Part 2

COMMONWEALTH OF VIRGINIA
BEFORE THE
STATE CORPORATION COMMISSION

APPLICATION OF

VIRGINIA ELECTRIC AND POWER COMPANY

FOR APPROVAL AND CERTIFICATION
OF ELECTRIC FACILITIES

Idylwood Substation Rebuild and Rearrangement of 230 kV Transmission Lines #202, #207, #251, #266, #2035, and #2097

Application No. 281

Appendix

Containing Information in Response to
"Guidelines of Minimum Requirements for Transmission Line Application"

Case No. PUR-2017-00002

Filed: January 12, 2017

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I. NECESSITY FOR THE PROPOSED PROJECT

A. Detail the engineering justifications for the proposed project (for example, provide narrative to support why the project is necessary to upgrade or replace an existing facility, to significantly increase system reliability, to connect a new generating station to the Company's system, etc.). Detail the later plans for the proposed project, if appropriate.

Response: In order to comply with mandatory North American Electric Reliability Corporation ("NERC") Reliability Standards and PJM Interconnection, L.L.C. ("PJM") reliability standards; to improve operational performance; and to maximize available land use to accommodate potential future transmission terminations and transformation at its existing Idylwood Substation located in Fairfax County, Virginia, Virginia Electric and Power Company ("Dominion Virginia Power" or the "Company") proposes to shift the existing substation footprint within Company-owned property in order to rebuild and rearrange Idylwood Substation from a straight bus arrangement to a breaker-and-a-half arrangement using Gas Insulated Substation ("GIS") bus and breakers (collectively, the "Idylwood Substation Rebuild Project" or "Rebuild Project").

In May 2015, Fairfax County Board of Supervisors ("Board of Supervisors") approved the Company's Special Exception application for the work at Idylwood Substation to redesign and upgrade Idylwood Substation, including demolition of existing facilities and replacement with new facilities.[1] A copy of the Board of Supervisors' approval is included as Attachment III.E.1, and a copy of the Company's Special Exception application is included as Attachment III.E.2. Additionally, on December 22, 2016, the Company submitted an application for a Special Exception Amendment with Fairfax County Department of Planning and Zoning for the limited purpose of incorporating the construction of a 230 kV high bus into the approved Special Exception and the site plan. The Company must shift a portion of the transmission power flow to a high bus for new distribution transformers and Line #2035 to remain electrified and in service at Idylwood Substation during the Rebuild Project. The construction high bus is a steel, linear structure that is approximately 35-37 feet in height. The Company anticipates that the high bus will be located within Idylwood Substation for approximately three years, subject to extension relating to construction scheduling, obtaining transmission outages and required permits and authorizations. The high bus will be de-energized and removed later in the construction sequence for the Rebuild Project. A copy of the Company's Special Exception Amendment application is available at: https://www.dom.com/about-us/news-center/electric-projects-and-initiatives/power-line-projects/idylwood-at-shreve-road-project.

[1] In accordance with the Supreme Court of Virginia's decision in *BASF Corp. v. State Corp. Comm'n*, 770 S.E.2d 458 (Va. 2015), the appeal of the Commission's decision in Case No. PUE-2012-00029, to the extent that the Idylwood Substation Rebuild Project requires any approvals under Va. Code § 56-46.1, such approvals for transmission facilities located inside the Idylwood Substation are within the exclusive jurisdiction of Fairfax County, Virginia, which has approved the Company's Special Exception application under Va. Code § 15.2223 *et seq.*

In connection with and as part of the Idylwood Substation Rebuild Project, the Company proposes to perform the following work:

(1) Relocate overhead lines: Clark-Idylwood Line #202, Braddock-Idylwood Line #207, Glen Carlyn-Idylwood Line #251, Clifton-Glen Carlyn Line #266, CIA-Idylwood Line #2035, and Ox-Idylwood Line #2097;

(2) Rearrange, rename and renumber Line #266, which currently bypasses Idylwood Substation, to terminate at Idylwood, by splitting existing Line #266 into Idylwood-Glen Carlyn Line #266, and renaming and renumbering Clifton-Idylwood Line #2164;

(3) Remove nine existing structures on Idylwood Substation property, and install twelve structures and conductors with new materials inside Idylwood Substation;

(4) Remove four existing structures and install five structures on Company-owned property outside Idylwood Substation;

(5) Temporarily relocate an existing cellular antenna and equipment to a structure across Shreve Road from Idylwood Substation, then at a future point permanently locate the cellular antenna and equipment on one of the new structures on Company-owned property adjacent to Idylwood Substation;

(6) Replace and relocate three distribution transformers, relocate twelve distribution circuits and relocate distribution air insulated bus with new distribution GIS equipment; and

(7) Install temporary 230 kV bus facilities to enable Idylwood Substation to remain electrified and in-service during the Idylwood Substation Rebuild Project.[2]

To the extent consistent with the Commission's jurisdiction, the Company is seeking approval from the Commission to perform the Idylwood Substation Rebuild Project.[3] Attachment I.E.1 contains a map of the Company's existing transmission Lines #202, #207, #251, #266, #2035, and #2097. For illustration purposes, construction of the Idylwood Substation Rebuild Project is depicted in phases on Attachment I.A.1.

[2] The temporary 230 kV construction bus is currently being reviewed by Fairfax County Department of Planning and Zoning as part of the Company's Special Exception Amendment submitted on December 22, 2016. *See also supra* note 1.

[3] This application for approval and certification is requested under Va. Code § 56-265.2 A 1 to the extent the Idylwood Substation Rebuild Project involves the construction of "facilities for use in public utility service" which may not be considered to be ordinary extensions or improvements in the usual course of business. In 2014, the Company first presented the Rebuild Project to Commission Staff ("Staff") seeking guidance whether a certificate under Va. Code § 56-265.2 would be required. Following a subsequent meeting in 2016 to discuss the Rebuild Project and in advance of construction, Staff recommended that the Company file for Commission approval. *See also supra* note 1.

The mandatory NERC Reliability Standards constitute minimum criteria with which all public utilities must comply as components of the interstate electric transmission system. Moreover, the Energy Policy Act of 2005 mandates that electric utilities must follow these NERC Reliability Standards, and utilities could be fined up to and in excess of $1 million per day per violation if found to be in noncompliance. NERC has been designated by the Federal Energy Regulatory Commission ("FERC") as the Electric Reliability Organization for the United States.

Dominion Virginia Power is part of the Eastern Interconnection transmission grid, meaning it is interconnected, directly or indirectly, with all of the other transmission systems in the U.S. and Canada between the Rocky Mountains and the Atlantic coast, except Quebec and most of Texas. All of the transmission systems in the Eastern Interconnection are dependent on each other for support in moving bulk power through the transmission system and for reliability support. Dominion Virginia Power's service to its customers is extremely reliant on a robust and reliable regional transmission system.

Dominion Virginia Power also is part of the PJM regional transmission organization (RTO) providing service to a large portion of the eastern United States. PJM is currently responsible for ensuring the reliability and coordinating 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. This service area has a population of approximately 60 million, and on July 21, 2011, set a record high of 158,450 MW for summer peak demand, of which Dominion Virginia Power's load portion was approximately 19,636 MW serving 2.4 million customers. On July 22, 2011, the Company set a record high of 20,061 MW for summer peak demand. On February 20, 2015, the Company set a winter peak and all-time record demand of 21,651 MW. Dominion Virginia Power's load zone is the third largest area in PJM, behind only the American Electric and Power Company and Commonwealth Edison Zones.

Dominion Virginia Power's transmission system is responsible for providing transmission service to the Company's retail customers and also to Appalachian Power Company (APCo), Old Dominion Electric Cooperative (ODEC), Northern Virginia Electric Cooperative (NOVEC), Central Virginia Electric Cooperative (CVEC), and Virginia Municipal Electric Association (VMEA) for redelivery to their retail customers in the Commonwealth of Virginia, as well as to North Carolina Electric Membership Corporation (NCEMC) and North Carolina Eastern Municipal Power Agency (NCEMPA) for redelivery to their customers in the state of North Carolina. The Company needs to be able to maintain the overall, long-term reliability of its transmission system, as its customers require more power in the future.

PJM's Regional Transmission Expansion Plan ("RTEP"), including the Company's own Transmission Planning Criteria and analysis, produced PJM's RTEP for 2011, which identified the need for the proposed Rebuild Project to relieve violations of mandatory NERC Reliability Standards by spring 2020. The Rebuild Project's RTEP number is b1969. Dominion Virginia Power, along with other TOs in PJM, is actively involved in the development and the reliability assessment of these power flow models used in the RTEP analysis. The active participation of the TOs in the development and assessment phases of this process is critical to ensure a comprehensive and accurate RTEP. PJM Manual 14B focuses on the RTEP process can be found at http://www.pjm.com/documents/manuals.aspx.

PJM's annual RTEP is based on the effective criteria in place at the time of the analyses, including applicable standards and criteria of the NERC, PJM, and local reliability planning criteria, among others (see Manual 14B, Attachment D: PJM Reliability Planning Criteria).

Projects identified through the RTEP process are developed by the Transmission Owner ("TO") in coordination with PJM and presented at the Transmission Expansion Advisory Committee ("TEAC") meetings prior to inclusion in the RTEP that is presented for approval by the PJM Board of Managers.

The Idylwood Substation Rebuild Project is necessary to ensure that Dominion Virginia Power can continue to provide reliable electric service to its customers served by Idylwood Substation and the 230 kV network in this region, consistent with mandatory NERC Reliability Standards for transmission facilities.

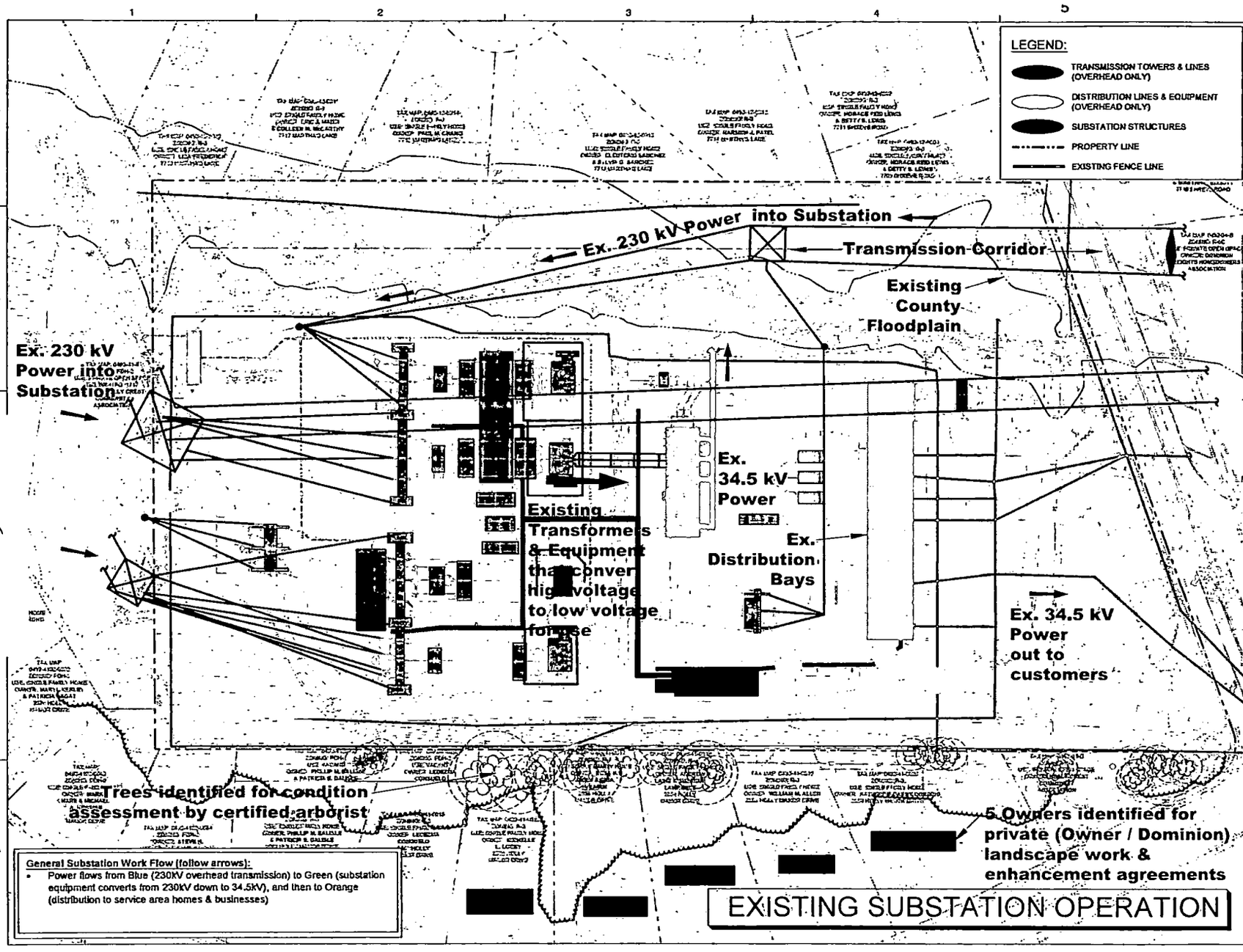
As discussed in more detail in Section I.B, PJM's Generation Deliverability analysis, as part of the 2011 RTEP process, identified reliability violations beginning in 2016 and determined that the Company's transmission facilities are not projected to meet NERC Reliability Standards. Idylwood Substation Rebuild Project was initially submitted to the PJM TEAC in June 2011 and contained a proposed in-service target date of May 2016. PJM subsequently accelerated the required target in-service date to 2015, and the PJM Board approved the Idylwood Substation Rebuild Project at a 2011 Board Meeting and authorized it as a PJM baseline upgrade (b1969). For temporary relief, the Company has increased the capacity of the existing 230 kV bus and replaced the tie breaker until the Idylwood Substation Rebuild Project is in service.

In addition, the Company originally planned to replace existing 230 kV straight bus with a traditional (air insulated) breaker-and-a-half design. With the potential future transmission terminations and transformation needed to support the continued load growth in northern Virginia, coupled with the relocation and shifting of the substation footprint due to Fairfax County setback requirements, the Company determined that GIS equipment was the optimal alternative. With this changed scope, the Company will be able to maximize the space available

within the Idylwood Substation parcel without needing to pursue an additional substation location in the vicinity of Idylwood Substation. As discussed in Section II.A.7, the Company decided to use GIS after the Company's real estate consultant performed an extensive study of property along the Braddock to Idylwood transmission corridor and the results of that study did not identify any suitable parcels for an additional substation location.

Assuming a Commission order approving the Rebuild Project is issued on or before June 30, 2017, and an estimated completion date by May 31, 2020, the estimated total cost of the Idylwood Substation Rebuild Project is approximately $107.0 million. The estimated cost for station work is approximately $100.8 million, and the estimated cost for transmission line work is approximately $6.2 million. All costs are in 2016 dollars.

The Idylwood Substation Rebuild Project will enable the Company to maintain the overall long-term reliability of its transmission system and maximize use of existing Company-owned property to accommodate potential future transmission terminations and transformation at its existing Idylwood Substation.



Dewberry

Dewberry Engineers Inc.

