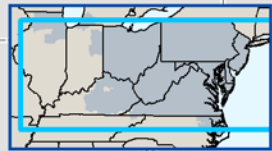
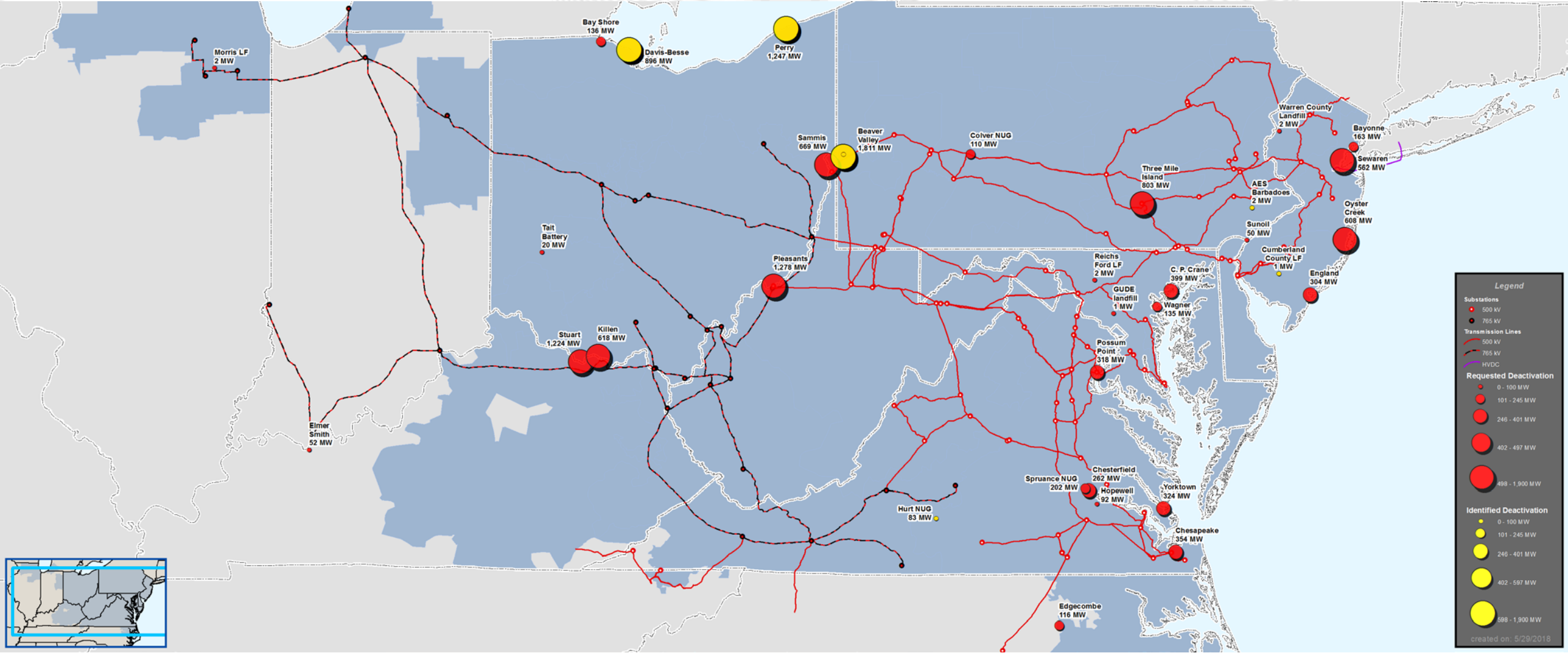




