PJM Generator Interconnection Request
Queue AA1-007
Stone Coal Gap 34.5 kV
Feasibility/Impact Study Report

October 2015

Preface

The intent of the Feasibility/System Impact Study is to determine a plan, with approximate 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 project 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 Feasibility/System Impact Study is performed.

The Feasibility/System Impact 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

Ingenco Renewable Development, LLC (Ingenco) proposes to interconnect PJM Queue #AA1-007 Smith Gap Regional Landfill Methane Gas Plant with 3 MW (3 MW Capacity) to the American Electric Power (AEP) system. The plant is located within the Craig-Botetourt Electric Co-op (CBEC) footprint and is served by a radial 24.9 kV distribution line owned and operated by CBEC. This radial line connects to the Stone Coal Gap 34.5 kV Substation served by the AEP Mount Union-New Castle 34.5 kV Line (see Figure 1). Ingenco's Single Line Diagram that is included in this report shows the actual POI (see Figure 3). The plant is located in Salem, VA (see Figure 2).

The requested in service date is October 1, 2016.

The objective of this Feasibility/System Impact study is to determine budgetary cost estimates and approximate construction timelines for identified transmission facilities required to connect the proposed generating facilities to the AEP transmission system. These reinforcements include the Attachment Facilities, Local Upgrades, and Network Upgrades required to maintain the reliability of the AEP transmission system. Stability analysis is not included as part of this study.

Attachment Facilities

Ingenco shall either install metering and telemetry, or arrange for CBEC to install metering and telemetry, at the point of common coupling between Ingenco's Facility and CBEC's feeder as required by PJM Manuals M-01 and M14D. CBEC and Ingenco will collectively determine meter ownership.

Ingenco shall make its metering data at the point of common coupling available to CBEC via telemetry for use by CBEC and Appalachian Power Company for balancing, settlement and audit purposes. Ingenco may purchase and install its own backup metering.

The estimated cost for new metering system: $80,000

Protection and Relaying Cost:

- Line protection and controls at the Stone Coal Gap 34.5 kV station will need to be upgraded. (Network Upgrade # n4575)
    - Direct Material Cost: $73,523
    - Direct Labor Cost: $83,455
- Line protection and controls at the Mount Union 34.5 kV station will need to be upgraded. (Network Upgrade # n4576)
    - Direct Material Cost: $41,767
    - Direct Labor Cost: $57,815

Local and Network Impacts

The impact of the proposed generating facility on the AEP Transmission System was assessed for adherence with applicable reliability criteria. AEP planning criteria require that the transmission system meet performance parameters prescribed in the AEP FERC Form 715[1] and Connection Requirements for AEP Transmission System[2]. Therefore, these criterion were used to assess the impact of the proposed facility on the AEP System. PJM project # AA1-007 was studied as a 3 MW (3 MW capacity) landfill gas generating facility consistent with the interconnection application. Project #AA1-007 was evaluated for compliance with reliability criteria for summer peak conditions in 2018.

Note that the customer is expected to understand and comply with IEEE 1547 concerning the DG installation and its requirements for interconnection with the utility grid. Furthermore, this study only addresses impacts on the AEP and larger PJM systems. Conditions on the CBEC facilities between the Stone Coal Gap Delivery Point and the Smith Gap Regional Landfill Methane Gas Plant are beyond the scope of this study.

Potential network impacts were as follows:

Normal System (2018 Summer Conditions Capacity Output)

- No problems identified

Single Contingency (2018 Summer Conditions Capacity Output)

- No problems identified

Multiple Contingency (2018 Summer Conditions Capacity Output)

- No problems identified

1 http://www.aep.com/about/codeofconduct/OASIS/TransmissionStudies/GuideLines/2015_AEP_PJM_FERC_715_Final_Part_4.pdf

2 https://www.aep.com/about/codeofconduct/OASIS/TransmissionStudies/Requirements/AEP_Interconnection_Requirements_rev1.pdf

Contributions to Previously Identified Overloads (2018 Summer Conditions Capacity Output)

- No problem identified

Normal System (2018 Summer Conditions Full Output)

- No problems identified

Single Contingency (2018 Summer Conditions Full Output)

- No problems identified

Multiple Contingency (2018 Summer Conditions Full Output)

- No problems identified

Contributions to Previously Identified Overloads (2018 Summer Conditions Full Output)

- No problems identified
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Short Circuit Analysis

- No problem identified

Stability Analysis

- N/A

Voltage Variations

- No problems identified

Additional Limitations of Concern

- No known additional limitations of concern.