Dominion

DOMINION VIRGINIA POWER
Idylwood Substation

PROVIDENCE DISTRICT
FAIRFAX COUNTY, VIRGINIA

SEAL

KEY PLAN

SCALE

GRAPHIC SCALE

No.	DATE	BY	Description

REVISIONS

DRAWN BY BKJ
APPROVED BY KWW
CHECKED BY KWW
DATE OCTOBER 2015

TITLE

EXISTING CONDITIONS

PROJECT NO. 50058411

EX

SHEET NO. 1 OF 5

Attachment I.A.1
Page 1 of 5

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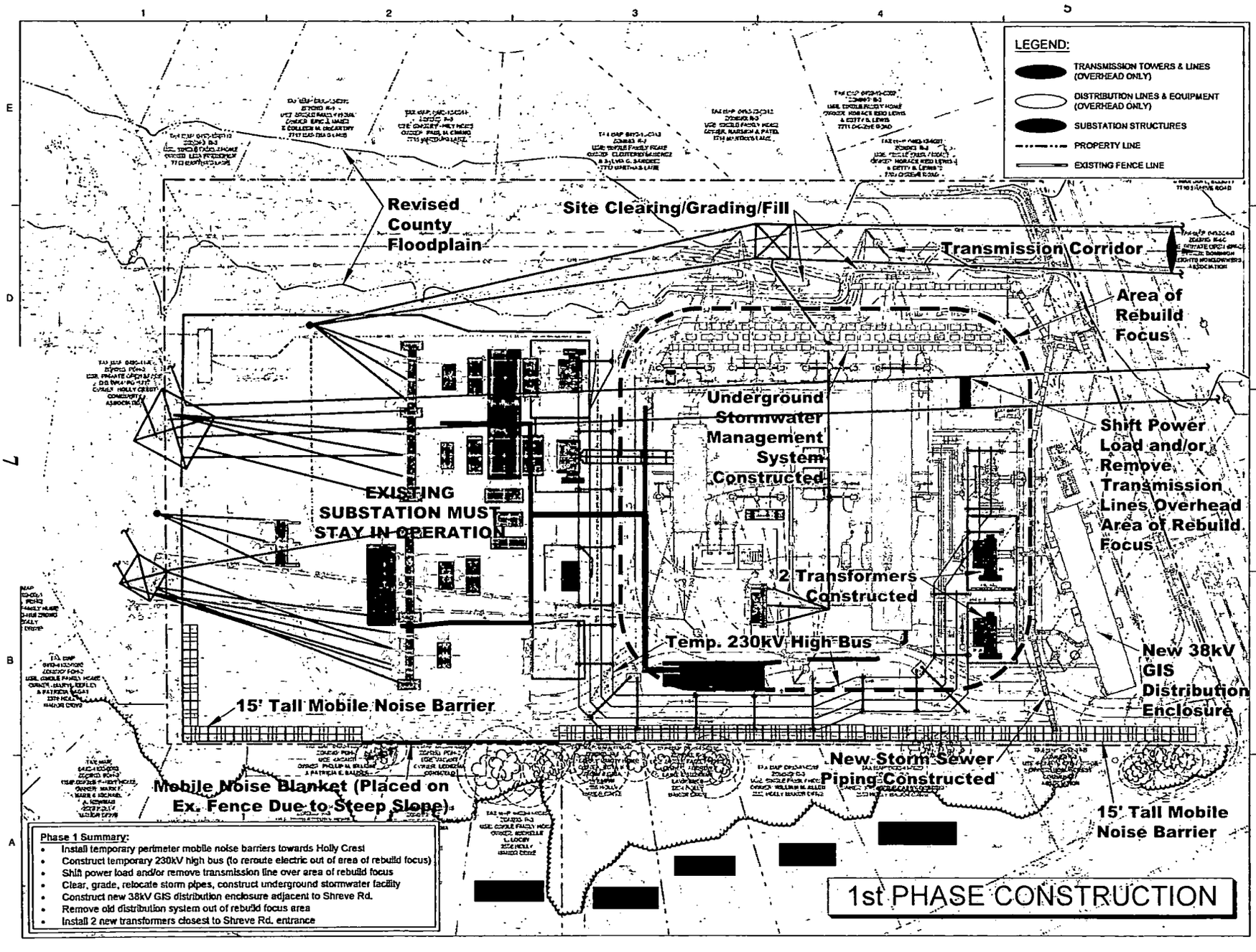

Dewberry

Dewberry Engineers Inc.

Dominion

DOMINION VIRGINIA POWER
Idylwood Substation

PROVIDENCE DISTRICT
FAIRFAX COUNTY, VIRGINIA

SEAL

KEY PLAN

SCALE

GRAPHIC SCALE

No.	DATE	BY	Description
REVISIONS			

DRAWN BY	EMJ
APPROVED BY	KMW
CHECKED BY	KMW
DATE	OCTOBER 2015

TITLE

1st PHASE CONSTRUCTION

PROJECT NO. 50058411

1

SHEET NO. 2 OF 5

Attachment I.A.1
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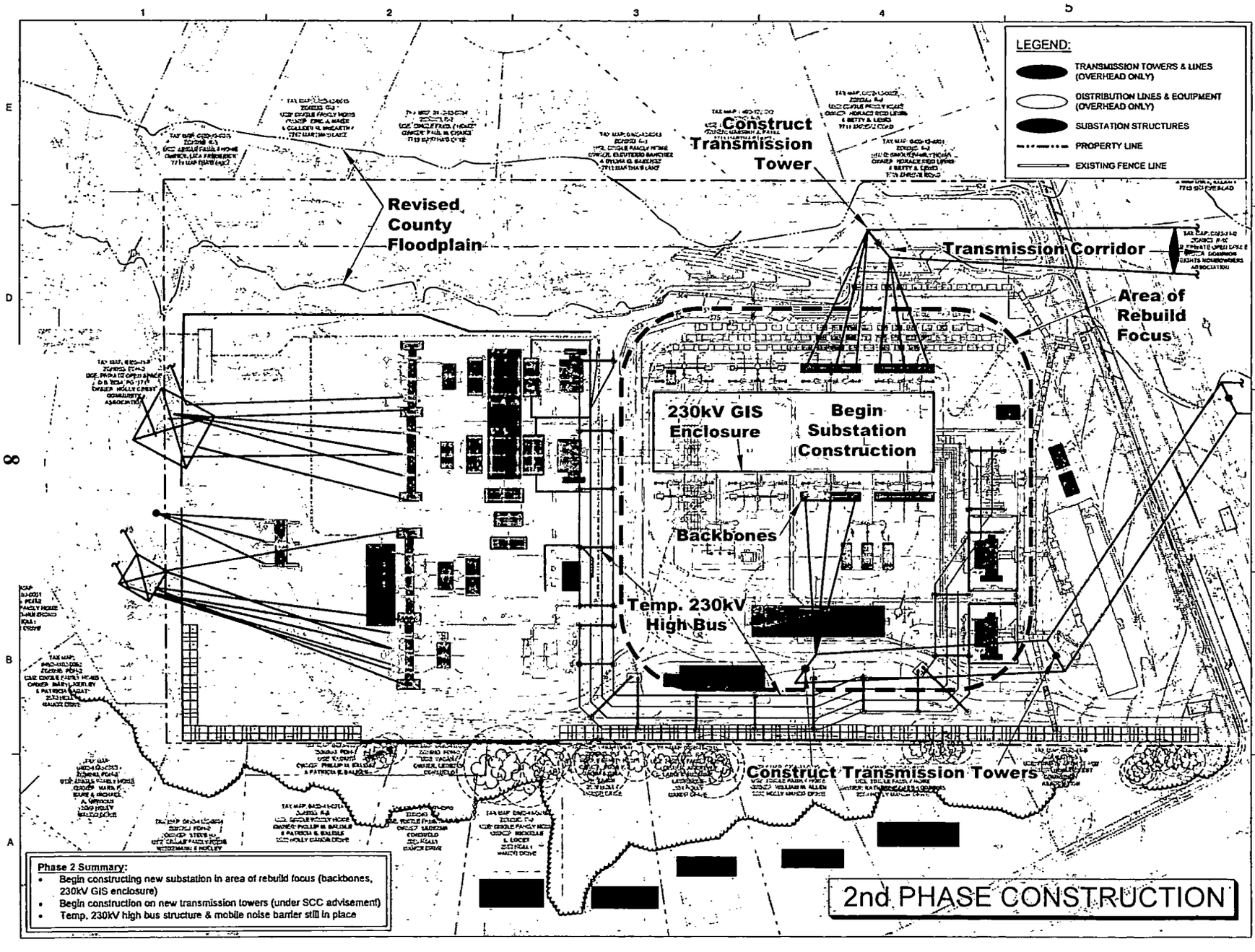

Dewberry

Dewberry Engineers Inc.

Dominion

DOMINION VIRGINIA POWER
Idylwood Substation

PROVIDENCE DISTRICT
FAIRFAX COUNTY, VIRGINIA

SEAL

KEY PLAN

SCALE

GRAPHIC SCALE

No.	DATE	BY	Description
REVISIONS			

DRAWN BY: BEJ
APPROVED BY: KWW
CHECKED BY: KWW
DATE: OCTOBER 2018

TITLE
2nd PHASE CONSTRUCTION

PROJECT NO. 50058411

2

SHEET NO. 3 OF 5

Attachment I.A.1
Page 3 of 5

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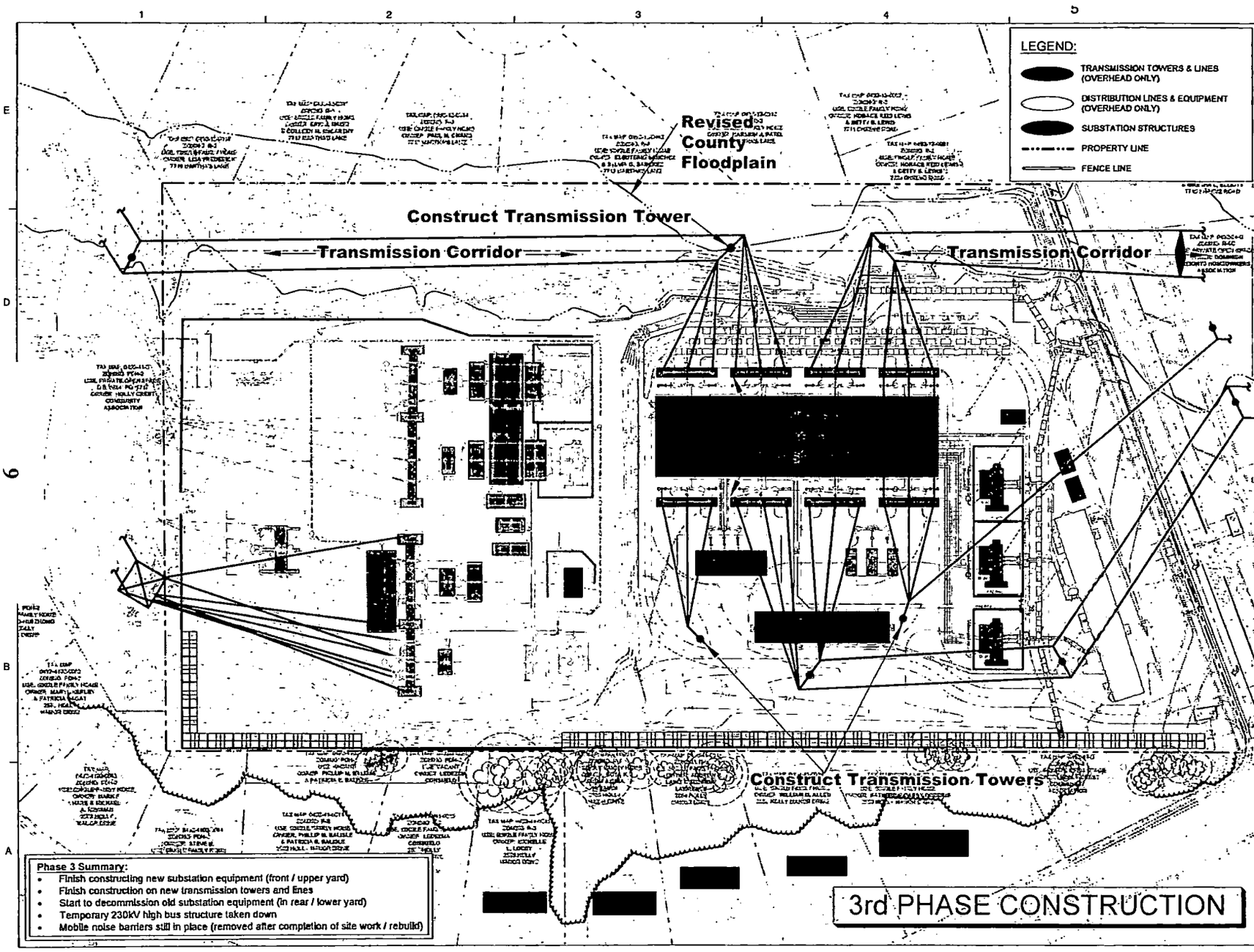

Dewberry

Dewberry Engineers Inc.

Dominion

DOMINION VIRGINIA POWER
Idylwood Substation

PROVIDENCE DISTRICT
FAIRFAX COUNTY, VIRGINIA

SEAL

KEY PLAN

SCALE

0' 30' 60'
GRAPHIC SCALE

No.	DATE	BY	Description
REVISIONS			

DRAWN BY BEJ
APPROVED BY KWW
CHECKED BY KWW
DATE OCTOBER 2016

TITLE
3rd PHASE CONSTRUCTION

PROJECT NO. 50058411

3

SHEET NO. 4 OF 5

Attachment I.A.1
Page 4 of 5

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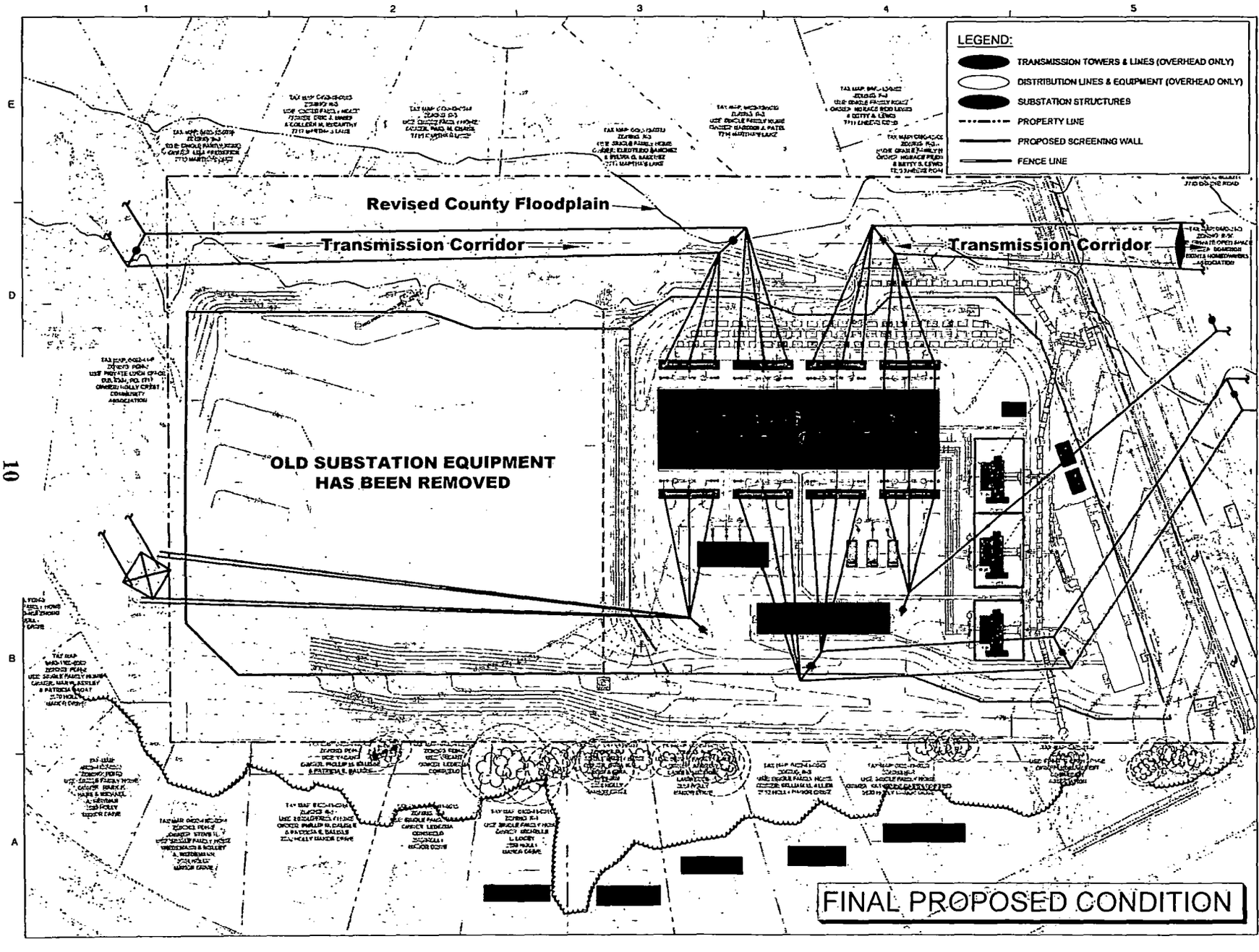

Dewberry

Dewberry Engineers Inc.

