REDACTED

INFORMATION SHEET

PRESIDING: Commissioner Duffley, Chair Mitchell, and Commissioner Clodfelter
PLACE: Via Videoconference
DATE: Tuesday, November 23, 2021
TIME: 9:30 a.m. – 10:51 a.m.
DOCKET NOS.: EMP-117, Sub 0
COMPANY: Shawboro East Ridge Solar, LLC
DESCRIPTION: Application for a Certificate of Public Convenience and Necessity to Construct a 150-MW Solar Facility in Currituck County, NC

VOLUME NUMBER:

APPEARANCES
See Attached

WITNESSES
See Attached

EXHIBITS
See Attached

CONFIDENTIAL COPIES OF TRANSCRIPTS AND EXHIBITS ORDERED BY: Ms. Luhr and Mr. Eason

REPORTED BY: Kim Mitchell
TRANSCRIBED BY: Kim Mitchell
DATE FILED: December 14, 2021

TRANSCRIPT PAGES: 69
PREFILED PAGES: 37
TOTAL PAGES: 106

I/A

STATE OF NORTH CAROLINA
UTILITIES COMMISSION
RALEIGH, NORTH CAROLINA

DOCKET NO. EMP-117, Sub 0

In the Matter of the Application of Shawboro East Ridge Solar, LLC for a Certificate of Public Convenience and Necessity for Merchant Plant Pursuant to N.C. Gen. Stat. 62-110.1 and Commission Rule R8-63	SHAWBORO EAST RIDGE SOLAR, LLC'S APPLICATION FOR A CERTIFICATE OF PUBLIC CONVENIENCE AND NECESSITY FOR 150 MW MERCHANT PLANT

Shawboro East Ridge Solar, LLC (the "Applicant"), by and through its undersigned counsel, hereby applies to the North Carolina Utilities Commission (the "Commission") pursuant to N.C. Gen. Stat. § 62-101.1, and Commission Rule R8-63, for a Certificate of Public Convenience and Necessity for Merchant Plant authorizing the construction of a solar photovoltaic merchant plant facility with a capacity of 150 MW AC to be located in Currituck County, North Carolina. In support of its application, the Applicant provides the Commission with the exhibits attached hereto as required by N.C.U.C. Rule R8-63, and also shows unto the Commission the following:

1. Exhibit 1 attached hereto contains the required information about the Applicant.

2. All correspondence, documents and filings regarding this application should be sent to:

Joseph W. Eason
Nelson Mullins Riley & Scarborough LLP
GlenLake One, Suite 200
4140 Parklake Avenue
Raleigh, North Carolina 27612
Tel: (919) 329-3800
joe.eason@nelsonmullins.com
Attorney for the Applicant

And, with a copy also to the following corporate agent of Applicant:

Shawboro East Ridge Solar, LLC
Attn: Kenny Habul
192 Raceway Drive
Mooresville, NC 28117
704-662-0375
project.development@sunenergyl.com

The Applicant and its Counsel consent to electronic service of filings related to this application.

3. Exhibit 2 attached hereto contains the required information about the proposed generation facility.

4. Exhibit 3 attached hereto provides a description of the need for the facility in the state and/or region, with supporting documentation.

5. Exhibit 4 attached hereto provides information regarding the interconnection and estimated system impact of the project that has recently been requested of applicants by way of supplemental testimony.

6. This Application has been signed and verified by an individual duly authorized to act on behalf of the Applicant for that purpose.

7. This Application is submitted together with the pre-filed direct testimony of Linda Nwadike, Director of Permitting and Community Relations for SunEnergyl, which testimony incorporates and supports this application and is submitted on behalf of the Applicant in accordance with NCUC Rule R8-63 (b)(5).

8. Confidential Information has been designated as such and filed under seal with this Commission contemporaneously with the filing of this Application in accordance with Rule R8-63(c).

WHEREFORE, the Applicant, Shawboro East Ridge Solar, LLC, respectfully prays that this Commission consider the foregoing information submitted in support of this application and issue the Applicant a Certificate of Public Convenience and Necessity for the construction of the merchant plant described herein in accordance with N.C. Gen. Stat. §62-110.1 and NCUC Rule R8-63.

Respectfully submitted this 18th day of June, 2021.

Joseph W. Eason
Nelson Mullins Riley & Scarborough LLP
4140 Parklake Avenue, Suite 200
Raleigh, NC 27612

Tel: (919) 329-3800
joe.eason@nelsonmullins.com

Attorneys for the Applicant

Shawboro East Rudge Solar, LLC
CPCN Application – Merchant Plant
NCUC EMP-117, sub 0

INFORMATION ABOUT THE APPLICANT
EXHIBIT 1

i. The full and correct name, business address, business telephone number and electronic mailing address of the Applicant;

Shawboro East Ridge Solar, LLC
192 Raceway Drive
Mooresville, NC 28117
704-662-0375
project.development@sunenergy1.com

ii. A description of the Applicant, including the identities of its principal participant(s) and officers, and the name and business address of a person authorized to act as corporate agent or to whom correspondence should be directed;

Shawboro East Ridge Solar, LLC is a North Carolina limited liability company formed on August 29, 2014. Kenny Habul is duly authorized to act as a registered agent of the Applicant for the purpose of this application. A copy of the Articles of Organization of the Applicant as filed with the North Carolina Secretary of State is attached as **Schedule 1-1**.

iii. A copy of the applicant's most recent annual report to stockholders, which may be attached as an exhibit, or, if the applicant is not publicly traded, its most recent balance sheet and income statement. If the applicant is a newly formed entity with little history, this information should be provided for its parent company, equity partner, and/or the other participant(s) in the project;

Shawboro East Ridge Solar, LLC is an affiliate of SunEnergy1, LLC ("SunEnergy1"); SunEnergy1 is the direct parent of the Applicant.

SunEnergy1 is one of the largest solar developers and engineering, procurement, and construction companies in the U.S. SunEnergy1 is not a publicly traded company; therefore, its most recent balance sheet and income statement are filed under seal as confidential information (See **Confidential Schedule 1-2** included with the Confidential Documents submitted with this Application).

iv. Information about generating facilities in the Southeastern Electric Reliability Council region which the Applicant or an affiliate has any ownership interest in and/or the ability

to control through leases, contracts, options, and/or other arrangements and information about certificates that have been granted for any such facilities not yet constructed.

The Applicant does not have any generating facilities in the Southern Electric Reliability Council region. The Applicant is an individual project company formed to own the solar facility assets for the project that is the subject of this application.

The Applicant's parent-affiliate, SunEnergy1 has ownership interest in and/or the ability to control through leases or contracts numerous solar generating facilities in the Southeastern Electric Reliability Council ("SERC") region. A list of generating facilities that SunEnergy1 has constructed within the Southern Electric Reliability Council region is attached as **Schedule 1-3**. A list of generating facilities that SunEnergy1 has under development but have not been completed sufficient to achieve commercial operation is attached as **Schedule 1-4**.

Schedule 1-1

Articles of Organization

NORTH CAROLINA
Department of the Secretary of State

To all whom these presents shall come, Greetings:

I, Elaine F. Marshall, Secretary of State of the State of North Carolina, do hereby certify the following and hereto attached to be a true copy of

ARTICLES OF ORGANIZATION

OF

SHAWBORO EAST RIDGE SOLAR, LLC

the original of which was filed in this office on the 29th day of August, 2014.

Scan to verify online.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed my official seal at the City of Raleigh, this 29th day of August, 2014.

Elaine F. Marshall

Secretary of State

State of North Carolina
Department of the Secretary of State

SOSID: 1398576
Date Filed: 8/29/2014 2:42:00 PM
Elaine F. Marshall
North Carolina Secretary of State

C2014 240 00881

OFFICIAL COPY

Dec 14 2021

Limited Liability Company
ARTICLES OF ORGANIZATION

Pursuant to §57D-2-20 of the General Statutes of North Carolina, the undersigned does hereby submit these Articles of Organization for the purpose of forming a limited liability company.

1. The name of the limited liability company is: Shawboro East Ridge Solar, LLC
(See Item 1of the Instructions for appropriate entity designation)

2. The name and address of each person executing these articles of organization is as follows: (State whether each person is executing these articles of organization in the capacity of a member, organizer or both. **Note: This document must be signed by all persons listed.**)
Alicia Nerad, Organizer, 192 Raceway Dr., Mooresville, NC 28117

3. The name of the initial registered agent is: Kenny Habul

4. The street address and county of the initial registered agent office of the limited liability company is:

Number and Street 192 Raceway Dr.

City Mooresville State: NC Zip Code: 28117 County: Iredell

5. The mailing address, if different from the street address, of the initial registered agent office is:

Number and Street _____

City _____ State: NC Zip Code: _____ County: _____

6. Principal office information: (Select either a or b.)

a. ☒ The limited liability company has a principal office.

The principal office telephone number: 704-662-0375

The street address and county of the principal office of the limited liability company is:

Number and Street 192 Raceway Dr.

City Mooresville State: nc Zip Code: 28117 County: iredell

The mailing address, if different from the street address, of the principal office of the company is:

Number and Street _____

City_____ State: _____ Zip Code: _____ County: _____

b. ☐ The limited liability company does not have a principal office.

7. Any other provisions which the limited liability company elects to include (e.g., the purpose of the entity) are attached.

8. (Optional): Please provide a business e-mail address: *Privacy Redaction*
The Secretary of State's Office will e-mail the business automatically at the address provided above at no cost when a document is filed. The e-mail provided will not be viewable on the website. For more information on why this service is offered, please see the instructions for this document.

9. These articles will be effective upon filing, unless a future date is specified:

_____

This is the 28 day of August, 2014.

Alicia Nerad

Signature

Alicia Nerad, Organizer

Type or Print Name and Title

The below space to be used if more than one organizer or member is listed in Item #2 above.

_____ _____

Signature Signature

Type and Print Name and Title Type and Print Name and Title

_____ _____

Signature Signature

Type and Print Name and Title Type and Print Name and Title

NOTES:
1. Filing fee is $125. This document must be filed with the Secretary of State.

Schedule 1-2

CONFIDENTIAL

FINANCIAL STATEMENTS

Schedule 1-3

Applicant's other affiliated generating facilities in the Southeastern Electric Reliability Council Region

The Applicant's affiliate SunEnergy1 has completed numerous solar generating facilities in the Southeastern Electric Reliability Council (SERC) region as shown in the below table.

Sites developed by SunEnergy1 with potential ownership Interest through lessees or contracts:

Project	MW	County/State	Completion Date
Bethel	7	Pitts, NC	May 2016
Elizabeth City	28	Pasquotank, NC	April 2015
Everetts	7	Martin, NC	April 2015
Scotland Neck	28	Halifax, NC	March 2014
Battleboro	7	Edgecombe, NC	June 2015
Conetoe II	112	Edgecombe, NC	April 2016
Creswell	19.95	Washington, NC	June 2015
Kelford	30.10	Bertie, NC	February 2016
Sunbury	7	Gates, NC	March 2016
Whitakers	16.8	Whitakers, NC	February 2016
Whitepost I	14.99	Beaufort, NC	February 2013
Whitepost II	6.4	Beaufort, NC	May 2014
Windsor	7	Bertie, NC	April 2014
River Road	7	Hertford, NC	December 2016
Leggett	7	Whitakers, NC	July 2017
Barnhill	4	Pasquotank, NC	December 2016
Aulander Hwy 42	7	Hertford, NC	July 2017
Summit	84	Currituck, NC	February 2017
Shiloh Hwy 1108	7	Camden, NC.	March 2018
Sandy Solar	7	Camden, NC	April 2018
Chowan Jehu	7	Chowan, NC	March 2018
Scotland Neck 3	4	Halifax, NC	January 2015
Elk Park	0.197	Avery, NC	March 2012
SE1-Asheville	0.25	Buncombe, NC	May 2010
Plymouth Solar	6.5	Plymouth, NC	December 2014
Pamlico Solar	6.6	Beaufort, NC	February 2014
Choco Solar	7	Beaufort, NC	March 2015
Sugar Run Solar	6.6	Gates, NC	December 2015

Project	MW	County/State	Completion Date
Albertson Solar	7	Duplin, NC	December 2014
Conetoe Solar	6.6	Edgecombe, NC	January 2016
Williamston Speight	20.84	Martin, NC	December 2016
Ranchland	84	Currituck, NC	January 2018
Mill Pond	7	Martin, NC	September 2019
Jamesville	7	Martin, NC	October 2019
Aulander Holloman	112	Hertford, NC	June 2019
Camden Dam	7	Camden, NC	August 2019
Mechanicsville	28	Hanover, VA	October 2020
Gliden Solar	7	Chowan, NC	February 2021

Schedule 1-4
Projects in SERC region in development

Project	MW	County/State	Completion Date
Windsor Hwy 17	7	Bertie, NC	
Ryland Road	7	Chowan, NC	
Albemarle Beach	140	Washington, NC	
Pitt Solar	150	Pitt, NC	
Wildcat Road	7	Martin, NC	
Williamston Hwy 125	7	Martin, NC	
Colice Hall	17	Hertford, NC	
Creswell Hwy 64	20	Tyrell & Washington, NC	
Manning	7	Edgecombe, NC	
Cherry Solar	180	Northampton	
Oak Solar	120	Northampton	

Shawboro East Ridge Solar, LLC
CPCN Application – Merchant Plant
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INFORMATION ABOUT THE PROPOSED FACILITY
EXHIBIT 2

i. The nature of the proposed generating facility, including its type, fuel, expected service life, and the gross, net, and nameplate generating capacity of each generating unit and the entire facility, as well as the facility's total projected dependable capacity, in megawatts (alternating current); the anticipated beginning date for construction; the expected commercial operation date; and estimated construction costs;

The Applicant is proposing to construct a 150MW AC solar facility in Currituck County, based on the nameplate capacity of the panels. The gross and net capacity of the resource is equal to its nameplate capacity. The expected service life of the facility is approximately 40 years.

The Applicant anticipates beginning construction of the site during 2Q2022 and expects commercial operation of the facility by 4Q2022. The estimated construction cost of the facility is filed under seal as confidential information (See **Confidential Schedule 2-1** of the Confidential documents submitted with this Application).

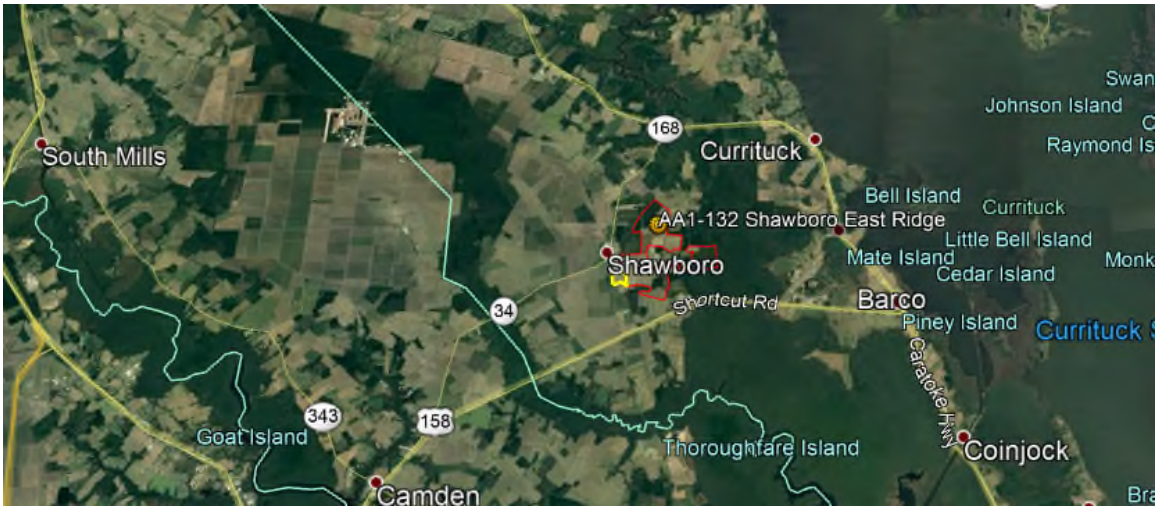
ii. A color map or aerial photo (a U.S. Geological Survey map or aerial photo map prepared via the State's geographic information system is preferred) showing the proposed site boundary and layout, with all major equipment, including the generator, fuel handling equipment, plant distribution system, startup equipment, planned and existing pipelines, planned and existing roads, planned and existing water supplies, and planned and existing electric facilities;

A Site map of Shawboro East Ridge Solar, LLC showing the equipment layout is attached as **Schedule 2-2.**

An aerial view showing the relationship of the site to nearby highways and state boundaries and county lines in its vicinity is reproduced below as Image 2-1.

IMAGE 2-1

General location of site proposed generation resource of Shawboro East Ridge Solar, LLC



iii. The E911 street address, county in which the proposed facility would be located, and GPS coordinates of the approximate center of the proposed facility site to the nearest second or one thousandth of a degree.

E911 addresses have not been assigned for the proposed facility, however the GPS coordinates for the proposed facility is 36.410266, -76.074890.

iv. In the case of natural gas-fired facilities, a map showing the proximity of the facility to existing natural gas facilities; a description of dedicated facilities to be constructed to serve the facility; and any filed agreements, service contracts, or tariffs for interstate pipeline capacity;

The facility is not a natural gas fired facility.

v. A list of all needed federal, state and local approvals related to the facility and site, identified by title and the nature of the needed approval is listed in **Schedule 2-3** attached hereto. The same exhibit includes a copy of such approvals as has been obtained, or a report on the current status of the approvals. There will be no application related to an application for eligible facility status or exempt wholesale generator status pursuant to Section 32 of the Public Utility Holding Company Act of 1935 (PUHCA), as amended by the Energy Policy Act of 1992, including attachments and subsequent amendments as necessary.

vi. The proposed Shawboro Solar generating facility will interconnect with the Dominion (also known as Virginia Electric and Power Company (VEPCO)) transmission system via a new three breaker ring bus switching station that connects on Dominion's Shawboro to Sligo 230 kV line # 269.

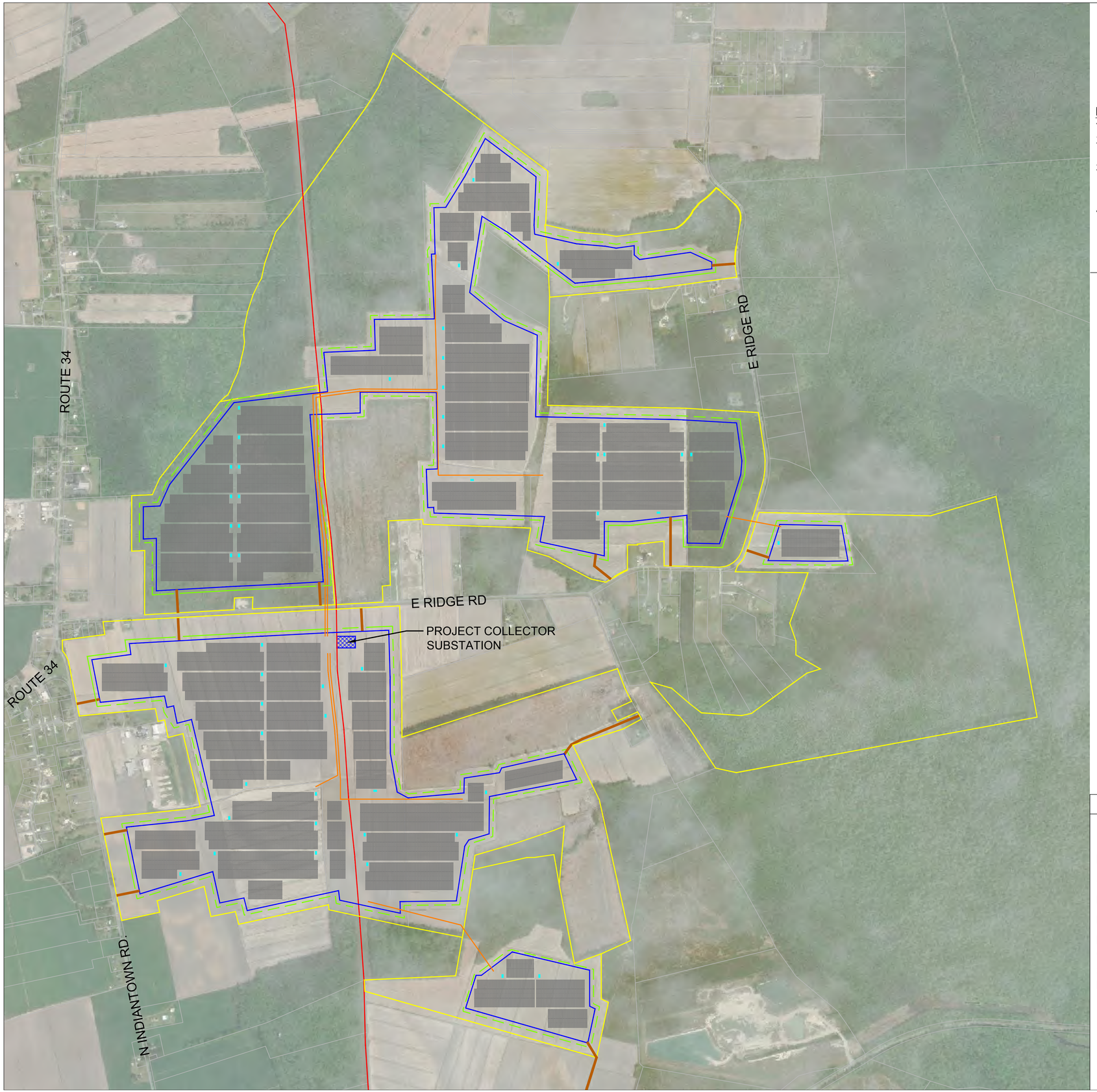
Schedule 2-1

CONFIDENTIAL

ESTIMATED CONSTRUCTION COSTS

Schedule 2-2

Shawboro East Ridge Solar Site Plan



SHAWBORO EAST RIDGE SOLAR, LLC

APPROXIMATE LOCATION
LATITUDE 36.424831
LONGITUDE -76.064464

NOTES:

1. ALL PARCELS USED ARE ZONED AGRICULTURAL
2. ALL EQUIPMENT LOCATIONS ARE PRELIMINARY AND SUBJECT TO CHANGE
3. BUILDINGS THAT HOUSE INVERTER EQUIPMENT MUST FACE AWAY FORM THE NAVAL SUPPORT ACTIVITY NORTHWEST ANNEX
4. A 25 FOOT MAINTENANCE ACCESS DRAINAGE EASEMENT ALONG AT LEAST ONE SIDE OF WATERWAY CONVEYANCE SYSTEMS THAT DRAIN MORE THAN 5 ACRES SHALE BE PROVIDED.

LEGEND

- PROPERTY LINE
- FENCE LINE
- PV ARRAY
- SITE ENTRANCE
- PROJECT OVERHEAD
- EXISTING TRANSMISSION LINE
- EQUIPMENT SKID (Inverter, Transformer, Communications, Etc.)
- 300' MIN SETBACK FROM ROADWAY, TYPE D BUFFER
- 150' MIN SETBACK FROM PROPERTY LINE, TYPE D BUFFER

0 300' 600' 1,200'
SCALE: 1" = 600'

SUNENERGY1
192 Raceway Dr.
Mooresville, NC 28117
(T) 704-662-0375
(F) 704-662-0352

NO.	DATE	DESCRIPTION
1	03/06/18	PROPERTY CHANGES
2	07/31/18	PROPERTY CHANGES
3	05/31/19	UPDATE LAYOUT
4	03/02/21	ADDED DETAILS PER COUNTY
5	03/05/21	Property Changes
6	03/17/21	Updated Layout
7	05/20/21	Removed Eastern Property N Hobbstown Rd / Removed Property on
	05/25/21	CPCN Drawing

DRAWN: CJM
CHECKED: LN

PROJECT NAME
SHAWBORO EAST RIDGE SOLAR, LLC
PV POWER PLANT
IN SHAWBORO, NORTH CAROLINA

SCALE:
JOB NO.
DATE ORIGINAL: 19 FEB 2015
LATEST REVISION: 25 MAY 2021

DRAWING TITLE
PROJECT OVERVIEW

DRAWING NO.
SL2.0

Schedule 2-3

Required List of Permits or Certificates

	Permit/Approval	Status	Copy
Federal			
USACOE	Wetland Delineation	In process	
FERC	Market Base Rate Authorization	Forthcoming	
FERC	EQR	Forthcoming	
State			
CPCN	Generation CPCN-NCUC	Application	
NCDOT	Driveway Permits	Obtained	Y
NCDEQ	Erosion and Sedimentation Control Permit	Forthcoming	
Local			
Currituck County	Use Permit	Forthcoming	
Currituck County	Building/Electrical Permit	Forthcoming	

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

ROY COOPER
GOVERNOR

J. ERIC BOYETTE
SECRETARY

June 2, 2020

Permit # 2805

Subject: Driveway Permit – Shawboro East Ridge Solar, LLC
County: Currituck

SunEnergy1, LLC
192 Raceway Drive
Mooreseville, NC 28117

Dear Applicant,

Attached for your files is a copy of a Commercial / Residential Driveway Permit, which has been properly executed. Please note any comments, which may appear on the permit form.

Sincerely,

David Otts, P.E.
District One Engineer

Attachments

Cc: Division Engineer (W/Attachments)
County Maintenance Engineer (W/Attachments)

1929 North Road Street, Elizabeth City, NC 27909 Phone: (252)331-4737; Fax: (252)331-4739

APPLICATION IDENTIFICATION		N.C. DEPARTMENT OF TRANSPORTATION STREET AND DRIVEWAY ACCESS PERMIT APPLICATION
Driveway Permit No. 2805	Date of Application ~~8/5/19~~ 11/3/20	
County: Currituck		
Development Name: Shawboro East Ridge Solar, LLC		

LOCATION OF PROPERTY:

Route/Road: Approx 1550 feet from the intersection of Shawboro Road and East Ridge Road, headed east, we plan to install a 40 foot driveway entrance on the south side of the road. Entrance #1

Exact Distance 1550 ☐ Miles ☒ Feet N ☐ S ☐ E ☒ W ☐

From the Intersection of Route No. Shawboro Road (SR1205) and Route No. E. Ridge Rd (SR1203) Toward Meads Rd (SR1204)

Property Will Be Used For: ☐ Residential /Subdivision ☒ Commercial ☐ Educational Facilities ☐ TND ☐ Emergency Services ☐ Other

Property: ☐ is ☒ is not within Shawboro City Zoning Area.

AGREEMENT

- I, the undersigned property owner, request access and permission to construct driveway(s) or street(s) on public right-of-way at the above location.
- I agree to construct and maintain driveway(s) or street entrance(s) in absolute conformance with the current "Policy on Street and Driveway Access to North Carolina Highways" as adopted by the North Carolina Department of Transportation.
- I agree that no signs or objects will be placed on or over the public right-of-way other than those approved by NCDOT.
- I agree that the driveway(s) or street(s) will be constructed as shown on the attached plans.
- I agree that that driveway(s) or street(s) as used in this agreement include any approach tapers, storage lanes or speed change lanes as deemed necessary.
- I agree that if any future improvements to the roadway become necessary, the portion of driveway(s) or street(s) located on public right-of-way will be considered the property of the North Carolina Department of Transportation, and I will not be entitled to reimbursement or have any claim for present expenditures for driveway or street construction.
- I agree that this permit becomes void if construction of driveway(s) or street(s) is not completed within the time specified by the "Policy on Street and Driveway Access to North Carolina Highways".
- I agree to pay a $50 construction inspection fee. Make checks payable to NCDOT. This fee will be reimbursed if application is denied.
- I agree to construct and maintain the driveway(s) or street(s) in a safe manner so as not to interfere with or endanger the public travel.
- I agree to provide during and following construction proper signs, signal lights, flaggers and other warning devices for the protection of traffic in conformance with the current "Manual on Uniform Traffic Control Devices for Streets and Highways" and Amendments or Supplements thereto. Information as to the above rules and regulations may be obtained from the District Engineer.
- I agree to indemnify and save harmless the North Carolina Department of Transportation from all damages and claims for damage that may arise by reason of this construction.
- I agree that the North Carolina Department of Transportation will assume no responsibility for any damages that may be caused to such facilities, within the highway right-of-way limits, in carrying out its construction.
- I agree to provide a Performance and Indemnity Bond in the amount specified by the Division of Highways for any construction proposed on the State Highway system.
- The granting of this permit is subject to the regulatory powers of the NC Department of Transportation as provided by law and as set forth in the N.C. Policy on Driveways and shall not be construed as a contract access point.
- I agree that the entire cost of constructing and maintaining an approved private street or driveway access connection and conditions of this permit will be borne by the property owner, the applicant, and their grantees, successors, and assignees.
- **I AGREE TO NOTIFY THE DISTRICT ENGINEER WHEN THE PROPOSED WORK BEGINS AND WHEN IT IS COMPLETED.**

APPLICATION IDENTIFICATION		N.C. DEPARTMENT OF TRANSPORTATION STREET AND DRIVEWAY ACCESS PERMIT APPLICATION
Driveway Permit No. 2805	Date of Application ~~6/5/19~~ 11/3/20	
County: Currituck		
Development Name: Shawboro East Ridge Solar, LLC		

LOCATION OF PROPERTY:

Route/Road: Approx 1315 feet from the intersection of Shawboro Road and East Ridge Road, headed east, we plan to install a 40 foot driveway entrance on the south side of the road. Entrance #2

Exact Distance 1315 ☐ Miles ☒ Feet N ☐ S ☐ E ☒ W ☐

From the Intersection of Route No. Shawboro Road (SR1205) and Route No. E. Ridge Rd (SR1203) Toward Meads Rd (SR1204)

Property Will Be Used For: ☐ Residential /Subdivision ☒ Commercial ☐ Educational Facilities ☐ TND ☐ Emergency Services ☐ Other

Property: ☐ is ☒ is not within Shawboro City Zoning Area.

AGREEMENT

- I, the undersigned property owner, request access and permission to construct driveway(s) or street(s) on public right-of-way at the above location.
- I agree to construct and maintain driveway(s) or street entrance(s) in absolute conformance with the current "Policy on Street and Driveway Access to North Carolina Highways" as adopted by the North Carolina Department of Transportation.
- I agree that no signs or objects will be placed on or over the public right-of-way other than those approved by NCDOT.
- I agree that the driveway(s) or street(s) will be constructed as shown on the attached plans.
- I agree that that driveway(s) or street(s) as used in this agreement include any approach tapers, storage lanes or speed change lanes as deemed necessary.
- I agree that if any future improvements to the roadway become necessary, the portion of driveway(s) or street(s) located on public right-of-way will be considered the property of the North Carolina Department of Transportation, and I will not be entitled to reimbursement or have any claim for present expenditures for driveway or street construction.
- I agree that this permit becomes void if construction of driveway(s) or street(s) is not completed within the time specified by the "Policy on Street and Driveway Access to North Carolina Highways".
- I agree to pay a $50 construction inspection fee. Make checks payable to NCDOT. This fee will be reimbursed if application is denied.
- I agree to construct and maintain the driveway(s) or street(s) in a safe manner so as not to interfere with or endanger the public travel.
- I agree to provide during and following construction proper signs, signal lights, flaggers and other warning devices for the protection of traffic in conformance with the current "Manual on Uniform Traffic Control Devices for Streets and Highways" and Amendments or Supplements thereto. Information as to the above rules and regulations may be obtained from the District Engineer.
- I agree to indemnify and save harmless the North Carolina Department of Transportation from all damages and claims for damage that may arise by reason of this construction.
- I agree that the North Carolina Department of Transportation will assume no responsibility for any damages that may be caused to such facilities, within the highway right-of-way limits, in carrying out its construction.
- I agree to provide a Performance and Indemnity Bond in the amount specified by the Division of Highways for any construction proposed on the State Highway system.
- The granting of this permit is subject to the regulatory powers of the NC Department of Transportation as provided by law and as set forth in the N.C. Policy on Driveways and shall not be construed as a contract access point.
- I agree that the entire cost of constructing and maintaining an approved private street or driveway access connection and conditions of this permit will be borne by the property owner, the applicant, and their grantees, successors, and assignees.
- **I AGREE TO NOTIFY THE DISTRICT ENGINEER WHEN THE PROPOSED WORK BEGINS AND WHEN IT IS COMPLETED.**

APPLICATION IDENTIFICATION		N.C. DEPARTMENT OF TRANSPORTATION
Driveway Permit No. 2805	Date of Application ~~6/5/19~~ 4/6/2020 11/3/20	STREET AND DRIVEWAY ACCESS PERMIT APPLICATION
County: Currituck		
Development Name: Shawboro East Ridge Solar, LLC		

LOCATION OF PROPERTY:

Route/Road: Approx 1315 feet from the intersection of Shawboro Road and East Ridge Road, headed east, we plan to install a 40 foot driveway entrance on the north side of the road. Entrance #3

Exact Distance 1315 ☐ Miles ☒ Feet N ☐ S ☐ E ☒ W ☐

From the Intersection of Route No. Shawboro Road (SR1205) and Route No. E. Ridge Rd (SR1203) Toward Meads Rd (SR1204)

Property Will Be Used For: ☐ Residential /Subdivision ☒ Commercial ☐ Educational Facilities ☐ TND ☐ Emergency Services ☐ Other

Property: ☐ is ☒ is not within Shawboro City Zoning Area.

AGREEMENT

- I, the undersigned property owner, request access and permission to construct driveway(s) or street(s) on public right-of-way at the above location.
- I agree to construct and maintain driveway(s) or street entrance(s) in absolute conformance with the current "Policy on Street and Driveway Access to North Carolina Highways" as adopted by the North Carolina Department of Transportation.
- I agree that no signs or objects will be placed on or over the public right-of-way other than those approved by NCDOT.
- I agree that the driveway(s) or street(s) will be constructed as shown on the attached plans.
- I agree that that driveway(s) or street(s) as used in this agreement include any approach tapers, storage lanes or speed change lanes as deemed necessary.
- I agree that if any future improvements to the roadway become necessary, the portion of driveway(s) or street(s) located on public right-of-way will be considered the property of the North Carolina Department of Transportation, and I will not be entitled to reimbursement or have any claim for present expenditures for driveway or street construction.
- I agree that this permit becomes void if construction of driveway(s) or street(s) is not completed within the time specified by the "Policy on Street and Driveway Access to North Carolina Highways".
- I agree to pay a $50 construction inspection fee. Make checks payable to NCDOT. This fee will be reimbursed if application is denied.
- I agree to construct and maintain the driveway(s) or street(s) in a safe manner so as not to interfere with or endanger the public travel.
- I agree to provide during and following construction proper signs, signal lights, flaggers and other warning devices for the protection of traffic in conformance with the current "Manual on Uniform Traffic Control Devices for Streets and Highways" and Amendments or Supplements thereto. Information as to the above rules and regulations may be obtained from the District Engineer.
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- I agree that the North Carolina Department of Transportation will assume no responsibility for any damages that may be caused to such facilities, within the highway right-of-way limits, in carrying out its construction.
- I agree to provide a Performance and Indemnity Bond in the amount specified by the Division of Highways for any construction proposed on the State Highway system.
- The granting of this permit is subject to the regulatory powers of the NC Department of Transportation as provided by law and as set forth in the N.C. Policy on Driveways and shall not be construed as a contract access point.
- I agree that the entire cost of constructing and maintaining an approved private street or driveway access connection and conditions of this permit will be borne by the property owner, the applicant, and their grantees, successors, and assignees.
- **I AGREE TO NOTIFY THE DISTRICT ENGINEER WHEN THE PROPOSED WORK BEGINS AND WHEN IT IS COMPLETED.**

APPLICATION IDENTIFICATION		N.C. DEPARTMENT OF TRANSPORTATION
Driveway Permit No. 2805	Date of Application ~~8/5/19~~ 9.3.2020	STREET AND DRIVEWAY ACCESS PERMIT APPLICATION
County: Currituck		
Development Name: Shawboro East Ridge Solar, LLC		

OFFICIAL COPY

Rec'd 11 2021

LOCATION OF PROPERTY:

Route/Road: Approx 1685 feet from the intersection of Meads Road and East Ridge Road, headed south, we plan to install a 40 foot driveway entrance on the west side of the road. Entrance #4

Exact Distance 1685 ☐ Miles ☒ Feet N ☐ S ☒ E ☐ W ☐

From the Intersection of Route No. Meads Road (SR1204) and Route No. E. Ridge Rd (SR1203) Toward Dead End Meads Road

Property Will Be Used For: ☐ Residential /Subdivision ☒ Commercial ☐ Educational Facilities ☐ TND ☐ Emergency Services ☐ Other

Property: ☐ is ☒ is not within Shawboro City Zoning Area.

AGREEMENT

- I, the undersigned property owner, request access and permission to construct driveway(s) or street(s) on public right-of-way at the above location.
- I agree to construct and maintain driveway(s) or street entrance(s) in absolute conformance with the current "Policy on Street and Driveway Access to North Carolina Highways" as adopted by the North Carolina Department of Transportation.
- I agree that no signs or objects will be placed on or over the public right-of-way other than those approved by NCDOT.
- I agree that the driveway(s) or street(s) will be constructed as shown on the attached plans.
- I agree that that driveway(s) or street(s) as used in this agreement include any approach tapers, storage lanes or speed change lanes as deemed necessary.
- I agree that if any future improvements to the roadway become necessary, the portion of driveway(s) or street(s) located on public right-of-way will be considered the property of the North Carolina Department of Transportation, and I will not be entitled to reimbursement or have any claim for present expenditures for driveway or street construction.
- I agree that this permit becomes void if construction of driveway(s) or street(s) is not completed within the time specified by the "Policy on Street and Driveway Access to North Carolina Highways".
- I agree to pay a $50 construction inspection fee. Make checks payable to NCDOT. This fee will be reimbursed if application is denied.
- I agree to construct and maintain the driveway(s) or street(s) in a safe manner so as not to interfere with or endanger the public travel.
- I agree to provide during and following construction proper signs, signal lights, flaggers and other warning devices for the protection of traffic in conformance with the current "Manual on Uniform Traffic Control Devices for Streets and Highways" and Amendments or Supplements thereto. Information as to the above rules and regulations may be obtained from the District Engineer.
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- **I AGREE TO NOTIFY THE DISTRICT ENGINEER WHEN THE PROPOSED WORK BEGINS AND WHEN IT IS COMPLETED.**

APPLICATION IDENTIFICATION		N.C. DEPARTMENT OF TRANSPORTATION STREET AND DRIVEWAY ACCESS PERMIT APPLICATION
Driveway Permit No. 2805	Date of Application ~~6/5/19~~ 11/13/2020	
County: Currituck		
Development Name: Shawboro East Ridge Solar, LLC		

OFFICIAL COPY

DEC 14 2021

LOCATION OF PROPERTY:

Route/Road: Approx 405 feet from the intersection of Meads Road and East Ridge Road, headed east, we plan to install a 40 foot driveway entrance on the north side of the road. Entrance #5

Exact Distance 405 ☐ Miles ☒ Feet N ☐ S ☐ E ☒ W ☐

From the Intersection of Route No. Meads Road (SR1204) and Route No. E. Ridge Rd (SR1203) Toward Amy Landing Road

Property Will Be Used For: ☐ Residential /Subdivision ☒ Commercial ☐ Educational Facilities ☐ TND ☐ Emergency Services ☐ Other

Property: ☐ is ☒ is not within Shawboro City Zoning Area.