Schedule

The estimated time required for construction is between 6 to 12 months after signing an interconnection agreement.

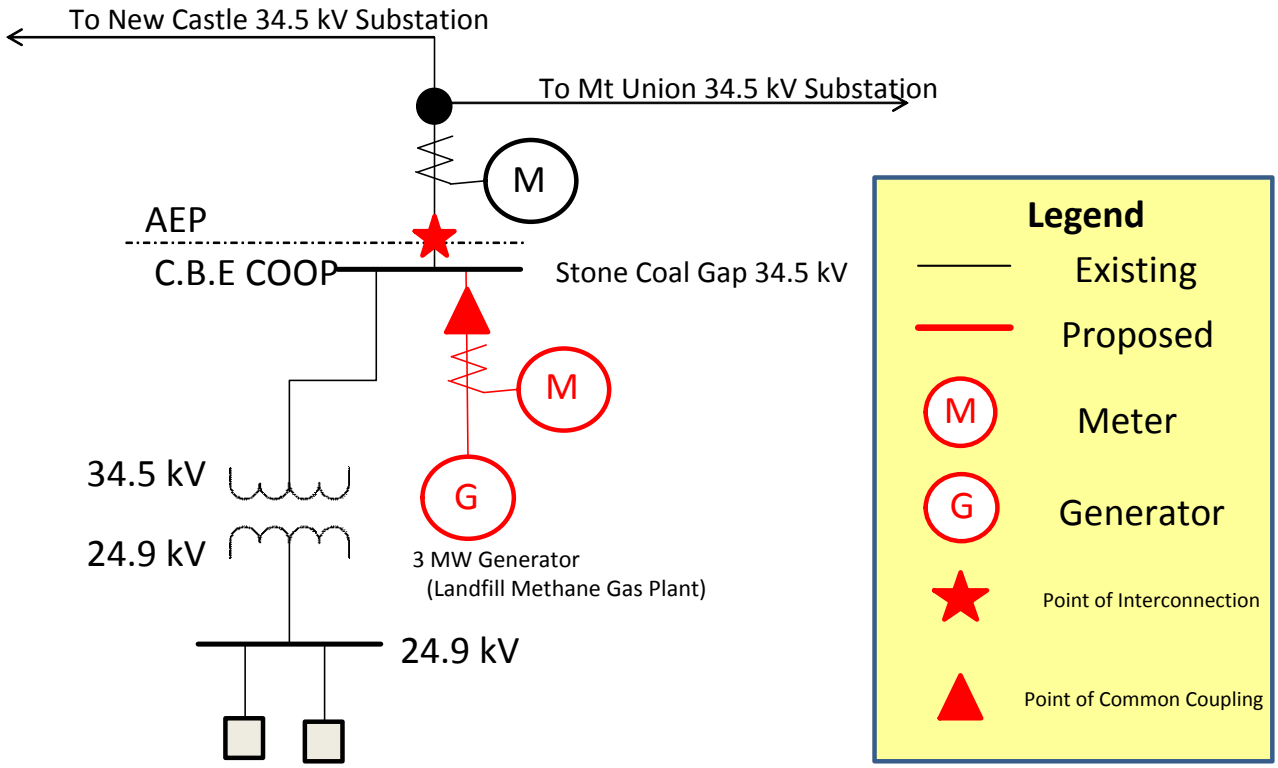
Conclusion

Based upon the results of this Feasibility/System Impact Study, the injection of a 3 MW (3 MW Capacity) at Stone Coal Gap 34.5 kV Substation (PJM Project #AA1-007) will require additional Network upgrades on AEP's Transmission. A new metering system will have to be installed and protection controls will have to be upgraded at the Stone Coal Gap 34.5 kV station and at the Mount Union 34.5 kV station.

