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Generation Interconnection

Feasibility Study Report

for

Queue Project AG1-275

GLADYS DP-STONE MILL 69 KV

12 MW Capacity / 20 MW Energy

January 2021

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1 Introduction

This Feasibility Study has been prepared in accordance with the PJM Open Access Transmission Tariff, 36.2, as well as the Feasibility Study Agreement between the Interconnection Customer (IC), and PJM Interconnection, LLC (PJM), Transmission Provider (TP). The Interconnected Transmission Owner (ITO) is Dominion.

2 Preface

The intent of the feasibility study is to determine a plan, with ballpark cost and construction time estimates, to connect the subject generation to the PJM network at a location specified by the Interconnection Customer. The Interconnection Customer may request the interconnection of generation as a capacity resource or as an energy-only resource. As a requirement for interconnection, the Interconnection Customer may be responsible for the cost of constructing: (1) Direct Connections, which are new facilities and/or facilities upgrades needed to connect the generator to the PJM network, and (2) Network Upgrades, which are facility additions, or upgrades to existing facilities, that are needed to maintain the reliability of the PJM system.

In some instances a generator interconnection may not be responsible for 100% of the identified network upgrade cost because other transmission network uses, e.g. another generation interconnection, may also contribute to the need for the same network reinforcement. Cost allocation rules for network upgrades can be found in PJM Manual 14A, Attachment B. The possibility of sharing the reinforcement costs with other projects may be identified in the feasibility study, but the actual allocation will be deferred until the impact study is performed.

The Interconnection Customer seeking to interconnect a wind or solar generation facility shall maintain meteorological data facilities as well as provide that meteorological data which is required per Schedule H to the Interconnection Service Agreement and Section 8 of Manual 14D.

The Feasibility Study estimates do not include the feasibility, cost, or time required to obtain property rights and permits for construction of the required facilities. The project developer is responsible for the right of way, real estate, and construction permit issues. For properties currently owned by Transmission Owners, the costs may be included in the study.

3 General

The Interconnection Customer (IC), has proposed a Solar generating facility located in Campbell County, Virginia. The installed facilities will have a total capability of 20 MW with 12 MW of this output being recognized by PJM as Capacity. The proposed in-service date for this project is March 01, 2022. This study does not imply a TO commitment to this in-service date.

Queue Number	AG1-275
Project Name	GLADYS DP-STONE MILL 69 KV
State	Virginia
County	Campbell
Transmission Owner	Dominion
MFO	20
MWE	20
MWC	12
Fuel	Solar
Base Case Study Year	2024

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

4 Point of Interconnection

4.1 Primary Point of Interconnection

AG1-275 "Gladys DP-Stone Mill 69 kV" will interconnect with the Dominion transmission system. The primary POI will be a newly constructed 69 kV station located on the line between the Gladys DP substation and Stone Mill substation. AG1-275 will interconnect to the line via single breaker.

The IC is responsible for securing right-of-way, permits, and constructing the proposed attachment line from the generating facility site to the Point of Interconnection. The IC may not install any facilities on Dominion's right-of-way without first obtaining the necessary approval from Dominion Energy.

Attachment 1 shows a one-line diagram of the proposed interconnection facilities.

4.2 Secondary Point of Interconnection

There is no secondary point of interconnection specified for AG1-275.

5 Cost Summary

The AG1-275 project will be responsible for the following costs:

Description	Total Cost
Total Physical Interconnection Costs	$4,800,000
Total System Network Upgrade Costs	$53,947,000[1]
Total Costs	$58,747,000

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

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

[1] This project currently causes and/or contributes to overloads of the Transmission System (see Summer Peak Load Flow Analysis section below) and therefore has potential to have cost allocation for the system reinforcements listed in the report. This will be re-evaluated in the System Impact phase. The results may vary with queue customers withdrawing from the queue and other generators deactivating over time. If a customer is the first to cause the need for a project (causes loading to exceed 100% of rating), then the customer is responsible. If a customer contributes to a facility that is already overloaded by a prior queue, then they may receive cost allocation.

6 Transmission Owner Scope of Work

The required Attachment Facilities, Direct Connection and Non-Direct Connection work for the interconnection of AG1-275 to the Dominion Transmission System is detailed in the following sections. The associated one-line showing the generation project attachment facilities and primary direct and non-direct connection is shown in Attachment 1.

Note that the ITO findings were made from a conceptual review of this project. A more detailed review of the connection facilities and their cost will be identified in a future study phase. Further note that the cost estimate data contained in this document should be considered high level estimates since it was produced without a detailed engineering review. The applicant will be responsible for the actual cost of construction. ITO herein reserves the right to return to any issues in this document and, upon appropriate justification, request additional monies to complete any reinforcements to the transmission systems.

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

Description	Total Cost
Attachment Facilities	$1,700,000
69 kV Single Breaker Station	$1,500,000
Re-arrange line and tie-in new substation	$1,600,000
Total Physical Interconnection Costs	$4,800,000

AG1-275 "Gladys DP-Stone Mill 69 kV" will interconnect with the Dominion transmission system. The primary POI will be a newly constructed 69 kV station located on the line between the Gladys DP substation and Stone Mill substation. AG1-275 will interconnect to the line via single breaker.

It is estimated to take 18-30 months to complete this work upon execution of an Interconnection Construction Service Agreement (ICSA). 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.

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.

7 Schedule

The estimated schedule for the Attachment Facilities, Direct Connection and Non-Direct Connection work is identified in the “Transmission Owner Scope of Work” section of this report.

The estiamted schedule for the required Network Impact Reinforcements is identified in the “System Reinforcements” section of this report.

These scheuldes will be more cleary idetnifed in future study phases.

If the customer is ultimately responsible for network upgrades, then the schedule for those upgrades will be refined in future study phases. The customer would need to wait for those upgrades to be completed prior to commercial operation unless determined deliverable by an interim deliverability study. The elapsed time to complete any network upgrades is provided in the System Reinforcements table of this report.

8 Transmission Owner Analysis

Dominion assessed the impact of the proposed AG1-275 for compliance with NERC Reliability Criteria on the Dominion Transmission System. The system was assessed using the summer 2024 AG1 case provided to Dominion by PJM.

When performing a generation analysis, Dominion’s main analysis includes load flow study results following a single contingency event for both normal and stressed system conditions. Dominion Criteria considers a transmission facility overloaded if it exceeds 94% of its emergency rating under normal and stressed system conditions. A full listing of Dominion’s Planning Criteria and interconnection requirements can be found in the Company’s Facility Connection Requirements which are publicly available at: http://www.dominionenergy.com.

The results of these studies evaluate the system under a limited set of operating conditions and do not guarantee the full delivery of the capacity and associated energy of this proposed generation facility under all operating conditions. NERC Planning and Operating Reliability Criteria allow for the re-dispatch of generating units to resolve projected and actual deficiencies in real time and planning studies. Specifically, in Planning Studies, NERC Planning Event 3 and 6 Contingency Conditions (Loss of generator, transmission circuit, transformer, shunt device, or Single Pole of a DC line followed by the loss of a generator, transmission circuit, transformer, shunt device or single pole of a DC line) allow for re-dispatch of generating units to resolve potential reliability deficiencies. For Dominion Planning Criteria the re-dispatch of generating units for these contingency conditions is allowed as long as the projected loading does not exceed 100% of a facility Load Dump Rating.

