PJM Generator Interconnection Request
Queue #T101
Glassrock (Suburban Landfill) 69kV
Or
Crooksville-North Newark (Suburban Landfill)
138kV
Feasibility/Impact Study

476245
April 2008

T101 Glassrock (Suburban Landfill) 69 kV or Crooksville-North Newark (Suburban Landfill) Feasibility/Impact Study

General

WM Renewable Energy LLC proposes to install Project #T101, a 6.4 MW generating facility comprised of eight Caterpillar 3516 generator sets connecting to the American Electric Power (AEP) system approximately four miles northeast of Glassrock Substation. The proposed location/address of the generating facilities is 3415 Township Road 447, Glenford, Ohio 43739 (See Exhibits 1 & 2). The desired projected in-service date is December 2008.

The intent of the Feasibility / Impact study is to determine system reinforcements and associated costs and construction time estimates required to facilitate the addition of the new generating plant to the transmission system. The reinforcements include the direct connection of the generator to the system and any network upgrades necessary to maintain the reliability of the transmission system.

Direct Connection

There are two options for interconnection of the proposed generation project to the AEP transmission system. Option #1 is to connect to the AEP 69 kV system via a new 69 kV circuit breaker and metering at AEP's Glassrock Substation. Option #2 involves connecting the proposed generation to the Crooksville – North Newark 138 kV Line via a new 138 kV switching substation.

Option #1 – 69 kV connection:

Glassrock Substation will require expansion as well as the installation of three additional 69 kV circuit breakers to establish two unique 69 kV feeds into Glassrock substation, provide an isolation point to the generation source, and provide acceptable over current protection to the 69 kV system (see Exhibit #3). Two additional 69 kV circuit breakers will be required at Thornville Substation to establish adequate system protection for the proposed system configuration.

As part of the necessary transmission line improvements to protect the system, AEP will construct a new 69 kV line with 795 ACSR from a location southeast of AEP's Zion Switch Substation to Glassrock Substation (approximately 6.1 miles). One new 69 kV CB will receive this new line, while a second will receive the existing line from the existing Zion Switch Substation line. The Glassrock 69 kV circuit breaker toward Zion Switch Substation (Thornville) will be operated normally open, but will close upon the loss of the preferred feed from the Crooksville 69 kV system. A third circuit breaker will tie to Suburban Landfill. Zion Switch Substation will be retired. Circuit breaker and relay upgrades are necessary at various substations to provide adequate 69 kV relaying/protection. Also, due to the unique system topology, switching procedures will be established to verify acceptable system protection is maintained during contingencies or while the system is being maintained. It is understood WM Renewable Energy will be responsible for all costs associated with this construction.

It is also understood that WM Renewable Energy will need to construct a 69 kV line from AEP's Glassrock Substation to their generation location. At their generator location, WM Renewable Energy will construct a step-up station (4/69kV) with applicable relaying disconnect their

generation should a system disturbance take place. WM Renewable Energy will also need to provide a fiber optic cable between the step-up station and the point of interconnection at Glassrock Substation.

The AEP construction scope for Option #1 – 69 kV connection:

- Construct a 6.14 mile 795 ACSR 69 kV line from a location southeast of Zion Switch Substation to establish a unique line route from the Thornville – New Lexington (Newark) 69 kV Line to Glassrock Substation, and expand/upgrade Glassrock Substation to include three (3) 69 kV circuit breakers, relaying, 69 kV metering & SCADA.

- Related to the necessary relay upgrades at Glassrock, it is necessary to make many other upgrades to make the relay scheme acceptable. These improvements include replacing the two (2) Thornville 69 kV MOAB's with circuit breakers (with appropriate relaying), and upgrading relaying at New Lexington, South Fultonham, Crooksville, East Lancaster and Baltimore Substations, and the retirement of Zion Switch Substation.

Total Attachment Facilities Cost *: **$8,250,000**

Option #2 – 138 kV connection:
For Option #2, AEP will reroute the Crooksville – North Newark 138 kV Line into a new 138 kV switching substation (see Exhibit #4). It is assumed AEP will be able to obtain the necessary 0.5 miles of ROW in a timely manner. Installation of remote end relaying will be required at Crooksville and North Newark Substations to support the new circuit breakers at Suburban Landfill's substation.

The AEP construction scope for Option #2 – 138 kV connection:

- Reroute the Crooksville – North Newark 138 kV Line into a new 138 kV switching substation. Install necessary 138 kV bus work, two (2) 138 kV circuit breakers, relays, 138 kV metering, SCADA, and associated equipment. Install remote end relaying at North Newark and Crooksville Substations.

