Generation Interconnection Request
V1-013 (revised)
Springdale 138kV

General

The Interconnection Customer (IC) has proposed a change to their existing Point of Interconnection for their 580 MW energy (580 MW capacity) coal fired Cheswick Power Station located in Springdale, Pennsylvania. The project was studied as a 580 MW injection into the Allegheny Power Springdale 138kV substation and evaluated for compliance with reliability criteria for summer peak conditions in 2013. The in-service date, as identified in the Generation Interconnection Feasibility Study Agreement, is January 1, 2012.

Point of Interconnection

V1-013 proposes to change its existing Point of Interconnection from the Cheswick 138kV substation in the Duquesne Light (DLCO) zone to the Allegheny Power (APS) system at the Springdale 138kV.

Direct Connection Requirements

Transmission Owner Scope of Direct Connection Work

The Transmission Owners' (APS and DLCO) scope of work for the direct connection facility includes:

Attachment Facilities

- Springdale Substation (APS)

  Expand the existing fence and yard for the addition of a 138kV box bay structure. Note: All property and right-of-way must be acquired by the Developer and transferred to Allegheny Power in the form of a permanent lease or direct ownership.

  Extend the 138kV bus. Install two (2) 2000A 138kV 80kA breakers, four (4) 2000A 138kV breaker disconnect switches, two (2) sets of 138kV metering, two (2) 138kV line traps, two (2) 138kV CVTs, control cables, panels, grounding, foundations, structures, and associated equipment. Cost for a site development consultant is included. Engineering time for the evaluation of the ground grid is included. There may be additional costs if the existing ground grid requires reinforcement. Note: Actual soil conditions and subsurface obstructions may increase the cost of site work significantly. These issues will be further investigated during the System Impact Study and facilities Study. Assume connection to developer's 138kV line. Assume property to be acquired from developer at no cost to AP.

  The estimated cost to perform this work is **$3,716,700** in 2011 dollars.

- Cheswick Substation (DLCO)

  The IC proposed eliminating the bus ties between the east and west yards. The No. 2 138kV bus in the east yard is connected to both the No. 3 and No.4 138kV bus in the west yard through breakers 90 and 180 respectively. The No. 1 138kV bus in the east yard is connected to the No. 3 138kV bus in the west yard though breaker 80.

  The estimated cost of removing the identified bus tie sections is **$100,778** in 2009 dollars. See Attachment 2 for substation and line arrangement.

- Cheswick-Pine Creek (Z-61) & Cheswick-North (Z-66) (DLCO)

  The Cheswick-Pine Creek (Z-61) 138kV circuit must be relocated from breaker 95, on the No. 1 138kV bus in the east yard, to the existing double breaker positions 90 and 180 in the west yard. Breaker 90 will be re-numbered breaker 84 and breaker 180 will be numbered breaker 85.

  The Cheswick-North w/ California tap (Z-66) 138kV circuit must be relocated from breaker 94, on the No. 2 138kV bus in the east yard, to the existing breaker 80 on the No. 3 138kV bus in the west yard. Breaker 80 will be re-numbered breaker 186.

  The estimated cost to perform these relocations is **$561,010** in 2009 dollars**.**

- Cheswick 138kV Capacitors (DLCO)

  The 138kV capacitors on the No. 2 138kV bus in the Cheswick east yard must be relocated. The new location will be determined during the System Impact Study phase of V1-013.
  The estimated cost to perform this relocation work is **$1,343,250** in 2009 dollars.

Interconnection Customer Scope of Direct Connection Work

The IC has assumed full responsibility for the design and construction of all facilities associated with the V1-013 generating facility and the 138kV direct connection line on the IC side of the Point of Interconnection (POI). The IC will interconnect V1-013 with the AP transmission system by constructing a customer-owned 138kV line from the generating facility to AP's Springdale 138kV substation, a distance of approximately 1.5 miles. Route selection, line design, right-of-way acquisition and construction of such lines will be entirely the responsibility of the IC. Cost estimates do not include construction of that line. It is assumed that the ICs step up transformer will conform to the AP standard of delta on the low side and grounded wye on the high side as illustrated in the AP Facility Connection Manual.

The IC will be required to install metering and telemetry equipment to provide revenue metering and real-time telemetry data to PJM. The requirements for this equipment are listed in Appendix 2, Section 8 of Attachment O to the PJM Tariff, as well as PJM Manuals 01 and 14D. Protective relaying and metering design and installation must comply with the Allegheny Power Applicable Standards. It is assumed that a fiber optic interface will be used for the protection channel between

the AP and Developer's substations.

Cost and Timing Summary

While the information in this transmittal is reasonable for the scope of work defined, it should be noted that the cost figures are conceptual in nature at this stage and that an engineering team has not yet been assigned to the project. Obviously, any change to the scope of work will require that the estimates be revisited. The costs are a best estimate, but the developer will be charged for actual costs. Any under-runs or over-runs will be reconciled at the conclusion of the project.

The cost estimates in this report do not include tax gross-up, land acquisition, or any network upgrades which may have been identified and required by this project.