AGREEMENT

- I, the undersigned property owner, request access and permission to construct driveway(s) or street(s) on public right-of-way at the above location.
- I agree to construct and maintain driveway(s) or street entrance(s) in absolute conformance with the current "Policy on Street and Driveway Access to North Carolina Highways" as adopted by the North Carolina Department of Transportation.
- I agree that no signs or objects will be placed on or over the public right-of-way other than those approved by NCDOT.
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- I agree to pay a $50 construction inspection fee. Make checks payable to NCDOT. This fee will be reimbursed if application is denied.
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APPLICATION IDENTIFICATION		N.C. DEPARTMENT OF TRANSPORTATION STREET AND DRIVEWAY ACCESS PERMIT APPLICATION
Driveway Permit No. 2806	Date of Application ~~6/5/19~~ 12.2.2020 1/13/20	
County: Currituck		
Development Name: Shawboro East Ridge Solar, LLC		

LOCATION OF PROPERTY:

Route/Road: Approx 1175 feet from the intersection of Meads Road and East Ridge Road, headed east, we plan to install a 40 foot driveway entrance on the north side of the road. Entrance #6

Exact Distance 1175 ☐ Miles ☒ Feet N ☐ S ☐ E ☒ W ☐

From the Intersection of Route No. Meads Road (SR1204) and Route No. E. Ridge Rd (SR1203) Toward Amy Landing Road

Property Will Be Used For: ☐ Residential /Subdivision ☒ Commercial ☐ Educational Facilities ☐ TND ☐ Emergency Services ☐ Other

Property: ☐ is ☒ is not within Shawboro City Zoning Area.

AGREEMENT

- I, the undersigned property owner, request access and permission to construct driveway(s) or street(s) on public right-of-way at the above location.
- I agree to construct and maintain driveway(s) or street entrance(s) in absolute conformance with the current "Policy on Street and Driveway Access to North Carolina Highways" as adopted by the North Carolina Department of Transportation.
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- I agree that this permit becomes void if construction of driveway(s) or street(s) is not completed within the time specified by the "Policy on Street and Driveway Access to North Carolina Highways".
- I agree to pay a $50 construction inspection fee. Make checks payable to NCDOT. This fee will be reimbursed if application is denied.
- I agree to construct and maintain the driveway(s) or street(s) in a safe manner so as not to interfere with or endanger the public travel.
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APPLICATION IDENTIFICATION		N.C. DEPARTMENT OF TRANSPORTATION STREET AND DRIVEWAY ACCESS PERMIT APPLICATION
Driveway Permit No. 2805	Date of Application ~~8/5/19~~ 9.2.2020 11/3/20	
County: Currituck		
Development Name: Shawboro East Ridge Solar, LLC		

LOCATION OF PROPERTY:

Route/Road: Approx 2135 feet from the intersection of Meads Road and East Ridge Road, headed north east, we plan to install a 40 foot driveway entrance on the east side of the road. Entrance #7

Exact Distance 2135 ☐ Miles ☒ Feet N ☒ S ☐ E ☒ W ☐

From the Intersection of Route No. Meads Road (SR1204) and Route No. E. Ridge Rd (SR1203) Toward Amy Landing Road

Property Will Be Used For: ☐ Residential /Subdivision ☒ Commercial ☐ Educational Facilities ☐ TND ☐ Emergency Services ☐ Other

Property: ☐ is ☒ is not within Shawboro City Zoning Area.

AGREEMENT

- I, the undersigned property owner, request access and permission to construct driveway(s) or street(s) on public right-of-way at the above location.
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APPLICATION IDENTIFICATION		N.C. DEPARTMENT OF TRANSPORTATION STREET AND DRIVEWAY ACCESS PERMIT APPLICATION
Driveway Permit No. 2805	Date of Application ~~6/5/19~~ 6.2.2020 4/13/20	
County: Currituck		
Development Name: Shawboro East Ridge Solar, LLC		

LOCATION OF PROPERTY:

Route/Road: Approx 2560 feet from the intersection of Meads Road and East Ridge Road, headed north east, we plan to install a 40 foot driveway entrance on the east side of the road. Entrance #8

Exact Distance 2560 ☐ Miles ☒ Feet N ☒ S ☐ E ☒ W ☐

From the Intersection of Route No. Meads Road (SR1204) and Route No. E. Ridge Rd (SR1203) Toward Amy Landing Road

Property Will Be Used For: ☐ Residential /Subdivision ☒ Commercial ☐ Educational Facilities ☐ TND ☐ Emergency Services ☐ Other

Property: ☐ is ☒ is not within Shawboro City Zoning Area.

AGREEMENT

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- **I AGREE TO NOTIFY THE DISTRICT ENGINEER WHEN THE PROPOSED WORK BEGINS AND WHEN IT IS COMPLETED.**

SIGNATURES OF APPLICANT

PROPERTY OWNER (APPLICANT)		WITNESS	
COMPANY		NAME	
SIGNATURE		SIGNATURE	
ADDRESS		ADDRESS	
	Phone No.		

AUTHORIZED AGENT		WITNESS	
COMPANY	SunEnergy1, LLC – Cody Jannise	NAME	Ellen Aycock
SIGNATURE		SIGNATURE	
ADDRESS	192 Raceway Drive	ADDRESS	6750 NC Highway 30 East
	Mooresville, NC 28117 Phone No. 252-508-6014		Bethel, NC 27812

APPROVALS

APPLICATION RECEIVED BY DISTRICT ENGINEER

SIGNATURE DATE

APPLICATION APPROVED BY LOCAL GOVERNMENTAL AUTHORITY (when required)

SIGNATURE TITLE DATE

APPLICATION APPROVED BY NCDOT

SIGNATURE TITLE: DISTRICT ENG DATE: 8/12/20

INSPECTION BY NCDOT

SIGNATURE TITLE DATE

COMMENTS:

ENTRANCE #1, 2, AND 9 WILL REQUIRE 48" DIAMETER PIPES, WHILE ENTRANCE # 3, 5, 6, 7 AND 8 MUST BE AN 18" DIAMETER PIPE.

Shawboro Rd.

E. Ridge Rd.

Entrance 1
1550 ft. From Intersection of
Shawboro Rd. and E. Ridge Rd.

Entrance 2
1315 ft. From Intersection of
E. Ridge Rd. and Meads Rd.

Entrance 3
1315 ft. From Intersection of
E. Ridge Rd. and Meads Rd.

E. Ridge Rd.

Entrance 4
1685 ft. From Intersection of
E. Ridge Rd. and Meads Rd.

Entrance 5
405 ft. From Intersection of
E. Ridge Rd. and Meads Rd.

Entrance 6
1175 ft. From Intersection of
E. Ridge Rd. and Meads Rd.

E. Ridge Rd.

Meads Rd.

Entrance 7
2135 ft. From Intersection of
E. Ridge Rd. and Meads Rd.

Entrance 8
2560 ft. From Intersection of
E. Ridge Rd. and Meads Rd.

I/A

Shawboro East Ridge Solar, LLC
CPCN Application – Merchant Plant
NCUC EMP-117, Sub 0

DESCRIPTION OF THE NEED FOR THE FACILITY
Exhibit 3

Forecasts of the quantities of renewable power to be purchased within the PJM market over the next several years, and elsewhere in the southeastern United States, reflect a strong public need for additional utility-scale solar power production. The proposed facility will interconnect with Dominion's transmission grid, providing direct access to all load-serving suppliers participating in PJM, a Regional Transmission Organization ("RTO") in which Dominion participates. PJM coordinates the movement of electricity through all or parts of Delaware, Illinois, Indiana, Kentucky, Maryland, Michigan, New Jersey, North Carolina, Ohio, Pennsylvania, Tennessee, Virginia, West Virginia, and the District of Columbia.

Additionally, Summer peak load growth for the Dominion zone, which serves parts of Eastern North Carolina where the Facility is located is expected to grow by 0.5.% per year over the next ten to fifteen years. While winter peak load growth in the Dominion zone is expected to grow by 0.9% per year over the next ten to fifteen years (PJM Load Forecast Report (Jan. 2021), available at. https://www.pjm.com/-/media/library/reports-notices/load-forecast/2021-load-report.ashx). Finally, the annual net energy in Dominion zone is expected to grow by 0.6% per year over the next ten to fifteen years. Therefore, the Applicant believes that there are strong market conditions and needs for renewable energy projects such as this proposed facility.

VERIFICATION

NOW COMES Linda Nwadike, being first duly sworn, and deposes and says that I am duly authorized to act on behalf of Shawboro East Ridge Solar, LLC as Director of Permitting and Community Relations for SunEnergy1, LLC, parent and affiliate of the Applicant; that I have read the foregoing, Shawboro East Ride Solar, LLC's Application For a Certificate of Public Convenience and Necessity For Merchant Plant, and declare that the statements and information therein are true and accurate to my personal knowledge and belief, except where otherwise indicated, and in those instances, I believe the statements and information to be true.

Signed this 17 day of June 2021.

Linda Nwadike
Director of Permitting and Community Relations
SunEnergy1, LLC

SIGNED AND SEALED BEFORE ME THIS 17 day of June 2021.

Sworn to and subscribed to before me
this 17 day of June 2021.

Notary Public (Signature)

Angie Williams
Notary Public (Printed)

My Commission Expires: April 26, [illegible]

ANGIE WILLIAMS
NOTARY PUBLIC
CABARRUS COUNTY, NORTH CAROLINA

Docket EMP-117, Sub 0

I/A

NWADIKE

EXHIBIT 1

CONFIDENTIAL

DES LCOT CALCULATIONS-GGA-SHAWBORO

Docket EMP-117, Sub 0

I/A

NWADIKE

EXHIBIT 2

AE1-072 Feasibility Study

Generation Interconnection

Feasibility Study Report

for

Queue Project AE1-072

SHAWBORO-SLIGO 230 KV

98.6 MW Capacity / 150 MW Energy

January, 2019

Table Of Contents

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 Interconnected Transmission Owner (ITO) is Virginia Electric and Power Company (VEPCO).

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.

An Interconnection Customer with a proposed new Customer Facility that has a Maximum Facility Output equal to or greater than 100 MW shall install and maintain, at its expense, phasor measurement units (PMUs). See Section 8.5.3 of Appendix 2 to the Interconnection Service Agreement as well as section 4.3 of PJM Manual 14D for additional information.

PJM utilizes manufacturer models to ensure the performance of turbines is properly captured during the simulations performed for stability verification and, where applicable, for compliance with low voltage ride through requirements. Turbine manufacturers provide such models to their customers. The list of manufacturer models PJM has already validated is contained in Attachment B of Manual 14G. Manufacturer models may be updated from time to time, for various reasons such as to reflect changes to the control systems or to more accurately represent the capabilities turbines and controls which are currently available in the field. Additionally, as new turbine models are developed, turbine manufacturers provide such new models which must be used in the conduct of these studies. PJM needs adequate time to evaluate the new models in order to reduce delays to the System Impact Study process timeline for the Interconnection Customer as well as other Interconnection Customers in the study group. Therefore, PJM will require that any Interconnection Customer with a new manufacturer model must supply that model to PJM, along with a $10,000 fully refundable deposit, no later than three (3) months prior to the starting date of the System Impact Study (See Section 4.3 for starting dates) for the Interconnection Request which shall specify the use of the new model.

The Interconnection Customer will be required to submit a completed dynamic model study request form (Attachment B-1 of Manual 14G) in order to document the request for the study.

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.

General

The IC has proposed a solar generating facility located in Currituck County, Virginia. The installed facilities will have a capability of 150 MW with 98.6 MW of this output being recognized by PJM as Capacity. The proposed in-service date for the AE1-072 project is 12/31/2019. This study does not imply an ITO commitment to either in-service date.

Queue Number	**AE1-072**
Project Name	SHAWBORO-SLIGO 230 KV
Interconnection Customer	
State	North Carolina
County	Currituck
Transmission Owner	Dominion
MFO	150
MWE	150
MWC	98.6
Fuel	Solar
Basecase Study Year	2022

Point of Interconnection

Primary Point of Interconnection

AE1-072 will interconnect with the ITO transmission system via a new three breaker ring bus switching station that connects on the Shawboro to Sligo 230 kV line # 269. See one line in **Attachment 1**.

Secondary Point of Interconnection

AE1-072 will interconnect with the ITO transmission system via a new three breaker ring bus switching station that connects on the Shawboro to Sligo 230 kV line # 2192.

Cost Summary

The AE1-072 project will be responsible for the following costs:

Description	Total Cost
Attachment Facilities	$1,800,000
Direct Connection Network Upgrade	$6,300,000
Non Direct Connection Network Upgrades	$1,000,000
Total Costs	$9,100,000

In addition, the AE1-072 project may be responsible for a contribution to the following costs

(Reference System Reinforcements in the Network Impacts section for details):

Description	Total Cost
System Upgrades	$349,830,000

Cost allocations for these upgrades will be provided in the System Impact Study Report.

Note: PJM Open Access Transmission Tariff (OATT) section 217.3A outline cost allocation rules. The rules are further clarified in PJM Manual 14A Attachment B. The allocation of costs for a network upgrade will start with the first Queue project to cause the need for the upgrade. Later queue projects will receive cost allocation contingent on their contribution to the violation and are allocated to the queues that have not closed less than 5 years following the execution of the first Interconnection Service Agreement which identifies the need for this upgrade.

The Feasibility Study is used to make a preliminary determination of the type and scope of Attachment Facilities, Local Upgrades, and Network Upgrades that will be necessary to accommodate the Interconnection Request and to provide the Interconnection Customer a preliminary estimate of the time that will be required to construct any necessary facilities and upgrades and the Interconnection Customer's cost responsibility. The

System Impact Study provides refined and comprehensive estimates of cost responsibility and construction lead times for new facilities and system upgrades. Facilities Studies will include, commensurate with the degree of engineering specificity as provided in the Facilities Study Agreement, good faith estimates of the cost, determined in accordance with Section 217 of the Tariff,

(a) to be charged to each affected New Service Customer for the Facilities and System Upgrades that are necessary to accommodate this queue project;

(b) the time required to complete detailed design and construction of the facilities and upgrades; and

(c) a description of any site-specific environmental issues or requirements that could reasonably be anticipated to affect the cost or time required to complete construction of such facilities and upgrades.

Transmission Owner Scope of Work

Attachment Facilities

Generation Substation: Install metering and associated protection equipment. Estimated Cost is $600,000.

Transmission: Construct approximately one span of 230 kV Attachment line between the generation substation and a new AE1-072 Switching Station. The estimated cost for this work is $1,200,000.

The estimated total cost of the Attachment Facilities is $1,800,000. It is estimated to take 18-24 months to complete this work. These preliminary cost estimates are based on typical engineering costs. A more detailed engineering cost estimates are normally done when the IC provides an exact site plan location for the generation substation during the Facility Study phase. The total preliminary cost estimate for the Attachment work is given in the table below. These costs do not include CIAC Tax Gross-up.

Description	Total Cost
Substation	$ 600,000
Transmission	$1,200,000
Total Attachment Facility Costs	$1,800,000

Direct Connection Cost Estimate

Substation: Establish the new 230 kV AE1-072 Switching Substation (interconnection substation). The estimated cost of this work scope is $6,300,000. It is estimated to take 24-36 months to complete this work.

Non-Direct Connection Cost Estimate

Transmission: Install transmission structure in-line with transmission line to allow the proposed interconnection switching station to be interconnected with the transmission system. Estimated cost is $1,000,000 and is estimated to take 24-30 months to complete.

Remote Terminal Work: During the Facilities Study, ITO's System Protection Engineering Department will review transmission line protection as well as anti-islanding required to accommodate the new generation and interconnection substation. System Protection Engineering will determine the minimal acceptable protection requirements to reliably interconnect the proposed generating facility with the transmission system. The review is based on maintaining system reliability by reviewing ITO's protection requirements with the known transmission system configuration which includes generating facilities in the area. This review may determine that transmission line protection and communication upgrades are required at remote substations.

Interconnection Customer Requirements

ITO's Facility Connection Requirements as posted on PJM's website
http://www.pjm.com/~/media/planning/plan-standards/private-dominion/facility-connection-requirements1.ashx

Voltage Ride Through Requirements - The Customer Facility shall be designed to remain in service (not trip) for voltages and times as specified for the Eastern Interconnection in Attachment 1 of NERC Reliability Standard PRC-024-1, and successor Reliability Standards, for both high and low voltage conditions, irrespective of generator size, subject to the permissive trip exceptions established in PRC-024-1 (and successor Reliability Standards).

Frequency Ride Through Requirements - The Customer Facility shall be designed to remain in service (not trip) for frequencies and times as specified in Attachment 2 of NERC Reliability Standard PRC-024-1, and successor Reliability Standards, for both high and low frequency condition, irrespective of generator size, subject to the permissive trip exceptions established in PRC-024-1 (and successor Reliability Standards).

Reactive Power - The Generation Interconnection Customer shall design its non-synchronous Customer Facility with the ability to maintain a power factor of at least 0.95 leading to 0.95 lagging measured at the generator's terminals.

Revenue Metering and SCADA Requirements

PJM Requirements

The IC 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 Appendix 2.

Meteorological Data Reporting Requirement

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

- Temperature (degrees Fahrenheit)
- Atmospheric pressure (hectopascals)
- Irradiance
- Forced outage data

Network Impacts - Option 1

The Queue Project AE1-072 was evaluated as a 150 MW (Capacity 98.6 MW) injection tapping the Shawboro to Sligo 230 kV line # 269 in the ITO area. Project AE1-072 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AE1-072 was studied with a commercial probability of 53%. Potential network impacts were as follows:

Summer Peak Load Flow

Generation Deliverability

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

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
123962	314209	6SKIFF CREEK	DVP	314386	6KINGS M	DVP	1	DVP_P1-2: LN 567	single	441.8	101.34	103.16	DC	7.99

Multiple Facility Contingency

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

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
123607	314902	8CARSON	DVP	314914	8MDLTHAN	DVP	1	DVP_P4-2: 557T574	breaker	3938.0	128.87	129.4	DC	45.92
123608	314902	8CARSON	DVP	314914	8MDLTHAN	DVP	1	DVP_P4-2: H2T557	breaker	3938.0	121.47	121.98	DC	44.34

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)

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
123959	314209	6SKIFF CREEK	DVP	314386	6KINGS M	DVP	1	DVP_P1-2: LN 557	single	441.8	154.03	155.63	DC	7.04
123553	314218	6ELMONT	DVP	314908	8ELMONT	DVP	1	DVP_P4-2: H2T557	breaker	1050.6	138.12	139.18	DC	24.33
123988	314296	6PENNIMAN	DVP	314415	6WALR209	DVP	1	DVP_P1-2: LN 557	single	441.8	142.64	144.24	DC	7.04
123983	314386	6KINGS M	DVP	314296	6PENNIMAN	DVP	1	DVP_P1-2: LN 557	single	441.8	146.26	147.86	DC	7.04
124068	314415	6WALR209	DVP	314391	6LIGH209	DVP	1	DVP_P1-2: LN 557	single	441.8	127.52	129.12	DC	7.04
123664	314596	3POPLR C	DVP	314573	3EVERETS	DVP	1	DVP_P4-2: 246T2034	breaker	239.0	114.67	116.27	DC	8.39
123589	314903	8CHCKAHM	DVP	314908	8ELMONT	DVP	1	DVP_P4-2: 563T576	breaker	3144.0	134.27	134.97	DC	48.0
123590	314903	8CHCKAHM	DVP	314908	8ELMONT	DVP	1	DVP_P4-2: 56372	breaker	3144.0	130.89	131.57	DC	46.99
123970	314903	8CHCKAHM	DVP	314908	8ELMONT	DVP	1	DVP_P1-2: LN 563	single	2442.12	127.69	128.93	DC	30.08

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
123971	314903	8CHCKAHM	DVP	314908	8ELMONT	DVP	1	DVP_P1-2: LN 576	single	2442.12	127.62	128.87	DC	30.14
123530	314908	8ELMONT	DVP	314911	8LADYSMITH	DVP	1	DVP_P4-2: WT576	breaker	3351.0	145.65	146.3	DC	47.93
123531	314908	8ELMONT	DVP	314911	8LADYSMITH	DVP	1	DVP_P4-2: 57602	breaker	3351.0	145.65	146.3	DC	47.93
123848	314908	8ELMONT	DVP	314911	8LADYSMITH	DVP	1	DVP_P1-2: LN 576	single	2442.12	157.36	157.95	DC	31.51
123851	314908	8ELMONT	DVP	314911	8LADYSMITH	DVP	1	DVP_P1-2: LN 563	single	2442.12	142.44	142.95	DC	27.08
123540	314914	8MDLTHAN	DVP	314918	8NO ANNA	DVP	1	DVP_P4-2: 557T574	breaker	3637.0	140.52	140.95	DC	47.27
123872	314914	8MDLTHAN	DVP	314918	8NO ANNA	DVP	1	DVP_P1-2: LN 574	single	2442.12	134.96	136.12	DC	28.13
123875	314914	8MDLTHAN	DVP	314918	8NO ANNA	DVP	1	DVP_P1-2: LN 557	single	2442.12	125.61	126.74	DC	27.43

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.

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
123958	314209	6SKIFF CREEK	DVP	314386	6KINGS M	DVP	1	DVP_P1-2: LN 557	operation	441.8	166.01	167.11	DC	10.72
124389	314218	6ELMONT	DVP	314908	8ELMONT	DVP	2	DVP_P1-2: LN 557	operation	879.84	99.34	100.15	DC	15.56
123987	314296	6PENNIMAN	DVP	314415	6WALR209	DVP	1	DVP_P1-2: LN 557	operation	441.8	154.62	155.73	DC	10.72
123982	314386	6KINGS M	DVP	314296	6PENNIMAN	DVP	1	DVP_P1-2: LN 557	operation	441.8	158.25	159.35	DC	10.72
124067	314415	6WALR209	DVP	314391	6LIGH209	DVP	1	DVP_P1-2: LN 557	operation	441.8	139.51	140.61	DC	10.72
124363	314481	6LANDSTN	DVP	314486	6LYNHAVN	DVP	1	DVP_P1-2: LN 2072	operation	598.78	103.5	104.4	DC	11.98
124240	314486	6LYNHAVN	DVP	314504	6THALIA	DVP	1	DVP_P1-2: LN 2025	operation	740.72	115.44	116.08	DC	11.3

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
124003	314574	6EVERETS	DVP	936530	AD2-068 TAP	DVP	1	Base Case	operation	449.32	125.86	126.72	DC	8.49
124040	314902	8CARSON	DVP	314914	8MDLTHAN	DVP	1	DVP_P1-2: LN 557	operation	3218.56	145.9	147.25	DC	43.22
123964	314903	8CHCKAHM	DVP	314908	8ELMONT	DVP	1	DVP_P1-2: LN 563	operation	2442.12	165.96	166.81	DC	45.76
123969	314903	8CHCKAHM	DVP	314908	8ELMONT	DVP	1	Base Case	operation	2442.12	132.13	132.81	DC	36.57
124009	314905	8CHANCE	DVP	314900	8BRISTER	DVP	1	DVP_P1-2: LN 594	operation	2442.12	151.86	152.41	DC	29.13
123845	314908	8ELMONT	DVP	314911	8LADYSMITH	DVP	1	DVP_P1-2: LN 576	operation	2442.12	199.71	200.61	DC	47.94
123852	314908	8ELMONT	DVP	314911	8LADYSMITH	DVP	1	Base Case	operation	2442.12	131.98	132.57	DC	31.39
124103	314911	8LADYSMITH	DVP	314905	8CHANCE	DVP	1	DVP_P1-2: LN 573	operation	2738.22	137.02	137.52	DC	29.6
123868	314914	8MDLTHAN	DVP	314918	8NO ANNA	DVP	1	DVP_P1-2: LN 574	operation	2442.12	190.57	191.26	DC	42.79
123874	314914	8MDLTHAN	DVP	314918	8NO ANNA	DVP	1	Base Case	operation	2442.12	127.4	127.98	DC	31.41
124200	314918	8NO ANNA	DVP	314934	8SPOTSYL	DVP	1	DVP_P1-2: LN 581	operation	3218.56	124.97	125.43	DC	32.58
124291	314924	8SURRY	DVP	314903	8CHCKAHM	DVP	1	DVP_P1-2: LN 563	operation	2442.12	109.21	110.01	DC	42.98

System Reinforcements

ID	Index	Facility	Upgrade Description	Cost
123664	7	3POPLR C 115.0 kV - 3EVERETS 115.0 kV Ckt 1	Description : Replace Relay at Everetts 115kV substation. Time Estimate : 14-16 Months Cost : $200,000	$200,000
123553	3	6ELMONT 230.0 kV - 8ELMONT 230.0 kV Ckt 1	Description : Add 3rd 500-230kV Tx; Site Expansion Time Estimate : 24-30 Months Cost : $30,000,000	$30,000,000
123608,123607	2	8CARSON 500.0 kV - 8MDLTHAN 500.0 kV Ckt 1	Description : Wreck & Rebuild 39 miles of 500kV Line # 563 between Carson and Midlothian substations. A VA CPCN will be required. Time Estimate : 44-48 Months Cost : $112,230,000	$112,230,000
123872,123875,123540	10	8MDLTHAN 500.0 kV - 8NO ANNA 500.0 kV Ckt 1	Description : Rebuild / Uprate 41.13 miles of 500kV Line # 576 between Midlothian and North Anna substations. A VA CPCN will be required. Time Estimate : 24-30 Months Cost : $123,400,000	$123,400,000
123970,123971,123589,123590	8	8CHCKAHM 500.0 kV - 8ELMONT 500.0 kV Ckt 1	Description : Rebuild / Uprate 28 miles of 500kV Line # 557 between Chickahominy and Elmont substations. A VA CPCN will be required. Time Estimate : 36-44 Months Cost : $84,000,000	$84,000,000
123962,123959	1	6SKIFF CREEK 230.0 kV - 6KINGS M 230.0 kV Ckt 1	Description : PJM baseline upgrade b3057: Rebuild 6.1 miles of Waller-Skiffess Creek 230 kV Line (#2154) between Waller and Kings Mill to current standards with a minimum summer emergency rating of 1047 MVA utilizing single circuit steel structures. Remove this 6.1 mile section of Line #58 between Waller and Kings Mill. Rebuild the 1.6 miles of Line #2154 and #19 between Kings Mill and Skiffes Creek to current standards with a minimum summer emergency rating of 1047 MVA at 230 kV for Line #2154 and 261 MVA at 115 kV for Line #19, utilizing double circuit steel structures. The baseline project has an projected in-service date of 12/30/2024.	$0
123983	5	6KINGS M 230.0 kV - 6PENNIMAN 230.0 kV Ckt 1	Description : PJM baseline upgrade b3057: Rebuild 6.1 miles of Waller-Skiffess Creek 230 kV Line (#2154) between Waller and Kings Mill to current standards with a minimum summer emergency rating of 1047 MVA utilizing single circuit steel structures. Remove this 6.1 mile section of Line #58 between Waller and Kings Mill. Rebuild the 1.6 miles of Line #2154 and #19 between Kings Mill and Skiffes Creek to current standards with a minimum summer emergency rating of 1047 MVA at 230 kV for Line #2154 and 261 MVA at 115 kV for Line #19, utilizing double circuit steel structures. The baseline project has an projected in-service date of 12/30/2024.	$0

ID	Index	Facility	Upgrade Description	Cost
123988	4	**6PENNIMAN 230.0 kV - 6WALR209 230.0 kV Ckt 1**	Description : PJM baseline upgrade b3057: Rebuild 6.1 miles of Waller-Skiffess Creek 230 kV Line (#2154) between Waller and Kings Mill to current standards with a minimum summer emergency rating of 1047 MVA utilizing single circuit steel structures. Remove this 6.1 mile section of Line #58 between Waller and Kings Mill. Rebuild the 1.6 miles of Line #2154 and #19 between Kings Mill and Skiffes Creek to current standards with a minimum summer emergency rating of 1047 MVA at 230 kV for Line #2154 and 261 MVA at 115 kV for Line #19, utilizing double circuit steel structures. The baseline project has an projected in-service date of 12/30/2024.	$0
123848,123530,123531,123851	9	**8ELMONT 500.0 kV - 8LADYSMITH 500.0 kV Ckt 1**	Description : PJM baseline upgrade b3020: Rebuild 500kV Line #574 Ladysmith to Elmont - 26.2 miles long. The baseline project has an projected in-service date of 12/31/2022.	$0
124068	6	**6WALR209 230.0 kV - 6LIGH209 230.0 kV Ckt 1**	Description : PJM baseline upgrade b3056: Partial Rebuild 230 kV Line #2113 Waller to Lightfoot. The baseline project has an projected in-service date of 12/30/2024.	$0
			TOTAL COST	**$349,830,000**

Flow Gate Details

The following appendices contain additional information about each flowgate presented in the body of the report. For each appendix, a description of the flowgate and its contingency was included for convenience. However, the intent of the appendix section is to provide more information on which projects/generators have contributions to the flowgate in question. Although this information is not used "as is" for cost allocation purposes, it can be used to gage other generators impact.It should be noted the generator contributions presented in the appendices sections are full contributions, whereas in the body of the report, those contributions take into consideration the commercial probability of each project.

Index 1

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
123959	314209	6SKIFF CREEK	DVP	314386	6KINGS M	DVP	1	DVP_P1-2: LN 557	single	441.8	154.03	155.63	DC	7.04

Bus #	Bus	MW Impact
314421	6WINCHST	0.12
314507	3THOMPSN	0.14
315090	1YORKTN1	23.0
315091	1YORKTN2	23.87
315092	1YORKTN3	19.77
315098	1CHESPKA	0.19
315099	1CHESPKB	0.46
315108	1ELIZAR1	1.38
315109	1ELIZAR2	1.35
315110	1ELIZAR3	1.39
315233	1SURRY 2	14.07
315260	1GOSPORTA	0.15
315261	1GOSPORTB	0.19
315262	1GOSPORTC	0.16
916191	Z1-068 C	0.02
919151	AA1-139 C	1.04
923801	AB2-015 C O1	2.73
924241	AB2-068 O1	102.69
925281	AB2-186 C	0.23
925291	AB2-188 C O1	0.81
925521	AC1-027 C	0.14
926291	AC1-107 O1	155.01
926661	AC1-147 C	0.16
926751	AC1-161 C O1	13.97
932041	AC2-012 C	4.15
932591	AC2-079 C O1	1.66
933291	AC2-141 C	13.97
933731	AC2-196 C	0.13
933991	AD1-023 C	4.15
934061	AD1-033 C	3.08
934521	AD1-076 C	17.63
935111	AD1-144 C	0.13
936391	AD2-049 C	1.14
936661	AD2-085 C	0.98
936711	AD2-090 C O1	2.18
937221	AD2-160 C O1	2.37
937251	AD2-164	3.53
937541	AD2-215 C	0.75
938171	AE1-026 C1 O	8.7
938172	AE1-026 C2 O	1.26

Bus #	Bus	MW Impact
938181	AE1-027 C	0.96
938191	AE1-028 C	0.55
938461	AE1-065 C O1	11.61
938471	AE1-066 C O1	11.93
938481	AE1-067 C O1	10.85
938531	AE1-072 C O1	7.04
CARR	CARR	0.19
CBM-S1	CBM-S1	2.49
CBM-S2	CBM-S2	3.15
CBM-W1	CBM-W1	2.09
CBM-W2	CBM-W2	15.94
CIN	CIN	0.97
CPLE	CPLE	1.66
IPL	IPL	0.6
LGEE	LGEE	0.28
MEC	MEC	2.29
MECS	MECS	0.72
RENSSELAER	RENSSELAER	0.15
WEC	WEC	0.26

Index 2

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
123607	314902	8CARSON	DVP	314914	8MDLTHAN	DVP	1	DVP_P4-2: 557T574	breaker	3938.0	128.87	129.4	DC	45.92

Bus #	Bus	MW Impact
314539	3UNCAMP	3.9
314541	3WATKINS	1.1
314554	3BTLEBRO	1.2
314557	3BETHELC	1.22
314566	3CRESWEL	3.95
314572	3EMPORIA	0.62
314574	6EVERETS	6.48
314578	3HORNRTN	4.99
314582	3KELFORD	5.44
314594	6PLYMOTH	1.38
314603	3SCOT NK	5.06
314617	3TUNIS	1.32
314620	6CASHIE	1.36
314623	3WITAKRS	2.03
314648	6SUNBURY	1.5
314651	6WINFALL	2.97
315090	1YORKTN1	40.62
315091	1YORKTN2	42.16
315102	1BRUNSWICKG1	16.87
315103	1BRUNSWICKG2	16.87
315104	1BRUNSWICKG3	16.87
315105	1BRUNSWICKS1	35.05
315108	1ELIZAR1	5.8
315109	1ELIZAR2	5.7
315110	1ELIZAR3	5.87
315131	1EDGECMA	13.89
315132	1EDGECMB	13.89
315150	1BUGGS 1	14.89
315151	1BUGGS 2	14.89
315233	1SURRY 2	45.77
900672	V4-068 E	0.47
901082	W1-029 E	77.64
907092	X1-038 E	9.75
913392	Y1-086 E	3.75
916042	Z1-036 E	76.32
916191	Z1-068 C	0.08
916192	Z1-068 E	3.24
916301	Z1-086 C	102.98
916302	Z1-086 E	18.72
917122	Z2-027 E	1.8

Bus #	Bus	MW Impact
917332	Z2-043 E	1.55
917342	Z2-044 E	0.87
917512	Z2-088 E OP1	5.99
918492	AA1-063AE OP	6.12
918512	AA1-065 E OP	7.02
918532	AA1-067 E	1.14
918562	AA1-072 E	0.26
919151	AA1-139 C	4.44
919152	AA1-139 E	11.05
919692	AA2-053 E	5.69
919701	AA2-057 C	10.73
919702	AA2-057 E	5.36
920042	AA2-088 E OP	16.58
920592	AA2-165 E	0.71
920672	AA2-174 E	0.66
920692	AA2-178 E	6.77
923801	AB2-015 C O1	13.82
923802	AB2-015 E O1	11.33
923832	AB2-022 E	2.12
923852	AB2-025 E	1.64
923911	AB2-031 C O1	3.35
923912	AB2-031 E O1	1.65
923941	AB2-035 C	0.51
923942	AB2-035 E	0.22
923992	AB2-040 E O1	8.99
924022	AB2-043 E O1	6.43
924152	AB2-059 E O1	8.13
924162	AB2-060 E O1	5.28
924241	AB2-068 O1	333.94
924302	AB2-077 E O1	1.67
924312	AB2-078 E O1	1.67
924322	AB2-079 E O1	1.67
924391	AB2-088 C	0.66
924392	AB2-088 E	0.32
924401	AB2-089 C	2.95
924402	AB2-089 E	1.52
924491	AB2-098 C	0.89
924492	AB2-098 E	0.38
924501	AB2-099 C	0.92
924502	AB2-099 E	0.39
924511	AB2-100 C	17.28
924512	AB2-100 E	8.51
924812	AB2-134 E O1	14.4
925061	AB2-161 C O1	4.86
925062	AB2-161 E O1	7.93
925122	AB2-169 E	9.3
925171	AB2-174 C O1	10.49
925172	AB2-174 E O1	9.49
925281	AB2-186 C	1.03
925282	AB2-186 E	0.44
925291	AB2-188 C O1	3.89
925292	AB2-188 E O1	1.75

Bus #	Bus	MW Impact
925331	AB2-190 C	22.91
925332	AB2-190 E	9.82
925521	AC1-027 C	0.59
925522	AC1-027 E	1.97
925591	AC1-034 C	10.22
925592	AC1-034 E	7.71
925781	AC1-054 C O1	10.09
925782	AC1-054 E O1	4.65
926071	AC1-086 C	31.41
926072	AC1-086 E	14.3
926201	AC1-098 C	9.4
926202	AC1-098 E	5.6
926211	AC1-099 C	3.15
926212	AC1-099 E	1.85
926271	AC1-105 C O1	7.5
926272	AC1-105 E O1	3.73
926291	AC1-107 O1	504.06
926662	AC1-147 E	2.27
926751	AC1-161 C O1	55.61
926752	AC1-161 E O1	23.74
927021	AC1-189 C	13.41
927022	AC1-189 E	6.68
927141	AC1-208 C	13.7
927142	AC1-208 E	6.09
927221	AC1-216 C O1	11.57
927222	AC1-216 E O1	9.1
927251	AC1-221 C	3.14
927252	AC1-221 E	3.14
927261	AC1-222 C	4.86
927262	AC1-222 E	4.63
930402	AB1-081 E O1	5.74
930862	AB1-132 E O1	9.14
931232	AB1-173 E	1.57
931242	AB1-173AE	1.57
932041	AC2-012 C	17.47
932042	AC2-012 E	28.5
932581	AC2-078 C O1	5.18
932582	AC2-078 E O1	8.44
932591	AC2-079 C O1	8.83
932592	AC2-079 E O1	14.41
932631	AC2-084 C	13.41
932632	AC2-084 E	6.6
932761	AC2-100 C	7.23
932762	AC2-100 E	3.53
933291	AC2-141 C	55.61
933292	AC2-141 E	23.74
933731	AC2-196 C	0.53
933732	AC2-196 E	2.07
933991	AD1-023 C	21.24
933992	AD1-023 E	11.56
934011	AD1-025 C	19.89
934012	AD1-025 E	11.78

