Generation Interconnection

Facilities Study Report

For

Queue Project AE1-212

Grandview - Clifftop 138 kV

Raleigh County, West Virginia

90 MW Energy / 53.3 MW Capacity

February 2022

1 Facilities Study Summary

1.1 Project Description

Raleigh Solar I, LLC proposes to install PJM project AE1-212, a 90 MW (53.3 MW Capacity) Solar generating facility in Raleigh County, West Virginia (Figure 2). The point of interconnection for the generating facility will be a new station cut into the Grandview - Clifftop section of the Grandview - Cherry Creek 138 kV circuit.

1.2 Amendments/Changes to the Impact Study Report

No significant amendments/changes noted.

1.3 Interconnection Customer Schedule

PJM and AEP understand that the Interconnection Customer (IC) has requested the following schedule dates:

Receive back feed power from AEP: 4/1/2022

Generation Commercial Operation Date: 6/30/2022

1.4 AEP's Scope of Work to Facilitate Interconnection

- The Grandview - Clifftop section of the Grandview - Cherry Creek 138 kV circuit will be tapped by constructing a new three (3) circuit breaker 138 kV station physically configured and operated as a ring bus (Figure 1).
- Associated protection and control equipment, line risers, switches, jumpers, SCADA, and 138 kV revenue metering will also be installed at the proposed 138 kV station. AEP reserves the right to specify the final acceptable configuration considering design practices, future expansion, and compliance requirements.
- AEP will extend, and own, one span of 138 kV transmission line for the generation lead going to the AE1-212 site.
- Two fiber connections are required. AEP will extend the fiber-optic cables from the proposed 138 kV station control house to the points of transition. The customer will be responsible for the fiber work on the IPP side of the points of transition..
- AEP will review and revise (as needed) the remote end station protection schemes and settings.

1.5 Description of Transmission Owner Facilities Included in the Facilities Study

1.5.1 Direct Connection Work

- The Grandview - Clifftop section of the Grandview - Cherry Creek 138 kV circuit will be tapped by constructing a new three (3) circuit breaker 138 kV station physically configured and operated as a ring bus (Figure 1).
- AEP will install associated line protection and control equipment, line risers, switches, jumpers, and SCADA at the proposed 138 kV station.

1.5.2 Non-Direct Connection Work

- AEP will construct 138 kV line extensions from the two proposed dead end structures at the existing Right of Way of the Grandview - Clifftop section of the Grandview - Cherry Creek 138 kV circuit and perform final connection of the circuit to the new station.
- AEP will upgrade the protection and control equipment to use a fiber-based relay scheme, and review settings at the Grandview station and adjust as needed.
- AEP will review the protection and control settings at the Cherry Creek station and adjust as needed.
- AEP will perform a protection and controls checkout including end-to-end testing.

1.5.3 Attachment Facilities Work

- Two fiber connections are required. AEP will extend the fiber-optic cables from the proposed 138 kV station control house to the points of transition. The customer will be responsible for the fiber work on the IPP side of the points of transition.
- AEP will install 138 kV revenue metering at the proposed 138 kV station.
- AEP will extend, and own, one span of 138 kV transmission line for the generation lead going to the AE1-212 site.

1.5.4 Network Upgrade Work

Due to system overloads found during the PJM studies, the following network reinforcements are required:

- None

1.6 Total Cost of Transmission Owner Facilities Included in the Facilities Study:

Attachment Facilities	$565,088.73
Direct Connection Facilities	$3,903,260.27
Non-Direct Connection Facilities	$1,716,317.00
Network Upgrade Facilities	$0
Total Cost	$6,184,666.00

The estimates do not include the impact that delays in obtaining ROW, permits, or other approvals may have.

1.7 Summary of Schedule Milestones for Completion of Transmission Owner Work Included in Facilities Study:

Standard Process

Task	Dates***
Engineering Start	Day 1*
Material Ordered	Day 60
Construction Start (Grading & Below Grade)	Day 394
Construction Start (Above Grade)	Day 460
Outage Requests Made By	Day 180
Outage (Structure Foundations)**	Day 394
Outage (Cut-in & Testing)**	Day 700
Ready For Back Feed (TO In-Service Date)	Day 730

*** Day 1 occurs the first working day after ISA/CSA have been fully excuted.**

****Scheduled Outages are contingent upon outage availability. Longer duration outages are not available during peak load periods.**