The estimated time to provide for the Allegheny Power portion of the interconnection (Attachment Facilities) for this project is **24 months** after the receipt of a signed Interconnection Service Agreement and Construction Service Agreement and no delays in permitting.

The estimated time to provide for the Duquesne Light portion of the interconnection (Attachment Facilities) for this project is **9 months** after the receipt of a signed Interconnection Service Agreement and Construction Service Agreement and no delays in permitting.

The duration for each Allegheny Power network reinforcement identified below is approximately 24 months per individual line segment. A December 2011 in-service date for all reinforcements is not possible as all segments cannot be constructed simultaneously. The estimated total project duration is **36 months** after the receipt of an executed Interconnection Service Agreement and Construction Service Agreement.

Network Impacts

Potential network impacts are as follows:

Generator Deliverability

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

1. The 01SPGDL - 01PITTML 138 kV (APS) line (from bus 20256 to bus 20603 ckt 1) loads from 56.34% to 109.14% (DC power flow) of its normal rating (185 MVA) for non-contingency condition. This project contributes approximately 97.68 MW to cause the thermal violation.

2. The 01SPGDL - 01SHFCRN 138 kV (APS) line (from bus 20256 to bus 20245 ckt 1) loads from 81.21% to 124.19% (DC power flow) of its normal rating (297 MVA) for the single line contingency ('APS-SB-145'). This project contributes approximately 127.65 MW to cause the thermal violation.

3. The 01SHFCRN - 01AL 2J 138 kV (APS) line (from bus 20245 to bus 20137 ckt 1) loads from 72.37% to 115.35% (DC power flow) of its normal rating (297 MVA) for the single line contingency ('APS-SB-145'). This project contributes approximately 127.65 MW to cause the

thermal violation.

4. The 15CARSNT – 15CARSON 138 kV (DLCO) line (from bus 27694 to bus 27655) loads from 43.3% to 104.6% (DC power flow) of its normal rating (297 MVA) for the single line contingency for the single line outage (Forbes – Oakland 138kV). This project contributes approximately 154.5MW to cause the thermal violation.

Multiple Facility Contingency

*(Double Circuit Tower Line, Line with Failed Breaker, and Bus Fault contingencies for the **Full** energy output.*

5. The 01SPGDL - 01PITTML 138 kV (APS) line (from bus 20256 to bus 20603 ckt 1) loads from 84.04% to 148.52% (DC power flow) of its emergency rating (227 MVA) for the tower line contingency ('54'). This project contributes approximately 146.37 MW to cause the thermal violation.

6. The 01AL&D6T - 01KITTAN 138 kV (APS) line (from bus 20139 to bus 20204 ckt 1) loads from 45.72% to 111.86% (DC power flow) of its emergency rating (116 MVA) for the tower line contingency ('52'). This project contributes approximately 76.72 MW to cause the thermal violation.

7. The 01PITTML - 01GOBAIN 138 kV (APS) line (from bus 20603 to bus 20185 ckt 1) loads from 58.13% to 107.41% (DC power flow) of its emergency rating (297 MVA) for the tower line contingency ('54'). This project contributes approximately 146.37 MW to cause the thermal violation.

8. The 01AL 4J - 01AL&D6T 138 kV (APS) line (from bus 20138 to bus 20139 ckt 1) loads from 40.8% to 106.96% (DC power flow) of its emergency rating (116 MVA) for the tower line contingency ('52'). This project contributes approximately 76.74 MW to cause the thermal violation.

9. The 15B.I – 15FORBES 138 kV (APS-DLCO) line (from bus 27627 to bus 254065 ckt 1) loads from 87.0% to 120% (DC power flow) of its emergency rating (375 MVA) for the tower line contingency ('TWR_40'). This project contributes approximately 123.75 MW to cause the thermal violation.

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 01SPGDL - 01AL 4J 138 kV (APS) line (from bus 20256 to bus 20138 ckt 1) loads from 121% to 153% (DC power flow) of its emergency rating (240 MVA) for the tower line contingency ('3_1'). This project contributes approximately 70.66 MW to cause the thermal

violation.

Short Circuit

The following breakers have been identified as being over their maximum interrupting rating:

BUS NO.	BUS	BREAKER	RATING TYPE	2009 Rating	A-symmetrical without V1-013	A-symmetrical with V1-013	New Rating
20831	SPRINGDA 138.kV	AES 1&2,138P	S	63 kA-S	53724.3	70751.8	80 kA-S
20831	SPRINGDA 138.kV	AES 5, 138T	S	63 kA-S	52252.5	67889.8	80 kA-S
20831	SPRINGDA 138.kV	FEDST,138E	S	63 kA-S	55471.5	72816.1	80 kA-S
20831	SPRINGDA 138.kV	HARWICK,138U	S	63 kA-S	53260.3	71233	80 kA-S
20831	SPRINGDA 138.kV	HUNTING,138G	S	63 kA-S	53718.5	71621.1	80 kA-S
20831	SPRINGDA 138.kV	KISKIVLY138D	S	63 kA-S	53322.5	70991.1	80 kA-S
20831	SPRINGDA 138.kV	KITTANG,138C	S	63 kA-S	54410.8	72112	80 kA-S
20831	SPRINGDA 138.kV	Pitts M,138V	S	63 kA-S	53640.5	71523.8	80 kA-S
20831	SPRINGDA 138.kV	WHITVLY,138F	S	63 kA-S	53771	71451.3	80 kA-S
20831	SPRINGDA 138.kV	YUKON, 138R	S	63 kA-S	53362.3	71325.6	80 kA-S
20831	SPRINGDA 138.kV	1-2BUS,138K	S	63 kA-S	41939.6	59256.5	63 kA-S
20831	SPRINGDA 138.kV	AE - 5	S	63 kA-S	55565	73098.1	80 kA-S
20831	SPRINGDA 138.kV	CHESWICK138H	S	63 kA-S	35665.8	54995.8	63 kA-S
20831	SPRINGDA 138.kV	AES 3, 138Q	S	63 kA-S	52266.8	67928.6	80 kA-S
20831	SPRINGDA 138.kV	AES 4, 138S	S	63 kA-S	52269.2	67935	80 kA-S

