955 Jefferson Ave.
Valley Forge Corporate Center
Norristown, PA 19403-2497

Via E-mail

June 15, 2012

Robert Colozza
LS Power Genco, LLC
Suite 110
400 Chesterfield Center
St. Louis, MO 63017

Dear Mr. Colozza:

Re: X4-020 – Peach Bottom-Three Mile Island #1 – Feasibility Study Report and System Impact Study Agreement

Attached is a report documenting the results of the X4-020 Feasibility Study. The intent of the Feasibility Study is to determine a plan, with preliminary cost estimates to connect the subject project to the PJM network at a location specified by the Interconnection Customer. The results of this Feasibility Study are predicated on a year 2015 transmission system based upon PJM's best assumptions at the present time for load growth and connection of proposed new generation additions. The project was evaluated for system normal conditions and single contingency outage conditions.

Feasibility Studies are performed to provide an Interconnection Customer with preliminarily estimated reinforcement costs and information concerning both direct connection facilities and potential transmission network upgrades. Since the analysis inherently has to include assumptions for future system conditions, the results should be used in this context. 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: (1) Attachment Facilities, which are new facilities and/or facilities upgrades needed to connect the project 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 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. 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.

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 Feasibility Study are being tabulated and you will receive a statement / invoice electronically from PJM identifying your balance.

Pursuant to Section 204.3 of the PJM Tariff, enclosed is a copy of a System Impact Study Agreement for your consideration. The necessary deposit and executed agreement must be in the possession of PJM within thirty days (by close of business on **July 16, 2012**) to maintain the project's position in the queue. In addition, your project's electrical data sheet must be completed and submitted electronically by the above date for the Impact Study Agreement to be considered complete. The data sheet is located here: http://www.pjm.com/planning/rtep-development/expansion-plan-process/form-impact-study-data.aspx. Failure to submit this data by the due date will result in the withdrawal of your project. Please print, sign two copies of the agreement's signature page and return both with one copy of the agreement to PJM. Required with the signed agreement, per Section 3 of the enclosed System Impact Study Agreement is a deposit of **$290,000** ($50,000 of which is non-refundable). Please send the agreement, signed signature pages and check to:

Jeannette Mittan
PJM Interconnection, LLC
Valley Forge Corporate Center
955 Jefferson Avenue
Norristown, PA 19403

If you prefer, you may provide a wire transfer instead of a check. Send it as follows:

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

Please e-mail Jeannette Mittan at mittaj@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.

If you wish to discuss the results of the study report or agreement with me, please let me know. My office telephone number is 610-666-4573 and my email address is mcgils@pjm.com.

Sincerely,

Susan L. McGill
Sr. Engineer
PJM Interconnection Projects

slm\jm DMS#693115v1
Attachments

PJM (w/attachments): Dennis Hassler – PPL
Randy Kreider – PPL
Lisa Krizenoskas – PPL
Vincent Chin – PPL

Jay Liu – PJM
File

Generation Interconnection Feasibility Study Report

For

PJM Generation Interconnection Request Queue Position X4-020

Peach Bottom – Three Mile Island #1 500kV

June 2012

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

General

LS Power Genco, LLC, the Interconnection Customer (IC), has proposed a natural gas generating facility located in York County, Pennsylvania. The installed facilities will have a total capability of 800 MW with 760 MW of this output being recognized by PJM as capacity. This means that the remaining 40 MW will be curtailable should a system reliability constraint occur.

Point of Interconnection

X4-020 will connect at one of two options. Option 1 is to connect to the PPL Electric Utilities transmission system at the 500kV line between PECO Energy's Peach Bottom substation and FirstEnergy's Three Mile Island substation. Option 2 is to connect at the FirstEnergy transmission system at the 230kV line between the Brunner Island and Yorkana substations.

Cost Summary

X4-020 will be responsible for the following costs:

Type	Cost
Attachment Facilities	$ 0
Direct Connection Facilities	$ 4,660,500
Non Direct Connection Facilities	$ 500,000
Total	**$ 5,160,500**

In addition, X4-020 will be responsible for the following network reinforcements:

Type	Cost
New System Reinforcements	$ 0
Previously Identified System Reinforcements	$ 9,410,000
Total	**$ 9,410,000**

Note: These reinforcements may be subject to cost allocations which will be confirmed during the System Impact Study phase.

These costs do not include CIAC (Contribution in Aid of Construction) Federal Income Tax Gross Up charge.

