

DTT frequencies
- TX/TX (126.5kHz)/(127.5kHz) (TX/TX DTT to Jackson)

Line to Hunterstown:

[1] EPRI Document TR-111490 "Integration of Distributed Resources in Electric Utility Distribution Systems: Distribution System Behavior Analysis for Suburban Feeder", published November 1998, page 62

Protection

- SEL - 311L Prim Primary Protection (Line Differential , BU Mho and DTT)
- SEL - 387L Backup Protection (Line Differential)
- SEL - 352 Breaker Failure

Communication and metering equipment

- Fiber connection to Hunterstown Two independent fiber optic cables required.
- Set of 230kV CCVT's(Sync Check)
- SATEC meter

Shared Line Breaker:

Protection

- SEL - 352 Breaker Failure
- SEL – 351A Reclosing (Shared Breaker – and Sync Check)

Generation Line Exit:

Protection

- SEL - 311L Prim (Line exit , B.U. Mho and DTT)
- SEL - 387L B.U. (B.U. Line exit Protection)

Communication and Metering Equipment

- Fiber connection Two independent fiber optic cables required.
- 230 kV PT's or CCVT's (Sync Check and B.U Mho element into plant via 311L)

Substation equipment

- Cooper Cybectec communications processor, and compatible modem with cables
- Arbiter Systems, Inc., GPS satellite-controlled clock Model 1094B with option 1094OPT10
- Required cabling to connect new SEL devices to the communication processor

RTU

- Remote Control and Indication of substation equipment is required (RTU)

<u>Existing Jackson Substation</u>

Line to X3-022:

Protection <u>(New equipment to be installed)</u>

- SEL - 311C Prim Primary Protection (Carrier) DCB
- Remove existing primary line relaying

Protection (Existing equipment to be utilized)

- SEL 352 Breaker Failure
- SEL 279H2 Reclosing (Sync Check)
- Utilize existing back up line relaying

Communication and Metering Equipment (Existing equipment to be utilized)

- Wave Trap (Tuned to 73 kHz and 127 kHz DTT Freq)
- Line Tuner
- SEL 2020 communication processor and Arbiter GPS clock
- 230kV PT and CCVT (Sync Check)

Communication and Metering Equipment (New equipment to be installed)

- RFL 9785 (For DCB carrier) Include Carrier Checkback module)
- RFL 9780 (RX/RX DTT and BF from X3-022)

TT frequencies

- RX/RX (126.5kHz)/(127.5kHz) (RX/RX DTT and BF from X3-022 via 9780)

Substation equipment

- Required cabling to connect new SEL devices to the existing 2020 communication processor

Existing Hunterstown Substation

Line to X3-022:

Protection (New equipment to be installed)

- SEL - 311L Prim Primary Protection (Line Differential, BU Mho and DTT)
  DTT – utilized for breaker failure
- SEL - 387L Backup Protection (Line Differential)
- SEL - 351A Reclosing (Sync Check)

Protection (Existing equipment to be utilized)

- SEL 352 Breaker Failure (Reuse the existing)

Communication and metering equipment (New equipment to be installed)

- Fiber connection to X3-022 Two independent fiber optic cables required.
- Set of 115kV CCVT's(Sync Check)
- SATEC meter

Substation equipment

- Cooper Cybectec communications processor, and compatible modem with cables
- Arbiter Systems, Inc., GPS satellite-controlled clock Model 1094B with option 1094OPT10

- Required cabling to connect new SEL devices to the communication processor

Customer owned X3-022 Substation (customer responsibility)

Generation line exit

Protection
- SEL - 311L Prim (Line exit, B.U. Mho and T.T.)
- SEL - 387L B.U. (B.U. Line exit Protection)
- SEL – 351-7 (Intertie Relay see description below)*

Communication and metering equipment
- Fiber connection (Two independent fiber optic cables required.)
- PT's or CCVT's (Sync Check and B.U Mho element into plant via 311L)

Interconnection Customer shall furnish to FE documentation that the inverter equipment to be installed for the Hunterstown-Jackson 230 kV Solar project complies with the inverter standard UL1741 and IEEE 1547, "Standard for Interconnecting Distributed resources with Electrical Power Systems", IC shall furnish and install at the Swift Run Road (customer owned) X3-022 substation one directional overcurrent, over/under voltage and over/under frequency relay connected to the 230 kV current transformers along with three phase 230 kV potential transformers to provide directional reference. The recommended intertie relay type is Schweitzer model SEL-351-7. The intertie relay tripping output shall be wired to trip open an appropriate Swift Run Road breaker so that the solar system output is isolated from the connection to the Met-E system supply to the facility. The relay will prevent generating power onto the Met-Ed system for abnormal system conditions, including a fault and to prevent islanding to system load. Interconnection Customer shall furnish a single-line diagram to FE, for review and comment, showing the intertie relay and connection to current and potential sources as well as the tripping path for the trip output of the relay. FE shall approve the proposed intertie relay manufacturer and model number. FE shall calculate and furnish documentation of the settings required to be installed on the intertie relay. Upon completion of the installation and before operation of the generation output of the Hunterstown-Jackson 230 kV Solar project. FE personnel will verify connections to and settings on the intertie relay as well as witness functional testing to verify the intertie relay trips required breakers.

