



# SERTP – PJM Biennial Regional Transmission Plan Review

April 26, 2016



# Transmission Coordination Between the SERTP and PJM Regions

## Selected points from Tariffs

- Coordinate and share the results of regional transmission plans to identify possible interregional transmission projects that could address transmission needs more efficiently or cost-effectively
- Identify and jointly evaluate (biennially) proposed interregional transmission projects
- Exchange planning data and information at least annually
- Representatives of the SERTP and PJM will meet no less than once per year to facilitate the interregional coordination
- Maintain a website and e-mail list for the communication of information related to the coordinated planning process
  - 1.4 The Office of the Interconnection shall post procedures for coordination and joint evaluation on the Regional Planning website and will coordinate with SERTP
  - 2.1 & 2.2 Post exchanged power flows subject to regional CEII and notify SERTP

- 3.2 and 3.4 Stakeholder project proposals submitted to both regions
  - Through Regional processes
- 4. Transparency
  - Post procedures
  - Post data (CEII)
  - SERTP updates and PJM Regional input through the TEAC
  - Links to SERTP process and distribution lists
  - Post a list of projects not eligible for consideration, and explanation

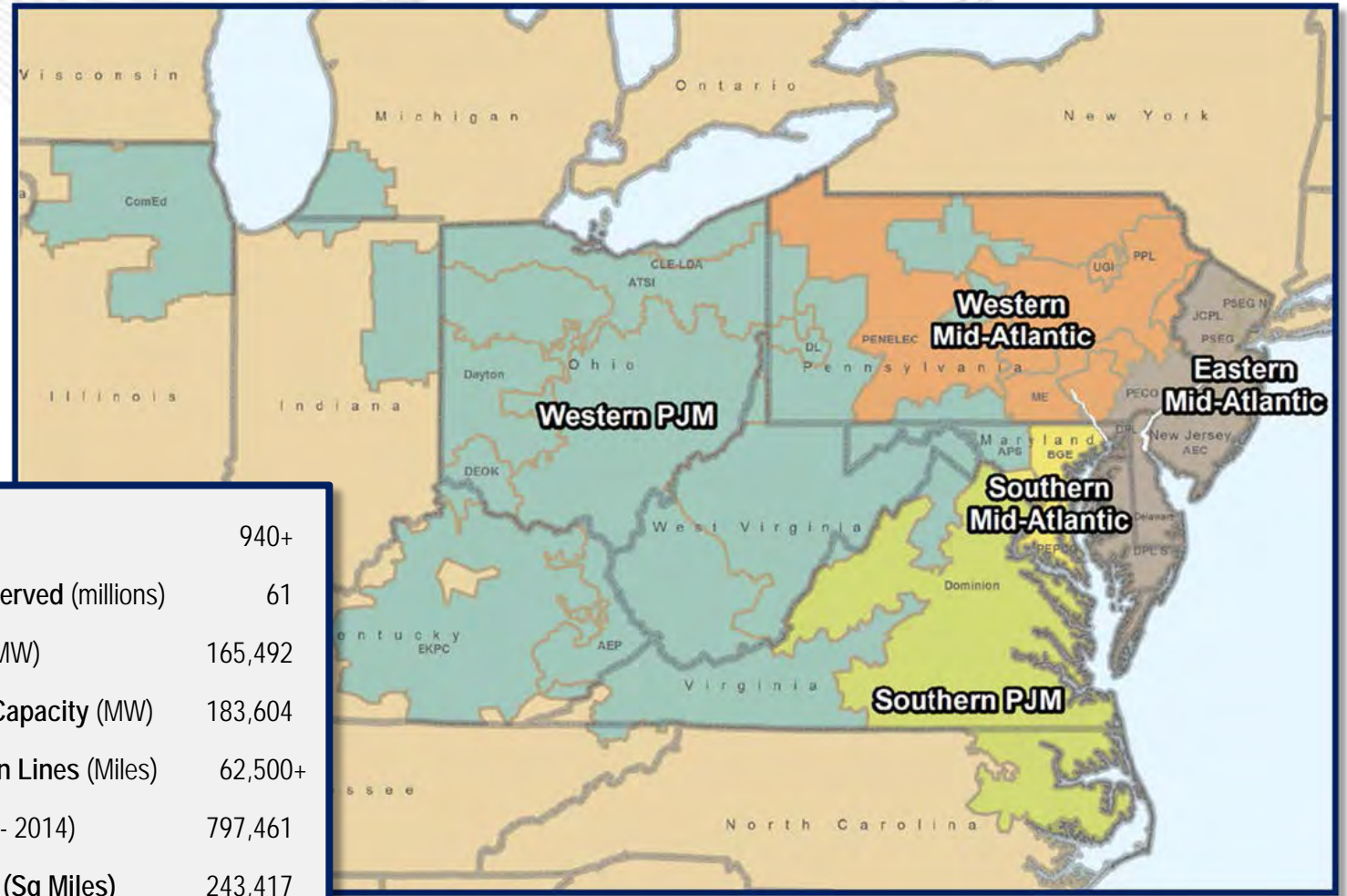


# PJM Planning Process

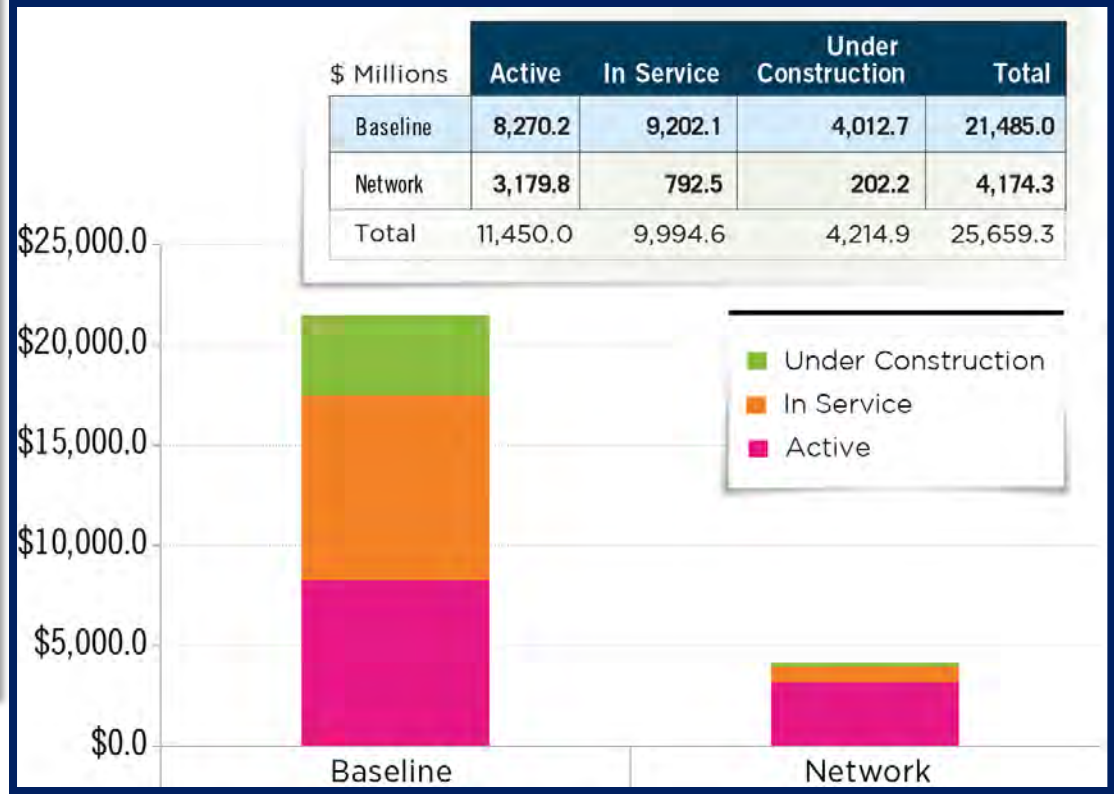
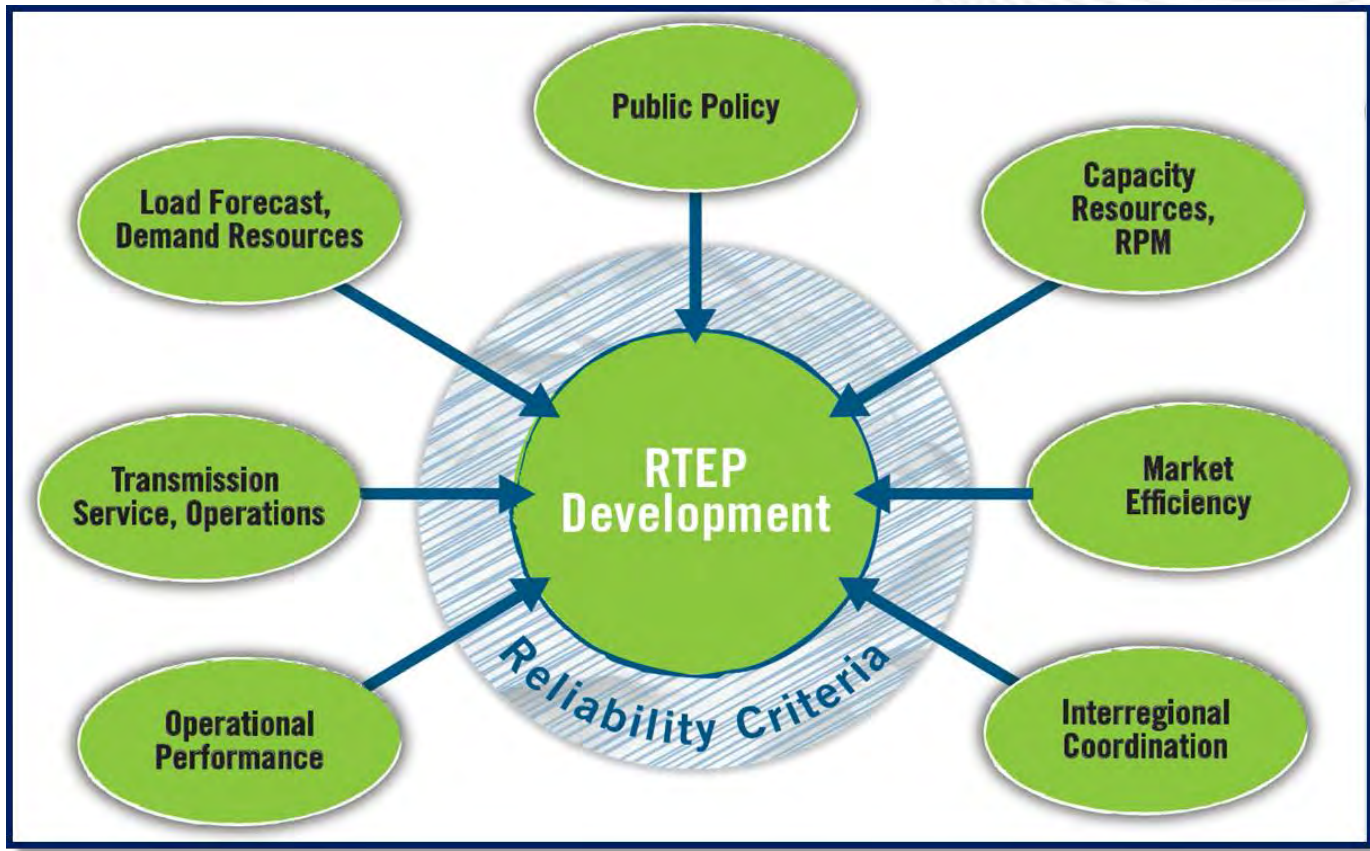
## SERTP – PJM Biennial Regional Transmission Plan Review

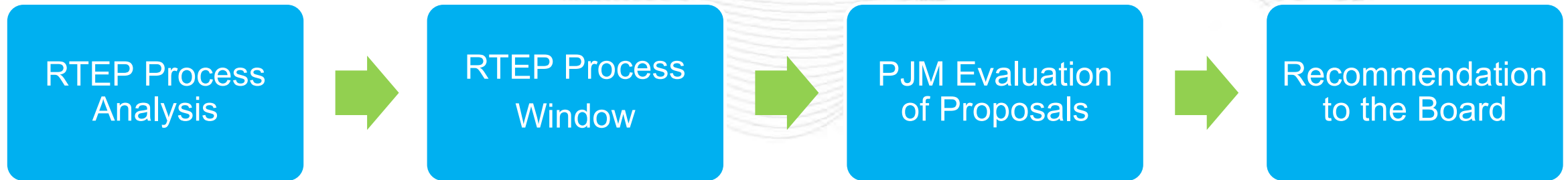
April 26, 2016

Members	940+
Population served (millions)	61
Peak Load (MW)	165,492
Generating Capacity (MW)	183,604
Transmission Lines (Miles)	62,500+
Energy (GW - 2014)	797,461
Area Served (Sq Miles)	243,417
States served	13 + DC









- ✓ Applicable to all facilities 100 kV+ and operationally controlled facilities below 100 kV
- ✓ FERC-approved
- ✓ 15 year planning horizon
- ✓ 12 month and 24 month cycle
- ✓ Comprehensive and Holistic
  - Multi-driver: Reliability, Market Efficiency, Public Policy
- ✓ Open, transparent, collaborative stakeholder process
- ✓ NERC and RFC compliant
- ✓ Order No. 1000 compliant



# RTEP Process Study Scope

## Baseline

- ✓ Exceeds scope required by NERC
- ✓ Identify violations for multiple deliverability areas, or multiple or severe violations clustered in one specific area.
- ✓ Permits PJM to assess larger-scale, longer lead-time solutions
- ✓ RTEP process analyses:
  - Normal system, single and multiple contingency analysis.
  - Load deliverability and generator deliverability test conditions