Dominion

DOMINION VIRGINIA POWER
Idylwood Substation

PROVIDENCE DISTRICT
FAIRFAX COUNTY, VIRGINIA

SEAL

KEY PLAN

SCALE

GRAPHIC SCALE

No.	DATE	BY	Description
REVISIONS			

DRAWN BY BMJ
APPROVED BY KWW
CHECKED BY KWW
DATE OCTOBER 2016

TITLE

PROPOSED FACILITY PLAN

PROJECT NO. 50058411

FINAL

SHEET NO. 5 OF 5

Attachment I.A.1
Page 5 of 5

17011179

I. NECESSITY FOR THE PROPOSED PROJECT

B. Describe the present system and detail how the proposed project will effectively satisfy present and future demand requirements. Provide pertinent load growth data (at least five years of historical and ten years of projected loads where applicable). Provide all assumptions inherent within the projected data and why existing right-of-way cannot adequately serve the needs of the Company if that is the case. Indicate when the existing system is projected to be inadequate. If the existing system is, or will at some future time be inadequate in a contingency situation, describe this critical contingency. Detail what might cause such situation. Where appropriate, provide historical incidence of similar situations which would be avoided by the proposed construction.

Response: As presented in Attachment I.E.1, Idylwood Substation is located approximately at the intersection of two major overhead transmission corridors and is an electrical transmission hub and major distribution substation. One of the transmission corridors is oriented roughly in an east-west direction and contains two overhead 230 kV lines that terminate at Idylwood Substation, while the other transmission corridor is oriented roughly in a north-south direction and contains three overhead 230 kV lines that terminate at Idylwood Substation. In the east-west corridor, Clark-Idylwood Line #202 approaches Idylwood from the west while Glen Carlyn-Idylwood Line #251 approaches Idylwood from the east. In the north-south corridor, Braddock-Idylwood Line #207 and Ox-Idylwood Line #2097 approach Idylwood from the south while CIA-Idylwood Line #2035 approaches Idylwood from the north. These five 230 kV lines terminate on two straight buses within Idylwood (three lines on one bus and two lines on the other bus), with each straight bus connected by a tie breaker. Additionally, overhead 230 kV Clifton-Glen Carlyn Line #266 approaches Idylwood from the south and bypasses the station as it transitions to the eastern corridor. As part of the Rebuild Project, in order to route the existing transmission lines around the expanded substation, it will be necessary to terminate Line #266 at Idylwood Substation. This will be accomplished by cutting the line at Idylwood and terminating each end on a bus section within the new breaker-and-a-half arrangement. This will create renamed and renumbered Clifton-Idylwood Line #2164 and Idylwood-Glen Carlyn Line #266. Although it is not the driver for terminating Line #266 at Idylwood, splitting the line into two separate lines has the added reliability benefit of reducing the number of customers affected by an outage of the line.

As mentioned above, Idylwood Substation is also a major distribution substation and has three 230-34.5 kV distribution transformers (one 168 MVA unit and two 84 MVA units) connected to the straight buses and feeding twelve 34.5 kV distribution circuits. There is also a 34.5-12.5 kV, 14 MVA distribution transformer that feeds two 12.5 kV distribution circuits. The combined 34.5 kV and 12.5 kV distribution circuits feed more than 22,300 Dominion Virginia Power residential and commercial customers in Fairfax County communities that

include Merrifield, southern Tysons Corner, and the Cities of Falls Church and Fairfax. Additionally, two distribution circuits from Idylwood Substation are dedicated to help power the Washington Metropolitan Area Transit Authority Metro Rail and stations in the vicinity of Idylwood Substation.

The table in Attachment I.B.1 provides historical system peak loads over the period from 2007 to 2016, and also provides the anticipated summer peak loads from 2017 to 2026. The projected loads shown in the attachment represent the Company's forecasted peaks based on actual loads and the PJM 2016 Load Forecast, and demonstrate the continued growth that is projected to occur.

From an operational performance perspective, the existing straight-bus arrangement at Idylwood Substation is inferior to the proposed breaker-and-a-half arrangement. For example, if any of the lines terminating at Idylwood experience a fault that is not properly cleared by its respective line breaker at Idylwood (also called a "breaker failure" event), it will cause all of the other line breakers on that bus and the bus tie breaker to open. Such an event would cause all of the 230 kV lines connected to the bus with a failed breaker to be operated in a radial condition until the failed breaker could be isolated and the bus restored, which would disrupt the network flows for any line terminating on that bus and put any of the customers served from the radial lines at risk of an extended outage for another event that involves the radial line (*e.g.*, tapped substations). Additionally, the distribution transformers served from the bus with a failed breaker would be in an outage situation until the bus was restored. Similarly, a bus fault involving one of the straight buses would require all of the line breakers and the bus tie breaker to open. Further, if a breaker failure event involving the bus tie breaker were to occur, all of the 230 kV lines terminating at Idylwood would have to be operated in a radial condition and all of the distribution transformers would be in an outage situation until the buses were returned to service. Continuing to terminate lines and add load to Idylwood Substation with a straight-bus arrangement would increase the severity of a breaker failure event.

By contrast, a breaker failure event within the breaker-and-a-half arrangement proposed for the Rebuild Project would isolate the effect to a single additional element – a transmission line bus section, which would have the effect of minimizing disruption to the network flows by reducing the number of lines in a radial condition. Additionally, breaker maintenance activities for a breaker-and-a-half arrangement can be performed without disrupting network connectivity, unlike a straight-bus, which requires lines to be operated in a radial condition while their line breaker is taken out of service. Further, the proposed Rebuild Project eliminates the existing condition (described above) where a single breaker failure of the bus tie would cause an interruption for all customers served from Idylwood Substation by causing an outage of all of the distribution transformers until the busses are returned to service.

Mandatory NERC Reliability Standards require that the interconnected transmission system be analyzed both in the near term (years 1-5) and long term (years 6 -10) for compliance with NERC Reliability Standards. NERC Reliability Standards require the identification of critical system conditions and the assessment of system performance for various events. These events fall into eight categories, Categories P0 to P7 NERC Reliability Standards provide for different system responses based on the severity of the system test (Category P0 is the least severe test and Categories P6 and P7 are the most severe). More specifically, the eight contingency categories are segmented as follows:

- Category P0 - No Contingencies
- Category P1 and P2 - Event resulting in the loss of a single element
- Category P3 through P7 - Event(s) resulting in the loss of two or more (multiple) elements.

For Category P0 through P7 events, it is required that the system remain stable and that both thermal and voltage limits remain within applicable ratings.

NERC Reliability Standards require that the Planning Authority and Transmission Planner develop planning criteria to ensure compliance with NERC Reliability Standards. Mandatory NERC Reliability Standards require that a TO develop Facility Connection Requirements (FAC-001) that identify load and generation interconnection minimum requirements for a TO's transmission system and also identify a TO's Reliability Criteria.[4]

The Company's transmission facilities are not projected to meet PJM and NERC Reliability Standards unless Idylwood Substation is rebuilt and rearranged to resolve the Generator Deliverability violation described herein. PJM's generator deliverability test for the reliability analysis ensures that the transmission system is capable of delivering the aggregate system generating capacity at peak load with all firm transmission service modeled. Generator Deliverability is a critical system condition test which is part of the PJM reliability standards and hence also required to be satisfied by NERC Reliability Standards.

In 2011, as part of PJM's RTEP annual transmission planning process, PJM Generation Deliverability analysis identified several network violations projected to occur beginning in 2016, including a Generator Deliverability violation. An outage on Idylwood-CIA Line #2035, among other Lines in the vicinity, would overload the Idylwood 230 kV bus. Idylwood Substation Rebuild Project was initially submitted to the PJM TEAC in June 2011 and contained a proposed in-service target date of May 2016. Attachment I.B.2 contains the PJM slide identifying the Idylwood violations and solution that was

[4] The Company's Transmission Planning Criteria can be found in Exhibit A of the Company's Facility Interconnection Requirements document, which is available online at www.dom.com/library/domcom/pdfs/electric-transmission/facility-connection-requirements.pdf.

presented at the TEAC meeting on June 9, 2011. Attachments I.B.3 and I.B.4 contain excerpts from PJM's 2011 Annual RTEP Report, Books 3 and 5, respectively. The Annual RTEP Report is a compilation of 5 books that includes system reinforcements approved by the PJM Board. Book 3 identifies Baseline Results and includes the proposed Rebuild Project at Idylwood Substation as a needed system reinforcement. Book 5 provides the results by state.

PJM subsequently accelerated the required target in-service date to 2015, and the PJM Board approved the Idylwood Substation Rebuild Project at a 2011 Board Meeting and authorized it as a PJM baseline upgrade (b1969). For temporary relief, the Company has increased the capacity of the existing 230 kV bus and replaced the tie breaker until the Idylwood Substation Rebuild Project is in service. Attachment I.B.5 contains the PJM slide identifying the Rebuild Project scope and target date change to May 2017 that was presented at PJM's Southern Subregional RTEP meeting on August 21, 2013. Attachment I.B.6 contains the PJM slide identifying the Rebuild Project scope and same target date change that was presented at PJM's TEAC meeting on September 12, 2013. As a result of the target date change, the Company planned to place a temporary bus reinforcement to increase the bus rating in service by summer 2016. This temporary reinforcement was accelerated and placed in service by summer 2015 to resolve deficiencies at Idylwood Substation, identified by PJM in 2014, as part of PJM's 2015 RPM analysis. Primarily to accommodate permitting activities, the in-service date of the Rebuild Project has been changed to spring 2020. Attachment I.B.7 contains the PJM slide identifying the Idylwood scope and the 2020 target date change that was presented at PJM's Southern Subregional RTEP meeting on July 26, 2016, while Attachment I.B.8 contains PJM's informational document posted to its website, relating to the target date change and cost increase.

These reliability violations, if not relieved, will impact service reliability to the citizens of the Commonwealth of Virginia. The Supreme Court of Virginia has affirmed the Commission's determination of need for new transmission facilities based on violations of NERC Reliability Standards identified through the PJM RTEP process.[5] For this reason, the transmission facilities and substation facilities are proposed to be rebuilt and rearranged as part of the Rebuild Project.

Assuming a Commission order approving the Rebuild Project is issued by June 30, 2017, the Rebuild Project in-service date is anticipated to be May 31, 2020. The Company's Special Exception approval, included as Attachment III.E.1, is currently set to expire automatically 30 months after the Special Exception approval date (May 12, 2015), in other words on October 12, 2017 unless the use has been established or construction has been commenced and been diligently prosecuted.

[5] *Piedmont Envtl. Council v. Va. Elec. & Power Co.*, 278 Va. 553, 684 S.E.2d 805 (Va. 2009).

ATTACHMENT I.B.1

Historical Loads (MW)

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Fairfax Zone - Summer	2989	3015	2853	3057	3283	3237	3166	3224	3132	3405
Growth (%)		0.8%	(5.4%)	7.2%	7.4%	(1.4%)	(2.2%)	1.8%	(2.9%)	8.7%
Date	8/8/2007	6/10/2008	8/10/2009	7/24/2010	7/22/2011	6/29/2012	7/18/2013	7/02/2014	6/23/2015	7/25/2016
Fairfax Zone - Winter	2505	2322	2635	2418	2649	2514	2574	2928	3060	2895
Growth (%)		(7.3%)	13.5%	(8.3%)	9.6%	(5.1%)	2.4%	13.7%	4.5%	(5.4%)
Date	2/06/2007	1/21/2008	1/16/2009	1/11/2010	12/15/2010	1/4/2012	1/23/2013	1/30/2014	2/20/2015	1/19/2016

Projected Loads (MW)*

	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
Fairfax Zone - Summer	3486	3578	3654	3700	3760	3830	3901	3983	4065	4142
Growth (%)	--	2.6%	2.1%	1.3%	1.6%	1.9%	1.9%	2.1%	2.1%	1.9%
Fairfax Zone - Winter	2593	2660	2712	2729	2747	2780	2816	2854	2888	2928
Growth (%)	--	2.6%	1.9%	0.6%	0.7%	1.2%	1.3%	1.4%	1.2%	1.4%

* PJM 2016 Load Forecast (includes losses)

Attachment I.B.2
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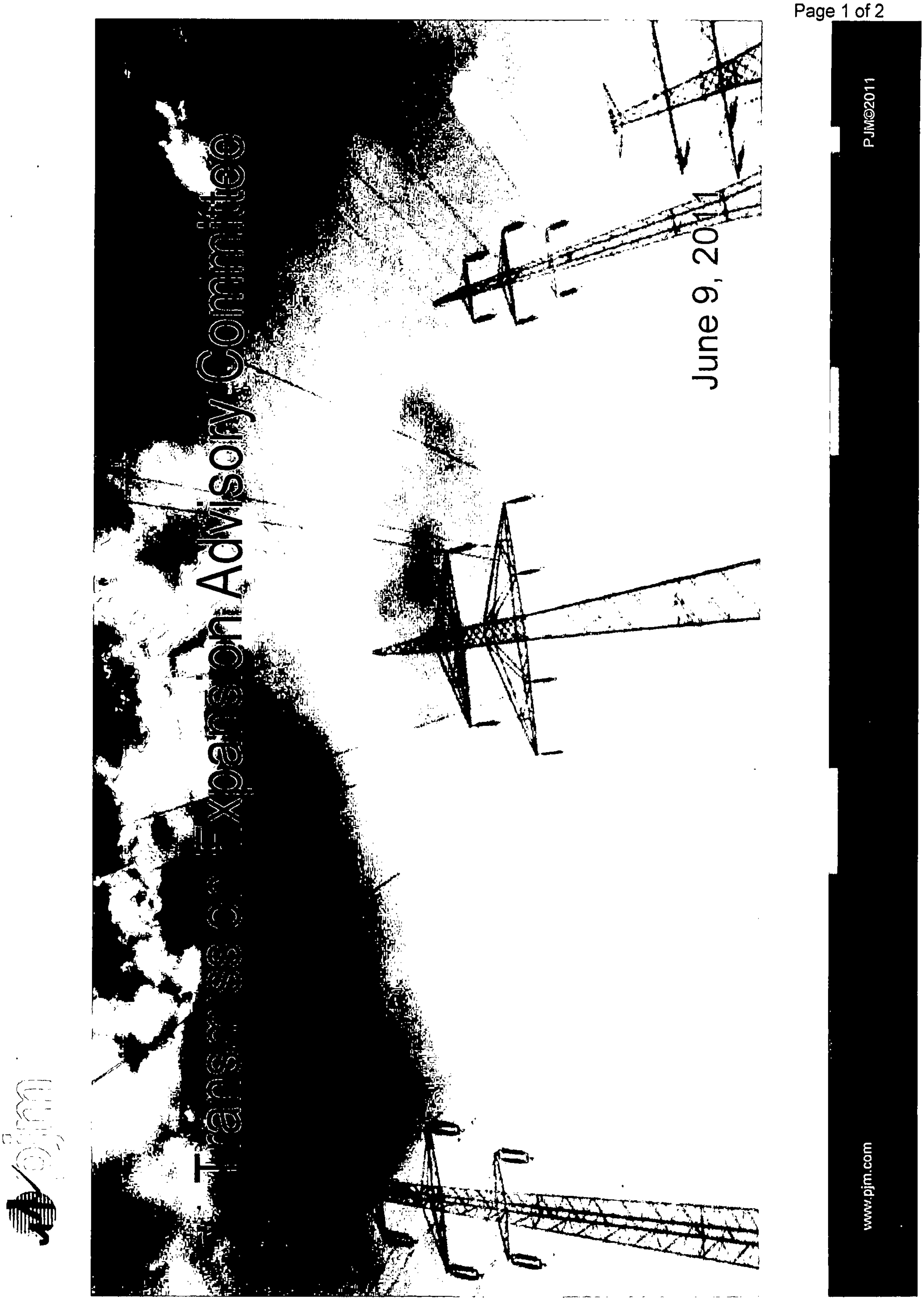
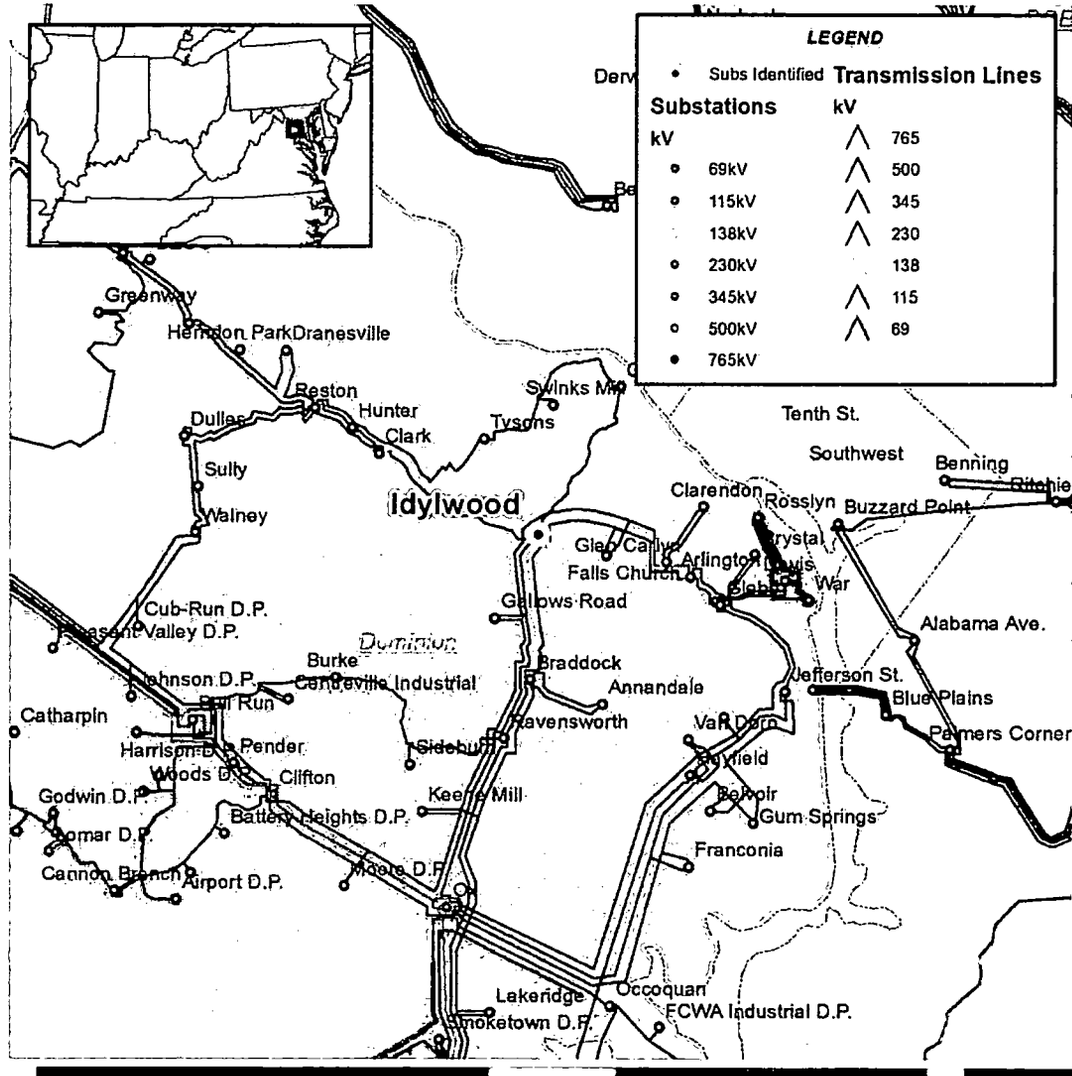