8.1 Power Flow Analysis

PJM performed a power flow analysis of the transmission system using a 2024 summer peak load flow model and the results were verified by Dominion. Additionally, Dominion performed an analysis of its transmission system and no further deficiencies were identified.

9 Interconnection Customer Requirements

9.1 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.

9.2 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).

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

2. 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.

3. 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.

9.3 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.

10 Revenue Metering and SCADA Requirements

10.1 PJM Requirements

The Interconnection Customer will be required to install equipment necessary to provide Revenue Metering (KWH, KVARH) and real time data (KW, KVAR) for IC's generating Resource. See PJM Manuals M-01 and M-14D, and PJM Tariff Section 8 of Attachment O.

10.2 Meteorological Data Reporting Requirements

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

- Back Panel temperature (Fahrenheit) - (Required for plants with Maximum Facility Output of 3 MW or higher)
- Irradiance (Watts/meter2) - (Required for plants with Maximum Facility Output of 3 MW or higher)
- Ambient air temperature (Fahrenheit) - (Accepted, not required)
- Wind speed (meters/second) - (Accepted, not required)
- Wind direction (decimal degrees from true north) - (Accepted, not required)

10.3 Interconnected Transmission Owner Requirements

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

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

11 Summer Peak - Load Flow Analysis

The Queue Project AG1-275 was evaluated as a 20.0 MW (Capacity 12.0 MW) injection tapping the Gladys DP to Stone Mill 69 kV line in the Dominion area. Project AG1-275 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AG1-275 was studied with a commercial probability of 53.0 %. Potential network impacts were as follows:

11.1 Generation Deliverability

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

None

11.2 Multiple Facility Contingency

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

None

11.3 Contribution to Previously Identified Overloads

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

ID	FROM BUS#	FROM BUS	kV	FROM BUS AREA	TO BUS#	TO BUS	kV	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
161650054	242687	05JOHNMT	138.0	AEP	242734	05NEWLDN	138.0	AEP	1	AEP_P2-2_#13260_05SKIMMR 69.0_1	bus	240.0	138.96	142.09	DC	7.51
161650055	242687	05JOHNMT	138.0	AEP	242734	05NEWLDN	138.0	AEP	1	AEP_P2-2_#10163_05EDAN 2 138_2	bus	240.0	138.77	141.73	DC	7.1
161650421	242687	05JOHNMT	138.0	AEP	242734	05NEWLDN	138.0	AEP	1	AEP_P7-1_#10778	tower	240.0	138.77	141.73	DC	7.1
161650422	242687	05JOHNMT	138.0	AEP	242734	05NEWLDN	138.0	AEP	1	AEP_P7-1_#10830	tower	240.0	134.44	137.35	DC	6.99
167362925	242687	05JOHNMT	138.0	AEP	242734	05NEWLDN	138.0	AEP	1	AEP_P4_#2914_05J.FERR	breaker	240.0	130.19	132.95	DC	6.61
167362926	242687	05JOHNMT	138.0	AEP	242734	05NEWLDN	138.0	AEP	1	AEP_P4_#311_05CLOVRD	breaker	240.0	130.19	132.95	DC	6.61
168168474	242687	05JOHNMT	138.0	AEP	242734	05NEWLDN	138.0	AEP	1	Base Case	single	167.0	136.42	138.86	DC	4.08
161650049	242741	05OTTER	138.0	AEP	242687	05JOHNMT	138.0	AEP	1	AEP_P2-2_#13260_05SKIMMR 69.0_1	bus	245.0	141.93	145.0	DC	7.51
161650050	242741	05OTTER	138.0	AEP	242687	05JOHNMT	138.0	AEP	1	AEP_P2-2_#10163_05EDAN 2 138_2	bus	245.0	138.59	141.49	DC	7.1
161650431	242741	05OTTER	138.0	AEP	242687	05JOHNMT	138.0	AEP	1	AEP_P7-1_#10778	tower	245.0	138.59	141.49	DC	7.1
161650432	242741	05OTTER	138.0	AEP	242687	05JOHNMT	138.0	AEP	1	AEP_P7-1_#10830	tower	245.0	136.56	139.42	DC	6.99
167362933	242741	05OTTER	138.0	AEP	242687	05JOHNMT	138.0	AEP	1	AEP_P4_#2914_05J.FERR	breaker	245.0	130.19	132.89	DC	6.61
167362934	242741	05OTTER	138.0	AEP	242687	05JOHNMT	138.0	AEP	1	AEP_P4_#311_05CLOVRD	breaker	245.0	130.19	132.89	DC	6.61
168168466	242741	05OTTER	138.0	AEP	242687	05JOHNMT	138.0	AEP	1	Base Case	single	167.0	140.31	142.75	DC	4.08

ID	FROM BUS#	FROM BUS	kV	FROM BUS AREA	TO BUS#	TO BUS	kV	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
163678302	314667	4ALTVSTA	138.0	DVP	242741	05OTTER	138.0	AEP	1	Base Case	single	167.0	142.22	144.67	DC	4.08
163678303	314667	4ALTVSTA	138.0	DVP	242741	05OTTER	138.0	AEP	1	DVP_P1-2: LN 1016-A	single	245.0	114.76	116.83	DC	5.09
169181582	314670	2ALTVSTA	69.0	DVP	314667	4ALTVSTA	138.0	DVP	1	Base Case	single	128.779998779	103.81	113.13	DC	12.0
169181583	314670	2ALTVSTA	69.0	DVP	314667	4ALTVSTA	138.0	DVP	1	DVP_P1-2: LN 173-A	single	134.044006348	104.88	113.84	DC	12.0
169181539	314730	2STONEMIL	69.0	DVP	314670	2ALTVSTA	69.0	DVP	1	DVP_P1-2: LN 173-A	single	101.519996643	138.49	150.31	DC	12.0
169181540	314730	2STONEMIL	69.0	DVP	314670	2ALTVSTA	69.0	DVP	1	Base Case	single	101.519996643	131.69	143.51	DC	12.0
163678498	314861	3SKIMMER	115.0	DVP	242886	05SKIMMR	69.0	AEP	1	DVP_P1-3: 3SKIMMER-3SKIMMER_CK2	single	53.0	106.48	108.01	DC	0.81
163678510	314861	3SKIMMER	115.0	DVP	242886	05SKIMMR	69.0	AEP	2	DVP_P1-3: 3SKIMMER-3SKIMMER	single	53.0	105.76	107.27	DC	0.8
169951967	964140	AG1-275 TAP	69.0	DVP	314730	2STONEMIL	69.0	DVP	1	DVP_P1-2: LN 35-D	single	66.7399978638	113.28	131.26	DC	12.0
169951968	964140	AG1-275 TAP	69.0	DVP	314730	2STONEMIL	69.0	DVP	1	Base Case	single	66.7399978638	105.18	123.16	DC	12.0

11.4 Potential Congestion due to Local Energy Deliverability

PJM also studied the delivery of the energy portion of this interconnection request. Any problems identified below are likely to result in operational restrictions to the project under study. The developer can proceed with network upgrades to eliminate the operational restriction at their discretion by submitting a Merchant Transmission Interconnection request.