## As well as...

- ✓ New service studies (e.g., generator interconnection)
- ✓ Market efficiency studies
- ✓ Scenario studies
  - Operational Performance - winter conditions
  - Regulatory Impact - EPA CPP
- ✓ Interregional analyses

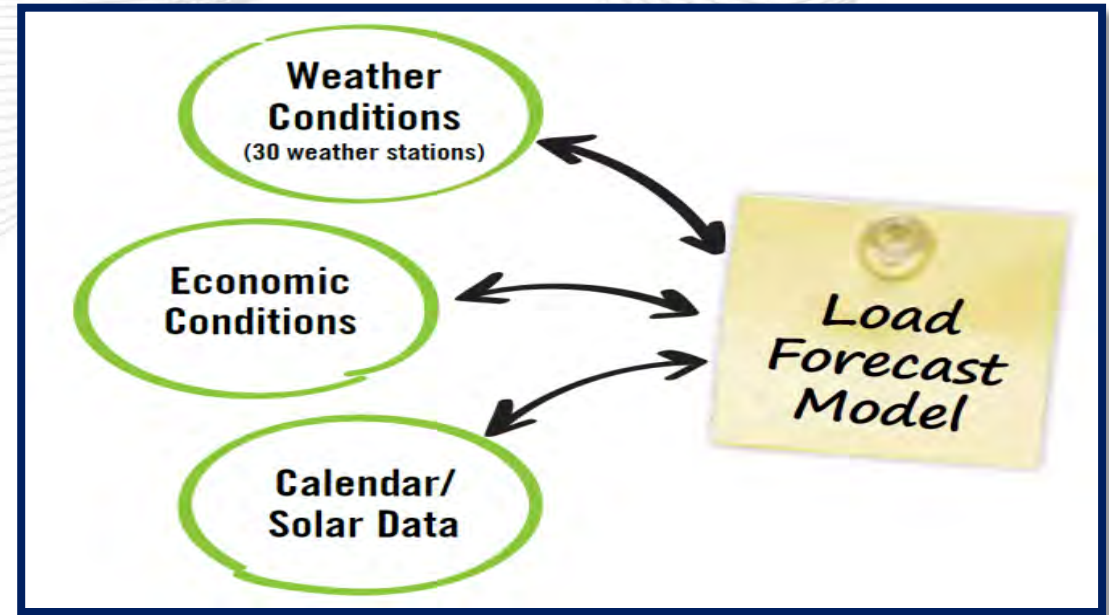


## Weather Conditions

- ✓ Weighted average temperature, humidity & wind speed
- ✓ 30+ weather stations across PJM.

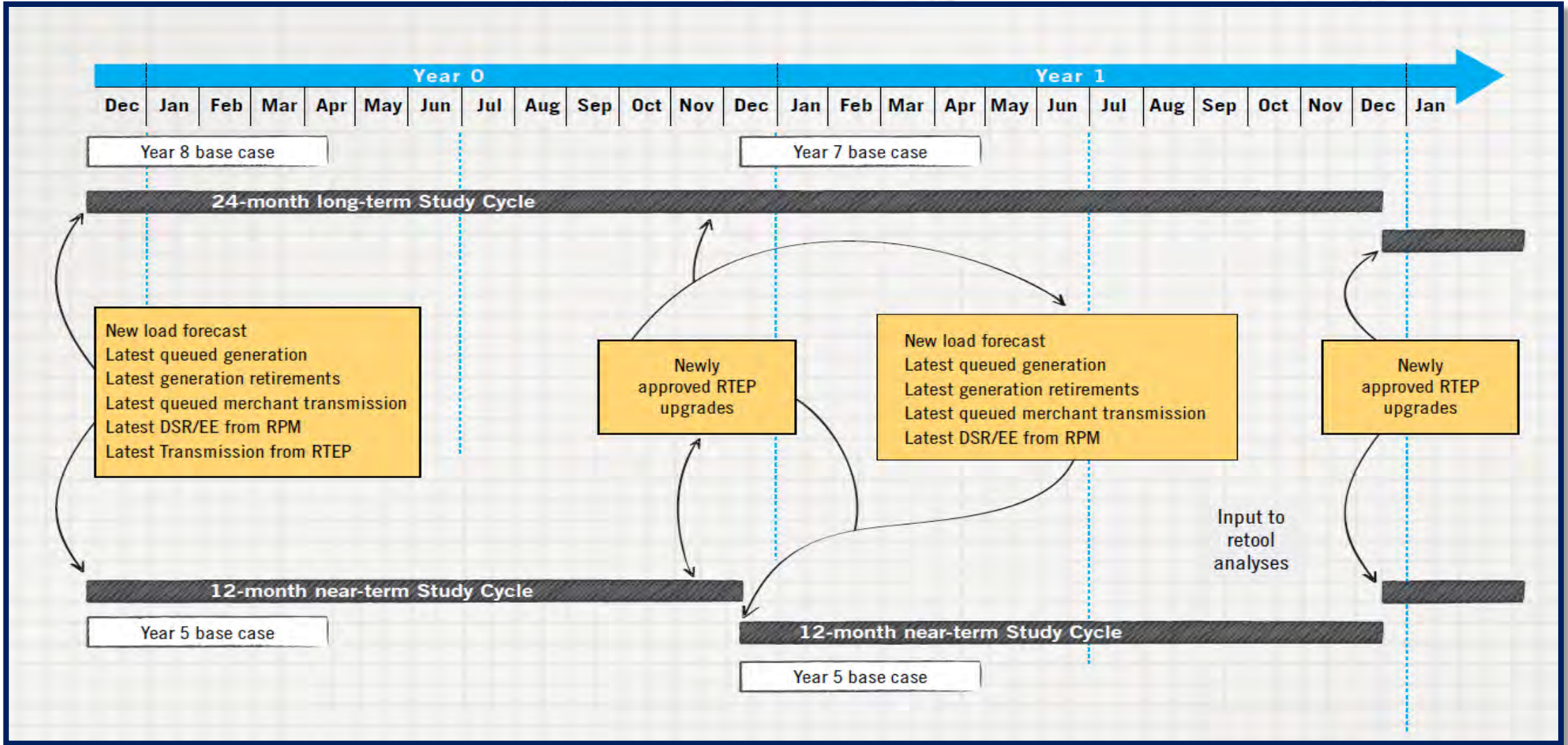
## Economic Conditions

- ✓ Gross Domestic Product,
- ✓ Gross Metropolitan Product,
- ✓ Real personal income,
- ✓ Population,
- ✓ Households,
- ✓ Non-manufacturing employment



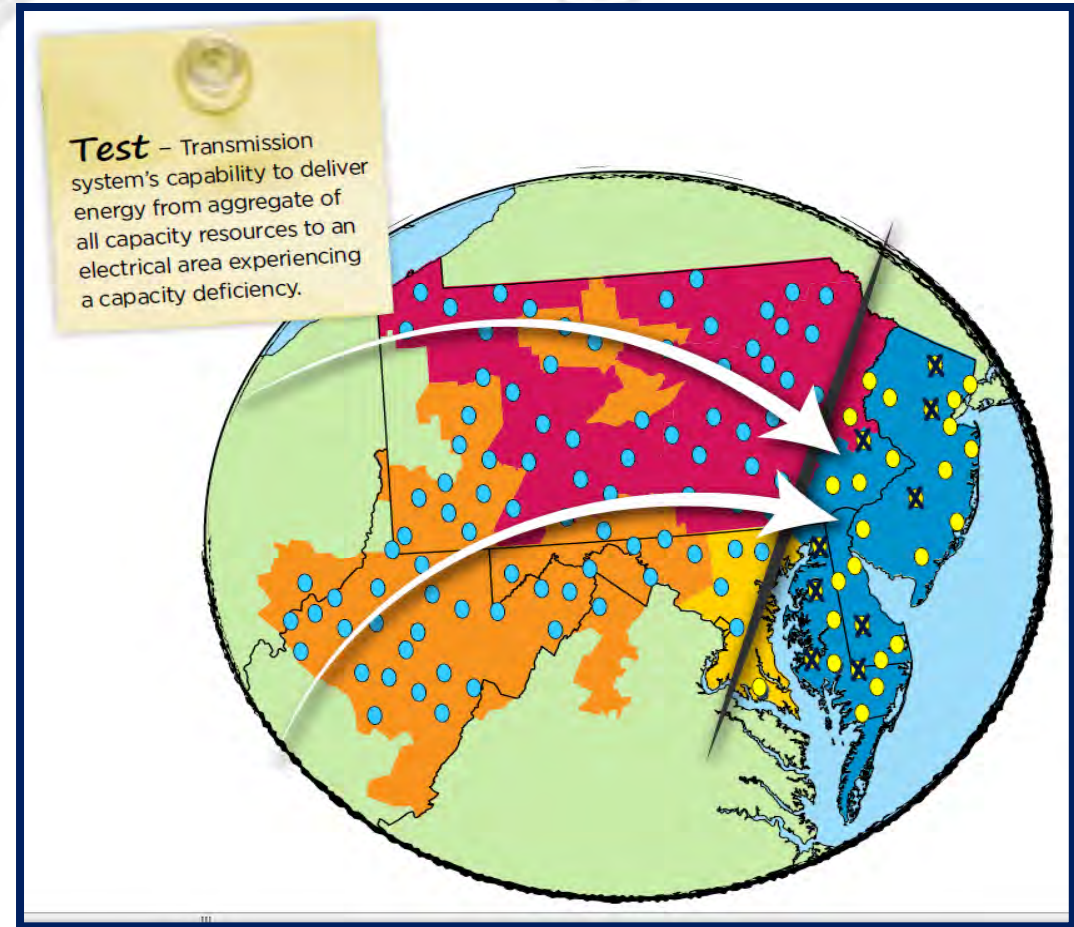
## Calendar / Solar Data

- ✓ Day of week
- ✓ Month
- ✓ Weekends / Holidays
- ✓ Minutes of Daylight

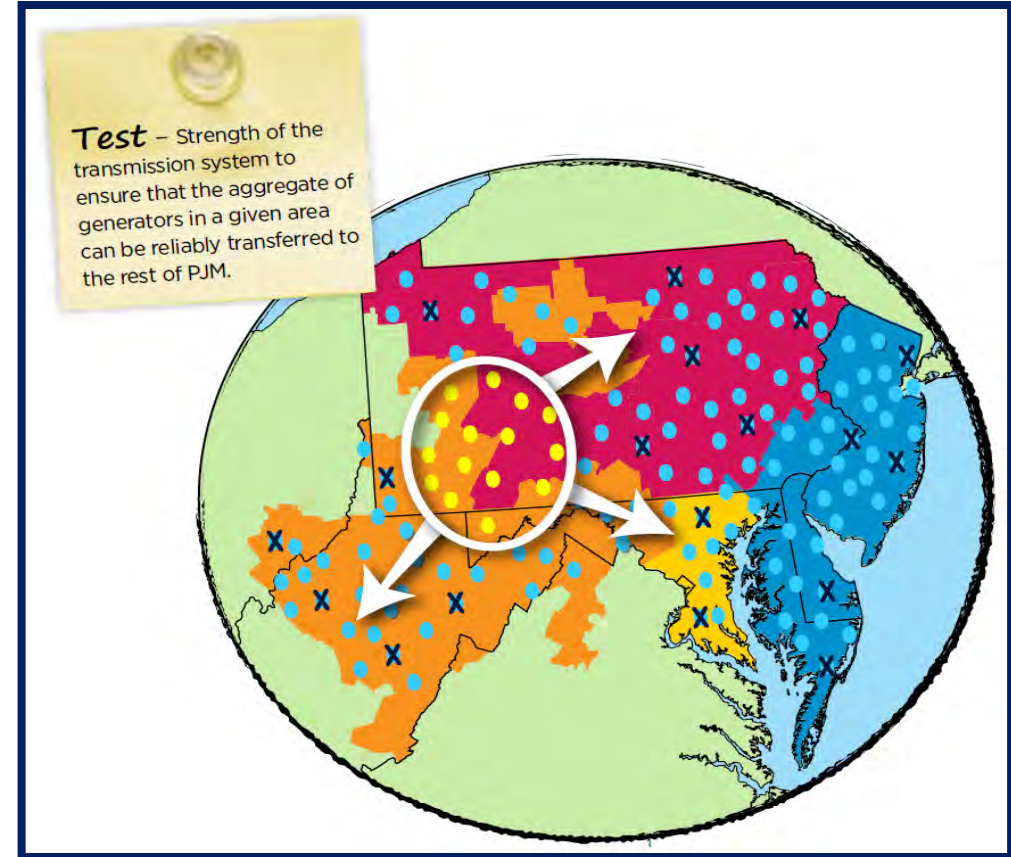




- ✓ Transmission system's capability to deliver energy from aggregate of all capacity resources to an electrical area experiencing a capacity deficiency
- ✓ Test failure: load is "bottled" inside a defined area
- ✓ Maintain CETO in defined area to achieve LOLE of 1-event-in-25 years
- ✓ Area tested for its expected import capability (CETL) up to established transmission facility limits
- ✓ **If  $CETL < CETO$ , test fails, additional transmission capability is needed**



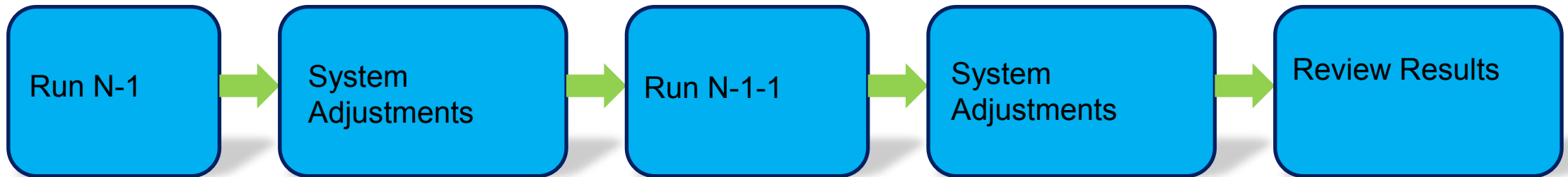
- ✓ Strength of the transmission system to ensure that the aggregate of generators in a given area can be reliably transferred to the rest of PJM.
- ✓ Test determines if transmission limits exist that prevent generation in a defined area to be exported to the rest of PJM ... is generation “bottled” or not.
- ✓ Also performed for each queued generator interconnection request at System Impact Study step.