Generation Deactivation Notification Update

Transmission Expansion Advisory
Committee

June 7, 2018

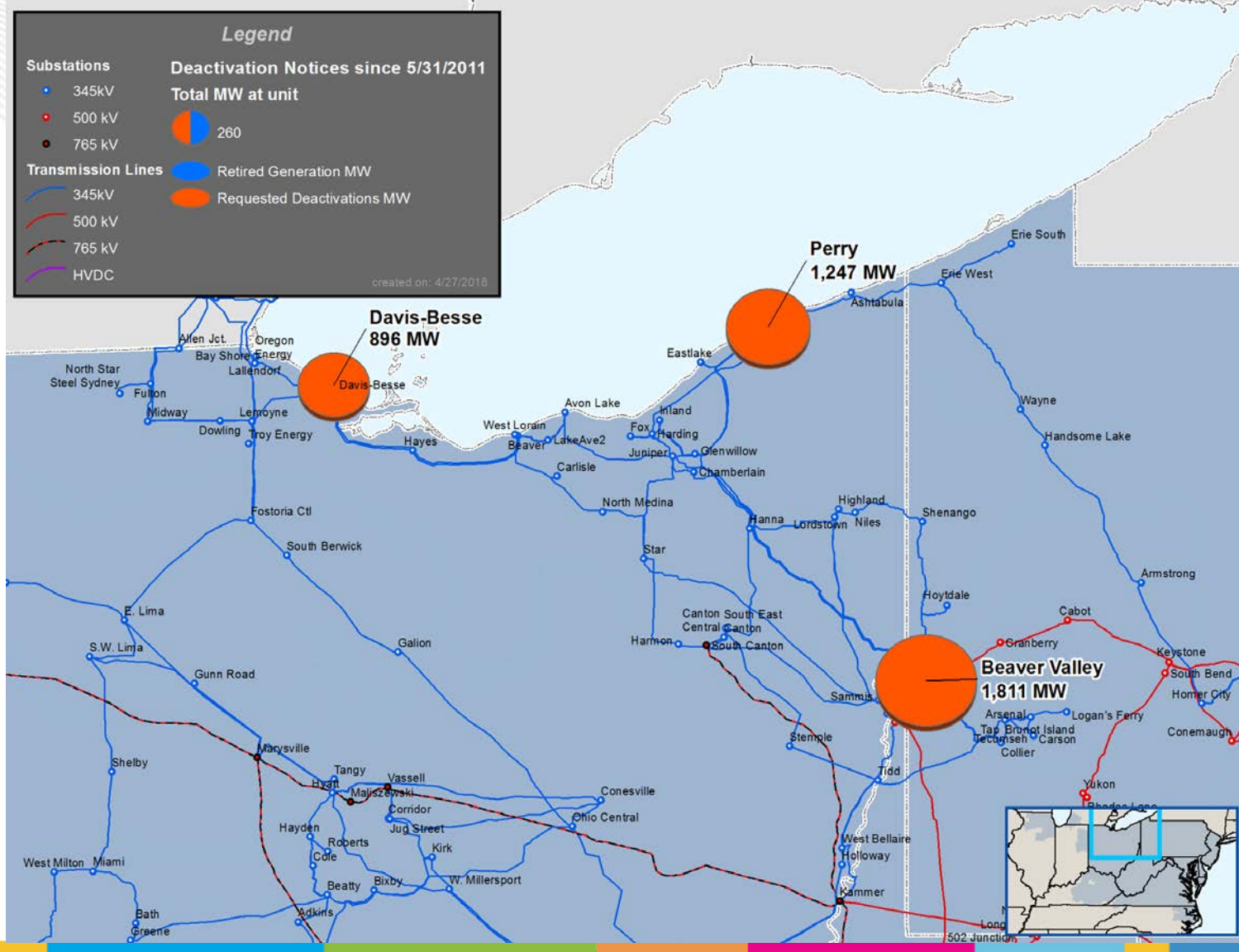


| Unit(s) | Transmission Zone | Requested Deactivation Date | PJM Reliability Status |
|-------------------------------|-------------------|-----------------------------|--|
| Davis Besse Unit 1 (896 MW) | ATSI | 5/31/2020 | Reliability analysis complete. New and existing baselines resolve identified impacts. Units can retire as scheduled. Operational flexibility allows to bridge any delays with the transmission upgrades. |
| Perry Unit 1 (1247 MW) | ATSI | 5/31/2021 | |
| Beaver Valley Unit 1 (909 MW) | DUQ | 5/31/2021 | |
| Beaver Valley Unit 2 (902 MW) | DUQ | 10/31/2021 | |