Bus #	Bus	MW Impact
934061	AD1-033 C	13.01
934062	AD1-033 E	8.68
934201	AD1-047 C	11.99
934202	AD1-047 E	7.99
934231	AD1-050 C	6.51
934232	AD1-050 E	3.56
934311	AD1-055 C	3.38
934312	AD1-055 E	0.87
934331	AD1-057 C O1	15.07
934332	AD1-057 E O1	8.04
934341	AD1-058 C	7.87
934342	AD1-058 E	2.0
934521	AD1-076 C	88.52
934522	AD1-076 E	45.07
934571	AD1-082 C	11.07
934572	AD1-082 E	6.31
934611	AD1-087 C O1	12.77
934612	AD1-087 E O1	6.0
934621	AD1-088 C	17.21
934622	AD1-088 E	8.08
934991	AD1-131 C	2.58
934992	AD1-131 E	1.72
935112	AD1-144 E	1.54
935161	AD1-151 C O1	18.41
935162	AD1-151 E O1	12.27
935171	AD1-152 C O1	12.69
935172	AD1-152 E O1	8.46
935212	AD1-156 E	1.73
936041	AD2-007	2.11
936051	AD2-008 C	3.46
936052	AD2-008 E	7.54
936331	AD2-043 C	6.32
936332	AD2-043 E	7.48
936361	AD2-046 C O1	11.9
936362	AD2-046 E O1	5.47
936391	AD2-049 C	2.65
936392	AD2-049 E	2.65
936401	AD2-051 C O1	13.77
936402	AD2-051 E O1	5.91
936481	AD2-063 C O1	17.89
936482	AD2-063 E O1	11.93
936531	AD2-068 C	7.89
936532	AD2-068 E	4.07
936661	AD2-085 C	5.28
936662	AD2-085 E	8.61
936701	AD2-089 C	11.02
936702	AD2-089 E	7.35
936711	AD2-090 C O1	11.44
936712	AD2-090 E O1	7.62
937221	AD2-160 C O1	10.1
937222	AD2-160 E O1	5.3
937251	AD2-164	6.91

Bus #	Bus	MW Impact
937481	AD2-202 C O1	3.52
937482	AD2-202 E O1	1.77
937541	AD2-215 C	2.84
937542	AD2-215 E	1.51
937571	AD2-169 C	14.99
937572	AD2-169 E	9.99
938171	AE1-026 C1 O	45.11
938172	AE1-026 C2 O	6.53
938173	AE1-026 E O1	13.62
938181	AE1-027 C	4.05
938182	AE1-027 E	2.13
938191	AE1-028 C	2.35
938192	AE1-028 E	1.36
938221	AE1-035 C	3.56
938222	AE1-035 E	1.76
938461	AE1-065 C O1	48.97
938462	AE1-065 E O1	197.59
938471	AE1-066 C O1	50.32
938472	AE1-066 E O1	196.23
938481	AE1-067 C O1	45.76
938482	AE1-067 E O1	200.79
938491	AE1-068 C O1	119.55
938492	AE1-068 E O1	66.03
938501	AE1-069 C O1	93.4
938502	AE1-069 E O1	53.4
938531	AE1-072 C O1	30.18
938532	AE1-072 E O1	15.73
AA2-074	AA2-074	8.89
AB2-013	AB2-013	5.7
AE1-033	AE1-033	5.94
AE1-042	AE1-042	14.39
CARR	CARR	1.71
CBM-S1	CBM-S1	21.98
CBM-S2	CBM-S2	25.61
CBM-W1	CBM-W1	20.03
CBM-W2	CBM-W2	142.14
CIN	CIN	9.32
CPLE	CPLE	13.07
G-007	G-007	5.64
IPL	IPL	5.81
LGEE	LGEE	2.72
MEC	MEC	21.15
MECS	MECS	7.49
O-066	O-066	18.81
RENSSELAER	RENSSELAER	1.35
WEC	WEC	2.47
Z1-043	Z1-043	9.72

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ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
123553	314218	6ELMONT	DVP	314908	8ELMONT	DVP	1	DVP_P4-2: H2T557	breaker	1050.6	138.12	139.18	DC	24.33

Bus #	Bus	MW Impact
314189	6PAPERMILL	8.75
314229	6MT RD221	0.24
314236	6NRTHEST	0.32
314250	6ROCKVILLE	0.55
314539	3UNCAMP	2.17
314541	3WATKINS	0.61
314566	3CRESWEL	2.06
314648	6SUNBURY	0.8
314651	6WINFALL	1.58
315043	1FOUR RIVERA	6.01
315044	1FOUR RIVERB	4.65
315045	1FOUR RIVERC	6.01
315046	1FOUR RIVERD	4.65
315047	1FOUR RIVERE	4.65
315048	1FOUR RIVERF	6.0
315053	1BELMED1	25.32
315054	1BELMED2	25.32
315055	1BELMED3	21.01
315058	1CHESTF3	26.88
315059	1CHESTF4	43.58
315067	1DARBY 1	4.35
315068	1DARBY 2	4.36
315069	1DARBY 3	4.37
315070	1DARBY 4	4.38
315073	1STONECA	9.3
315074	1HOPCGN1	11.22
315075	1HOPCGN2	11.07
315083	1SPRUNCA	14.81
315084	1SPRUNCB	14.81
315085	1SPRUNCC	10.98
315086	1SPRUNCD	10.98
315090	1YORKTN1	30.69
315091	1YORKTN2	31.84
901082	W1-029 E	41.34
907092	X1-038 E	5.42
913392	Y1-086 E	1.99
916042	Z1-036 E	40.33
916192	Z1-068 E	1.74
917122	Z2-027 E	0.96
919152	AA1-139 E	5.86

Bus #	Bus	MW Impact
919211	AA1-145	17.36
920692	AA2-178 E	3.54
923801	AB2-015 C O1	7.65
923802	AB2-015 E O1	6.27
923832	AB2-022 E	1.12
923842	AB2-024 E	1.47
923852	AB2-025 E	1.08
924061	AB2-050	1.02
924241	AB2-068 O1	176.35
924511	AB2-100 C	10.34
924512	AB2-100 E	5.09
924812	AB2-134 E O1	14.74
925051	AB2-160 C O1	7.09
925052	AB2-160 E O1	11.57
925061	AB2-161 C O1	3.59
925062	AB2-161 E O1	5.85
925281	AB2-186 C	0.55
925282	AB2-186 E	0.23
925291	AB2-188 C O1	2.03
925292	AB2-188 E O1	0.91
925331	AB2-190 C	24.59
925332	AB2-190 E	10.54
925522	AC1-027 E	1.06
925861	AC1-065 C	4.34
925862	AC1-065 E	7.08
926291	AC1-107 O1	266.19
926411	AC1-112 C	0.59
926412	AC1-112 E	1.92
926472	AC1-118 E	1.07
926551	AC1-134	2.55
926662	AC1-147 E	1.24
926751	AC1-161 C O1	26.91
926752	AC1-161 E O1	11.49
926781	AC1-164 C	58.04
926782	AC1-164 E	26.08
927041	AC1-191 C O1	17.46
927042	AC1-191 E O1	8.7
927221	AC1-216 C O1	11.84
927222	AC1-216 E O1	9.31
930121	AB1-027 C	0.76
930122	AB1-027 E	1.89
932041	AC2-012 C	9.53
932042	AC2-012 E	15.56
932501	AC2-070 C	0.5
932502	AC2-070 E	1.2
932532	AC2-073 E	1.55
932581	AC2-078 C O1	4.7
932582	AC2-078 E O1	7.67
932591	AC2-079 C O1	5.75
932592	AC2-079 E O1	9.39
932831	AC2-110 C	1.74
932832	AC2-110 E	2.83

Bus #	Bus	MW Impact
933061	AC2-130	3.45
933071	AC2-131 1	2.33
933081	AC2-131 2	1.06
933111	AC2-132 1	1.23
933121	AC2-132 2	0.63
933261	AC2-137 C	0.54
933262	AC2-137 E	2.04
933272	AC2-138 E	1.08
933291	AC2-141 C	26.91
933292	AC2-141 E	11.49
933732	AC2-196 E	1.09
934011	AD1-025 C	20.36
934012	AD1-025 E	12.06
934061	AD1-033 C	6.9
934062	AD1-033 E	4.6
934141	AD1-041 C	6.73
934142	AD1-041 E	4.49
934211	AD1-048 C	0.65
934212	AD1-048 E	1.92
934392	AD1-063 E	1.38
934571	AD1-082 C	8.18
934572	AD1-082 E	4.66
934781	AD1-105 C	11.46
934782	AD1-105 E	7.97
935112	AD1-144 E	0.91
935161	AD1-151 C O1	19.76
935162	AD1-151 E O1	13.17
935212	AD1-156 E	1.68
936041	AD2-007	2.16
936051	AD2-008 C	3.54
936052	AD2-008 E	7.72
936151	AD2-021	0.36
936241	AD2-030 C	2.87
936242	AD2-030 E	1.47
936301	AD2-039 C	1.74
936302	AD2-039 E	2.83
936341	AD2-044 C	0.27
936342	AD2-044 E	0.31
936391	AD2-049 C	1.87
936392	AD2-049 E	1.87
936581	AD2-073 C	2.23
936582	AD2-073 E	1.1
936591	AD2-074 C	6.34
936592	AD2-074 E	10.35
936661	AD2-085 C	3.46
936662	AD2-085 E	5.65
936711	AD2-090 C O1	6.28
936712	AD2-090 E O1	4.19
937221	AD2-160 C O1	5.35
937222	AD2-160 E O1	2.81
937251	AD2-164	5.09
937541	AD2-215 C	1.68

Bus #	Bus	MW Impact
937542	AD2-215 E	0.89
938031	AE1-004 C	1.74
938032	AE1-004 E	2.83
938181	AE1-027 C	2.15
938182	AE1-027 E	1.13
938191	AE1-028 C	1.24
938192	AE1-028 E	0.72
938461	AE1-065 C O1	26.33
938462	AE1-065 E O1	106.25
938471	AE1-066 C O1	27.06
938472	AE1-066 E O1	105.52
938481	AE1-067 C O1	24.61
938482	AE1-067 E O1	107.97
938531	AE1-072 C O1	15.99
938532	AE1-072 E O1	8.34
938551	AE1-074 C	3.11
938552	AE1-074 E	1.57
AA2-074	AA2-074	3.27
CARR	CARR	0.75
CBM-S1	CBM-S1	4.33
CBM-S2	CBM-S2	8.6
CBM-W1	CBM-W1	0.25
CBM-W2	CBM-W2	24.69
CIN	CIN	0.32
CPLE	CPLE	4.81
DEARBORN	DEARBORN	0.45
G-007	G-007	2.3
IPL	IPL	0.14
LGEE	LGEE	0.09
MEC	MEC	2.15
O-066	O-066	7.7
RENSSELAER	RENSSELAER	0.6
WEC	WEC	0.08

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ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
123988	314296	6PENNIMAN	DVP	314415	6WALR209	DVP	1	DVP_P1-2: LN 557	single	441.8	142.64	144.24	DC	7.04

Bus #	Bus	MW Impact
314421	6WINCHST	0.12
314507	3THOMPSN	0.14
315090	1YORKTN1	23.0
315091	1YORKTN2	23.87
315092	1YORKTN3	19.77
315098	1CHESPKA	0.19
315099	1CHESPKB	0.46
315108	1ELIZAR1	1.38
315109	1ELIZAR2	1.35
315110	1ELIZAR3	1.39
315233	1SURRY 2	14.07
315260	1GOSPORTA	0.15
315261	1GOSPORTB	0.19
315262	1GOSPORTC	0.16
916191	Z1-068 C	0.02
919151	AA1-139 C	1.04
923801	AB2-015 C O1	2.73
924241	AB2-068 O1	102.69
925281	AB2-186 C	0.23
925291	AB2-188 C O1	0.81
925521	AC1-027 C	0.14
926291	AC1-107 O1	155.01
926661	AC1-147 C	0.16
926751	AC1-161 C O1	13.97
932041	AC2-012 C	4.15
932591	AC2-079 C O1	1.66
933291	AC2-141 C	13.97
933731	AC2-196 C	0.13
933991	AD1-023 C	4.15
934061	AD1-033 C	3.08
934521	AD1-076 C	17.63
935111	AD1-144 C	0.13
936391	AD2-049 C	1.14
936661	AD2-085 C	0.98
936711	AD2-090 C O1	2.18
937221	AD2-160 C O1	2.37
937251	AD2-164	3.53
937541	AD2-215 C	0.75
938171	AE1-026 C1 O	8.7
938172	AE1-026 C2 O	1.26

Bus #	Bus	MW Impact
938181	AE1-027 C	0.96
938191	AE1-028 C	0.55
938461	AE1-065 C O1	11.61
938471	AE1-066 C O1	11.93
938481	AE1-067 C O1	10.85
938531	AE1-072 C O1	7.04
CARR	CARR	0.19
CBM-S1	CBM-S1	2.49
CBM-S2	CBM-S2	3.15
CBM-W1	CBM-W1	2.09
CBM-W2	CBM-W2	15.94
CIN	CIN	0.97
CPLE	CPLE	1.66
IPL	IPL	0.6
LGEE	LGEE	0.28
MEC	MEC	2.29
MECS	MECS	0.72
RENSSELAER	RENSSELAER	0.15
WEC	WEC	0.26

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ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
123983	314386	6KINGSM	DVP	314296	6PENNIMAN	DVP	1	DVP_P1-2: LN 557	single	441.8	146.26	147.86	DC	7.04

Bus #	Bus	MW Impact
314421	6WINCHST	0.12
314507	3THOMPSN	0.14
315090	1YORKTN1	23.0
315091	1YORKTN2	23.87
315092	1YORKTN3	19.77
315098	1CHESPKA	0.19
315099	1CHESPKB	0.46
315108	1ELIZAR1	1.38
315109	1ELIZAR2	1.35
315110	1ELIZAR3	1.39
315233	1SURRY 2	14.07
315260	1GOSPORTA	0.15
315261	1GOSPORTB	0.19
315262	1GOSPORTC	0.16
916191	Z1-068 C	0.02
919151	AA1-139 C	1.04
923801	AB2-015 C O1	2.73
924241	AB2-068 O1	102.69
925281	AB2-186 C	0.23
925291	AB2-188 C O1	0.81
925521	AC1-027 C	0.14
926291	AC1-107 O1	155.01
926661	AC1-147 C	0.16
926751	AC1-161 C O1	13.97
932041	AC2-012 C	4.15
932591	AC2-079 C O1	1.66
933291	AC2-141 C	13.97
933731	AC2-196 C	0.13
933991	AD1-023 C	4.15
934061	AD1-033 C	3.08
934521	AD1-076 C	17.63
935111	AD1-144 C	0.13
936391	AD2-049 C	1.14
936661	AD2-085 C	0.98
936711	AD2-090 C O1	2.18
937221	AD2-160 C O1	2.37
937251	AD2-164	3.53
937541	AD2-215 C	0.75
938171	AE1-026 C1 O	8.7
938172	AE1-026 C2 O	1.26

Bus #	Bus	MW Impact
938181	AE1-027 C	0.96
938191	AE1-028 C	0.55
938461	AE1-065 C O1	11.61
938471	AE1-066 C O1	11.93
938481	AE1-067 C O1	10.85
938531	AE1-072 C O1	7.04
CARR	CARR	0.19
CBM-S1	CBM-S1	2.49
CBM-S2	CBM-S2	3.15
CBM-W1	CBM-W1	2.09
CBM-W2	CBM-W2	15.94
CIN	CIN	0.97
CPLE	CPLE	1.66
IPL	IPL	0.6
LGEE	LGEE	0.28
MEC	MEC	2.29
MECS	MECS	0.72
RENSSELAER	RENSSELAER	0.15
WEC	WEC	0.26

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ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
124068	314415	6WALR209	DVP	314391	6LIGH209	DVP	1	DVP_P1-2: LN 557	single	441.8	127.52	129.12	DC	7.04

Bus #	Bus	MW Impact
314421	6WINCHST	0.12
314507	3THOMPSN	0.14
315090	1YORKTN1	23.0
315091	1YORKTN2	23.87
315092	1YORKTN3	19.77
315098	1CHESPKA	0.19
315099	1CHESPKB	0.46
315108	1ELIZAR1	1.38
315109	1ELIZAR2	1.35
315110	1ELIZAR3	1.39
315233	1SURRY 2	14.07
315260	1GOSPORTA	0.15
315261	1GOSPORTB	0.19
315262	1GOSPORTC	0.16
916191	Z1-068 C	0.02
919151	AA1-139 C	1.04
923801	AB2-015 C O1	2.73
924241	AB2-068 O1	102.69
925281	AB2-186 C	0.23
925291	AB2-188 C O1	0.81
925521	AC1-027 C	0.14
926291	AC1-107 O1	155.01
926661	AC1-147 C	0.16
926751	AC1-161 C O1	13.97
932041	AC2-012 C	4.15
932591	AC2-079 C O1	1.66
933291	AC2-141 C	13.97
933731	AC2-196 C	0.13
933991	AD1-023 C	4.15
934061	AD1-033 C	3.08
934521	AD1-076 C	17.63
935111	AD1-144 C	0.13
936391	AD2-049 C	1.14
936661	AD2-085 C	0.98
936711	AD2-090 C O1	2.18
937221	AD2-160 C O1	2.37
937251	AD2-164	3.53
937541	AD2-215 C	0.75
938171	AE1-026 C1 O	8.7
938172	AE1-026 C2 O	1.26

Bus #	Bus	MW Impact
938181	AE1-027 C	0.96
938191	AE1-028 C	0.55
938461	AE1-065 C O1	11.61
938471	AE1-066 C O1	11.93
938481	AE1-067 C O1	10.85
938531	AE1-072 C O1	7.04
CARR	CARR	0.19
CBM-S1	CBM-S1	2.49
CBM-S2	CBM-S2	3.15
CBM-W1	CBM-W1	2.09
CBM-W2	CBM-W2	15.94
CIN	CIN	0.97
CPLE	CPLE	1.66
IPL	IPL	0.6
LGEE	LGEE	0.28
MEC	MEC	2.29
MECS	MECS	0.72
RENSSELAER	RENSSELAER	0.15
WEC	WEC	0.26

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ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
123664	314596	3POPLR C	DVP	314573	3EVERETS	DVP	1	DVP_P4-2: 246T2034	breaker	239.0	114.67	116.27	DC	8.39

Bus #	Bus	MW Impact
314566	3CRESWEL	3.19
314594	6PLYMOTH	1.34
314648	6SUNBURY	0.35
314651	6WINFALL	1.09
315292	1DOMTR78	3.27
315293	1DOMTR9	2.66
315294	1DOMTR10	4.83
901082	W1-029 E	25.83
913392	Y1-086 E	0.97
916041	Z1-036 C	0.99
916042	Z1-036 E	38.4
917122	Z2-027 E	0.53
919152	AA1-139 E	1.82
920691	AA2-178 C	2.2
920692	AA2-178 E	5.47
923832	AB2-022 E	0.55
925121	AB2-169 C	0.91
925122	AB2-169 E	4.73
925281	AB2-186 C	0.44
925282	AB2-186 E	0.19
925291	AB2-188 C O1	3.15
925292	AB2-188 E O1	1.41
933991	AD1-023 C	21.44
933992	AD1-023 E	11.67
934521	AD1-076 C	88.5
934522	AD1-076 E	45.06
938531	AE1-072 C O1	5.51
938532	AE1-072 E O1	2.87
BAYOU	BAYOU	0.83
BIG_CAJUN1	BIG_CAJUN1	1.3
BIG_CAJUN2	BIG_CAJUN2	2.62
BLUEG	BLUEG	2.3
CALDERWOOD	CALDERWOOD	0.49
CANNELTON	CANNELTON	0.16
CATAWBA	CATAWBA	0.47
CBM-N	CBM-N	0.08
CHEOAH	CHEOAH	0.45
CHILHOWEE	CHILHOWEE	0.16
CHOCTAW	CHOCTAW	0.89
COFFEEN	COFFEEN	0.27

Bus #	Bus	MW Impact
COTTONWOOD	COTTONWOOD	3.23
DEARBORN	DEARBORN	0.28
DUCKCREEK	DUCKCREEK	0.55
EDWARDS	EDWARDS	0.25
ELMERSMITH	ELMERSMITH	0.28
FARMERCITY	FARMERCITY	0.2
G-007A	G-007A	0.36
GIBSON	GIBSON	0.1
HAMLET	HAMLET	1.97
NEWTON	NEWTON	0.7
NYISO	NYISO	0.34
O-066A	O-066A	0.16
PRAIRIE	PRAIRIE	1.48
SANTEETLA	SANTEETLA	0.13
SMITHLAND	SMITHLAND	0.13
TATANKA	TATANKA	0.33
TILTON	TILTON	0.29
TRIMBLE	TRIMBLE	0.25
TVA	TVA	1.37
UNIONPOWER	UNIONPOWER	0.68
VFT	VFT	0.95

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ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
123589	314903	8CHCKAHM	DVP	314908	8ELMONT	DVP	1	DVP_P4-2: 563T576	breaker	3144.0	134.27	134.97	DC	48.0

Bus #	Bus	MW Impact
314189	6PAPERMILL	10.95
314421	6WINCHST	0.29
314539	3UNCAMP	3.9
314541	3WATKINS	1.09
314554	3BTLEBRO	1.03
314557	3BETHELC	1.08
314566	3CRESWEL	3.92
314572	3EMPORIA	0.55
314574	6EVERETS	5.93
314578	3HORNRTN	4.49
314582	3KELFORD	5.04
314594	6PLYMOTH	1.36
314603	3SCOT NK	4.6
314617	3TUNIS	1.25
314620	6CASHIE	1.31
314623	3WITAKRS	1.76
314648	6SUNBURY	1.55
314651	6WINFALL	3.05
315073	1STONECA	8.72
315074	1HOPCGN1	10.52
315075	1HOPCGN2	10.38
315090	1YORKTN1	53.51
315091	1YORKTN2	55.53
315092	1YORKTN3	45.83
315110	1ELIZAR3	6.23
315131	1EDGECMA	11.92
315132	1EDGECMB	11.92
315233	1SURRY 2	55.26
900672	V4-068 E	0.45
901082	W1-029 E	80.05
907092	X1-038 E	9.75
913392	Y1-086 E	3.89
916042	Z1-036 E	77.65
916192	Z1-068 E	3.42
916302	Z1-086 E	13.64
917122	Z2-027 E	1.86
917332	Z2-043 E	1.43
917342	Z2-044 E	0.75
917512	Z2-088 E OP1	5.37
918492	AA1-063AE OP	5.61

Bus #	Bus	MW Impact
918512	AA1-065 E OP	6.66
918532	AA1-067 E	1.05
918562	AA1-072 E	0.24
919152	AA1-139 E	11.57
919692	AA2-053 E	5.18
919701	AA2-057 C	9.4
919702	AA2-057 E	4.7
920042	AA2-088 E OP	15.98
920592	AA2-165 E	0.62
920672	AA2-174 E	0.6
920692	AA2-178 E	6.71
923801	AB2-015 C O1	13.74
923802	AB2-015 E O1	11.26
923832	AB2-022 E	2.2
923842	AB2-024 E	1.84
923852	AB2-025 E	1.45
923911	AB2-031 C O1	2.99
923912	AB2-031 E O1	1.47
923941	AB2-035 C	0.45
923942	AB2-035 E	0.19
923992	AB2-040 E O1	8.03
924152	AB2-059 E O1	6.98
924241	AB2-068 O1	619.73
924391	AB2-088 C	0.58
924392	AB2-088 E	0.28
924491	AB2-098 C	0.81
924492	AB2-098 E	0.35
924501	AB2-099 C	0.87
924502	AB2-099 E	0.37
924511	AB2-100 C	15.35
924512	AB2-100 E	7.56
924812	AB2-134 E O1	18.14
925051	AB2-160 C O1	6.27
925052	AB2-160 E O1	10.23
925061	AB2-161 C O1	5.12
925062	AB2-161 E O1	8.36
925122	AB2-169 E	8.81
925171	AB2-174 C O1	9.34
925172	AB2-174 E O1	8.45
925281	AB2-186 C	1.06
925282	AB2-186 E	0.45
925291	AB2-188 C O1	3.86
925292	AB2-188 E O1	1.73
925331	AB2-190 C	29.21
925332	AB2-190 E	12.52
925522	AC1-027 E	2.08
925591	AC1-034 C	8.77
925592	AC1-034 E	6.62
925861	AC1-065 C	5.37
925862	AC1-065 E	8.76
926071	AC1-086 C	28.17
926072	AC1-086 E	12.82

Bus #	Bus	MW Impact
926201	AC1-098 C	8.45
926202	AC1-098 E	5.04
926211	AC1-099 C	2.83
926212	AC1-099 E	1.66
926291	AC1-107 O1	935.44
926662	AC1-147 E	2.41
926751	AC1-161 C O1	59.53
926752	AC1-161 E O1	25.41
926781	AC1-164 C	68.02
926782	AC1-164 E	30.56
927021	AC1-189 C	12.1
927022	AC1-189 E	6.03
927141	AC1-208 C	12.2
927142	AC1-208 E	5.42
927221	AC1-216 C O1	14.57
927222	AC1-216 E O1	11.46
930402	AB1-081 E O1	4.92
930862	AB1-132 E O1	8.2
931232	AB1-173 E	1.4
931242	AB1-173AE	1.4
932041	AC2-012 C	18.56
932042	AC2-012 E	30.29
932532	AC2-073 E	1.96
932581	AC2-078 C O1	5.52
932582	AC2-078 E O1	9.01
932591	AC2-079 C O1	9.26
932592	AC2-079 E O1	15.11
932631	AC2-084 C	12.05
932632	AC2-084 E	5.94
932831	AC2-110 C	2.15
932832	AC2-110 E	3.5
933061	AC2-130	3.1
933071	AC2-131 1	2.1
933081	AC2-131 2	0.95
933111	AC2-132 1	1.1
933121	AC2-132 2	0.56
933262	AC2-137 E	1.87
933272	AC2-138 E	1.18
933291	AC2-141 C	59.53
933292	AC2-141 E	25.41
933732	AC2-196 E	2.17
933991	AD1-023 C	20.59
933992	AD1-023 E	11.21
934011	AD1-025 C	25.05
934012	AD1-025 E	14.84
934061	AD1-033 C	13.7
934062	AD1-033 E	9.13
934141	AD1-041 C	8.5
934142	AD1-041 E	5.66
934201	AD1-047 C	10.7
934202	AD1-047 E	7.13
934212	AD1-048 E	1.38

Bus #	Bus	MW Impact
934331	AD1-057 C O1	13.19
934332	AD1-057 E O1	7.04
934392	AD1-063 E	1.75
934521	AD1-076 C	86.43
934522	AD1-076 E	44.01
934571	AD1-082 C	11.68
934572	AD1-082 E	6.66
934611	AD1-087 C O1	9.65
934612	AD1-087 E O1	4.53
935112	AD1-144 E	1.67
935161	AD1-151 C O1	23.47
935162	AD1-151 E O1	15.65
935171	AD1-152 C O1	9.59
935172	AD1-152 E O1	6.39
935212	AD1-156 E	1.73
936041	AD2-007	2.66
936051	AD2-008 C	4.36
936052	AD2-008 E	9.49
936151	AD2-021	0.33
936241	AD2-030 C	3.72
936242	AD2-030 E	1.9
936301	AD2-039 C	2.15
936302	AD2-039 E	3.5
936341	AD2-044 C	0.3
936342	AD2-044 E	0.33
936391	AD2-049 C	3.25
936392	AD2-049 E	3.25
936401	AD2-051 C O1	12.94
936402	AD2-051 E O1	5.55
936531	AD2-068 C	6.84
936532	AD2-068 E	3.52
936591	AD2-074 C	7.46
936592	AD2-074 E	12.17
936661	AD2-085 C	5.54
936662	AD2-085 E	9.04
936701	AD2-089 C	9.69
936702	AD2-089 E	6.46
936711	AD2-090 C O1	11.21
936712	AD2-090 E O1	7.48
937221	AD2-160 C O1	10.59
937222	AD2-160 E O1	5.55
937251	AD2-164	8.87
937481	AD2-202 C O1	2.66
937482	AD2-202 E O1	1.34
937541	AD2-215 C	3.09
937542	AD2-215 E	1.64
937571	AD2-169 C	13.41
937572	AD2-169 E	8.94
938031	AE1-004 C	2.15
938032	AE1-004 E	3.5
938171	AE1-026 C1 O	43.53
938172	AE1-026 C2 O	6.3

Bus #	Bus	MW Impact
938173	AE1-026 E O1	13.15
938181	AE1-027 C	4.26
938182	AE1-027 E	2.24
938191	AE1-028 C	2.47
938192	AE1-028 E	1.43
938221	AE1-035 C	3.38
938222	AE1-035 E	1.66
938461	AE1-065 C O1	51.77
938462	AE1-065 E O1	208.9
938471	AE1-066 C O1	53.2
938472	AE1-066 E O1	207.47
938481	AE1-067 C O1	48.38
938482	AE1-067 E O1	212.29
938491	AE1-068 C O1	87.05
938492	AE1-068 E O1	48.08
938501	AE1-069 C O1	68.07
938502	AE1-069 E O1	38.92
938531	AE1-072 C O1	31.55
938532	AE1-072 E O1	16.45
AA2-074	AA2-074	6.79
AE1-042	AE1-042	9.43
CARR	CARR	1.31
CBM-S1	CBM-S1	13.87
CBM-S2	CBM-S2	18.86
CBM-W1	CBM-W1	10.0
CBM-W2	CBM-W2	87.36
CIN	CIN	4.78
CPLE	CPLE	9.98
G-007	G-007	4.21
IPL	IPL	2.93
LGEE	LGEE	1.39
MEC	MEC	11.89
MECS	MECS	2.63
O-066	O-066	14.06
RENSSELAER	RENSSELAER	1.04
WEC	WEC	1.26

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ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
123848	314908	8ELMONT	DVP	314911	8LADYSMITH	DVP	1	DVP_P1-2: LN 576	single	2442.12	157.36	157.95	DC	31.51

Bus #	Bus	MW Impact
314229	6MT RD221	0.24
314236	6NRTHEST	0.37
314309	6IRON208	0.87
315053	1BELMED1	31.59
315054	1BELMED2	31.59
315055	1BELMED3	26.22
315058	1CHESTF3	33.56
315059	1CHESTF4	54.4
315060	1CHESTF5	19.83
315061	1CHESTG7	7.77
315062	1CHESTS7	3.53
315063	1CHESTG8	7.62
315064	1CHESTS8	3.93
315067	1DARBY 1	5.07
315068	1DARBY 2	5.08
315069	1DARBY 3	5.09
315070	1DARBY 4	5.1
315074	1HOPCGN1	15.47
315075	1HOPCGN2	15.27
315083	1SPRUNCA	19.12
315084	1SPRUNCB	19.12
315085	1SPRUNCC	14.17
315086	1SPRUNCD	14.17
315090	1YORKTN1	53.35
315091	1YORKTN2	55.36
315092	1YORKTN3	45.59
315233	1SURRY 2	49.51
923801	AB2-015 C O1	14.88
923911	AB2-031 C O1	3.63
924241	AB2-068 O1	428.75
924501	AB2-099 C	0.97
924511	AB2-100 C	19.07
925051	AB2-160 C O1	9.9
925061	AB2-161 C O1	6.07
925171	AB2-174 C O1	11.43
925281	AB2-186 C	1.08
925291	AB2-188 C O1	4.07
925331	AB2-190 C	37.17
925861	AC1-065 C	6.04
926071	AC1-086 C	33.58

Bus #	Bus	MW Impact
926291	AC1-107 O1	647.17
926411	AC1-112 C	0.66
926751	AC1-161 C O1	55.63
926781	AC1-164 C	77.8
927041	AC1-191 C O1	17.07
927221	AC1-216 C O1	18.16
930121	AB1-027 C	0.85
932041	AC2-012 C	18.51
932501	AC2-070 C	0.56
932581	AC2-078 C O1	7.33
932591	AC2-079 C O1	10.28
932831	AC2-110 C	2.42
933061	AC2-130	4.51
933071	AC2-131 1	3.06
933081	AC2-131 2	1.39
933111	AC2-132 1	1.61
933121	AC2-132 2	0.82
933261	AC2-137 C	0.69
933291	AC2-141 C	55.63
933991	AD1-023 C	22.21
934011	AD1-025 C	31.22
934061	AD1-033 C	13.58
934141	AD1-041 C	9.42
934201	AD1-047 C	13.02
934211	AD1-048 C	0.79
934521	AD1-076 C	92.52
934571	AD1-082 C	13.84
935161	AD1-151 C O1	29.87
936041	AD2-007	3.31
936051	AD2-008 C	5.44
936151	AD2-021	0.45
936241	AD2-030 C	4.05
936301	AD2-039 C	2.42
936391	AD2-049 C	3.31
936401	AD2-051 C O1	14.46
936661	AD2-085 C	6.17
936711	AD2-090 C O1	12.28
937221	AD2-160 C O1	10.54
937251	AD2-164	8.91
937541	AD2-215 C	3.16
937571	AD2-169 C	16.22
938031	AE1-004 C	2.42
938171	AE1-026 C1 O	47.17
938172	AE1-026 C2 O	6.82
938181	AE1-027 C	4.23
938191	AE1-028 C	2.45
938221	AE1-035 C	3.73
938461	AE1-065 C O1	51.48
938471	AE1-066 C O1	52.9
938481	AE1-067 C O1	48.11
938491	AE1-068 C O1	93.35
938501	AE1-069 C O1	73.22

Bus #	Bus	MW Impact
938531	AE1-072 C O1	31.51
938551	AE1-074 C	4.29
AA2-074	AA2-074	8.69
AB2-013	AB2-013	8.01
AE1-033	AE1-033	8.34
AE1-042	AE1-042	17.0
CARR	CARR	2.56
CBM-S1	CBM-S1	27.03
CBM-S2	CBM-S2	26.21
CBM-W1	CBM-W1	28.48
CBM-W2	CBM-W2	177.58
CIN	CIN	13.28
CPLE	CPLE	12.77
IPL	IPL	8.37
LGEE	LGEE	3.91
MEC	MEC	28.22
MECS	MECS	11.98
RENSSELAER	RENSSELAER	2.02
WEC	WEC	3.49
Z1-043	Z1-043	13.73

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ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
123540	314914	8MDLTHAN	DVP	314918	8NO ANNA	DVP	1	DVP_P4-2: 557T574	breaker	3637.0	140.52	140.95	DC	47.27

Bus #	Bus	MW Impact
314539	3UNCAMP	4.14
314541	3WATKINS	1.17
314557	3BETHELC	1.27
314566	3CRESWEL	4.1
314572	3EMPORIA	0.69
314574	6EVERETS	6.74
314578	3HORNRTN	5.35
314582	3KELFORD	5.73
314594	6PLYMOTH	1.44
314603	3SCOT NK	5.33
314617	3TUNIS	1.39
314620	6CASHIE	1.42
314623	3WITAKRS	2.12
314648	6SUNBURY	1.55
314651	6WINFALL	3.07
315053	1BELMED1	25.14
315054	1BELMED2	25.14
315055	1BELMED3	20.87
315058	1CHESTF3	25.47
315059	1CHESTF4	41.29
315073	1STONECA	10.44
315074	1HOPCGN1	12.59
315075	1HOPCGN2	12.42
315083	1SPRUNCA	16.1
315084	1SPRUNCB	16.1
315085	1SPRUNCC	11.94
315086	1SPRUNCD	11.94
315090	1YORKTN1	47.18
315091	1YORKTN2	48.96
315102	1BRUNSWICKG1	15.48
315103	1BRUNSWICKG2	15.48
315104	1BRUNSWICKG3	15.48
315105	1BRUNSWICKS1	32.16
315108	1ELIZAR1	6.0
315109	1ELIZAR2	5.89
315110	1ELIZAR3	6.07
315233	1SURRY 2	46.74
900672	V4-068 E	0.5
901082	W1-029 E	80.38
907092	X1-038 E	10.35

Bus #	Bus	MW Impact
913392	Y1-086 E	3.87
916042	Z1-036 E	79.08
916191	Z1-068 C	0.08
916192	Z1-068 E	3.34
916301	Z1-086 C	94.23
916302	Z1-086 E	17.13
917122	Z2-027 E	1.86
917332	Z2-043 E	1.63
917342	Z2-044 E	0.91
917512	Z2-088 E OP1	6.23
918492	AA1-063AE OP	6.52
918512	AA1-065 E OP	7.35
918532	AA1-067 E	1.19
918562	AA1-072 E	0.27
919152	AA1-139 E	11.37
919692	AA2-053 E	6.09
919701	AA2-057 C	11.25
919702	AA2-057 E	5.62
920042	AA2-088 E OP	17.64
920592	AA2-165 E	0.74
920672	AA2-174 E	0.7
920692	AA2-178 E	7.03
923801	AB2-015 C O1	14.68
923802	AB2-015 E O1	12.03
923832	AB2-022 E	2.18
923852	AB2-025 E	1.85
923862	AB2-026 E	1.7
923911	AB2-031 C O1	3.65
923912	AB2-031 E O1	1.8
923941	AB2-035 C	0.53
923942	AB2-035 E	0.23
923992	AB2-040 E O1	9.81
924241	AB2-068 O1	340.98
924391	AB2-088 C	0.69
924392	AB2-088 E	0.33
924491	AB2-098 C	0.93
924492	AB2-098 E	0.4
924501	AB2-099 C	0.97
924502	AB2-099 E	0.42
924511	AB2-100 C	19.06
924512	AB2-100 E	9.39
924812	AB2-134 E O1	19.56
925051	AB2-160 C O1	8.46
925052	AB2-160 E O1	13.8
925061	AB2-161 C O1	5.7
925062	AB2-161 E O1	9.3
925122	AB2-169 E	9.67
925171	AB2-174 C O1	11.48
925172	AB2-174 E O1	10.39
925281	AB2-186 C	1.07
925282	AB2-186 E	0.46
925291	AB2-188 C O1	4.04