## Study Parameters

- ✓ 50/50 non-diversified case
- ✓ Single contingencies
- ✓ Both thermal and voltage limits



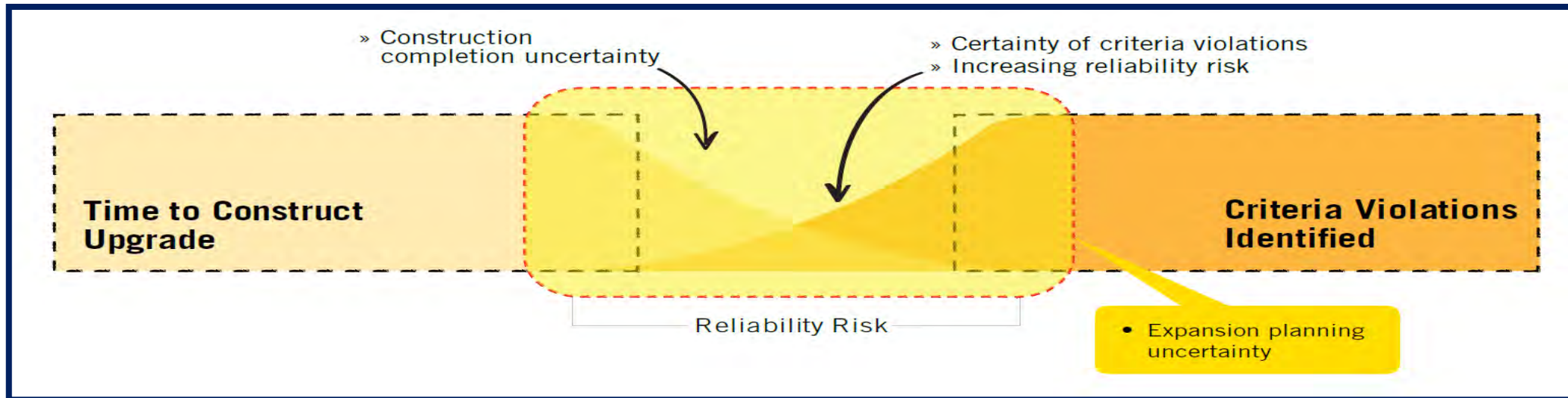
- ✓ Fault or short circuit currents cause high thermal and mechanical stresses on power system equipment
- ✓ Circuit breakers clear faults to restore system to a stable operating point and to prevent equipment damage
- ✓ Analysis ensures each circuit breaker is rated sufficiently to interrupt system fault currents.
- ✓ PJM studies the circuit breakers for impacts from planned system changes
- ✓ If Breaker Interrupting Capacity  $<$  Fault Current, replacement required
  - Baseline RTEP Analysis
  - System Impact Studies



- ✓ Below 50 percent of summer peak in some TO zones
- ✓ Operational challenges
  - Low demand generation dispatch differs markedly from peak
  - Capacitive effects of lightly loaded transmission lines
  - Intermittent source output
  - Thermal overloads, high voltage events
- ✓ 2010 creation and approval of new light load reliability criteria
- ✓ 2011 first implemented and benchmarked in RTEP process
  - Baseline analysis
  - Queued interconnection request studies
- ✓ Overall, ensure transmission capable of delivering generating capacity under light load conditions
- ✓ Generator Deliverability Study
- ✓ Common Mode Voltage Study



- ✓ Reliability tests reasonably defined expected date of criteria violations with minimal risk of fluctuation.
- ✓ That has changed. Today...
  - Public policy and regulatory action -- e.g., EPA CPP
  - Operational performance -- e.g., winter peak conditions (polar vortex)
  - Market economics – e.g., fuel-of-choice shifts to natural gas

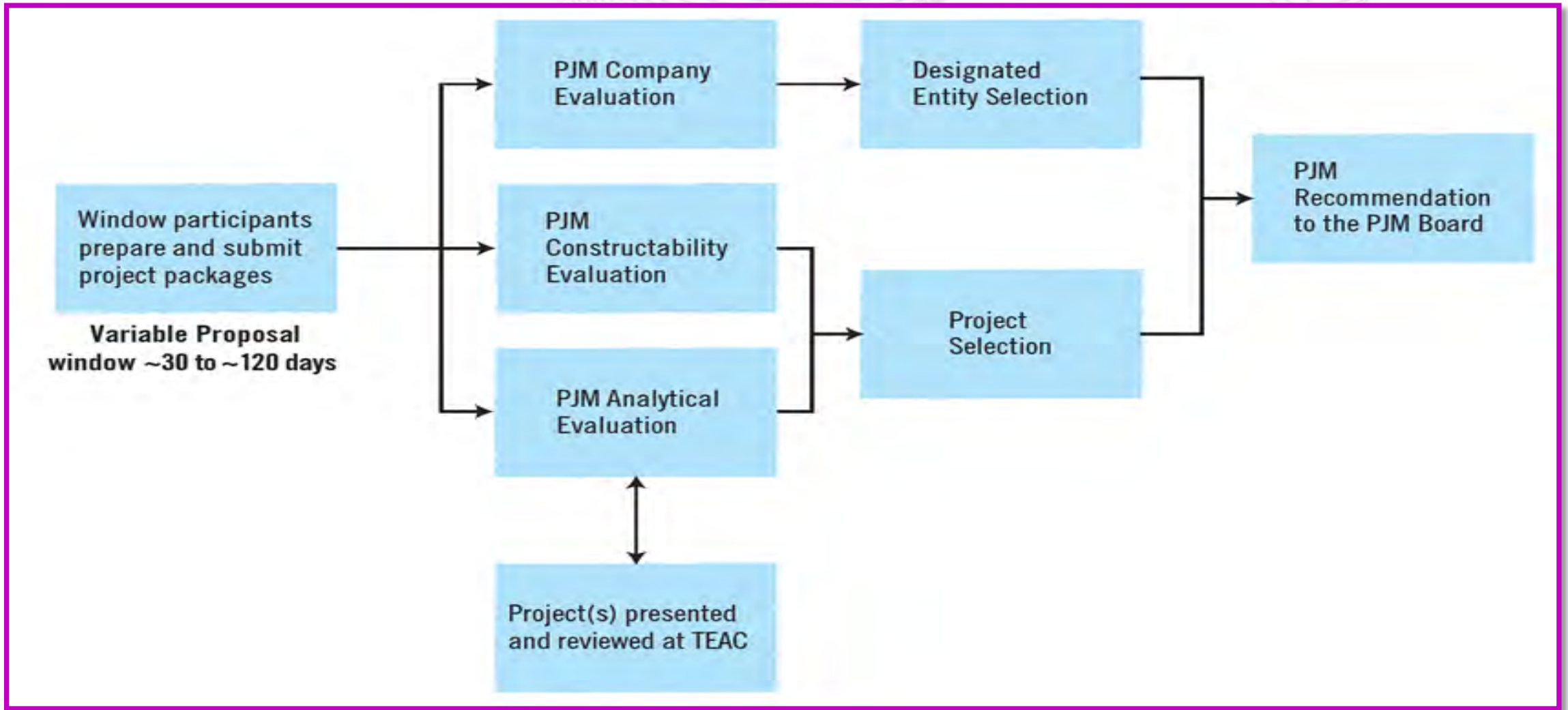




- ✓ Conduct market simulations identify congestion in future years
  - Production cost tool
  - TEAC and Board reviewed input parameters
  - Hourly security-constrained generation commitment and dispatch
  - Year 1, Year 5, Year 8, Year 11, Year 15
  
- ✓ Identify transmission enhancement plans that may realize economic benefit by mitigating congestion
  - Accelerate existing reliability-justified enhancement plans
  - Solutions via RTEP process window
    - Stand-alone project
    - Multi-driver – expand scope of existing reliability enhancement
  - Cost-to-benefit ratio  $\geq 1.25$
  
- ✓ PJM evaluation of window-submitted proposals

- ✓ Greater opportunities for transmission development by non-incumbents.
- ✓ One or more needs: reliability, market efficiency, operational performance, public policy
- ✓ If included in RTEP, project could be assigned to proposing party to build.
- ✓ Competitive solicitation window based process project classes:
  - *Long-lead projects*: reliability or market efficiency driven system enhancements in year six or beyond – 120 day window
  - *Short-term projects*: reliability driven system enhancements needed in year four or five – 30 day window.
  - *Immediate-need projects*: reliability driven system enhancements needed in three years or less; window if possible, likely less than 30 days nominally.