Note: Only the most severely overloaded conditions are listed below. There is no guarantee of full delivery of energy for this project by fixing only the conditions listed in this section. With a Transmission Interconnection Request, a subsequent analysis will be performed which shall study all overload conditions associated with the overloaded element(s) identified.

ID	FROM BUS#	FROM BUS	kV	FROM BUS AREA	TO BUS#	TO BUS	kV	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
167910839	242549	05BANSTR	138.0	AEP	242632	05EDAN2	138.0	AEP	1	AEP_P2-1_242720 05MONETA 138 242775 05ROCKCASS 138 1	operation	296.0	141.83	142.99	DC	3.41
168168473	242687	05JOHNMT	138.0	AEP	242734	05NEWLDN	138.0	AEP	1	Base Case	operation	167.0	167.92	172.0	DC	6.8
168168475	242687	05JOHNMT	138.0	AEP	242734	05NEWLDN	138.0	AEP	1	AEP_P1-2_#3174_6	operation	240.0	118.62	120.95	DC	5.59
168168607	242734	05NEWLDN	138.0	AEP	242569	05BRUSHT	138.0	AEP	1	AEP_P2-1_242641 05FOREST 138 242734 05NEWLDN 138 1	operation	207.0	108.59	111.32	DC	5.64
168168465	242741	05OTTER	138.0	AEP	242687	05JOHNMT	138.0	AEP	1	Base Case	operation	167.0	179.17	183.24	DC	6.8

ID	FROM BUS#	FROM BUS	kV	FROM BUS AREA	TO BUS#	TO BUS	kV	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
168168621	242802	05SMITHMTN	138.0	AEP	926050	AC1-083 TAP	138.0	AEP	1	AEP_P2-1_242607 05CLOVRD 138 243892 05MEADS8 138 1	operation	296.0	117.05	118.2	DC	3.41
163678297	314667	4ALTVSTA	138.0	DVP	242741	05OTTER	138.0	AEP	1	Base Case	operation	167.0	181.08	185.15	DC	6.8
163678298	314667	4ALTVSTA	138.0	DVP	242741	05OTTER	138.0	AEP	1	DVP_P1-2: LN 1016-A	operation	245.0	155.6	159.05	DC	8.48
169181753	314667	4ALTVSTA	138.0	DVP	314666	3ALTVSTA	115.0	DVP	1	DVP_P1-3: 4ALTVSTA-TX#4	operation	126.524002075	97.76	101.82	DC	5.14
169181773	314667	4ALTVSTA	138.0	DVP	314666	3ALTVSTA	115.0	DVP	2	AEP_P2-1_242687 05JOHNMT 138 242734 05NEWLDN 138 1	operation	130.472000122	104.08	108.17	DC	5.33
169181580	314670	2ALTVSTA	69.0	DVP	314667	4ALTVSTA	138.0	DVP	1	Base Case	operation	128.779998779	197.74	213.27	DC	20.0
169181581	314670	2ALTVSTA	69.0	DVP	314667	4ALTVSTA	138.0	DVP	1	DVP_P1-2: LN 173-A	operation	134.044006348	195.12	210.04	DC	20.0
169181807	314688	3CRSTL HILL	115.0	DVP	927260	AC1-222 TAP	115.0	DVP	1	AEP_P1-2_#375_5201	operation	285.760009766	103.13	105.18	DC	5.85
169181590	314696	3SEDGE HILL	115.0	DVP	314697	6SEDGE HILL	230.0	DVP	1	DVP_P1-3: 6SEDGE HILL-TX#2	operation	226.727996826	200.78	201.32	DC	2.72
169181606	314696	3SEDGE HILL	115.0	DVP	314697	6SEDGE HILL	230.0	DVP	2	DVP_P1-3: 6SEDGE HILL-TX#1	operation	256.055999756	177.25	177.72	DC	2.71
169181802	314714	3PERTH	115.0	DVP	964470	AG1-310 TAP	115.0	DVP	1	AEP_P1-2_#375_5201	operation	285.760009766	109.15	111.2	DC	5.85
169181537	314730	2STONE MIL	69.0	DVP	314670	2ALTVSTA	69.0	DVP	1	DVP_P1-2: LN 173-A	operation	101.519996643	257.63	277.33	DC	20.0
169181538	314730	2STONE MIL	69.0	DVP	314670	2ALTVSTA	69.0	DVP	1	Base Case	operation	101.519996643	250.83	270.53	DC	20.0
163678493	314861	3SKIMMER	115.0	DVP	242886	05SKIMMR	69.0	AEP	1	DVP_P1-3: 3SKIMMER-3SKIMMER_CK2	operation	53.0	122.68	123.82	DC	1.34
163678509	314861	3SKIMMER	115.0	DVP	242886	05SKIMMR	69.0	AEP	2	DVP_P1-3: 3SKIMMER-3SKIMMER	operation	53.0	121.83	122.96	DC	1.33
167910866	926050	AC1-083 TAP	138.0	AEP	242550	05BEARSK	138.0	AEP	1	AEP_P2-1_242607 05CLOVRD 138 243892 05MEADS8 138 1	operation	296.0	137.39	138.54	DC	3.41
169951965	964140	AG1-275 TAP	69.0	DVP	314730	2STONE MIL	69.0	DVP	1	DVP_P1-2: LN 35-D	operation	66.7399978638	180.4	210.37	DC	20.0
169951966	964140	AG1-275 TAP	69.0	DVP	314730	2STONE MIL	69.0	DVP	1	Base Case	operation	66.7399978638	172.31	202.28	DC	20.0
169181758	964470	AG1-310 TAP	115.0	DVP	314688	3CRSTL HILL	115.0	DVP	1	AEP_P1-2_#375_5201	operation	285.760009766	109.15	111.2	DC	5.85

11.5 System Reinforcements - Summer Peak Load Flow - Primary POI

ID	Idx	Facility	Upgrade Description	Cost
163678303,163678302	3	4ALTVSTA 138.0 kV - 05OTTER 138.0 kV Ckt 1	**AEP** **AEPA0014a (287) : Rebuild / reconductor 0.9 miles of overhead conductor (ACSR ~ 397.5 ~ 30/7 ~ LARK)** **Project Type : FAC** **Cost : $1,350,000** **Time Estimate : 24-36 Months** **AEPA0014b (288) : Replace 795 AAC station conductors at Altavista** **Project Type : FAC** **Cost : $100,000** **Time Estimate : 12-18 Months** **DVP** **dom-001 (1720) : Relay Change Outs (Secondary) at Altavista Substation** **Project Type : FAC** **Cost : $120,000** **Time Estimate : 6-12 Months**	$1,570,000
161650050,161650049,168168466,161650431,161650432,167362934,167362933	2	05OTTER 138.0 kV - 05JOHNMT 138.0 kV Ckt 1	**AEP** **AEPA0019a (301) : 2) Rebuild/reconductor JohnMt - Otter Line, ACSR ~ 397.5 ~ 30/7 ~ LARK Conductor Section 1, 7 Miles. $10.5M** **Project Type : FAC** **Cost : $10,500,000** **Time Estimate : 24-36 Months** **AEPA0019b (302) : Replace 795 AAC station conductors at Otter** **Project Type : FAC** **Cost : $10,670,000** **Time Estimate : 18-24 Months**	$21,170,000
169181540,169181539	5	2STONE MIL 69.0 kV - 2ALTVSTA 69.0 kV Ckt 1	**DVP** **dom-111 (1854) : Rebuild 1.64 miles of 69 kV Line 35 from Stone Mill to Altavista with 768 ACSS.** **Project Type : FAC** **Cost : $2,132,000** **Time Estimate : 30-36 Months**	$2,132,000
161650055,161650054,168168474,161650422,161650421,167362926,167362925	1	05JOHNMT 138.0 kV - 05NEWLDN 138.0 kV Ckt 1	**AEP** **AEPA0020a (304) : Current Station Rating: S/N: 167, S/E: 240** **1) Rebuild/reconductor ACSR ~ 397.5 ~ 30/7 ~ LARK ~ Fe Clamps 9 d, Conductor Section 1, 14.43 miles** **Project Type : FAC** **Cost : $21,650,000** **Time Estimate : 12-18 Months** **AEPA0020b (305) : Replace 1200 A Wavetrap at New London** **Project Type : FAC** **Cost : $50,000** **Time Estimate : 24-36 Months**	$21,700,000