Attachment Facilities

None.

Direct Connection Cost Estimate

Queue X4-020 is responsible for design, construction and costs for all facilities associated with X4-020 shown in Attachment 1.

The IC has requested to design and construct the facilities required for interconnection. In addition, the IC has requested ownership of the generator tie line. **The switchyard will be designed to PPL EU standards and the ownership of the switchyard and associated land will be turned over to PPL EU after construction is complete.**

In order for the IC to take ownership of the generator tie lines, a circuit breaker and motor operated disconnect switch, installed and owned by the IC, must be located outside of the PPL EU switchyard fence. At the generation substation, a circuit breaker on the high side will be optional. If the IC chooses not to install this circuit breaker on the high side of the step up transformer, a low side circuit breaker must be installed.

The generator tie line does not need to be built to PPL EU technical specifications if they are owned by the IC. PaPUC siting regulations are for regulated electric utilities only and the lines will only need to be approved by the PaPUC if the IC is a regulated electric utility. If the IC is not a regulated utility, the IC will likely be required to follow local zoning ordinances. If the IC constructs the generator tie lines with the intention of turning ownership of the lines to PPL EU, consultation with the PaPUC will be required to ensure compliance with PaPUC siting regulations.

If the IC chooses to not take ownership of the generator tie lines, they must be sited and built to PPL EU standards and approved by the PaPUC. The circuit breakers and motor operated disconnect switches just outside of the new 500 kV switchyard will not be required. The point of interconnection will then occur at the dead-end structure at the generation substation. A high side breaker and motor operated disconnect will be required at the substation. Please see Attachment 2.

The total estimated cost of Direct Connection Facilities needed to connect X4-020 to the new switchyard on the Three Mile Island-Peach Bottom 500 kV line is **$4,660,500 (substation cost + transmission cost)** (excluding any applicable state or federal taxes. The 500 kV connection estimate is based on the assumptions stated in the following Transmission and Substation Direct Connection Work sections. This estimate will vary depending upon the Queue X4-020 switchyard location and orientation. Network impacts and associated upgrade requirements are addressed at the end of the report.

The transmission and substation costs given above exclude any applicable state or federal taxes. If at a future date Federal CIAC taxes are deemed necessary by the IRS for this project, both PJM and PPL EU shall be reimbursed by the Interconnection Customer for such taxes.

The total preliminary cost estimate for Direct Connection work is given in the table below:

Description	Total Cost
New 500 kV switchyard work (includes engineering review, testing and commissioning)	$ 1,105,000
Installation of 12 miles of OPGW between the new switchyard and TMI	$ 1,560,000
TMI-Peach Bottom 500 kV line retermination to accommodate X4-020	$ 1,950,000
Siting/ROW for connecting into the Three Mile Island-Peach Bottom 500 kV line	$ 45,500
Total Direct Connection	**$ 4,660,500**

Note: Before the Impact Study stage, the exact location of the Interconnection Switchyard must be identified by the X4-020 IC in order to refine the cost estimate.

After the PJM three-party Interconnection Service Agreement (ISA) and Construction Service Agreement (CSA) are signed and PPL EU receives written authorization by PJM to begin work, PPL EU will commence the transmission line siting, engineering design, material purchase and construction of the 500 kV transmission line retermination into the new switchyard described above. The estimate above assumes that X4-020 will do all the siting work and provide all the necessary right-of-way for the new 500 kV switchyard. The time required for siting and right-of-way acquisition for the transmission line work is estimated to be 6-9 months assuming X4-020 is the only landowner involved and is willing to provide the necessary right-of-way. This work could take longer than expected if X4-020 is not the only landowner involved or if unforeseen complications arise.

The typical time needed to complete the transmission design and construction work is estimated to be approximately 15-18 months. All right-of-way will need to be acquired prior to the start of construction. The scope, schedule and cost of the substation work at Three Mile Island and Peach Bottom will be determined by FirstEnergy and PECO.

500 kV Transmission Tap Direct Connection Work

$ 1,950,000 TMI-Peach Bottom 500 kV line retermination to accommodate X4-020

The transmission direct connection work includes breaking the Three Mile Island-Peach Bottom 500 kV line and reterminating it into a new 500 kV switchyard. The lead time required for the transmission line direct connection work is approximately **15 to 18 months** (6-9 months for the siting/right-of-way work and 15-18 months for the transmission engineering/construction work, where both can be done concurrently). This estimate assumes that suitable line outages can be scheduled as required to terminate the new tap onto the existing transmission lines. Failure to meet a scheduled line outage may result in project delays. All right-of-way must be acquired prior to construction of the new transmission line.