| Unit(s) | Transmission Zone | Requested Deactivation Date | PJM Reliability Status |
|-------------------------------------|-------------------|-----------------------------|---|
| Cumberland County Landfill (1.6 MW) | ACE | 1/1/2019 | Reliability analysis complete. No impacts |
| Barbados AES Battery (2 MW) | PECO | 7/29/2018 | Reliability analysis complete. No impacts |
| Hurt NUG (83 MW) | Dominion | 7/29/2018 | Reliability analysis complete. No impacts |

ATSI and Duquesne Transmission Zones

- Davis-Besse (5/31/2020)
 - Unit 1 896 MW
- Beaver Valley Unit 1 (5/31/2021)
 - Unit 1 909 MW
- Perry (5/31/2021)
 - Unit 1 (1247 MW)
- Beaver Valley Unit 2 (10/31/2021)
 - Unit 2 902 MW



Problem Statement: Generation Deliverability

- Allenport - Charleroi 138 kV line is overloaded for the following tower contingencies:
 - Loss of Yukon - Charleroi 138 kV and Yukon-Westraver 138 kV lines.
 - Loss of Charleroi - Westraver 138 kV and Charleroi - Yukon 138 kV lines.

Recommended Solution:

- Existing baseline **b2965** - Replace the Charleroi - Allenport 138 kV line with 954 ACSR, and replace breaker Risers at two ends.