# RTEP Process Window Proposal Evaluation



- **PJM Planning Committee**

<http://www.pjm.com/committees-and-groups/committees/pc.aspx>

- **Transmission Expansion Advisory Committee (TEAC)**

<http://www.pjm.com/committees-and-groups/committees/teac.aspx>

- **M-14B: PJM Region Transmission Planning Process**

<http://www.pjm.com/~media/documents/manuals/m14b.ashx>



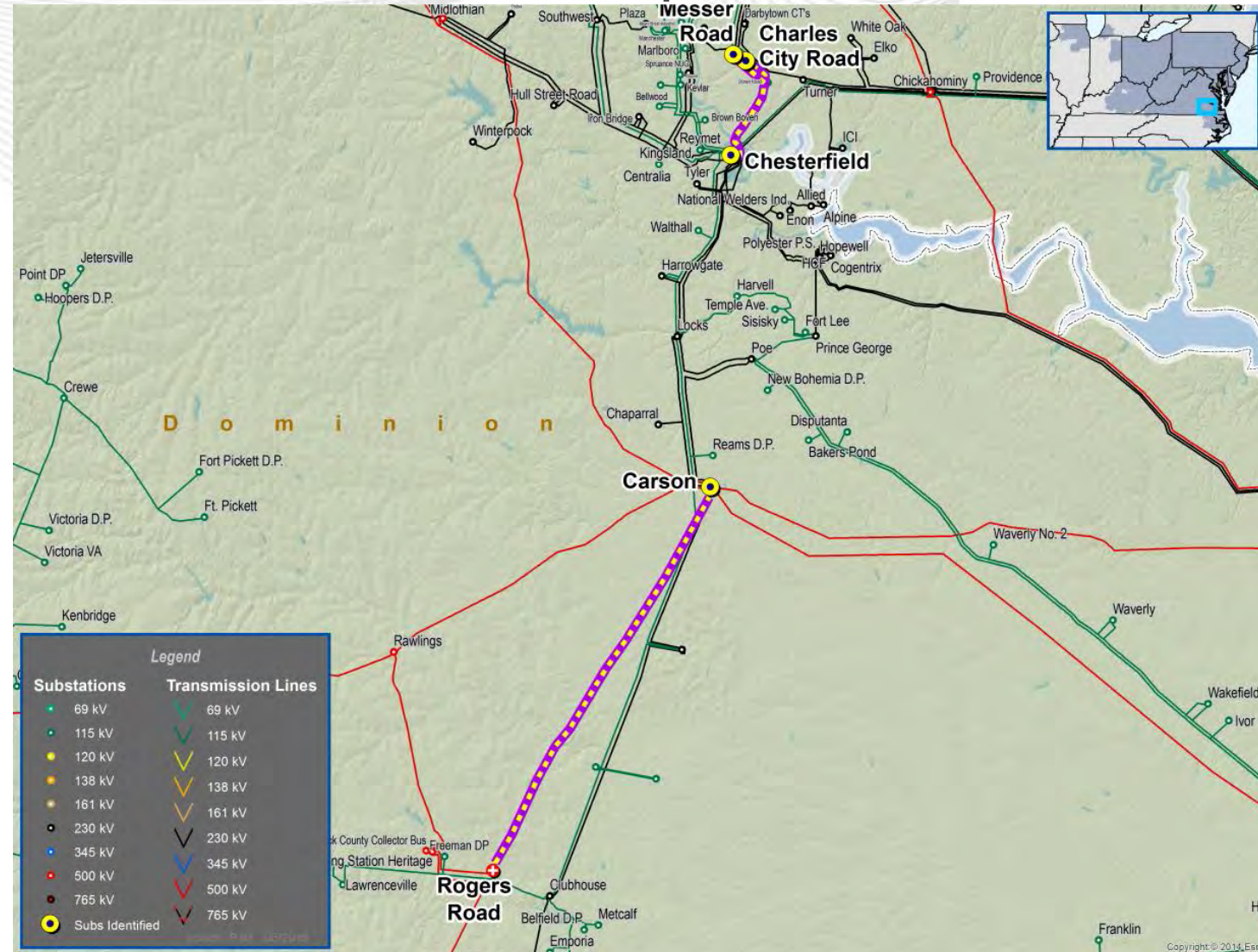


# PJM Regional Transmission Plans Review



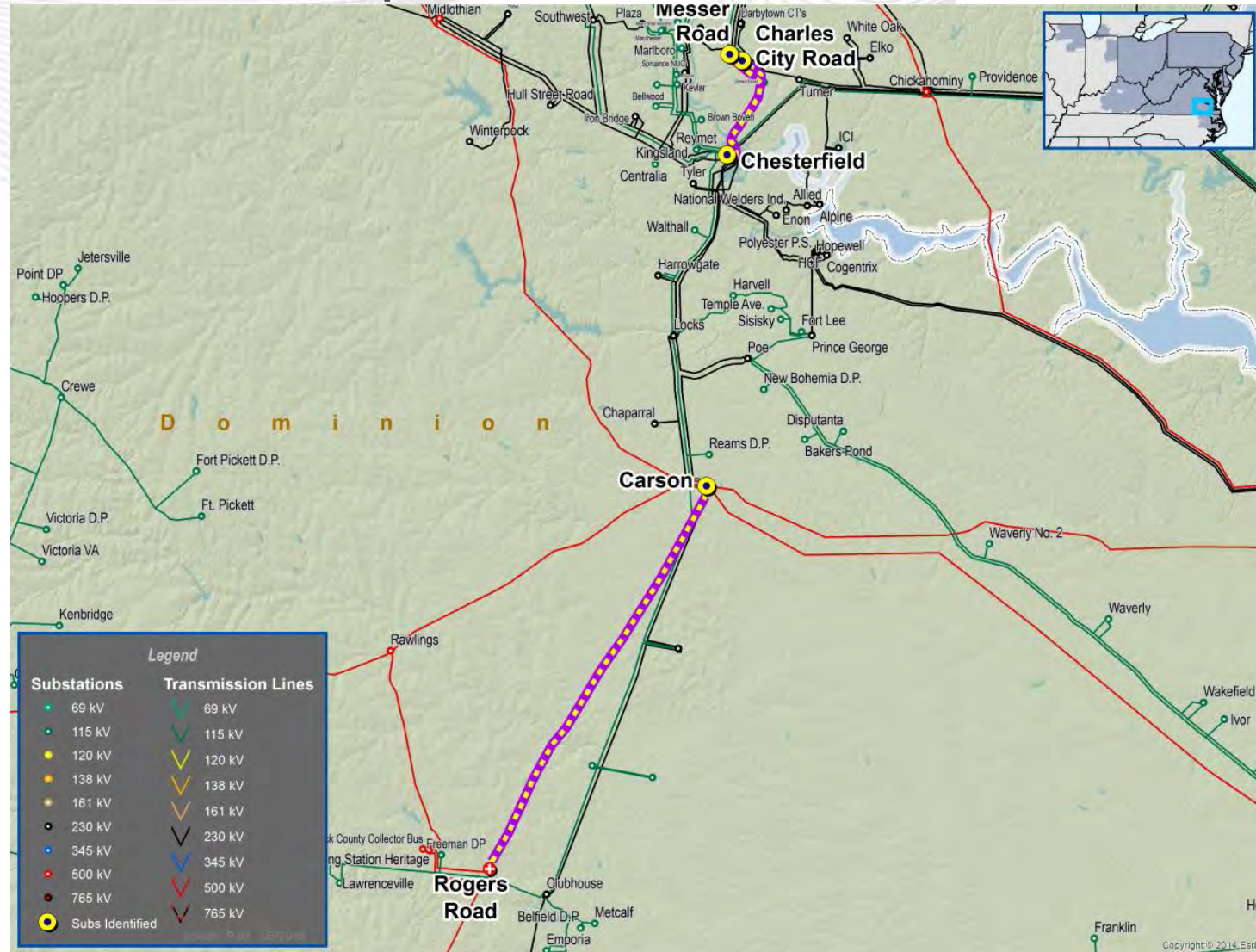
# 2016 RTEP Proposal Window #1

- Scope of Violations Found in Dominion Area
  - Generator Deliverability and Common Mode Outage Violations
  - End of life facilities
- Preliminary Files Released: 2/5/2016
- Window Opened: 2/16/2016
- Window Closes: 3/17/2016
  - Proposal definitions, simulation data and planning cost estimate due
- Detailed Cost due: 4/1/2016
  - Additional 15 days to develop and provide detailed cost data
  - See the window documentation for additional information





- 13 flow gates addressed
- 26 Proposals from 7 entities
  - 3 Transmission Owner Upgrades
    - Cost range of \$7.7M to \$48.5M
  - 22 Greenfield Projects
    - Cost range of \$15.6M - \$111.5 M







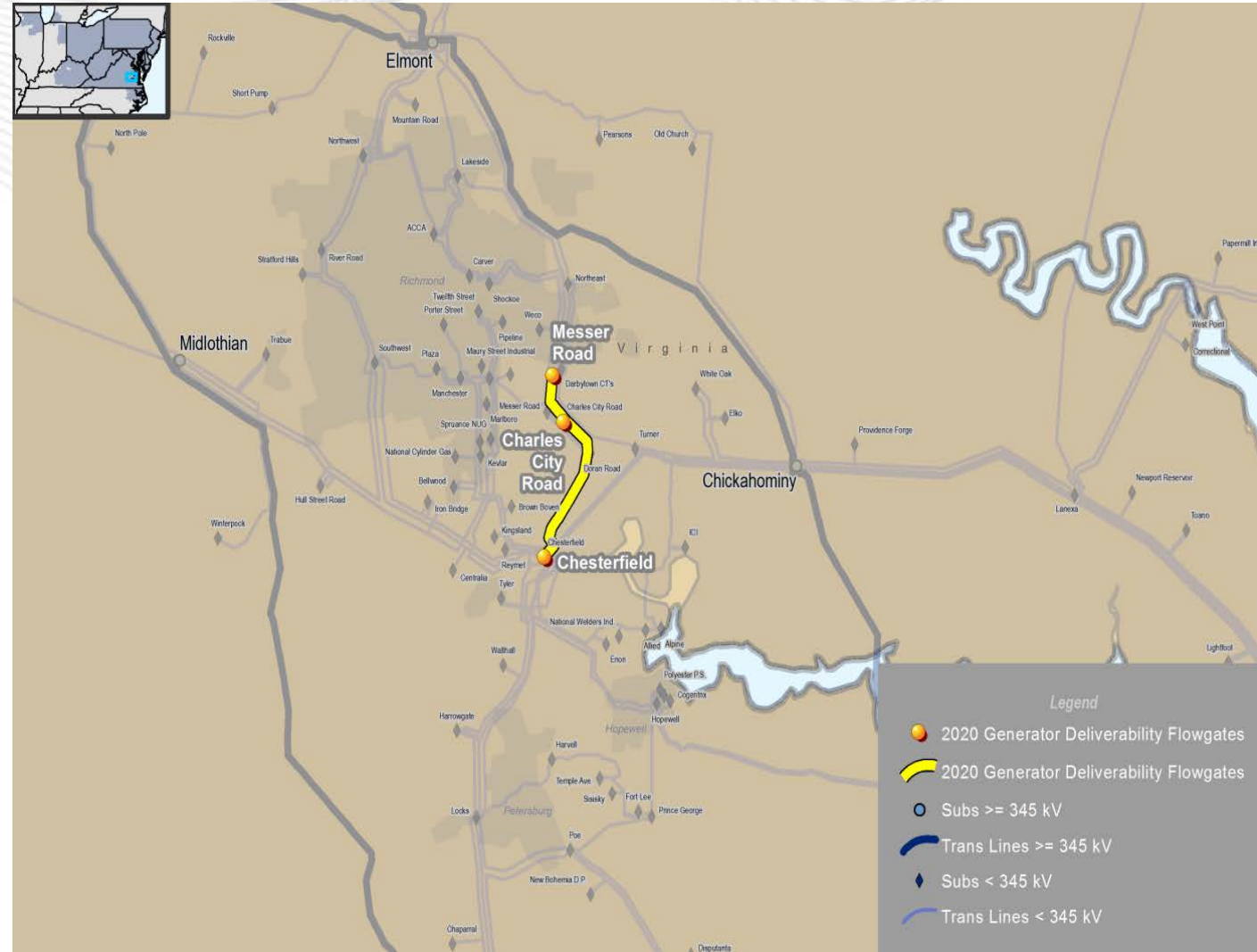
# 2016 RTEP Proposals Submitted for Window #1

- **Generation Deliverability and Common Mode Outage ( FG# 60, 61, 62, 66, 68, 70, 71, 72, 76, 78, 248, 249)**
- The Chesterfield – Messer Road – Charles City Road 230kV circuit is overloaded for several contingencies
  - End of Life Facility
- Proposals Considered

Proposal Id	Cost Estimate
2016_1-3B	\$22 M
2016_1-3F*	\$58.8 M
2016_1-3G	\$7.7 M
2016_1-5A	\$41.7 M
2016_1-5B	\$15.6 M
2016_1-5C	\$26 M



- **Generation Deliverability and Common Mode Outage ( FG# 60, 61, 62, 66, 68, 70, 71, 72, 76, 78, 248, 249) & DOM End of Life Facility**
  - The Chesterfield – Messer Road – Charles City Road 230kV circuit
- **Preliminary Recommended Solution:**
  - Rebuild 21.32 miles of existing line between Chesterfield and Lakeside. (2016\_1-3B)
- **Estimated Project Cost: \$ 22 M**
- **Required IS Date: 6/1/2020**