OPGW Installation

$ 1,560,000 Installation of 12 miles of OPGW between the new switchyard and Three Mile Island

To accommodate X4-020, protection equipment and settings changes will be required at Three Mile Island and Peach Bottom Substations. FirstEnergy and PECO will be providing estimates for the cost of the work at the terminal ends of the line. It is assumed that fiber OPGW will be used to communicate between Three Mile Island Substation and the new switchyard and that Power Line Carrier (PLC) will be used to communicate between the new switchyard and Peach Bottom Substation. The scope of the work for PPL EU is to install 12 miles of OPGW between the new switchyard and Three Mile Island substation on PPL EU-owned transmission facilities. FirstEnergy will be required to install OPGW on their portion of the line from Three Mile Island to the new switchyard.

PPL EU intends to have all major substation facilities connected to its fiber optic system. A splice point will be necessary to tie the new 500 kV switchyard to PPL EU's fiber optic system. The estimate assumes that the new OPGW between the new switchyard and Three Mile Island will intersect with existing PPL EU fiber. The fiber path will need to be evaluated if this project proceeds to the Impact Study.

Siting, Right-of-Way Acquisition and Environmental Impact

$ 45,500 Siting/ROW for connecting into the Three Mile Island-Peach Bottom 500 kV line

PPL EU is assuming that sufficient right-of-way will be provided by the developer to PPL EU for the retermination of the Three Mile Island- Peach Bottom 500 kV line into the new X4-020 500 kV switchyard. A 200 ft right-of-way width is PPL EU's standard for 500 kV line construction.

The estimate cost of the siting work is **$45,500** and is included in the above estimate. It includes the cost of filing a Letter-of-Notification with the PUC for breaking in to the Three Mile Island-Peach Bottom 500 kV line and reterminating it into the new 500 kV switchyard. No condemnation costs are included. Costs for threatened and endangered species studies or environmental constraints are also not included. The estimated cost of the 500 kV switchyard siting work is **not included** in this study.

500 kV Substation Direct Connection Work

$ 1,105,000 New 500 kV switchyard work (includes engineering review, testing and commissioning)

The X4-020 developer has requested the option to build (i.e. to engineer and construct) the new 500 kV switchyard that will interconnect the Three Mile Island, Peach Bottom and X4-020 substations. **After the new switchyard is completed by X4-020, the switchyard and land ownership will be turned over to PPL EU.** The new switchyard will be located adjacent to the Three Mile Island-Peach Bottom 500 kV line. The switchyard footprint is expected to have a 1000 foot by 1000 foot fenced in area with additional space for drainage and grading. Approximately 30-50 acres will be required depending on the orientation of the new switchyard.

The land should encompass the 500 kV line and PPL EU will require a 400 foot wide right-of-way on each side of the switchyard to allow for future 500 kV lines to terminate in the new yard. The switchyard must also meet all applicable PPL EU, NERC and FERC requirements.

PPL EU will perform engineering review and commissioning of the new 500 kV switchyard and install the necessary DME. Detailed lists of equipment and requirements will be provided during the Facilities Study.

To comply with the PRC-002-RFC-01 standard, PPL EU will install Disturbance Monitoring Equipment (DME) including a Digital Fault Recorder (DFR), a sequence of events recorder (AMS) and, if needed, a digital swing recorder (DDR) at the new 500 kV switchyard. The estimated cost given above is only for the PPL EU portion of the work. Please see the FirstEnergy and PECO sections for the costs associated with the work at Three Mile Island and at Peach Bottom Substations.

Transmission Owner Assumptions in Developing the Cost Estimates

- This magnitude estimate has been prepared without extensive research and field review.
- The estimate is based on the assumption that LS Power Genco LLC will provide the required land for the new 500 kV switchyard and the required right-of-way to reterminate the Three Mile Island-Peach Bottom 500 kV line into the new 500 kV switchyard.
- After the 500 kV switchyard is constructed, the switchyard and the land on which the switchyard is placed will be turned over to PPL EU.
- No environmental, real estate, or permitting issues were reviewed for the estimate of this project.

