



**Generation Interconnection  
Feasibility Study Report  
for  
Queue Project AG1-045  
REDBUD-GAYLORD 34.5 KV  
18 MW Capacity / 36 MW Energy**

January 2021

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## 1 Introduction

This Feasibility Study has been prepared in accordance with the PJM Open Access Transmission Tariff, 36.2, as well as the Feasibility Study Agreement between the Interconnection Customer (IC), and PJM Interconnection, LLC (PJM), Transmission Provider (TP). **The AG1-045 customer will be an interconnection to Rappahannock Electric Cooperative (REC) facilities. REC will provide the scope, cost and schedule for this physical interconnection in a separate report to follow. This PJM report identifies the effects on the transmission system and also includes some work that FirstEnergy has identified (APS – Potomac Edison zone).**

## 2 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. Cost allocation rules for network upgrades can be found in PJM Manual 14A, Attachment B. 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 Interconnection Customer seeking to interconnect a wind or solar generation facility shall maintain meteorological data facilities as well as provide that meteorological data which is required per Schedule H to the Interconnection Service Agreement and Section 8 of Manual 14D.

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.

### 3 General

The Interconnection Customer (IC), has proposed a Solar; Storage generating facility located in Frederick County, Virginia. The installed facilities will have a total capability of 36 MW with 18 MW of this output being recognized by PJM as Capacity. The proposed in-service date for this project is December 01, 2023. This study does not imply a TO commitment to this in-service date.

Final attachment facilities and local upgrades (if required) along with terms and conditions to interconnect AG1-045 will be specified in a separate two party Interconnection Agreement (IA) between REC and the Interconnection Customer as this project is considered FERC non-jurisdictional per the PJM Open Access Transmission Tariff (OATT).

From the transmission perspective, the impacts are were analyzed and detailed in the “Network Impacts” section below.

<b>Queue Number</b>	<b>AG1-045</b>
<b>Project Name</b>	REDBUD-GAYLORD 34.5 KV
<b>State</b>	Virginia
<b>County</b>	Frederick
<b>Transmission Owner</b>	APS – Potomac Edison
<b>MFO</b>	36
<b>MWE</b>	36
<b>MWC</b>	18
<b>Fuel</b>	Solar; Storage
<b>Basecase Study Year</b>	2024

Any new service customers who can feasibly be commercially operable prior to June 1st of the basecase study year are required to request interim deliverability analysis.

## 4 Point of Interconnection

AG1-045 will interconnect with the REC system by tapping the Redbud - Gaylord 34.5 kV line. The transmission line tap will be located approximately 2.92 miles from Redbud substation and 9.2 miles from Gaylord substation. The IC will be responsible for acquiring all easements, properties, and permits that may be required to construct both the new interconnection line tap and the associated Attachment facilities.

Attachment 1 shows a one-line diagram of the proposed primary direct connection facilities for the AG1-045 generation project to connect to the Rappahannock Electric Cooperative (REC) transmission system. IC will be responsible for constructing all of the facilities on its side of the POI, including the Attachment facilities which connect the generator to the REC transmission system.

## 5 Cost Summary

The AG1-045 project will be responsible for the following costs:

Description	Total Cost
<b>Total Physical Interconnection Costs</b>	\$1,026,000 + Costs from REC to be determined
<b>Total System Network Upgrade Costs</b>	\$0
<b>Total Costs</b>	<b>\$1,026,000</b>

This cost excludes a Federal Income Tax Gross Up charges. This tax may or may not be charged based on whether this project meets the eligibility requirements of IRS Notice 2016-36, 2016-25 I.R.B. (6/20/2016). If at a future date it is determined that the Federal Income Tax Gross charge is required, the Transmission Owner shall be reimbursed by the Interconnection Customer for such taxes.

Cost allocations for any System Upgrades will be provided in the System Impact Study Report.

## 6 Transmission Owner Scope of Work

The project will interconnect with the REC-owned Redbud-Gaylord 34.5 kV line.

The interconnection of the project at the Primary POI will be accomplished by tapping the Redbud - Gaylord 34.5 kV line. The transmission line tap will be located approximately 2.92 miles from Redbud substation and 9.2 miles from Gaylord substation. The IC will be responsible for acquiring all easements, properties, and permits that may be required to construct both the new interconnection line tap and the associated Attachment facilities.

REC will be responsible for providing the interconnection requirements for this Point of Interconnection in a separate report to follow. FE will upgrade relaying at Redbud and Gaylord substations.