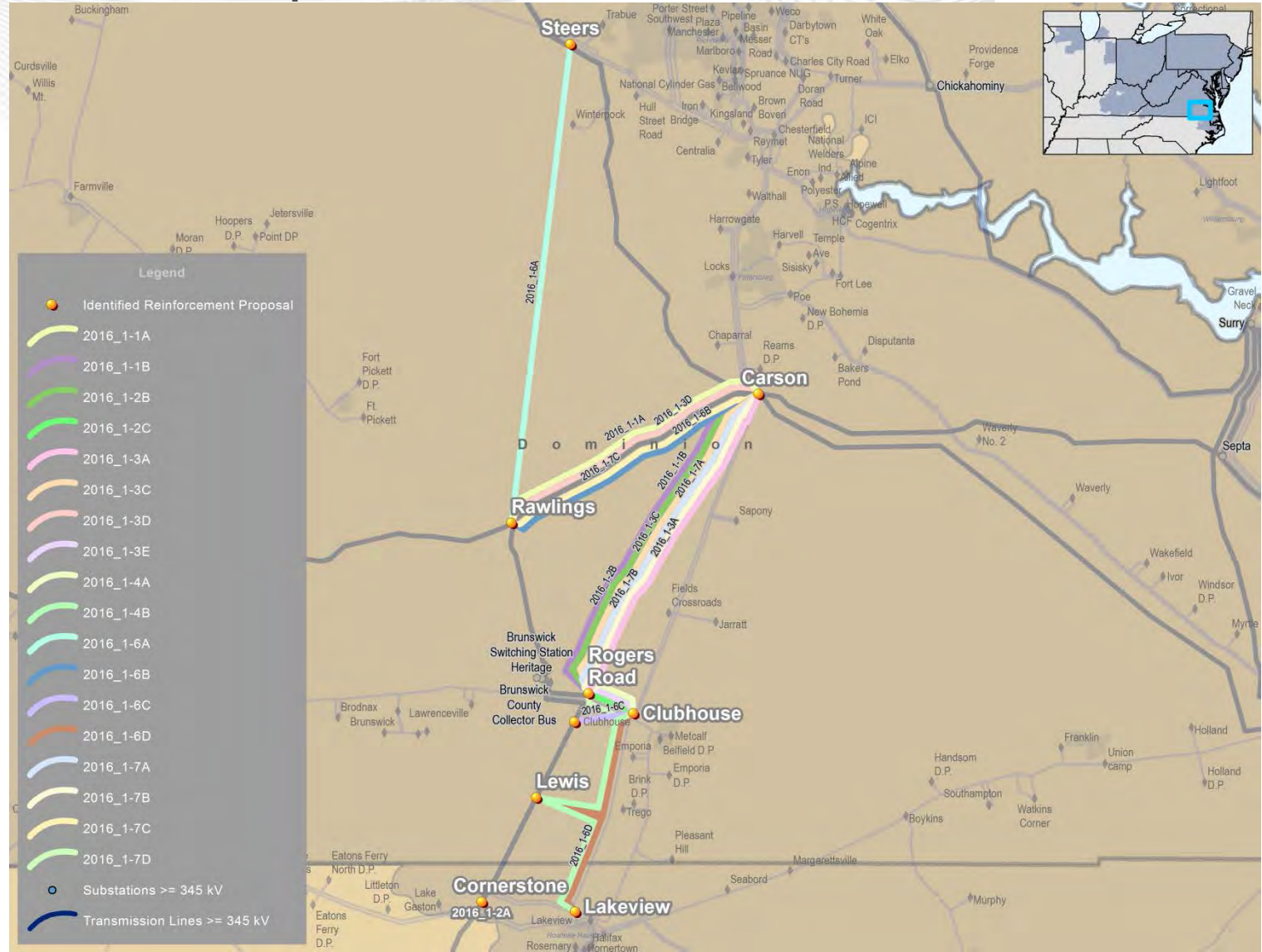


# 2016 RTEP Proposals Submitted for Window #1

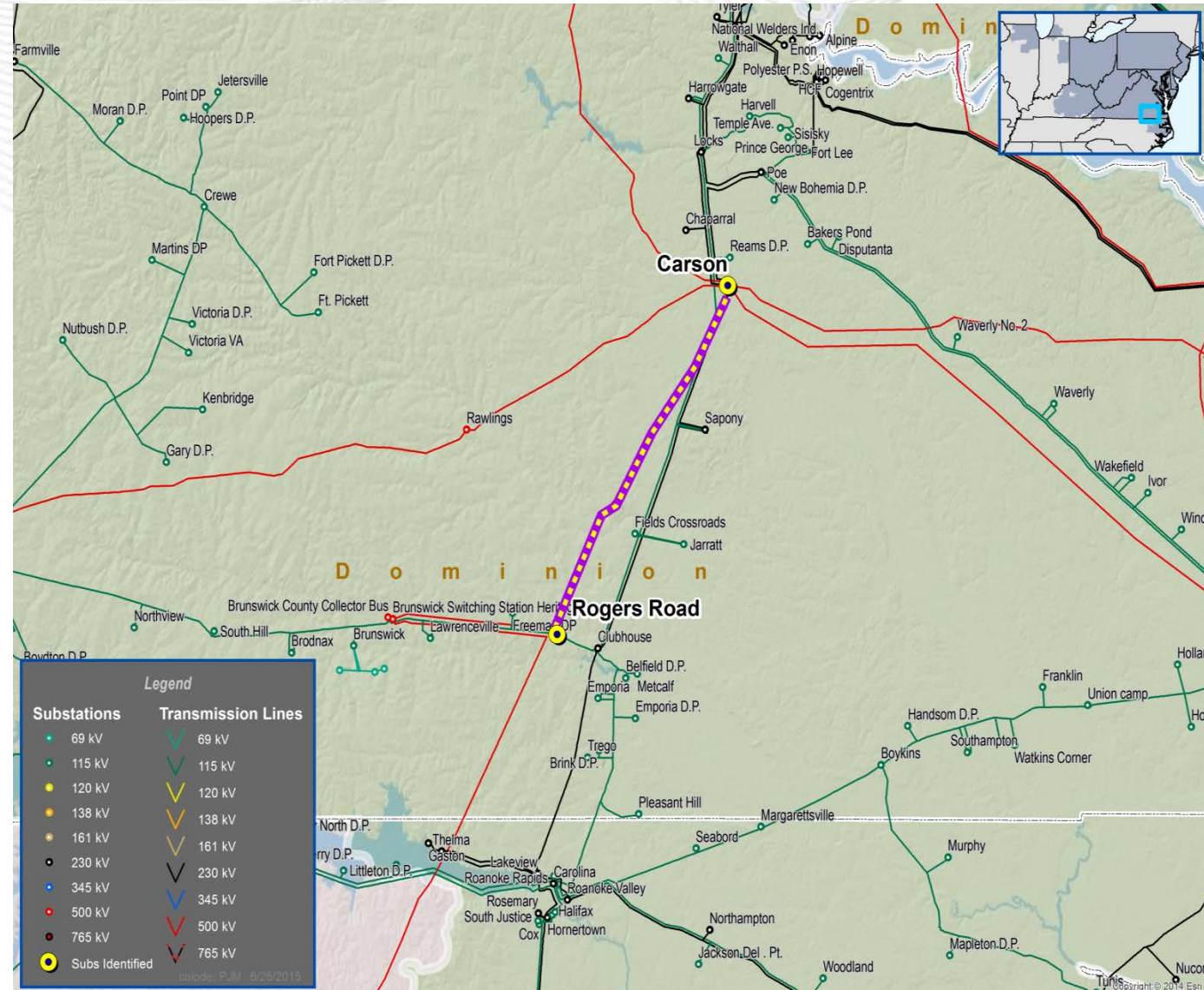
- **Generation Deliverability and Common Mode Outage ( FG# 102)**
- The Carson – Rogers Rd 500 kV circuit is overloaded for single contingency loss of the Carson – Rawlings 500 kV circuit.
- Proposals Considered

2016_1-1A	2016_1-1B	2016_1-2A	2016_1-2B
2016_1-2C	2016_1-3A	2016_1-3C	2016_1-3D*
2016_1-3E	2016_1-4A	2016_1-4B*	2016_1-6A
2016_1-6B	2016_1-6C	2016_1-6D	2016_1-7A
2016_1-7B	2016_1-7C	2016_1-7D	

- Cost Estimates: ( \$24 M to \$115 M)



- **Generation Deliverability Violation ( FG# 102)**
  - The Carson – Rogers Rd 500 kV circuit.
- **Preliminary Recommended Solution:**
  - Rebuild the Carson – Rogers Rd 500kV circuit. (2016\_1-3A)
- **Estimated Project Cost: \$ 48.5 M**
- **Required IS Date: 6/1/2020**



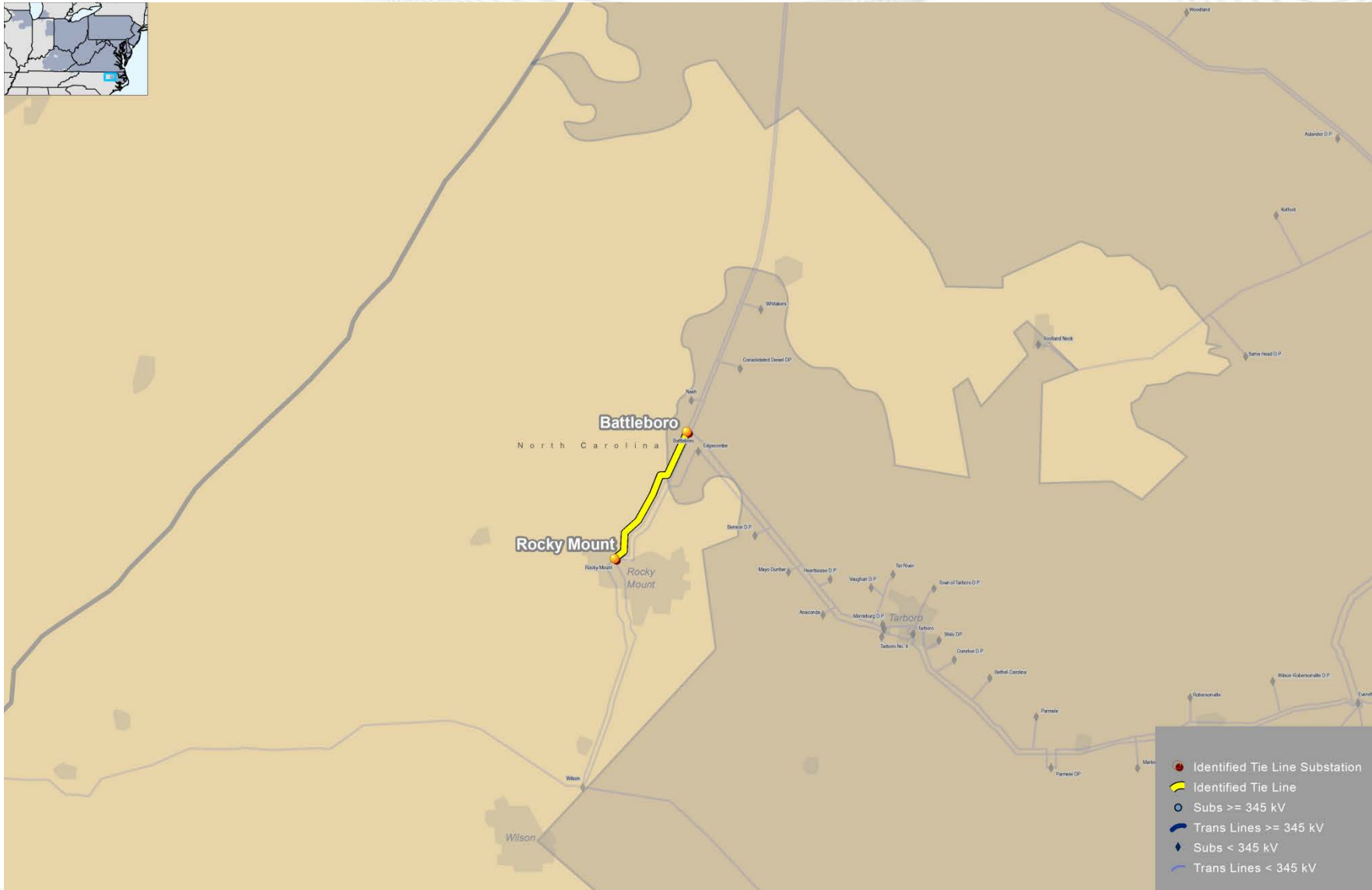




# 2016 RTEP Upcoming Proposal Window #2 – Selected Potential Issues

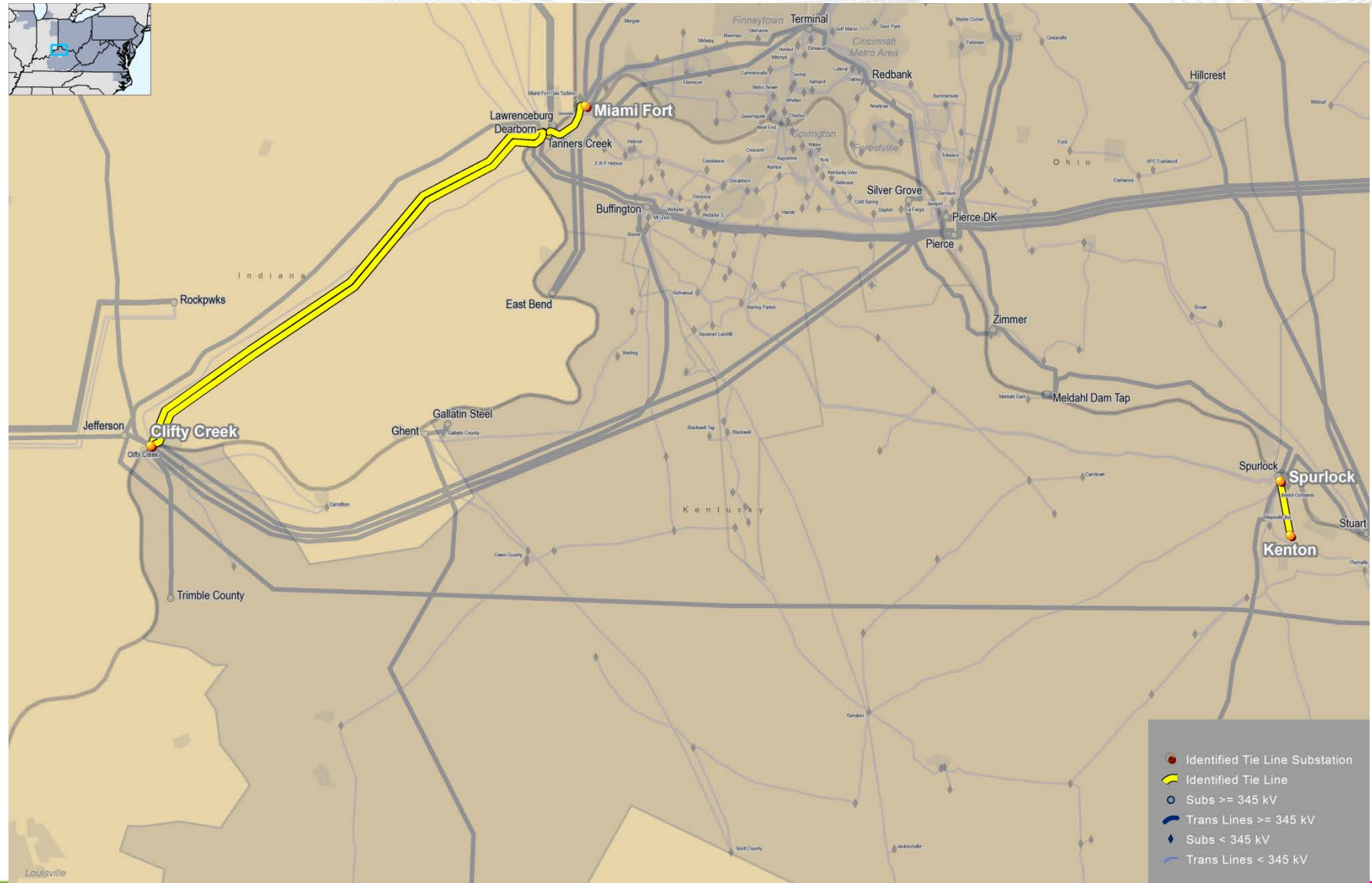


# Contingency OL on Dominion/CPLE Battleboro-Rocky Mount 115 kV Tie





# Contingency OL on OVEC/DEOK Clifty Ck - Miami Fort 138 kV and LGEE/EKPC Kenton - Spurlock 138 kV Ties



- LGE/KU
  - ✓ Bluegrass
  - ✓ LTFTS
  - ✓ Trimble County – Clifty Creek
  - ✓ Duff-Rockport-Coleman
  
- TVA
  - ✓ Summer Shade
  
- Other

- 4/20/2016 – PJM Webcast Review of 2016 RTEP Window #1 recommendation
- 5/5/2016
  - In-person PJM TEAC meeting
  - Provide final recommendation
  - Review of ongoing 2016 RTEP Windows preliminary analysis
- July 2016 – Recommendation to the PJM Board for all 2016 RTEP Window #1 recommended solutions reviewed with the PJM TEAC
- Ongoing analysis/discussion – “other items” list