Non-Direct Connection Cost Estimate

The protection systems at the remote ends of the 500kV line will be modified to support this interconnection. MetEd (FirstEnergy) has supplied estimates for the work at Three Mile Island and PECO has supplied estimates for the work at Peach Bottom. The total preliminary cost estimate for Non-Direct Connection work is given in the following tables below:

Description	Total Cost
FirstEnergy: Upgrade line relaying on the at the Three Mile Island terminal of the 500kV line.	$ 250,000
PECO Energy: Upgrade line relaying on the at the Peach Bottom terminal of the 500kV line.	$ 250,000
Total Non Direct Connection	**$** 500,000

Revenue Metering and SCADA Requirements

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 Sections 24.1 and 24.2.

PPL EU Requirements

Revenue Metering Equipment Installation at the Point of Interconnection

Installation of revenue grade Bidirectional Metering Equipment will be required at the Queue X4-020 Point of Interconnection (POI) to measure KWh and KVARh. PPL EU will review the design of the high voltage metering equipment. PPL EU will supply the required metering equipment but the installation would be borne by the developer including CT/PTs. All metering equipment must meet applicable PPL EU tariff requirements as well as being compliant with all applicable requirements of the PJM agreements. The revenue meters should be housed in a control cabinet or similar enclosure (per PPL EU specification) and must be accessible to PPL EU metering personnel.

SCADA Requirements

PPL EU will require the installation of PPL EU approved SCADA equipment that will connect to its existing SCADA system. PPL EU will provide detailed specifications and design drawings for this equipment.

Interconnection Customer Facility Requirements

Telephone Circuit Requirements

PPL EU will require a communication path for SCADA and voice circuits. PPL EU anticipates that telephone circuits will be required to establish these paths. The Interconnection Customer will be responsible to procure the following:

a) A 4-wire dedicated FDDA-type phone line for SCADA.
b) A normal dialup telephone line for voice communication.

Phone lines tend to be long lead-time items and must be in place and operational for equipment testing. The Interconnection Customer should investigate with the local phone company the possibility of obtaining this type of service at their facility.

All installation, maintenance, and monthly lease or billing charges for communications facilities are the responsibility of the Interconnection Customer.

Protection Equipment

The Interconnection Customer will need to install suitable protection and control equipment. The new 500 kV switchyard protection must meet all applicable PPL EU, NERC and FERC

requirements. The protection must be suitable for the proposed system and the surrounding or connected lines. This relaying is done on a case by case basis. The protection equipment and schemes will be identified during the Facilities Study.

X4-020 Generator Harmonic and Flicker Requirements

On the PPL EU 500 kV system, the total harmonic distortion to the fundamental voltage wave from a single customer is limited to 1.0% of nominal. In addition, no individual harmonic component can exceed 0.7% of the fundamental system voltage.

If PPL EU discovers that objectionable harmonics in excess of the stated limits are being injected into the system from X4-020's equipment, the Queue X4-020 Interconnection Customer will be responsible for taking corrective measures to mitigate harmonic currents.

Concerning voltage flicker, the X4-020 Project must limit the severity of their voltage variation to within a level which will not cause objectionable flickers to other customers. A voltage drop greater than 5% at the point of interconnection is generally not acceptable. The frequency and severity of the voltage variation will be considered when determining whether a customer's equipment is violating PPL EU flicker guidelines. PPL EU uses the General Electric flicker-irritation curves as a guideline to determine if the system is operating within acceptable limits. **PPL EU will require corrective actions by the X4-020 customer if their operation causes flickers that exceed PPL EU guidelines.** One such correction could be the installation of static var compensators (SVC) to hold a constant voltage.

X4-020 Generator and GSU Modeling for the New 500 kV Switchyard Connection

Per the X4-020 supplied data, the following was used in modeling the generators and GSUs.

Generator 1 & 2:
MVA Base: 240 MVA
Power Factor: 0.85
Saturated sub-transient reactance: 0.1487 pu

Generator 3:
MVA Base: 411 MVA
Power Factor: 0.85
Saturated sub-transient reactance: 0.125 pu

Generators 1& 2 GSU:
MVA Base: 150 MVA
MVA Rating: 150/200/250 MVA
Voltage Levels:18-500 kV
Positive Sequence Impedance: R – 999 jX – 10

Generator 3 GSU:
MVA Base: 270
MVA Rating: 270/360/250 MVA

Voltage Levels: 22-500 kV
Positive Sequence Impedance: R – 999 jX – 10

Network Impacts

The Queue Project #X4-020 was studied as a(n) 800.0MW(Capacity760.0MW) injection in to the PPL area. Project #X4-020 was evaluated for compliance with reliability criteria for summer peak conditions in 2015. Potential network impacts were as follows:

Option1: Peachbottom-ThreeMile 500kV

Generator Deliverability

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

None

Multiple Facility Contingency

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

None

Short Circuit

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

None.