The estimated cost to upgrade the fifteen (15) 138kV Springdale breakers to an 80 kA-S rating is **$4,956,300** in 2010 dollars. This cost estimate does not include AFUDC. The estimated project duration is **24 months** after the receipt of an executed Interconnection Service Agreement and Construction Service Agreement.

Note: Additional study is required at Springdale substation to determine if additional work will be required to upgrade the ground grid and bus support structures in order to accommodate the 80kA

breakers. If it is determined that substation expansion, bus support upgrade, and/or ground grid upgrade is required, a complete rebuild and/or expansion of the existing Springdale 138kV buses, terminals, and yard may be required and costs may increase significantly. This analysis is ongoing and will be included as part of the System Impact and Facilities Studies.

Allegheny Power reserves the right to review the electrical protection design and relay settings for interconnecting customer facilities to ensure that the protective relaying equipment will be compatible with that installed at the new switching station. The relaying package will likely include both primary and backup protection. Allegheny Power personnel must be present at the time of commissioning to witness proper function of the protection scheme and related coordination. The estimated cost to perform this engineering review and field test effort is **$5,000** in 2009 dollars.

Note: The purchase and installation of protective relaying and associated equipment at the generation site is the responsibility of the interconnecting customer and is not included in this scope of work.

Stability and Reactive Power Requirements

Will be performed during the Queue V1-013 System Impact Study.

New System Reinforcements

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

1. See Item #5 below for reinforcement.

2. To mitigate the 01SPGDL - 01SHFCRN 138 kV (APS) line overload will require; 1) the reconductor of 4.93 miles of circuit between Springdale and Shaffers Corner with high temperature conductor and; 2) the upgrade of the bus tie and Springdale line air switch at Shaffers Corner; 3) upgrade the line trap, relay circuitry, and RTU at Springdale. The estimated cost to perform this work is **$2,020,350**.

3. To mitigate the 01SHFCRN - 01AL 2J 138 kV (APS) line overload will require the reconductor of 1.56 miles of circuit between Shaffers Corner and Allegheny Ludlum No. 2 Jct. with high temperature conductor. The estimated cost to perform this work is **$743,100**.

4. The overloads identified on the section of the Dravosburg-Oakland-Carson (DLCO) (Z-71) 138kV circuit between Carson and the three terminal junction points will require two sections of Z-71 and sections of conductor within the Carson substation to be reconductored to address this violation. The estimated cost to perform this work is **$98,310**.

5. To mitigate the 01SPGDL - 01PITTML 138 kV (APS) line overload will require: 1) the reconductor of 3.01 miles of circuit between Springdale and Pittsburgh Mills with high temperature conductor; 2) upgrade the line trap and conductor clamp at Springdale. The estimated cost to perform this work is **$1,180,150.**

6. To mitigate the 01AL&D6T - 01KITTAN 138 kV (APS) line overload will require the reconductor of 5.79 miles of circuit between Allegheny Lock and Dam 6 Tap and Kittanning with 954ACSR. The estimated cost to perform this work is **$2,635,200**.

7. To mitigate the 01PITTML - 01GOBAIN 138 kV (APS) line overload will require: 1) the reconductor of 2.45 miles of circuit between Pittsburgh Mills and Gobain with high temperature conductor; 2) upgrade the line trap at Gobain. The estimated cost to perform this work is **$1,009,450**

8. To mitigate the 01AL 4J - 01AL&D6T 138 kV (APS) line overload will require the reconductor of 7.29 miles of circuit between Allegheny Ludlum 4 Jct and Allegheny Lock & Dam 6 Tap with 954ACSR. The estimated cost to perform this work is **$3,452,900.**

9. To mitigate the 15B.I – 15FORBES 138 kV (APS-DLCO) line overload will require:

   DLCO portion (Z-46) - The underground construction of the Z-46 does not allow for conventional methods of increasing this circuit's capacity. Preliminary analysis showed that reconductoring and force cooling of the Z-46 circuit would not eliminate the identified overload. DLCO determined that reconductoring the Cheswick-Springdale (AP) (Z-58) 138kV tie line to achieve a minimum summer normal rating of 500MVA would eliminate the overload on the Z-46 circuit. AP will be responsible for estimating the cost of reconductoring the Z-58 circuit and the required upgrades to the Springdale substation.