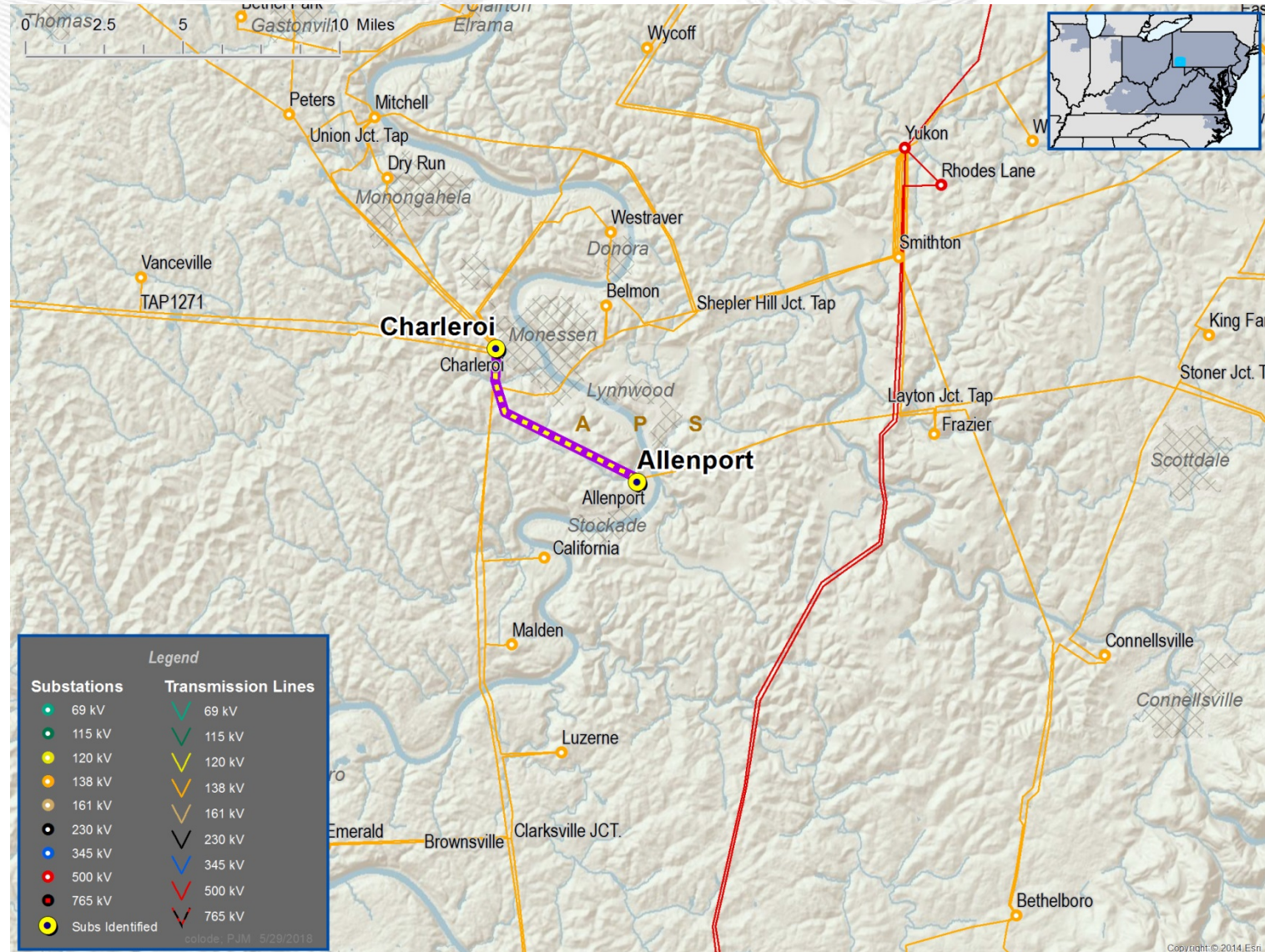
Required IS Date: 06/01/2020

Projected IS Date: 06/01/2021

* Operating measures identified to mitigate reliability impacts in interim

Original Required IS Date: 06/01/2022

Original TEAC Date: 11/02/2017



Problem Statement: Generation Deliverability

- Shanor Manor - Krendale 138 kV and Butler – Shanor Manor 138 kV lines are overloaded for the single contingency tripping Cabot – Cranberry 500 kV line.

Recommended Solution:

- Existing baseline **b2967** - Convert the existing 6 wire Butler - Shanor Manor - Krendale 138 kV Line into two separate 138 kV lines. New lines will be Butler - Keisters and Butler - Shanor Manor - Krendale 138 kV lines .