Contribution to Previously Identified Overloads

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

1. The ROCKSPGS-KEENEY 500 kV line (from bus 200051 to bus 200010 ckt 1) loads from 107.76% to 109.42% (DC power flow) of its rating (3014 MVA) for the single line contingency ('PJM40'). This project contributes approximately 65.46 MW to the thermal violation.

```
CONTINGENCY 'PJM40'
  DISCONNECT BRANCH FROM BUS 200013 TO BUS 200024 CKT 1
     /* PEACHBTM LIMERICK 500 500
  END
```

2. The PEACHBTM-LIMERICK 500 kV line (from bus 200013 to bus 200024 ckt 1) loads from 120.75% to 122.8% (DC power flow) of its rating (2598 MVA) for the single line contingency ('PJM27'). This project contributes approximately 56.69 MW to the thermal violation.

```
CONTINGENCY 'PJM27'
  OPEN LINE FROM BUS 200010 TO BUS 200051 CIRCUIT 1
     /* KEENEY EHV - A29 COLL 500
  END
```

Steady-State Voltage Requirements

(Results of the steady-state voltage studies should be inserted here)

To be determined

Stability and Reactive Power Requirement

(Results of the dynamic studies should be inserted here)

To be determined.

New System Reinforcements

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

None.

Contribution to Previously Identified System Reinforcements

(Overloads initially caused by prior Queue positions with additional contribution to overloading by this project. This project may have a % allocation cost responsibility which will be calculated and reported for the Impact Study)

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

Please see Attachment 3 for a table summarizing all Contributions to Previously Identified System Reinforcements.

Delivery of Energy Portion of Interconnection Request

PJM also studied the delivery of the energy portion of this interconnection request. Any problems identified below are likely to result in operational restrictions to the project under study. The developer can proceed with network upgrades to eliminate the operational restriction at their discretion by submitting a Merchant Transmission Interconnection request.

Only the most severely overloaded conditions are listed. There is no guarantee of full delivery of energy for this project by fixing only the conditions listed in this section. With a Transmission Interconnection Request, a subsequent analysis will be performed, which will study all overload conditions associated with the overloaded element(s) identified.

None.

Option2: BrunnerIsland-Yorkana 230kV:

Generator Deliverability

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

1. The X1-013 TAP-NORTHKILL 230 kV line (from bus 907090 to bus 204875 ckt 1) loads from 94.78% to 102.64% (DC power flow) of its rating (554 MVA) for the single line contingency ('B_ME230-SX-#11_X1_013_B'). This project contributes approximately 43.56 MW to the thermal violation.

```
CONTINGENCY 'B_ME230-SX-#11_X1_013_B'
     /* IRONWOOD TAP - N.HERSHEY,N.TEMPLE & IRONWOOD 230 KV
  DISCONNECT BRANCH FROM BUS 907100 TO BUS 204508 CKT 1
  END
```

2. The X4-020 TAP-BRIS 230 kV line (from bus 912170 to bus 207922 ckt 1) loads from 0.08% to 123.1% (DC power flow) of its rating (617 MVA) for the single line contingency ('B_ME230-SX-#44_X4-020A'). This project contributes approximately 760 MW to the thermal violation.

```
CONTINGENCY 'B_ME230-SX-#44_X4-020A'
     /* YORKANA-BRUNNER 230 KV & YORKANA 1A,1B BANKS
  DISCONNECT BRANCH FROM BUS 204515 TO BUS 912170 CKT 1
  DISCONNECT BRANCH FROM BUS 204515 TO BUS 204570 CKT 1
  END
```

3. The X4-020 TAP-BRIS 230 kV line (from bus 912170 to bus 207922 ckt 1) loads from 0.08% to 123.1% (DC power flow) of its rating (617 MVA) for the single line contingency ('PL100611_X4-020B'). This project contributes approximately 760 MW to the thermal violation.

```
CONTINGENCY 'PL100611_X4-020B'
     /*BRUNNER-YORKANNA 230 LINE OUT
  DISCONNECT BRANCH FROM BUS 912170 TO BUS 204515 CKT 1
  END
```