   DLCO requires the Z-58 tie line be connected to both the Cheswick No. 3 and No. 4 138kV buses through a double breaker position. The Z-58 circuit will utilize new breaker positions 184 and 185 as seen in Figure 3. The estimated cost for this work is **$1,790,568** in 2009 dollars.

   APS portion (Z-58) - reconductor approximately 2.7 miles of 138kV line between Springdale and Cheswick with 1158 ACSS/TW HT conductor. Assume that all existing structures will be reused. The estimated cost to perform this work is **$1,916,000**.

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 in the System Impact Study report)

1. To mitigate the 01SPGDL - 01AL 4J 138 kV (APS) line overload will require: 1) the reconductor of 5.7 miles of circuit between Springdale and Allegheny Ludlum No. 4 Jct. with high temperature conductor and; 2) upgrade the line trap, relay circuitry, and RTU at the Springdale substation. The estimated cost to perform this work is **$1,996,000.**

Generation Interconnection Feasibility Study Report (Revised)

For

PJM Generation Interconnection Request Queue Position #V1-013

Springdale 138kV

August, 2009

Preface

The intent of the Generation Interconnection Feasibility Study is to determine a plan, with ballpark cost and construction time estimates, to connect the subject generation interconnection project to the PJM network at a location specified by the Interconnection Customer. 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. All facilities required for interconnection of a Generation Interconnection Request must be designed to meet the technical specifications (on PJM web site) for the appropriate transmission owner.

In some instances an Interconnection Customer may not be responsible for 100% of the identified Network Upgrade cost because other transmission network uses, e.g. another generation interconnection or merchant transmission upgrade, 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 Generation Interconnection 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

The Interconnection Customer (IC), has proposed a change to their existing Point of Interconnection for their 580 MW energy (580 MW capacity) coal fired Cheswick Power Station located in Springdale, Pennsylvania. The project was studied as a 580 MW injection into the Allegheny Power Springdale 138kV substation and evaluated for compliance with reliability criteria for summer peak conditions in 2013. The in-service date, as identified in the Generation Interconnection Feasibility Study Agreement, is January 1, 2012. The IC has requested a backfeed date of December 15, 2011.

Point of Interconnection

V1-013 proposes to change its existing Point of Interconnection from the Cheswick 138kV substation in the Duquesne Light (DLCO) zone to the Allegheny Power (APS) system at the Springdale 138kV (see Attachment 1).

Direct Connection Requirements

Transmission Owner Scope of Direct Connection Work

The Transmission Owners' (APS and DLCO) scope of work for the direct connection facility includes:

Attachment Facilities

- Springdale Substation (APS)

  Expand the existing fence and yard for the addition of a 138kV box bay structure. Note: All property and right-of-way must be acquired by the Developer and transferred to Allegheny Power in the form of a permanent lease or direct ownership.

  Extend the 138kV bus. Install two (2) 2000A 138kV 80kA breakers, four (4) 2000A 138kV breaker disconnect switches, two (2) sets of 138kV metering, two (2) 138kV line traps, two (2) 138kV CVTs, control cables, panels, grounding, foundations, structures, and associated equipment. Cost for a site development consultant is included. Engineering time for the evaluation of the ground grid is included. There may be additional costs if the existing ground grid requires reinforcement. Note: Actual soil conditions and subsurface obstructions may increase the cost of site work significantly. These issues will be further investigated during the System Impact Study and facilities Study. Assume connection to developer's 138kV line. Assume property to be acquired from developer at no cost to AP.

  The estimated cost to perform this work is **$3,716,700** in 2011 dollars.

- Cheswick Substation (DLCO)

  The interconnection customer proposed eliminating the bus ties between the east and west yards. The No. 2 138kV bus in the east yard is connected to both the No. 3 and No.4 138kV bus in the west yard through breakers 90 and 180 respectively. The No. 1 138kV bus in the east yard is connected to the No. 3 138kV bus in the west yard though breaker 80.

  The estimated cost of removing the identified bus tie sections is **$100,778** in 2009 dollars. See Attachment 2 for substation and line arrangement.

- Cheswick-Pine Creek (Z-61) & Cheswick-North (Z-66) (DLCO)

  The Cheswick-Pine Creek (Z-61) 138kV circuit must be relocated from breaker 95, on the No. 1 138kV bus in the east yard, to the existing double breaker positions 90 and 180 in the west yard. Breaker 90 will be re-numbered breaker 84 and breaker 180 will be numbered breaker 85.

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  The estimated cost to perform these relocations is **$561,010** in 2009 dollars**.**

- Cheswick 138kV Capacitors (DLCO)

  The 138kV capacitors on the No. 2 138kV bus in the Cheswick east yard must be relocated. The new location will be determined during the System Impact Study phase of V1-013.

The estimated cost to perform this relocation work is **$1,343,250** in 2009 dollars.