Total estimated cost for new metering system: $80,000
Total estimated Protection and Relaying Cost: $256,560
Total Estimated Cost for Project AA1-007: $336,560

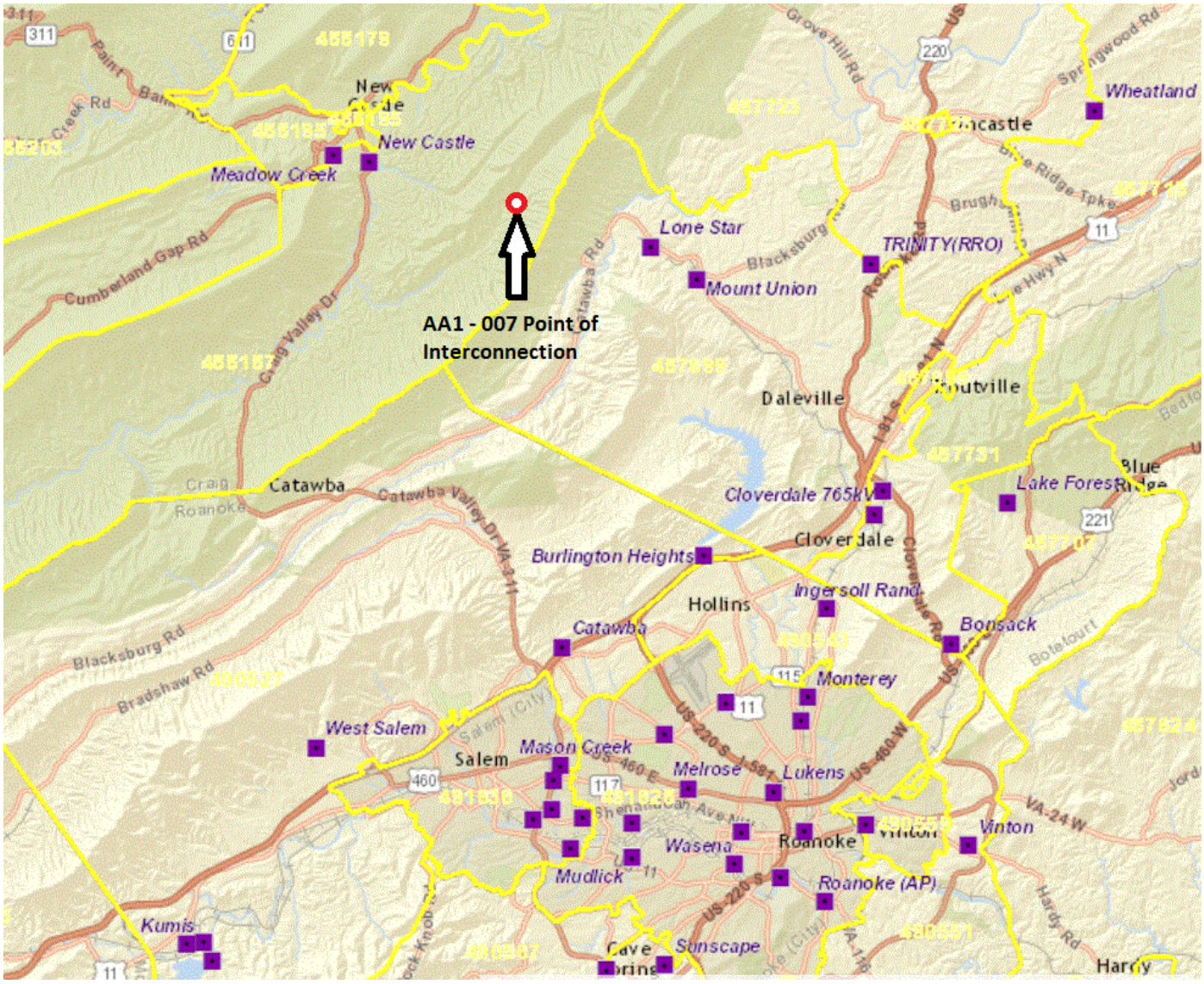
The estimates are preliminary in nature, as they were determined without the benefit of detailed engineering studies. Final estimates will require an on-site review and coordination to determine final construction requirements.