ID	Idx	Facility	Upgrade Description	Cost
169181582,169181583	4	2ALTVSTA 69.0 kV - 4ALTVSTA 138.0 kV Ckt 1	**DVP** **dom-121 (1864) : Add additional 138/69 kV transformer at Altavista substation** **Project Type : CON** **Cost : $6,000,000** **Time Estimate : 16-18 Months**	$6,000,000
169951967,169951968	8	AG1-275 TAP 69.0 kV - 2STONE MIL 69.0 kV Ckt 1	**DVP** **dom-416 (2193) : Reconductor 2 miles of 69 kV Line 35 from AG1-275 Tap to Stone Mill with 636 ACSR 150 C. Replace Wave Trap at Stone Mill terminal.** **Project Type : FAC** **Cost : $1,350,000** **Time Estimate : 30-36 Months**	$1,350,000
163678498	6	3SKIMMER 115.0 kV - 05SKIMMR 69.0 kV Ckt 1	**AEP** **AEPA0016a (237) : Increase relay thermal limit above 80 MVA** **Project Type : FAC** **Cost : $25,000** **Time Estimate : 12-18 Months** **DVP** **Limiting equipment owned by AEP**	$25,000
163678510	7	3SKIMMER 115.0 kV - 05SKIMMR 69.0 kV Ckt 2		
			TOTAL COST	**$53,947,000**

11.6 Flow Gate Details

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

11.6.1 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
161650054	242687	05JOHNMT	AEP	242734	05NEWLDN	AEP	1	AEP_P2-2_#13260_05SKIMMR 69.0_1	bus	240.0	138.96	142.09	DC	7.51

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
246843	05SMG1	1.1693	50/50	1.1693
246844	05SMG2	3.1786	50/50	3.1786
246845	05SMG3	1.9928	50/50	1.9928
246846	05SMG4	3.1292	50/50	3.1292
246847	05SMG5	1.2187	50/50	1.2187
247284	05LEESVG	1.8564	50/50	1.8564
315156	1HALLBR1	2.9223	50/50	2.9223
316118	AC1-105 C	1.8331	Adder	2.16
316123	AC1-075 C	1.2269	50/50	1.2269
925661	AC1-042 C	5.9959	50/50	5.9959
925662	AC1-042 E	9.7827	50/50	9.7827
925997	AC1-075 E	4.4060	50/50	4.4060
926023	AC1-080 C	0.4100	50/50	0.4100
926024	AC1-080 E	1.4619	50/50	1.4619
926051	AC1-083 C O1	2.5478	Adder	3.0
926052	AC1-083 E O1	4.1570	Adder	4.89
926274	AC1-105 E	0.9006	Adder	1.06
926645	AC1-145 C	1.1261	50/50	1.1261
926646	AC1-145 E	6.4053	50/50	6.4053
927261	AC1-222 C	1.9259	Adder	2.27
927262	AC1-222 E	1.8334	Adder	2.16
933941	AD1-017 C	0.5096	Adder	0.6

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
933942	AD1-017 E	0.8314	Adder	0.98
934311	AD1-055 C	1.3372	Adder	1.57
934312	AD1-055 E	0.3448	Adder	0.41
938451	AE1-064 C	4.7778	Adder	5.62
938452	AE1-064 E	2.4705	Adder	2.91
939941	AE1-230 C	2.7049	50/50	2.7049
939942	AE1-230 E	4.8087	50/50	4.8087
941801	AE2-185 C	13.5245	50/50	13.5245
941802	AE2-185 E	9.0163	50/50	9.0163
941821	AE2-187 C	13.5245	50/50	13.5245
941822	AE2-187 E	6.0109	50/50	6.0109
942671	AE2-283 C	14.8769	50/50	14.8769
942672	AE2-283 E	7.8141	50/50	7.8141
942751	AE2-291 C	15.1898	50/50	15.1898
942752	AE2-291 E	10.1266	50/50	10.1266
942761	AE2-292 C O1	18.9128	50/50	18.9128
942762	AE2-292 E O1	12.6086	50/50	12.6086
943901	AF1-058 C	0.7117	Adder	0.84
943902	AF1-058 E	0.4744	Adder	0.56
945081	AF1-173	5.2407	50/50	5.2407
960061	AF2-297 C	2.8466	Adder	3.35
960062	AF2-297 E	1.8977	Adder	2.23
961121	AF2-403	3.0054	50/50	3.0054
962441	AG1-093 C O1	2.5908	Adder	5.75
962442	AG1-093 E O1	0.7885	Adder	1.75
963601	AG1-209 C	1.0519	50/50	1.0519
963602	AG1-209 E	1.5779	50/50	1.5779
964141	AG1-275 C	4.5082	50/50	4.5082
964142	AG1-275 E	3.0054	50/50	3.0054
964151	AG1-276 C	4.5082	50/50	4.5082
964152	AG1-276 E	3.0054	50/50	3.0054
964251	AG1-286 C	3.3401	50/50	3.3401
964252	AG1-286 E	2.2268	50/50	2.2268
964261	AG1-287 C	0.2829	Adder	0.63
964262	AG1-287 E	0.1886	Adder	0.42
964471	AG1-310 C	1.4850	50/50	1.4850
964472	AG1-310 E	0.7314	50/50	0.7314
964533	AG1-316 BAT	1.6207	Merchant Transmission	1.6207
966253	AG1-494 BAT	2.5943	Merchant Transmission	2.5943
966691	AG1-539 C	7.9424	50/50	7.9424
966692	AG1-539 E	10.6726	50/50	10.6726
966761	AG1-547 C	12.2246	50/50	12.2246
966762	AG1-547 E	6.5594	50/50	6.5594
CPLE	CPLE	0.9111	Confirmed LTF	0.9111
NY	NY	0.0210	Confirmed LTF	0.0210
PRAIRIE	PRAIRIE	0.4288	Confirmed LTF	0.4288
O-066	O-066	0.0673	Confirmed LTF	0.0673
CBM-S2	CBM-S2	8.1014	Confirmed LTF	8.1014
COTTONWOOD	COTTONWOOD	0.0105	Confirmed LTF	0.0105
G-007	G-007	0.0084	Confirmed LTF	0.0084
GIBSON	GIBSON	0.1381	Confirmed LTF	0.1381
BLUEG	BLUEG	0.4826	Confirmed LTF	0.4826