Total Attachment Facilities Cost *: **$3,150,000**

*The estimates are detailed yet preliminary in nature, as there are some variables which can affect the detailed engineering studies as well as right of way costs. Final estimates will require additional on-site reviews and coordination to determine final construction requirements.

It will take approximately one year after obtaining the authorization to construct the facilities as outlined above. This will defer the possible service date back to at least the second quarter of 2009.

Local Network Impacts

The impact of the proposed generating facility on the AEP System was assessed for adherence with applicable reliability criteria. AEP planning criteria require that the transmission system meet single contingency performance criteria in accordance with the AEP FERC Form 715. Therefore, this criterion was used to assess the impact of the proposed facility on the AEP System. The WM Renewable Energy project was studied as a 6.4 MW net capacity. The results are summarized below for both interconnection options.

Normal System (2012 Summer Conditions)

- No additional problems identified.

Single Contingency (2012 Summer Conditions)

- No additional problems identified.

Short Circuit Analysis

- No problems identified.

Stability Analysis

- AEP staff was consulted regarding the stability of the system regarding the proposed new generation. In neither case do we anticipate any stability issues, and thus stability studies were not performed.

Reactive Requirements

Studies were run assuming a generation power factor between .9 lagging and .95 leading will be maintained.

Network Impacts

The queue project T101 was studied as a 6.4MW (capacity) injection into AEP's system. Two options were considered during this study: option 1 was a direct connection to the Glassrock 69kV substation, while option 2 was a tap of the Crooksville to North Newark 138kV line. T101 was evaluated for compliance with reliability criteria for summer peak conditions in 2012. Potential network impacts were as follows:

Option 1: Glassrock 69kV

Generator Deliverability

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

No problems identified.

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

No problems identified.

Short Circuit

No problems identified

Stability

Not required due to size of project.

Contribution to Previously Identified Overloads

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

No problems identified.

New System Reinforcements

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

None.

Contribution to Previously Identified System Reinforcements

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

None.

Option 2: Crooksville – North Newark 138kV

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

No problems identified.

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

No problems identified.

Short Circuit

No problems identified.

Stability

Not required due to size of project.

Contribution to Previously Identified Overloads

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

No problems identified.

New System Reinforcements

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

None.

Contribution to Previously Identified System Reinforcements

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

None.

Exhibit 1: Location of the proposed facilities (Inset area is shown on Exhibit 2)