Figure 1: PJM #AA1-007 POI
Stone Coal Gap 34.5 kV
Substation *



* Stone Coal Gap 34.5 kV Substation is partially shown

Figure 2: AA1-007 Point of Interconnection



PJM Generator Interconnection Request
Queue AA1-007
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Feasibility/Impact Study Report

July 2015

Preface

The intent of the Feasibility/System Impact Study is to determine a plan, with approximate 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 project 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 Feasibility/System Impact Study is performed.

The Feasibility/System Impact 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

INGENCO Holdings, L.L.C. proposes to interconnect PJM Queue #AA1-007 Smith Gap Regional Landfill Methane Gas Plant with 6 MW (6 MW Capacity) to the American Electric Power (AEP) system. The plant is located within the Craig-Botetourt Electric Co-op (CBEC) footprint and is served by a radial 24.9 kV distribution line owned and operated by CBEC. This radial line connects to the Stone Coal Gap 34.5 kV Substation served by the AEP Mount Union-New Castle 34.5 kV Line (see Figure 1). INGENCO's Single Line Diagram that is included in this report shows the actual POI (see Figure 3). The plant is located in Salem, VA (see Figure 2).

The requested in service date is June 1, 2016.

The objective of this Feasibility/System Impact study is to determine budgetary cost estimates and approximate construction timelines for identified transmission facilities required to connect the proposed generating facilities to the AEP transmission system. These reinforcements include the Attachment Facilities, Local Upgrades, and Network Upgrades required to maintain the reliability of the AEP transmission system. Stability analysis is not included as part of this study.

Attachment Facilities

Interconnection Customer shall either install metering and telemetry, or arrange for REMC to install metering and telemetry, at the point of common coupling between the Wholesale Market Participant Facility and its Rural Electric Membership Corporation ("REMC") feeder as required by PJM Manuals M-01 and M14D. REMC and Wholesale Market Participant will collectively determine meter ownership.

Wholesale Market Participant shall make its metering data at the point of common coupling available to REMC via telemetry for use by REMC and Appalachian Power Company for balancing, settlement and audit purposes. Wholesale Market Participant may purchase and install its own backup metering.

The estimated cost for new metering system: $80,000

Protection and Relaying Cost:

- Line protection and controls at the Stone Coal Gap 34.5 kV station will need to be upgraded.
    - Direct Material Cost: $73,523
    - Direct Labor Cost: $83,455

- Line protection and controls at the Mount Union 34.5 kV station will need to be upgraded.

    - Direct Material Cost: $41,767
    - Direct Labor Cost: $57,815

Local and Network Impacts

The impact of the proposed generating facility on the AEP Transmission System was assessed for adherence with applicable reliability criteria. AEP planning criteria require that the transmission system meet performance parameters prescribed in the AEP FERC Form 715[1] and Connection Requirements for AEP Transmission System[2]. Therefore, these criterion were used to assess the impact of the proposed facility on the AEP System. PJM project # AA1-007 was studied as a 6 MW (6 MW capacity) landfill gas generating facility consistent with the interconnection application. Project #AA1-007 was evaluated for compliance with reliability criteria for summer peak conditions in 2018.

Note that the customer is expected to understand and comply with IEEE 1547 concerning the DG installation and its requirements for interconnection with the utility grid. Furthermore, this study only addresses impacts on the AEP and larger PJM systems. Conditions on the REMC facilities between the Stone Coal Gap Delivery Point and the Smith Gap Regional Landfill Methane Gas Plant are beyond the scope of this study.

Potential network impacts were as follows:

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Multiple Contingency (2018 Summer Conditions Full Output)

- No problems identified

Contributions to Previously Identified Overloads (2018 Summer Conditions Full Output)

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Short Circuit Analysis

- No problem identified

Stability Analysis

- N/A

Voltage Variations

- No problems identified

Additional Limitations of Concern

- No known additional limitations of concern.