Interconnection Customer Scope of Direct Connection Work

The Interconnection Customer (IC) has assumed full responsibility for the design and construction of all facilities associated with the V1-013 generating facility and the 138kV direct connection line on the IC side of the Point of Interconnection (POI). The IC will interconnect V1-013 with the AP transmission system by constructing a customer-owned 138kV line from the generating facility to AP's Springdale 138kV substation, a distance of approximately 1.5 miles. Route selection, line design, right-of-way acquisition and construction of such lines will be entirely the responsibility of the IC. Cost estimates do not include construction of that line. It is assumed that the ICs step up transformer will conform to the AP standard of delta on the low side and grounded wye on the high side as illustrated in the AP Facility Connection Manual:

http://www.alleghenypower.com/Bus2Bus/Gen%20Trans%20AP%20Facility%20Connection%20Requirements.pdf

The IC will be required to install metering and telemetry equipment to provide revenue metering and real-time telemetry data to PJM. The requirements for this equipment are listed in Appendix 2, Section 8 of Attachment O to the PJM Tariff, as well as PJM Manuals 01 and 14D. Protective relaying and metering design and installation must comply with the Allegheny Power Applicable Standards. It is assumed that a fiber optic interface will be used for the protection channel between the AP and Developer's substations.

Cost and Timing Summary

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

1. The 01SPGDL - 01PITTML 138 kV (APS) line (from bus 20256 to bus 20603 ckt 1) loads from 56.34% to 109.14% (DC power flow) of its normal rating (185 MVA) for non-contingency condition. This project contributes approximately 97.68 MW to cause the thermal violation.

2. The 01SPGDL - 01SHFCRN 138 kV (APS) line (from bus 20256 to bus 20245 ckt 1) loads from 81.21% to 124.19% (DC power flow) of its normal rating (297 MVA) for the single line contingency ('APS-SB-145'). This project contributes approximately 127.65 MW to cause the thermal violation.

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Short Circuit

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20831	SPRINGDA 138.kV	AE - 5	S	63 kA-S	55565	73098.1	80 kA-S
20831	SPRINGDA 138.kV	CHESWICK138H	S	63 kA-S	35665.8	54995.8	63 kA-S
20831	SPRINGDA 138.kV	AES 3, 138Q	S	63 kA-S	52266.8	67928.6	80 kA-S
20831	SPRINGDA 138.kV	AES 4, 138S	S	63 kA-S	52269.2	67935	80 kA-S

The estimated cost to upgrade the fifteen (15) 138kV Springdale breakers to an 80 kA-S rating is **$4,956,300** in 2010 dollars. This cost estimate does not include AFUDC. The estimated project duration is **24 months** after the receipt of an executed Interconnection Service Agreement and Construction Service Agreement.

Note: Additional study is required at Springdale substation to determine if additional work will be required to upgrade the ground grid and bus support structures in order to accommodate the 80kA breakers. If it is determined that substation expansion, bus support upgrade, and/or ground grid upgrade is required, a complete rebuild and/or expansion of the existing Springdale 138kV buses, terminals, and yard may be required and costs may increase significantly. This analysis is ongoing and will be included as part of the System Impact and Facilities Studies.

Allegheny Power reserves the right to review the electrical protection design and relay settings for interconnecting customer facilities to ensure that the protective relaying equipment will be compatible with that installed at the new switching station. The relaying package will likely include both primary and backup protection. Allegheny Power personnel must be present at the time of commissioning to witness proper function of the protection scheme and related coordination. The estimated cost to perform this engineering review and field test effort is **$5,000** in 2009 dollars.

Note: The purchase and installation of protective relaying and associated equipment at the generation site is the responsibility of the interconnecting customer and is not included in this scope of work.

Stability and Reactive Power Requirements

Will be performed during the Queue V1-013 System Impact Study.

New System Reinforcements

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

1. See Item #5 below for reinforcement.

2. To mitigate the 01SPGDL - 01SHFCRN 138 kV (APS) line overload will require; 1) the reconductor of 4.93 miles of circuit between Springdale and Shaffers Corner with high temperature conductor and; 2) the upgrade of the bus tie and Springdale line air switch at Shaffers Corner; 3) upgrade the line trap, relay circuitry, and RTU at Springdale. The estimated cost to perform this work is **$2,020,350**.

3. To mitigate the 01SHFCRN - 01AL 2J 138 kV (APS) line overload will require the reconductor of 1.56 miles of circuit between Shaffers Corner and Allegheny Ludlum No. 2 Jct. with high temperature conductor. The estimated cost to perform this work is **$743,100**.

4. The overloads identified on the section of the Dravosburg-Oakland-Carson (DLCO) (Z-71) 138kV circuit between Carson and the three terminal junction point will require two sections of Z-71 and sections of conductor within the Carson substation to be reconductored to address this violation. The estimated cost to perform this work is **$98,310**.

5. To mitigate the 01SPGDL - 01PITTML 138 kV (APS) line overload will require: 1) the reconductor of 3.01 miles of circuit between Springdale and Pittsburgh Mills with high temperature conductor; 2) upgrade the line trap and conductor clamp at Springdale. The estimated cost to perform this work is **$1,180,150.**

6. To mitigate the 01AL&D6T - 01KITTAN 138 kV (APS) line overload will require the reconductor of 5.79 miles of circuit between Allegheny Lock and Dam 6 Tap and Kittanning with 954ACSR. The estimated cost to perform this work is **$2,635,200**.