4. The X4-020 TAP-YORKANA 230 kV line (from bus 912170 to bus 204515 ckt 1) loads from 88.52% to 138.07% (DC power flow) of its normal rating (617 MVA) for the single line contingency ('B_ME230-SX-#12'). This project contributes approximately 305.73 MW to the thermal violation.

```
CONTINGENCY 'B_ME230-SX-#12'
     /* JACKSON - THREE MILE ISLAND 230 KV
  DISCONNECT BRANCH FROM BUS 204502 TO BUS 204514 CKT 1
  END
```

5. The X4-020 TAP-YORKANA 230 kV line (from bus 912170 to bus 204515 ckt 1) loads from 85.32% to 149.63% (DC power flow) of its normal rating (488 MVA) for non-contingency condition. This project contributes approximately 313.79 MW to the thermal violation.

Multiple Facility Contingency

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

None.

Short Circuit

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

PJM identified 3 new circuit breakers to be over-duty in the MetEd area:

Bus No.	Bus	Breaker	Rating Type	Duty Percent With X4-020	Duty Percent Without X4-020	Duty Percent Difference
207922	Brunner Island 230kV	TRANS NO 30	S	104.20%	96.50%	7.70%
207922	Brunner Island 230kV	WEST SHORE E	S	102.50%	94.50%	8.00%
207922	Brunner Island 230kV	WEST SHORE F	S	102.50%	94.50%	8.00%
13	Peach Bottom 500kV	225	S	106.30%	103.00%	3.30%

Contribution to Previously Identified Overloads

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

1. The ST PETRS-MOSELEM 69 kV line (from bus 204858 to bus 204846 ckt 1) loads from 101.12% to 102.58% (DC power flow) of its rating (86 MVA) for the tower line contingency ('C5_ME230-DCT-#3'). This project contributes approximately 7.78 MW to the thermal violation.

```
CONTINGENCY 'C5_ME230-DCT-#3'
     /* N.TEMPLE-LYONS & N.TEMPLE-HOSENSACK 230 KV
  DISCONNECT BRANCH FROM BUS 204508 TO BUS 204503 CKT 1
  DISCONNECT BRANCH FROM BUS 204508 TO BUS 207983 CKT 1
  DISCONNECT BRANCH FROM BUS 204508 TO BUS 204607 CKT 4
  END
```

2. The MOSELEM-LYONS 69 kV line (from bus 204846 to bus 204605 ckt 1) loads from 101.65% to 103.61% (DC power flow) of its rating (64 MVA) for the tower line contingency ('C5_ME230-DCT-#3'). This project contributes approximately 7.78 MW to the thermal violation.

```
CONTINGENCY 'C5_ME230-DCT-#3'
     /* N.TEMPLE-LYONS & N.TEMPLE-HOSENSACK 230 KV
  DISCONNECT BRANCH FROM BUS 204508 TO BUS 204503 CKT 1
  DISCONNECT BRANCH FROM BUS 204508 TO BUS 207983 CKT 1
  DISCONNECT BRANCH FROM BUS 204508 TO BUS 204607 CKT 4
  END
```

3. The N.TEMPLE-LYONS 230 kV line (from bus 204508 to bus 204503 ckt 1) loads from 109% to 114.03% (DC power flow) of its rating (805 MVA) for the single line contingency ('B_ME230-SX-#4'). This project contributes approximately 40.45 MW to the thermal violation.

```
CONTINGENCY 'B_ME230-SX-#4'
     /* HOSENSACK-NORTH TEMPLE & NORTH TEMPLE BANK 6
  DISCONNECT BRANCH FROM BUS 207983 TO BUS 204508 CKT 1
  DISCONNECT BRANCH FROM BUS 204508 TO BUS 204607 CKT 4
  END
```

4. The N.TEMPLE-HOSE 230 kV line (from bus 204508 to bus 207983 ckt 1) loads from 136.66% to 137.74% (DC power flow) of its normal rating (623 MVA) for the single line contingency ('B_ME230-SX-#16'). This project contributes approximately 41.78 MW to the thermal violation.

```
CONTINGENCY 'B_ME230-SX-#16'
     /* LYONS - NORTH TEMPLE 230 KV
  DISCONNECT BRANCH FROM BUS 204508 TO BUS 204503 CKT 1
  END
```

Steady-State Voltage Requirements

(Results of the steady-state voltage studies should be inserted here)

To be determined

Stability and Reactive Power Requirement

(Results of the dynamic studies should be inserted here)

To be determined.