Schedule

The estimated time required for construction is between 6 to 12 months after signing an Interconnection Agreement (IA).

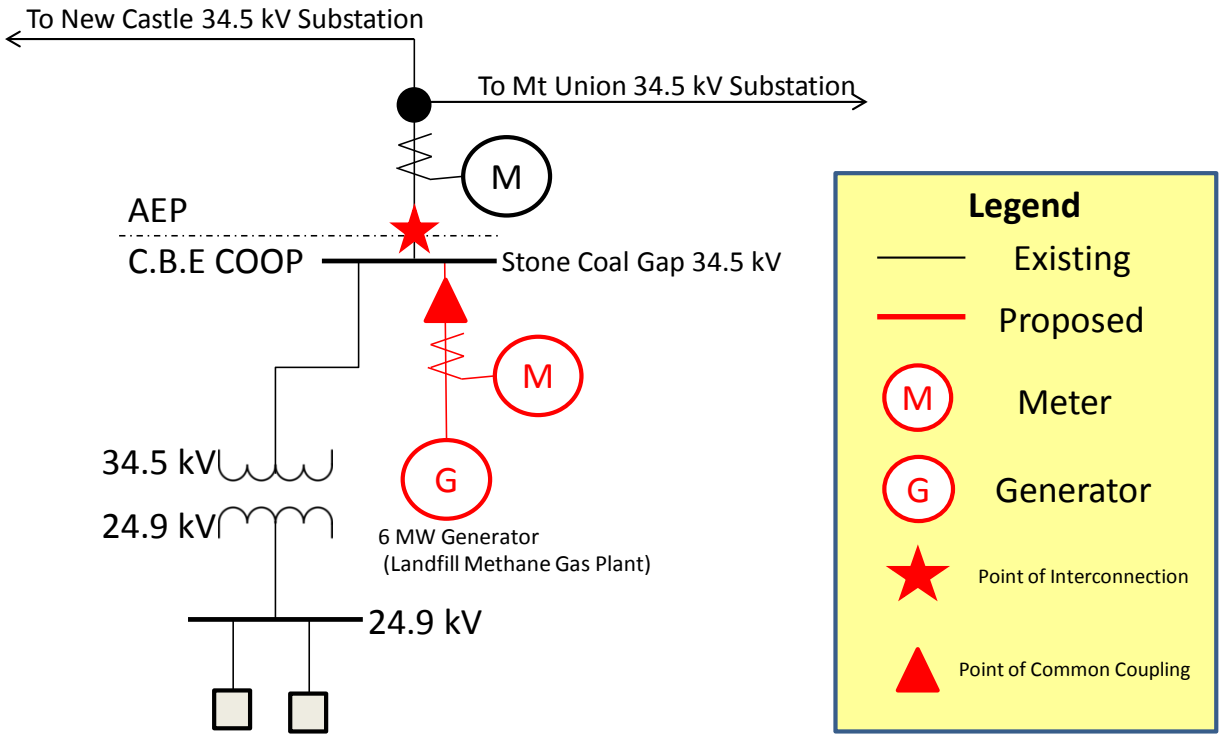
Conclusion

Based upon the results of this Feasibility/System Impact Study, the injection of a 6 MW (6 MW Capacity) at Stone Coal Gap 34.5 kV Substation (PJM Project #AA1-007) will require additional Interconnection work on AEP's Transmission. A new metering system will have to be installed and protection controls will have to be upgraded at the Stone Coal Gap 34.5 kV station and at the Mount Union 34.5 kV station.

Total estimated cost for new metering system: $80,000
Total estimated Protection and Relaying Cost: $256,560
Total Estimated Cost for Project AA1-007: $336,560

The estimates are preliminary in nature, as they were determined without the benefit of detailed engineering studies. Final estimates will require an on-site review and coordination to determine final construction requirements. All costs and scope of work will be detailed in an Interconnection Agreement (IA) with AEP.

Figure 1: PJM #AA1- 007 POI
Stone Coal Gap 34.5 kV
Substation*



* Stone Coal Gap 34.5 kV Substation is partially shown.

Figure 2: AA1-007 Point of Interconnection