*****Significant scope of work changes will impact the above schedule.**

Assumptions

- **Estimates provided are based on a table top process without the benefit of the results of site specific engineering studies (e.g., soil borings, environmental survey, ground grid, etc.), unless otherwise provided by the interconnection customer.**
- **System conditions must allow scheduled outages to occur. All transmission outages are subject to PJM and AEP Operations BES outage scheduling requirements.**
- **The customer will obtain, at its cost, all necessary provisions for the AEP direct connection facilities.**
- **The customer will perform site development and road construction in accordance with AEP specifications as required for this interconnection.**
- **The customer will provide a site acceptable to AEP (for transfer in Fee Simple) and any required additional easements for the 138 kV station and line work to enable access to all facilities and structures.**
- **The customer will have their construction and required checkout complete prior to the start of the interconnection to the proposed 138 kV station and any required testing outages.**

2 Transmission Owner Facilities Study Results

2.1 Transmission Lines - New

- AEP will extend one span of 138 kV transmission line for the generation lead going to the AE1-212 site.
- Grandview - Clifftop section of the Grandview - Cherry Creek 138 kV:

  Construct 138 line extensions from the two proposed dead end structure(s) at the existing circuit Right of Way to the new AE1-212 138 kV interconnection station and perform final connection of the 138 kV circuit to the new station.

2.2 Transmission Line - Upgrades

- No transmission line upgrades will be required for this project.

2.3 Station Facilities - New

- A new 138 kV station will be established consisting of a 3-breaker ring bus loop fed by tapping AEP's Grandview - Clifftop section of the Grandview - Cherry Creek 138 kV circuit.
- Associated protection and control equipment, line risers, switches, jumpers, SCADA, and 138 kV revenue metering will also be installed at the proposed 138 kV station. AEP reserves the right to specify the final acceptable configuration considering design practices, future expansion, and compliance requirements.

2.4 Station Facilities - Upgrades

- Protective relay equipment at AEP's Grandview remote end station will be upgraded to use a fiber-based protection scheme on the circuit between the proposed new station and Grandview, including new settings (as needed) to coordinate with the proposed 138 kV station and generation.

- Protective relay settings at AEP's Cherry Creek remote end station will be reviewed and updated (as needed) to coordinate with the proposed 138 kV station and generation.

2.5 Metering & Communications

Standard 138 kV metering will be installed at the proposed 138 kV station. A standard station communication scheme will be used. All metering equipment shall meet the requirements as specified by AEP in the 'AEP Metering and Telemetering Requirements for AEP Transmission Customers' document (SS-490011). Communication requirements are published in the 'AEP SCADA RTU Requirements at Transmission Interconnection Facilities' (SS-500000).

Two fiber connections are required. AEP will extend the fiber-optic cables from the proposed 138 kV station control house to the points of transition. The customer will be responsible for the fiber work on the IPP side of the points of transition.

The Generation Interconnection Agreement does not in or by itself establish a requirement for American Electric Power to provide power for consumption at the developer's facilities. A separate agreement must be reached with the local utility that provides service in the area to ensure that infrastructure is in place to meet this demand and proper metering equipment is installed. The metering work described above and the associated cost estimates indicated below do not include any potential work or cost to address metering requirements of the local service provider. It is the responsibility of the developer to contact the local service provider to obtain a local service agreement. This is required prior to energization.

2.6 Environmental, Real Estate, and Permitting Issues

The Interconnection customer is expected to obtain, at its cost, all necessary permits and provisions for the IPP station connecting to the proposed 138 kV station.

2.7 System Modeling and Operating Requirements

In addition to the IPP modeling requirements imposed by PJM as part of the Generation Interconnection process, the following system modeling parameters are required to be supplied by the Interconnection Customer to AEP:

- Modeling parameters are required as outlined in the 'Connection Requirements for the AEP Transmission System.' These requirements can be accessed at: https://aep.com/requiredpostings/AEPTransmissionStudies