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
TRIMBLE	TRIMBLE	0.1564	Confirmed LTF	0.1564

11.6.2 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
161650049	242741	05OTTER	AEP	242687	05JOHNMT	AEP	1	AEP_P2-2_#13260_05SKIMMR 69.0_1	bus	245.0	141.93	145.0	DC	7.51

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
246843	05SMG1	1.1693	50/50	1.1693
246844	05SMG2	3.1786	50/50	3.1786
246845	05SMG3	1.9928	50/50	1.9928
246846	05SMG4	3.1292	50/50	3.1292
246847	05SMG5	1.2187	50/50	1.2187
247284	05LEESVG	1.8564	50/50	1.8564
315156	1HALLBR1	2.9223	50/50	2.9223
316118	AC1-105 C	1.8331	Adder	2.16
316123	AC1-075 C	1.2269	50/50	1.2269
925661	AC1-042 C	5.9959	50/50	5.9959
925662	AC1-042 E	9.7827	50/50	9.7827
925997	AC1-075 E	4.4060	50/50	4.4060
926023	AC1-080 C	0.4100	50/50	0.4100
926024	AC1-080 E	1.4619	50/50	1.4619
926051	AC1-083 C O1	2.5478	Adder	3.0
926052	AC1-083 E O1	4.1570	Adder	4.89
926274	AC1-105 E	0.9006	Adder	1.06
926645	AC1-145 C	1.1261	50/50	1.1261
926646	AC1-145 E	6.4053	50/50	6.4053
927261	AC1-222 C	1.9259	Adder	2.27
927262	AC1-222 E	1.8334	Adder	2.16
933941	AD1-017 C	0.5096	Adder	0.6
933942	AD1-017 E	0.8314	Adder	0.98
934311	AD1-055 C	1.3372	Adder	1.57
934312	AD1-055 E	0.3448	Adder	0.41
938451	AE1-064 C	4.7778	Adder	5.62
938452	AE1-064 E	2.4705	Adder	2.91
939941	AE1-230 C	2.7049	50/50	2.7049
939942	AE1-230 E	4.8087	50/50	4.8087
940081	AE1-250 C	4.5831	Adder	5.39
940082	AE1-250 E	3.0554	Adder	3.59
941801	AE2-185 C	13.5245	50/50	13.5245
941802	AE2-185 E	9.0163	50/50	9.0163
941821	AE2-187 C	13.5245	50/50	13.5245
941822	AE2-187 E	6.0109	50/50	6.0109
942671	AE2-283 C	14.8769	50/50	14.8769
942672	AE2-283 E	7.8141	50/50	7.8141

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
942751	AE2-291 C	15.1898	50/50	15.1898
942752	AE2-291 E	10.1266	50/50	10.1266
942761	AE2-292 C O1	18.9128	50/50	18.9128
942762	AE2-292 E O1	12.6086	50/50	12.6086
943901	AF1-058 C	0.7117	Adder	0.84
943902	AF1-058 E	0.4744	Adder	0.56
945081	AF1-173	5.2407	50/50	5.2407
960061	AF2-297 C	2.8466	Adder	3.35
960062	AF2-297 E	1.8977	Adder	2.23
961121	AF2-403	3.0054	50/50	3.0054
962441	AG1-093 C O1	2.5908	Adder	5.75
962442	AG1-093 E O1	0.7885	Adder	1.75
963601	AG1-209 C	1.0519	50/50	1.0519
963602	AG1-209 E	1.5779	50/50	1.5779
964141	AG1-275 C	4.5082	50/50	4.5082
964142	AG1-275 E	3.0054	50/50	3.0054
964151	AG1-276 C	4.5082	50/50	4.5082
964152	AG1-276 E	3.0054	50/50	3.0054
964261	AG1-287 C	0.2829	Adder	0.63
964262	AG1-287 E	0.1886	Adder	0.42
964471	AG1-310 C	1.4850	50/50	1.4850
964472	AG1-310 E	0.7314	50/50	0.7314
964533	AG1-316 BAT	1.6207	Merchant Transmission	1.6207
966253	AG1-494 BAT	2.5943	Merchant Transmission	2.5943
966691	AG1-539 C	7.9424	50/50	7.9424
966692	AG1-539 E	10.6726	50/50	10.6726
966761	AG1-547 C	12.2246	50/50	12.2246
966762	AG1-547 E	6.5594	50/50	6.5594
CPLE	CPLE	0.9111	Confirmed LTF	0.9111
NY	NY	0.0210	Confirmed LTF	0.0210
PRAIRIE	PRAIRIE	0.4288	Confirmed LTF	0.4288
O-066	O-066	0.0673	Confirmed LTF	0.0673
CBM-S2	CBM-S2	8.1014	Confirmed LTF	8.1014
COTTONWOOD	COTTONWOOD	0.0105	Confirmed LTF	0.0105
G-007	G-007	0.0084	Confirmed LTF	0.0084
GIBSON	GIBSON	0.1381	Confirmed LTF	0.1381
BLUEG	BLUEG	0.4826	Confirmed LTF	0.4826
TRIMBLE	TRIMBLE	0.1564	Confirmed LTF	0.1564

11.6.3 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
163678302	314667	4ALTVSTA	DVP	242741	05OTTER	AEP	1	Base Case	single	167.0	142.22	144.67	DC	4.08

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
246843	05SMG1	1.0628	80/20	1.0628

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
246844	05SMG2	2.8890	80/20	2.8890
246845	05SMG3	1.8113	80/20	1.8113
246846	05SMG4	2.8441	80/20	2.8441
246847	05SMG5	1.1077	80/20	1.1077
247284	05LEESVG	1.6819	80/20	1.6819
315156	1HALLBR1	2.5326	80/20	2.5326
315266	1PLYWOOD A	0.3932	80/20	0.3932
316118	AC1-105 C	1.8744	80/20	1.8744
316123	AC1-075 C	1.0637	80/20	1.0637
925661	AC1-042 C	5.4272	80/20	5.4272
926023	AC1-080 C	0.3555	80/20	0.3555
926051	AC1-083 C O1	2.7208	80/20	2.7208
926645	AC1-145 C	1.0193	80/20	1.0193
927261	AC1-222 C	1.9669	80/20	1.9669
933941	AD1-017 C	0.5442	80/20	0.5442
934311	AD1-055 C	1.3657	80/20	1.3657
938451	AE1-064 C	5.1128	80/20	5.1128
939941	AE1-230 C	2.4484	80/20	2.4484
940081	AE1-250 C	4.8870	80/20	4.8870
941801	AE2-185 C	12.2418	80/20	12.2418
941821	AE2-187 C	12.2418	80/20	12.2418
942671	AE2-283 C	13.4660	80/20	13.4660
942751	AE2-291 C	13.1678	80/20	13.1678
942761	AE2-292 C O1	16.3952	80/20	16.3952
943901	AF1-058 C	0.7274	80/20	0.7274
945081	AF1-173	4.7437	80/20	4.7437
960061	AF2-297 C	2.9098	80/20	2.9098
961121	AF2-403	2.7204	80/20	2.7204
962441	AG1-093 C O1	4.9984	80/20	4.9984
963601	AG1-209 C	0.9521	80/20	0.9521
964141	AG1-275 C	4.0806	80/20	4.0806
964151	AG1-276 C	4.0806	80/20	4.0806
964261	AG1-287 C	0.5456	80/20	0.5456
964471	AG1-310 C	1.2888	80/20	1.2888
966691	AG1-539 C	6.8851	80/20	6.8851
966761	AG1-547 C	11.0652	80/20	11.0652
CPLE	CPLE	0.8026	Confirmed LTF	0.8026
NY	NY	0.0194	Confirmed LTF	0.0194
PRAIRIE	PRAIRIE	0.3771	Confirmed LTF	0.3771
CBM-S2	CBM-S2	7.1514	Confirmed LTF	7.1514
COTTONWOOD	COTTONWOOD	0.0084	Confirmed LTF	0.0084
GIBSON	GIBSON	0.1212	Confirmed LTF	0.1212
BLUEG	BLUEG	0.4236	Confirmed LTF	0.4236
TRIMBLE	TRIMBLE	0.1375	Confirmed LTF	0.1375