Dominion Transmission Zone

- Gen Deliv and Cat C Violations
- Overload on Idylwood 230 kV bus for the outage of line #2035 and various other 230 kV circuits in the area. Potential Solution(s):
  - Install a Breaker and a Half Scheme at Idylwood 230 kV
- Potential IS Date: May 2016



Book 3

Book 1
RTEP in Review

Book 2
Scope and Input Assumptions

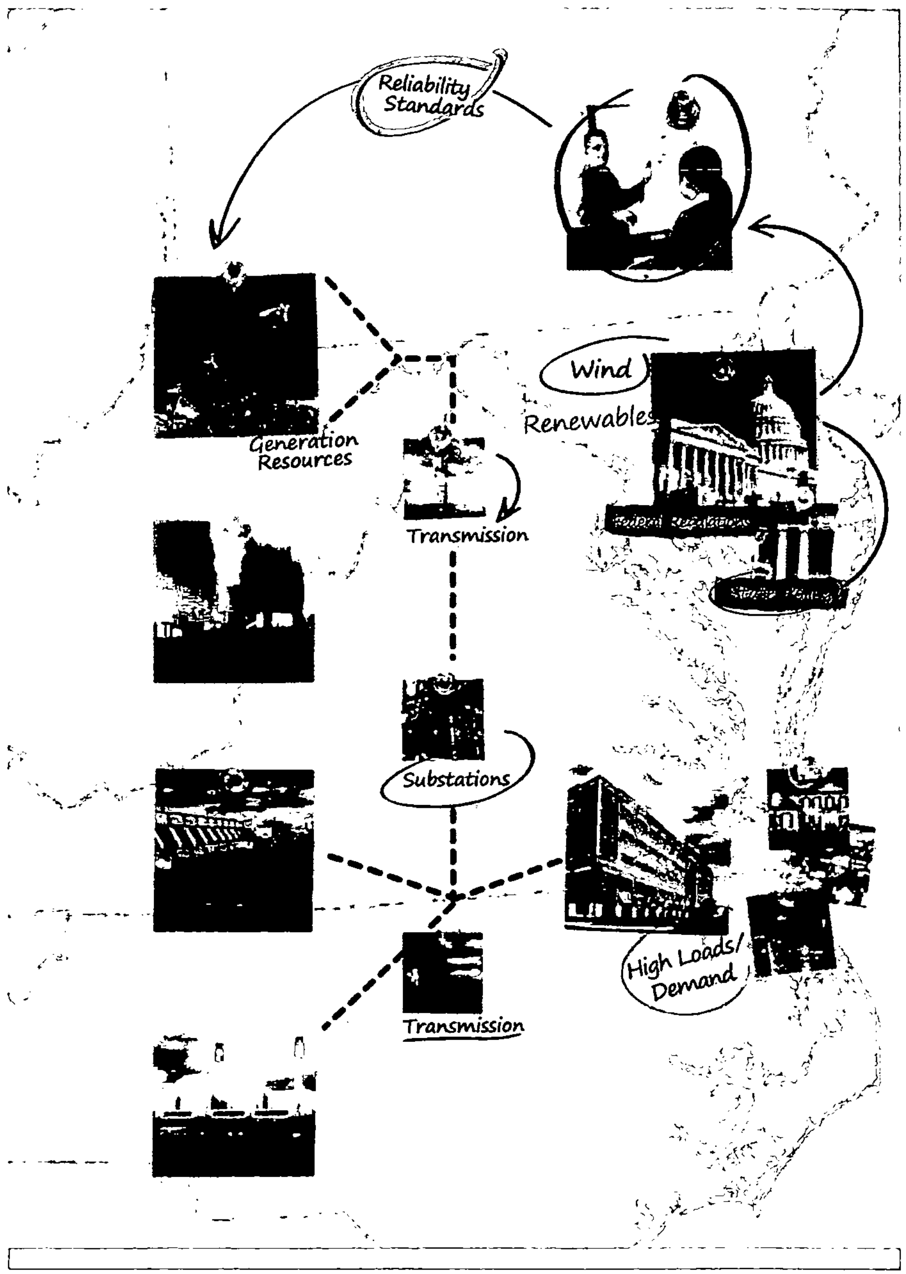
PJM 2011
Baseline Results

February 28, 2012

Book 4
Scenario Study Results

Book 5
State RTEP Summaries

pjm



Preface

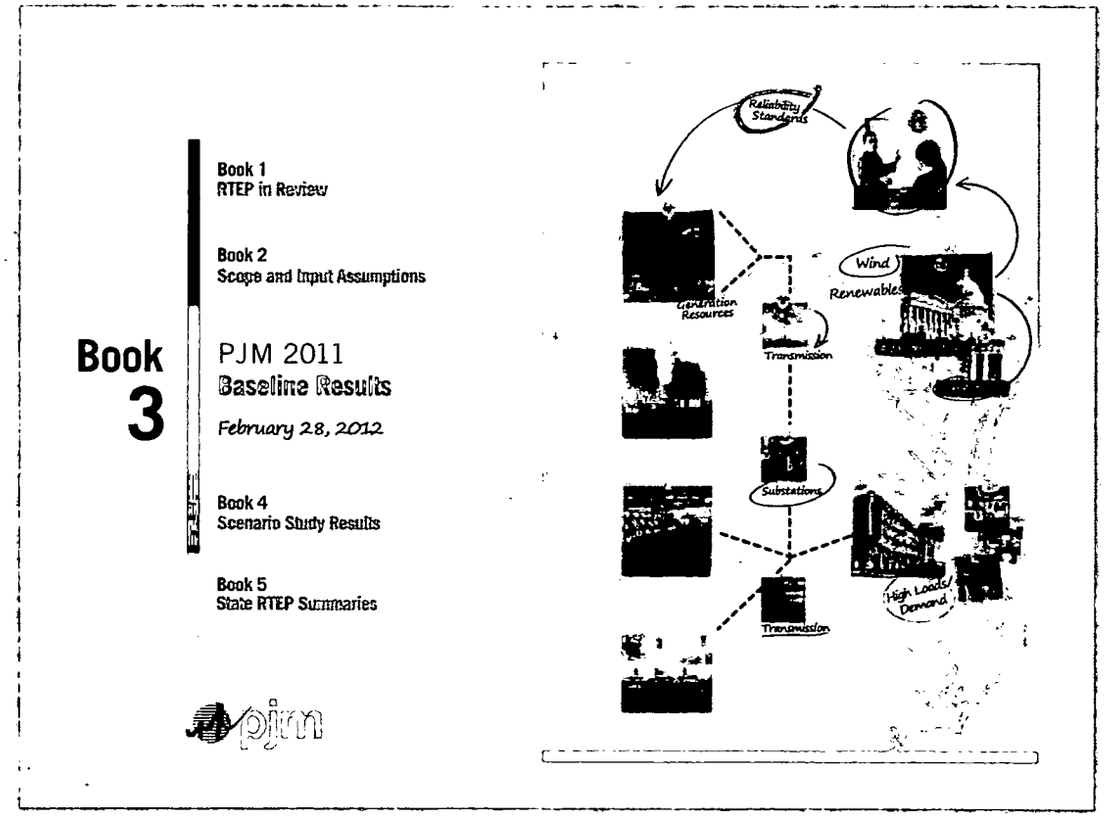
PJM DE DC IL IN KY MD MI NJ NC OH PA TN VA WV

This **Book 3**, 2011 Baseline Results, is the third in a series of five books that comprise PJM's 2011 Regional Transmission Expansion Plan (RTEP) Report:

- **Book 1:** RTEP in Review
- **Book 2:** Scope and Input Assumptions
- **Book 3:** Baseline Results
- **Book 4:** Scenario Study Results
- **Book 5:** State RTEP Summaries

Consistent with PJM stakeholder discussions throughout 2011 to expand and enhance the RTEP protocol, this series of books represents one element of the FYI (For Your Information) Process, providing a format which enables future communication of RTEP FYI Process assumptions and study results with greater detail and transparency.

Book 3 summarizes 2011 RTEP baseline reliability interregional and market efficiency results as part of this broader FYI Process in the context of PJM's expanded RTEP Protocol.



Documented RTEP Process Descriptions

In addition to the RTEP process description provided in **Book 1**, the reader is directed to a number of online resources, including those noted below, to pursue greater understanding of the RTEP process. Detailed information on the RTEP process itself can be found in the following resources, available on PJM's website:

- The M-14 series of PJM Manuals describe the specific business rules that govern the entire RTEP Process. Specifically, Manual 14B addresses the details associated with methodologies associated with the planning studies and the upgrades derived from them as discussed in this report. PJM Manual 14B, "Regional Planning Process" can be found via the following URL link: http://www.pjm.com/~/media/documents/manuals/m14b.ashx.

- The PJM Operating Agreement, Schedule 6, codifies the overall provisions under which PJM executes its Regional Transmission Expansion Planning Protocol, more familiarly known (and used throughout this document) as the "PJM RTEP Process." The PJM Operating Agreement can be found on PJM's website via the following URL link: http://www.pjm.com/documents/agreements/~/media/documents/agreements/oa.ashx.

- The PJM Open Access Transmission Tariff (OATT) describes the interconnection request process for generating resource interconnection, merchant transmission interconnection as well as specific process provisions to address long-term firm transmission service and Auction Revenue Rights. The PJM OATT can be found via the following URL link: http://www.pjm.com/documents/agreements/~/media/documents/agreements/tariff.ashx.

Communicating Baseline Analysis Results

Activities of the TEAC and Sub-regional RTEP Committees will continue to provide the primary forums for the ongoing exchange of ideas including discussion of baseline reliability and market efficiency study input assumptions. In particular, PJM stakeholders are encouraged to participate in the ongoing activities of the PJM Transmission Expansion Advisory Committee (TEAC). This forum provides opportunity for stakeholder participation and advice throughout the RTEP process and for remaining apprised of all evolving aspects of PJM's RTEP – plans and process alike.

- PJM TEAC materials can be accessed online from PJM's website via the following URL link: http://www.pjm.com/committees-and-groups/committees/teac.aspx.

- PJM RTEP Baseline Assessment reports can also be accessed online from PJM's website via the following URL link: http://www.pjm.com/planning/rtep-development/baseline-reports.aspx.

Sub-regional Review

Each Sub-Regional RTEP Committee increases the opportunity for direct stakeholder participation in the planning process from initial assumption setting stages through review of the planning analyses, violations, and alternative transmission expansions. The Sub-Regional RTEP Committee provides a more local forum for gathering and considering planning issues. Interested parties can access Sub-regional RTEP Committee planning process information from PJM's website via the following URL links:

- PJM Mid-Atlantic Sub-Regional RTEP Committee: http://www.pjm.com/committees-and-groups/committees/srrtep-ma.aspx.

- PJM Western Sub-Regional RTEP Committee: http://www.pjm.com/committees-and-groups/committees/ssrtep-w.aspx.

- PJM Southern Sub-Regional RTEP Committee: http://www.pjm.com/committees-and-groups/committees/ssrtep-s.aspx.

Through the activities of these committees, all PJM stakeholders have a forum to raise issues, propose solutions or alternatives and conduct other related discussions. These meetings are open to all stakeholders interested in the issues under consideration.

2.2.3 – PJM Southern Sub Region – 2016

PJM operates the bulk electric system (BES) transmission facilities (and others monitored at lower voltage levels) throughout the Southern Sub-Region footprint shown in **Map 3.14**, including those of Dominion Virginia Power (Dominion) which operates in Virginia and Northeastern North Carolina.

The electricity needs of Virginia area are supplied not only by local generation, but also by energy transfers across the interstate transmission systems of northern West Virginia, northern Virginia, Maryland, eastern Ohio and central-southwestern Pennsylvania. This dependence on bulk power transfers from western sources has been growing steadily since the integration of western and southern markets into PJM.

Upgrades listed in **Table 3.10** and shown in **Map 3.14** have an estimated cost of $5 million or more approved by PJM's Board in 2011 to eliminate NERC reliability criteria violations. 2016 RTEP analysis did not include the Mid-Atlantic Power Path (MAPP) and Potomac Appalacian Transmission Highline (PATH) lines.