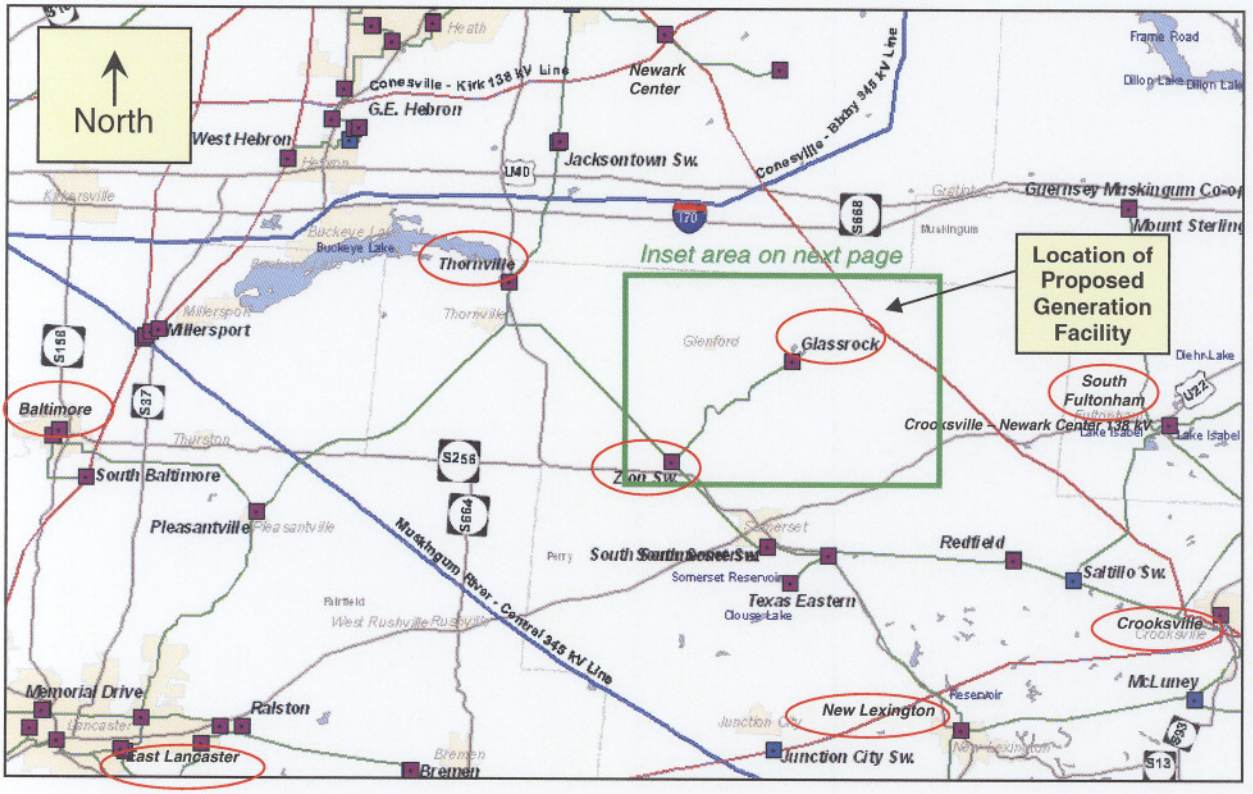

Exhibit 2: Location of the proposed facilities – Inset area of Exhibit 1

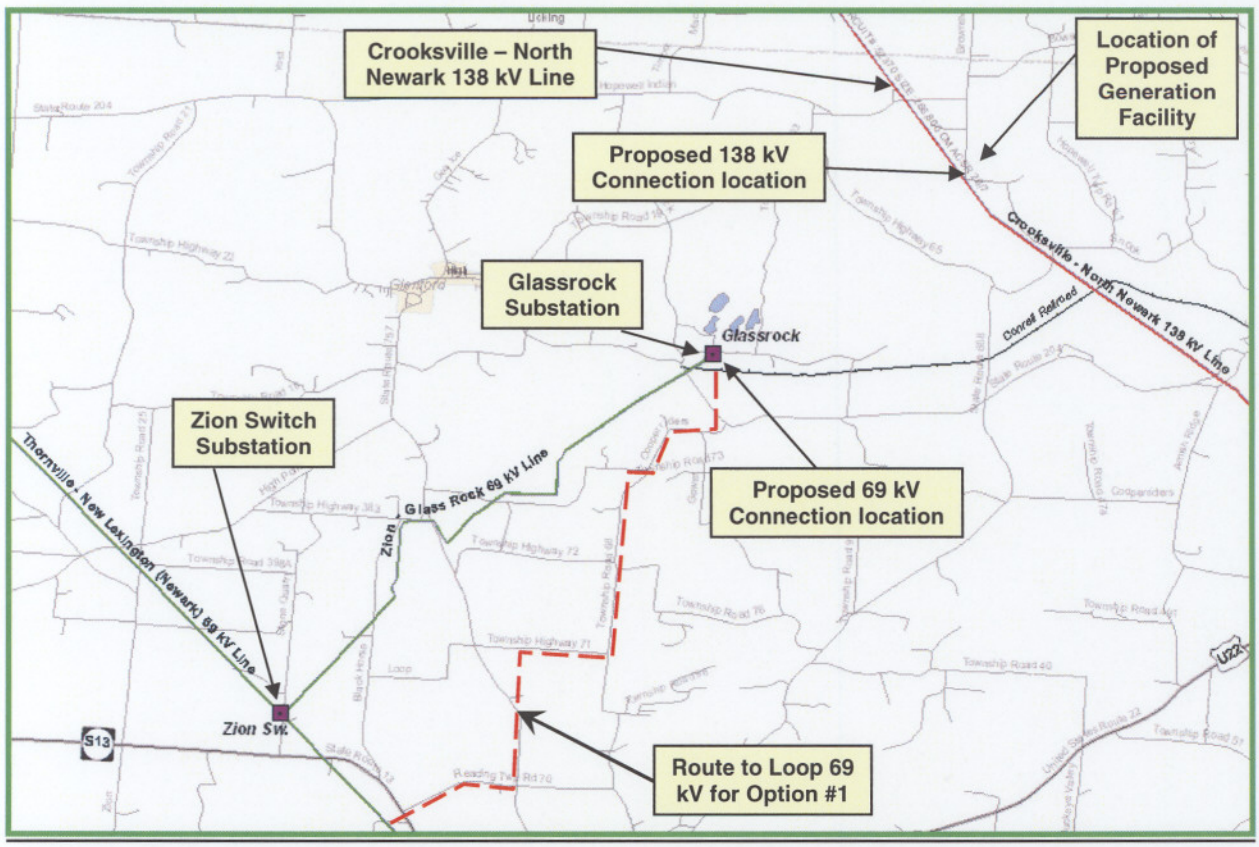

Exhibit 3: Simplified diagram of proposed 69 kV Glassrock Substation service connection (Option #1)