2.8 Summary of Results of Study

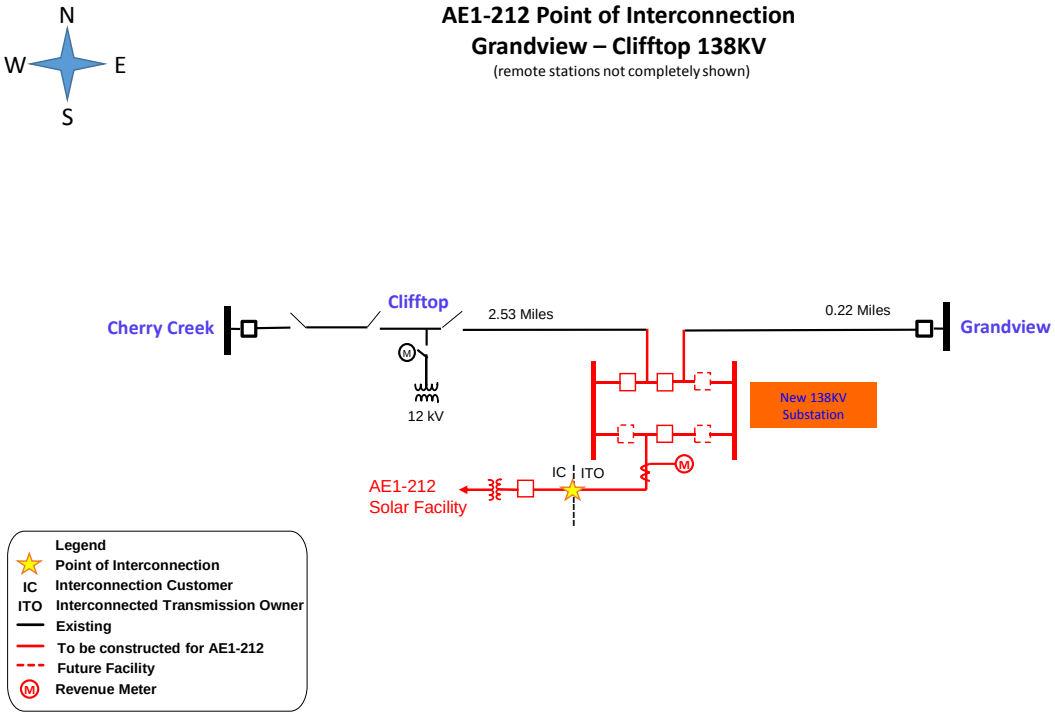
Cost Estimates for AEP

Task	Network Upgrade Number	Engineering	Material	Construction	Other	TOTAL
New 138 kV Switching Station	N8004	$358,361.00	$1,925,126.00	$1,311,197.00	$289,572.00	$3,884,257.00
Grandview - Clifftop 138 kV T-Line Tap	N8005	$198,212.33	$166,719.33	$671,031.33	$185,504.00	$1,221,466.99
Cherry Creek Relay setting updates	N8007	$12,483.00	$2,633.00	$11,696.00	$19,542.00	$46,354.00
Grandview Remote End Relay Upgrades	N8006	$77,231.00	$71,583.00	$107,896.00	$45,492.00	$302,202.00
Grandview - New Station install Fiber for relaying	N8008	$15,625.67	$23,802.67	$89,608.67	$17,257.00	$146,294.01
Fiber for IPP station	N8003	$15,526.67	$25,595.67	$96,810.67	$19,694.00	$157,627.01
AEP 138 kV Metering	N8003	$60,119.33	$115,046.33	$80,770.33	$45,035.00	$300,970.99
Install single span for the generator lead circuit	N8003	$23,064.00	$16,302.00	$58,706.00	$27,423.00	**$125,494.00**
TOTAL		**$760,623.00**	**$2,346,808.00**	**$2,427,716.00**	**$649,519.00**	**$6,184,666.00**

2.9 Information Required for Interconnection Service Agreement

Description	DCF Facility	NUF Facility	ATF Facility	TOTAL
Direct Material	$1,925,126.00	$264,738.00	$156,944.00	$2,346,808.00
Direct Labor	$1,669,558.00	$1,183,784.00	$334,997.00	$3,188,339.00
Indirect Material	$165,257.42	$47,641.19	$25,297.71	$238,196.32
Indirect Labor	$143,318.85	$220,153.81	$47,850.02	$411,322.68
TOTAL	$3,903,260.27	$1,716,317.00	$565,088.73	$6,184,666.00

Figure 1: Point of Interconnection One-Line Diagram



The Point of Interconnection is the first structure outside of the new 138 kV station (such structure being located in Interconnection Customer's Collector Substation) with the Interconnected Transmission Owner owning the first span of conductors, and the Interconnection Customer owning the first structure.

Figure 2: Point of Interconnection Map