Bus #	Bus	MW Impact
925292	AB2-188 E O1	1.82
925331	AB2-190 C	31.9
925332	AB2-190 E	13.67
925521	AC1-027 C	0.61
925522	AC1-027 E	2.04
926071	AC1-086 C	33.74
926072	AC1-086 E	15.36
926201	AC1-098 C	9.91
926202	AC1-098 E	5.9
926211	AC1-099 C	3.32
926212	AC1-099 E	1.95
926291	AC1-107 O1	514.69
926662	AC1-147 E	2.35
926751	AC1-161 C O1	55.26
926752	AC1-161 E O1	23.59
926781	AC1-164 C	48.23
926782	AC1-164 E	21.67
927021	AC1-189 C	13.94
927022	AC1-189 E	6.95
927141	AC1-208 C	14.48
927142	AC1-208 E	6.43
927221	AC1-216 C O1	15.72
927222	AC1-216 E O1	12.36
930862	AB1-132 E O1	9.82
931232	AB1-173 E	1.72
931242	AB1-173AE	1.72
932041	AC2-012 C	18.12
932042	AC2-012 E	29.57
932581	AC2-078 C O1	6.67
932582	AC2-078 E O1	10.88
932591	AC2-079 C O1	9.84
932592	AC2-079 E O1	16.05
932631	AC2-084 C	14.13
932632	AC2-084 E	6.96
933061	AC2-130	3.41
933071	AC2-131 1	2.31
933081	AC2-131 2	1.05
933111	AC2-132 1	1.21
933121	AC2-132 2	0.62
933291	AC2-141 C	55.26
933292	AC2-141 E	23.59
933501	AC2-165 C	14.6
933502	AC2-165 E	10.99
933731	AC2-196 C	0.55
933732	AC2-196 E	2.12
933991	AD1-023 C	22.14
933992	AD1-023 E	12.05
934011	AD1-025 C	27.02
934012	AD1-025 E	16.01
934061	AD1-033 C	13.38
934062	AD1-033 E	8.92
934201	AD1-047 C	13.08

Bus #	Bus	MW Impact
934202	AD1-047 E	8.72
934331	AD1-057 C O1	15.89
934332	AD1-057 E O1	8.48
934521	AD1-076 C	92.14
934522	AD1-076 E	46.92
934571	AD1-082 C	12.99
934572	AD1-082 E	7.41
934611	AD1-087 C O1	12.84
934612	AD1-087 E O1	6.03
934621	AD1-088 C	19.56
934622	AD1-088 E	9.18
935112	AD1-144 E	1.64
935161	AD1-151 C O1	25.64
935162	AD1-151 E O1	17.09
935171	AD1-152 C O1	12.76
935172	AD1-152 E O1	8.51
935212	AD1-156 E	2.31
936041	AD2-007	2.87
936051	AD2-008 C	4.7
936052	AD2-008 E	10.24
936391	AD2-049 C	3.01
936392	AD2-049 E	3.01
936401	AD2-051 C O1	14.48
936402	AD2-051 E O1	6.22
936661	AD2-085 C	5.9
936662	AD2-085 E	9.62
936701	AD2-089 C	11.46
936702	AD2-089 E	7.64
936711	AD2-090 C O1	12.16
936712	AD2-090 E O1	8.1
937221	AD2-160 C O1	10.39
937222	AD2-160 E O1	5.45
937251	AD2-164	7.96
937481	AD2-202 C O1	3.54
937482	AD2-202 E O1	1.78
937541	AD2-215 C	3.04
937542	AD2-215 E	1.61
937571	AD2-169 C	16.3
937572	AD2-169 E	10.87
938171	AE1-026 C1 O	47.05
938172	AE1-026 C2 O	6.81
938173	AE1-026 E O1	14.21
938181	AE1-027 C	4.16
938182	AE1-027 E	2.19
938191	AE1-028 C	2.42
938192	AE1-028 E	1.4
938221	AE1-035 C	3.73
938222	AE1-035 E	1.84
938461	AE1-065 C O1	50.56
938462	AE1-065 E O1	204.02
938471	AE1-066 C O1	51.96
938472	AE1-066 E O1	202.62

Bus #	Bus	MW Impact
938481	AE1-067 C O1	47.25
938482	AE1-067 E O1	207.33
938491	AE1-068 C O1	109.16
938492	AE1-068 E O1	60.29
938501	AE1-069 C O1	85.46
938502	AE1-069 E O1	48.86
938531	AE1-072 C O1	31.07
938532	AE1-072 E O1	16.2
938551	AE1-074 C	4.01
938552	AE1-074 E	2.02
938561	AE1-075 C	3.31
938562	AE1-075 E	1.62
AA2-074	AA2-074	8.98
AB2-013	AB2-013	6.5
AE1-033	AE1-033	6.77
AE1-042	AE1-042	15.47
CARR	CARR	2.09
CBM-S1	CBM-S1	23.98
CBM-S2	CBM-S2	26.24
CBM-W1	CBM-W1	22.91
CBM-W2	CBM-W2	155.72
CIN	CIN	10.7
CPLE	CPLE	13.2
G-007	G-007	6.94
IPL	IPL	6.7
LGEE	LGEE	3.14
MEC	MEC	23.69
MECS	MECS	8.88
O-066	O-066	23.15
RENSSELAER	RENSSELAER	1.66
WEC	WEC	2.82
Z1-043	Z1-043	11.11

Contingency Name	Contingency Defintion
DVP_P4-2: WT576	CONTINGENCY 'DVP_P4-2: WT576' /* NORTH ANNA 500 KV OPEN BRANCH FROM BUS 314914 TO BUS 314918 CKT 1 /* 8MDLTHAN 500.00 - 8NO ANNA 500.00 OPEN BRANCH FROM BUS 314232 TO BUS 314918 CKT 2 /* 6NO ANNA 230.00 - 8NO ANNA 500.00 END
DVP_P1-2: LN 567	CONTINGENCY 'DVP_P1-2: LN 567' OPEN BRANCH FROM BUS 314903 TO BUS 314924 CKT 1 /* 8CHCKAHM 500.00 - 8SURRY 500.00 END
DVP_P4-2: 246T2034	CONTINGENCY 'DVP_P4-2: 246T2034' /* EARLEYS 230 KV OPEN BRANCH FROM BUS 314537 TO BUS 919140 CKT 1 /* 6SUFFOLK 230.00 - AA1-138 TAP 230.00 OPEN BRANCH FROM BUS 314569 TO BUS 314575 CKT 1 /* 6EARLEYS 230.00 - 6NUCO TP 230.00 OPEN BRANCH FROM BUS 314575 TO BUS 314590 CKT 1 /* 6NUCO TP 230.00 - 6NUCOR 230.00 OPEN BRANCH FROM BUS 314575 TO BUS 919140 CKT 1 /* 6NUCO TP 230.00 - AA1-138 TAP 230.00 OPEN BUS 314575 /* ISLAND: 6NUCO TP 230.00 OPEN BUS 314590 /* ISLAND: 6NUCOR 230.00 OPEN BUS 919140 /* ISLAND: AA1-138 TAP 230.00 OPEN BRANCH FROM BUS 314569 TO BUS 314620 CKT 1 /* 6EARLEYS 230.00 - 6CASHIE 230.00 OPEN BRANCH FROM BUS 933990 TO BUS 314620 CKT 1 /* AD1-023 TAP 230.00 - 6CASHIE 230.00 /* CONTINGENCY LINE ADDED FOR AE1 BUILD OPEN BUS 314620 /* ISLAND: 6CASHIE 230.00 END
DVP_P1-2: LN 557	CONTINGENCY 'DVP_P1-2: LN 557' OPEN BRANCH FROM BUS 314214 TO BUS 314903 CKT 1 /* 6CHCKAHM 230.00 - 8CHCKAHM 500.00 OPEN BRANCH FROM BUS 314903 TO BUS 314908 CKT 1 /* 8CHCKAHM 500.00 - 8ELMONT 500.00 END
DVP_P1-2: LN 563	CONTINGENCY 'DVP_P1-2: LN 563' OPEN BRANCH FROM BUS 314902 TO BUS 314914 CKT 1 /* 8CARSON 500.00 - 8MDLTHAN 500.00 END
DVP_P4-2: H2T557	CONTINGENCY 'DVP_P4-2: H2T557' /* ELMONT 500 KV OPEN BRANCH FROM BUS 314214 TO BUS 314903 CKT 1 /* 6CHCKAHM 230.00 - 8CHCKAHM 500.00 OPEN BRANCH FROM BUS 314903 TO BUS 314908 CKT 1 /* 8CHCKAHM 500.00 - 8ELMONT 500.00 OPEN BRANCH FROM BUS 314218 TO BUS 314908 CKT 2 /* 6ELMONT 230.00 - 8ELMONT 500.00 END
DVP_P1-2: LN 574	CONTINGENCY 'DVP_P1-2: LN 574' OPEN BRANCH FROM BUS 314908 TO BUS 314911 CKT 1 /* 8ELMONT 500.00 - 8LADYSMITH 500.00 END

Contingency Name	Contingency Defintion
DVP_P4-2: 56372	CONTINGENCY 'DVP_P4-2: 56372' /* CARSON 500 KV OPEN BRANCH FROM BUS 314902 TO BUS 314914 CKT 1 /* 8CARSON 500.00 - 8MDLTHAN 500.00 OPEN BRANCH FROM BUS 314282 TO BUS 314902 CKT 1 /* 6CARSON 230.00 - 8CARSON 500.00 END
DVP_P1-2: LN 576	CONTINGENCY 'DVP_P1-2: LN 576' OPEN BRANCH FROM BUS 314914 TO BUS 314918 CKT 1 /* 8MDLTHAN 500.00 - 8NO ANNA 500.00 END
DVP_P4-2: 557T574	CONTINGENCY 'DVP_P4-2: 557T574' /* ELMONT 500 KV OPEN BRANCH FROM BUS 314214 TO BUS 314903 CKT 1 /* 6CHCKAHM 230.00 - 8CHCKAHM 500.00 OPEN BRANCH FROM BUS 314903 TO BUS 314908 CKT 1 /* 8CHCKAHM 500.00 - 8ELMONT 500.00 OPEN BRANCH FROM BUS 314908 TO BUS 314911 CKT 1 /* 8ELMONT 500.00 - 8LADYSMITH 500.00 END
DVP_P4-2: 57602	CONTINGENCY 'DVP_P4-2: 57602' /* NORTH ANNA 500 KV OPEN BRANCH FROM BUS 314914 TO BUS 314918 CKT 1 /* 8MDLTHAN 500.00 - 8NO ANNA 500.00 OPEN BRANCH FROM BUS 314232 TO BUS 314918 CKT 1 /* 6NO ANNA 230.00 - 8NO ANNA 500.00 END
DVP_P4-2: 563T576	CONTINGENCY 'DVP_P4-2: 563T576' /* MIDLOTHIAN 500 500 KV OPEN BRANCH FROM BUS 314902 TO BUS 314914 CKT 1 /* 8CARSON 500.00 - 8MDLTHAN 500.00 OPEN BRANCH FROM BUS 314914 TO BUS 314918 CKT 1 /* 8MDLTHAN 500.00 - 8NO ANNA 500.00 END

Short Circuit

Short Circuit

(Summary of impacted circuit breakers)

New circuit breakers found to be over-duty:

None

Contributions to previously identified circuit breakers found to be over-duty:

None

Network Impacts – Option 2

The Queue Project AE1-072 was evaluated as a 150 MW (Capacity 98.6 MW) injection tapping the Shawboro to Sligo 230 kV line # 2192 in the ITO area. Project AE1-072 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AE1-072 was studied with a commercial probability of 53%. Potential network impacts were as follows:

Summer Peak Load Flow

Generation Deliverability

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

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
124403	314209	6SKIFF CREEK	DVP	314386	6KINGS M	DVP	1	DVP_P1-2: LN 567	single	441.8	101.4	103.21	DC	7.99

Multiple Facility Contingency

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

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
123962	314490	6VA BCH	DVP	314486	6LYNHAVN	DVP	1	DVP_P4-2: 231T2026	breaker	906.0	128.21	128.65	DC	9.74
124038	314902	8CARSON	DVP	314914	8MDLTHAN	DVP	1	DVP_P4-2: 557T574	breaker	3938.0	128.87	129.4	DC	45.9
124039	314902	8CARSON	DVP	314914	8MDLTHAN	DVP	1	DVP_P4-2: H2T557	breaker	3938.0	121.47	121.98	DC	44.33

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)

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
124400	314209	6SKIFF CREEK	DVP	314386	6KINGS M	DVP	1	DVP_P1-2: LN 557	single	441.8	154.07	155.66	DC	7.04
123982	314218	6ELMONT	DVP	314908	8ELMONT	DVP	1	DVP_P4-2: H2T557	breaker	1050.6	138.13	139.19	DC	24.33
124439	314296	6PENNIMAN	DVP	314415	6WALR209	DVP	1	DVP_P1-2: LN 557	single	441.8	142.66	144.26	DC	7.04
124428	314386	6KINGS M	DVP	314296	6PENNIMAN	DVP	1	DVP_P1-2: LN 557	single	441.8	146.28	147.88	DC	7.04
124522	314415	6WALR209	DVP	314391	6LIGH209	DVP	1	DVP_P1-2: LN 557	single	441.8	127.56	129.16	DC	7.04
124018	314903	8CHCKAHM	DVP	314908	8ELMONT	DVP	1	DVP_P4-2: 563T576	breaker	3144.0	134.28	134.97	DC	47.99
124019	314903	8CHCKAHM	DVP	314908	8ELMONT	DVP	1	DVP_P4-2: 56372	breaker	3144.0	130.89	131.57	DC	46.98
124411	314903	8CHCKAHM	DVP	314908	8ELMONT	DVP	1	DVP_P1-2: LN 563	single	2442.12	127.7	128.94	DC	30.08

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
124412	314903	8CHCKAHM	DVP	314908	8ELMONT	DVP	1	DVP_P1-2: LN 576	single	2442.12	127.64	128.88	DC	30.14
123949	314908	8ELMONT	DVP	314911	8LADYSMITH	DVP	1	DVP_P4-2: 57602	breaker	3351.0	145.65	146.31	DC	47.92
123950	314908	8ELMONT	DVP	314911	8LADYSMITH	DVP	1	DVP_P4-2: WT576	breaker	3351.0	145.65	146.3	DC	47.92
124272	314908	8ELMONT	DVP	314911	8LADYSMITH	DVP	1	DVP_P1-2: LN 576	single	2442.12	157.37	157.97	DC	31.51
124275	314908	8ELMONT	DVP	314911	8LADYSMITH	DVP	1	DVP_P1-2: LN 563	single	2442.12	142.45	142.96	DC	27.08
123971	314914	8MDLTHAN	DVP	314918	8NO ANNA	DVP	1	DVP_P4-2: 557T574	breaker	3637.0	140.51	140.94	DC	47.26
124297	314914	8MDLTHAN	DVP	314918	8NO ANNA	DVP	1	DVP_P1-2: LN 574	single	2442.12	134.98	136.14	DC	28.12
124301	314914	8MDLTHAN	DVP	314918	8NO ANNA	DVP	1	DVP_P1-2: LN 557	single	2442.12	125.63	126.76	DC	27.43

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.

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
124399	314209	6SKIFF CREEK	DVP	314386	6KINGS M	DVP	1	DVP_P1-2: LN 557	operation	441.8	166.05	167.15	DC	10.71
124843	314218	6ELMONT	DVP	314908	8ELMONT	DVP	2	DVP_P1-2: LN 557	operation	879.84	99.35	100.15	DC	15.55
124438	314296	6PENNIMAN	DVP	314415	6WALR209	DVP	1	DVP_P1-2: LN 557	operation	441.8	154.64	155.75	DC	10.71
124427	314386	6KINGS M	DVP	314296	6PENNIMAN	DVP	1	DVP_P1-2: LN 557	operation	441.8	158.27	159.37	DC	10.71
124521	314415	6WALR209	DVP	314391	6LIGH209	DVP	1	DVP_P1-2: LN 557	operation	441.8	139.55	140.65	DC	10.71
124768	314481	6LANDSTN	DVP	314486	6LYNHAVN	DVP	1	DVP_P1-2: LN 2072	operation	598.78	107.53	108.44	DC	11.98

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
124786	314486	6LYNHAVN	DVP	314504	6THALIA	DVP	1	DVP_P1-2: LN 2025	operation	740.72	106.08	106.72	DC	11.3
124457	314574	6EVERETS	DVP	936530	AD2-068 TAP	DVP	1	Base Case	operation	449.32	125.91	126.76	DC	8.49
124494	314902	8CARSON	DVP	314914	8MDLTHAN	DVP	1	DVP_P1-2: LN 557	operation	3218.56	145.91	147.26	DC	43.21
124405	314903	8CHCKAHM	DVP	314908	8ELMONT	DVP	1	DVP_P1-2: LN 563	operation	2442.12	165.96	166.82	DC	45.76
124410	314903	8CHCKAHM	DVP	314908	8ELMONT	DVP	1	Base Case	operation	2442.12	132.13	132.82	DC	36.57
124463	314905	8CHANCE	DVP	314900	8BRISTER	DVP	1	DVP_P1-2: LN 594	operation	2442.12	151.86	152.41	DC	29.13
124269	314908	8ELMONT	DVP	314911	8LADYSMITH	DVP	1	DVP_P1-2: LN 576	operation	2442.12	199.71	200.61	DC	47.94
124276	314908	8ELMONT	DVP	314911	8LADYSMITH	DVP	1	Base Case	operation	2442.12	131.99	132.57	DC	31.39
124556	314911	8LADYSMITH	DVP	314905	8CHANCE	DVP	1	DVP_P1-2: LN 573	operation	2738.22	137.03	137.53	DC	29.6
124294	314914	8MDLTHAN	DVP	314918	8NO ANNA	DVP	1	DVP_P1-2: LN 574	operation	2442.12	190.57	191.26	DC	42.78
124300	314914	8MDLTHAN	DVP	314918	8NO ANNA	DVP	1	Base Case	operation	2442.12	127.41	127.99	DC	31.41
124658	314918	8NO ANNA	DVP	314934	8SPOTSYL	DVP	1	DVP_P1-2: LN 581	operation	3218.56	124.97	125.44	DC	32.58
124752	314924	8SURRY	DVP	314903	8CHCKAHM	DVP	1	DVP_P1-2: LN 563	operation	2442.12	109.23	110.03	DC	42.97
124322	938170	AE1-026 TAP	DVP	314620	6CASHIE	DVP	1	Base Case	operation	571.52	100.78	101.68	DC	11.43

Flow Gate Details

The following appendices contain additional information about each flowgate presented in the body of the report. For each appendix, a description of the flowgate and its contingency was included for convenience. However, the intent of the appendix section is to provide more information on which projects/generators have contributions to the flowgate in question. Although this information is not used "as is" for cost allocation purposes, it can be used to gage other generators impact.It should be noted the generator contributions presented in the appendices sections are full contributions, whereas in the body of the report, those contributions take into consideration the commercial probability of each project.

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ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
124400	314209	6SKIFF CREEK	DVP	314386	6KINGS M	DVP	1	DVP_P1-2: LN 557	single	441.8	154.07	155.66	DC	7.04

Bus #	Bus	MW Impact
314421	6WINCHST	0.12
314507	3THOMPSN	0.14
315090	1YORKTN1	23.0
315091	1YORKTN2	23.87
315092	1YORKTN3	19.77
315098	1CHESPKA	0.19
315099	1CHESPKB	0.46
315108	1ELIZAR1	1.38
315109	1ELIZAR2	1.35
315110	1ELIZAR3	1.39
315233	1SURRY 2	14.07
315260	1GOSPORTA	0.15
315261	1GOSPORTB	0.19
315262	1GOSPORTC	0.16
916191	Z1-068 C	0.02
919151	AA1-139 C	1.04
923801	AB2-015 C O1	2.73
924241	AB2-068 O1	102.68
925281	AB2-186 C	0.23
925291	AB2-188 C O1	0.81
925521	AC1-027 C	0.14
926291	AC1-107 O1	154.99
926661	AC1-147 C	0.16
926751	AC1-161 C O1	13.97
932041	AC2-012 C	4.15
932591	AC2-079 C O1	1.66
933291	AC2-141 C	13.97
933731	AC2-196 C	0.13
933991	AD1-023 C	4.15
934061	AD1-033 C	3.08
934521	AD1-076 C	17.63
935111	AD1-144 C	0.13
936391	AD2-049 C	1.14
936661	AD2-085 C	0.98
936711	AD2-090 C O1	2.18
937221	AD2-160 C O1	2.37
937251	AD2-164	3.53
937541	AD2-215 C	0.75
938171	AE1-026 C1 O	8.71
938172	AE1-026 C2 O	1.26

Bus #	Bus	MW Impact
938181	AE1-027 C	0.96
938191	AE1-028 C	0.55
938461	AE1-065 C O2	11.61
938471	AE1-066 C O2	11.93
938481	AE1-067 C O2	10.85
938531	AE1-072 C O2	7.04
CARR	CARR	0.19
CBM-S1	CBM-S1	2.49
CBM-S2	CBM-S2	3.15
CBM-W1	CBM-W1	2.09
CBM-W2	CBM-W2	15.94
CIN	CIN	0.97
CPLE	CPLE	1.66
IPL	IPL	0.6
LGEE	LGEE	0.28
MEC	MEC	2.29
MECS	MECS	0.72
RENSSELAER	RENSSELAER	0.15
WEC	WEC	0.26

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ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
123962	314490	6VA BCH	DVP	314486	6LYNHAVN	DVP	1	DVP_P4-2: 231T2026	breaker	906.0	128.21	128.65	DC	9.74

Bus #	Bus	MW Impact
913392	Y1-086 E	0.65
916191	Z1-068 C	0.13
916192	Z1-068 E	5.3
919152	AA1-139 E	2.44
923832	AB2-022 E	0.37
925521	AC1-027 C	0.7
925522	AC1-027 E	2.34
933732	AC2-196 E	0.52
934061	AD1-033 C	4.66
934062	AD1-033 E	3.11
937221	AD2-160 C O1	2.31
937222	AD2-160 E O1	1.21
938181	AE1-027 C	0.98
938182	AE1-027 E	0.52
938191	AE1-028 C	0.57
938192	AE1-028 E	0.33
938461	AE1-065 C O2	80.16
938462	AE1-065 E O2	323.45
938471	AE1-066 C O2	82.38
938472	AE1-066 E O2	321.23
938481	AE1-067 C O2	74.91
938482	AE1-067 E O2	328.7
938531	AE1-072 C O2	6.4
938532	AE1-072 E O2	3.34
CARR	CARR	0.0
CBM-S1	CBM-S1	0.21
CBM-S2	CBM-S2	0.23
CBM-W1	CBM-W1	0.24
CBM-W2	CBM-W2	1.41
CIN	CIN	0.11
CPLE	CPLE	0.12
G-007	G-007	0.01
IPL	IPL	0.07
LGEE	LGEE	0.03
MEC	MEC	0.23
MECS	MECS	0.12
O-066	O-066	0.04
RENSSELAER	RENSSELAER	0.0
WEC	WEC	0.03

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ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
124038	314902	8CARSON	DVP	314914	8MDLTHAN	DVP	1	DVP_P4-2: 557T574	breaker	3938.0	128.87	129.4	DC	45.9

Bus #	Bus	MW Impact
314539	3UNCAMP	3.9
314541	3WATKINS	1.1
314554	3BTLEBRO	1.2
314557	3BETHELC	1.22
314566	3CRESWEL	3.95
314572	3EMPORIA	0.62
314574	6EVERETS	6.49
314578	3HORNRTN	4.99
314582	3KELFORD	5.44
314594	6PLYMOTH	1.38
314603	3SCOT NK	5.06
314617	3TUNIS	1.32
314620	6CASHIE	1.36
314623	3WITAKRS	2.03
314648	6SUNBURY	1.5
314651	6WINFALL	2.97
315090	1YORKTN1	40.61
315091	1YORKTN2	42.15
315102	1BRUNSWICKG1	16.89
315103	1BRUNSWICKG2	16.89
315104	1BRUNSWICKG3	16.89
315105	1BRUNSWICKS1	35.08
315108	1ELIZAR1	5.8
315109	1ELIZAR2	5.69
315110	1ELIZAR3	5.87
315131	1EDGECMA	13.89
315132	1EDGECMB	13.89
315150	1BUGGS 1	14.9
315151	1BUGGS 2	14.9
315233	1SURRY 2	45.76
900672	V4-068 E	0.47
901082	W1-029 E	77.63
907092	X1-038 E	9.74
913392	Y1-086 E	3.75
916042	Z1-036 E	76.31
916191	Z1-068 C	0.08
916192	Z1-068 E	3.24
916301	Z1-086 C	103.07
916302	Z1-086 E	18.73
917122	Z2-027 E	1.8

Bus #	Bus	MW Impact
917332	Z2-043 E	1.55
917342	Z2-044 E	0.87
917512	Z2-088 E OP1	5.99
918492	AA1-063AE OP	6.12
918512	AA1-065 E OP	7.02
918532	AA1-067 E	1.14
918562	AA1-072 E	0.26
919151	AA1-139 C	4.44
919152	AA1-139 E	11.05
919692	AA2-053 E	5.69
919701	AA2-057 C	10.73
919702	AA2-057 E	5.36
920042	AA2-088 E OP	16.58
920592	AA2-165 E	0.71
920672	AA2-174 E	0.66
920692	AA2-178 E	6.77
923801	AB2-015 C O1	13.82
923802	AB2-015 E O1	11.33
923832	AB2-022 E	2.11
923852	AB2-025 E	1.64
923911	AB2-031 C O1	3.35
923912	AB2-031 E O1	1.65
923941	AB2-035 C	0.51
923942	AB2-035 E	0.22
923992	AB2-040 E O1	8.99
924022	AB2-043 E O1	6.43
924152	AB2-059 E O1	8.13
924162	AB2-060 E O1	5.28
924241	AB2-068 O1	333.87
924302	AB2-077 E O1	1.67
924312	AB2-078 E O1	1.67
924322	AB2-079 E O1	1.67
924391	AB2-088 C	0.66
924392	AB2-088 E	0.32
924401	AB2-089 C	2.96
924402	AB2-089 E	1.52
924491	AB2-098 C	0.89
924492	AB2-098 E	0.38
924501	AB2-099 C	0.92
924502	AB2-099 E	0.39
924511	AB2-100 C	17.27
924512	AB2-100 E	8.51
924812	AB2-134 E O1	14.39
925061	AB2-161 C O1	4.86
925062	AB2-161 E O1	7.92
925122	AB2-169 E	9.3
925171	AB2-174 C O1	10.49
925172	AB2-174 E O1	9.49
925281	AB2-186 C	1.03
925282	AB2-186 E	0.44
925291	AB2-188 C O1	3.89
925292	AB2-188 E O1	1.75

Bus #	Bus	MW Impact
925331	AB2-190 C	22.91
925332	AB2-190 E	9.82
925521	AC1-027 C	0.59
925522	AC1-027 E	1.97
925591	AC1-034 C	10.23
925592	AC1-034 E	7.71
925781	AC1-054 C O1	10.09
925782	AC1-054 E O1	4.65
926071	AC1-086 C	31.41
926072	AC1-086 E	14.3
926201	AC1-098 C	9.4
926202	AC1-098 E	5.6
926211	AC1-099 C	3.15
926212	AC1-099 E	1.85
926271	AC1-105 C O1	7.51
926272	AC1-105 E O1	3.74
926291	AC1-107 O1	503.95
926662	AC1-147 E	2.27
926751	AC1-161 C O1	55.59
926752	AC1-161 E O1	23.73
927021	AC1-189 C	13.41
927022	AC1-189 E	6.68
927141	AC1-208 C	13.7
927142	AC1-208 E	6.09
927221	AC1-216 C O1	11.57
927222	AC1-216 E O1	9.1
927251	AC1-221 C	3.14
927252	AC1-221 E	3.14
927261	AC1-222 C	4.86
927262	AC1-222 E	4.63
930402	AB1-081 E O1	5.74
930862	AB1-132 E O1	9.14
931232	AB1-173 E	1.57
931242	AB1-173AE	1.57
932041	AC2-012 C	17.46
932042	AC2-012 E	28.49
932581	AC2-078 C O1	5.17
932582	AC2-078 E O1	8.44
932591	AC2-079 C O1	8.83
932592	AC2-079 E O1	14.4
932631	AC2-084 C	13.41
932632	AC2-084 E	6.6
932761	AC2-100 C	7.23
932762	AC2-100 E	3.53
933291	AC2-141 C	55.59
933292	AC2-141 E	23.73
933731	AC2-196 C	0.53
933732	AC2-196 E	2.06
933991	AD1-023 C	21.24
933992	AD1-023 E	11.56
934011	AD1-025 C	19.88
934012	AD1-025 E	11.78

Bus #	Bus	MW Impact
934061	AD1-033 C	13.01
934062	AD1-033 E	8.67
934201	AD1-047 C	11.99
934202	AD1-047 E	7.99
934231	AD1-050 C	6.51
934232	AD1-050 E	3.56
934311	AD1-055 C	3.38
934312	AD1-055 E	0.87
934331	AD1-057 C O1	15.07
934332	AD1-057 E O1	8.04
934341	AD1-058 C	7.88
934342	AD1-058 E	2.0
934521	AD1-076 C	88.51
934522	AD1-076 E	45.07
934571	AD1-082 C	11.07
934572	AD1-082 E	6.31
934611	AD1-087 C O1	12.77
934612	AD1-087 E O1	6.0
934621	AD1-088 C	17.21
934622	AD1-088 E	8.08
934991	AD1-131 C	2.58
934992	AD1-131 E	1.72
935112	AD1-144 E	1.54
935161	AD1-151 C O1	18.41
935162	AD1-151 E O1	12.27
935171	AD1-152 C O1	12.69
935172	AD1-152 E O1	8.46
935212	AD1-156 E	1.73
936041	AD2-007	2.11
936051	AD2-008 C	3.46
936052	AD2-008 E	7.53
936331	AD2-043 C	6.33
936332	AD2-043 E	7.49
936361	AD2-046 C O1	11.9
936362	AD2-046 E O1	5.47
936391	AD2-049 C	2.65
936392	AD2-049 E	2.65
936401	AD2-051 C O1	13.76
936402	AD2-051 E O1	5.91
936481	AD2-063 C O1	17.9
936482	AD2-063 E O1	11.93
936531	AD2-068 C	7.89
936532	AD2-068 E	4.07
936661	AD2-085 C	5.28
936662	AD2-085 E	8.61
936701	AD2-089 C	11.02
936702	AD2-089 E	7.35
936711	AD2-090 C O1	11.44
936712	AD2-090 E O1	7.62
937221	AD2-160 C O1	10.1
937222	AD2-160 E O1	5.29
937251	AD2-164	6.91

Bus #	Bus	MW Impact
937481	AD2-202 C O1	3.52
937482	AD2-202 E O1	1.77
937541	AD2-215 C	2.84
937542	AD2-215 E	1.51
937571	AD2-169 C	14.99
937572	AD2-169 E	9.99
938171	AE1-026 C1 O	45.12
938172	AE1-026 C2 O	6.53
938173	AE1-026 E O2	13.63
938181	AE1-027 C	4.05
938182	AE1-027 E	2.13
938191	AE1-028 C	2.35
938192	AE1-028 E	1.36
938221	AE1-035 C	3.56
938222	AE1-035 E	1.76
938461	AE1-065 C O2	48.97
938462	AE1-065 E O2	197.6
938471	AE1-066 C O2	50.33
938472	AE1-066 E O2	196.25
938481	AE1-067 C O2	45.76
938482	AE1-067 E O2	200.81
938491	AE1-068 C O2	118.32
938492	AE1-068 E O2	65.35
938501	AE1-069 C O2	93.92
938502	AE1-069 E O2	53.7
938531	AE1-072 C O2	30.17
938532	AE1-072 E O2	15.73
AA2-074	AA2-074	8.9
AB2-013	AB2-013	5.7
AE1-033	AE1-033	5.95
AE1-042	AE1-042	14.39
CARR	CARR	1.71
CBM-S1	CBM-S1	22.0
CBM-S2	CBM-S2	25.63
CBM-W1	CBM-W1	20.05
CBM-W2	CBM-W2	142.21
CIN	CIN	9.32
CPLE	CPLE	13.08
G-007	G-007	5.64
IPL	IPL	5.82
LGEE	LGEE	2.72
MEC	MEC	21.16
MECS	MECS	7.5
O-066	O-066	18.81
RENSSELAER	RENSSELAER	1.35
WEC	WEC	2.47
Z1-043	Z1-043	9.73

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ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
123982	314218	6ELMONT	DVP	314908	8ELMONT	DVP	1	DVP_P4-2: H2T557	breaker	1050.6	138.13	139.19	DC	24.33

Bus #	Bus	MW Impact
314189	6PAPERMILL	8.75
314229	6MT RD221	0.24
314236	6NRTHEST	0.32
314250	6ROCKVILLE	0.55
314539	3UNCAMP	2.17
314541	3WATKINS	0.61
314566	3CRESWEL	2.06
314648	6SUNBURY	0.8
314651	6WINFALL	1.58
315043	1FOUR RIVERA	6.01
315044	1FOUR RIVERB	4.65
315045	1FOUR RIVERC	6.01
315046	1FOUR RIVERD	4.65
315047	1FOUR RIVERE	4.65
315048	1FOUR RIVERF	6.0
315053	1BELMED1	25.32
315054	1BELMED2	25.32
315055	1BELMED3	21.01
315058	1CHESTF3	26.88
315059	1CHESTF4	43.57
315067	1DARBY 1	4.35
315068	1DARBY 2	4.36
315069	1DARBY 3	4.37
315070	1DARBY 4	4.38
315073	1STONECA	9.3
315074	1HOPCGN1	11.22
315075	1HOPCGN2	11.07
315083	1SPRUNCA	14.81
315084	1SPRUNCB	14.81
315085	1SPRUNCC	10.98
315086	1SPRUNCD	10.98
315090	1YORKTN1	30.68
315091	1YORKTN2	31.84
901082	W1-029 E	41.33
907092	X1-038 E	5.42
913392	Y1-086 E	1.99
916042	Z1-036 E	40.32
916192	Z1-068 E	1.74
917122	Z2-027 E	0.96
919152	AA1-139 E	5.86

Bus #	Bus	MW Impact
919211	AA1-145	17.36
920692	AA2-178 E	3.54
923801	AB2-015 C O1	7.65
923802	AB2-015 E O1	6.27
923832	AB2-022 E	1.12
923842	AB2-024 E	1.47
923852	AB2-025 E	1.08
924061	AB2-050	1.02
924241	AB2-068 O1	176.33
924511	AB2-100 C	10.34
924512	AB2-100 E	5.09
924812	AB2-134 E O1	14.74
925051	AB2-160 C O1	7.09
925052	AB2-160 E O1	11.57
925061	AB2-161 C O1	3.59
925062	AB2-161 E O1	5.85
925281	AB2-186 C	0.55
925282	AB2-186 E	0.23
925291	AB2-188 C O1	2.03
925292	AB2-188 E O1	0.91
925331	AB2-190 C	24.59
925332	AB2-190 E	10.54
925522	AC1-027 E	1.06
925861	AC1-065 C	4.34
925862	AC1-065 E	7.08
926291	AC1-107 O1	266.16
926411	AC1-112 C	0.59
926412	AC1-112 E	1.92
926472	AC1-118 E	1.07
926551	AC1-134	2.55
926662	AC1-147 E	1.24
926751	AC1-161 C O1	26.91
926752	AC1-161 E O1	11.49
926781	AC1-164 C	58.04
926782	AC1-164 E	26.08
927041	AC1-191 C O1	17.46
927042	AC1-191 E O1	8.7
927221	AC1-216 C O1	11.84
927222	AC1-216 E O1	9.31
930121	AB1-027 C	0.76
930122	AB1-027 E	1.89
932041	AC2-012 C	9.53
932042	AC2-012 E	15.55
932501	AC2-070 C	0.5
932502	AC2-070 E	1.2
932532	AC2-073 E	1.55
932581	AC2-078 C O1	4.7
932582	AC2-078 E O1	7.67
932591	AC2-079 C O1	5.75
932592	AC2-079 E O1	9.39
932831	AC2-110 C	1.74
932832	AC2-110 E	2.83

Bus #	Bus	MW Impact
933061	AC2-130	3.45
933071	AC2-131 1	2.33
933081	AC2-131 2	1.06
933111	AC2-132 1	1.23
933121	AC2-132 2	0.63
933261	AC2-137 C	0.54
933262	AC2-137 E	2.04
933272	AC2-138 E	1.08
933291	AC2-141 C	26.91
933292	AC2-141 E	11.49
933732	AC2-196 E	1.09
934011	AD1-025 C	20.36
934012	AD1-025 E	12.06
934061	AD1-033 C	6.9
934062	AD1-033 E	4.6
934141	AD1-041 C	6.73
934142	AD1-041 E	4.49
934211	AD1-048 C	0.65
934212	AD1-048 E	1.92
934392	AD1-063 E	1.38
934571	AD1-082 C	8.18
934572	AD1-082 E	4.66
934781	AD1-105 C	11.46
934782	AD1-105 E	7.97
935112	AD1-144 E	0.91
935161	AD1-151 C O1	19.76
935162	AD1-151 E O1	13.17
935212	AD1-156 E	1.68
936041	AD2-007	2.16
936051	AD2-008 C	3.54
936052	AD2-008 E	7.71
936151	AD2-021	0.36
936241	AD2-030 C	2.87
936242	AD2-030 E	1.47
936301	AD2-039 C	1.74
936302	AD2-039 E	2.83
936341	AD2-044 C	0.27
936342	AD2-044 E	0.31
936391	AD2-049 C	1.87
936392	AD2-049 E	1.87
936581	AD2-073 C	2.23
936582	AD2-073 E	1.1
936591	AD2-074 C	6.34
936592	AD2-074 E	10.34
936661	AD2-085 C	3.46
936662	AD2-085 E	5.65
936711	AD2-090 C O1	6.28
936712	AD2-090 E O1	4.19
937221	AD2-160 C O1	5.35
937222	AD2-160 E O1	2.8
937251	AD2-164	5.09
937541	AD2-215 C	1.68