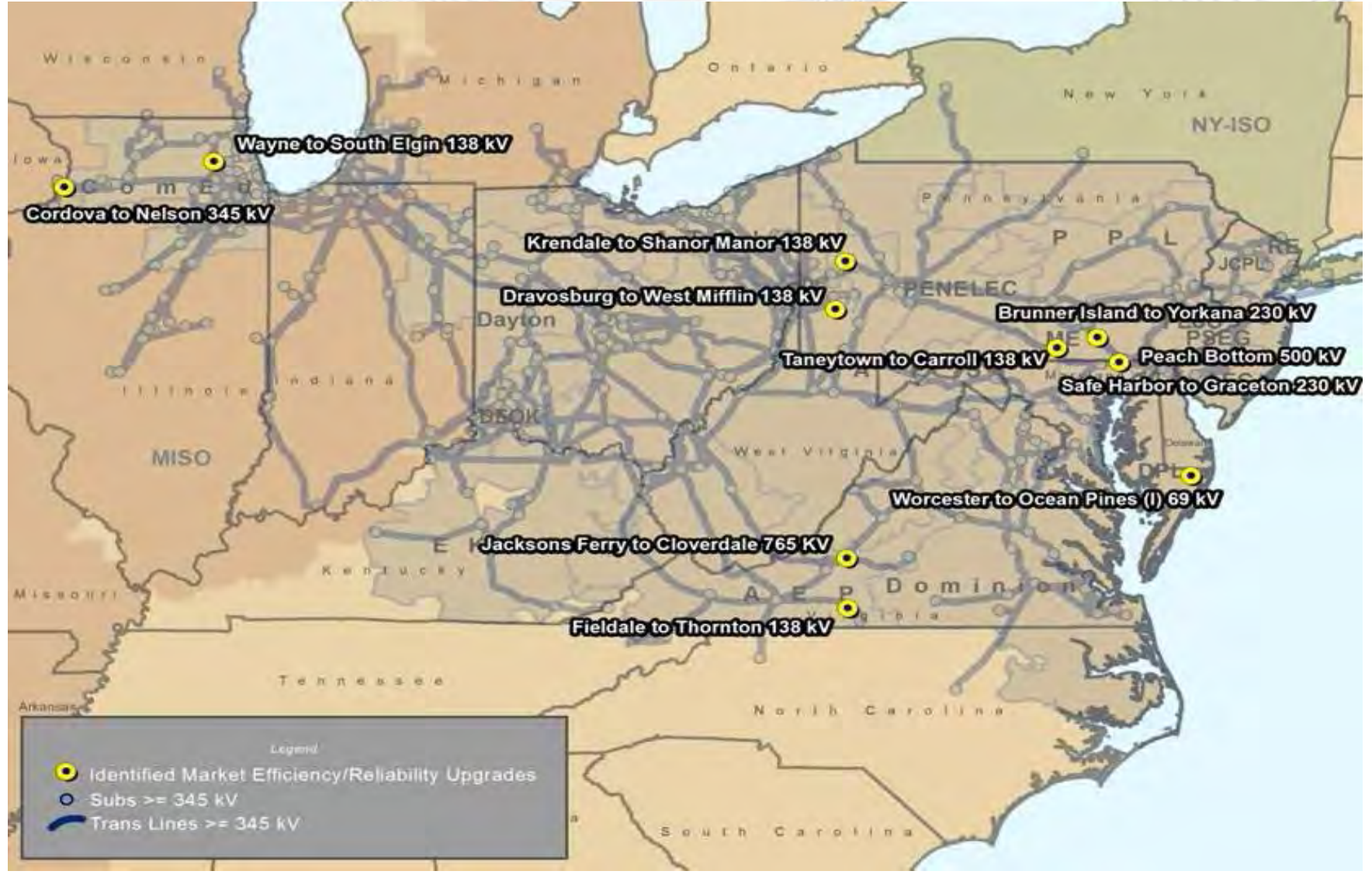


# 2014/15 RTEP Long-Term Proposal Window Drivers

<i>Facilities Recommended for Proposals: Criteria (Lower voltage &gt; \$1 million for 2019 and 2022, Regional &gt; \$10 million for 2019 and 2022, Frequency &gt; 25 hours)</i>			<i>2019 Input Assumptions with 2019 Topology</i>		<i>2022 Input Assumptions with 2019 Topology</i>	
Facility Name	AREA	TYPE	Frequency (Hours)	Market Congestion (\$ Millions)	Frequency (Hours)	Market Congestion (\$ Millions)
AP SOUTH L/O BED-BLA	PJM	INTERFACE	1,799	\$110.2	1,503	\$130.6
Miami Fort to Willey 138 kV	DEO&K	LINE	331	\$22.5	282	\$36.7
Brunner Island to Yorkana 230 kV	ME - PPL	LINE	1,073	\$36.7	937	\$39.0
AEP-DOM L/O BED-BLA	PJM	INTERFACE	527	\$22.7	575	\$34.2
Worcester to Ocean Pines (I) 69 kV	DP&L	LINE	112	\$23.9	116	\$27.0
Safe Harbor to Graceton 230 kV	PPL - BGE	LINE	357	\$7.9	237	\$5.2
Taneytown to Carroll 138 kV	AP	LINE	2,163	\$33.4	1,668	\$20.3
Cordova to Nelson 345 kV	CE	LINE	414	\$9.5	329	\$12.9
Lorreto to Wilton CTR 345 kV	CE	LINE	52	\$2.9	113	\$8.2
Fieldale to Thornton 138 kV	AEP	LINE	91	\$2.2	186	\$9.0
Dravosburg to West Mifflin 138 kV	DLCO	LINE	567	\$4.7	589	\$7.1
Woodville to 15USAP 138 kV	DLCO	LINE	131	\$1.7	218	\$4.7



# October 2015 Board Approved Market Efficiency Projects





# Dominion Replacement for Existing Facilities Criteria

- PJM and DOM are prioritizing End of Life facilities to determine the reliability impacts due to the End of Life Facilities and are evaluating the need for Proposal Windows

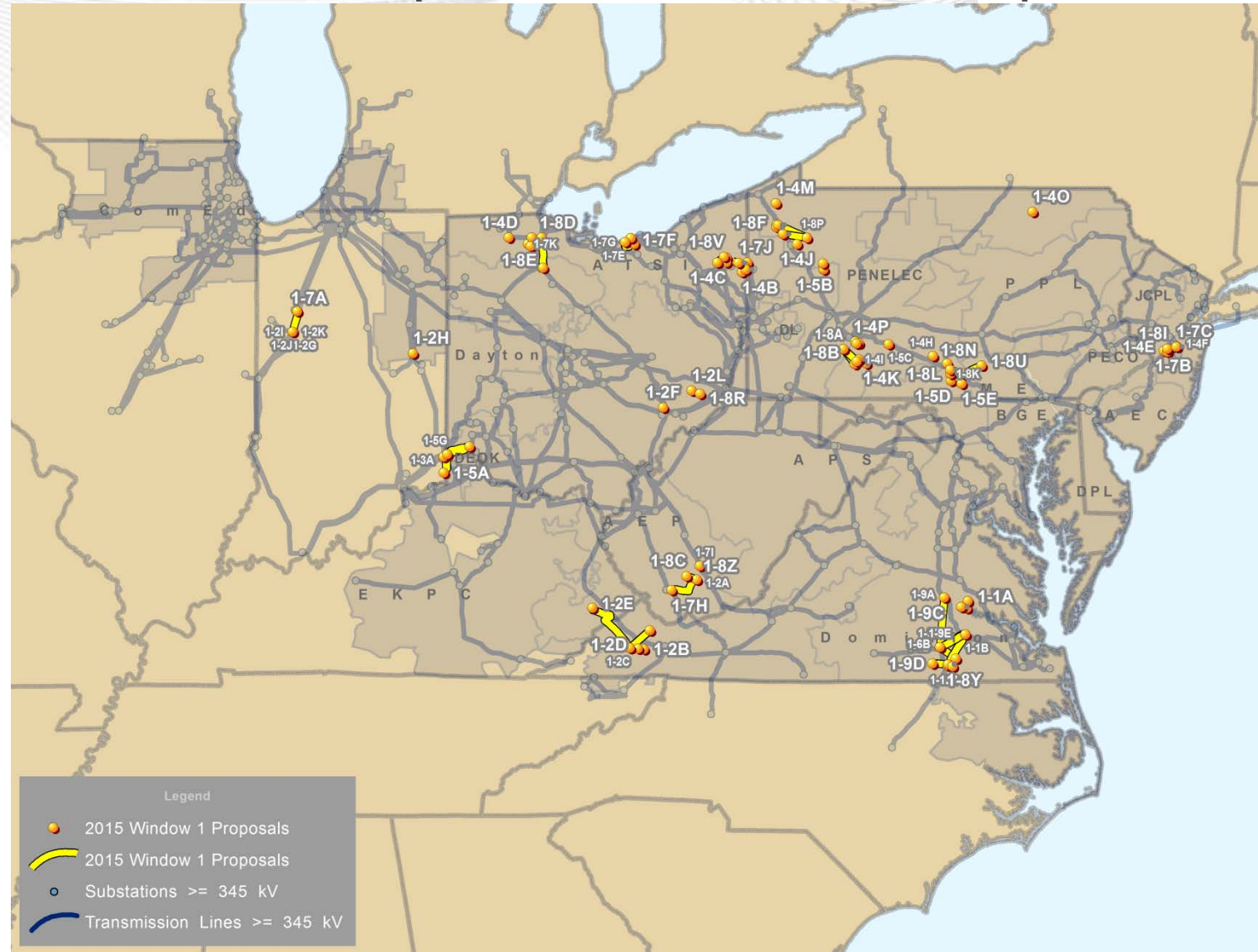
End of Life Facilities Summary		
Voltage Level (kV)	# of facilities	Line Length Range (mi.)
115	26	2.76 - 33.27
138	1	14.94
230	54	1.24 - 55.46
500	25	1.96 - 109



# 2015 RTEP Proposal Window # 1



- 292 flow gates addressed
- 9 proposing entities
- 91 proposals
  - 26 Transmission Owner Upgrades
    - Cost range of \$0.013M to \$73M
  - 64 Greenfield Projects
    - Cost range of \$6M to \$167.1M
  - 1 Modeling Correction
- 6 target zones







# Complete List of 2015 RTEP Window # 1 – Proposed Projects

Project ID	Upgrade/Greenfield	Final Project Cost (\$M)	Target Zone(s)	Reliability Criteria Violation Test Procedure Type
2015_1-1A	Upgrade	17.54	Dominion	Gen Deliv
2015_1-1B	Upgrade	73	Dominion	Gen Deliv
2015_1-1C	Greenfield	106.3	Dominion	Gen Deliv
2015_1-1D	Greenfield	78.9	Dominion	Gen Deliv
2015_1-1E	Greenfield	53.4	Dominion	Gen Deliv
2015_1-1F	Greenfield	67	Dominion	Gen Deliv
2015_1-2A	Upgrade	5.36	AEP	N-1-1 Thermal; N-1-1 Voltage Drop
2015_1-2B	Upgrade	1.25	AEP	Gen Deliv
2015_1-2C	Upgrade	2.5	AEP	Gen Deliv
2015_1-2D	Greenfield	38.5	AEP	Gen Deliv
2015_1-2E	Greenfield	95	AEP	Gen Deliv
2015_1-2F	Upgrade	0.144	AEP	N-1; Gen Deliv
2015_1-2G	Greenfield	25.6	AEP	Gen Deliv
2015_1-2H	Upgrade	10.6	AEP	Gen Deliv
2015_1-2I	Upgrade	27.5	AEP	Gen Deliv
2015_1-2J	Upgrade	26.6	AEP	Gen Deliv
2015_1-2K	Upgrade	5.1	AEP	Gen Deliv
2015_1-2L	Greenfield	25.82	AEP	N-1-1 Thermal; N-1-1 Voltage Magnitude; N-1-1 Voltage Drop
2015_1-3A	Upgrade	5.95	AEP/DEOK	Gen Deliv
2015_1-4A	Upgrade	5.1	ATSI	Gen Deliv
2015_1-4B	Upgrade	1.015	ATSI	N1-VM; N-1 Voltage Drop
2015_1-4C	Upgrade	4.6	ATSI	N-1-1 Thermal
2015_1-4D	Modeling Correction	N/A	ATSI	N-1 Voltage Drop



# Complete List of 2015 RTEP Window # 1 - Proposed Projects

Project ID	Upgrade/Greenfield	Final Project Cost (\$M)	Target Zone(s)	Reliability Criteria Violation Test Procedure Type
2015_1-4E	Upgrade	5.924	JCPL	N-1-1 Voltage Drop
2015_1-4F	Upgrade	1.5	JCPL	N-1 Voltage Drop; N-1 Voltage Magnitude; N-1-1 Voltage Magnitude; N-1-1 Voltage Drop
2015_1-4G	Upgrade	0.013	APS	Gen Deliv
2015_1-4H	Upgrade	2.5	Penelec	N-1-1 Voltage Drop
2015_1-4I	Upgrade	0.725	Penelec	N-1-1 Voltage Magnitude; N-1-1 Voltage Drop
2015_1-4J	Upgrade	0.383	Penelec	N-1-1 Voltage Magnitude; N-1-1 Voltage Drop
2015_1-4K	Upgrade	1.5	Penelec	N-1-1 Voltage Magnitude; N-1-1 Voltage Drop
2015_1-4L	Upgrade	1.518	Penelec	N-1-1 Voltage Drop
2015_1-4M	Upgrade	2.066	Penelec	N-1 Voltage Drop
2015_1-4N	Upgrade	1.419	Penelec	N-1 Voltage Drop
2015_1-4O	Upgrade	13.25	Penelec	N-1 Voltage Drop
2015_1-4P	Upgrade	0.6	Penelec	N-1 Thermal; Gen Deliv
2015_1-5A	Greenfield	15.3	AEP/DEOK	Gen Deliv
2015_1-5B	Greenfield	11.4	APS/Penelec	N-1-1 Voltage Drop
2015_1-5C	Greenfield	21.4	Penelec/Met ed	N-1, Gen Deliv, N-1-1 Voltage Magnitude, N-1-1 Voltage Drop
2015_1-5D	Greenfield	22.9	APS/Penelec	N-1-1 Voltage Drop
2015_1-5E	Greenfield	16.818	APS/Penelec	N-1-1 Voltage Drop
2015_1-5F	Greenfield	65.3	Dominion	Gen Deliv
2015_1-5G	Greenfield	19.3	AEP/DEOK	Gen Deliv
2015_1-6A	Greenfield	105	Dominion	Gen Deliv
2015_1-6B	Greenfield	51	Dominion	Gen Deliv
2015_1-6C	Greenfield	61.8	Dominion	Gen Deliv
2015_1-7A	Greenfield	34.2	AEP	Gen Deliv