11.6.4 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
169181583	314670	2ALTVSTA	DVP	314667	4ALTVSTA	DVP	1	DVP_P1-2: LN 173-A	single	134.04	104.88	113.84	DC	12.0

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
925661	AC1-042 C	15.9584	80/20	15.9584
926645	AC1-145 C	2.9973	80/20	2.9973
939941	AE1-230 C	7.1993	80/20	7.1993
941801	AE2-185 C	35.9964	80/20	35.9964
941821	AE2-187 C	35.9964	80/20	35.9964
942671	AE2-283 C	39.5960	80/20	39.5960
945081	AF1-173	13.9486	80/20	13.9486
961121	AF2-403	7.9992	80/20	7.9992
963601	AG1-209 C	2.7997	80/20	2.7997
964141	AG1-275 C	11.9988	80/20	11.9988
964151	AG1-276 C	11.9988	80/20	11.9988
966761	AG1-547 C	32.5367	80/20	32.5367
CALDERWOOD	CALDERWOOD	0.0050	Confirmed LTF	0.0050
NY	NY	0.0055	Confirmed LTF	0.0055
PRAIRIE	PRAIRIE	0.0258	Confirmed LTF	0.0258
CHEOAH	CHEOAH	0.0050	Confirmed LTF	0.0050
COTTONWOOD	COTTONWOOD	0.0210	Confirmed LTF	0.0210
HAMLET	HAMLET	0.0058	Confirmed LTF	0.0058
GIBSON	GIBSON	0.0055	Confirmed LTF	0.0055
BLUEG	BLUEG	0.0174	Confirmed LTF	0.0174
TRIMBLE	TRIMBLE	0.0056	Confirmed LTF	0.0056
CATAWBA	CATAWBA	0.0035	Confirmed LTF	0.0035

11.6.5 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
169181539	314730	2STONE MIL	DVP	314670	2ALTVSTA	DVP	1	DVP_P1-2: LN 173-A	single	101.52	138.49	150.31	DC	12.0

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
925661	AC1-042 C	15.9584	80/20	15.9584
926645	AC1-145 C	2.9973	80/20	2.9973
939941	AE1-230 C	7.1993	80/20	7.1993
941801	AE2-185 C	35.9964	80/20	35.9964
941821	AE2-187 C	35.9964	80/20	35.9964

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
942671	AE2-283 C	39.5960	80/20	39.5960
945081	AF1-173	13.9486	80/20	13.9486
961121	AF2-403	7.9992	80/20	7.9992
963601	AG1-209 C	2.7997	80/20	2.7997
964141	AG1-275 C	11.9988	80/20	11.9988
964151	AG1-276 C	11.9988	80/20	11.9988
966761	AG1-547 C	32.5367	80/20	32.5367
CALDERWOOD	CALDERWOOD	0.0050	Confirmed LTF	0.0050
NY	NY	0.0055	Confirmed LTF	0.0055
PRAIRIE	PRAIRIE	0.0258	Confirmed LTF	0.0258
CHEOAH	CHEOAH	0.0050	Confirmed LTF	0.0050
COTTONWOOD	COTTONWOOD	0.0210	Confirmed LTF	0.0210
HAMLET	HAMLET	0.0058	Confirmed LTF	0.0058
GIBSON	GIBSON	0.0055	Confirmed LTF	0.0055
BLUEG	BLUEG	0.0174	Confirmed LTF	0.0174
TRIMBLE	TRIMBLE	0.0056	Confirmed LTF	0.0056
CATAWBA	CATAWBA	0.0035	Confirmed LTF	0.0035

11.6.6 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
163678498	314861	3SKIMMER	DVP	242886	05SKIMMR	AEP	1	DVP_P1-3: 3SKIMMER-3SKIMMER_CK2	single	53.0	106.48	108.01	DC	0.81

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
315156	1HALLBR1	0.7351	80/20	0.7351
316123	AC1-075 C	0.3077	80/20	0.3077
925661	AC1-042 C	1.0730	80/20	1.0730
926023	AC1-080 C	0.1028	80/20	0.1028
926645	AC1-145 C	0.2015	80/20	0.2015
939941	AE1-230 C	0.4841	80/20	0.4841
941801	AE2-185 C	2.4203	80/20	2.4203
941821	AE2-187 C	2.4203	80/20	2.4203
942671	AE2-283 C	2.6623	80/20	2.6623
942751	AE2-291 C	3.8146	80/20	3.8146
942761	AE2-292 C O1	4.7495	80/20	4.7495
945081	AF1-173	0.9379	80/20	0.9379
961121	AF2-403	0.5378	80/20	0.5378
963601	AG1-209 C	0.1882	80/20	0.1882
964141	AG1-275 C	0.8068	80/20	0.8068
964151	AG1-276 C	0.8068	80/20	0.8068
966691	AG1-539 C	1.9946	80/20	1.9946
966761	AG1-547 C	2.1877	80/20	2.1877
CPLE	CPLE	0.2034	Confirmed LTF	0.2034
G-007A	G-007A	0.0048	Confirmed LTF	0.0048
VFT	VFT	0.0064	Confirmed LTF	0.0064

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
NY	NY	0.0033	Confirmed LTF	0.0033
PRAIRIE	PRAIRIE	0.1007	Confirmed LTF	0.1007
CBM-S2	CBM-S2	1.7957	Confirmed LTF	1.7957
CBM-N	CBM-N	0.0012	Confirmed LTF	0.0012
COTTONWOOD	COTTONWOOD	0.0063	Confirmed LTF	0.0063
GIBSON	GIBSON	0.0322	Confirmed LTF	0.0322
BLUEG	BLUEG	0.1111	Confirmed LTF	0.1111
TRIMBLE	TRIMBLE	0.0362	Confirmed LTF	0.0362

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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
163678510	314861	3SKIMMER	DVP	242886	05SKIMMR	AEP	2	DVP_P1-3: 3SKIMMER-3SKIMMER	single	53.0	105.76	107.27	DC	0.8