7. To mitigate the 01PITTML - 01GOBAIN 138 kV (APS) line overload will require: 1) the reconductor of 2.45 miles of circuit between Pittsburgh Mills and Gobain with high temperature conductor; 2) upgrade the line trap at Gobain. The estimated cost to perform this work is **$1,009,450**

8. To mitigate the 01AL 4J - 01AL&D6T 138 kV (APS) line overload will require the reconductor of 7.29 miles of circuit between Allegheny Ludlum 4 Jct and Allegheny Lock & Dam 6 Tap with 954ACSR. The estimated cost to perform this work is **$3,452,900.**

9. To mitigate the 15B.I – 15FORBES 138 kV (APS-DLCO) line overload will require:

   <u>DLCO portion (Z-46)</u> - The underground construction of the Z-46 does not allow for conventional methods of increasing this circuit's capacity. Preliminary analysis showed that reconductoring and force cooling of the Z-46 circuit would not eliminate the identified overload. DLCO determined that reconductoring the Cheswick-Springdale (AP) (Z-58) 138kV tie line to achieve a minimum summer normal rating of 500MVA would eliminate the overload on the Z-46 circuit. AP will be responsible for estimating the cost of reconductoring the Z-58 circuit and the required upgrades to the Springdale substation.

DLCO requires the Z-58 tie line be connected to both the Cheswick No. 3 and No. 4 138kV buses through a double breaker position. The Z-58 circuit will utilize new breaker positions 184 and 185 as seen in Figure 3. The estimated cost for this work is **$1,790,568** in 2009 dollars.

APS portion (Z-58) - reconductor approximately 2.7 miles of 138kV line between Springdale and Cheswick with 1158 ACSS/TW HT conductor. Assume that all existing structures will be reused. The estimated cost to perform this work is **$1,916,000**.

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 in the System Impact Study report)

1. To mitigate the 01SPGDL - 01AL 4J 138 kV (APS) line overload will require: 1) the reconductor of 5.7 miles of circuit between Springdale and Allegheny Ludlum No. 4 Jct. with high temperature conductor and; 2) upgrade the line trap, relay circuitry, and RTU at the Springdale substation. The estimated cost to perform this work is **$1,996,000.**

Generation Interconnection Request
Springdale 138kV

General

The Interconnection Customer (IC), has proposed a change to their existing Point of Interconnection for their 580 MW energy (580 MW capacity) coal fired Cheswick Power Station located in Springdale, Pennsylvania. The project was studied as a 580 MW injection into the Allegheny Power Springdale 138kV substation and evaluated for compliance with reliability criteria for summer peak conditions in 2013. The in-service date, as identified in the Generation Interconnection Feasibility Study Agreement, is January 1, 2012.

Point of Interconnection

V1-013 proposes to change its existing Point of Interconnection from the Cheswick 138kV substation in the Duquesne zone to the Allegheny Power system at the Springdale 138kV.

Direct Connection Requirements

Transmission Owner Scope of Direct Connection Work

The Transmission Owner's (Allegheny Power) scope of work for the direct connection facility includes:

Attachment Facilities

- Springdale Substation (APS) –

  Expand the existing fence and yard for the addition of a 138kV box bay structure. Note: All property and right-of-way must be acquired by the Developer and transferred to Allegheny Power in the form of a permanent lease or direct ownership.

  Extend the 138kV bus. Install two (2) 2000A 138kV 80kA breakers, four (4) 2000A 138kV breaker disconnect switches, two (2) sets of 138kV metering, two (2) 138kV line traps, two (2) 138kV CVTs, control cables, panels, grounding, foundations, structures, and associated equipment. Cost for a site development consultant is included. Engineering time for the evaluation of the ground grid is included. There may be additional costs if the existing ground grid requires reinforcement. Note: Actual soil conditions and subsurface obstructions may increase the cost of site work significantly. These issues will be further investigated during the System Impact Study and facilities Study. Assume connection to developer's 138kV line. Assume property to be acquired from developer at no cost to AP.

  The estimated cost to perform this work is **$3,716,700** in 2011 dollars.

- Cheswick Substation (DQE) –

Work at the Cheswick substation will include but not limited to: eliminating sections of the No.1 and No. 2 138kV buses; moving the 138kV circuits from the No.1 and No.2 138kV buses; and moving the 138kV capacitor bank from the No.2 138kV bus.

Final work scope and costs to perform work at the Cheswick substation is currently being developed and will be provided when it becomes available but no later than the System Impact Study report.

Interconnection Customer Scope of Direct Connection Work

The Interconnection Customer (IC) has assumed full responsibility for the design and construction of all facilities associated with the V1-013 generating facility and the 138kV direct connection line on the IC side of the Point of Interconnection (POI). The IC will interconnect V1-013 with the AP transmission system by constructing a customer-owned 138kV line from the generating facility to AP's Springdale 138kV substation, a distance of approximately 1.5 miles. Route selection, line design, right-of-way acquisition and construction of such lines will be entirely the responsibility of the IC. Cost estimates do not include construction of that line. It is assumed that the ICs step up transformer will conform to the AP standard of delta on the low side and grounded wye on the high side as illustrated in the AP Facility Connection Manual.