# Complete List of 2015 RTEP Window # 1 - Proposed Projects

Project ID	Upgrade/Greenfield	Final Project Cost (\$M)	Target Zone(s)	Reliability Criteria Violation Test Procedure Type
2015_1-7B	Greenfield	39.8	JCPL	N-1 Voltage Drop; N-1 Voltage Magnitude; N-1-1 Voltage Magnitude; N-1-1 Voltage Drop
2015_1-7C	Greenfield	48.5	JCPL	N-1 Voltage Drop; N-1 Voltage Magnitude; N-1-1 Voltage Magnitude; N-1-1 Voltage Drop
2015_1-7D	Greenfield	47.5	Dominion	Gen Deliv
2015_1-7E	Greenfield	16.5	ATSI	Gen Deliv
2015_1-7F	Greenfield	19.1	ATSI	Gen Deliv
2015_1-7G	Greenfield	39	ATSI	Gen Deliv
2015_1-7H	Greenfield	135.8	AEP	N-1-1 Thermal
2015_1-7I	Greenfield	61.6	AEP	N-1-1 Thermal; N-1-1 Voltage Magnitude; N-1-1 Voltage Drop
2015_1-7J	Greenfield	18.5	ATSI	N-1 Voltage Magnitude
2015_1-7K	Greenfield	17.9	ATSI	N-1 Voltage Drop
2015_1-8A	Greenfield	59.4	Penelec	N-1 Voltage Drop; N-1-1 Voltage Drop; N-1-1 Voltage Magnitude; N-1 Thermal; Gen Deliv
2015_1-8B	Greenfield	58.1	Penelec	N-1 Voltage Drop; N-1-1 Voltage Drop; N-1-1 Voltage Magnitude; N-1 Thermal; Gen Deliv
2015_1-8C	Greenfield	23	AEP	N-1-1 Voltage Drop; N-1-1 Voltage Magnitude; N-1-1 Thermal
2015_1-8D	Greenfield	20.6	ATSI	N-1 Voltage Drop
2015_1-8E	Greenfield	13.2	ATSI	N-1 Voltage Drop
2015_1-8F	Greenfield	45.3	Penelec	N-1 Voltage Drop; N-1-1 Voltage Drop; N-1-1 Voltage Magnitude
2015_1-8G	Greenfield	45.3	Penelec	N-1 Voltage Drop; N-1-1 Voltage Drop; N-1-1 Voltage Magnitude
2015_1-8H	Greenfield	29.9	Penelec	N-1 Voltage Drop; N-1-1 Voltage Drop; N-1-1 Voltage Magnitude
2015_1-8I	Greenfield	17.1	JCPL	N-1 Voltage Drop; N-1 Voltage Magnitude; N-1-1 Voltage drop; N-1-1 Voltage magnitude
2015_1-8J	Greenfield	26	JCPL	N-1 Voltage Drop; N-1 Voltage Magnitude; N-1-1 Voltage drop; N-1-1 Voltage magnitude
2015_1-8K	Greenfield	21.5	Penelec	N-1-1 Voltage Drop
2015_1-8L	Greenfield	22.2	Penelec	N-1-1 Voltage Drop
2015_1-8M	Greenfield	21.7	Penelec	N-1-1 Voltage Drop



# Complete List of 2015 RTEP Window # 1 - Proposed Projects

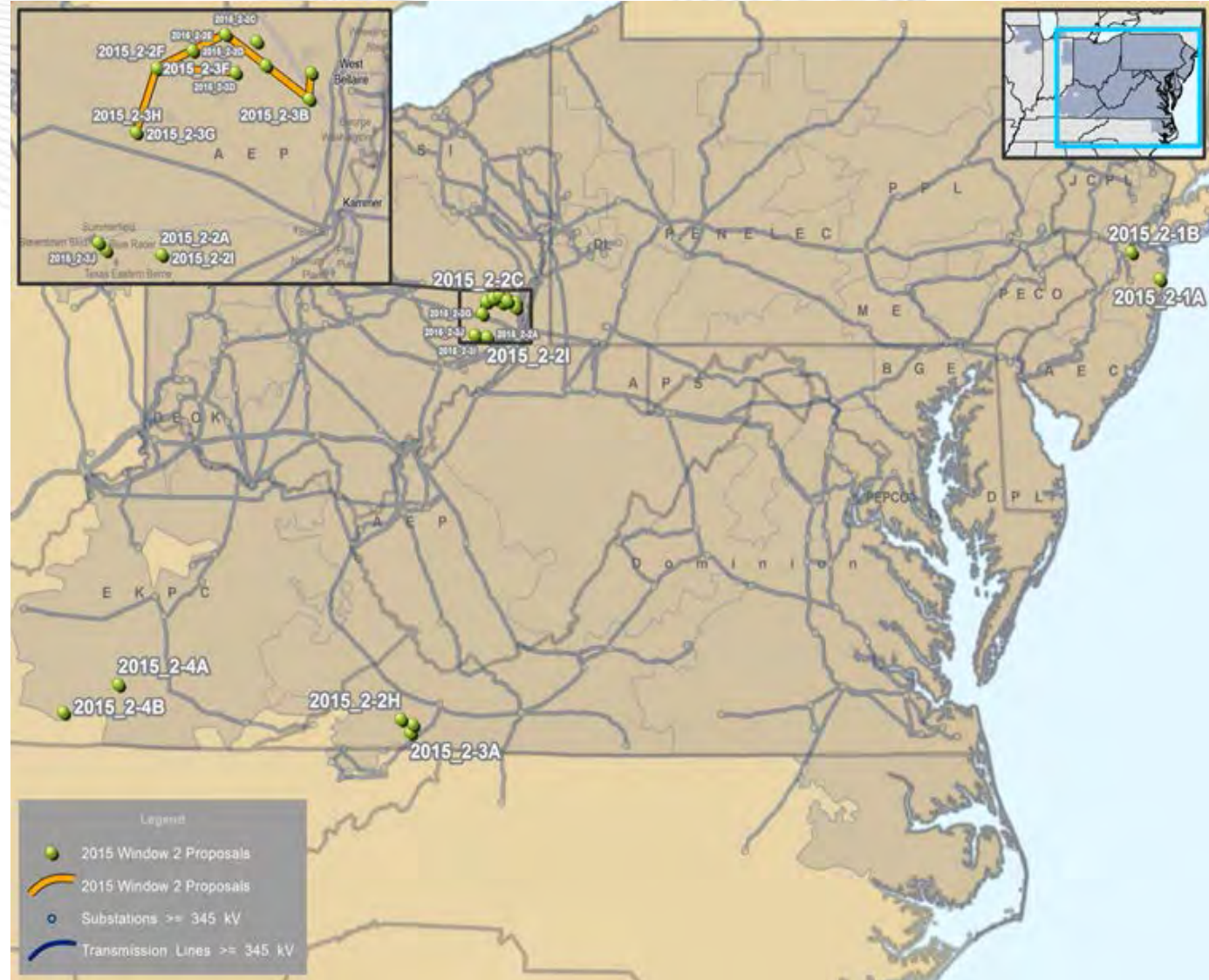
Project ID	Upgrade/Greenfield	Final Project Cost (\$M)	Target Zone(s)	Reliability Criteria Violation Test Procedure Type
2015_1-8N	Greenfield	22.3	Penelec	N-1-1 Voltage Drop
2015_1-8O	Greenfield	45.3	Penelec	N-1 Voltage Drop; N-1-1 Voltage Drop; N-1-1 Voltage Magnitude
2015_1-8P	Greenfield	45.4	Penelec	N-1 Voltage Drop; N-1-1 Voltage Drop; N-1-1 Voltage Magnitude
2015_1-8Q	Greenfield	30	Penelec	N-1 Voltage Drop; N-1-1 Voltage Drop; N-1-1 Voltage Magnitude
2015_1-8R	Greenfield	7.4	AEP	N-1-1 Voltage Drop; N-1-1 Voltage Magnitude; N-1-1 Thermal
2015_1-8S	Greenfield	15.6	Dominion	Gen Deliv
2015_1-8T	Greenfield	16.9	Penelec	N-1-1 Voltage Drop
2015_1-8U	Greenfield	32.3	Penelec	N-1-1 Voltage Drop
2015_1-8V	Greenfield	19.6	ATSI	N-1-1 Thermal
2015_1-8W	Greenfield	29.4	Dominion	Gen Deliv
2015_1-8X	Greenfield	78.7	Dominion	Gen Deliv
2015_1-8Y	Greenfield	27.8	Dominion	Gen Deliv
2015_1-8Z	Greenfield	19.2	AEP	N-1-1 Voltage Drop; N-1-1 Voltage Magnitude; N-1-1 Thermal
2015_1-8AA	Greenfield	12	ATSI	N-1 Voltage Drop; N-1 Voltage Magnitude
2015_1-8AB	Greenfield	6	ATSI	N-1 Voltage Drop; N-1 Voltage Magnitude
2015_1-8AC	Greenfield	6	ATSI	N-1 Voltage Drop; N-1 Voltage Magnitude
2015_1-8AD	Greenfield	19.4	ATSI	N-1-1 Thermal
2015_1-9A	Greenfield	167.1	Dominion	Gen Deliv
2015_1-9B	Greenfield	118.9	Dominion	Gen Deliv
2015_1-9C	Greenfield	105.7	Dominion	Gen Deliv
2015_1-9D	Greenfield	135.2	Dominion	Gen Deliv
2015_1-9E	Greenfield	94.2	Dominion	Gen Deliv





# 2015 RTEP Proposal Window # 2

- Scope: Transmission Owner Criteria, Light Load Reliability Criteria Violations
  - Opened Wednesday August 5<sup>th</sup>, 2015
  - Closes Friday September 4<sup>th</sup>, 2015\*
    - \*All final cost estimates and greenfield proposals due 9/21/2015





# Complete List of 2015 RTEP Window # 2 - Proposed Projects

Project ID	Upgrade/Greenfield	Final Project Cost (\$M)	Target Zone(s)	Reliability Criteria Violation Test Procedure Type
2015_2-1A	Upgrade	4.065	JCPL	N-1 Thermal
2015_2-1B	Upgrade	2.432	JCPL	N-1 Thermal
2015_2-2A	Greenfield	7.4	AEP	TO Thermal; TO Voltage
2015_2-2B	Greenfield	6.2	AEP	TO Thermal
2015_2-2C	Greenfield	4	AEP	TO Thermal
2015_2-2D	Greenfield	18.4	AEP	TO Thermal; TO Voltage
2015_2-2E	Greenfield	12.6	AEP	TO Thermal; TO Voltage
2015_2-2F	Greenfield	19.8	AEP	TO Thermal; TO Voltage
2015_2-2G	Greenfield	6	AEP	TO Thermal
2015_2-2H	Greenfield	6	AEP	TO Thermal
2015_2-2I	Greenfield	29.7	AEP	TO Thermal; TO Voltage
2015_2-3A	Greenfield	25.19	AEP	N-1 Thermal
2015_2-3B	Upgrade	6.014	AEP	N-1 Thermal
2015_2-3C	Greenfield	24.32	AEP	N-0 Thermal; N-0 Voltage
2015_2-3D	Greenfield	21.9	AEP	N-0 Thermal; N-0 Voltage
2015_2-3E	Greenfield	22.57	AEP	N-0 Thermal; N-0 Voltage
2015_2-3F	Greenfield	14.355	AEP	N-0 Thermal; N-0 Voltage
2015_2-3G	Greenfield	21.9	AEP	N-0 Thermal; N-0 Voltage
2015_2-3H	Greenfield	14.335	AEP	N-0 Thermal; N-0 Voltage
2015_2-3I	Greenfield	25.7	AEP	N-1 Thermal, N-1 Voltage Magnitude
2015_2-3J	Greenfield	17.8	AEP	N-1 Thermal, N-1 Voltage Magnitude
2015_2-4A	Upgrade	0.4	EKPC	N-1 Voltage Magnitude
2015_2-4B	Upgrade	0.075	EKPC	N-1 Thermal