Map 3.14: PJM Southern Sub-Region Transmission Upgrades

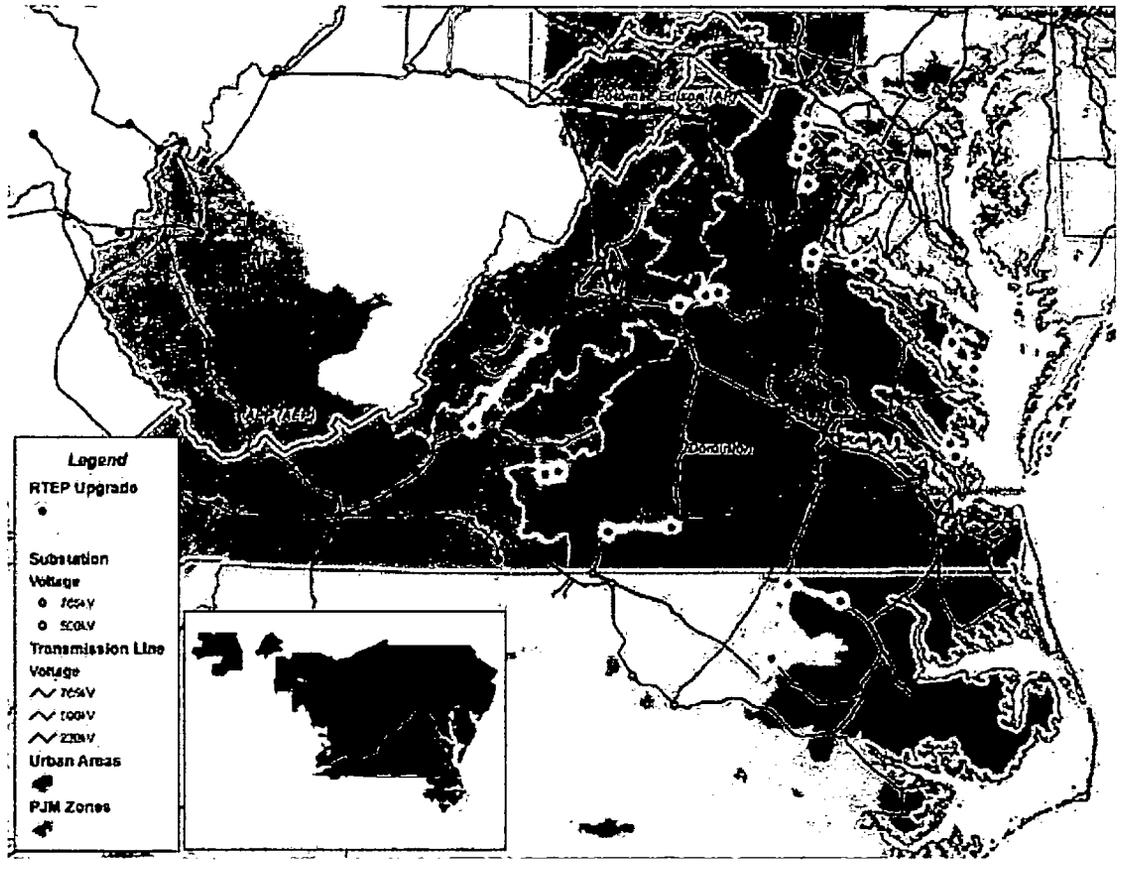


Table 3.10: PJM Southern Sub-Region Transmission Upgrades

		System Upgrade Drivers												
		Baseline Upgrades					Network Upgrades			Supplemental Upgrade				
	Upgrade	Baseline Load Growth / Deliverability & Reliability	Congestion Relief - Economic	Operational Performance	Generator Deactivation	TO Criteria Violation	Generation Interconnection	Merchant Transmission Interconnection	Long-term Firm Transmission Service	Criteria Compliance other than for Baseline	Date	Cost (M)	TO Zone(s)	2011 TEAC Review
1	Re-tension 15 miles of the Garner - Lancaster line for a new summer rating of 216 MVA					▲					June 2013	5.8	Dominion	3/3/2011
2	Build a new 230 kV line from Yorktown to Hayes	▲									June 2012	74	Dominion	3/3/2011
3	Loop the 2054 line (Charlottsville - Gordonville) in and out of Hollymeade and place a 230 kV breaker at Hollymeade					▲					June 2014	41	Dominion	3/3/2011
4	Resag line from Chesterfield - Shockoe to 125C and replace line switch 1,799 with 1,200 amp switch	▲									June 2014	8.9	Dominion	3/3/2011
5	Build Cannon Branch to Cloverhill to Liberty 230 kV line	▲									May 2018	44	Dominion	8/19/2011
6	Rebuild Loudoun - Brambleton 500 kV line	▲									May 2016	40	Dominion	6/9/2011
7	Install a breaker and a half scheme with a minimum of eight 230 kV breakers for five existing lines at Idylwood 230 kV	▲									May 2016	12	Dominion	6/9/2011
8	Build a 2nd Clark - Idylwood 230 kV line and install 230 kV gas-hybrid breakers at Clark	▲									May 2016	20	Dominion	6/9/2011
9	Install a 2nd 500/230 kV transformer at Brambleton	▲									May 2016	14	Dominion	6/9/2011
10	Reconductor Fredericksburg - Cranes Corner 230 kV line	▲									May 2016	5.5	Dominion	6/9/2011
11	Rebuild Line #11 section between Gordonsville and Somerset	▲									June 2016	5.25	Dominion	10/28/2011
12	Rebuild line #33 Halifax - Chase City and install 230 kV 4 breaker ring bus	▲									June 2016	26	Dominion	10/28/2011
13	Rebuild Line #22 and replace two pole H frame construction	▲									June 2016	25	Dominion	10/28/2011
14	Split 230 kV Line #2056 (Hornertown - Rocky Mount) and double tap line to Battleboro Substation. Expand the station, install a 230 kV 3 breaker ring bus, and install a 230/115 kV transformer	▲									June 2016	8	Dominion	10/28/2011
15	Reconductor segment of Line #54 (Carolina to Woodland 115 kV) to a minimum of 300 MVA	▲									June 2016	18	Dominion	10/28/2011

Table 3.10: PJM Southern Sub-Region Transmission Upgrades (continued)

		System Upgrade Drivers												
		Baseline Upgrades					Network Upgrades			Supplemental Upgrade				
	Upgrade	Baseline Load Growth / Deliverability & Reliability	Congestion Relief - Economic	Operational Performance	Generator Deactivation	TO Criteria Violation	Generation Interconnection	Merchant Transmission Interconnection	Long-term Firm Transmission Service	Criteria Compliance other than for Baseline	Date	Cost (M)	TO Zone(s)	2011 TEAC Review
16	Rebuild the Dominion owned section of Cloverdale - Lexington 500 kV line	▲									March 2014	18	Dominion	11/3/2011
17	Build a 450 MVAR SVC and 300 MVAR switched shunt at Loudoun 500 kV	▲									June 2014	70	Dominion	11/3/2011
18	Build 150 MVAR Switched Shunt at Pleasant View 500 kV	▲									June 2014	6	Dominion	11/3/2011
19	Establish new transmission delivery point at NSF Dahlgren and split existing 230 kV line in the vicinity of Arnolds Corner and loop the 230 kV line in and out of the Dahlgren site									▲	June 2020	30.9	Dominion	10/28/2011

Book 1
RTEP in Review

Book 2
Scope and Input Assumptions

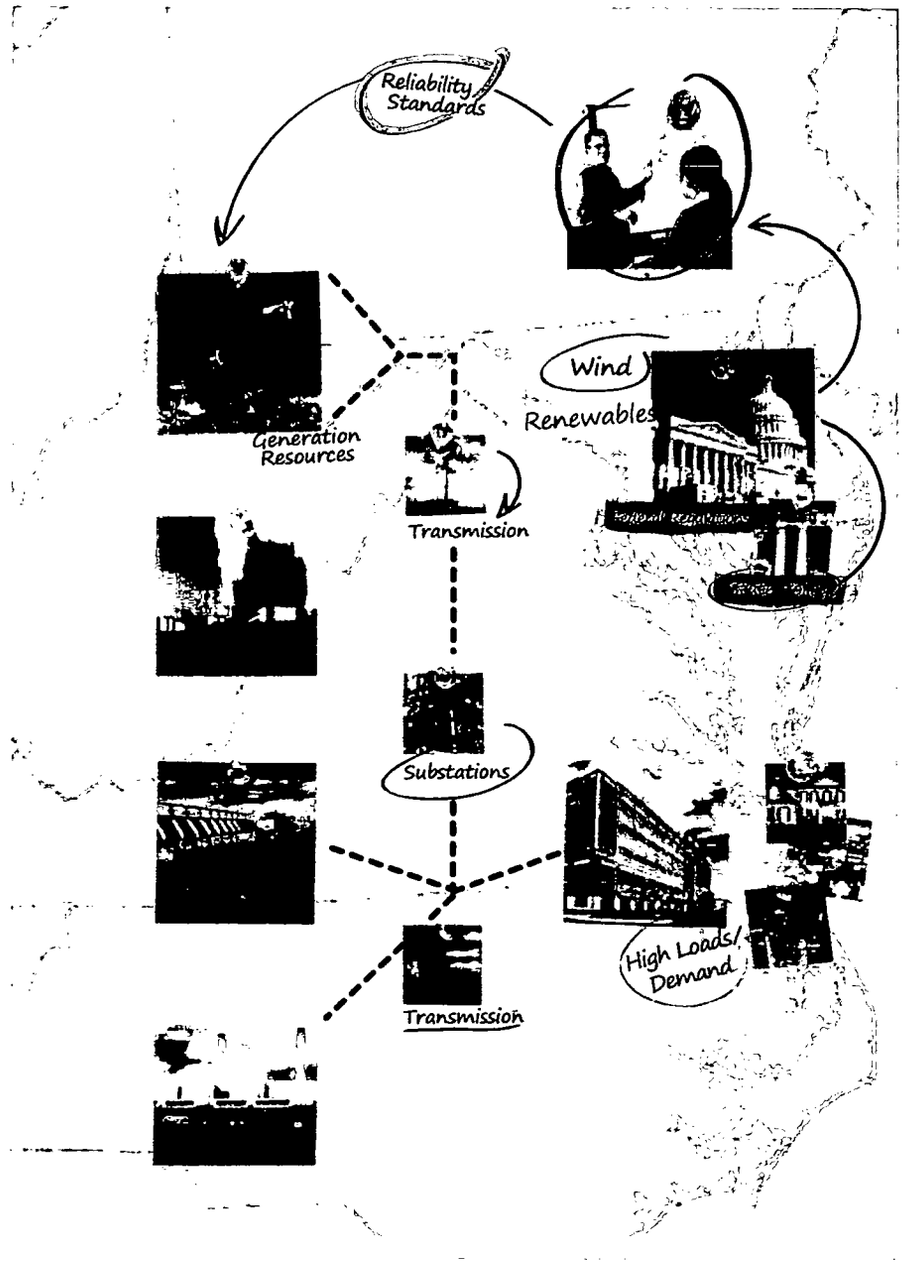
Book 3
Baseline Results

Book 4
Scenario Study Results

Book 5

PJM 2011
Map RTEP Summaries

February 28, 2012



Preface

PJM | DE | IL | IN | KY | MD | MI | NJ | NC | OH | PA | TN | VA | WV

This **Book 5**, 2011 For Your Information (FYI) Process Scenario Study Results, is the fifth in a series of five books that comprise PJM's 2011 Regional Transmission Expansion Plan (RTEP) Report:

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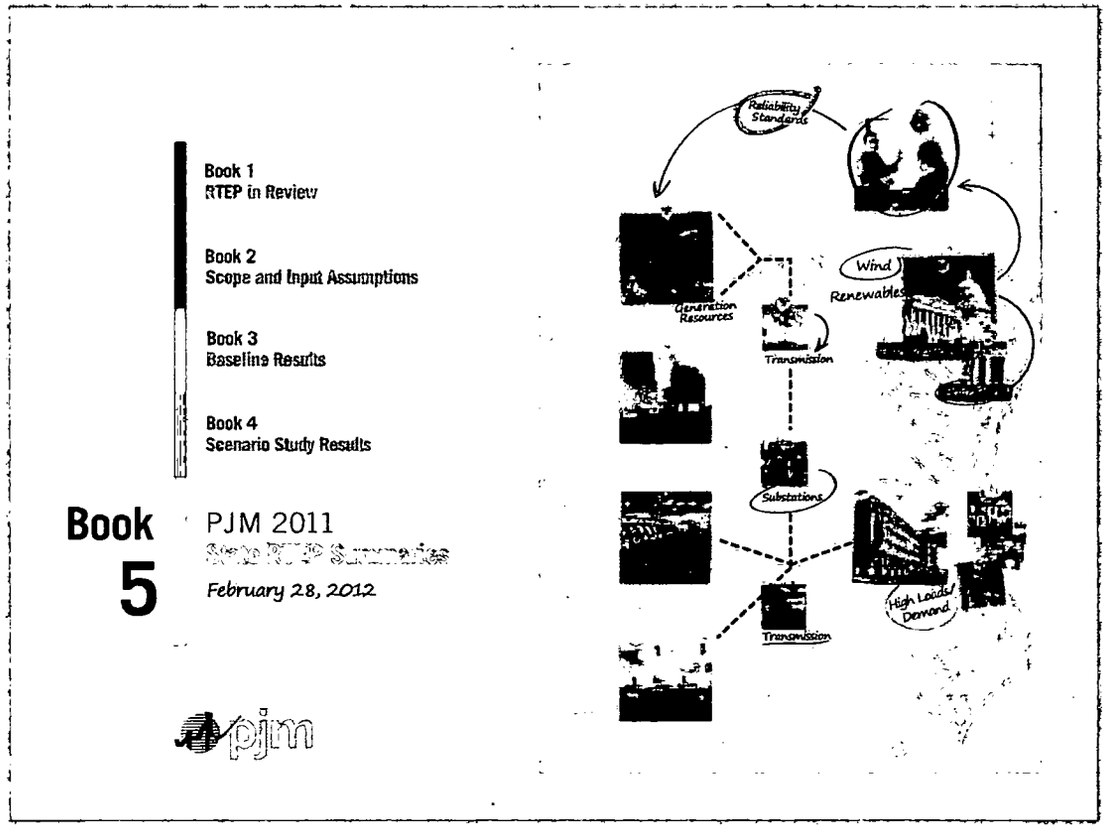
Consistent with PJM stakeholder discussions throughout 2011 to expand the RTEP protocol, this series of books provides a format which enables future communication of RTEP FYI Process assumptions and study results with greater detail and transparency.

Book 5 summarizes FYI Process input assumptions and results from baseline, market efficiency and scenario studies for each state within PJM's footprint. These state summaries are presented in this book as part of the broader FYI Process in the context of PJM's expanded RTEP Protocol.

PJM's FYI Process provides the foundation for an expanded RTEP decision-making framework that permits consideration of analyses and results that go beyond the existing reliability and market efficiency triggers driving transmission expansion upgrades today.



As described in **Book 1**, PJM has already begun the transition to the FYI Process. Doing so will allow PJM to perform additional studies and results – such as those arising from scenario studies of public policy impacts - that inform stakeholder business decisions and facilitate Board decisions to approve transmission plans that enhance reliability, enhance market efficiency and enable implementation of federal and state public policy.

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- PJM Southern Sub-Regional RTEP Committee: http://www.pjm.com/committees-and-groups/committees/ssrtep-s.aspx.

Through the activities of these committees, all PJM stakeholders have a forum to raise issues, propose solutions or alternatives and conduct other related discussions. These meetings are open to all stakeholders interested in the issues under consideration.

Section 13: Virginia

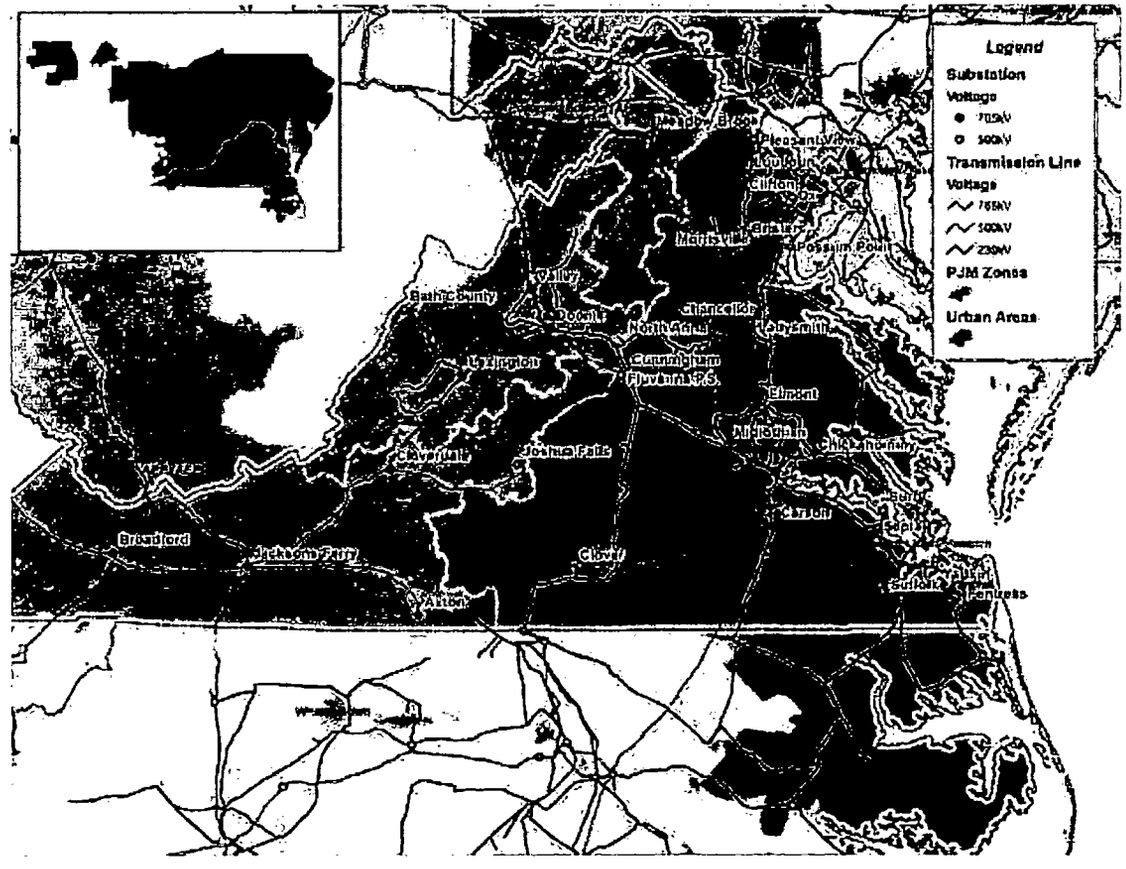
VA

13.0: Virginia RTEP Overview

PJM operates bulk electric system (BES) transmission facilities (and others monitored at lower voltages), in Virginia as shown on **Map 5.59**, including those of Allegheny Power (AP), American Electric Power (AEP) and Dominion Virginia Power (DOM).