Fault currents at the new Hunterstown-Jackson 230 kV Project substation are listed below:

Three phase : 11,191 amperes (X/R = 45.992)
Line-to Ground: 10,284 amperes (X/R = 30.258)

These values are for the current system configuration. Any system changes in the area could have a significant impact on these values. It will be an IC responsibility to make any protection upgrades required should this occur.

The cost estimate for the required FE system protection facilities is included on Attachment 3.

Metering

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

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

Compliance Issues

The proposed interconnection facilities must be designed in accordance with the FirstEnergy "Requirements for Transmission Connected Facilities" located at:

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

Interconnection Customer will also be responsible for following the requirements of the "FirstEnergy Wholesale Generation Interconnection (WGI) Manual" and the FE Approved Vendors and Contractors" documents which are also located at the above link.

Interconnection Customer will also be required to meet all PJM, ReliabilityFirst and NERC reliability criteria and operating procedures for standards compliance. For example, the Developer 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. Also, the developer will need to provide documentation that its inverters meet the requirements of UL1741 and IEEE Standard 929. 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.

FE Facility Upgrades and Costs

The results of the FE analysis shows that no planning criteria violations are attributable to the addition of the Hunterstown-Jackson 230 kV Project for the conditions studied. Therefore the conclusion is that no transmission or Subtransmission reinforcements will be required to provide the requested service.

Interconnection Customer Requirements

In addition to the FE facilities, Interconnection Customer will also be responsible for meeting all criteria as specified in the applicable sections of the "FE Requirements for Transmission Connected Facilities" document including:

1. 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.

2. A compliance with the FE and PJM generator power factor and voltage control requirements. Note that the Hunterstown-Jackson 230 kV Project may need to absorb reactive power at the point of interconnection to minimize the voltage change should the units rapidly reduce their output or trip off line.

3. The execution of a back-up service agreement to serve the customer load supplied from the Hunterstown 230 kV substation when the units are out-of-service. This assumes the intent of Interconnection Customer is to net the generation with the station load.

4. Any complaints from other customers (e.g. flicker complaints) will have to be corrected by Interconnection Customer. Correction may include changing operation, reducing generation, disconnecting the generators from the Met-Ed system, or other measures.

5. 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. The RTU, the communications channel and all related equipment will be furnished and maintained by Interconnection Customer. The RTU must communicate with the FirstEnergy EMS via DNP 3.0 protocol.

6. The following status and metering points will be required:
   a. Interconnection breaker position.
   b. Generator real and reactive power output measured at the high-side of the generator step-up transformer.
   c. Generator voltage at the point of interconnection.

7. An installation of two independent high-speed zones of protection to sense and clear faults on the interconnection transformer.

8. A compliance with the inverter standard UL1741 and IEEE 1547, "Standard for Interconnecting Distributed resources with Electrical Power Systems", in addition to the power quality standards defined by ReliabilityFirst and PJM.

9. A provision of the necessary generator protection, synchronization controls, and fault detection to initiate a trip to protect the Hunterstown-Jackson 230 kV Project equipment from faults on the Met-Ed System.

10. A compliance with the PJM Manuals and Operating instructions to have a plant operator on call 24/7 to respond within a minute to reduce the output of Hunterstown-Jackson 230 kV Project when network constraints occur.

11. Interconnection Customer will not excavate, construct facilities or locate solar panels under FE transmission facilities or on FE right-of-ways without the express permission of FE.

12. The purchase and installation of the standard voice grade (analog) telephone line and associated conduit between the telephone company source and the meter socket or enclosure.
13. Interconnection Customer will be required to obtain all permits, easement rights, and right of way necessary for all work related to the Hunterstown-Jackson 230 kV Project.

14. Interconnection Customer will be responsible for grading and providing an access road for any property necessary for the Hunterstown-Jackson 230 kV Project.

The above requirements are in addition to any metering or other requirements imposed by PJM and are applicable to both the primary choice and second choice

Note that an assumption of this study is that the Hunterstown-Jackson 230 kV Project generation will automatically be disconnected whenever the local area network is islanded. If this assumption is not correct, a direct transfer trip scheme will need to be implemented for such situations at the IC's cost.