The total physical interconnection costs is given in the table below:

<b>Description</b>	<b>Total Cost</b>
Upgrade relaying at Redbud 34.5 kV.	\$513,000
Upgrade relaying at Gaylord 34.5 kV.	\$513,000
REC Interconnection Work	Interconnection Customer to contact REC
<b>Total Physical Interconnection Costs</b>	<b>\$1,026,000 + Costs from REC to be determined</b>

## **7 Schedule**

The AG1-045 customer will be an interconnection to REC's facilities. REC will provide the scope, cost and schedule for this physical interconnection in a separate report to follow. This PJM report identifies the effects on the transmission system as an injection into the REC Redbud-Gaylord 34.5 kV bus.

FirstEnergy indicates that they will need 5 months for their portion of work identified in this report.

## **8 Transmission Owner Analysis**

### **8.1 Power Flow Analysis**

FE performed an analysis of its underlying transmission <100 kV system. The AG1-045 project did not contribute to any overloads on the FE transmission <100 kV system.

REC will also perform analysis of their lower voltage system and provide results in a separate report to follow.

## **9 Interconnection Customer Requirements**

REC will provide any specific interconnection requirements in their report to follow.

## 10 Revenue Metering and SCADA Requirements

### 10.1 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 Section 8 of Attachment O.

### 10.2 Meteorological Data Reporting Requirements

The solar generation facility shall provide the Transmission Provider with site-specific meteorological data including:

- Back Panel temperature (Fahrenheit) - (Required for plants with Maximum Facility Output of 3 MW or higher)
- Irradiance (Watts/meter<sup>2</sup>) - (Required for plants with Maximum Facility Output of 3 MW or higher)
- Ambient air temperature (Fahrenheit) - (Accepted, not required)
- Wind speed (meters/second) - (Accepted, not required)
- Wind direction (decimal degrees from true north) - (Accepted, not required)

### 10.3 Interconnected Transmission Owner Requirements

The IC will be required to comply with all Interconnected Transmission Owner's revenue metering requirements for generation interconnection customers located at the following link:

<http://www.pjm.com/planning/design-engineering/to-tech-standards/>

## 11 Summer Peak - Load Flow Analysis

The Queue Project AG1-045 was evaluated as a 36.0 MW (Capacity 18.0 MW) injection tapping the Redbud to Gaylord 34.5 kV line in the APS area. Project AG1-045 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AG1-045 was studied with a commercial probability of 53.0 %. Potential network impacts were as follows:

### **11.1 Generation Deliverability**

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

None.

### **11.2 Multiple Facility Contingency**

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

None.

### **11.3 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)

None.

### **11.4 Potential Congestion due to Local Energy Deliverability**

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.

Note: Only the most severely overloaded conditions are listed below. 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 shall study all overload conditions associated with the overloaded element(s) identified.

None.

## 11.5 System Reinforcements - Summer Peak Load Flow - Primary POI

None.

## 11.6 Flow Gate Details

The following indices contain additional information about each facility presented in the body of the report. For each index, a description of the flowgate and its contingency was included for convenience. The intent of the indices is to provide more details on which projects/generators have contributions to the flowgate in question. All New Service Queue Requests, through the end of the Queue under study, that are contributors to a flowgate will be listed in the indices. Please note that there may be contributors that are subsequently queued after the queue under study that are not listed in the indices. Although this information is not used "as is" for cost allocation purposes, it can be used to gage the impact of other projects/generators. It should be noted the project/generator MW contributions presented in the body of the report are Full MW Impact contributions which are also noted in the indices column named "Full MW Impact", whereas the loading percentages reported in the body of the report, take into consideration the PJM Generator Deliverability Test rules such as commercial probability of each project as well as the ramping impact of "Adder" contributions. The MW Impact found and used in the analysis is shown in the indices column named "Gendeliv MW Impact".

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None.

## 11.7 Queue Dependencies

The Queue Projects below are listed in one or more indices for the overloads identified in your report. These projects contribute to the loading of the overloaded facilities identified in your report. The percent overload of a facility and cost allocation you may have towards a particular reinforcement could vary depending on the action of these earlier projects. The status of each project at the time of the analysis is presented in the table. This list may change as earlier projects withdraw or modify their requests.

None.

## 11.8 Contingency Descriptions

None.

## **12 Short Circuit Analysis**

The following Breakers are overdutied:

None.

### **12.1 System Reinforcements - Short Circuit**

No short circuit impacts were identified for this project.

## 13 Affected Systems

### 13.1 NYISO

NYISO Impacts to be determined during later study phases (as applicable).

## 14 Attachment 1: One Line Diagram