The transmission system in Virginia delivers power to customers from native generation resources and power transfers across tie-line facilities with the rest of the PJM and other adjoining systems to the west and south.

Map 5.59: PJM Service Area in Virginia



Critical Regional Transmission Expansion Plan (RTEP) Issues and Upgrades

PJM's annual RTEP process assesses transmission facilities in Virginia for compliance with NERC reliability criteria violations. In order to solve identified violations, PJM determines necessary baseline upgrades as well as network upgrades, necessary for the interconnection of new generation and merchant transmission facilities.

A number of factors, collectively and progressively continue to reduce system reliability in northern Virginia, as well as Baltimore and the District of Columbia:

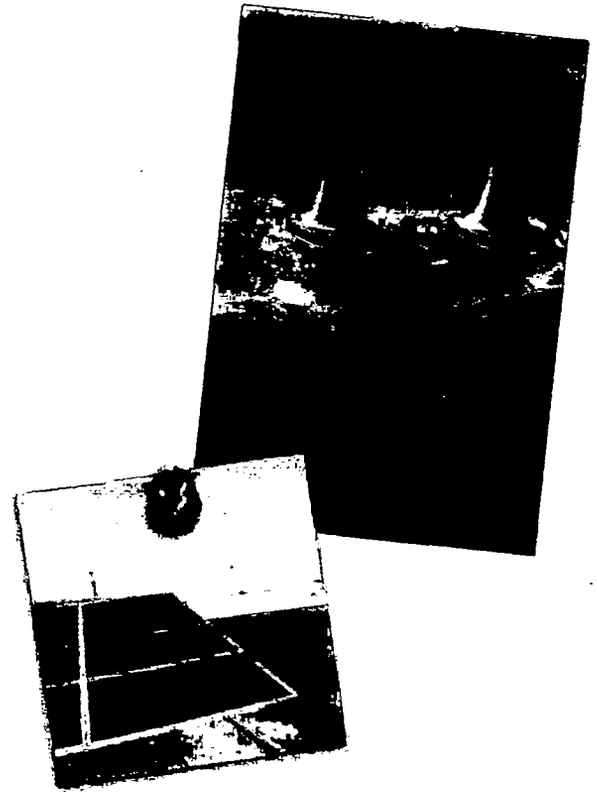
- Load growth
- Deactivation/retirement of generation resources
- Sluggish development of new generating facilities
- Continued reliance on transmission to resolve NERC reliability criteria violations and to obtain access to more economical sources of power west and south

Neither Virginia nor any other state within the PJM footprint, acts in isolation. Understanding system conditions throughout PJM – in particular those of the southern and Mid-Atlantic areas of PJM – is key to understanding impacts on Virginia customers. Thus, while this report provides summaries on a state-by-state basis, RTEP analysis is based on the aggregate requirements of the entire PJM system.

A topical index at the end of this book provides cross-references to RTEP results, issues and challenges discussed throughout the five books of this 2011 RTEP report.

13.0.1 – State Policy Perspectives

Originally a regulated cost of service state, Virginia re-regulated its retail electricity market in 2007. A hybrid form was created which includes incentive rates and a RTO requirement. The Virginia State Corporation Commission (SCC) implements laws and related regulations over jurisdictional utilities. The SCC is also responsible for the Certificate of Public Convenience and Necessity process for establishing need and siting for new transmission and generation projects.



VA

13.7: Transmission Expansion Plans in Virginia

Table 5.116 summarizes new RTEP planned transmission upgrades greater than $5 million in Virginia as approved by the PJM Board during 2011. **Map 5.64** shows the location of upgrades enumerated in **Table 5.114**.

A complete listing and status of all system reinforcements approved by the PJM Board can be found on PJM's website via the following URL: http://www.pjm.com/planning/rtep-upgrades-status.aspx.

Aging Infrastructure – Mt. Storm – Doubs 500 kV Rebuild

Mitigating operational risk is driving the need to rebuild the existing Mt. Storm - Doubs 500 kV line, in-service since 1966. Aging towers and other structural degradation make consideration of this rebuild a priority. Over the course of the past 45 years, despite ongoing maintenance efforts, tower structures, foundations and conductor hardware have deteriorated to the point where the line is approaching its end-of-life and is at risk of major failure. Rebuilding the line will improve regional reliability and reduce congestion along a major corridor that feeds power to northern Virginia and PJM's Mid-Atlantic region.

The Mt. Storm to Doubs 500 kV line has been a limiting element and, consequently, a major driver of system reinforcements since PJM's 2006 RTEP cycle. The TrAIL project itself was added to the RTEP in 2006 primarily the result of overloads on the Mt. Storm to Doubs line. The PATH line was added to PJM's RTEP as part of 2007 RTEP analysis to address further overloads on the line. Even with the TrAIL and PATH lines included, long-term planning studies conducted as part of the 2010 RTEP indicated line loading levels exceeding 95 percent of the applicable rating by 2025. The 2011 RTEP showed that the PATH line would not be required in the near future. However, recognizing the continuing need to upgrade the Mt. Storm-Doubts line, the 2011 RTEP included a rebuild of this line. Going forward, within its existing 150 foot right-of-way, the rebuilt line will utilize taller structures and line hardware increasing its existing 2,598 MVA rating by 65 percent to 4,300 MVA.

TrAIL Project

A new 500-kilovolt (kV) electric transmission line, the Trans Allegheny Interstate Line (TrAIL), was placed in service in May 2011 and will improve grid reliability by enabling more power to be delivered to high congestion areas such as Washington, D.C., Baltimore and northern Virginia.

The 220-mile TrAIL line was built by and is jointly owned by Allegheny Energy (now FirstEnergy) and Dominion. This project is the first high-voltage backbone transmission line approved by the PJM Interconnection Board through the PJM planning process to go into service. PJM first identified the need for the line in 2006 when planning studies showed potential reliability violations were likely to develop by the Summer of 2011.

The TrAIL line was built in three segments, connecting substations in southwestern Pennsylvania, northern West Virginia and northern Virginia.

Additional information is available from PJM's website via the following URL link: http://pjm.com/planning/rtep-upgrades-status/backbone-status.aspx.

Carson - Suffolk 500 kV Line

Likewise, the Carson - Suffolk line was placed in service on June 1, 2011. This line was specified by PJM to solve identified NERC reliability criteria violations.

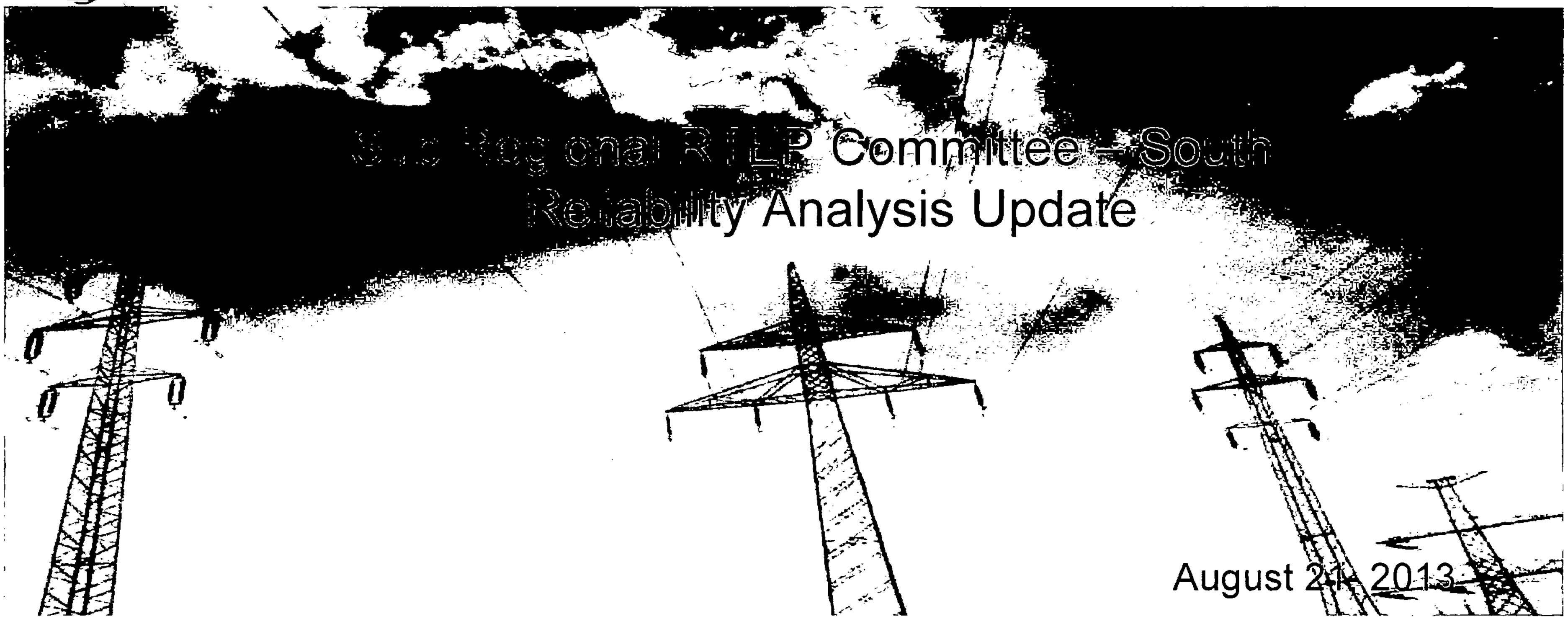
Additional information is available from PJM's website via the following URL link: http://pjm.com/planning/rtep-upgrades-status/backbone-status.aspx.

Table 5.114: Major 2011 RTEP Plans in Virginia

		System Upgrade Drivers												
		Baseline Upgrades					Network Upgrades			Supplemental Upgrade				
	Upgrade	Baseline Load Growth / Deliverability & Reliability	Congestion Relief - Economic	Operational Performance	Generator Deactivation	TO Criteria Violation	Generation Interconnection	Merchant Transmission Interconnection	Long-term Firm Transmission Service	Criteria Compliance other than for Baseline	Date	Cost (M)	TO Zone(s)	2011 TEAC Review
1	Re-tension 15 miles of the Garner - Lancaster line for a new summer rating of 216 MVA					▲					June 2013	5.8	Dominion	3/3/2011
2	Build a new 230 kV line from Yorktown to Hayes	▲									June 2012	74	Dominion	3/3/2011
3	Loop the 2054 line in and out of Hollymeade and place a 230 kV breaker at Hollymeade					▲					June 2014	41	Dominion	3/3/2011
4	Resag line from Chesterfield - Shockoe to 125C and replace line switch 1799 with 1200 amp switch	▲									June 2014	8.9	Dominion	3/3/2011
5	Build Cannon Branch to Cloverhill to Liberty 230 kV line	▲									May 2018	44	Dominion	8/19/2011
6	Rebuild Loudoun - Brambleton 500 kV line	▲									May 2016	40	Dominion	6/9/2011
7	Install a breaker and a half scheme with a minimum of eight 230 kV breakers for five existing lines at Idylwood 230 kV	▲									May 2016	12	Dominion	6/9/2011
8	Build a 2nd Clark - Idylwood 230 kV line and install 230 kV gas-hybrid breakers at Clark	▲									May 2016	20	Dominion	6/9/2011
9	Install a 2nd 500/230 kV transformer at Brambleton	▲									May 2016	14	Dominion	6/9/2011
10	Reconductor Fredericksburg - Cranes Corner 230 kV line	▲									May 2016	5.5	Dominion	6/9/2011
11	Rebuild Line #11 section between Gordonsville and Somerset	▲									June 2016	5.25	Dominion	10/28/2011
12	Rebuild line #33 Halifax - Chase City and install 230 kV 4 breaker ring bus	▲									June 2016	26	Dominion	10/28/2011
13	Rebuild the Dominion owned section of Cloverdale - Lexington 500 kV line	▲									March 2014	18	Dominion	11/3/2011
14	Build a 450 MVAR SVC and 300 MVAR switched shunt at Loudoun 500 kV	▲									June 2014	70	Dominion	11/3/2011
15	Build 150 MVAR Switched Shunt at Pleasant View 500 kV	▲									June 2014	6	Dominion	11/3/2011
16	Perform sag study on Altavista - Leesville 138 kV line	▲									September 2010	7.52	Dominion	9/8/2011

Table 5.114: Major 2011 RTEP Plans in Virginia (Continued)

		System Upgrade Drivers												
		Baseline Upgrades					Network Upgrades			Supplemental Upgrade				
	Upgrade	Baseline Load Growth / Deliverability & Reliability	Congestion Relief - Economic	Operational Performance	Generator Deactivation	TO Criteria Violation	Generation Interconnection	Merchant Transmission Interconnection	Long-term Firm Transmission Service	Criteria Compliance other than for Baseline	Date	Cost (M)	TO Zone(s)	2011 TEAC Review
17	Install a 765/500 kV transformer at Cloverdale	▲									March 2014	65	AEP	11/3/2011
18	Install a new 765/138 kV transformer at Jackson Ferry substation	▲									June 2015	40	AEP	9/19/2011
19	Install four 138 kV breakers in Danville area	▲									June 2015	5	AEP	9/19/2011
20	Establish new transmission delivery point at NSF Dahlgren and split existing 230 kV line in the vicinity of Arnolds Corner and loop the 230 kV line in and out of the Dahlgren site									▲	June 2020	30.9	Dominion	10/28/2011



PJM Subregional RTEP – South
8/21/2013

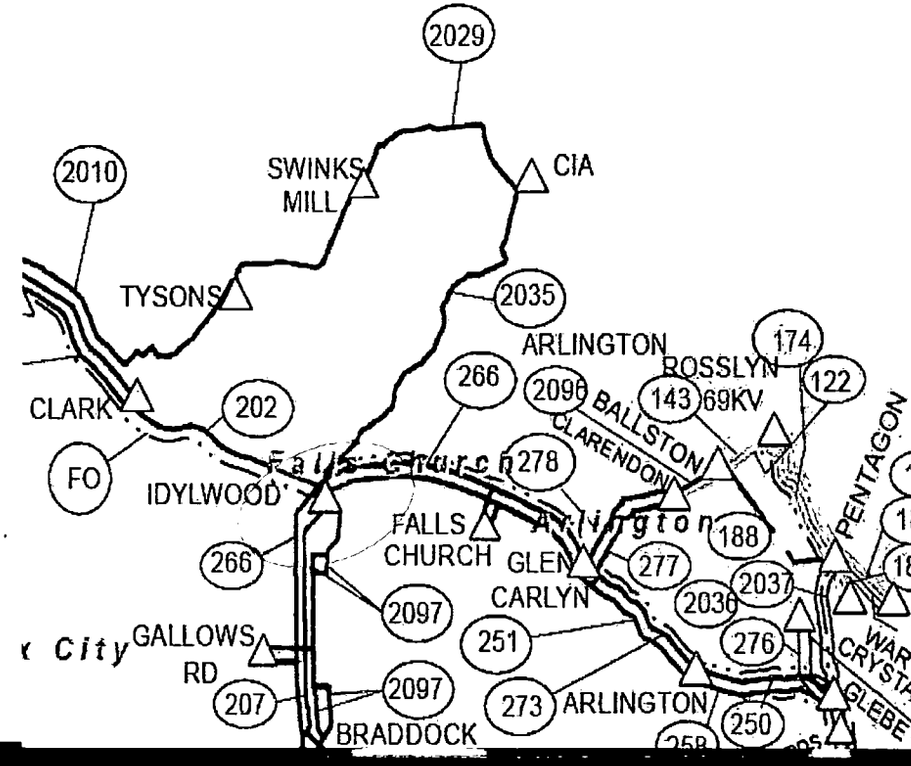
1

PJM©2013

Summer 2017 Reliability

Region with thermal issues

- **NERC Category B & C Violations – Date and Scope Change**
- Project #b1696 IS Date Change
- Problem: The 2016 summer base case indicates the following deficiencies:
  - An outage of Line #2035 (Idylwood – CIA) overloads Idylwood 230 kV Bus by 7.1%
  - An outage of Line #215(Possum Pt to Hayfield) overloads Idylwood 230 kV Bus by 1.2%
  - An outage of Line #241(Hayfield – Jefferson St) overloads Idylwood 230 kV Bus by 1.1%
  - Outage of Tower Line 248&2023 overload Idylwood Bus by 30.5%
  - Operational performance issues with straight bus
- Potential Solution(s)
  - Install a Breaker and Half Scheme
- New Potential IS Date May 2017
- Cost increase from $35M to $55 due to required use of GIS equipment