New System Reinforcements

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

Not applicable.

Contribution to Previously Identified System Reinforcements

(Overloads initially caused by prior Queue positions with additional contribution to overloading by this project. This project may have a % allocation cost responsibility which will be calculated and reported for the Impact Study)

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

Not applicable.

Delivery of Energy Portion of Interconnection Request

PJM also studied the delivery of the energy portion of this interconnection request. Any problems identified below are likely to result in operational restrictions to the project under study. The developer can proceed with network upgrades to eliminate the operational restriction at their discretion by submitting a Merchant Transmission Interconnection request.

Only the most severely overloaded conditions are listed. There is no guarantee of full delivery of energy for this project by fixing only the conditions listed in this section. With a Transmission Interconnection Request, a subsequent analysis will be performed, which will study all overload conditions associated with the overloaded element(s) identified.

1. The X4-020 TAP-BRIS 230 kV line (from bus 912170 to bus 207922 ckt 1) loads from 0.08% to 129.58% (DC power flow) of its rating (617 MVA) for the single line contingency ('PL100611_X4-020B'). This project contributes approximately 800 MW to the thermal violation.

```
CONTINGENCY 'PL100611_X4-020B'
     /*BRUNNER-YORKANNA 230 LINE OUT
  DISCONNECT BRANCH FROM BUS 912170 TO BUS 204515 CKT 1
  END
```

2. The X4-020 TAP-BRIS 230 kV line (from bus 912170 to bus 207922 ckt 1) loads from 0.08% to 129.58% (DC power flow) of its rating (617 MVA) for the single line contingency ('B_ME230-SX-#44_X4-020A'). This project contributes approximately 800 MW to the thermal violation.

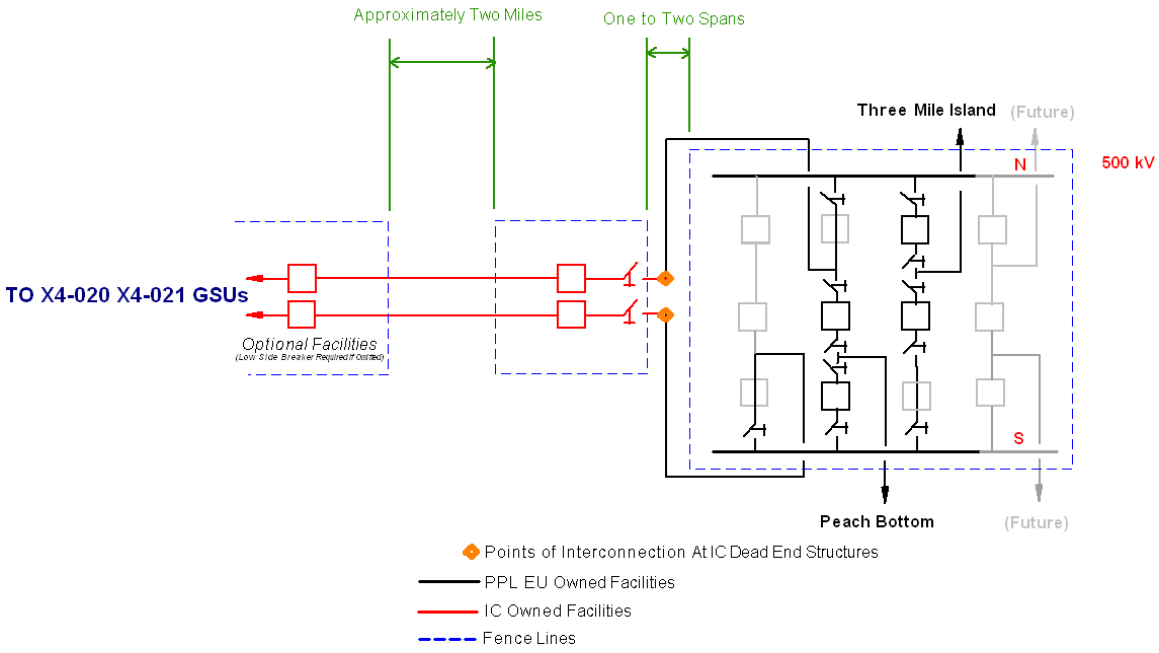
```
CONTINGENCY 'B_ME230-SX-#44_X4-020A'
     /* YORKANA-BRUNNER 230 KV & YORKANA 1A,1B BANKS
  DISCONNECT BRANCH FROM BUS 204515 TO BUS 912170 CKT 1
  DISCONNECT BRANCH FROM BUS 204515 TO BUS 204570 CKT 1
  END
```