Bus #	Bus	MW Impact
937542	AD2-215 E	0.89
938031	AE1-004 C	1.74
938032	AE1-004 E	2.83
938181	AE1-027 C	2.15
938182	AE1-027 E	1.13
938191	AE1-028 C	1.24
938192	AE1-028 E	0.72
938461	AE1-065 C O2	26.31
938462	AE1-065 E O2	106.18
938471	AE1-066 C O2	27.04
938472	AE1-066 E O2	105.45
938481	AE1-067 C O2	24.59
938482	AE1-067 E O2	107.9
938531	AE1-072 C O2	15.99
938532	AE1-072 E O2	8.34
938551	AE1-074 C	3.11
938552	AE1-074 E	1.57
AA2-074	AA2-074	3.28
CARR	CARR	0.76
CBM-S1	CBM-S1	4.33
CBM-S2	CBM-S2	8.6
CBM-W1	CBM-W1	0.26
CBM-W2	CBM-W2	24.71
CIN	CIN	0.33
CPLE	CPLE	4.82
DEARBORN	DEARBORN	0.45
G-007	G-007	2.3
IPL	IPL	0.14
LGEE	LGEE	0.1
MEC	MEC	2.15
O-066	O-066	7.7
RENSSELAER	RENSSELAER	0.6
WEC	WEC	0.08

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ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
124439	314296	6PENNIMAN	DVP	314415	6WALR209	DVP	1	DVP_P1-2: LN 557	single	441.8	142.66	144.26	DC	7.04

Bus #	Bus	MW Impact
314421	6WINCHST	0.12
314507	3THOMPSN	0.14
315090	1YORKTN1	23.0
315091	1YORKTN2	23.87
315092	1YORKTN3	19.77
315098	1CHESPKA	0.19
315099	1CHESPKB	0.46
315108	1ELIZAR1	1.38
315109	1ELIZAR2	1.35
315110	1ELIZAR3	1.39
315233	1SURRY 2	14.07
315260	1GOSPORTA	0.15
315261	1GOSPORTB	0.19
315262	1GOSPORTC	0.16
916191	Z1-068 C	0.02
919151	AA1-139 C	1.04
923801	AB2-015 C O1	2.73
924241	AB2-068 O1	102.68
925281	AB2-186 C	0.23
925291	AB2-188 C O1	0.81
925521	AC1-027 C	0.14
926291	AC1-107 O1	154.99
926661	AC1-147 C	0.16
926751	AC1-161 C O1	13.97
932041	AC2-012 C	4.15
932591	AC2-079 C O1	1.66
933291	AC2-141 C	13.97
933731	AC2-196 C	0.13
933991	AD1-023 C	4.15
934061	AD1-033 C	3.08
934521	AD1-076 C	17.63
935111	AD1-144 C	0.13
936391	AD2-049 C	1.14
936661	AD2-085 C	0.98
936711	AD2-090 C O1	2.18
937221	AD2-160 C O1	2.37
937251	AD2-164	3.53
937541	AD2-215 C	0.75
938171	AE1-026 C1 O	8.71
938172	AE1-026 C2 O	1.26

Bus #	Bus	MW Impact
938181	AE1-027 C	0.96
938191	AE1-028 C	0.55
938461	AE1-065 C O2	11.61
938471	AE1-066 C O2	11.93
938481	AE1-067 C O2	10.85
938531	AE1-072 C O2	7.04
CARR	CARR	0.19
CBM-S1	CBM-S1	2.49
CBM-S2	CBM-S2	3.15
CBM-W1	CBM-W1	2.09
CBM-W2	CBM-W2	15.94
CIN	CIN	0.97
CPLE	CPLE	1.66
IPL	IPL	0.6
LGEE	LGEE	0.28
MEC	MEC	2.29
MECS	MECS	0.72
RENSSELAER	RENSSELAER	0.15
WEC	WEC	0.26

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ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
124428	314386	6KINGSM	DVP	314296	6PENNIMAN	DVP	1	DVP_P1-2: LN 557	single	441.8	146.28	147.88	DC	7.04

Bus #	Bus	MW Impact
314421	6WINCHST	0.12
314507	3THOMPSN	0.14
315090	1YORKTN1	23.0
315091	1YORKTN2	23.87
315092	1YORKTN3	19.77
315098	1CHESPKA	0.19
315099	1CHESPKB	0.46
315108	1ELIZAR1	1.38
315109	1ELIZAR2	1.35
315110	1ELIZAR3	1.39
315233	1SURRY 2	14.07
315260	1GOSPORTA	0.15
315261	1GOSPORTB	0.19
315262	1GOSPORTC	0.16
916191	Z1-068 C	0.02
919151	AA1-139 C	1.04
923801	AB2-015 C O1	2.73
924241	AB2-068 O1	102.68
925281	AB2-186 C	0.23
925291	AB2-188 C O1	0.81
925521	AC1-027 C	0.14
926291	AC1-107 O1	154.99
926661	AC1-147 C	0.16
926751	AC1-161 C O1	13.97
932041	AC2-012 C	4.15
932591	AC2-079 C O1	1.66
933291	AC2-141 C	13.97
933731	AC2-196 C	0.13
933991	AD1-023 C	4.15
934061	AD1-033 C	3.08
934521	AD1-076 C	17.63
935111	AD1-144 C	0.13
936391	AD2-049 C	1.14
936661	AD2-085 C	0.98
936711	AD2-090 C O1	2.18
937221	AD2-160 C O1	2.37
937251	AD2-164	3.53
937541	AD2-215 C	0.75
938171	AE1-026 C1 O	8.71
938172	AE1-026 C2 O	1.26

Bus #	Bus	MW Impact
938181	AE1-027 C	0.96
938191	AE1-028 C	0.55
938461	AE1-065 C O2	11.61
938471	AE1-066 C O2	11.93
938481	AE1-067 C O2	10.85
938531	AE1-072 C O2	7.04
CARR	CARR	0.19
CBM-S1	CBM-S1	2.49
CBM-S2	CBM-S2	3.15
CBM-W1	CBM-W1	2.09
CBM-W2	CBM-W2	15.94
CIN	CIN	0.97
CPLE	CPLE	1.66
IPL	IPL	0.6
LGEE	LGEE	0.28
MEC	MEC	2.29
MECS	MECS	0.72
RENSSELAER	RENSSELAER	0.15
WEC	WEC	0.26

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ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
124522	314415	6WALR209	DVP	314391	6LIGH209	DVP	1	DVP_P1-2: LN 557	single	441.8	127.56	129.16	DC	7.04

Bus #	Bus	MW Impact
314421	6WINCHST	0.12
314507	3THOMPSN	0.14
315090	1YORKTN1	23.0
315091	1YORKTN2	23.87
315092	1YORKTN3	19.77
315098	1CHESPKA	0.19
315099	1CHESPKB	0.46
315108	1ELIZAR1	1.38
315109	1ELIZAR2	1.35
315110	1ELIZAR3	1.39
315233	1SURRY 2	14.07
315260	1GOSPORTA	0.15
315261	1GOSPORTB	0.19
315262	1GOSPORTC	0.16
916191	Z1-068 C	0.02
919151	AA1-139 C	1.04
923801	AB2-015 C O1	2.73
924241	AB2-068 O1	102.68
925281	AB2-186 C	0.23
925291	AB2-188 C O1	0.81
925521	AC1-027 C	0.14
926291	AC1-107 O1	154.99
926661	AC1-147 C	0.16
926751	AC1-161 C O1	13.97
932041	AC2-012 C	4.15
932591	AC2-079 C O1	1.66
933291	AC2-141 C	13.97
933731	AC2-196 C	0.13
933991	AD1-023 C	4.15
934061	AD1-033 C	3.08
934521	AD1-076 C	17.63
935111	AD1-144 C	0.13
936391	AD2-049 C	1.14
936661	AD2-085 C	0.98
936711	AD2-090 C O1	2.18
937221	AD2-160 C O1	2.37
937251	AD2-164	3.53
937541	AD2-215 C	0.75
938171	AE1-026 C1 O	8.71
938172	AE1-026 C2 O	1.26

Bus #	Bus	MW Impact
938181	AE1-027 C	0.96
938191	AE1-028 C	0.55
938461	AE1-065 C O2	11.61
938471	AE1-066 C O2	11.93
938481	AE1-067 C O2	10.85
938531	AE1-072 C O2	7.04
CARR	CARR	0.19
CBM-S1	CBM-S1	2.49
CBM-S2	CBM-S2	3.15
CBM-W1	CBM-W1	2.09
CBM-W2	CBM-W2	15.94
CIN	CIN	0.97
CPLE	CPLE	1.66
IPL	IPL	0.6
LGEE	LGEE	0.28
MEC	MEC	2.29
MECS	MECS	0.72
RENSSELAER	RENSSELAER	0.15
WEC	WEC	0.26

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ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
124018	314903	8CHCKAHM	DVP	314908	8ELMONT	DVP	1	DVP_P4-2: 563T576	breaker	3144.0	134.28	134.97	DC	47.99

Bus #	Bus	MW Impact
314189	6PAPERMILL	10.94
314421	6WINCHST	0.29
314539	3UNCAMP	3.9
314541	3WATKINS	1.09
314554	3BTLEBRO	1.03
314557	3BETHELC	1.08
314566	3CRESWEL	3.92
314572	3EMPORIA	0.55
314574	6EVERETS	5.93
314578	3HORNRTN	4.49
314582	3KELFORD	5.04
314594	6PLYMOTH	1.36
314603	3SCOT NK	4.6
314617	3TUNIS	1.25
314620	6CASHIE	1.31
314623	3WITAKRS	1.76
314648	6SUNBURY	1.55
314651	6WINFALL	3.05
315073	1STONECA	8.72
315074	1HOPCGN1	10.52
315075	1HOPCGN2	10.38
315090	1YORKTN1	53.51
315091	1YORKTN2	55.53
315092	1YORKTN3	45.83
315110	1ELIZAR3	6.23
315131	1EDGECMA	11.92
315132	1EDGECMB	11.92
315233	1SURRY 2	55.25
900672	V4-068 E	0.45
901082	W1-029 E	80.04
907092	X1-038 E	9.75
913392	Y1-086 E	3.89
916042	Z1-036 E	77.63
916192	Z1-068 E	3.42
916302	Z1-086 E	13.65
917122	Z2-027 E	1.86
917332	Z2-043 E	1.43
917342	Z2-044 E	0.75
917512	Z2-088 E OP1	5.37
918492	AA1-063AE OP	5.61

Bus #	Bus	MW Impact
918512	AA1-065 E OP	6.66
918532	AA1-067 E	1.05
918562	AA1-072 E	0.24
919152	AA1-139 E	11.57
919692	AA2-053 E	5.18
919701	AA2-057 C	9.4
919702	AA2-057 E	4.7
920042	AA2-088 E OP	15.98
920592	AA2-165 E	0.62
920672	AA2-174 E	0.6
920692	AA2-178 E	6.71
923801	AB2-015 C O1	13.73
923802	AB2-015 E O1	11.26
923832	AB2-022 E	2.2
923842	AB2-024 E	1.84
923852	AB2-025 E	1.45
923911	AB2-031 C O1	2.99
923912	AB2-031 E O1	1.47
923941	AB2-035 C	0.45
923942	AB2-035 E	0.19
923992	AB2-040 E O1	8.03
924152	AB2-059 E O1	6.98
924241	AB2-068 O1	619.69
924391	AB2-088 C	0.58
924392	AB2-088 E	0.28
924491	AB2-098 C	0.81
924492	AB2-098 E	0.35
924501	AB2-099 C	0.87
924502	AB2-099 E	0.37
924511	AB2-100 C	15.35
924512	AB2-100 E	7.56
924812	AB2-134 E O1	18.13
925051	AB2-160 C O1	6.27
925052	AB2-160 E O1	10.23
925061	AB2-161 C O1	5.12
925062	AB2-161 E O1	8.36
925122	AB2-169 E	8.81
925171	AB2-174 C O1	9.34
925172	AB2-174 E O1	8.45
925281	AB2-186 C	1.06
925282	AB2-186 E	0.45
925291	AB2-188 C O1	3.86
925292	AB2-188 E O1	1.73
925331	AB2-190 C	29.21
925332	AB2-190 E	12.52
925522	AC1-027 E	2.08
925591	AC1-034 C	8.77
925592	AC1-034 E	6.62
925861	AC1-065 C	5.37
925862	AC1-065 E	8.76
926071	AC1-086 C	28.17
926072	AC1-086 E	12.82

Bus #	Bus	MW Impact
926201	AC1-098 C	8.45
926202	AC1-098 E	5.04
926211	AC1-099 C	2.83
926212	AC1-099 E	1.66
926291	AC1-107 O1	935.38
926662	AC1-147 E	2.41
926751	AC1-161 C O1	59.52
926752	AC1-161 E O1	25.41
926781	AC1-164 C	68.01
926782	AC1-164 E	30.55
927021	AC1-189 C	12.1
927022	AC1-189 E	6.03
927141	AC1-208 C	12.2
927142	AC1-208 E	5.42
927221	AC1-216 C O1	14.57
927222	AC1-216 E O1	11.46
930402	AB1-081 E O1	4.93
930862	AB1-132 E O1	8.2
931232	AB1-173 E	1.4
931242	AB1-173AE	1.4
932041	AC2-012 C	18.56
932042	AC2-012 E	30.28
932532	AC2-073 E	1.96
932581	AC2-078 C O1	5.52
932582	AC2-078 E O1	9.01
932591	AC2-079 C O1	9.26
932592	AC2-079 E O1	15.11
932631	AC2-084 C	12.05
932632	AC2-084 E	5.94
932831	AC2-110 C	2.15
932832	AC2-110 E	3.5
933061	AC2-130	3.1
933071	AC2-131 1	2.1
933081	AC2-131 2	0.95
933111	AC2-132 1	1.1
933121	AC2-132 2	0.56
933262	AC2-137 E	1.87
933272	AC2-138 E	1.18
933291	AC2-141 C	59.52
933292	AC2-141 E	25.41
933732	AC2-196 E	2.17
933991	AD1-023 C	20.59
933992	AD1-023 E	11.21
934011	AD1-025 C	25.04
934012	AD1-025 E	14.83
934061	AD1-033 C	13.7
934062	AD1-033 E	9.13
934141	AD1-041 C	8.49
934142	AD1-041 E	5.66
934201	AD1-047 C	10.7
934202	AD1-047 E	7.13
934212	AD1-048 E	1.38

Bus #	Bus	MW Impact
934331	AD1-057 C O1	13.19
934332	AD1-057 E O1	7.04
934392	AD1-063 E	1.75
934521	AD1-076 C	86.42
934522	AD1-076 E	44.01
934571	AD1-082 C	11.68
934572	AD1-082 E	6.66
934611	AD1-087 C O1	9.65
934612	AD1-087 E O1	4.54
935112	AD1-144 E	1.67
935161	AD1-151 C O1	23.47
935162	AD1-151 E O1	15.65
935171	AD1-152 C O1	9.59
935172	AD1-152 E O1	6.39
935212	AD1-156 E	1.73
936041	AD2-007	2.66
936051	AD2-008 C	4.36
936052	AD2-008 E	9.49
936151	AD2-021	0.33
936241	AD2-030 C	3.72
936242	AD2-030 E	1.9
936301	AD2-039 C	2.15
936302	AD2-039 E	3.5
936341	AD2-044 C	0.3
936342	AD2-044 E	0.33
936391	AD2-049 C	3.25
936392	AD2-049 E	3.25
936401	AD2-051 C O1	12.94
936402	AD2-051 E O1	5.55
936531	AD2-068 C	6.84
936532	AD2-068 E	3.52
936591	AD2-074 C	7.46
936592	AD2-074 E	12.17
936661	AD2-085 C	5.54
936662	AD2-085 E	9.03
936701	AD2-089 C	9.7
936702	AD2-089 E	6.46
936711	AD2-090 C O1	11.21
936712	AD2-090 E O1	7.47
937221	AD2-160 C O1	10.59
937222	AD2-160 E O1	5.55
937251	AD2-164	8.87
937481	AD2-202 C O1	2.66
937482	AD2-202 E O1	1.34
937541	AD2-215 C	3.09
937542	AD2-215 E	1.64
937571	AD2-169 C	13.41
937572	AD2-169 E	8.94
938031	AE1-004 C	2.15
938032	AE1-004 E	3.5
938171	AE1-026 C1 O	43.56
938172	AE1-026 C2 O	6.3

Bus #	Bus	MW Impact
938173	AE1-026 E O2	13.15
938181	AE1-027 C	4.26
938182	AE1-027 E	2.24
938191	AE1-028 C	2.47
938192	AE1-028 E	1.43
938221	AE1-035 C	3.38
938222	AE1-035 E	1.66
938461	AE1-065 C O2	51.76
938462	AE1-065 E O2	208.87
938471	AE1-066 C O2	53.19
938472	AE1-066 E O2	207.44
938481	AE1-067 C O2	48.37
938482	AE1-067 E O2	212.26
938491	AE1-068 C O2	86.22
938492	AE1-068 E O2	47.62
938501	AE1-069 C O2	68.42
938502	AE1-069 E O2	39.12
938531	AE1-072 C O2	31.54
938532	AE1-072 E O2	16.44
AA2-074	AA2-074	6.79
AE1-042	AE1-042	9.44
CARR	CARR	1.31
CBM-S1	CBM-S1	13.88
CBM-S2	CBM-S2	18.86
CBM-W1	CBM-W1	10.01
CBM-W2	CBM-W2	87.39
CIN	CIN	4.78
CPLE	CPLE	9.98
G-007	G-007	4.21
IPL	IPL	2.93
LGEE	LGEE	1.39
MEC	MEC	11.9
MECS	MECS	2.63
O-066	O-066	14.06
RENSSELAER	RENSSELAER	1.04
WEC	WEC	1.26

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ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
124272	314908	8ELMONT	DVP	314911	8LADYSMITH	DVP	1	DVP_P1-2: LN 576	single	2442.12	157.37	157.97	DC	31.51

Bus #	Bus	MW Impact
314229	6MT RD221	0.24
314236	6NRTHEST	0.37
314309	6IRON208	0.87
315053	1BELMED1	31.59
315054	1BELMED2	31.59
315055	1BELMED3	26.22
315058	1CHESTF3	33.55
315059	1CHESTF4	54.39
315060	1CHESTF5	19.83
315061	1CHESTG7	7.77
315062	1CHESTS7	3.53
315063	1CHESTG8	7.62
315064	1CHESTS8	3.93
315067	1DARBY 1	5.07
315068	1DARBY 2	5.08
315069	1DARBY 3	5.09
315070	1DARBY 4	5.1
315074	1HOPCGN1	15.47
315075	1HOPCGN2	15.27
315083	1SPRUNCA	19.12
315084	1SPRUNCB	19.12
315085	1SPRUNCC	14.17
315086	1SPRUNCD	14.17
315090	1YORKTN1	53.34
315091	1YORKTN2	55.35
315092	1YORKTN3	45.58
315233	1SURRY 2	49.5
923801	AB2-015 C O1	14.87
923911	AB2-031 C O1	3.63
924241	AB2-068 O1	428.72
924501	AB2-099 C	0.97
924511	AB2-100 C	19.06
925051	AB2-160 C O1	9.9
925061	AB2-161 C O1	6.07
925171	AB2-174 C O1	11.43
925281	AB2-186 C	1.08
925291	AB2-188 C O1	4.07
925331	AB2-190 C	37.16
925861	AC1-065 C	6.04
926071	AC1-086 C	33.58

Bus #	Bus	MW Impact
926291	AC1-107 O1	647.12
926411	AC1-112 C	0.66
926751	AC1-161 C O1	55.63
926781	AC1-164 C	77.8
927041	AC1-191 C O1	17.07
927221	AC1-216 C O1	18.16
930121	AB1-027 C	0.85
932041	AC2-012 C	18.51
932501	AC2-070 C	0.56
932581	AC2-078 C O1	7.33
932591	AC2-079 C O1	10.28
932831	AC2-110 C	2.41
933061	AC2-130	4.51
933071	AC2-131 1	3.06
933081	AC2-131 2	1.39
933111	AC2-132 1	1.61
933121	AC2-132 2	0.82
933261	AC2-137 C	0.69
933291	AC2-141 C	55.63
933991	AD1-023 C	22.21
934011	AD1-025 C	31.22
934061	AD1-033 C	13.58
934141	AD1-041 C	9.42
934201	AD1-047 C	13.02
934211	AD1-048 C	0.79
934521	AD1-076 C	92.51
934571	AD1-082 C	13.84
935161	AD1-151 C O1	29.86
936041	AD2-007	3.31
936051	AD2-008 C	5.44
936151	AD2-021	0.45
936241	AD2-030 C	4.05
936301	AD2-039 C	2.41
936391	AD2-049 C	3.31
936401	AD2-051 C O1	14.46
936661	AD2-085 C	6.17
936711	AD2-090 C O1	12.28
937221	AD2-160 C O1	10.54
937251	AD2-164	8.91
937541	AD2-215 C	3.16
937571	AD2-169 C	16.22
938031	AE1-004 C	2.41
938171	AE1-026 C1 O	47.18
938172	AE1-026 C2 O	6.83
938181	AE1-027 C	4.23
938191	AE1-028 C	2.45
938221	AE1-035 C	3.73
938461	AE1-065 C O2	51.46
938471	AE1-066 C O2	52.89
938481	AE1-067 C O2	48.09
938491	AE1-068 C O2	92.72
938501	AE1-069 C O2	73.48

Bus #	Bus	MW Impact
938531	AE1-072 C O2	31.51
938551	AE1-074 C	4.28
AA2-074	AA2-074	8.69
AB2-013	AB2-013	8.01
AE1-033	AE1-033	8.34
AE1-042	AE1-042	17.0
CARR	CARR	2.56
CBM-S1	CBM-S1	27.03
CBM-S2	CBM-S2	26.21
CBM-W1	CBM-W1	28.48
CBM-W2	CBM-W2	177.6
CIN	CIN	13.28
CPLE	CPLE	12.77
IPL	IPL	8.37
LGEE	LGEE	3.91
MEC	MEC	28.22
MECS	MECS	11.98
RENSSELAER	RENSSELAER	2.03
WEC	WEC	3.49
Z1-043	Z1-043	13.73

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ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
123971	314914	8MDLTHAN	DVP	314918	8NO ANNA	DVP	1	DVP_P4-2: 557T574	breaker	3637.0	140.51	140.94	DC	47.26

Bus #	Bus	MW Impact
314539	3UNCAMP	4.14
314541	3WATKINS	1.17
314557	3BETHELC	1.27
314566	3CRESWEL	4.1
314572	3EMPORIA	0.69
314574	6EVERETS	6.74
314578	3HORNRTN	5.35
314582	3KELFORD	5.73
314594	6PLYMOTH	1.44
314603	3SCOT NK	5.33
314617	3TUNIS	1.39
314620	6CASHIE	1.42
314623	3WITAKRS	2.12
314648	6SUNBURY	1.55
314651	6WINFALL	3.07
315053	1BELMED1	25.14
315054	1BELMED2	25.14
315055	1BELMED3	20.87
315058	1CHESTF3	25.46
315059	1CHESTF4	41.28
315073	1STONECA	10.44
315074	1HOPCGN1	12.58
315075	1HOPCGN2	12.42
315083	1SPRUNCA	16.1
315084	1SPRUNCB	16.1
315085	1SPRUNCC	11.93
315086	1SPRUNCD	11.93
315090	1YORKTN1	47.18
315091	1YORKTN2	48.96
315102	1BRUNSWICKG1	15.49
315103	1BRUNSWICKG2	15.49
315104	1BRUNSWICKG3	15.49
315105	1BRUNSWICKS1	32.18
315108	1ELIZAR1	6.0
315109	1ELIZAR2	5.89
315110	1ELIZAR3	6.07
315233	1SURRY 2	46.73
900672	V4-068 E	0.5
901082	W1-029 E	80.37
907092	X1-038 E	10.35

Bus #	Bus	MW Impact
913392	Y1-086 E	3.87
916042	Z1-036 E	79.07
916191	Z1-068 C	0.08
916192	Z1-068 E	3.34
916301	Z1-086 C	94.29
916302	Z1-086 E	17.14
917122	Z2-027 E	1.86
917332	Z2-043 E	1.63
917342	Z2-044 E	0.91
917512	Z2-088 E OP1	6.23
918492	AA1-063AE OP	6.52
918512	AA1-065 E OP	7.35
918532	AA1-067 E	1.19
918562	AA1-072 E	0.27
919152	AA1-139 E	11.37
919692	AA2-053 E	6.09
919701	AA2-057 C	11.25
919702	AA2-057 E	5.62
920042	AA2-088 E OP	17.64
920592	AA2-165 E	0.74
920672	AA2-174 E	0.7
920692	AA2-178 E	7.03
923801	AB2-015 C O1	14.68
923802	AB2-015 E O1	12.03
923832	AB2-022 E	2.18
923852	AB2-025 E	1.85
923862	AB2-026 E	1.7
923911	AB2-031 C O1	3.65
923912	AB2-031 E O1	1.8
923941	AB2-035 C	0.53
923942	AB2-035 E	0.23
923992	AB2-040 E O1	9.81
924241	AB2-068 O1	340.92
924391	AB2-088 C	0.69
924392	AB2-088 E	0.33
924491	AB2-098 C	0.93
924492	AB2-098 E	0.4
924501	AB2-099 C	0.97
924502	AB2-099 E	0.42
924511	AB2-100 C	19.06
924512	AB2-100 E	9.39
924812	AB2-134 E O1	19.56
925051	AB2-160 C O1	8.46
925052	AB2-160 E O1	13.8
925061	AB2-161 C O1	5.7
925062	AB2-161 E O1	9.3
925122	AB2-169 E	9.67
925171	AB2-174 C O1	11.48
925172	AB2-174 E O1	10.39
925281	AB2-186 C	1.07
925282	AB2-186 E	0.46
925291	AB2-188 C O1	4.04

Bus #	Bus	MW Impact
925292	AB2-188 E O1	1.82
925331	AB2-190 C	31.9
925332	AB2-190 E	13.67
925521	AC1-027 C	0.61
925522	AC1-027 E	2.04
926071	AC1-086 C	33.74
926072	AC1-086 E	15.36
926201	AC1-098 C	9.91
926202	AC1-098 E	5.9
926211	AC1-099 C	3.32
926212	AC1-099 E	1.95
926291	AC1-107 O1	514.59
926662	AC1-147 E	2.35
926751	AC1-161 C O1	55.25
926752	AC1-161 E O1	23.59
926781	AC1-164 C	48.22
926782	AC1-164 E	21.66
927021	AC1-189 C	13.94
927022	AC1-189 E	6.95
927141	AC1-208 C	14.48
927142	AC1-208 E	6.43
927221	AC1-216 C O1	15.72
927222	AC1-216 E O1	12.36
930862	AB1-132 E O1	9.82
931232	AB1-173 E	1.72
931242	AB1-173AE	1.72
932041	AC2-012 C	18.12
932042	AC2-012 E	29.56
932581	AC2-078 C O1	6.67
932582	AC2-078 E O1	10.88
932591	AC2-079 C O1	9.83
932592	AC2-079 E O1	16.05
932631	AC2-084 C	14.13
932632	AC2-084 E	6.96
933061	AC2-130	3.4
933071	AC2-131 1	2.31
933081	AC2-131 2	1.05
933111	AC2-132 1	1.21
933121	AC2-132 2	0.62
933291	AC2-141 C	55.25
933292	AC2-141 E	23.59
933501	AC2-165 C	14.6
933502	AC2-165 E	10.99
933731	AC2-196 C	0.55
933732	AC2-196 E	2.12
933991	AD1-023 C	22.14
933992	AD1-023 E	12.05
934011	AD1-025 C	27.01
934012	AD1-025 E	16.0
934061	AD1-033 C	13.37
934062	AD1-033 E	8.92
934201	AD1-047 C	13.08

Bus #	Bus	MW Impact
934202	AD1-047 E	8.72
934331	AD1-057 C O1	15.9
934332	AD1-057 E O1	8.48
934521	AD1-076 C	92.13
934522	AD1-076 E	46.91
934571	AD1-082 C	12.98
934572	AD1-082 E	7.41
934611	AD1-087 C O1	12.84
934612	AD1-087 E O1	6.04
934621	AD1-088 C	19.56
934622	AD1-088 E	9.18
935112	AD1-144 E	1.64
935161	AD1-151 C O1	25.63
935162	AD1-151 E O1	17.09
935171	AD1-152 C O1	12.76
935172	AD1-152 E O1	8.51
935212	AD1-156 E	2.31
936041	AD2-007	2.87
936051	AD2-008 C	4.7
936052	AD2-008 E	10.24
936391	AD2-049 C	3.01
936392	AD2-049 E	3.01
936401	AD2-051 C O1	14.48
936402	AD2-051 E O1	6.22
936661	AD2-085 C	5.9
936662	AD2-085 E	9.62
936701	AD2-089 C	11.46
936702	AD2-089 E	7.64
936711	AD2-090 C O1	12.16
936712	AD2-090 E O1	8.1
937221	AD2-160 C O1	10.39
937222	AD2-160 E O1	5.45
937251	AD2-164	7.96
937481	AD2-202 C O1	3.54
937482	AD2-202 E O1	1.78
937541	AD2-215 C	3.04
937542	AD2-215 E	1.61
937571	AD2-169 C	16.3
937572	AD2-169 E	10.87
938171	AE1-026 C1 O	47.07
938172	AE1-026 C2 O	6.81
938173	AE1-026 E O2	14.21
938181	AE1-027 C	4.16
938182	AE1-027 E	2.19
938191	AE1-028 C	2.42
938192	AE1-028 E	1.4
938221	AE1-035 C	3.73
938222	AE1-035 E	1.84
938461	AE1-065 C O2	50.55
938462	AE1-065 E O2	203.99
938471	AE1-066 C O2	51.95
938472	AE1-066 E O2	202.59

Bus #	Bus	MW Impact
938481	AE1-067 C O2	47.24
938482	AE1-067 E O2	207.29
938491	AE1-068 C O2	108.24
938492	AE1-068 E O2	59.78
938501	AE1-069 C O2	85.85
938502	AE1-069 E O2	49.08
938531	AE1-072 C O2	31.07
938532	AE1-072 E O2	16.19
938551	AE1-074 C	4.01
938552	AE1-074 E	2.02
938561	AE1-075 C	3.31
938562	AE1-075 E	1.62
AA2-074	AA2-074	8.98
AB2-013	AB2-013	6.5
AE1-033	AE1-033	6.78
AE1-042	AE1-042	15.48
CARR	CARR	2.09
CBM-S1	CBM-S1	23.99
CBM-S2	CBM-S2	26.25
CBM-W1	CBM-W1	22.91
CBM-W2	CBM-W2	155.75
CIN	CIN	10.7
CPLE	CPLE	13.2
G-007	G-007	6.95
IPL	IPL	6.7
LGEE	LGEE	3.14
MEC	MEC	23.7
MECS	MECS	8.88
O-066	O-066	23.16
RENSSELAER	RENSSELAER	1.66
WEC	WEC	2.82
Z1-043	Z1-043	11.12

Contingency Name	Contingency Defintion
DVP_P4-2: 231T2026	CONTINGENCY 'DVP_P4-2: 231T2026' /* LANDSTOWN 230 KV OPEN BRANCH FROM BUS 314481 TO BUS 314502 CKT 1 /* 6LANDSTN 230.00 - 6STUMPY 230.00 OPEN BRANCH FROM BUS 314502 TO BUS 314508 CKT 1 /* 6STUMPY 230.00 - 6THRASHER 230.00 OPEN BUS 314502 /* ISLAND: 6STUMPY 230.00 OPEN BRANCH FROM BUS 314481 TO BUS 314486 CKT 1 /* 6LANDSTN 230.00 - 6LYNHAVN 230.00 END
DVP_P1-2: LN 567	CONTINGENCY 'DVP_P1-2: LN 567' OPEN BRANCH FROM BUS 314903 TO BUS 314924 CKT 1 /* 8CHCKAHM 500.00 - 8SURRY 500.00 END
DVP_P1-2: LN 557	CONTINGENCY 'DVP_P1-2: LN 557' OPEN BRANCH FROM BUS 314214 TO BUS 314903 CKT 1 /* 6CHCKAHM 230.00 - 8CHCKAHM 500.00 OPEN BRANCH FROM BUS 314903 TO BUS 314908 CKT 1 /* 8CHCKAHM 500.00 - 8ELMONT 500.00 END
DVP_P1-2: LN 563	CONTINGENCY 'DVP_P1-2: LN 563' OPEN BRANCH FROM BUS 314902 TO BUS 314914 CKT 1 /* 8CARSON 500.00 - 8MDLTHAN 500.00 END
DVP_P4-2: H2T557	CONTINGENCY 'DVP_P4-2: H2T557' /* ELMONT 500 KV OPEN BRANCH FROM BUS 314214 TO BUS 314903 CKT 1 /* 6CHCKAHM 230.00 - 8CHCKAHM 500.00 OPEN BRANCH FROM BUS 314903 TO BUS 314908 CKT 1 /* 8CHCKAHM 500.00 - 8ELMONT 500.00 OPEN BRANCH FROM BUS 314218 TO BUS 314908 CKT 2 /* 6ELMONT 230.00 - 8ELMONT 500.00 END
DVP_P1-2: LN 574	CONTINGENCY 'DVP_P1-2: LN 574' OPEN BRANCH FROM BUS 314908 TO BUS 314911 CKT 1 /* 8ELMONT 500.00 - 8LADYSMITH 500.00 END
DVP_P4-2: 56372	CONTINGENCY 'DVP_P4-2: 56372' /* CARSON 500 KV OPEN BRANCH FROM BUS 314902 TO BUS 314914 CKT 1 /* 8CARSON 500.00 - 8MDLTHAN 500.00 OPEN BRANCH FROM BUS 314282 TO BUS 314902 CKT 1 /* 6CARSON 230.00 - 8CARSON 500.00 END
DVP_P1-2: LN 576	CONTINGENCY 'DVP_P1-2: LN 576' OPEN BRANCH FROM BUS 314914 TO BUS 314918 CKT 1 /* 8MDLTHAN 500.00 - 8NO ANNA 500.00 END

Contingency Name	Contingency Defintion
DVP_P4-2: 557T574	CONTINGENCY 'DVP_P4-2: 557T574' /* ELMONT 500 KV OPEN BRANCH FROM BUS 314214 TO BUS 314903 CKT 1 /* 6CHCKAHM 230.00 - 8CHCKAHM 500.00 OPEN BRANCH FROM BUS 314903 TO BUS 314908 CKT 1 /* 8CHCKAHM 500.00 - 8ELMONT 500.00 OPEN BRANCH FROM BUS 314908 TO BUS 314911 CKT 1 /* 8ELMONT 500.00 - 8LADYSMITH 500.00 END
DVP_P4-2: 57602	CONTINGENCY 'DVP_P4-2: 57602' /* NORTH ANNA 500 KV OPEN BRANCH FROM BUS 314914 TO BUS 314918 CKT 1 /* 8MDLTHAN 500.00 - 8NO ANNA 500.00 OPEN BRANCH FROM BUS 314232 TO BUS 314918 CKT 1 /* 6NO ANNA 230.00 - 8NO ANNA 500.00 END
DVP_P4-2: WT576	CONTINGENCY 'DVP_P4-2: WT576' /* NORTH ANNA 500 KV OPEN BRANCH FROM BUS 314914 TO BUS 314918 CKT 1 /* 8MDLTHAN 500.00 - 8NO ANNA 500.00 OPEN BRANCH FROM BUS 314232 TO BUS 314918 CKT 2 /* 6NO ANNA 230.00 - 8NO ANNA 500.00 END
DVP_P4-2: 563T576	CONTINGENCY 'DVP_P4-2: 563T576' /* MIDLOTHIAN 500 500 KV OPEN BRANCH FROM BUS 314902 TO BUS 314914 CKT 1 /* 8CARSON 500.00 - 8MDLTHAN 500.00 OPEN BRANCH FROM BUS 314914 TO BUS 314918 CKT 1 /* 8MDLTHAN 500.00 - 8NO ANNA 500.00 END

Short Circuit

Short Circuit

(Summary of impacted circuit breakers)

New circuit breakers found to be over-duty:

None

Contributions to previously identified circuit breakers found to be over-duty:

None

Attachment 1

Single Line Diagram

I/A

NWADIKE

EXHIBIT 3

AE1-072 Impact Study

Generation Interconnection

System Impact Study Report

for

Queue Project AE1-072

SHAWBORO – SLIGO 230KV

98.6 MW Capacity / 150 MW Energy

August, 2019

Table of Contents

1 Introduction

This System Impact Study (SIS) has been prepared in accordance with the PJM Open Access Transmission Tariff, 205, as well as the Feasibility Study Agreement between Shawboro East Ridge Solar, LLC, the Interconnection Customer (IC), and PJM Interconnection, LLC (PJM), Transmission Provider (TP). The Interconnected Transmission Owner (ITO) is Virginia Electric and Power Company (VEPCO).

2 Preface

The intent of the 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 System Impact Study is performed.

The 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.

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.

An Interconnection Customer with a proposed new Customer Facility that has a Maximum Facility Output equal to or greater than 100 MW shall install and maintain, at its expense, phasor measurement units (PMUs). See Section 8.5.3 of Appendix 2 to the Interconnection Service Agreement as well as section 4.3 of PJM Manual 14D for additional information.

3 General

The IC has proposed a solar generating facility located in Currituck County, Virginia. The installed facilities will have a capability of 150 MW with 98.6 MW of this output being recognized by PJM as Capacity. The proposed

in-service date for the AE1-072 project is 12/30/2019. This study does not imply an ITO commitment to either in-service date.