The IC will be required to install metering and telemetry equipment to provide revenue metering and real-time telemetry data to PJM. The requirements for this equipment are listed in Appendix 2, Section 8 of Attachment O to the PJM Tariff, as well as PJM Manuals 01 and 14D. Protective relaying and metering design and installation must comply with the Allegheny Power Applicable Standards. It is assumed that a fiber optic interface will be used for the protection channel between the AP and developer's stations.

Cost and Timing Summary

The cost estimates in this report do not include tax gross-up, land acquisition, or any network upgrades which may have been identified and required by this project.

The estimated time to provide for the interconnection (Attachment Facilities) of this project is **24 months** after the receipt of a signed Interconnection Service Agreement and Construction Service Agreement and no delays n permitting.

The duration for each network reinforcement identified below is approximately 24 months per individual line segment. A December 2011 in-service date for all reinforcements is not possible as all segments cannot be constructed simultaneously. The estimated total project duration is **36 months** after the receipt of an executed Interconnection Service Agreement and Construction Service Agreement.

Network Impacts

Potential network impacts are as follows:

Generator Deliverability

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

1. The 01SPGDL - 01PITTML 138 kV (APS) line (from bus 20256 to bus 20603 ckt 1) loads from 56.34% to 109.14% (DC power flow) of its normal rating (185 MVA) for non-contingency condition. This project contributes approximately 97.68 MW to cause the thermal violation.

2. The 01SPGDL - 01SHFCRN 138 kV (APS) line (from bus 20256 to bus 20245 ckt 1) loads from 81.21% to 124.19% (DC power flow) of its normal rating (297 MVA) for the single line contingency ('APS-SB-145'). This project contributes approximately 127.65 MW to cause the thermal violation.

3. The 01SHFCRN - 01AL 2J 138 kV (APS) line (from bus 20245 to bus 20137 ckt 1) loads from 72.37% to 115.35% (DC power flow) of its normal rating (297 MVA) for the single line contingency ('APS-SB-145'). This project contributes approximately 127.65 MW to cause the thermal violation.

4. The 15CARSNT – 15CARSON 138 kV (DQE) line (from bus 27694 to bus 27655) loads from 43.3% to 104.6% (DC power flow) of its normal rating (297 MVA) for the single line contingency for the single line outage (Forbes – Oakland 138kV). This project contributes approximately 154.5MW to cause the thermal violation.

Multiple Facility Contingency

*(Double Circuit Tower Line, Line with Failed Breaker, and Bus Fault contingencies for the **Full** energy output.*

5. The 01SPGDL - 01PITTML 138 kV (APS) line (from bus 20256 to bus 20603 ckt 1) loads from 84.04% to 148.52% (DC power flow) of its emergency rating (227 MVA) for the tower line contingency ('54'). This project contributes approximately 146.37 MW to cause the thermal violation.

6. The 01AL&D6T - 01KITTAN 138 kV (APS) line (from bus 20139 to bus 20204 ckt 1) loads from 45.72% to 111.86% (DC power flow) of its emergency rating (116 MVA) for the tower line contingency ('52'). This project contributes approximately 76.72 MW to cause the thermal violation.

7. The 01PITTML - 01GOBAIN 138 kV (APS) line (from bus 20603 to bus 20185 ckt 1) loads from 58.13% to 107.41% (DC power flow) of its emergency rating (297 MVA) for the tower line contingency ('54'). This project contributes approximately 146.37 MW to cause the thermal violation.

8. The 01AL 4J - 01AL&D6T 138 kV (APS) line (from bus 20138 to bus 20139 ckt 1) loads from 40.8% to 106.96% (DC power flow) of its emergency rating (116 MVA) for the tower line contingency ('52'). This project contributes approximately 76.74 MW to cause the thermal

violation.

9. The 15B.I – 15FORBES 138 kV (DQE) line (from bus 27627 to bus 254065 ckt 1) loads from 87.0% to 120% (DC power flow) of its emergency rating (375 MVA) for the tower line contingency ('TWR_40'). This project contributes approximately 123.75 MW to cause the thermal violation.

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 01SPGDL - 01AL 4J 138 kV (APS) line (from bus 20256 to bus 20138 ckt 1) loads from 121% to 153% (DC power flow) of its emergency rating (240 MVA) for the tower line contingency ('3_1'). This project contributes approximately 70.66 MW to cause the thermal violation.