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
315156	1HALLBR1	0.7292	80/20	0.7292
316123	AC1-075 C	0.3051	80/20	0.3051
925661	AC1-042 C	1.0642	80/20	1.0642
926023	AC1-080 C	0.1020	80/20	0.1020
926645	AC1-145 C	0.1999	80/20	0.1999
939941	AE1-230 C	0.4801	80/20	0.4801
941801	AE2-185 C	2.4005	80/20	2.4005
941821	AE2-187 C	2.4005	80/20	2.4005
942671	AE2-283 C	2.6405	80/20	2.6405
942751	AE2-291 C	3.7834	80/20	3.7834
942761	AE2-292 C O1	4.7107	80/20	4.7107
945081	AF1-173	0.9302	80/20	0.9302
961121	AF2-403	0.5334	80/20	0.5334
963601	AG1-209 C	0.1867	80/20	0.1867
964141	AG1-275 C	0.8002	80/20	0.8002
964151	AG1-276 C	0.8002	80/20	0.8002
966691	AG1-539 C	1.9782	80/20	1.9782
966761	AG1-547 C	2.1698	80/20	2.1698
CPLE	CPLE	0.2020	Confirmed LTF	0.2020
G-007A	G-007A	0.0048	Confirmed LTF	0.0048
VFT	VFT	0.0064	Confirmed LTF	0.0064
NY	NY	0.0028	Confirmed LTF	0.0028
PRAIRIE	PRAIRIE	0.1007	Confirmed LTF	0.1007
CBM-S2	CBM-S2	1.7852	Confirmed LTF	1.7852
CBM-N	CBM-N	0.0012	Confirmed LTF	0.0012
COTTONWOOD	COTTONWOOD	0.0063	Confirmed LTF	0.0063
GIBSON	GIBSON	0.0317	Confirmed LTF	0.0317
BLUEG	BLUEG	0.1111	Confirmed LTF	0.1111
TRIMBLE	TRIMBLE	0.0362	Confirmed LTF	0.0362

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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
169951967	964140	AG1-275 TAP	DVP	314730	2STONE MIL	DVP	1	DVP_P1-2: LN 35-D	single	66.74	113.28	131.26	DC	12.0

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
941801	AE2-185 C	36.0000	80/20	36.0000
942671	AE2-283 C	39.6000	80/20	39.6000
964141	AG1-275 C	12.0000	80/20	12.0000
964151	AG1-276 C	12.0000	80/20	12.0000

11.7 Queue Dependencies

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

Queue Number	Project Name	Status
AC1-042	Altavista-Mt. Airy 69kV	Engineering and Procurement
AC1-075	Perth-Hickory Grove 115kV	Under Construction
AC1-080	Perth-Hickory Grove 115kV	Under Construction
AC1-083	Smith Mountain-Bearskin 138kV	Active
AC1-105	Halifax-Mt. Laurel 115kV	Engineering and Procurement
AC1-145	Gretna DP 69 kV	Engineering and Procurement
AC1-222	Crystal Hill-Halifax 115kV	Engineering and Procurement
AD1-017	Smith Mountain-Bearskin 138 kV	Active
AD1-055	Crystal Hill-Halifax 115 kV	Engineering and Procurement
AE1-064	Rockcastle 138 kV	Active
AE1-230	Shockoe 69 kV	Active
AE1-250	Smith Mountain-E. Danville 138 kV	Active
AE2-185	Gladys DP-Stonemill Switching Station 69 kV	Active
AE2-187	Shockoe DP-Chatham 69 kV	Active
AE2-283	Gladys-Stone Mill 69 kV	Active
AE2-291	Grit DP-Perth 115 kV	Active
AE2-292	Grit DP-Perth 115 kV	Active
AF1-058	Welco 34.5 kV	Engineering and Procurement
AF1-173	Gretna DP-Shockoe DP 69 kV	Active
AF2-297	Sedge Hill 115 kV	Active
AF2-403	Shockoe DP-Chatham 69 kV	Active
AG1-093	Halifax-Chase City 115 kV	Active
AG1-209	Gretna 12.5 kV	Active
AG1-275	Gladys DP-Stone Mill 69 kV	Active
AG1-276	Gladys DP-Stone Mill 69 kV	Active
AG1-286	Johnson Mountain 138 kV	Active
AG1-287	South Boston 12.5 kV	Active
AG1-310	Crystal Hill-Perth 115 kV	Active
AG1-316	Rustburg 138 kV	Active
AG1-494	Boxwood-Riverville 138 kV	Active
AG1-539	Grit DP-Perth 115 kV	Active
AG1-547	Mount Airy-Chatham 69 kV	Active

11.8 Contingency Descriptions

Contingency Name	Contingency Definition
DVP_P1-2: LN 35-D	CONTINGENCY 'DVP_P1-2: LN 35-D' OPEN BRANCH FROM BUS 314729 TO BUS 941800 CKT 1 /* 2GLADYS 69.000 - AE2-185 TAP 69.000 END
AEP_P2-1_242720 05MONETA 138 242775 05ROCKCAS SS 138 1	CONTINGENCY 'AEP_P2-1_242720 05MONETA 138 242775 05ROCKCAS SS 138 1' OPEN BRANCH FROM BUS 242720 TO BUS 242775 CKT 1 END
DVP_P1-2: LN 173-A	CONTINGENCY 'DVP_P1-2: LN 173-A' OPEN BRANCH FROM BUS 314680 TO BUS 941820 CKT 1 /* 2CHATHAM 69.000 - AE2-187 TAP 69.000 OPEN BUS 314680 /* ISLAND: 2CHATHAM 69.000 END
AEP_P4_#311_05CLOVRD	CONTINGENCY '"AEP_P4_#311_05CLOVRD' 765_CC2" / 1395 OPEN BRANCH FROM BUS 242512 TO BUS 242514 CKT 1 / 242512 05CLOVRD 765 242514 05J.FERR 765 1 END
AEP_P2-1_242687 05JOHNMT 138 242734 05NEWLDN 138 1	CONTINGENCY 'AEP_P2-1_242687 05JOHNMT 138 242734 05NEWLDN 138 1' OPEN BRANCH FROM BUS 242687 TO BUS 242734 CKT 1 END
AEP_P7-1_#10778	CONTINGENCY 'AEP_P7-1_#10778' OPEN BRANCH FROM BUS 242531 TO BUS 304094 CKT 1 / 242531 05EDANV2 230 304094 6YANCY TAP 230 1 OPEN BRANCH FROM BUS 242531 TO BUS 242632 CKT 4 / 242531 05EDANV2 230 242632 05EDAN 2 138 4 OPEN BRANCH FROM BUS 242549 TO BUS 242632 CKT 1 / 242549 05BANSTR 138 242632 05EDAN 2 138 1 OPEN BRANCH FROM BUS 242629 TO BUS 242632 CKT 1 / 242629 05E.MONU 138 242632 05EDAN 2 138 1 OPEN BRANCH FROM BUS 242629 TO BUS 242770 CKT 1 / 242629 05E.MONU 138 242770 05RIGIS 138 1 OPEN BRANCH FROM BUS 242631 TO BUS 242632 CKT Z1 / 242631 05EDAN 1 138 242632 05EDAN 2 138 Z1 OPEN BRANCH FROM BUS 242629 TO BUS 243948 CKT 1 / 242629 05E.MONU 138 243948 05BRANTLY 69.0 1 OPEN BRANCH FROM BUS 242770 TO BUS 243988 CKT 1 / 242770 05RIGIS 138 243988 05RIGIS 69.0 1 OPEN BRANCH FROM BUS 243974 TO BUS 243988 CKT 1 / 243974 05GOODYEAR 69.0 243988 05RIGIS 69.0 1 END