Queue Number	AE1-072
Project Name	SHAWBORO – SLIGO 230KV
Interconnection Customer	Shawboro East Ridge Solar, LLC
State	Virginia
County	Currituck
Transmission Owner	Dominion
MFO	150
MWE	150
MWC	98.6
Fuel	Solar
Basecase Study Year	2022

3.1 Point of Interconnection

AE1-072 will interconnect with the ITO transmission system via a new three breaker ring bus switching station that connects on the Shawboro to Sligo 230 kV line # 269. See one line in **Attachment 1**.

3.2 Cost Summary

The AE1-072 project will be responsible for the following costs:

Description	Total Cost
Attachment Facilities	$ 1,800,000
Direct Connection Network Upgrade	$ 6,300,000
Non Direct Connection Network Upgrades	$ 1,000,000
Total Costs	**$ 9,100,000**

In addition, the AE1-072 project may be responsible for a contribution to the following costs

Description	Total Cost
System Upgrades	$ 30,812,444

Note: PJM Open Access Transmission Tariff (OATT) section 217.3A outline cost allocation rules. The rules are further clarified in PJM Manual 14A Attachment B. The allocation of costs for a network upgrade will start with the first Queue project to cause the need for the upgrade. Later queue projects will receive cost allocation contingent on their contribution to the violation and are allocated to the queues that have not closed less than 5 years following the execution of the first Interconnection Service Agreement which identifies the need for this upgrade.

4 Transmission Owner Scope of Work

4.1 Attachment Facilities

Generation Substation: Install metering and associated protection equipment. Estimated Cost is $600,000.

Transmission: Construct approximately one span of 230 kV Attachment line between the generation substation and a new AE1-072 Switching Station. The estimated cost for this work is $1,200,000.

The estimated total cost of the Attachment Facilities is $1,800,000. It is estimated to take 18-24 months to complete this work. These preliminary cost estimates are based on typical engineering costs. A more detailed engineering cost estimates are normally done when the IC provides an exact site plan location for the generation substation during the Facility Study phase. The total preliminary cost estimate for the Attachment work is given in the table below. These costs do not include CIAC Tax Gross-up.

Description	Total Cost
Substation	$ 600,000
Transmission	$ 1,200,000
Total Attachment Facility Costs	**$ 1,800,000**

4.2 Direct Connection Cost Estimate

Substation: Establish the new 230 kV AE1-072 Switching Substation (interconnection substation). The estimated cost of this work scope is $6,300,000. It is estimated to take 24-36 months to complete this work.

The total preliminary cost estimate for the Direct Connection work is given in the table below. These costs do not include CIAC Tax Gross-up.

Description	Total Cost
Substation	$ 6,300,000
Total Direct Connection Facility Costs	**$ 6,300,000**

4.3 Non-Direct Connection Cost Estimate

Transmission: Install transmission structure in-line with transmission line to allow the proposed interconnection switching station to be interconnected with the transmission system. Estimated cost is $1,000,000 and is estimated to take 24-30 months to complete.

Remote Terminal Work: During the Facilities Study, ITO's System Protection Engineering Department will review transmission line protection as well as anti-islanding required to accommodate the new generation and interconnection substation. System Protection Engineering will determine the minimal acceptable protection requirements to reliably interconnect the proposed generating facility with the transmission system. The

review is based on maintaining system reliability by reviewing ITO's protection requirements with the known transmission system configuration which includes generating facilities in the area. This review may determine that transmission line protection and communication upgrades are required at remote substations.

The total preliminary cost estimate for the Non-Direct Connection work is given in the table below. These costs do not include CIAC Tax Gross-up.

Description	Total Cost
Transmission	$ 1,000,000
Remote Terminal Work	TBD in the Facilities Study
Total Non-Direct Connection Facility Costs	**$ 1,000,000**

5 Interconnection Customer Requirements

5.1 System Protection

The IC must design its Customer Facilities in accordance with all applicable standards, including the standards in Dominion's "Dominion Energy Electric Transmission Generator Interconnection Requirements" documented in Dominion's Facility Interconnection Requirements "Exhibit C" located at: https://www.dominionenergy.com/company/moving-energy/electric-transmission-access. Preliminary Protection requirements will be provided as part of the Facilities Study. Detailed Protection Requirements will be provided once the project enters the construction phase.

5.2 Compliance Issues and Interconnection Customer Requirements

The proposed Customer Facilities must be designed in accordance with Dominion's "Dominion's Facility Interconnection Requirements" document located at: https://www.dominionenergy.com/company/moving-energy/electric-transmission-access. In particular, the IC is responsible for the following:

1. The purchase and installation of a fully rated protection device (circuit breaker, circuit switcher, fuse) to protect the IC's GSU transformer(s).

2. The purchase and installation of the minimum required Dominion generation interconnection relaying and control facilities as described in the System Protection noted above. This includes over/under voltage protection, over/under frequency protection, and zero sequence voltage protection relays.

3. The purchase and installation of supervisory control and data acquisition ("SCADA") equipment to provide information in a compatible format to the Dominion Transmission System Control Center.

4. Compliance with the Dominion and PJM generator power factor and voltage control requirements.

The GSU(s) associated with the IC queue request shall meet the grounding requirements as noted in Dominion's "Dominion's Facility Interconnection Requirements" document located at: https://www.dominionenergy.com/company/moving-energy/electric-transmission-access.

The IC will also be required to meet all PJM, SERC, and NERC reliability criteria and operating procedures for standards compliance. For example, the IC will need to properly locate and report the over and under voltage and over and under frequency system protection elements for its units as well as the submission of the generator model and protection data required to satisfy the PJM and SERC audits. Failure to comply with these requirements may result in a disconnection of service if the violation is found to compromise the reliability of the Dominion system.

5.3 Power Factor Requirements

The IC shall design its non-synchronous Customer Facility with the ability to maintain a power factor of at least 0.95 leading (absorbing VARs) to 0.95 lagging (supplying VARs) measured at the high-side of the facility substation transformer(s) connected to the Dominion transmission system.

6 Revenue Metering and SCADA Requirements

6.1 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.

6.1.1 Meteorological Data Reporting Requirement

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

- Temperature (degrees Fahrenheit)
- Atmospheric pressure (hectopascals)
- Irradiance
- Forced outage data

6.2 Dominion Requirements

See Section 3.4.6 “Metering and Telecommunications” of Dominion’s “Dominion’s Facility Interconnection Requirements” document located at: https://www.dominionenergy.com/company/moving-energy/electric-transmission-access.

7 Network Impacts

The Queue Project AE1-072 was evaluated as a 150.0 MW (Capacity 98.6 MW) injection at Shawboro – Sligo 230kV line #269 in the Dominion area. Project AE1-072 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AE1-072 was studied with a commercial probability of 100%. Potential network impacts were as follows:

Summer Peak Load Flow

8 Generation Deliverability

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

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
3368160	314908	8ELMONT	DVP	314911	8LADYSMITH	DVP	1	Base Case	single	2442.12	99.6	100.32	AC	20.6
3368527	314934	8SPOTSYL	DVP	314916	8MORRSVL	DVP	1	DVP_P1-2: LN 581	single	3218.56	99.48	100.04	AC	20.8

9 Multiple Facility Contingency

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

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
3367888	314902	8CARSON	DVP	314914	8MDLTHAN	DVP	1	DVP_P4-2: H2T557	breaker	3938.0	99.53	100.51	AC	44.27

10 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)

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
3368380	314209	6SKIFF CREEK	DVP	314386	6KINGS M	DVP	1	DVP_P1-2: LN 557	single	441.8	138.36	139.97	AC	7.04
3367674	314218	6ELMONT	DVP	314908	8ELMONT	DVP	1	DVP_P4-2: H2T557	breaker	1050.6	128.76	130.32	AC	24.27
3368437	314296	6PENNIMAN	DVP	314415	6WALR209	DVP	1	DVP_P1-2: LN 557	single	441.8	127.15	128.76	AC	7.04
3368409	314386	6KINGS M	DVP	314296	6PENNIMAN	DVP	1	DVP_P1-2: LN 557	single	441.8	130.75	132.36	AC	7.04
3368612	314415	6WALR209	DVP	314391	6LIGH209	DVP	1	DVP_P1-2: LN 557	single	441.8	112.76	114.37	AC	7.04
3368378	314574	6EVERETS	DVP	936530	AD2-068 TAP	DVP	1	DVP_P1-2: LN 6002_FSA	single	449.32	105.07	106.23	AC	6.6
3368914	314574	6EVERETS	DVP	936530	AD2-068 TAP	DVP	1	DVP_P7-1: LN 2058-2181	tower	485.0	157.99	159.67	AC	10.18
3367895	314596	3POPLR C	DVP	314573	3EVERETS	DVP	1	DVP_P4-2: 246T2034	breaker	239.0	113.75	116.72	AC	8.39
3367887	314902	8CARSON	DVP	314914	8MDLTHAN	DVP	1	DVP_P4-2: 557T574	breaker	3938.0	105.94	106.97	AC	45.84
3367765	314903	8CHCKAHM	DVP	314908	8ELMONT	DVP	1	DVP_P4-2: 563T576	breaker	3144.0	123.25	124.56	AC	47.92
3367766	314903	8CHCKAHM	DVP	314908	8ELMONT	DVP	1	DVP_P4-2: 56372	breaker	3144.0	119.78	121.12	AC	46.92

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
3368257	314903	8CHCKAHM	DVP	314908	8ELMONT	DVP	1	DVP_P1-2: LN 563	single	2442.12	119.69	120.94	AC	30.04
3368258	314903	8CHCKAHM	DVP	314908	8ELMONT	DVP	1	DVP_P1-2: LN 576	single	2442.12	119.2	120.45	AC	30.09
3367699	314908	8ELMONT	DVP	314911	8LADYSMITH	DVP	1	DVP_P4-2: 57602	breaker	3351.0	132.04	133.27	AC	47.85
3367700	314908	8ELMONT	DVP	314911	8LADYSMITH	DVP	1	DVP_P4-2: WT576	breaker	3351.0	132.04	133.27	AC	47.85
3368152	314908	8ELMONT	DVP	314911	8LADYSMITH	DVP	1	DVP_P1-2: LN 576	single	2442.12	147.06	148.17	AC	31.46
3368153	314908	8ELMONT	DVP	314911	8LADYSMITH	DVP	1	DVP_P1-2: LN 563	single	2442.12	135.32	136.28	AC	27.04
3367806	314914	8MDLTHAN	DVP	314918	8NO ANNA	DVP	1	DVP_P4-2: 557T574	breaker	3637.0	121.29	122.28	AC	47.19
3368215	314914	8MDLTHAN	DVP	314918	8NO ANNA	DVP	1	DVP_P1-2: LN 574	single	2442.12	119.97	121.14	AC	28.08
3368217	314914	8MDLTHAN	DVP	314918	8NO ANNA	DVP	1	DVP_P1-2: LN 557	single	2442.12	113.38	114.54	AC	27.39
36235411	936530	AD2-068 TAP	DVP	304451	6GREENVILE T	CPLE	1	DVP_P1-2: LN 6002_FSA	single	478.0	100.42	101.51	AC	6.6

11 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.

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
3368379	314209	6SKIFF CREEK	DVP	314386	6KINGS M	DVP	1	DVP_P1-2: LN 557	operation	441.8	142.16	144.4	AC	10.71
3368781	314218	6ELMONT	DVP	314908	8ELMONT	DVP	2	DVP_P1-2: LN 557	operation	879.84	92.64	93.68	AC	15.52
3368802	314218	6ELMONT	DVP	314908	8ELMONT	DVP	1	DVP_P1-2: LN 557	operation	920.92	88.98	89.99	AC	15.59
3368436	314296	6PENNIMAN	DVP	314415	6WALR209	DVP	1	DVP_P1-2: LN 557	operation	441.8	131.0	133.24	AC	10.71
3368408	314386	6KINGS M	DVP	314296	6PENNIMAN	DVP	1	DVP_P1-2: LN 557	operation	441.8	134.61	136.85	AC	10.71
3368611	314415	6WALR209	DVP	314391	6LIGH209	DVP	1	DVP_P1-2: LN 557	operation	441.8	117.17	119.41	AC	10.71

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
3368373	314574	6EVERETS	DVP	936530	AD2-068 TAP	DVP	1	Base Case	operation	449.32	127.42	128.93	AC	8.48
3368555	314902	8CARSON	DVP	314914	8MDLTHAN	DVP	1	DVP_P1-2: LN 557	operation	3218.56	119.64	121.03	AC	43.16
3368251	314903	8CHCKAHM	DVP	314908	8ELMONT	DVP	1	DVP_P1-2: LN 563	operation	2442.12	152.44	154.05	AC	45.69
3368256	314903	8CHCKAHM	DVP	314908	8ELMONT	DVP	1	Base Case	operation	2442.12	121.85	123.14	AC	36.51
3368318	314905	8CHANCE	DVP	314900	8BRISTER	DVP	1	DVP_P1-2: LN 594	operation	2442.12	143.21	144.25	AC	29.04
3368149	314908	8ELMONT	DVP	314911	8LADYSMITH	DVP	1	DVP_P1-2: LN 576	operation	2442.12	181.05	182.73	AC	47.86
3368157	314908	8ELMONT	DVP	314911	8LADYSMITH	DVP	1	Base Case	operation	2442.12	114.49	115.65	AC	31.34
3368428	314911	8LADYSMITH	DVP	314905	8CHANCE	DVP	1	DVP_P1-2: LN 573	operation	2738.22	128.74	129.68	AC	29.51
3368213	314914	8MDLTHAN	DVP	314918	8NO ANNA	DVP	1	DVP_P1-2: LN 574	operation	2442.12	159.99	161.49	AC	42.71
3368220	314914	8MDLTHAN	DVP	314918	8NO ANNA	DVP	1	Base Case	operation	2442.12	99.88	100.99	AC	31.36
3368569	314918	8NO ANNA	DVP	314934	8SPOTSYL	DVP	1	DVP_P1-2: LN 581	operation	3218.56	117.95	118.82	AC	32.47
3368399	936530	AD2-068 TAP	DVP	304451	6GREENVILE T	CPLE	1	Base Case	operation	478.0	124.52	125.92	AC	8.48

12 System Reinforcements

<table>
<tr><th>ID</th><th>Index</th><th>Facility</th><th>Upgrade Description</th><th>Cost</th></tr>
<tr><td>3368437, 3368380, 3368409</td><td>6,4,7</td><td>6SKIFF CREEK 230.0 kV - 6KINGS M 230.0 kV Ckt 1, 6KINGS M 230.0 kV - 6PENNIMAN 230.0 kV Ckt 1, 6PENNIMAN 230.0 kV - 6WALR209 230.0 kV Ckt 1</td><td>Upgrade #1
Upgrade Description: PJM baseline upgrade b3057: Rebuild 6.1 miles of Waller-Skiffess Creek 230 kV Line (#2154) between Waller and Kings Mill to current standards with a minimum summer emergency rating of 1047 MVA utilizing single circuit steel structures. Remove this 6.1 mile section of Line #58 between Waller and Kings Mill. Rebuild the 1.6 miles of Line #2154 and #19 between Kings Mill and Skiffes Creek to current standards with a minimum summer emergency rating of 1047 MVA at 230 kV for Line #2154 and 261 MVA at 115 kV for Line #19, utilizing double circuit steel structures. The baseline project has a projected in-service date of 12/30/2024.
Cost : $10,000,000

Note 1: Although Queue Project AE1-072 may not have cost responsibility for this upgrade, Queue Project AE1-072 may need this upgrade in-service to be deliverable to the PJM system. If Queue Project AE1-072 comes into service prior to completion of the upgrade, Queue Project AE1-072 will need an interim study.</td><td>$0</td></tr>
<tr><td>3367888, 3367887</td><td>3</td><td>8CARSON 500.0 kV - 8MDLTHAN 500.0 kV Ckt 1</td><td>Upgrade Description: Rebuild 37.41 miles of 500 kV Line #563 from Carson to Midlothian with 3-1351.5 125C ACSR.
Ratings : SN: 4816 MVA; SE: 4816 MVA; SLD: 5539 MVA
Cost : $ 115,971,000
Time estimate : 48-60 months
n6172

<table>
<tr><th>Queue</th><th>MW contribution</th><th>Percentage of Cost</th><th>Cost($115,971,000)</th><th>Contingency Name</th><th>Contingency Type</th></tr>
<tr><td>AE1-068</td><td>78.16</td><td>28.71%</td><td>$33,290,338.48</td><td>'DVP_P4-2: 557T574'</td><td>breaker</td></tr>
<tr><td>AE1-069</td><td>148.28</td><td>54.46%</td><td>$63,156,235.79</td><td>'DVP_P4-2: 557T574'</td><td>breaker</td></tr>
<tr><td>AE1-072</td><td>45.84</td><td>16.84%</td><td>$19,524,425.74</td><td>'DVP_P4-2: 557T574'</td><td>breaker</td></tr>
</table>
</td><td>$19,524,426</td></tr>
</table>

ID	Index	Facility	Upgrade Description	Cost
3367766, 3367765, 3368258, 3368257	11	**8CHCKAHM 500.0 kV - 8ELMONT 500.0 kV Ckt 1**	Due to cost allocation rules, AE1-072 doesn't have any cost responsibility for the below upgrade: n5464 : Replace wave trap at Chickahominy Substation. Ratings : SN: 3424 MVA; SE: 3424 MVA; SLD: 3937 MVA Cost : $500,000 Time Estimate : 30-36 Months Note 1: As changes to the interconnection process occur, such as prior queued projects withdrawing from the queue, reducing in size, etc, Queue Project AE1-072 could become the driver and could be responsible for the upgrade. Note 2: Although Queue Project AE1-072 may not have cost responsibility for this upgrade, Queue Project AE1-072 may need this upgrade in-service to be deliverable to the PJM system. If Queue Project AE1-072 comes into service prior to completion of the upgrade, Queue Project AE1-072 will need an interim study.	$0

<table>
<tr><th>ID</th><th>Index</th><th>Facility</th><th>Upgrade Description</th><th>Cost</th></tr>
<tr>
<td>3367806, 3368217, 3368215</td>
<td>12</td>
<td>8MDLTHAN 500.0 kV - 8NO ANNA 500.0 kV Ckt 1</td>
<td>
<u>Upgrade #1</u>
Due to cost allocation rules, AE1-072 doesn't have any cost responsibility for the below upgrade:

Upgrade description: Replace wave trap at North Anna Substation for Midlothian – North Anna 500 kV line #576. This will increase emergency rating by 31% to 3424 MVA. Estimated to 12-16 months to engineer and construct.
3424/3424/3938
n6055

Note 1: As changes to the interconnection process occur, such as prior queued projects withdrawing from the queue, reducing in size, etc, Queue Project AE1-072 could become the driver and could be responsible for the upgrade.

Note 2: Although Queue Project AE1-072 may not have cost responsibility for this upgrade, Queue Project AE1-072 may need this upgrade in-service to be deliverable to the PJM system. If Queue Project AE1-072 comes into service prior to completion of the upgrade, Queue Project AE1-072 will need an interim study.

<u>Upgrade #2</u>
Upgrade description: Rebuild 41.13 miles of the Midlothian – North Anna 500kV line #576 with 3-1351.5 125C ACSR
Cost: 127,503,000
Time estimate; 48-60 months
Ratings: 4816/4816/5539
n5609

<table>
<tr><th>Queue</th><th>MW contribution</th><th>Percentage of Cost</th><th>Cost($123,390,000)</th><th>Contingency Name</th><th>Contingency Type</th></tr>
<tr><td>AC2-141</td><td>77.46</td><td>10.98%</td><td>$13,554,321.86</td><td>'557T574'</td><td>breaker</td></tr>
<tr><td>AD1-025</td><td>41.93</td><td>5.95%</td><td>$7,337,112.26</td><td>'DVP_P4-2: 557T574'</td><td>breaker</td></tr>
<tr><td>AD1-076</td><td>137.77</td><td>19.54%</td><td>$24,107,654.57</td><td>'DVP_P4-2: 557T574'</td><td>breaker</td></tr>
<tr><td>AD1-151</td><td>41.9</td><td>5.94%</td><td>$7,331,862.72</td><td>'DVP_P4-2: 557T574'</td><td>breaker</td></tr>
<tr><td>AE1-026</td><td>54.18</td><td>7.68%</td><td>$9,480,675.94</td><td>'DVP_P4-2: 557T574'</td><td>breaker</td></tr>
<tr><td>AE1-068</td><td>169.18</td><td>23.99%</td><td>$29,603,926.84</td><td>'DVP_P4-2: 557T574'</td><td>breaker</td></tr>
<tr><td>AE1-069</td><td>135.34</td><td>19.19%</td><td>$23,682,441.53</td><td>'DVP_P4-2: 557T574'</td><td>breaker</td></tr>
<tr><td>AE1-072</td><td>47.387</td><td>6.72%</td><td>$8,292,004.26</td><td>'DVP_P4-2: 557T574'</td><td>breaker</td></tr>
</table>
</td>
<td>$8,292,004</td>
</tr>
</table>

<table>
<tr><th>ID</th><th>Index</th><th>Facility</th><th>Upgrade Description</th><th>Cost</th></tr>
<tr><td>3367674</td><td>5</td><td>6ELMONT 230.0 kV - 8ELMONT 500.0 kV Ckt 1</td><td>Upgrade description : Elmont 500 – 230 kV Tx#1: replace the 500-230 kV transformer #1 increase its line rating to 1134 MVA (normal), 1203 MVA (emergency), and 1365 MVA (load dump).
Time Estimate : 24-30 Months
Cost : $22,000,000
n6127

<table>
<tr><th>Queue</th><th>MW contribution</th><th>Percentage of Cost</th><th>Cost($22,000,000)</th><th>Contingency Name</th><th>Contingency Type</th></tr>
<tr><td>AC1-164</td><td>48.87</td><td>11.04%</td><td>$2,429,042.23</td><td>'H2T557'</td><td>breaker</td></tr>
<tr><td>AC1-191</td><td>26.35</td><td>5.95%</td><td>$1,309,704.58</td><td>'H2T557'</td><td>breaker</td></tr>
<tr><td>AC1-216</td><td>21.14</td><td>4.78%</td><td>$1,050,745.91</td><td>'H2T557'</td><td>breaker</td></tr>
<tr><td>AC2-012</td><td>24.79</td><td>5.60%</td><td>$1,232,166.09</td><td>'H2T557'</td><td>breaker</td></tr>
<tr><td>AC2-078</td><td>12.13</td><td>2.74%</td><td>$602,911.44</td><td>'H2T557'</td><td>breaker</td></tr>
<tr><td>AC2-079</td><td>14.89</td><td>3.36%</td><td>$740,094.92</td><td>'H2T557'</td><td>breaker</td></tr>
<tr><td>AC2-141</td><td>38.06</td><td>8.60%</td><td>$1,891,740.28</td><td>'H2T557'</td><td>breaker</td></tr>
<tr><td>AD1-023</td><td>17.4</td><td>3.93%</td><td>$864,852.36</td><td>'DVP_P4-2: H2T557'</td><td>breaker</td></tr>
<tr><td>AD1-025</td><td>33.16</td><td>7.49%</td><td>$1,648,189.90</td><td>'DVP_P4-2: H2T557'</td><td>breaker</td></tr>
<tr><td>AD1-033</td><td>11.6074</td><td>2.62%</td><td>$576,936.05</td><td>'DVP_P4-2: H2T557'</td><td>breaker</td></tr>
<tr><td>AD1-041</td><td>11.2355</td><td>2.54%</td><td>$558,451.07</td><td>'DVP_P4-2: H2T557'</td><td>breaker</td></tr>
<tr><td>AD1-076</td><td>70.79</td><td>15.99%</td><td>$3,518,557.39</td><td>'DVP_P4-2: H2T557'</td><td>breaker</td></tr>
<tr><td>AD1-082</td><td>12.99</td><td>2.93%</td><td>$645,657.02</td><td>'DVP_P4-2: H2T557'</td><td>breaker</td></tr>
<tr><td>AD1-105</td><td>13.706</td><td>3.10%</td><td>$681,245.20</td><td>'DVP_P4-2: H2T557'</td><td>breaker</td></tr>
<tr><td>AD1-151</td><td>33.16</td><td>7.49%</td><td>$1,648,189.90</td><td>'DVP_P4-2: H2T557'</td><td>breaker</td></tr>
<tr><td>AD2-008</td><td>11.4</td><td>2.58%</td><td>$566,627.41</td><td>'DVP_P4-2: H2T557'</td><td>breaker</td></tr>
<tr><td>AD2-074</td><td>16.74</td><td>3.78%</td><td>$832,047.61</td><td>DVP_P4-2: H2T557'</td><td>breaker</td></tr>
<tr><td>AE1-072</td><td>24.2</td><td>5.47%</td><td>$1,202,840.64</td><td>DVP_P4-2: H2T557'</td><td>breaker</td></tr>
</table>
</td><td>$1,202,841</td></tr>
</table>

ID	Index	Facility	Upgrade Description	Cost
3367895	10	**3POPLR C 115.0 kV - 3EVERETS 115.0 kV Ckt 1**	The below upgrade is identified for a prior queue project and due to the cost allocation rules, AE1-072 does not currently receive an allocation towards the below upgrade. Upgrade description: Replace Relay at Everetts Cost : $ 500,000 Time Estimate : 14-16 months New Rating : A: 300, B: 300, C: 345 n6141 Note 1: As changes to the interconnection process occur, such as prior queued projects withdrawing from the queue, reducing in size, etc, Queue Project AE1-072 could become the driver and could be responsible for the upgrade Note 2: Although Queue Project AE1-072 may not have cost responsibility for this upgrade, Queue Project AE1-072 may need this upgrade in-service to be deliverable to the PJM system. If Queue Project AE1-072 comes into service prior to completion of the upgrade, Queue Project AE1-072 will need an interim study.	$0
3368527	2	**8SPOTSYL 500.0 kV - 8MORRSVL 500.0 kV Ckt 1**	Upgrade description: Wreck & rebuild the 17 mile Spotsylvania – Morrisville 500kV line #594. Project will require a Virginia CPCN Cost :$60,000,000 Time Estimate 44-48 months New Rating: A: 4453, B: 4453, C: 5121 n6160 Queue Project AE1-072 presently does not meet the cost allocation rules and so doesn't receive cost allocation for the below upgrade. Note 1: As changes to the interconnection process occur, such as prior queued projects withdrawing from the queue, reducing in size, etc, Queue Project AD1-072 could become the driver and could be responsible for the upgrade Note 2: Although Queue Project AE1-072 may not have cost responsibility for this upgrade, Queue Project AE1-072 may need this upgrade in-service to be deliverable to the PJM system. If Queue Project AE1-072 comes into service prior to completion of the upgrade, Queue Project AE1-072 will need an interim study.	$0

<table>
<tr><th>ID</th><th>Index</th><th>Facility</th><th>Upgrade Description</th><th>Cost</th></tr>
<tr>
<td>3368378, 3368914, 36235411</td>
<td>9,13</td>
<td>6EVERETS 230.0 kV - AD2-068 TAP - 6GREENVILE T 230.0 kV Ckt 1</td>
<td>
Upgrade #1
Upgrade description: Rebuild Dominion portion of the 20.5 mile Everetts – Greenville 230kV line #218 with 2-636 ACSR and Rebuild 17.5 miles 2-636 ACSR
Cost: $ 30,750,000
Time: 30-36 months
Ratings after the upgrade: 1047/1047/1204
n6144

<table>
<tr><th>Queue</th><th>MW contribution</th><th>Percentage of Cost</th><th>Cost($30,750,000)</th><th>Contingency Name</th><th>Contingency Type</th></tr>
<tr><td>AD1-023</td><td>0.92</td><td>0.53%</td><td>$162,037.9131</td><td>'DVP_P7-1: LN 2058-2181'</td><td>tower</td></tr>
<tr><td>AD1-047</td><td>7.1</td><td>4.07%</td><td>$1,251,870.7103</td><td>'DVP_P7-1: LN 2058-2181'</td><td>tower</td></tr>
<tr><td>AD1-057</td><td>13.49</td><td>7.74%</td><td>$2,378,554.3495</td><td>'DVP_P7-1: LN 2058-2181'</td><td>tower</td></tr>
<tr><td>AD1-076</td><td>82.59</td><td>47.36%</td><td>$14,562,253.7973</td><td>'DVP_P7-1: LN 2058-2181'</td><td>tower</td></tr>
<tr><td>AD2-051</td><td>13.6</td><td>7.80%</td><td>$2,397,949.5295</td><td>'DVP_P7-1: LN 2058-2181'</td><td>tower</td></tr>
<tr><td>AE1-026</td><td>46.53</td><td>26.68%</td><td>$8,204,161.15</td><td>'DVP_P7-1: LN 2058-2181'</td><td>tower</td></tr>
<tr><td>AE1-072</td><td>10.17</td><td>5.83%</td><td>$1,793,172.55</td><td>'DVP_P7-1: LN 2058-2181'</td><td>tower</td></tr>
</table>

Upgrade #1
Upgrade description: Reconductor 1.87 miles of the Duke/Progress Energy portion of the Everetts – Greenville 230kV line #218 with 6-1590 ACSR and replace disconnect switches at Greenville substation.
Cost: $8,500,000
Time: 30-36 Months
Ratings after the upgrade: 1195/1195/1195
</td>
<td>$1,793,173</td>
</tr>
</table>

ID	Index	Facility	Upgrade Description	Cost
3368160, 3368153, 3367700, 3367699, 3368152	1	**8ELMONT 500.0 kV - 8LADYSMITH 500.0 kV Ckt 1**	**Upgrade #1** Due to cost allocation rules, AE1-072 doesn't have any cost responsibility for the below upgrade: n5483 : PJM Network Upgrade n5483: Replace wave trap at Elmont and Ladysmith substations. The project as a projected in-service date of 03/31/2021. Ratings : SN: 2913 MVA; SE: 2913 MVA; SLD: 3351 MVA Cost : $700,000 Note 1: Although Queue Project AE1-072 may not have cost responsibility for this upgrade, Queue Project AE1-072 may need this upgrade in-service to be deliverable to the PJM system. If Queue Project AE1-072 comes into service prior to completion of the upgrade, Queue Project AE1-072 will need an interim study. **Upgrade #2** b3020 : PJM baseline upgrade b3020: Rebuild 500kV Line #574 Ladysmith to Elmont - 26.2 miles long. The baseline project has a projected in-service date of 12/31/2022. Ratings : SN: 4330 MVA; SE: 4330 MVA; SLD: 4979 MVA Note 1: Although Queue Project AE1-072 may not have cost responsibility for this upgrade, Queue Project AE1-072 may need this upgrade in-service to be deliverable to the PJM system. If Queue Project AE1-072 comes into service prior to completion of the upgrade, Queue Project AE1-072 will need an interim study.	$0
3368612	8	**6WALR209 230.0 kV - 6LIGH209 230.0 kV Ckt 1**	PJM Baseline Upgrade b3056. Partial Rebuild 230 kV Line #2113 Waller to Lightfoot. The baseline project has a projected in-service date of 12/30/2024. Ratings after the upgrade: 1047/10471204 Note 1: Although Queue Project AE1-072 may not have cost responsibility for this upgrade, Queue Project AE1-072 may need this upgrade in-service to be deliverable to the PJM system. If Queue Project AE1-072 comes into service prior to completion of the upgrade, Queue Project AE1-072 will need an interim study.	$0
			TOTAL COST	**$30,812,444**

13 Flow Gate Details

The following appendices contain additional information about each flowgate presented in the body of the report. For each appendix, a description of the flowgate and its contingency was included for convenience. However, the intent of the appendix section is to provide more information on which projects/generators have contributions to the flowgate in question. Although this information is not used "as is" for cost allocation purposes, it can be used to gage other generators impact. It should be noted the generator contributions presented in the appendices sections are full contributions, whereas in the body of the report, those contributions take into consideration the commercial probability of each project.

13.1 Contingency Descriptions

Contingency Name	Contingency Definition
DVP_P4-2: WT576	CONTINGENCY 'DVP_P4-2: WT576' /* NORTH ANNA 500 KV OPEN BRANCH FROM BUS 314914 TO BUS 314918 CKT 1 /* 8MDLTHAN 500.00 - 8NO ANNA 500.00 OPEN BRANCH FROM BUS 314232 TO BUS 314918 CKT 2 /* 6NO ANNA 230.00 - 8NO ANNA 500.00 END
DVP_P4-2: H2T557	CONTINGENCY 'DVP_P4-2: H2T557' /* ELMONT 500 KV OPEN BRANCH FROM BUS 314214 TO BUS 314903 CKT 1 /* 6CHCKAHM 230.00 - 8CHCKAHM 500.00 OPEN BRANCH FROM BUS 314903 TO BUS 314908 CKT 1 /* 8CHCKAHM 500.00 - 8ELMONT 500.00 OPEN BRANCH FROM BUS 314218 TO BUS 314908 CKT 2 /* 6ELMONT 230.00 - 8ELMONT 500.00 END
DVP_P4-2: 246T2034	CONTINGENCY 'DVP_P4-2: 246T2034' /* EARLEYS 230 KV OPEN BRANCH FROM BUS 314537 TO BUS 919140 CKT 1 /* 6SUFFOLK 230.00 - AA1-138 TAP 230.00 OPEN BRANCH FROM BUS 314569 TO BUS 314575 CKT 1 /* 6EARLEYS 230.00 - 6NUCO TP 230.00 OPEN BRANCH FROM BUS 314575 TO BUS 314590 CKT 1 /* 6NUCO TP 230.00 - 6NUCOR 230.00 OPEN BRANCH FROM BUS 314575 TO BUS 919140 CKT 1 /* 6NUCO TP 230.00 - AA1-138 TAP 230.00 OPEN BUS 314575 /* ISLAND: 6NUCO TP 230.00 OPEN BUS 314590 /* ISLAND: 6NUCOR 230.00 OPEN BUS 919140 /* ISLAND: AA1-138 TAP 230.00 OPEN BRANCH FROM BUS 314569 TO BUS 314620 CKT 1 /* 6EARLEYS 230.00 - 6CASHIE 230.00 OPEN BRANCH FROM BUS 933990 TO BUS 314620 CKT 1 /* AD1-023 TAP 230.00 - 6CASHIE 230.00 /* CONTINGENCY LINE ADDED FOR AE1 BUILD OPEN BUS 314620 /* ISLAND: 6CASHIE 230.00 END
DVP_P1-2: LN 557	CONTINGENCY 'DVP_P1-2: LN 557' OPEN BRANCH FROM BUS 314214 TO BUS 314903 CKT 1 /* 6CHCKAHM 230.00 - 8CHCKAHM 500.00 OPEN BRANCH FROM BUS 314903 TO BUS 314908 CKT 1 /* 8CHCKAHM 500.00 - 8ELMONT 500.00 END

Contingency Name	Contingency Definition
DVP_P1-2: LN 581	CONTINGENCY 'DVP_P1-2: LN 581' OPEN BRANCH FROM BUS 314135 TO BUS 314905 CKT 2 /* 3CHANCE 115.00 - 8CHANCE 500.00 OPEN BRANCH FROM BUS 314905 TO BUS 314911 CKT 1 /* 8CHANCE 500.00 - 8LADYSMITH 500.00 END
DVP_P1-2: LN 573	CONTINGENCY 'DVP_P1-2: LN 573' OPEN BRANCH FROM BUS 314918 TO BUS 314934 CKT 1 /* 8NO ANNA 500.00 - 8SPOTSYL 500.00 END
DVP_P4-2: 57602	CONTINGENCY 'DVP_P4-2: 57602' /* NORTH ANNA 500 KV OPEN BRANCH FROM BUS 314914 TO BUS 314918 CKT 1 /* 8MDLTHAN 500.00 - 8NO ANNA 500.00 OPEN BRANCH FROM BUS 314232 TO BUS 314918 CKT 1 /* 6NO ANNA 230.00 - 8NO ANNA 500.00 END
DVP_P1-2: LN 574	CONTINGENCY 'DVP_P1-2: LN 574' OPEN BRANCH FROM BUS 314908 TO BUS 314911 CKT 1 /* 8ELMONT 500.00 - 8LADYSMITH 500.00 END
DVP_P4-2: 56372	CONTINGENCY 'DVP_P4-2: 56372' /* CARSON 500 KV OPEN BRANCH FROM BUS 314902 TO BUS 314914 CKT 1 /* 8CARSON 500.00 - 8MDLTHAN 500.00 OPEN BRANCH FROM BUS 314282 TO BUS 314902 CKT 1 /* 6CARSON 230.00 - 8CARSON 500.00 END
DVP_P1-2: LN 576	CONTINGENCY 'DVP_P1-2: LN 576' OPEN BRANCH FROM BUS 314914 TO BUS 314918 CKT 1 /* 8MDLTHAN 500.00 - 8NO ANNA 500.00 END
DVP_P4-2: 557T574	CONTINGENCY 'DVP_P4-2: 557T574' /* ELMONT 500 KV OPEN BRANCH FROM BUS 314214 TO BUS 314903 CKT 1 /* 6CHCKAHM 230.00 - 8CHCKAHM 500.00 OPEN BRANCH FROM BUS 314903 TO BUS 314908 CKT 1 /* 8CHCKAHM 500.00 - 8ELMONT 500.00 OPEN BRANCH FROM BUS 314908 TO BUS 314911 CKT 1 /* 8ELMONT 500.00 - 8LADYSMITH 500.00 END
DVP_P1-2: LN 594	CONTINGENCY 'DVP_P1-2: LN 594' OPEN BRANCH FROM BUS 314916 TO BUS 314934 CKT 1 /* 8MORRSVL 500.00 - 8SPOTSYL 500.00 END
DVP_P1-2: LN 6002_FSA	CONTINGENCY 'DVP_P1-2: LN 6002_FSA' OPEN BRANCH FROM BUS 314935 TO BUS 918500 CKT 1 /* 8HERITAGE 500.00 - AA1-064 TAP 500.00 END