Short Circuit

The following breakers have been identified as being over their maximum interrupting rating:

BUS NO.	BUS	BREAKER	RATING TYPE	2009 Rating	2013 Rating	A-symmetrical without V1-013	A-symmetrical with V1-013	New Rating
20831	SPRINGDA 138.kV	AES 1&2,138P	S	63 kA-S	50000	53724.3	70751.8	80 kA-S
20831	SPRINGDA 138.kV	AES 5, 138T	S	63 kA-S	50000	52252.5	67889.8	80 kA-S
20831	SPRINGDA 138.kV	FEDST,138E	S	63 kA-S	50000	55471.5	72816.1	80 kA-S
20831	SPRINGDA 138.kV	HARWICK,138U	S	63 kA-S	50000	53260.3	71233	80 kA-S
20831	SPRINGDA 138.kV	HUNTING,138G	S	63 kA-S	50000	53718.5	71621.1	80 kA-S
20831	SPRINGDA 138.kV	KISKIVLY138D	S	63 kA-S	50000	53322.5	70991.1	80 kA-S
20831	SPRINGDA 138.kV	KITTANG,138C	S	63 kA-S	50000	54410.8	72112	80 kA-S
20831	SPRINGDA 138.kV	Pitts M,138V	S	63 kA-S	50000	53640.5	71523.8	80 kA-S
20831	SPRINGDA 138.kV	WHITVLY,138F	S	63 kA-S	50000	53771	71451.3	80 kA-S
20831	SPRINGDA 138.kV	YUKON, 138R	S	63 kA-S	50000	53362.3	71325.6	80 kA-S

The estimated cost to upgrade the ten (10) 138kV Springdale breakers to an 80 kA-S rating is **$3,304,200** in 2010 dollars. This cost estimate does not include AFUDC. The estimated

project duration is **24 months** after the receipt of an executed Interconnection Service Agreement and Construction Service Agreement.

Note: Additional study is required at Springdale substation to determine if additional work will be required to upgrade the ground grid and bus support structures in order to accommodate the 80kA breakers. If it is determined that substation expansion, bus support upgrade, and/or ground grid upgrade is required, a complete rebuild and/or expansion of the existing Springdale 138kV buses, terminals, and yard may be required and costs may increase significantly. This analysis is ongoing and will be included as part of the System Impact and Facilities Studies.

Stability and Reactive Power Requirements

Will be performed during the Queue V1-013 System Impact Study.

New System Reinforcements

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

1. See Item #5 below for reinforcement.

2. To mitigate the 01SPGDL - 01SHFCRN 138 kV (APS) line overload will require; 1) the reconductor of 4.93 miles of circuit between Springdale and Shaffers Corner with high temperature conductor and; 2) the upgrade of the bus tie and Springdale line air switch at Shaffers Corner; 3) upgrade the line trap, relay circuitry, and RTU at Springdale. The estimated cost to perform this work is **$2,020,350**.

3. To mitigate the 01SHFCRN - 01AL 2J 138 kV (APS) line overload will require the reconductor of 1.56 miles of circuit between Shaffers Corner and Allegheny Ludlum No. 2 Jct. with high temperature conductor. The estimated cost to perform this work is **$743,100**.

4. The reinforcement and cost necessary to mitigate this overload is currently under development and will be provided when it becomes available but no later than the System Impact Study report.

5. To mitigate the 01SPGDL - 01PITTML 138 kV (APS) line overload will require: 1) the reconductor of 3.01 miles of circuit between Springdale and Pittsburgh Mills with high temperature conductor; 2) upgrade the line trap and conductor clamp at Springdale. The estimated cost to perform this work is **$1,180,150.**

6. To mitigate the 01AL&D6T - 01KITTAN 138 kV (APS) line overload will require the reconductor of 5.79 miles of circuit between Allegheny Lock and Dam 6 Tap and Kittanning with 954ACSR. The estimated cost to perform this work is **$2,635,200**.

7. To mitigate the 01PITTML - 01GOBAIN 138 kV (APS) line overload will require: 1) the reconductor of 2.45 miles of circuit between Pittsburgh Mills and Gobain with high temperature

conductor; 2) upgrade the line trap at Gobain. The estimated cost to perform this work is **$1,009,450**

8. To mitigate the 01AL 4J - 01AL&D6T 138 kV (APS) line overload will require the reconductor of 7.29 miles of circuit between Allegheny Ludlum 4 Jct and Allegheny Lock & Dam 6 Tap with 954ACSR. The estimated cost to perform this work is **$3,452,900.**

9. To mitigate the 15B.I – 15FORBES 138 kV (APS-DQE) line overload will require:

   APS portion - reconductor approximately 2.7 miles of 138kV line between Springdale and Cheswick with 1158 ACSS/TW HT conductor. Assume that all existing structures will be reused. The estimated cost to perform this work is **$1,916,000**.

   DQE portion - upgrade the following 138kV Cheswick line terminal equipment at Springdale substation: breaker disconnect switch, risers, bus taps, conductor, connectors, CT's, relaying, and RTU. The reinforcement and cost necessary to mitigate this overload is currently under development and will be provided when it becomes available but no later than the System Impact Study report.

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 in the System Impact Study report)

1. To mitigate the 01SPGDL - 01AL 4J 138 kV (APS) line overload will require: 1) the reconductor of 5.7 miles of circuit between Springdale and Allegheny Ludlum No. 4 Jct. with high temperature conductor and; 2) upgrade the line trap, relay circuitry, and RTU at the Springdale substation. The estimated cost to perform this work is **$1,996,000.**