# Additional Information





# 2014/15 Long-Term Window Recommended Projects from Groups 2 through 19

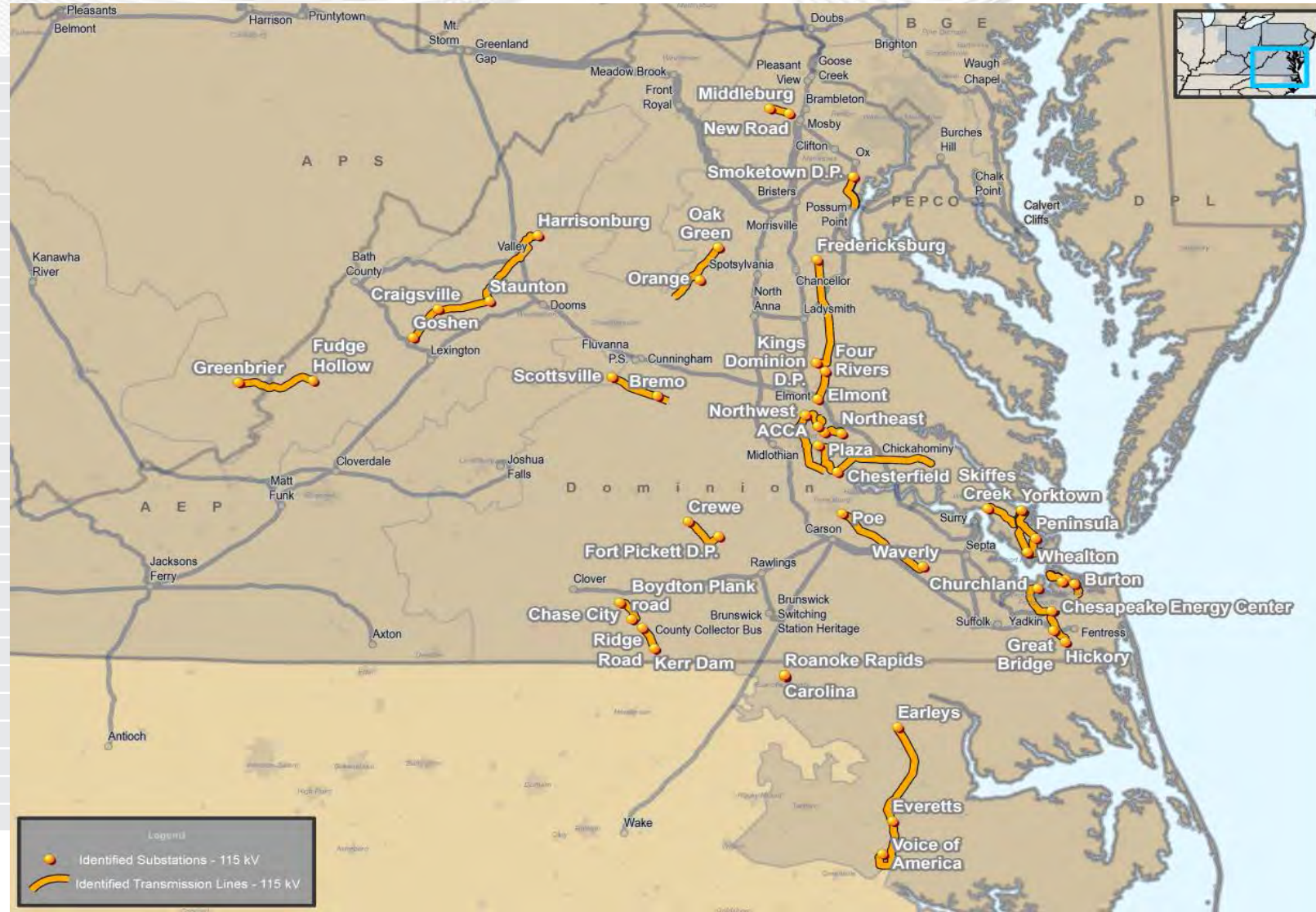
Group	Project ID	Area	Constraint	Cost (\$millions)	Type	In-service date	B/C 2014 Base	B/C 2015 Sensitivity	Does Project address congestion on Driver?
Group 4	201415_1-18G	APS	Taneytown to Carroll 138 kV	5.2	Upgrade	2019	55.7	90.1	Yes
Group 5	201415_1-12A	DUQ	Dravosburg to West Mifflin 138 kV	11.18	Upgrade	2018	5.8	2.0	Yes
Group 8	201415_1-2A	PPL - BGE	Safe Harbor to Graceton 230 kV	1.1	Upgrade	2019	4.3	14.4	Yes
Group 8	201415_1-2B	ME - PPL	Brunner Island to Yorkana 230 kV	3.1	Upgrade	2019	73.3	22.2	Yes
Group 9	201415_1-10J	COMED	Cordova to Nelson 345 kV	24.6	Upgrade	2019	1.7	1.9	Yes
Group 10	201415_1-10B	COMED	Wayne to South Elgin 138 kV	0.1	Upgrade	2019	7.2	6.4	Yes
Group 11	201415_1-11H	PECO	Peach Bottom 500 kV	9.7	Upgrade	2019	2.6	3.0	Yes
Group 14	201415_1-13E	DPL	Worcester to Ocean Pines (I) 69 kV	2.4	Upgrade	2019	82.7	65.3	Yes
Group 15	201415_1-18I	APS/ATSI	Krendale to Shanor Manor 138 kV	0.6	Upgrade	2019	35.8	123.4	Yes
Group 18	201415_1-4I	AEP	Fieldale to Thornton 138 kV	0.75	Upgrade	2019	114.2	101.2	Yes
Group 19	201415_1-4J	AEP	Jacksons Ferry to Cloverdale 765 KV	0.5	Upgrade	2019	15.8	62.0	Yes

# Dominion Local TO Criteria – Replacement for Existing Facilities



Line	Voltage	Length (mi.)
Carolina-Roanoke Rapids Hydro	115	2.76
Acca-Lakeside	115	3.21
Poe-Waverly	115	5.5
Northeast-Carver	115	6.03
Great Bridge-Hickory	115	6.28
Northwest-Acca	115	6.66
Wheaton-Peninsula	115	7.51
Portsmouth-Great Bridge	115	8.36
Elmont-Four Rivers	115	8.97
New Road-Middleburg	115	9.75
Kerr Dam-Ridge Road	115	9.88
Yorktown-Peninsula	115	11.12
Chase City-Boydton Plank	115	11.41
Portsmouth-Greenwich	115	11.51
Chesterfield 115-Plaza	115	14.18
Bremo-Scottsville Inter	115	14.46
Portsmouth-Churchland	115	14.61
Earleys-Everetts	115	16.58
Yorktown-Wheaton	115	17.44
Staunton - Craigs ville (Radial)	115	19.32
Staunton-Craigs ville	115	20.62
Goshen-Craigs ville	115	21.24
Staunton-Harrisonburg	115	22.78
Str 551-Str 706	115	25.14
Northwest-Chesterfield 115	115	25.33
Chesterfield 115-Lanexa	115	33.27
Fudge Hollow-Greenbrier Inter	138	14.94

\*End of life Facility List has not changed since previously reviewed at January 2015 TEAC





Line	Voltage	Length (mi.)
280 Marsh Run Ct 1 Remington 11 Va	230	1.24
210 Hayfield 1A Van Dorn 22 Va	230	2.9
2039 Morrisville 1A Marsh Run Ct 22 Va	230	3.92
239 Lakeview 58 Hornertown 90 Nc	230	4.06
216 Lakeside 1B Elmont 41 Va	230	5.74
221 Northwest 1A Elmont 34E Va	230	5.92
201 Brambleton 26A Pleasant View A Va	230	7.97
231 Yadkin 1A Landstown 103L Va	230	8.54
213 Thelma 1A Carolina 70 Nc	230	8.62
295 Loudoun 1A Bull Run 45A Va	230	8.67
2058 Edgcombe Nug 1A Rocky Mount Inter 34A Nc	230	9.34
2049 Chesterfield 230 1A Allied 75A Va	230	9.95
253 Harrisonburg 1A Valley 66 Va	230	10.58
204 Gum Springs 1A Jefferson St 86 Va	230	10.8
211 Chesterfield 230 1B Hopewell 71A Va	230	11.17
272 Dooms 115 1A Grottoes 80 Va	230	11.53
252 Fredericksburg 5397 Possum Point 5589 Va	230	11.85
205 Chesterfield 230 1B Locks 84 Va	230	12.23
259 Basin 1A Chesterfield 230 106A Va	230	12.4
2001 Possum Point 1A Occoquan 76 Va	230	12.61
2002 Carson 1A Poe 106A Va	230	12.68
283 Northeast 1A Elmont 91A Va	230	13.19
2008 Loudoun 1A Dulles 107A Va	230	13.25
262 Greenwich 1B Yadkin 87 Va	230	13.55
265 Clifton 1 Sully 108 Va	230	14.01
2024 Chickahominy 105A Lanexa 190 Va	230	14.26
Lanexa-Waller	230	14.52



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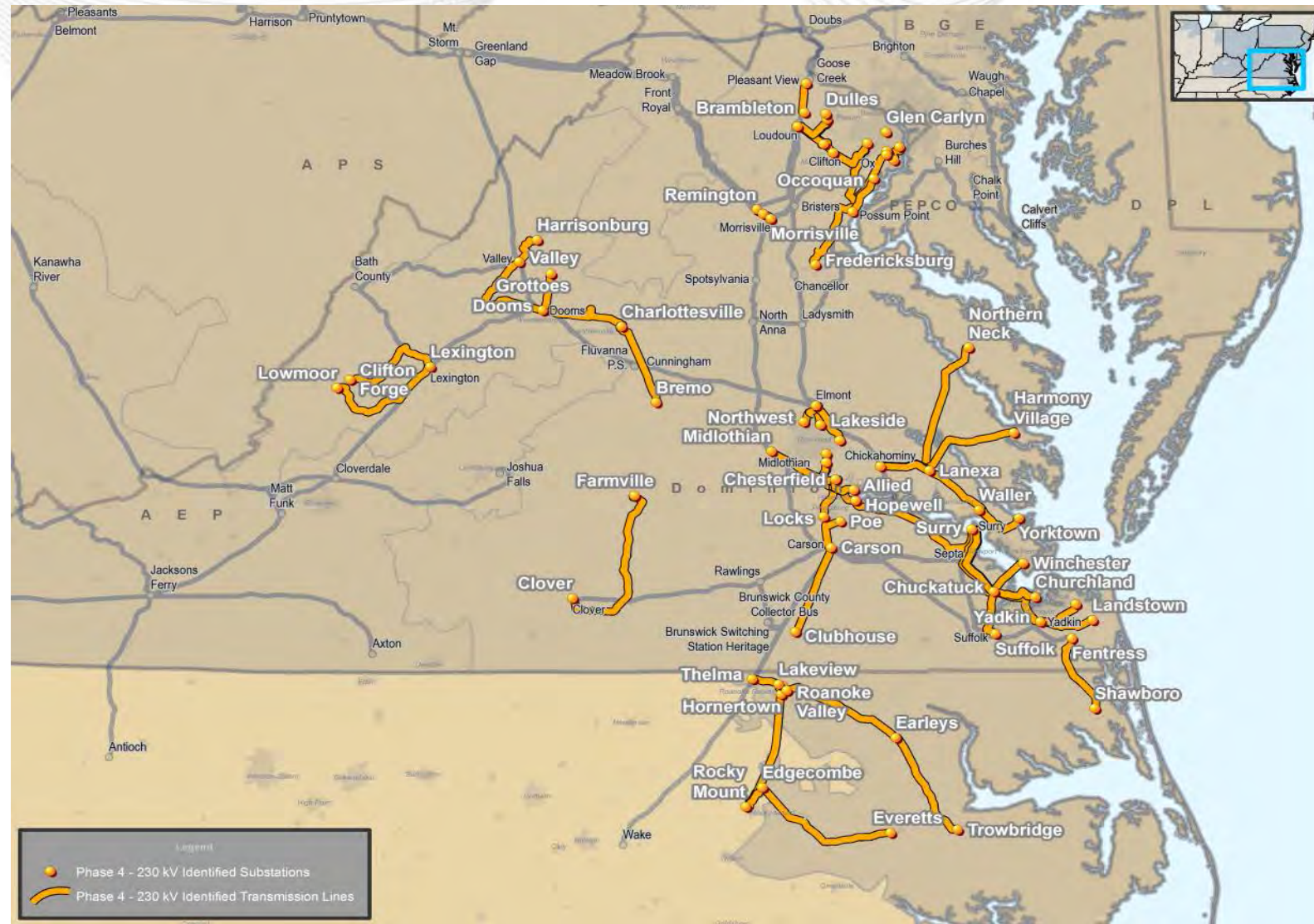




# Dominion End Of Life Facilities

Line	Voltage	Length (mi.)
289 Suffolk 1B Chuckatuck 92 Va	230	14.62
229 Everetts 1A Edgecombe Nug 372 Nc	230	16.4
285 Waller 362A Yorktown 490 Va	230	19.96
215 Possum Point 1A Hayfield 127 Va	230	21.02
Chesterfield 230-Lakeside	230	21.32
282 Midlothian Mw 1D Spruance Nug 148A Va	230	21.59
237 Possum Point 1A Braddock 147 Va	230	21.99
233 Charlottesville 1A Doods 115 149 Va	230	22.66
266 Clifton 59 Glen Carlyn 251 Va	230	24.66
269 Fentress 1A - Shawboro	230	25.33
2028 Charlottesville 1A Bremo 186A Va	230	25.54
238 Carson 1A Clubhouse 264 Va	230	28.55
2102 Chickahominy 139A Waller 362B Va	230	28.68
2016 Lanexa 1B Harmony Village 213 Va	230	31.03
2052 Lexington 1 Clifton Forge 197 Va	230	33.42
293 Doods 115 1A Valley 261 Va	230	33.97
2034 Earleys 1A Trowbridge 281 Nc	230	35.06
2084 Lexington 1A Lowmoor 224 Va	230	37.37
2056 Hornertown 89 Rocky Mount Inter 351 Nc	230	37.63
214 Winchester 1A Surry 200 Va	230	37.64
2012 Roanoke Valley Nug 1 Earleys 269 Nc	230	37.7
226 Surry 1A Churchland 216 Va	230	37.74
224 Northern Neck 1B Lanexa 306 Va	230	41.27
212 Surry 1A Hopewell 240A Va	230	42.97
223 Yadkin 86A Surry 338 Va	230	44.09
246 Suffolk 1C - Earlys	230	49.77
235 Farmville 1A Clover 436 Va	230	55.46

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Line	Voltage	Length (mi.)
580 Meadowbrook Inter 1 Morrisville 248 Va	500	1.96
561 Clifton 64A Ox 101 Va	500	7.05
545 Bristers 113 Morrisville 159 Va	500	7.9
578 Surry 1A Septa 61 Va	500	11.46
559 Loudoun 1 Clifton 64 Va	500	12.08
573 North Anna 1A Morrisville 182 Va	500	14.02
575 North Anna 1A Ladysmith 79 Va	500	14.53
<b>Valley – Dooks</b>	500	22.56
557 Chickahominy 226A Elmont 359A Va	500	27.73
569 Loudoun 1 - 159 Va	500	31.78
585 Carson 1A - Rodgers Road	500	32.87
579 Septa 1 Fentress 256 Va	500	33.09
Elmont – Ladysmith	500	33.61
547 Bath County 1 Lexington 185 Va	500	34.7
531 Surry 1A Yadkin 255 Va	500	37.27
563 Carson 1A Midlothian 500 209A Va	500	37.41
562 Septa 61 Carson 251A Va	500	38.47
576 North Anna 1A Midlothian 500 209A Va	500	41.13
567 Surry 1A Chickahominy 226A Va	500	44.44
Ladysmith - Bristers	500	46.48
541 Morrisville - Front Royal	500	46.68
568 Possum Point 1A Ladysmith 258 Va	500	47.56
548 Bath County 1 Valley 274 Va	500	51.82
<b>Mt Storm – Valley</b>	500	82.38
570 - Heritage - Wake Intertie (Progress Duke)	500	109

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**Currently at End of Life**