Contingency Name	Contingency Definition
Base Case	
DVP_P4-2: 563T576	CONTINGENCY 'DVP_P4-2: 563T576' /* MIDLOTHIAN 500 500 KV OPEN BRANCH FROM BUS 314902 TO BUS 314914 CKT 1 /* 8CARSON 500.00 - 8MDLTHAN 500.00 OPEN BRANCH FROM BUS 314914 TO BUS 314918 CKT 1 /* 8MDLTHAN 500.00 - 8NO ANNA 500.00 END
DVP_P7-1: LN 2058-2181	CONTINGENCY 'DVP_P7-1: LN 2058-2181' OPEN BRANCH FROM BUS 304222 TO BUS 313845 CKT 1 /* 6ROCKYMT230T230.00 - 6HATHAWAY 230.00 OPEN BUS 304226 /* ISLAND: 6PA-RMOUNT#4115.00 OPEN BRANCH FROM BUS 304226 TO BUS 314591 CKT 1 /* 6PA-RMOUNT#4230.00 - 6NASH 230.00 OPEN BRANCH FROM BUS 313845 TO BUS 314591 CKT 1 /* 6HATHAWAY 230.00 - 6NASH 230.00 OPEN BUS 314591 /* ISLAND: 6NASH 230.00 END
DVP_P1-2: LN 563	CONTINGENCY 'DVP_P1-2: LN 563' OPEN BRANCH FROM BUS 314902 TO BUS 314914 CKT 1 /* 8CARSON 500.00 - 8MDLTHAN 500.00 END

13.2 Index 1

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
3368152	314908	8ELMONT	DVP	314911	8LADYSMITH	DVP	1	DVP_P1-2: LN 576	single	2442.12	147.06	148.17	AC	31.46

Bus #	Bus	MW Impact
314229	6MT RD221	0.2
314236	6NRTHEST	0.3
314309	6IRON208	0.71
315053	1BELMED1	31.54
315054	1BELMED2	31.54
315055	1BELMED3	26.18
315058	1CHESTF3	33.5
315059	1CHESTF4	54.31
315060	1CHESTF5	16.25
315061	1CHESTG7	6.37
315062	1CHESTS7	2.9
315063	1CHESTG8	6.25
315064	1CHESTS8	3.22
315067	1DARBY 1	4.16
315068	1DARBY 2	4.16
315069	1DARBY 3	4.18
315070	1DARBY 4	4.18
315074	1HOPCGN1	15.45
315075	1HOPCGN2	15.25
315083	1SPRUNCA	19.09
315084	1SPRUNCB	19.09
315085	1SPRUNCC	14.15
315086	1SPRUNCD	14.15
315090	1YORKTN1	53.26
315091	1YORKTN2	55.27
315092	1YORKTN3	37.36
315233	1SURRY 2	40.58
923801	AB2-015 C O1	14.85
923911	AB2-031 C O1	3.63
924241	AB2-068 O1	428.17
924501	AB2-099 C	0.97
924511	AB2-100 C	19.03
925051	AB2-160 C O1	9.89
925061	AB2-161 C O1	6.06
925171	AB2-174 C O1	11.41
925331	AB2-190 C	37.1
925861	AC1-065 C	6.03
926071	AC1-086 C	33.51
926291	AC1-107 O1	646.29
926411	AC1-112 C	0.54
926751	AC1-161 C O1	55.54

Bus #	Bus	MW Impact
926781	AC1-164 C	77.68
927041	AC1-191 C O1	17.04
927221	AC1-216 C O1	18.13
930121	AB1-027 C	0.7
932041	AC2-012 C	18.48
932501	AC2-070 C	0.46
932581	AC2-078 C O1	7.32
932591	AC2-079 C O1	10.27
932831	AC2-110 C	2.41
933061	AC2-130	0.64
933261	AC2-137 C	0.56
933291	AC2-141 C	55.54
933991	AD1-023 C	22.17
934011	AD1-025 C	31.17
934061	AD1-033 C	13.56
934141	AD1-041 C	9.41
934201	AD1-047 C	12.99
934211	AD1-048 C	0.65
934521	AD1-076 C	92.34
934571	AD1-082 C	13.81
935161	AD1-151 C O1	29.82
936041	AD2-007	3.31
936051	AD2-008 C	5.43
936151	AD2-021	0.45
936301	AD2-039 C	2.41
936391	AD2-049 C	3.3
936401	AD2-051 C O1	14.43
936661	AD2-085 C	6.16
936711	AD2-090 C O1	12.26
937221	AD2-160 C O1	10.52
937251	AD2-164	8.89
937541	AD2-215 C	3.15
937571	AD2-169 C	16.18
938031	AE1-004 C	2.41
938171	AE1-026 C1 O	47.08
938172	AE1-026 C2 O	7.24
938181	AE1-027 C	4.22
938191	AE1-028 C	2.45
938221	AE1-035 C	3.72
938491	AE1-068 C O1	93.17
938501	AE1-069 C O1	73.62
938531	AE1-072 C O1	31.46
938551	AE1-074 C	4.28
938631	AE1-085 C O1	16.04
938661	AE1-088	5.51
938771	AE1-103 C O1	6.33
939191	AE1-149 C O1	19.28
939311	AE1-162 C	3.93
939411	AE1-173 C	149.31
939421	AE1-174 C	0.68
939431	AE1-175 C	4.55
939611	AE1-191 C	18.81

Bus #	Bus	MW Impact
939751	AE1-206 C O1	50.31
940061	AE1-248 C O1	28.71
940071	AE1-249 C	13.04
AA2-074	AA2-074	8.67
CARR	CARR	2.58
CBM-S1	CBM-S1	26.83
CBM-S2	CBM-S2	26.11
CBM-W1	CBM-W1	28.21
CBM-W2	CBM-W2	175.2
CIN	CIN	13.15
CPLE	CPLE	12.75
IPL	IPL	8.28
LGEE	LGEE	3.88
MEC	MEC	27.98
MECS	MECS	11.81
RENSSELAER	RENSSELAER	2.04
WEC	WEC	3.45
Z1-043	Z1-043	13.6

13.3 Index 2

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
3368527	314934	8SPOTSYL	DVP	314916	8MORRSVL	DVP	1	DVP_P1-2: LN 581	single	3218.56	99.48	100.04	AC	20.8

Bus #	Bus	MW Impact
314236	6NRTHEST	0.19
314250	6ROCKVILLE	0.35
314309	6IRON208	0.45
314314	3LOCKS	0.3
315053	1BELMED1	20.6
315054	1BELMED2	20.6
315055	1BELMED3	17.09
315058	1CHESTF3	21.34
315059	1CHESTF4	34.59
315065	1CHESTF6	20.55
315074	1HOPCGN1	9.89
315075	1HOPCGN2	9.77
315083	1SPRUNCA	12.78
315084	1SPRUNCB	12.78
315085	1SPRUNCC	9.47
315086	1SPRUNCD	9.47
315090	1YORKTN1	33.77
315091	1YORKTN2	35.05
315108	1ELIZAR1	3.31
315109	1ELIZAR2	3.25
315110	1ELIZAR3	3.35
315225	1N ANNA1	51.02
315226	1N ANNA2	51.14
315233	1SURRY 2	25.64
923801	AB2-015 C O1	9.92
923911	AB2-031 C O1	2.48
924241	AB2-068 O1	224.89
924501	AB2-099 C	0.65
924511	AB2-100 C	13.03
925021	AB2-158 C	1.91
925051	AB2-160 C O1	6.5
925061	AB2-161 C O1	4.02
925171	AB2-174 C O1	7.8
925331	AB2-190 C	23.9
925821	AC1-061	0.01
925861	AC1-065 C	3.88
926001	AC1-076 C	4.9
926071	AC1-086 C	22.77
926291	AC1-107 O1	339.46
926731	AC1-158 C	192.01
926751	AC1-161 C O1	36.43

Bus #	Bus	MW Impact
926781	AC1-164 C	46.58
927041	AC1-191 C O1	10.81
927221	AC1-216 C O1	11.69
932041	AC2-012 C	12.19
932581	AC2-078 C O1	4.85
932591	AC2-079 C O1	6.8
932831	AC2-110 C	1.55
933011	AC2-125	2.79
933021	AC2-126	2.81
933291	AC2-141 C	36.43
933501	AC2-165 C	10.9
933991	AD1-023 C	14.81
934011	AD1-025 C	20.1
934061	AD1-033 C	8.96
934141	AD1-041 C	6.1
934201	AD1-047 C	8.88
934521	AD1-076 C	61.63
934541	AD1-078 C	3.0
934571	AD1-082 C	9.16
935161	AD1-151 C O1	19.21
935211	AD1-156 C	0.36
936041	AD2-007	2.13
936051	AD2-008 C	3.5
936151	AD2-021	0.28
936301	AD2-039 C	1.55
936391	AD2-049 C	2.12
936401	AD2-051 C O1	9.7
936591	AD2-074 C	6.04
936661	AD2-085 C	4.08
936711	AD2-090 C O1	8.21
937221	AD2-160 C O1	6.95
937251	AD2-164	5.67
937541	AD2-215 C	2.07
937571	AD2-169 C	11.04
938031	AE1-004 C	1.55
938171	AE1-026 C1 O	31.48
938172	AE1-026 C2 O	4.84
938181	AE1-027 C	2.79
938191	AE1-028 C	1.62
938221	AE1-035 C	2.5
938491	AE1-068 C O1	68.54
938501	AE1-069 C O1	54.16
938531	AE1-072 C O1	20.8
938551	AE1-074 C	3.01
938561	AE1-075 C	2.42
938631	AE1-085 C O1	10.63
938661	AE1-088	3.69
938771	AE1-103 C O1	4.22
939191	AE1-149 C O1	12.79
939231	AE1-154 C	2.22
939241	AE1-155 C	13.9
939261	AE1-157 C O1	14.97

Bus #	Bus	MW Impact
939271	AE1-158 C O1	15.28
939311	AE1-162 C	2.56
939411	AE1-173 C	105.63
939421	AE1-174 C	0.42
939431	AE1-175 C	2.82
939611	AE1-191 C	12.21
939751	AE1-206 C O1	37.25
940061	AE1-248 C O1	19.03
940071	AE1-249 C	8.58
AA2-074	AA2-074	5.77
CARR	CARR	1.8
CBM-S1	CBM-S1	13.29
CBM-S2	CBM-S2	16.6
CBM-W1	CBM-W1	8.84
CBM-W2	CBM-W2	81.4
CIN	CIN	4.56
CPLE	CPLE	8.48
IPL	IPL	2.8
LGEE	LGEE	1.38
MEC	MEC	11.1
MECS	MECS	1.55
RENSSELAER	RENSSELAER	1.43
WEC	WEC	1.16

13.4 Index 3

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
3367887	314902	8CARSON	DVP	314914	8MDLTHAN	DVP	1	DVP_P4-2: 557T574	breaker	3938.0	105.94	106.97	AC	45.84

Bus #	Bus	MW Impact
314539	3UNCAMP	3.89
314541	3WATKINS	1.1
314554	3BTLEBRO	1.19
314557	3BETHELC	1.22
314566	3CRESWEL	3.94
314572	3EMPORIA	0.62
314574	6EVERETS	6.47
314578	3HORNRTN	4.98
314582	3KELFORD	5.43
314594	6PLYMOTH	1.38
314603	3SCOT NK	5.05
314617	3TUNIS	1.32
314620	6CASHIE	1.36
314623	3WITAKRS	2.02
314648	6SUNBURY	1.49
314651	6WINFALL	2.96
315090	1YORKTN1	40.55
315091	1YORKTN2	42.08
315102	1BRUNSWICKG1	13.83
315103	1BRUNSWICKG2	13.83
315104	1BRUNSWICKG3	13.83
315105	1BRUNSWICKS1	28.74
315108	1ELIZAR1	4.75
315109	1ELIZAR2	4.67
315110	1ELIZAR3	4.81
315131	1EDGECMA	13.86
315132	1EDGECMB	13.86
315150	1BUGGS 1	14.86
315151	1BUGGS 2	14.86
315233	1SURRY 2	37.52
900672	V4-068 E	0.47
901082	W1-029 E	77.52
907092	X1-038 E	9.73
913392	Y1-086 E	3.74
916042	Z1-036 E	76.2
916191	Z1-068 C	0.07
916192	Z1-068 E	3.23
916301	Z1-086 C	84.43
916302	Z1-086 E	18.69
917122	Z2-027 E	1.8
917332	Z2-043 E	1.55

Bus #	Bus	MW Impact
917342	Z2-044 E	0.87
917512	Z2-088 E OP1	5.98
918492	AA1-063AE OP	6.11
918512	AA1-065 E OP	7.01
918532	AA1-067 E	1.14
918562	AA1-072 E	0.26
919151	AA1-139 C	3.64
919152	AA1-139 E	11.04
919692	AA2-053 E	5.68
919702	AA2-057 E	5.35
920042	AA2-088 E OP	16.55
920592	AA2-165 E	0.71
920672	AA2-174 E	0.66
920692	AA2-178 E	6.76
923801	AB2-015 C O1	13.8
923802	AB2-015 E O1	11.31
923832	AB2-022 E	2.11
923852	AB2-025 E	1.64
923911	AB2-031 C O1	3.34
923912	AB2-031 E O1	1.65
923992	AB2-040 E O1	8.97
924022	AB2-043 E O1	6.41
924152	AB2-059 E O1	8.12
924162	AB2-060 E O1	5.26
924241	AB2-068 O1	333.45
924302	AB2-077 E O1	1.66
924312	AB2-078 E O1	1.66
924322	AB2-079 E O1	1.66
924401	AB2-089 C	2.95
924402	AB2-089 E	1.52
924491	AB2-098 C	0.89
924492	AB2-098 E	0.38
924501	AB2-099 C	0.92
924502	AB2-099 E	0.39
924511	AB2-100 C	17.24
924512	AB2-100 E	8.49
924812	AB2-134 E O1	14.37
925061	AB2-161 C O1	4.85
925062	AB2-161 E O1	7.91
925122	AB2-169 E	9.28
925171	AB2-174 C O1	10.47
925172	AB2-174 E O1	9.47
925331	AB2-190 C	22.86
925332	AB2-190 E	9.8
925521	AC1-027 C	0.49
925522	AC1-027 E	1.97
925591	AC1-034 C	10.2
925592	AC1-034 E	7.7
925781	AC1-054 C O1	10.07
925782	AC1-054 E O1	4.64
926071	AC1-086 C	31.36
926072	AC1-086 E	14.27

Bus #	Bus	MW Impact
926201	AC1-098 C	9.39
926202	AC1-098 E	5.59
926211	AC1-099 C	3.15
926212	AC1-099 E	1.85
926271	AC1-105 C O1	7.49
926272	AC1-105 E O1	3.73
926291	AC1-107 O1	503.33
926662	AC1-147 E	2.26
926751	AC1-161 C O1	55.53
926752	AC1-161 E O1	23.7
927021	AC1-189 C	13.39
927022	AC1-189 E	6.67
927141	AC1-208 C	13.68
927142	AC1-208 E	6.07
927221	AC1-216 C O1	11.54
927222	AC1-216 E O1	9.08
927251	AC1-221 C	3.13
927252	AC1-221 E	3.13
927261	AC1-222 C	4.85
927262	AC1-222 E	4.62
930402	AB1-081 E O1	5.73
930862	AB1-132 E O1	9.13
931232	AB1-173 E	1.57
931242	AB1-173AE	1.57
932041	AC2-012 C	17.44
932042	AC2-012 E	28.46
932581	AC2-078 C O1	5.17
932582	AC2-078 E O1	8.43
932591	AC2-079 C O1	8.81
932592	AC2-079 E O1	14.38
932631	AC2-084 C	13.38
932632	AC2-084 E	6.59
932761	AC2-100 C	7.21
932762	AC2-100 E	3.52
933291	AC2-141 C	55.53
933292	AC2-141 E	23.7
933731	AC2-196 C	0.44
933732	AC2-196 E	2.06
933991	AD1-023 C	21.21
933992	AD1-023 E	11.54
934011	AD1-025 C	19.84
934012	AD1-025 E	11.75
934061	AD1-033 C	12.99
934062	AD1-033 E	8.66
934201	AD1-047 C	11.96
934202	AD1-047 E	7.98
934231	AD1-050 C	6.5
934232	AD1-050 E	3.55
934311	AD1-055 C	3.37
934312	AD1-055 E	0.87
934331	AD1-057 C O1	15.04
934332	AD1-057 E O1	8.02

Bus #	Bus	MW Impact
934341	AD1-058 C	7.86
934342	AD1-058 E	2.0
934521	AD1-076 C	88.37
934522	AD1-076 E	45.0
934571	AD1-082 C	11.05
934572	AD1-082 E	6.3
934611	AD1-087 C O1	12.74
934612	AD1-087 E O1	5.99
934621	AD1-088 C	17.17
934622	AD1-088 E	8.06
934991	AD1-131 C	2.58
934992	AD1-131 E	1.72
935112	AD1-144 E	1.54
935161	AD1-151 C O1	18.37
935162	AD1-151 E O1	12.25
935171	AD1-152 C O1	12.66
935172	AD1-152 E O1	8.44
935212	AD1-156 E	1.73
936041	AD2-007	2.11
936051	AD2-008 C	3.45
936052	AD2-008 E	7.52
936331	AD2-043 C	6.31
936332	AD2-043 E	7.47
936361	AD2-046 C O1	11.87
936362	AD2-046 E O1	5.46
936391	AD2-049 C	2.65
936392	AD2-049 E	2.65
936401	AD2-051 C O1	13.74
936402	AD2-051 E O1	5.9
936481	AD2-063 C O1	17.85
936482	AD2-063 E O1	11.9
936531	AD2-068 C	7.88
936532	AD2-068 E	4.06
936661	AD2-085 C	5.27
936662	AD2-085 E	8.6
936701	AD2-089 C	11.0
936702	AD2-089 E	7.33
936711	AD2-090 C O1	11.42
936712	AD2-090 E O1	7.61
937221	AD2-160 C O1	10.08
937222	AD2-160 E O1	5.29
937251	AD2-164	6.89
937481	AD2-202 C O1	3.51
937482	AD2-202 E O1	1.77
937541	AD2-215 C	2.84
937542	AD2-215 E	1.51
937571	AD2-169 C	14.96
937572	AD2-169 E	9.97
938171	AE1-026 C1 O	45.03
938172	AE1-026 C2 O	6.92
938173	AE1-026 E O1	13.19
938181	AE1-027 C	4.05

Bus #	Bus	MW Impact
938182	AE1-027 E	2.13
938191	AE1-028 C	2.35
938192	AE1-028 E	1.36
938221	AE1-035 C	3.56
938222	AE1-035 E	1.75
938491	AE1-068 C O1	119.4
938492	AE1-068 E O1	65.95
938501	AE1-069 C O1	94.34
938502	AE1-069 E O1	53.94
938531	AE1-072 C O1	30.14
938532	AE1-072 E O1	15.71
938631	AE1-085 C O1	11.5
938632	AE1-085 E O1	5.75
938661	AE1-088	5.3
938771	AE1-103 C O1	5.87
938772	AE1-103 E O1	8.11
939181	AE1-148 C O1	11.67
939182	AE1-148 E O1	7.78
939191	AE1-149 C O1	13.24
939192	AE1-149 E O1	8.83
939311	AE1-162 C	3.24
939312	AE1-162 E	2.16
939411	AE1-173 C	175.38
939412	AE1-173 E	116.92
939421	AE1-174 C	0.43
939422	AE1-174 E	0.65
939431	AE1-175 C	2.86
939432	AE1-175 E	1.42
940061	AE1-248 C O1	22.97
940062	AE1-248 E O1	15.31
AA2-074	AA2-074	8.88
CARR	CARR	1.72
CBM-S1	CBM-S1	21.81
CBM-S2	CBM-S2	25.52
CBM-W1	CBM-W1	19.8
CBM-W2	CBM-W2	139.83
CIN	CIN	9.2
CPLE	CPLE	13.06
G-007	G-007	5.69
IPL	IPL	5.74
LGEE	LGEE	2.69
MEC	MEC	20.94
MECS	MECS	7.34
O-066	O-066	36.17
RENSSELAER	RENSSELAER	1.36
WEC	WEC	2.44
Z1-043	Z1-043	9.61

13.5 Index 4

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
3368380	314209	6SKIFF CREEK	DVP	314386	6KINGS M	DVP	1	DVP_P1-2: LN 557	single	441.8	138.36	139.97	AC	7.04

Bus #	Bus	MW Impact
314421	6WINCHST	0.1
314507	3THOMPSN	0.12
315090	1YORKTN1	22.99
315091	1YORKTN2	23.86
315092	1YORKTN3	16.23
315098	1CHESPKA	0.15
315099	1CHESPKB	0.38
315108	1ELIZAR1	1.13
315109	1ELIZAR2	1.11
315110	1ELIZAR3	1.14
315233	1SURRY 2	11.54
315260	1GOSPORTA	0.12
315261	1GOSPORTB	0.16
315262	1GOSPORTC	0.13
916191	Z1-068 C	0.02
919151	AA1-139 C	0.85
923801	AB2-015 C O1	2.73
924241	AB2-068 O1	102.65
925521	AC1-027 C	0.12
926291	AC1-107 O1	154.94
926661	AC1-147 C	0.13
926751	AC1-161 C O1	13.96
932041	AC2-012 C	4.15
932591	AC2-079 C O1	1.66
933291	AC2-141 C	13.96
933731	AC2-196 C	0.1
933991	AD1-023 C	4.14
934061	AD1-033 C	3.08
934521	AD1-076 C	17.62
935111	AD1-144 C	0.1
936391	AD2-049 C	1.14
936661	AD2-085 C	0.98
936711	AD2-090 C O1	2.18
937221	AD2-160 C O1	2.37
937251	AD2-164	3.53
937541	AD2-215 C	0.75
938171	AE1-026 C1 O	8.69
938172	AE1-026 C2 O	1.34
938181	AE1-027 C	0.95
938191	AE1-028 C	0.55
938531	AE1-072 C O1	7.04

Bus #	Bus	MW Impact
938771	AE1-103 C O1	1.2
939311	AE1-162 C	0.78
939411	AE1-173 C	27.59
939421	AE1-174 C	0.16
939431	AE1-175 C	1.08
CARR	CARR	0.19
CBM-S1	CBM-S1	2.47
CBM-S2	CBM-S2	3.14
CBM-W1	CBM-W1	2.07
CBM-W2	CBM-W2	15.68
CIN	CIN	0.96
CPLE	CPLE	1.65
IPL	IPL	0.6
LGEE	LGEE	0.28
MEC	MEC	2.27
MECS	MECS	0.7
RENSSELAER	RENSSELAER	0.15
WEC	WEC	0.26

13.6 Index 5

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
3367674	314218	6ELMONT	DVP	314908	8ELMONT	DVP	1	DVP_P4-2: H2T557	breaker	1050.6	128.76	130.32	AC	24.27

Bus #	Bus	MW Impact
314189	6PAPERMILL	8.73
314229	6MT RD221	0.2
314236	6NRTHEST	0.26
314250	6ROCKVILLE	0.45
314539	3UNCAMP	2.16
314541	3WATKINS	0.61
314566	3CRESWEL	2.06
314648	6SUNBURY	0.8
314651	6WINFALL	1.57
315043	1FOUR RIVERA	4.92
315044	1FOUR RIVERB	3.81
315045	1FOUR RIVERC	4.92
315046	1FOUR RIVERD	3.81
315047	1FOUR RIVERE	3.81
315048	1FOUR RIVERF	4.92
315053	1BELMED1	25.28
315054	1BELMED2	25.28
315055	1BELMED3	20.98
315058	1CHESTF3	26.84
315059	1CHESTF4	43.51
315067	1DARBY 1	3.57
315068	1DARBY 2	3.57
315069	1DARBY 3	3.58
315070	1DARBY 4	3.59
315073	1STONECA	9.29
315074	1HOPCGN1	11.2
315075	1HOPCGN2	11.05
315083	1SPRUNCA	14.78
315084	1SPRUNCB	14.78
315085	1SPRUNCC	10.96
315086	1SPRUNCD	10.96
315090	1YORKTN1	30.62
315091	1YORKTN2	31.78
901082	W1-029 E	41.23
907092	X1-038 E	5.41
913392	Y1-086 E	1.98
916042	Z1-036 E	40.22
916192	Z1-068 E	1.73
917122	Z2-027 E	0.95
919152	AA1-139 E	5.84
919211	AA1-145	14.23

Bus #	Bus	MW Impact
920692	AA2-178 E	3.53
923801	AB2-015 C O1	7.63
923802	AB2-015 E O1	6.26
923832	AB2-022 E	1.12
923842	AB2-024 E	1.47
923852	AB2-025 E	1.07
924061	AB2-050	0.84
924241	AB2-068 O1	175.92
924511	AB2-100 C	10.31
924512	AB2-100 E	5.08
924812	AB2-134 E O1	14.71
925051	AB2-160 C O1	7.08
925052	AB2-160 E O1	11.55
925061	AB2-161 C O1	3.58
925062	AB2-161 E O1	5.84
925331	AB2-190 C	24.54
925332	AB2-190 E	10.52
925522	AC1-027 E	1.06
925861	AC1-065 C	4.33
925862	AC1-065 E	7.07
926291	AC1-107 O1	265.54
926411	AC1-112 C	0.48
926412	AC1-112 E	1.92
926472	AC1-118 E	1.06
926551	AC1-134	2.09
926662	AC1-147 E	1.23
926751	AC1-161 C O1	26.84
926752	AC1-161 E O1	11.46
926781	AC1-164 C	57.96
926782	AC1-164 E	26.04
927041	AC1-191 C O1	17.44
927042	AC1-191 E O1	8.68
927221	AC1-216 C O1	11.82
927222	AC1-216 E O1	9.3
930121	AB1-027 C	0.62
930122	AB1-027 E	1.89
932041	AC2-012 C	9.51
932042	AC2-012 E	15.52
932501	AC2-070 C	0.41
932502	AC2-070 E	1.2
932532	AC2-073 E	1.54
932581	AC2-078 C O1	4.69
932582	AC2-078 E O1	7.65
932591	AC2-079 C O1	5.74
932592	AC2-079 E O1	9.37
932831	AC2-110 C	1.73
932832	AC2-110 E	2.83
933261	AC2-137 C	0.44
933262	AC2-137 E	2.03
933272	AC2-138 E	1.08
933291	AC2-141 C	26.84
933292	AC2-141 E	11.46

Bus #	Bus	MW Impact
933732	AC2-196 E	1.09
934011	AD1-025 C	20.32
934012	AD1-025 E	12.04
934061	AD1-033 C	6.89
934062	AD1-033 E	4.59
934141	AD1-041 C	6.72
934142	AD1-041 E	4.48
934211	AD1-048 C	0.54
934212	AD1-048 E	1.91
934392	AD1-063 E	1.38
934571	AD1-082 C	8.16
934572	AD1-082 E	4.65
934781	AD1-105 C	11.45
934782	AD1-105 E	7.95
935112	AD1-144 E	0.91
935161	AD1-151 C O1	19.72
935162	AD1-151 E O1	13.15
935212	AD1-156 E	1.68
936041	AD2-007	2.16
936051	AD2-008 C	3.54
936052	AD2-008 E	7.7
936151	AD2-021	0.36
936242	AD2-030 E	1.47
936301	AD2-039 C	1.73
936302	AD2-039 E	2.83
936341	AD2-044 C	0.27
936342	AD2-044 E	0.3
936391	AD2-049 C	1.86
936392	AD2-049 E	1.86
936581	AD2-073 C	2.22
936582	AD2-073 E	1.1
936591	AD2-074 C	6.33
936592	AD2-074 E	10.32
936661	AD2-085 C	3.46
936662	AD2-085 E	5.64
936711	AD2-090 C O1	6.26
936712	AD2-090 E O1	4.18
937221	AD2-160 C O1	5.34
937222	AD2-160 E O1	2.8
937251	AD2-164	5.08
937541	AD2-215 C	1.68
937542	AD2-215 E	0.89
938031	AE1-004 C	1.73
938032	AE1-004 E	2.83
938181	AE1-027 C	2.14
938182	AE1-027 E	1.13
938191	AE1-028 C	1.24
938192	AE1-028 E	0.72
938531	AE1-072 C O1	15.95
938532	AE1-072 E O1	8.32
938551	AE1-074 C	3.1
938552	AE1-074 E	1.56

Bus #	Bus	MW Impact
938631	AE1-085 C O1	10.18
938632	AE1-085 E O1	5.09
938771	AE1-103 C O1	3.27
938772	AE1-103 E O1	4.52
939191	AE1-149 C O1	12.55
939192	AE1-149 E O1	8.37
939241	AE1-155 C	14.51
939242	AE1-155 E	9.67
939281	AE1-159 C O1	12.02
939282	AE1-159 E O1	7.11
939311	AE1-162 C	2.22
939312	AE1-162 E	1.48
939411	AE1-173 C	69.78
939412	AE1-173 E	46.52
939421	AE1-174 C	0.43
939422	AE1-174 E	0.65
939431	AE1-175 C	2.86
939432	AE1-175 E	1.42
939611	AE1-191 C	13.44
939612	AE1-191 E	8.96
939751	AE1-206 C O1	56.73
939752	AE1-206 E O1	37.82
940061	AE1-248 C O1	16.96
940062	AE1-248 E O1	11.31
940071	AE1-249 C	9.34
940072	AE1-249 E	6.96
AA2-074	AA2-074	3.26
CARR	CARR	0.77
CBM-S1	CBM-S1	4.19
CBM-S2	CBM-S2	8.52
CBM-W1	CBM-W1	0.03
CBM-W2	CBM-W2	23.23
CIN	CIN	0.22
CPLE	CPLE	4.79
G-007	G-007	2.34
IPL	IPL	0.07
LGEE	LGEE	0.07
MEC	MEC	1.96
O-066	O-066	14.96
RENSSELAER	RENSSELAER	0.61
WEC	WEC	0.05

13.7 Index 6

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
3368437	314296	6PENNIMAN	DVP	314415	6WALR209	DVP	1	DVP_P1-2: LN 557	single	441.8	127.15	128.76	AC	7.04

Bus #	Bus	MW Impact
314421	6WINCHST	0.1
314507	3THOMPSN	0.12
315090	1YORKTN1	22.99
315091	1YORKTN2	23.86
315092	1YORKTN3	16.23
315098	1CHESPKA	0.15
315099	1CHESPKB	0.38
315108	1ELIZAR1	1.13
315109	1ELIZAR2	1.11
315110	1ELIZAR3	1.14
315233	1SURRY 2	11.54
315260	1GOSPORTA	0.12
315261	1GOSPORTB	0.16
315262	1GOSPORTC	0.13
916191	Z1-068 C	0.02
919151	AA1-139 C	0.85
923801	AB2-015 C O1	2.73
924241	AB2-068 O1	102.65
925521	AC1-027 C	0.12
926291	AC1-107 O1	154.94
926661	AC1-147 C	0.13
926751	AC1-161 C O1	13.96
932041	AC2-012 C	4.15
932591	AC2-079 C O1	1.66
933291	AC2-141 C	13.96
933731	AC2-196 C	0.1
933991	AD1-023 C	4.14
934061	AD1-033 C	3.08
934521	AD1-076 C	17.62
935111	AD1-144 C	0.1
936391	AD2-049 C	1.14
936661	AD2-085 C	0.98
936711	AD2-090 C O1	2.18
937221	AD2-160 C O1	2.37
937251	AD2-164	3.53
937541	AD2-215 C	0.75
938171	AE1-026 C1 O	8.69
938172	AE1-026 C2 O	1.34
938181	AE1-027 C	0.95
938191	AE1-028 C	0.55
938531	AE1-072 C O1	7.04

Bus #	Bus	MW Impact
938771	AE1-103 C O1	1.2
939311	AE1-162 C	0.78
939411	AE1-173 C	27.59
939421	AE1-174 C	0.16
939431	AE1-175 C	1.08
CARR	CARR	0.19
CBM-S1	CBM-S1	2.47
CBM-S2	CBM-S2	3.14
CBM-W1	CBM-W1	2.07
CBM-W2	CBM-W2	15.68
CIN	CIN	0.96
CPLE	CPLE	1.65
IPL	IPL	0.6
LGEE	LGEE	0.28
MEC	MEC	2.27
MECS	MECS	0.7
RENSSELAER	RENSSELAER	0.15
WEC	WEC	0.26

13.8 Index 7

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
3368409	314386	6KINGSM	DVP	314296	6PENNIMAN	DVP	1	DVP_P1-2: LN 557	single	441.8	130.75	132.36	AC	7.04

Bus #	Bus	MW Impact
314421	6WINCHST	0.1
314507	3THOMPSN	0.12
315090	1YORKTN1	22.99
315091	1YORKTN2	23.86
315092	1YORKTN3	16.23
315098	1CHESPKA	0.15
315099	1CHESPKB	0.38
315108	1ELIZAR1	1.13
315109	1ELIZAR2	1.11
315110	1ELIZAR3	1.14
315233	1SURRY 2	11.54
315260	1GOSPORTA	0.12
315261	1GOSPORTB	0.16
315262	1GOSPORTC	0.13
916191	Z1-068 C	0.02
919151	AA1-139 C	0.85
923801	AB2-015 C O1	2.73
924241	AB2-068 O1	102.65
925521	AC1-027 C	0.12
926291	AC1-107 O1	154.94
926661	AC1-147 C	0.13
926751	AC1-161 C O1	13.96
932041	AC2-012 C	4.15
932591	AC2-079 C O1	1.66
933291	AC2-141 C	13.96
933731	AC2-196 C	0.1
933991	AD1-023 C	4.14
934061	AD1-033 C	3.08
934521	AD1-076 C	17.62
935111	AD1-144 C	0.1
936391	AD2-049 C	1.14
936661	AD2-085 C	0.98
936711	AD2-090 C O1	2.18
937221	AD2-160 C O1	2.37
937251	AD2-164	3.53
937541	AD2-215 C	0.75
938171	AE1-026 C1 O	8.69
938172	AE1-026 C2 O	1.34
938181	AE1-027 C	0.95
938191	AE1-028 C	0.55
938531	AE1-072 C O1	7.04

Bus #	Bus	MW Impact
938771	AE1-103 C O1	1.2
939311	AE1-162 C	0.78
939411	AE1-173 C	27.59
939421	AE1-174 C	0.16
939431	AE1-175 C	1.08
CARR	CARR	0.19
CBM-S1	CBM-S1	2.47
CBM-S2	CBM-S2	3.14
CBM-W1	CBM-W1	2.07
CBM-W2	CBM-W2	15.68
CIN	CIN	0.96
CPLE	CPLE	1.65
IPL	IPL	0.6
LGEE	LGEE	0.28
MEC	MEC	2.27
MECS	MECS	0.7
RENSSELAER	RENSSELAER	0.15
WEC	WEC	0.26

13.9 Index 8

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
3368612	314415	6WALR209	DVP	314391	6LIGH209	DVP	1	DVP_P1-2: LN 557	single	441.8	112.76	114.37	AC	7.04

Bus #	Bus	MW Impact
314421	6WINCHST	0.1
314507	3THOMPSN	0.12
315090	1YORKTN1	22.99
315091	1YORKTN2	23.86
315092	1YORKTN3	16.23
315098	1CHESPKA	0.15
315099	1CHESPKB	0.38
315108	1ELIZAR1	1.13
315109	1ELIZAR2	1.11
315110	1ELIZAR3	1.14
315233	1SURRY 2	11.54
315260	1GOSPORTA	0.12
315261	1GOSPORTB	0.16
315262	1GOSPORTC	0.13
916191	Z1-068 C	0.02
919151	AA1-139 C	0.85
923801	AB2-015 C O1	2.73
924241	AB2-068 O1	102.65
925521	AC1-027 C	0.12
926291	AC1-107 O1	154.94
926661	AC1-147 C	0.13
926751	AC1-161 C O1	13.96
932041	AC2-012 C	4.15
932591	AC2-079 C O1	1.66
933291	AC2-141 C	13.96
933731	AC2-196 C	0.1
933991	AD1-023 C	4.14
934061	AD1-033 C	3.08
934521	AD1-076 C	17.62
935111	AD1-144 C	0.1
936391	AD2-049 C	1.14
936661	AD2-085 C	0.98
936711	AD2-090 C O1	2.18
937221	AD2-160 C O1	2.37
937251	AD2-164	3.53
937541	AD2-215 C	0.75
938171	AE1-026 C1 O	8.69
938172	AE1-026 C2 O	1.34
938181	AE1-027 C	0.95
938191	AE1-028 C	0.55
938531	AE1-072 C O1	7.04

Bus #	Bus	MW Impact
938771	AE1-103 C O1	1.2
939311	AE1-162 C	0.78
939411	AE1-173 C	27.59
939421	AE1-174 C	0.16
939431	AE1-175 C	1.08
CARR	CARR	0.19
CBM-S1	CBM-S1	2.47
CBM-S2	CBM-S2	3.14
CBM-W1	CBM-W1	2.07
CBM-W2	CBM-W2	15.68
CIN	CIN	0.96
CPLE	CPLE	1.65
IPL	IPL	0.6
LGEE	LGEE	0.28
MEC	MEC	2.27
MECS	MECS	0.7
RENSSELAER	RENSSELAER	0.15
WEC	WEC	0.26

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ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
3368914	314574	6EVERETS	DVP	936530	AD2-068 TAP	DVP	1	DVP_P7-1: LN 2058-2181	tower	485.0	157.99	159.67	AC	10.18