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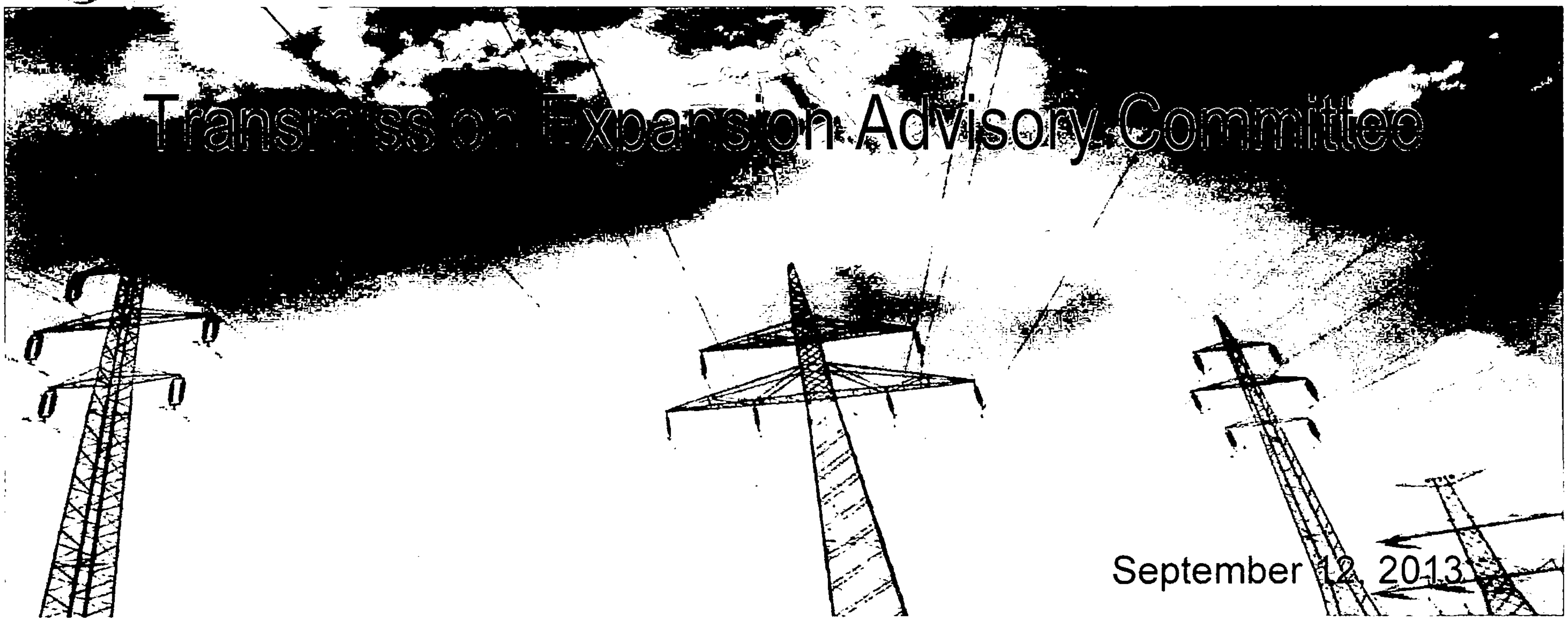
Transmission Expansion Advisory Committee



September 12, 2013

PJM TEAC 9/12/2013 1 PJM©2013

Summer 2017 Reliability

Region with thermal issues

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  - An outage of Line #2035 (Idylwood – CIA) overloads Idylwood 230 kV Bus by 7.1%
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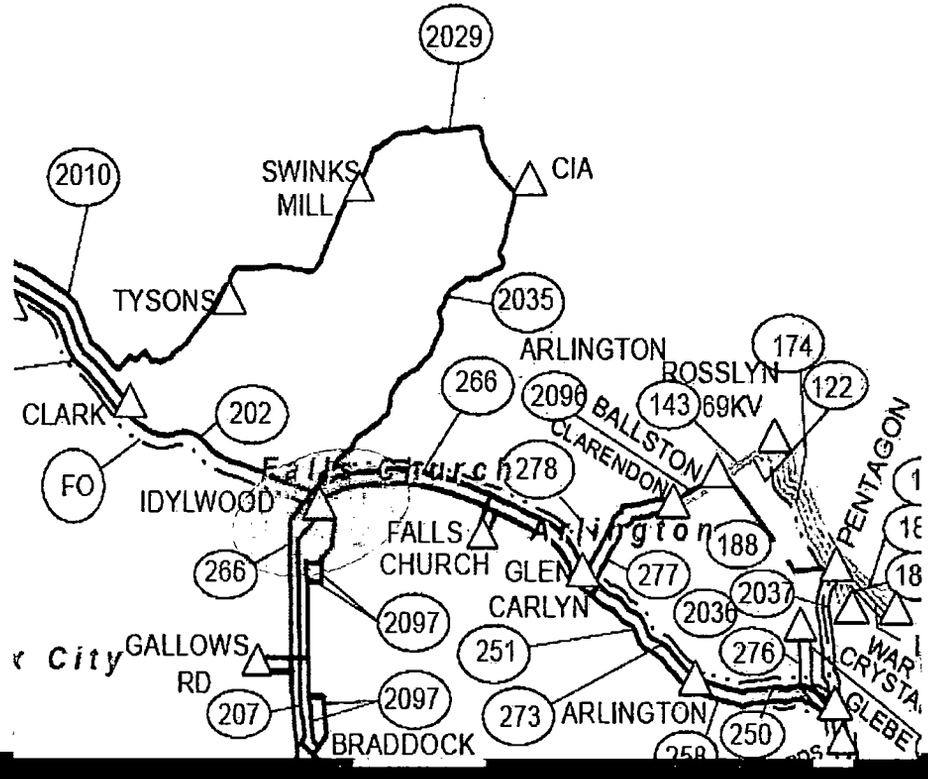


Sub-Regional RTEP Committee PJM South

SRRTEP - South
July 26, 2016

B1696 Cost Increase and Scope Addition

Problem: N-1 and N-1-1 Thermal Violations

- For various contingencies, the Idylwood 230kV bus is overloaded

Proposed Solution

- Install a Breaker and Half Scheme at Idylwood

Reason for cost increase:

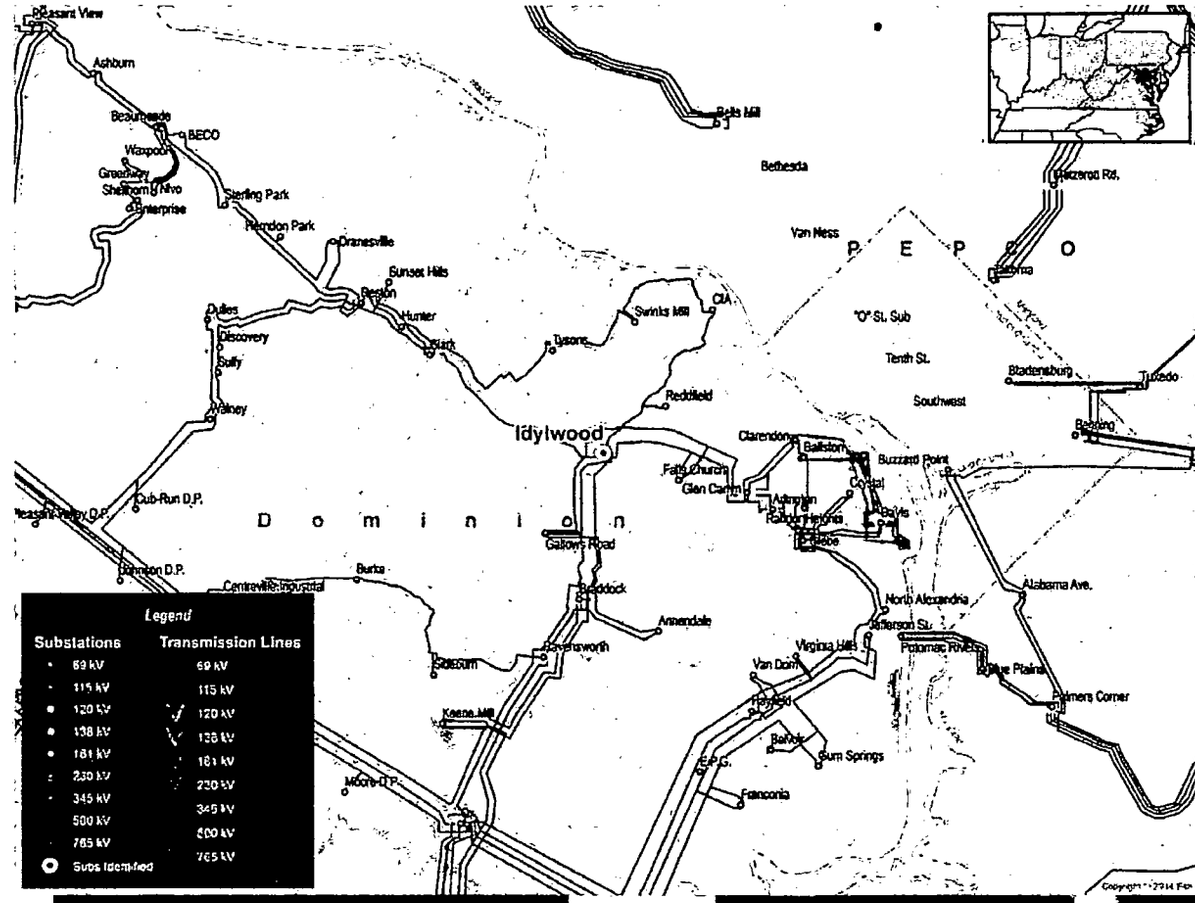
- Detailed cost estimate included additional cost due to GIS breakers, security wall, transmission structures, labor, and permitting.

Previous Cost Estimate: $55 M

Revised Cost Estimate: $80 M

Projected IS Date: 02/01/2020

Dominion Transmission Area



Sub-Regional RTEP Committee
PJM South July 26, 2016
Questions submitted by PJM Stakeholders

1) Slide 2 – B1696
   a) What other alternatives were considered beside the currently proposed installation of a breaker and half scheme at Idylwood? Provide cost and performance details for each alternative considered.

      Answer:
      This project was initially presented at the June 9, 2011 TEAC meeting as a conversion from the existing straight-bus arrangement to a conventional (i.e. "air insulated") breaker-and-a-half arrangement with a potential in-service target date of May 2016. The use of a "GIS" breaker-and-a-half arrangement, with a projected cost of $55M and a revised potential in-service target date of May 2017, was presented and discussed at the August 21, 2013 Southern Sub-Regional RTEP meeting and subsequently presented at the September 12, 2013 TEAC meeting. Idylwood is located at the intersection of two major transmission corridors and is an electrical transmission hub and major distribution substation. As an electrical transmission hub, Idylwood Substation is presently the terminus for five 230kV transmission lines and is a key component to supplying the energy required to keep up with the growth in Northern Virginia. As a major distribution substation, Idylwood presently has one 168 MVA and two 84 MVA, 230-34.5kV transformers, and fourteen 34.5kV distribution circuits that directly supply power to more than 22,300 local Fairfax County residents and businesses in communities that include Merrifield, southern Tysons Corner, and the cities of Falls Church and Fairfax. Rebuilding the 230kV bus using GIS equipment will resolve the identified NERC criteria violations and serve to maximize the utilization of space at Idylwood Substation, ensuring that it will continue to support the regional growth while minimizing impact to the surrounding communities. For these reasons, no other alternatives were considered.

   b) What is the breakdown of the cost increase for this project by component listed in the 'Reason for cost increase' section?

      Answer:
      At the July 26, 2016 Southern Sub-Regional RTEP meeting, the projected cost estimate increased from $55M to $80M and the projected in-service target date was revised to February 2020. A breakdown of the $25M cost increase is as follows:
      $7.6M – increased labor rate and number of hours estimated
      $6.0M – increase number of GIS breakers from 15 to 18 to include highside breaker at each distribution transformer
      $0.5M – replace 230kV capbank

$1.6M – due to outage restrictions requiring 230kV temp bus modifications and addition of 2 SF_6 breakers as part of temporary (3 year) feed to existing distribution transformers
$0.7M – due to revised system protection standards $0.5M – increase in grading and clearing
$0.5M – construction fence (sound fence)
$1.1M – contract civil engr/permitting and sound studies
$0.2M – project management and field supervision
$5.8M – transmission line work
$24.5M = TOTAL of above (rounded to $25M)

c) Can the original bus just be replaced to mitigate the thermal violations?

Answer:
No. The breaker-and-a-half arrangement was proposed to resolve the identified NERC violations and operational performance issues associated with the straight-bus. It should be noted that the breaker-and-a-half arrangement was also proposed in anticipation of the need to terminate either a future 2nd Clark-Idylwood 230kV line or an Idylwood-Spring Hill 230kV line, as identified and presented at the June 9, 2011 TEAC meeting. The driver for the 2nd Clark-Idylwood 230kV line was subsequently mitigated and the cancellation of that project was discussed at the August 21, 2013 Southern Sub-Regional RTEP meeting. However, at that same meeting, the need for a new Idylwood-Scott's Run 230kV line was presented and discussed. The Idylwood – Scott's Run project is now a baseline approved project. It should be further noted that, in July 2014, PJM identified violations associated with the 2015 RPM model that were mitigated by accelerating a temporary up-rate (parallel conductor with existing bus) that was planned to accommodate the target date delay from 2016 to 2017.

d) Provide a breakdown of the project costs related to The Thermal Violation and Operational Performance

Answer:
The project was approved as a single baseline upgrade to resolve **all** of the identified issues without distinction being made as to the driver. Therefore, no cost allocation by driver will be attempted.

2) Slide 3 – B1792

a) What is the breakdown of the cost increase for this project by component listed in the 'Proposed Revised Solution' section?

Answer:
The original cost estimate of $26,000,000 was a ballpark cost estimate for rebuilding the line and installing a 230kV four breaker ring bus. The revised detailed cost estimate is broken down as follows:

I. NECESSITY FOR THE PROPOSED PROJECT

C. Describe the feasible alternatives, if any, for meeting the identified need without constructing the proposed project. Explain why these alternatives were rejected.

Response: The Company considered alternative sites to address the issues resolved with Idylwood Substation Rebuild Project, as described in more detail in Section II.A.7. These alternative locations were rejected because they were incapable of completion in the required timeframe, or would have greater costs and/or impacts associated with the new or expanded rights-of-way required. The Rebuild Project is the only option to resolve the Generator Deliverability violation at Idylwood Substation by rebuilding and rearranging Idylwood Substation to accommodate space for the existing 230 kV equipment and potential future transmission terminations and transformation.

I. NECESSITY FOR THE PROPOSED PROJECT

D. Describe any lines or facilities which will be removed, replaced, or taken out of service upon completion of the proposed project.

Response: The Idylwood Substation Rebuild Project will involve removing and replacing transmission and distribution facilities. During and upon completion of the Rebuild Project, no lines will be removed.