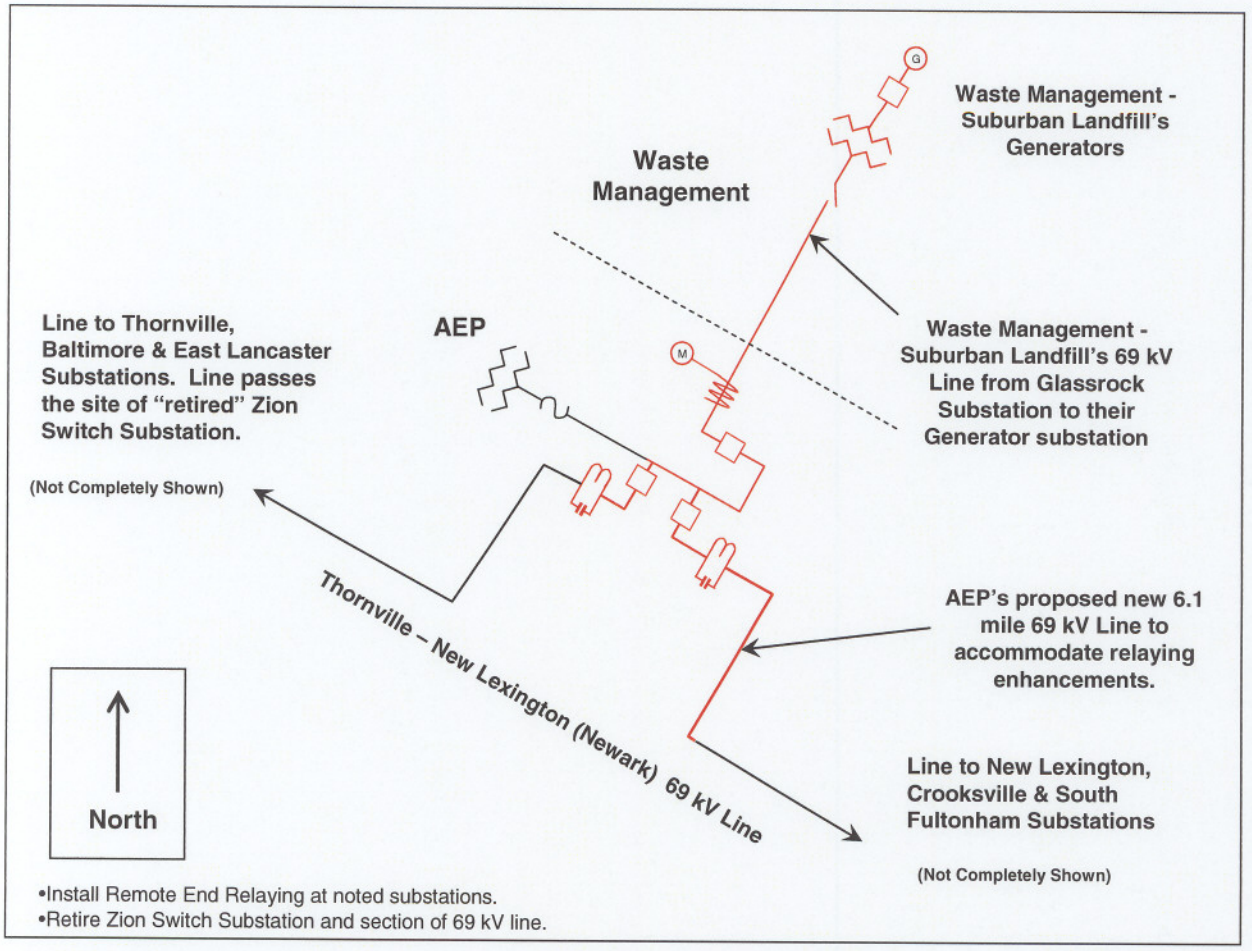

Exhibit 4: Simplified diagram of proposed 138 kV service connection (Option #2)