Bus #	Bus	MW Impact
314539	3UNCAMP	1.27
314541	3WATKINS	0.39
314554	3BTLEBRO	0.38
314557	3BETHELC	1.06
314566	3CRESWEL	2.23
314572	3EMPORIA	0.22
314574	6EVERETS	8.22
314578	3HORNRTN	2.14
314582	3KELFORD	3.33
314589	3MURPHYS	0.06
314594	6PLYMOTH	0.9
314603	3SCOT NK	2.69
314617	3TUNIS	0.78
314620	6CASHIE	0.97
314623	3WITAKRS	0.71
314648	6SUNBURY	0.41
314651	6WINFALL	0.99
315131	1EDGECMA	8.55
315132	1EDGECMB	8.55
315136	1ROSEMG1	1.46
315137	1ROSEMS1	0.9
315138	1ROSEMG2	0.68
315292	1DOMTR78	1.52
315293	1DOMTR9	1.24
315294	1DOMTR10	2.26
900672	V4-068 E	0.24
901082	W1-029 E	24.7
907092	X1-038 E	3.17
913392	Y1-086 E	1.0
916042	Z1-036 E	30.84
917122	Z2-027 E	0.52
917331	Z2-043 C	0.31
917332	Z2-043 E	0.95
917342	Z2-044 E	0.31
917511	Z2-088 C OP1	2.11
917512	Z2-088 E OP1	6.41
918491	AA1-063AC OP	0.98
918492	AA1-063AE OP	3.28
918511	AA1-065 C OP	1.58
918512	AA1-065 E OP	5.52

Bus #	Bus	MW Impact
918531	AA1-067 C	0.48
918532	AA1-067 E	1.45
918561	AA1-072 C	0.05
918562	AA1-072 E	0.16
919692	AA2-053 E	2.78
919702	AA2-057 E	2.06
920042	AA2-088 E OP	6.8
920592	AA2-165 E	0.27
920672	AA2-174 E	0.32
920691	AA2-178 C	1.26
920692	AA2-178 E	3.82
923801	AB2-015 C O1	4.71
923802	AB2-015 E O1	3.86
923832	AB2-022 E	0.57
923911	AB2-031 C O1	1.26
923912	AB2-031 E O1	0.62
923992	AB2-040 E O1	3.38
924152	AB2-059 E O1	3.09
924491	AB2-098 C	1.13
924492	AB2-098 E	0.48
924501	AB2-099 C	0.59
924502	AB2-099 E	0.25
924511	AB2-100 C	6.09
924512	AB2-100 E	3.0
925121	AB2-169 C	1.38
925122	AB2-169 E	8.74
925171	AB2-174 C O1	3.82
925172	AB2-174 E O1	3.46
925591	AC1-034 C	3.89
925592	AC1-034 E	2.93
926071	AC1-086 C	15.84
926072	AC1-086 E	7.21
926201	AC1-098 C	4.51
926202	AC1-098 E	2.69
926211	AC1-099 C	1.51
926212	AC1-099 E	0.89
927021	AC1-189 C	15.22
927022	AC1-189 E	7.58
927141	AC1-208 C	5.86
927142	AC1-208 E	2.6
930402	AB1-081 E O1	2.18
930862	AB1-132 E O1	4.61
931232	AB1-173 E	0.59
931242	AB1-173AE	0.59
932631	AC2-084 C	6.44
932632	AC2-084 E	3.17
933991	AD1-023 C	14.77
933992	AD1-023 E	8.04
934201	AD1-047 C	4.51
934202	AD1-047 E	3.01
934331	AD1-057 C O1	8.5
934332	AD1-057 E O1	4.53

Bus #	Bus	MW Impact
934521	AD1-076 C	58.8
934522	AD1-076 E	29.94
936401	AD2-051 C O1	9.44
936402	AD2-051 E O1	4.05
936701	AD2-089 C	9.53
936702	AD2-089 E	6.35
936711	AD2-090 C O1	4.25
936712	AD2-090 E O1	2.83
937571	AD2-169 C	5.83
937572	AD2-169 E	3.88
938171	AE1-026 C1 O	32.17
938172	AE1-026 C2 O	4.94
938173	AE1-026 E O1	9.42
938221	AE1-035 C	2.8
938222	AE1-035 E	1.38
938531	AE1-072 C O1	6.69
938532	AE1-072 E O1	3.49
938661	AE1-088	5.0
938771	AE1-103 C O1	1.85
938772	AE1-103 E O1	2.55
AC1-131	AC1-131	6.18
BLUEG	BLUEG	7.81
CALDERWOOD	CALDERWOOD	1.67
CANNELTON	CANNELTON	0.54
CATAWBA	CATAWBA	1.63
CBM-N	CBM-N	0.21
CHEOAH	CHEOAH	1.56
CHILHOWEE	CHILHOWEE	0.54
COFFEEN	COFFEEN	0.92
COTTONWOOD	COTTONWOOD	5.62
DUCKCREEK	DUCKCREEK	1.89
EDWARDS	EDWARDS	0.84
FARMERCITY	FARMERCITY	0.67
G-007A	G-007A	1.0
GIBSON	GIBSON	0.34
HAMLET	HAMLET	3.48
NEWTON	NEWTON	2.4
NYISO	NYISO	0.91
PRAIRIE	PRAIRIE	5.08
SANTEETLA	SANTEETLA	0.46
SMITHLAND	SMITHLAND	0.45
TATANKA	TATANKA	1.13
TILTON	TILTON	0.99
TRIMBLE	TRIMBLE	0.86
TVA	TVA	4.7
UNIONPOWER	UNIONPOWER	2.33
VFT	VFT	2.66

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ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
3367895	314596	3POPLR C	DVP	314573	3EVERETS	DVP	1	DVP_P4-2: 246T2034	breaker	239.0	113.75	116.72	AC	8.39

Bus #	Bus	MW Impact
314566	3CRESWEL	3.19
314594	6PLYMOTH	1.34
314648	6SUNBURY	0.35
314651	6WINFALL	1.09
315292	1DOMTR78	2.68
315293	1DOMTR9	2.19
315294	1DOMTR10	3.97
901082	W1-029 E	25.83
913392	Y1-086 E	0.97
916041	Z1-036 C	0.81
916042	Z1-036 E	38.4
917122	Z2-027 E	0.53
919152	AA1-139 E	1.82
920691	AA2-178 C	1.81
920692	AA2-178 E	5.47
923832	AB2-022 E	0.55
925121	AB2-169 C	0.74
925122	AB2-169 E	4.73
933991	AD1-023 C	21.44
933992	AD1-023 E	11.67
934521	AD1-076 C	88.5
934522	AD1-076 E	45.06
938531	AE1-072 C O1	5.51
938532	AE1-072 E O1	2.87
938661	AE1-088	2.7
BLUEG	BLUEG	2.3
CALDERWOOD	CALDERWOOD	0.49
CANNELTON	CANNELTON	0.16
CATAWBA	CATAWBA	0.48
CBM-N	CBM-N	0.08
CHEOAH	CHEOAH	0.46
CHILHOWEE	CHILHOWEE	0.16
COFFEEN	COFFEEN	0.27
COTTONWOOD	COTTONWOOD	1.63
DUCKCREEK	DUCKCREEK	0.55
EDWARDS	EDWARDS	0.25
FARMERCITY	FARMERCITY	0.2
G-007A	G-007A	0.35
GIBSON	GIBSON	0.1
HAMLET	HAMLET	0.98
NEWTON	NEWTON	0.71

Bus #	Bus	MW Impact
NYISO	NYISO	0.34
PRAIRIE	PRAIRIE	1.49
SANTEETLA	SANTEETLA	0.14
SMITHLAND	SMITHLAND	0.13
TATANKA	TATANKA	0.33
TILTON	TILTON	0.29
TRIMBLE	TRIMBLE	0.25
TVA	TVA	1.37
UNIONPOWER	UNIONPOWER	0.68
VFT	VFT	0.94

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ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
3367765	314903	8CHCKAHM	DVP	314908	8ELMONT	DVP	1	DVP_P4-2: 563T576	breaker	3144.0	123.25	124.56	AC	47.92

Bus #	Bus	MW Impact
314189	6PAPERMILL	10.93
314421	6WINCHST	0.23
314539	3UNCAMP	3.89
314541	3WATKINS	1.09
314554	3BTLEBRO	1.02
314557	3BETHELC	1.07
314566	3CRESWEL	3.91
314572	3EMPORIA	0.55
314574	6EVERETS	5.91
314578	3HORNRTN	4.48
314582	3KELFORD	5.02
314594	6PLYMOTH	1.35
314603	3SCOT NK	4.59
314617	3TUNIS	1.25
314620	6CASHIE	1.31
314623	3WITAKRS	1.75
314648	6SUNBURY	1.55
314651	6WINFALL	3.05
315073	1STONECA	8.7
315074	1HOPCGN1	10.49
315075	1HOPCGN2	10.36
315090	1YORKTN1	53.43
315091	1YORKTN2	55.45
315092	1YORKTN3	37.57
315110	1ELIZAR3	5.11
315131	1EDGECMA	11.89
315132	1EDGECMB	11.89
315233	1SURRY 2	45.3
900672	V4-068 E	0.45
901082	W1-029 E	79.92
907092	X1-038 E	9.74
913392	Y1-086 E	3.88
916042	Z1-036 E	77.51
916192	Z1-068 E	3.42
916302	Z1-086 E	13.62
917122	Z2-027 E	1.86
917332	Z2-043 E	1.43
917342	Z2-044 E	0.75
917512	Z2-088 E OP1	5.36
918492	AA1-063AE OP	5.6
918512	AA1-065 E OP	6.65

Bus #	Bus	MW Impact
918532	AA1-067 E	1.04
918562	AA1-072 E	0.24
919152	AA1-139 E	11.55
919692	AA2-053 E	5.17
919702	AA2-057 E	4.69
920042	AA2-088 E OP	15.95
920592	AA2-165 E	0.62
920672	AA2-174 E	0.6
920692	AA2-178 E	6.7
923801	AB2-015 C O1	13.71
923802	AB2-015 E O1	11.24
923832	AB2-022 E	2.19
923842	AB2-024 E	1.84
923852	AB2-025 E	1.44
923911	AB2-031 C O1	2.98
923912	AB2-031 E O1	1.47
923992	AB2-040 E O1	8.01
924152	AB2-059 E O1	6.96
924241	AB2-068 O1	619.19
924491	AB2-098 C	0.81
924492	AB2-098 E	0.35
924501	AB2-099 C	0.87
924502	AB2-099 E	0.37
924511	AB2-100 C	15.32
924512	AB2-100 E	7.54
924812	AB2-134 E O1	18.1
925051	AB2-160 C O1	6.26
925052	AB2-160 E O1	10.21
925061	AB2-161 C O1	5.12
925062	AB2-161 E O1	8.35
925122	AB2-169 E	8.79
925171	AB2-174 C O1	9.32
925172	AB2-174 E O1	8.43
925331	AB2-190 C	29.15
925332	AB2-190 E	12.49
925522	AC1-027 E	2.08
925591	AC1-034 C	8.75
925592	AC1-034 E	6.6
925781	AC1-054 C O1	8.64
925782	AC1-054 E O1	3.98
925861	AC1-065 C	5.36
925862	AC1-065 E	8.75
926071	AC1-086 C	28.11
926072	AC1-086 E	12.79
926201	AC1-098 C	8.43
926202	AC1-098 E	5.02
926211	AC1-099 C	2.83
926212	AC1-099 E	1.66
926291	AC1-107 O1	934.62
926662	AC1-147 E	2.41
926751	AC1-161 C O1	59.45
926752	AC1-161 E O1	25.38

Bus #	Bus	MW Impact
926781	AC1-164 C	67.9
926782	AC1-164 E	30.51
927021	AC1-189 C	12.08
927022	AC1-189 E	6.02
927141	AC1-208 C	12.17
927142	AC1-208 E	5.4
927221	AC1-216 C O1	14.54
927222	AC1-216 E O1	11.44
930402	AB1-081 E O1	4.91
930862	AB1-132 E O1	8.18
931232	AB1-173 E	1.4
931242	AB1-173AE	1.4
932041	AC2-012 C	18.53
932042	AC2-012 E	30.24
932532	AC2-073 E	1.95
932581	AC2-078 C O1	5.51
932582	AC2-078 E O1	8.99
932591	AC2-079 C O1	9.25
932592	AC2-079 E O1	15.09
932631	AC2-084 C	12.02
932632	AC2-084 E	5.92
932831	AC2-110 C	2.14
932832	AC2-110 E	3.5
933262	AC2-137 E	1.87
933272	AC2-138 E	1.18
933291	AC2-141 C	59.45
933292	AC2-141 E	25.38
933732	AC2-196 E	2.17
933991	AD1-023 C	20.55
933992	AD1-023 E	11.19
934011	AD1-025 C	25.0
934012	AD1-025 E	14.81
934061	AD1-033 C	13.68
934062	AD1-033 E	9.12
934141	AD1-041 C	8.48
934142	AD1-041 E	5.65
934201	AD1-047 C	10.68
934202	AD1-047 E	7.12
934212	AD1-048 E	1.38
934331	AD1-057 C O1	13.16
934332	AD1-057 E O1	7.02
934392	AD1-063 E	1.75
934521	AD1-076 C	86.27
934522	AD1-076 E	43.93
934571	AD1-082 C	11.66
934572	AD1-082 E	6.65
934611	AD1-087 C O1	9.62
934612	AD1-087 E O1	4.52
935112	AD1-144 E	1.67
935161	AD1-151 C O1	23.43
935162	AD1-151 E O1	15.62
935171	AD1-152 C O1	9.56

Bus #	Bus	MW Impact
935172	AD1-152 E O1	6.38
935212	AD1-156 E	1.72
936041	AD2-007	2.65
936051	AD2-008 C	4.35
936052	AD2-008 E	9.47
936151	AD2-021	0.33
936242	AD2-030 E	1.9
936301	AD2-039 C	2.14
936302	AD2-039 E	3.5
936341	AD2-044 C	0.29
936342	AD2-044 E	0.33
936391	AD2-049 C	3.25
936392	AD2-049 E	3.25
936401	AD2-051 C O1	12.91
936402	AD2-051 E O1	5.54
936531	AD2-068 C	6.82
936532	AD2-068 E	3.51
936591	AD2-074 C	7.44
936592	AD2-074 E	12.15
936661	AD2-085 C	5.53
936662	AD2-085 E	9.02
936701	AD2-089 C	9.67
936702	AD2-089 E	6.45
936711	AD2-090 C O1	11.19
936712	AD2-090 E O1	7.46
937221	AD2-160 C O1	10.57
937222	AD2-160 E O1	5.54
937251	AD2-164	8.86
937481	AD2-202 C O1	2.65
937482	AD2-202 E O1	1.33
937541	AD2-215 C	3.08
937542	AD2-215 E	1.64
937571	AD2-169 C	13.38
937572	AD2-169 E	8.92
938031	AE1-004 C	2.14
938032	AE1-004 E	3.5
938171	AE1-026 C1 O	43.45
938172	AE1-026 C2 O	6.68
938173	AE1-026 E O1	12.73
938181	AE1-027 C	4.25
938182	AE1-027 E	2.24
938191	AE1-028 C	2.47
938192	AE1-028 E	1.43
938221	AE1-035 C	3.37
938222	AE1-035 E	1.66
938491	AE1-068 C O1	86.89
938492	AE1-068 E O1	47.99
938501	AE1-069 C O1	68.65
938502	AE1-069 E O1	39.25
938531	AE1-072 C O1	31.5
938532	AE1-072 E O1	16.42
938631	AE1-085 C O1	12.25

Bus #	Bus	MW Impact
938632	AE1-085 E O1	6.13
938661	AE1-088	5.02
938771	AE1-103 C O1	5.9
938772	AE1-103 E O1	8.15
939191	AE1-149 C O1	14.16
939192	AE1-149 E O1	9.44
939241	AE1-155 C	16.81
939242	AE1-155 E	11.21
939311	AE1-162 C	3.67
939312	AE1-162 E	2.45
939411	AE1-173 C	146.82
939412	AE1-173 E	97.88
939421	AE1-174 C	0.66
939422	AE1-174 E	1.0
939431	AE1-175 C	4.42
939432	AE1-175 E	2.19
939611	AE1-191 C	16.96
939612	AE1-191 E	11.31
940061	AE1-248 C O1	24.23
940062	AE1-248 E O1	16.15
940071	AE1-249 C	8.25
940072	AE1-249 E	6.15
AA2-074	AA2-074	6.78
CARR	CARR	1.33
CBM-S1	CBM-S1	13.68
CBM-S2	CBM-S2	18.76
CBM-W1	CBM-W1	9.73
CBM-W2	CBM-W2	85.19
CIN	CIN	4.65
CPLE	CPLE	9.96
G-007	G-007	4.26
IPL	IPL	2.85
LGEE	LGEE	1.36
MEC	MEC	11.66
MECS	MECS	2.46
O-066	O-066	27.14
RENSSELAER	RENSSELAER	1.06
WEC	WEC	1.23

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ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
3367806	314914	8MDLTHAN	DVP	314918	8NO ANNA	DVP	1	DVP_P4-2: 557T574	breaker	3637.0	121.29	122.28	AC	47.19

Bus #	Bus	MW Impact
314189	6PAPERMILL	9.09
314539	3UNCAMP	4.13
314541	3WATKINS	1.17
314554	3BTLEBRO	1.24
314557	3BETHELC	1.27
314566	3CRESWEL	4.09
314572	3EMPORIA	0.69
314574	6EVERETS	6.73
314578	3HORNRTN	5.34
314582	3KELFORD	5.72
314594	6PLYMOTH	1.44
314603	3SCOT NK	5.32
314617	3TUNIS	1.39
314620	6CASHIE	1.42
314623	3WITAKRS	2.11
314648	6SUNBURY	1.55
314651	6WINFALL	3.07
315053	1BELMED1	25.09
315054	1BELMED2	25.09
315055	1BELMED3	20.83
315058	1CHESTF3	25.42
315059	1CHESTF4	41.2
315073	1STONECA	10.42
315074	1HOPCGN1	12.56
315075	1HOPCGN2	12.4
315083	1SPRUNCA	16.07
315084	1SPRUNCB	16.07
315085	1SPRUNCC	11.91
315086	1SPRUNCD	11.91
315090	1YORKTN1	47.1
315091	1YORKTN2	48.87
315102	1BRUNSWICKG1	12.69
315103	1BRUNSWICKG2	12.69
315104	1BRUNSWICKG3	12.69
315105	1BRUNSWICKS1	26.36
315108	1ELIZAR1	4.92
315109	1ELIZAR2	4.83
315110	1ELIZAR3	4.98
315131	1EDGECMA	14.4
315132	1EDGECMB	14.4
315233	1SURRY 2	38.3

Bus #	Bus	MW Impact
900672	V4-068 E	0.5
901082	W1-029 E	80.24
907092	X1-038 E	10.33
913392	Y1-086 E	3.86
916042	Z1-036 E	78.94
916191	Z1-068 C	0.07
916192	Z1-068 E	3.34
916301	Z1-086 C	77.23
916302	Z1-086 E	17.1
917122	Z2-027 E	1.86
917332	Z2-043 E	1.63
917342	Z2-044 E	0.91
917512	Z2-088 E OP1	6.22
918492	AA1-063AE OP	6.51
918512	AA1-065 E OP	7.34
918532	AA1-067 E	1.19
918562	AA1-072 E	0.27
919152	AA1-139 E	11.35
919692	AA2-053 E	6.07
919702	AA2-057 E	5.61
920042	AA2-088 E OP	17.61
920592	AA2-165 E	0.74
920672	AA2-174 E	0.7
920692	AA2-178 E	7.02
923801	AB2-015 C O1	14.65
923802	AB2-015 E O1	12.01
923832	AB2-022 E	2.18
923842	AB2-024 E	1.53
923852	AB2-025 E	1.85
923862	AB2-026 E	1.69
923911	AB2-031 C O1	3.65
923912	AB2-031 E O1	1.8
923992	AB2-040 E O1	9.79
924022	AB2-043 E O1	3.79
924152	AB2-059 E O1	8.43
924241	AB2-068 O1	340.41
924401	AB2-089 C	3.24
924402	AB2-089 E	1.67
924491	AB2-098 C	0.92
924492	AB2-098 E	0.4
924501	AB2-099 C	0.97
924502	AB2-099 E	0.42
924511	AB2-100 C	19.02
924512	AB2-100 E	9.37
924812	AB2-134 E O1	19.52
925051	AB2-160 C O1	8.44
925052	AB2-160 E O1	13.78
925061	AB2-161 C O1	5.69
925062	AB2-161 E O1	9.28
925122	AB2-169 E	9.65
925171	AB2-174 C O1	11.46
925172	AB2-174 E O1	10.37

Bus #	Bus	MW Impact
925331	AB2-190 C	31.84
925332	AB2-190 E	13.65
925521	AC1-027 C	0.5
925522	AC1-027 E	2.03
925591	AC1-034 C	10.6
925592	AC1-034 E	8.0
925781	AC1-054 C O1	11.02
925782	AC1-054 E O1	5.08
925861	AC1-065 C	4.62
925862	AC1-065 E	7.54
926071	AC1-086 C	33.67
926072	AC1-086 E	15.33
926201	AC1-098 C	9.89
926202	AC1-098 E	5.89
926211	AC1-099 C	3.31
926212	AC1-099 E	1.95
926291	AC1-107 O1	513.82
926662	AC1-147 E	2.35
926751	AC1-161 C O1	55.17
926752	AC1-161 E O1	23.55
926781	AC1-164 C	54.86
926782	AC1-164 E	24.65
927021	AC1-189 C	13.91
927022	AC1-189 E	6.93
927141	AC1-208 C	14.45
927142	AC1-208 E	6.42
927221	AC1-216 C O1	15.69
927222	AC1-216 E O1	12.34
930402	AB1-081 E O1	5.95
930862	AB1-132 E O1	9.8
931232	AB1-173 E	1.71
931242	AB1-173AE	1.71
932041	AC2-012 C	18.09
932042	AC2-012 E	29.52
932532	AC2-073 E	1.64
932581	AC2-078 C O1	6.66
932582	AC2-078 E O1	10.86
932591	AC2-079 C O1	9.82
932592	AC2-079 E O1	16.02
932631	AC2-084 C	14.1
932632	AC2-084 E	6.94
932831	AC2-110 C	1.85
932832	AC2-110 E	3.02
933262	AC2-137 E	1.82
933291	AC2-141 C	55.17
933292	AC2-141 E	23.55
933501	AC2-165 C	14.57
933502	AC2-165 E	10.96
933731	AC2-196 C	0.45
933732	AC2-196 E	2.12
933991	AD1-023 C	22.1
933992	AD1-023 E	12.03

Bus #	Bus	MW Impact
934011	AD1-025 C	26.97
934012	AD1-025 E	15.97
934061	AD1-033 C	13.35
934062	AD1-033 E	8.9
934141	AD1-041 C	7.26
934142	AD1-041 E	4.84
934201	AD1-047 C	13.06
934202	AD1-047 E	8.7
934212	AD1-048 E	1.63
934231	AD1-050 C	7.13
934232	AD1-050 E	3.9
934331	AD1-057 C O1	15.86
934332	AD1-057 E O1	8.46
934392	AD1-063 E	1.46
934521	AD1-076 C	91.96
934522	AD1-076 E	46.83
934571	AD1-082 C	12.96
934572	AD1-082 E	7.39
934611	AD1-087 C O1	12.81
934612	AD1-087 E O1	6.02
934621	AD1-088 C	19.52
934622	AD1-088 E	9.16
935112	AD1-144 E	1.64
935161	AD1-151 C O1	25.59
935162	AD1-151 E O1	17.06
935171	AD1-152 C O1	12.73
935172	AD1-152 E O1	8.49
935212	AD1-156 E	2.31
936041	AD2-007	2.86
936051	AD2-008 C	4.69
936052	AD2-008 E	10.22
936151	AD2-021	0.32
936242	AD2-030 E	1.61
936301	AD2-039 C	1.85
936302	AD2-039 E	3.02
936361	AD2-046 C O1	13.17
936362	AD2-046 E O1	6.06
936391	AD2-049 C	3.0
936392	AD2-049 E	3.0
936401	AD2-051 C O1	14.45
936402	AD2-051 E O1	6.2
936531	AD2-068 C	8.1
936532	AD2-068 E	4.17
936661	AD2-085 C	5.89
936662	AD2-085 E	9.6
936701	AD2-089 C	11.43
936702	AD2-089 E	7.62
936711	AD2-090 C O1	12.13
936712	AD2-090 E O1	8.09
937221	AD2-160 C O1	10.37
937222	AD2-160 E O1	5.44
937251	AD2-164	7.94

Bus #	Bus	MW Impact
937481	AD2-202 C O1	3.53
937482	AD2-202 E O1	1.78
937541	AD2-215 C	3.03
937542	AD2-215 E	1.61
937571	AD2-169 C	16.27
937572	AD2-169 E	10.85
938031	AE1-004 C	1.85
938032	AE1-004 E	3.02
938171	AE1-026 C1 O	46.96
938172	AE1-026 C2 O	7.22
938173	AE1-026 E O1	13.76
938181	AE1-027 C	4.16
938182	AE1-027 E	2.19
938191	AE1-028 C	2.41
938192	AE1-028 E	1.4
938221	AE1-035 C	3.72
938222	AE1-035 E	1.83
938491	AE1-068 C O1	108.99
938492	AE1-068 E O1	60.19
938501	AE1-069 C O1	86.11
938502	AE1-069 E O1	49.23
938531	AE1-072 C O1	31.02
938532	AE1-072 E O1	16.17
938551	AE1-074 C	4.0
938552	AE1-074 E	2.02
938561	AE1-075 C	3.31
938562	AE1-075 E	1.61
938631	AE1-085 C O1	14.64
938632	AE1-085 E O1	7.32
938661	AE1-088	5.52
938771	AE1-103 C O1	6.23
938772	AE1-103 E O1	8.6
939181	AE1-148 C O1	12.97
939182	AE1-148 E O1	8.65
939191	AE1-149 C O1	17.43
939192	AE1-149 E O1	11.62
939311	AE1-162 C	3.66
939312	AE1-162 E	2.44
939411	AE1-173 C	164.81
939412	AE1-173 E	109.87
939421	AE1-174 C	0.56
939422	AE1-174 E	0.84
939431	AE1-175 C	3.74
939432	AE1-175 E	1.85
939611	AE1-191 C	14.52
939612	AE1-191 E	9.68
940061	AE1-248 C O1	26.94
940062	AE1-248 E O1	17.96
940071	AE1-249 C	11.14
940072	AE1-249 E	8.3
AA2-074	AA2-074	8.96
CARR	CARR	2.11

Bus #	Bus	MW Impact
CBM-S1	CBM-S1	23.78
CBM-S2	CBM-S2	26.14
CBM-W1	CBM-W1	22.62
CBM-W2	CBM-W2	153.22
CIN	CIN	10.57
CPLE	CPLE	13.18
G-007	G-007	7.0
IPL	IPL	6.62
LGEE	LGEE	3.1
MEC	MEC	23.44
MECS	MECS	8.7
O-066	O-066	44.51
RENSSELAER	RENSSELAER	1.67
WEC	WEC	2.78
Z1-043	Z1-043	10.97

13.14 Index 13

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
36235411	936530	AD2-068 TAP	DVP	304451	6GREENVILE T	CPLE	1	DVP_P1-2: LN 6002_FSA	single	478.0	100.42	101.51	AC	6.6

Bus #	Bus	MW Impact
314589	3MURPHYS	0.05
314638	6ELIZ CT	0.08
314639	6TANGLEW	0.16
314643	3O INLET	0.14
315115	1S HAMPT1	0.58
315139	1GASTONA	1.12
315141	1GASTONB	1.12
315292	1DOMTR78	1.33
315293	1DOMTR9	1.08
315294	1DOMTR10	1.96
901081	W1-029 C	0.49
916041	Z1-036 C	0.59
917331	Z2-043 C	0.23
917511	Z2-088 C OP1	1.56
918491	AA1-063AC OP	0.71
918511	AA1-065 C OP	1.33
918531	AA1-067 C	0.42
918561	AA1-072 C	0.03
919691	AA2-053 C	0.62
920041	AA2-088 C OP	0.45
920671	AA2-174 C	0.03
920691	AA2-178 C	1.1
923801	AB2-015 C O1	3.81
923831	AB2-022 C	0.14
924491	AB2-098 C	0.99
924501	AB2-099 C	0.47
925121	AB2-169 C	1.2
926071	AC1-086 C	8.91
926201	AC1-098 C	2.58
926211	AC1-099 C	0.87
927021	AC1-189 C	12.0
930861	AB1-132 C O1	0.85
932631	AC2-084 C	3.69
933991	AD1-023 C	12.68
934521	AD1-076 C	50.95
936401	AD2-051 C O1	7.59
936531	AD2-068 C	18.66
936701	AD2-089 C	5.03
936711	AD2-090 C O1	3.34
937221	AD2-160 C O1	2.04
937571	AD2-169 C	3.66

Bus #	Bus	MW Impact
938171	AE1-026 C1 O	27.5
938172	AE1-026 C2 O	4.23
938221	AE1-035 C	2.35
938531	AE1-072 C O1	6.6
938661	AE1-088	4.36
938771	AE1-103 C O1	1.54
AC1-131	AC1-131	6.94
BLUEG	BLUEG	9.14
CALDERWOOD	CALDERWOOD	1.99
CANNELTON	CANNELTON	0.63
CATAWBA	CATAWBA	1.96
CBM-N	CBM-N	0.29
CHEOAH	CHEOAH	1.86
CHILHOWEE	CHILHOWEE	0.64
COFFEEN	COFFEEN	1.09
COTTONWOOD	COTTONWOOD	6.67
DUCKCREEK	DUCKCREEK	2.21
EDWARDS	EDWARDS	0.99
FARMERCITY	FARMERCITY	0.79
G-007A	G-007A	1.32
GIBSON	GIBSON	0.4
HAMLET	HAMLET	4.21
NEWTON	NEWTON	2.82
NYISO	NYISO	1.25
PRAIRIE	PRAIRIE	5.99
SANTEETLA	SANTEETLA	0.55
SMITHLAND	SMITHLAND	0.54
TATANKA	TATANKA	1.33
TILTON	TILTON	1.16
TRIMBLE	TRIMBLE	1.0
TVA	TVA	5.57
UNIONPOWER	UNIONPOWER	2.77
VFT	VFT	3.52

Affected Systems

14 Affected Systems

14.1 Duke Energy Progress

Enter into an Affected System Facilities Study agreement with Duke / Progress Energy (DEP) to determine how to mitigate the Line #218 Everetts – Greenville 115kV overload. The upgrade will likely be a complete reconductor, probably replacing some structures. The estimated cost is $8.5 million and is anticipated to require 36 months to complete

Short Circuit

15 Short Circuit

The following Breakers are overduty

None

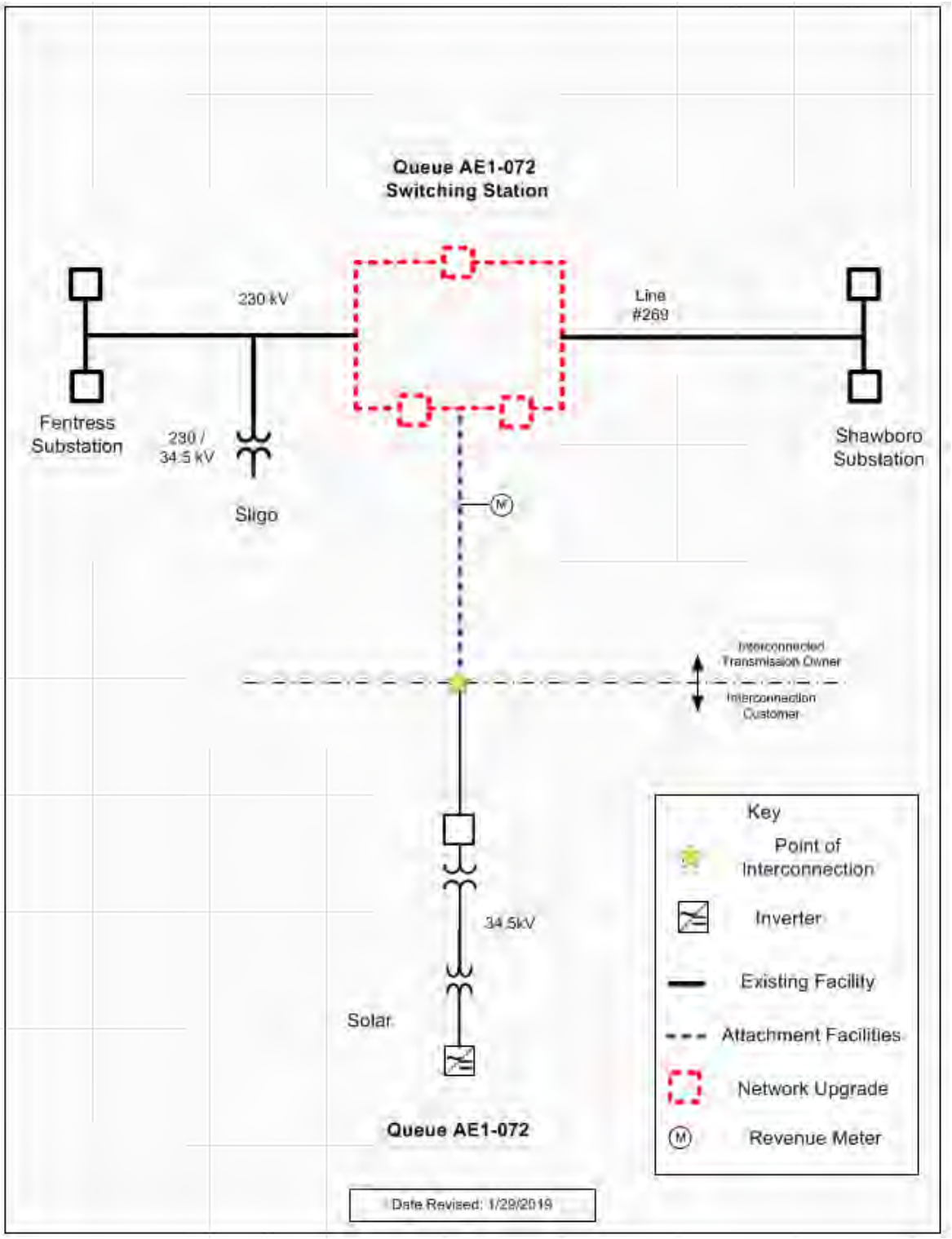
Stability

16 Stability

The project Stability Study will be complete as part of the Facilities Study.

Attachment 1

System Configuration



I/A

NWADIKE REPLY
EXHIBIT 1

Interconnection Queue Status Update

Jason Shoemaker
Manager
Interconnection Projects

Current Backlog Retool and Delayed Queue Schedules

- Retool schedule is general and may vary slightly between Transmission Owner zones

- Availability of retool results does not always mean that a project is ready to move to final agreements
  - Earlier projects may yet need to make their decision
  - Other studies may need to be completed or retooled

Current Backlog Retool Schedules

Queue	Retool Timeframe
AD1/AD2	October (handful will push into Nov)
AE1/AE2	November – January 2022
AF1/AF2	February – April 2022
AG1	May – July 2022

Current Backlog Retool Schedules

ComEd Zone Schedule

Queue	Retool Timeframe
Backlogged System Impact Studies	October – December 2021
AD1/AD2	January – February 2022
AE1/AE2	March – April 2022
AF1/AF2	May – July 2022
AG1	August 2022

Contact

Presenter:

Jason Shoemaker, Manager,
Interconnection Projects

Jason.shoemaker@pjm.com

Member Hotline

(610) 666 – 8980

(866) 400 – 8980

custsvc@pjm.com

STATE OF NORTH CAROLINA

COUNTY OF IREDELL

VERIFICATION

I, Linda Nwadike, being first duly sworn, depose and say that I am duly authorized to act on behalf of Shawboro East Ridge Solar, LLC as Director of Permitting and Community Relations for SunEnergy1, LLC, the parent, and an affiliate of the Petitioner; that I have read the foregoing Pre-Filed Reply Testimony, and that the same is true and accurate to my personal knowledge and belief except where otherwise indicated, and in those instances, I believe my answers to be true.

This 3 day of November 2021.

Linda Nwadike
SunEnergy1, LLC

Sworn to and subscribed to before me
this 3 day of November 2021.

Shelby F. Smithwick (Seal)
Notary Public (Signature)

Shelby F. Smithwick
Notary Public (Printed)

My Commission Expires: 3/27/23

SHELBY F SMITHWICK NOTARY PUBLIC IREDELL COUNTY, N.C.

I/A

Docket No. EMP-117, Sub 0

Confidential Exhibit 1

Public Staff's Testimony of Jay B. Lucas, Manager, Electric Section – Operations and Planning, Energy Division

I/A

Docket No. EMP-117, Sub 0

Confidential Exhibit 2

Public Staff's Testimony of Jay B. Lucas, Manager, Electric Section – Operations and Planning, Energy Division

I/A

Docket No. EMP-117, Sub 0

Confidential Exhibit 3

Public Staff's Testimony of Jay B. Lucas, Manager, Electric Section – Operations and Planning, Energy Division

I/A

Docket No. EMP-117, Sub 0

Confidential Exhibit 4

Public Staff's Testimony of Jay B. Lucas, Manager, Electric Section – Operations and Planning, Energy Division

Recent EMP solar facility proceedings before the Commission in PJM's queue for North Carolina						
EMP-	**Sub**	**Applicant Name**	**Filing Date**	**Approval Date**	**Capacity, MW_{AC}**	**County**
101	0	Edgecombe Solar LLC	10-05-18		75	Edgecombe
102	1	Pitt Solar, LLC	08-10-20		150	Pitt
103	0	Albemarle Beach Solar, LLC	09-21-15		80	Washington
104	0	Fern Solar LLC	11-27-18	03-16-20	100	Edgecombe
107	0	Halifax County Solar LLC	08-30-19	09-02-20	80	Halifax
108	0	American Beech Solar LLC	01-28-20		110	Halifax
109	0	Camden Solar LLC	04-01-20	09-14-20	20	Camden
110	0	Sumac Solar LLC	04-16-20		120	Bertie
111	0	Sweetleaf Solar LLC	06-02-20		94	Halifax
112	0	Oak Solar, LLC	07-15-20		120	Northampton
114	0	Oak Trail Solar, LLC	09-17-20	10-08-21	100	Currituck
115	0	Cherry Solar, LLC	11-13-20		180	Northampton
117	0	Shawboro East Ridge Solar, LLC	06-22-21		150	Currituck
119	0	Macadamia Solar, LLC	08-30-21		484	Washington
				Total =	1863	

Public Staff
Lucas Exhibit 5