Contingency Name	Contingency Definition
DVP_P1-3: 3SKIMMER-3SKIMMER	CONTINGENCY 'DVP_P1-3: 3SKIMMER-3SKIMMER' OPEN BRANCH FROM BUS 242886 TO BUS 314861 CKT 1 /* 05SKIMMR 69.000 - 3SKIMMER 115.00 END
AEP_P1-2_#375_5201	CONTINGENCY 'AEP_P1-2_#375_5201' OPEN BRANCH FROM BUS 242687 TO BUS 242734 CKT 1 / 242687 05JOHNMT 138 242734 05NEWLDN 138 1 OPEN BRANCH FROM BUS 242687 TO BUS 242741 CKT 1 / 242687 05JOHNMT 138 242741 05OTTER 138 1 OPEN BRANCH FROM BUS 242741 TO BUS 314667 CKT 1 / 242741 05OTTER 138 314667 4ALTVSTA 138 1 END
DVP_P1-3: 6SEDGE HILL-TX#1	CONTINGENCY 'DVP_P1-3: 6SEDGE HILL-TX#1' OPEN BRANCH FROM BUS 314696 TO BUS 314697 CKT 1 /* 3SEDGE HILL 115.00 - 6SEDGE HILL 230.00 END
Base Case	
DVP_P1-3: 6SEDGE HILL-TX#2	CONTINGENCY 'DVP_P1-3: 6SEDGE HILL-TX#2' OPEN BRANCH FROM BUS 314696 TO BUS 314697 CKT 2 /* 3SEDGE HILL 115.00 - 6SEDGE HILL 230.00 END
AEP_P2-1_242641 05FOREST 138 242734 05NEWLDN 138 1	CONTINGENCY 'AEP_P2-1_242641 05FOREST 138 242734 05NEWLDN 138 1' OPEN BRANCH FROM BUS 242641 TO BUS 242734 CKT 1 END
DVP_P1-3: 3SKIMMER-3SKIMMER_CK2	CONTINGENCY 'DVP_P1-3: 3SKIMMER-3SKIMMER_CK2' OPEN BRANCH FROM BUS 242886 TO BUS 314861 CKT 2 /* 05SKIMMR 69.000 - 3SKIMMER 115.00 END
AEP_P2-2_#10163_05EDAN 2 138_2	CONTINGENCY 'AEP_P2-2_#10163_05EDAN 2 138_2' OPEN BRANCH FROM BUS 242531 TO BUS 304094 CKT 1 / 242531 05EDANV2 230 304094 6YANCY TAP 230 1 OPEN BRANCH FROM BUS 242531 TO BUS 242632 CKT 4 / 242531 05EDANV2 230 242632 05EDAN 2 138 4 OPEN BRANCH FROM BUS 242549 TO BUS 242632 CKT 1 / 242549 05BANSTR 138 242632 05EDAN 2 138 1 OPEN BRANCH FROM BUS 242629 TO BUS 242632 CKT 1 / 242629 05E.MONU 138 242632 05EDAN 2 138 1 OPEN BRANCH FROM BUS 242631 TO BUS 242632 CKT Z1 / 242631 05EDAN 1 138 242632 05EDAN 2 138 Z1 END

Contingency Name	Contingency Definition
AEP_P4_#2914_05J.FERR	CONTINGENCY '"AEP_P4_#2914_05J.FERR' 765_B2" / 1487 OPEN BRANCH FROM BUS 242512 TO BUS 242514 CKT 1 / 242512 05CLOVRD 765 242514 05J.FERR 765 1 OPEN BRANCH FROM BUS 242514 TO BUS 245993 CKT 4 / 242514 05J.FERR 765 245993 05J.FERR SVS 20.6 4 REMOVE SWSHUNT FROM BUS 242514 /* 242514 05J.FERR 765 END
DVP_P1-3: 4ALTVSTA-TX#4	CONTINGENCY 'DVP_P1-3: 4ALTVSTA-TX#4' OPEN BRANCH FROM BUS 314666 TO BUS 314667 CKT 2 /* 3ALTVSTA 115.00 - 4ALTVSTA 138.00 END
AEP_P2-2_#13260_05SKIMMR 69.0_1	CONTINGENCY 'AEP_P2-2_#13260_05SKIMMR 69.0_1' OPEN BRANCH FROM BUS 242886 TO BUS 314861 CKT 1 / 242886 05SKIMMR 69.0 314861 3SKIMMER 115 1 OPEN BRANCH FROM BUS 242886 TO BUS 314861 CKT 2 / 242886 05SKIMMR 69.0 314861 3SKIMMER 115 2 OPEN BRANCH FROM BUS 242860 TO BUS 242886 CKT 1 / 242860 05ABERT 69.0 242886 05SKIMMR 69.0 1 OPEN BRANCH FROM BUS 242884 TO BUS 242886 CKT 1 / 242884 05S.LYNCHB 69.0 242886 05SKIMMR 69.0 1 REMOVE SWSHUNT FROM BUS 242886 / 242886 05SKIMMR 69.0 END
DVP_P1-2: LN 1016-A	CONTINGENCY 'DVP_P1-2: LN 1016-A' OPEN BRANCH FROM BUS 314688 TO BUS 927260 CKT 1 /* 3CRSTL HILL 115.00 - AC1-222 TAP 115.00 OPEN BUS 314688 /* ISLAND: 3CRSTL HILL 115.00 END
AEP_P7-1_#10830	CONTINGENCY 'AEP_P7-1_#10830' OPEN BRANCH FROM BUS 242555 TO BUS 242843 CKT 1 / 242555 05BLAINE 138 242843 05WLAKE 138 1 OPEN BRANCH FROM BUS 242748 TO BUS 243951 CKT 1 / 242748 05PENHOK 138 243951 05REDWOOD 138 1 OPEN BRANCH FROM BUS 242748 TO BUS 242802 CKT 1 / 242748 05PENHOK 138 242802 05SMITHMTN 138 1 OPEN BRANCH FROM BUS 242843 TO BUS 243951 CKT 1 / 242843 05WLAKE 138 243951 05REDWOOD 138 1 END
AEP_P2-1_242607 05CLOVRD 138 243892 05MEADS8 138 1	CONTINGENCY 'AEP_P2-1_242607 05CLOVRD 138 243892 05MEADS8 138 1' OPEN BRANCH FROM BUS 242607 TO BUS 243892 CKT 1 END

Contingency Name	Contingency Definition
AEP_P1-2_#3174_6	CONTINGENCY 'AEP_P1-2_#3174_6' OPEN BRANCH FROM BUS 242512 TO BUS 242515 CKT 1 / 242512 05CLOVRD 765 242515 05JOSHUA 765 1 END

12 Short Circuit Analysis

The following Breakers are overdutied

None

12.1 System Reinforcements - Short Circuit

None

13 Affected Systems

13.1 TVA

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

13.2 Duke Energy Progress

Duke Energy Progress Impacts to be determined during later study phases (as applicable).

14 Attachment 1: One Line Diagram