The Rebuild Project will include the following:

Conductor Replacements (230 kV):

Line #	Existing Type	Proposed Type	Diameter (in.)		Conductors Per Phase	
			Existing	Proposed	Existing	Proposed
202	1192 ACSR 45/7	636 ACSR 24/7	1.302	0.997	1	2
207	1192.5 ACSS 45/7	636 ACSR 24/7	1.823	0.997	1	2
251	1192.5 ACSS 45/7	636 ACSR 24/7	1.302	0.997	1	2
2035	1033.5 ACSS 45/7	636 ACSR 24/7	1.212	0.997	1	2
2097	636 ACSR 24/7	636 ACSR 24/7	0.977	0.997	2	2
266	1600 AAAC 61/0	636 ACSR 24/7	1.458	0.997	1	2
2164	-	636 ACSR 24/7	-	0.997	-	2

Structure Replacements (230 kV):

	Within Substation Fence		Outside Substation Fence	
	Existing	Proposed	Existing	Proposed
Number of Structures	9	12	4	5
Height Range (ft.)	50-85	75-130	85-150	105-140
Average Approximate Height (ft.)	69	91	122	131
Material	Concrete, wood, painted galvanized steel, and galvanized steel	Galvanized steel	Galvanized Steel	Galvanized steel
Design Type	Lattice tower, lattice bay backbone, engineered monopole, monopole, and H-frame backbone	Engineered monopole and engineered H-frame backbone	Lattice tower and engineered monopole	Engineered monopole
Crossarm Width range (ft.)	34-120	15-38	25-41	15-38
Insulation	230 kV	230 kV	230 kV	230 kV

New foundations, monopole structures, transmission conductor, and shield wire will be installed inside Idylwood Substation to replace the transmission structures, conductors and shield wire being removed.

For the existing line relocation inside Idylwood Substation, six single circuit, two double circuit, and one triple circuit 230 kV structures and conductors will be removed and replaced with ten single circuit and two double circuit 230 kV structures and conductors.

For the existing line relocation outside Idylwood Substation, two single circuit and two double circuit structures and conductors will be removed and replaced with one single circuit and four double circuit 230 kV structures and conductors. The additional structures are necessary for Clifton-Glen Carlyn Line #266 to be split into renamed and renumbered Clifton-Idylwood Line #2164 and Idylwood-Glen Carlyn Line #266 proposed to terminate inside Idylwood Substation instead of bypassing the substation without terminating. Additionally, a cellular antenna and equipment at the base of a double circuit structure supporting Lines #251 and #266 will be temporarily relocated to a structure across Shreve Road from Idylwood Substation while site grading occurs at Idylwood Substation. During or following completion of the Idylwood Substation Rebuild Project, the cellular antenna and equipment will be relocated to a permanent location on one of the new structures on Company-owned property adjacent to Idylwood Substation.

Although the proposed structures inside Idylwood Substation will be taller than the existing structures, the proposed structures are consistent with the height of the surrounding transmission structures.

The transmission work to be completed under the Rebuild Project includes the following:

Remove

1. Remove three steel lattice towers.
2. Remove one wooden monopole structure.
3. Remove three concrete monopole structures.
4. Remove one steel monopole structure with stub pole.
5. Remove one concrete H-frame backbone structure.
6. Remove four steel lattice backbone structures.
7. Remove approximately 0.7 miles of conductor and shield wires.

Install

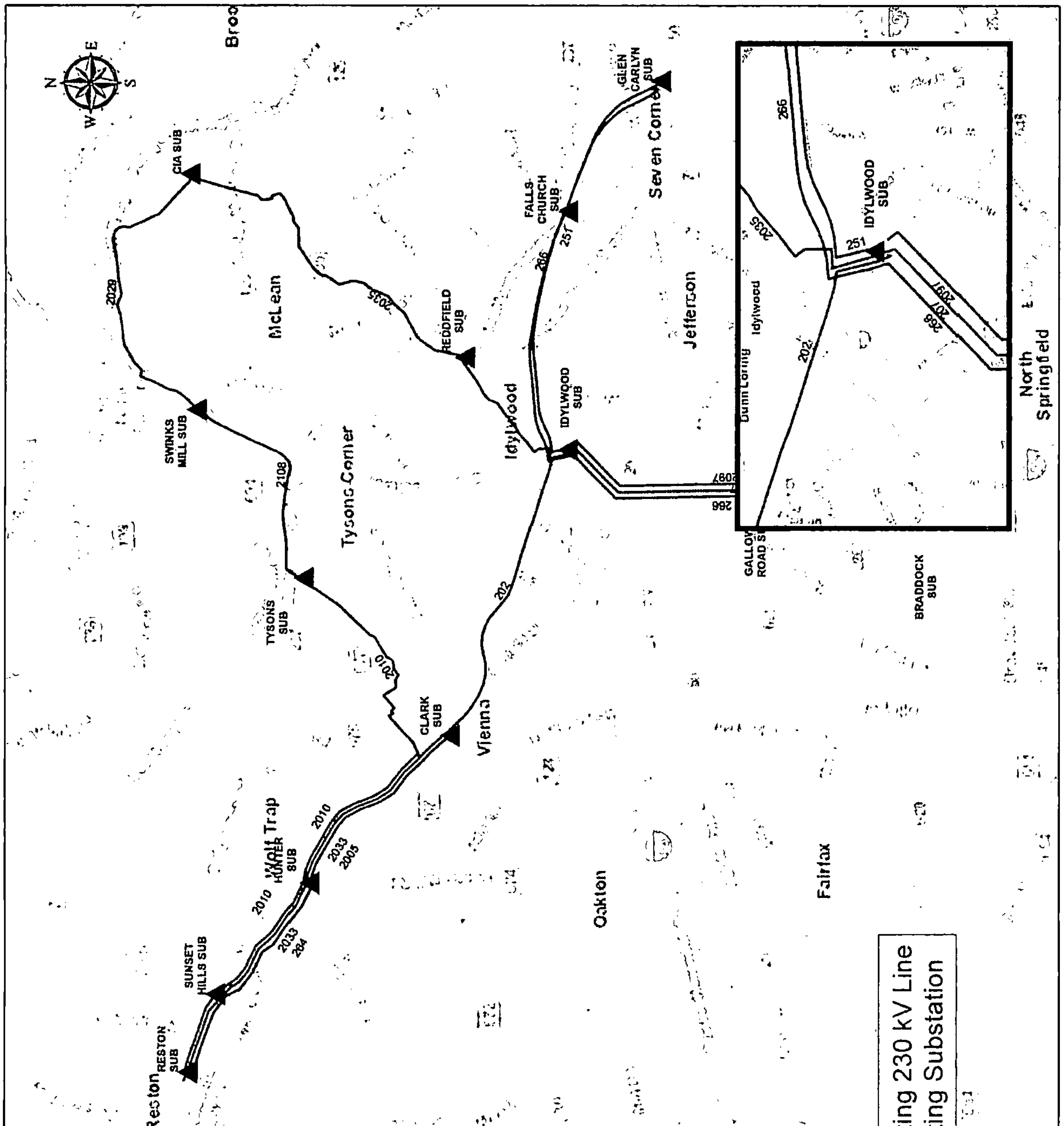
8. Install nine galvanized steel monopoles.
9. Install eight galvanized steel backbones.
10. Install approximately 0.7 miles of conductor and shield wires.

Additionally, the Rebuild Project replaces and relocates certain distribution and substation facilities. See Section II.C for a detailed description of the transmission voltage station work and transformation.

I. NECESSITY FOR THE PROPOSED PROJECT

E. Provide a system map of suitable scale showing the location and voltage of the Company's transmission lines, substations, generation facilities, etc., which would affect or be affected by the new transmission line and are relevant to the necessity for the proposed line. Clearly label on this map all points referenced in the necessity statement.

Response: See Attachment I.E.1. for a map of the Company's existing transmission Lines #202, #207, #251, #266, #2035, and #2097.


Existing 230 kV Line
Existing Substation
RESTON SUB
SUNSET HILLS SUB
HUNTER SUB
CLARK SUB
TYSONS SUB
SWINKS MILL SUB
CIA SUB
REDDFIELD SUB
IDYLWOOD SUB
FALLS-CHURCH SUB
GLEN CARLYN SUB
BRADDOCK SUB
Reston
Herndon
Wolf Trap
Vienna
Oakton
Fairfax
Tysons Corner
McLean
Idylwood
Jefferson
Seven Corners
North Springfield
2010
2033
264
2005
2108
2028
2035
202
266
251
2087

I. NECESSITY FOR THE PROPOSED PROJECT

F. Provide the desired in-service date of the proposed project and the estimated construction time.

Response: Assuming a Commission order approving the Rebuild Project is issued on or before June 30, 2017, the anticipated in-service date for the Idylwood Substation Rebuild Project is May 31, 2020. The estimated construction time for the Rebuild Project is 42 months, inclusive of both distribution and transmission construction. A period of 24 months will be needed for engineering, material procurement, and construction permitting.

I. NECESSITY FOR THE PROPOSED PROJECT

G. Provide the estimated cost of the project.

Response: Assuming a Commission order approving the Rebuild Project is issued on or before June 30, 2017, and an estimated completion date by May 31, 2020, the estimated total cost of the Idylwood Substation Rebuild Project is approximately $107.0 million. The estimated cost for station work is approximately $100.8 million. The estimated cost for transmission line work is approximately $6.2 million. These costs estimates are based on 2016 dollars.

I. NECESSITY FOR THE PROPOSED PROJECT

H. In addition to all other information required by these guidelines, applications for approval to construct facilities and transmission lines inter-connecting a Non Utility Generator (NUG) and a utility shall include the following information.

1. The full name of the NUG as it appears in its contract with the utility and the dates of the initial contract and any amendments;

2. A description of the arrangements for financing the facilities, including information on the allocation of costs between the utility and the NUG:

3. a. For Qualifying Facilities (QFs) certificated by Federal Energy Regulatory Commission (FERC) order, provide the QF or docket number, the dates of all certification or recertification orders, and the citation to FERC Reports, if available;

b. For self-certificated QFs, provide a copy of the notice filed with the FERC;

4. In addition to the information required in 3a or 3b, provide the project number and project name used by the FERC in licensing hydroelectric projects, also provide the dates of all orders and citations to FERC Reports, if available; and

5. If the name provided in 1 above differs from the name provided in 3 above, give a full explanation.

Response: Not applicable.

I. NECESSITY FOR THE PROPOSED PROJECT

I. Describe the new and existing generating sources, distribution circuits or load centers planned to be served by all new substations, switching stations and other ground facilities associated with the proposed project.

Response: There are no new or existing generating stations, and no new substations, switching stations, or ground facilities associated with the Idylwood Substation Rebuild Project, except as described in Section I.B.

For a description of load centers to be served by the Idylwood Substation, see Sections I.A and I.B.

II. DESCRIPTION OF THE PROPOSED PROJECT

A. Right-of-way (ROW)

1. Provide the length of the proposed corridor and viable alternatives;

Response: The relevant lengths of each transmission line with relocated structures inside or outside of the station are as follows:

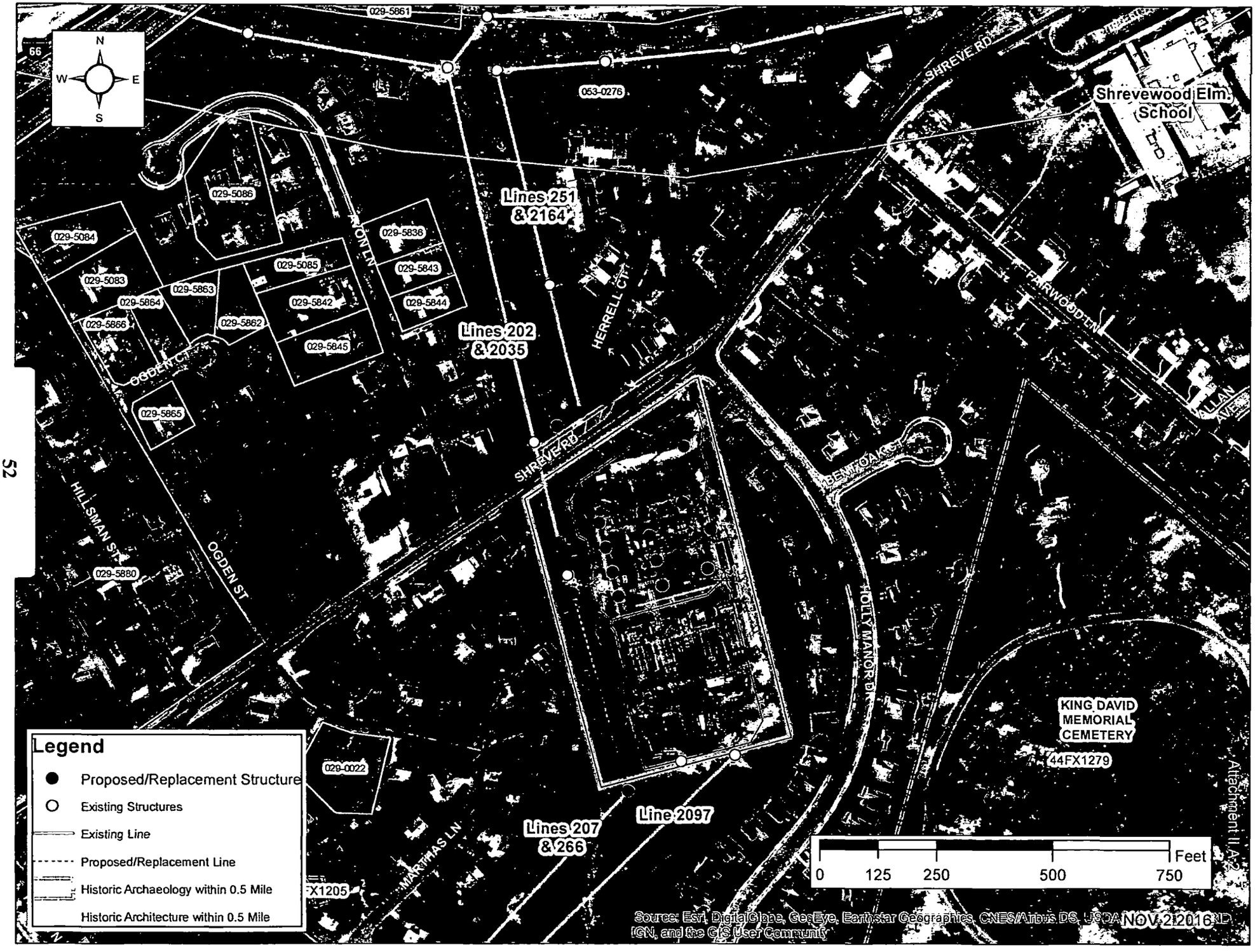
LINE NUMBER	PROPOSED APPROXIMATE MILEAGE (MI.)
Clark-Idylwood Line #202	0.02
Braddock-Idylwood Line #207	0.10
Glen Carlyn-Idylwood Line #251	0.11
Idylwood-Glen Carlyn Line #266	0.11
CIA-Idylwood Line #2035	0.04
Ox-Idylwood Line #2097	0.09
Clifton-Idylwood Line #2164	0.10

II. DESCRIPTION OF THE PROPOSED PROJECT

A. Right-of-way (ROW)

2. Provide a map of suitable scale showing the route of the proposed line and its relation to: the facilities of other public utilities which could influence the route selection, highways, streets, parks and recreational areas, scenic and historic areas, schools, convalescent centers, hospitals, airports and other notable structures close to the proposed project. Indicate the existing facilities which the line is proposed to follow, such as existing ROW, railroad tracks, etc.;

Response: See Attachment II.A.2.


N
W
E
S
029-5861
053-0276
SHREVE RD
Shrevewood Elm. School
029-5086
Lines 251 & 2164
029-5084
029-5836
029-5085
029-5843
029-5083
029-5863
029-5842
029-5844
029-5864
029-5866
029-5862
029-5845
Lines 202 & 2035
HERRELL CT
FARWOOD LN
OGDEN CT
029-5865
ALLAN AVE
SHREVE RD
BENTOAKS
HILLSMAN ST
OGDEN ST
029-5880
HOLLY MANOR DR
KING DAVID MEMORIAL CEMETERY
44FX1279
029-0022
Line 2097
Lines 207 & 266
MARTHAS LN
X1205
Legend
Proposed/Replacement Structure
Existing Structures
Existing Line
Proposed/Replacement Line
Historic Archaeology within 0.5 Mile
Historic Architecture within 0.5 Mile
0
125
250
500
750
Feet
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, IGN, and the GIS User Community
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