Generation Connection Requirements

The proposed interconnection facilities must be designed in accordance with the FirstEnergy "Requirements for Transmission Connected Facilities" located at:

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

The Interconnection Customer will also be responsible for following the requirements of the "FirstEnergy Wholesale Generation Interconnection (WGI) Manual" and the "FE Approved Vendors and Contractors" documents which are also located at the above link.

Summary

The connection of the Hunterstown-Jackson 230 kV Project to the FE transmission system will require no network upgrades for the requested primary POI. Therefore Interconnection Customer will only have a cost responsibility for the Direct Connection of the Hunterstown-Jackson 230 kV Project to the Met-Ed transmission system. As shown on Attachment 3, the estimated cost of the facilities for the primary connection to the Hunterstown – Jackson (1053) 230 kV line is $9,330,800. Note that all costs given in this report include a CIAC (Contribution in Aid of Construction) Federal Income Tax Gross Up charge. This tax may or may not be charged based on whether or not this project meets the eligibility requirements of IRS Notice 88-129. The total cost without the CIAC charge is also shown on Attachment 3.

Based on the extent of the FE direct connection and system upgrades required to support this project, it is estimated that it will take two (2) years from the date of a fully executed Interconnection Construction Service Agreement to complete the upgrades required for the Hunterstown-Jackson 230 kV Project. This includes the requirement for Interconnection Customer to make a preliminary payment which funds the first three months of engineering design that is related to the construction of the Direct Connection facilities. It further assumes that Interconnection Customer will provide the property for the attachment and right-of-way facilities that will be needed. A further assumption is 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 PJM will allow all 230 kV transmission system outages when requested.

Note that the FE findings were made from a conceptual review of this project. A more detailed review of the connection facilities and their cost will be identified in the System Impact Study. Further note that the cost estimate data contained in this document should be considered as only ballpark since it was produced without a detailed engineering review. The applicant will be responsible for the actual cost of construction. FE herein reserves the right to return to any issues in this document and, upon appropriate justification, request additional monies to complete any connections to the transmission system.

Attachment 3
Hunterstown-Jackson 230 kV Feasibility Study
Direct Connection Requirements

UpgradeID	Description	Total Cost	Total with Tax
ME-T-119-1 (X3-022)	**Hunterstown-Jackson 230kV, Loop to Solar Farm Sub (X3-022).** Install a loop from the Hunterstown-Jackson 230kV line for the proposed solar farm substation. See estimate ME-T-119-2 for the 115kV work to relocate around the proposed substation.	280,100	374,100
ME-T-119-2 (X3-022)	**Hunterstown-Gardners 115kV, Relocate for Loop to Solar Farm Sub (X3-022).** Relocate a section of the Hunterstown-Gardners 115kV line for the proposed solar farm substation. See estimate ME-T-119-1 for the 230kV work to loop to the proposed substation.	238,900	319,100
ME-S-129-1 (X3-022)	**Hunterstown SS.** Upgrade relaying on the 230kV Jackson line to support the PJM X3-022 generation project.	319,800	427,100
ME-S-129-2 (X3-022)	**Jackson SS.** Upgrade relaying on the 230kV Hunterstown line to support the PJM X3-022 generation project.	261,300	349,000
ME-S-129-3 (X3-022)	**X3-022 (Swift Run Road) Interconnect SS.** Install new 230kV 3 position ring substation as interconnection for X3-022 generation project.	5,586,500	7,461,300
Fiber	**Fiber.** Approximately 1.25 miles of fiber to be installed between Hunterstown 230 kV SS and X3-022.	164,100	219,200
EOC	Engineering Oversight and Commissioning	135,500	181,000
	TOTAL	**6,986,200**	**9,330,800**

Attachment 4
Hunterstown-Jackson 230 kV Feasibility Study
FE Contingency Analysis Results

	Transmission Network Upgrades					
Identified Required Project Upgrades						
ID #	Contingency	Outage description	Overloaded Element	N/4-Hr Rating	FE Results MVA Flow	PJM Results MVA Flow
			No Constraints Identified			
Contribution to Previously Identified Overloads						
ID #	Contingency	Outage description	Overloaded Element	N/4-Hr Rating	FE Results MVA Flow	PJM Results MVA Flow
			No Constraints Identified			
Identified Potential Network Congestion Overloads						
ID #	Contingency	Outage description	Overloaded Element	N/4-Hr Rating	FE Results MVA Flow	PJM Results MVA Flow
1	PJM17	Conastone - Peachbottom 500 kV Line	Otter Creek - Conastone 230 kV	XXX/ 531	838.6	
2	PJM17	Conastone - Peachbottom 500 kV Line	Yorkana - Otter Creek 230 kV Line	XXX/ 793	807.4	
3	PJM17	Conastone - Peachbottom 500 kV Line	Safe Harbor - Graceton 230 kV Line	XXX/ 485	744.5	