3. The X4-020 TAP-YORKANA 230 kV line (from bus 912170 to bus 204515 ckt 1) loads from 62.65% to 130.25% (DC power flow) of its normal rating (488 MVA) for non-contingency condition. This project contributes approximately 330.3 MW to the thermal violation.

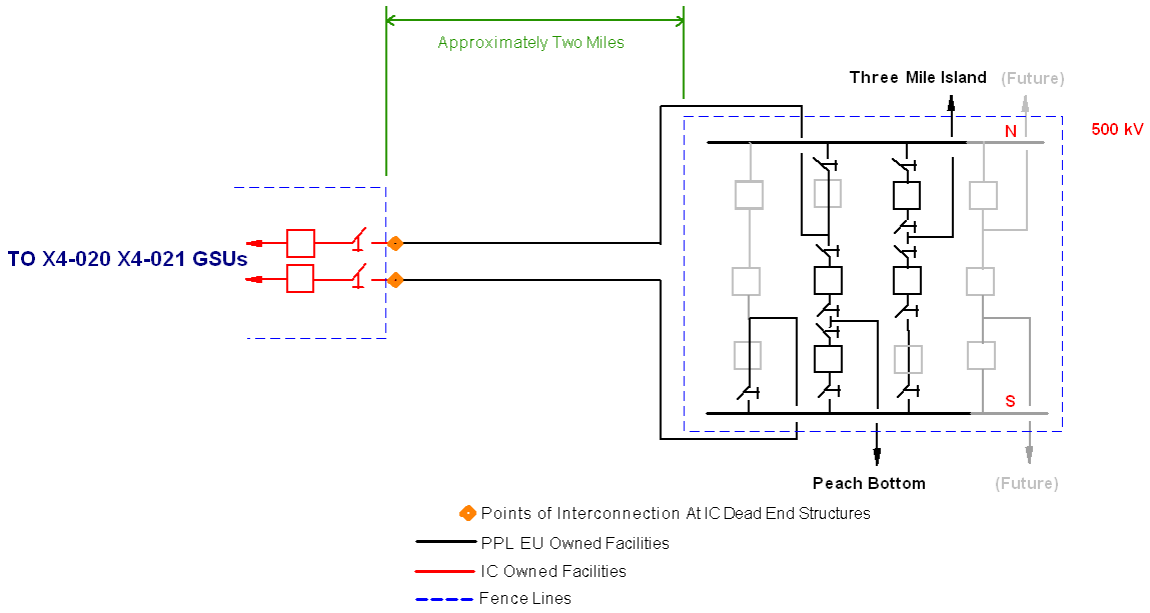
4. The N.TEMPLE-HOSE 230 kV line (from bus 204508 to bus 207983 ckt 1) loads from 139.27% to 140.41% (DC power flow) of its normal rating (623 MVA) for the single line contingency ('B_ME230-SX-#16'). This project contributes approximately 43.98 MW to the thermal violation.

```
CONTINGENCY 'B_ME230-SX-#16'
     /* LYONS - NORTH TEMPLE 230 KV
  DISCONNECT BRANCH FROM BUS 204508 TO BUS 204503 CKT 1
  END
```

Attachment 1. System Configuration – IC owned Tie Lines



Attachment 2. System Configuration – TO owned Tie Lines



Attachment 3. Contributions to Previously Identified Reinforcements

Transmission Line Upgrades

Violation #	Overloaded Facility	Upgrade Description	Network Upgrade Number	Upgrade Cost
1	Rock Springs – Keeney 500kV Line	Keeney substation: Replace line traps on the 5014 and 5025 lines and replace 500kV circuit breakers.	Pending	$ 2,160,000
2	Peach Bottom – Limerick 500kV Line	Limerick and Peach Bottom substations: Replace terminal equipment at each end. This work is expected to take 2 years to complete.	Pending	$ 7,250,000
			Total New Transmission Line Upgrades	**$ 9,410,000**

Circuit Breaker Upgrades

None