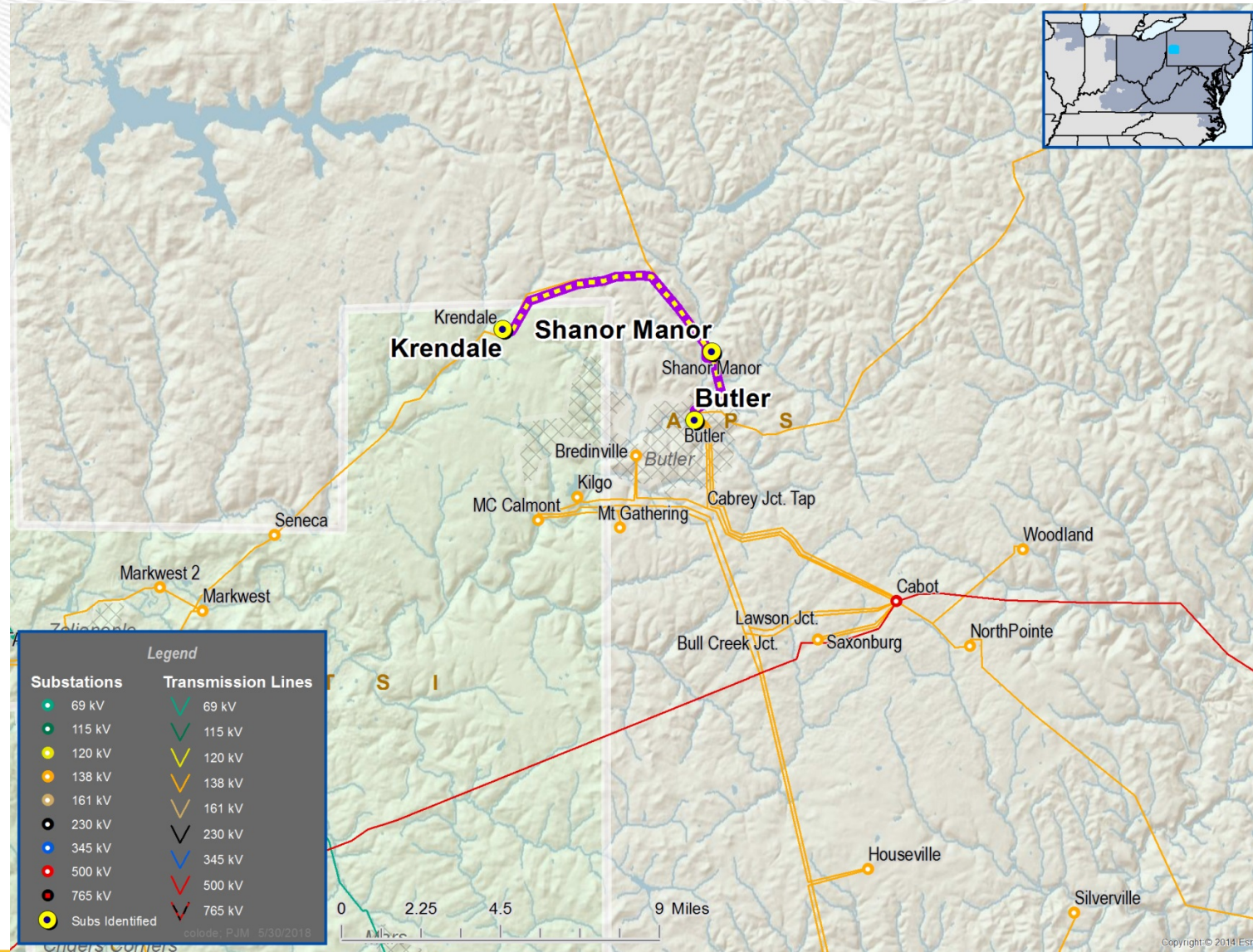
Required IS Date: 06/01/2020

Projected IS Date: 06/01/2021

* Operating measures identified to mitigate reliability impacts in interim

Original Required IS Date: 06/01/2022

Original TEAC Date: 11/02/2017





APS Transmission Zone

Problem Statement: Generation Deliverability

- Yukon-Smithton #62 138 kV and Smithton #62 - Shepler Hill Jct 138 kV lines are overloaded for the following tower contingencies:
- Loss of Yukon - Charleroi 138 kV and Yukon-Westraver 138 kV lines.
- Loss of Charleroi - Westraver 138 kV and Charleroi - Yukon 138 kV lines

Recommended Solution:

- Existing baseline **b2966** – need to rescope with a larger conductor: Reconductor the Yukon-Smithton #62 - Shepler Hill Jct with 954 ACSS, and replace line disconnect switch at Yukon.

Estimated Project Cost: From \$6.2M to \$6.7M

Required IS Date: 06/01/2020

Projected IS Date: 06/01/2021

Project Status: Engineering

* Operating measures identified to mitigate reliability impacts in interim

Original Required IS Date: 06/01/2022

Original TEAC Date: 11/02/2017





PENELEC Transmission Zone

Problem Statement: Generation Deliverability

- Seward - Florence 138 kV line is overloaded for the breaker failure contingency for loss of Shelocta - Keystone 230 kV, Homer CT - Shelocta 230 kV, Shelocta - Blairsville 115 KV, Shelocta - Edgewood 115 kV lines, Shelocta 115/23 kV and Shelocta 230/115 kV transformers.

Recommended Solution:

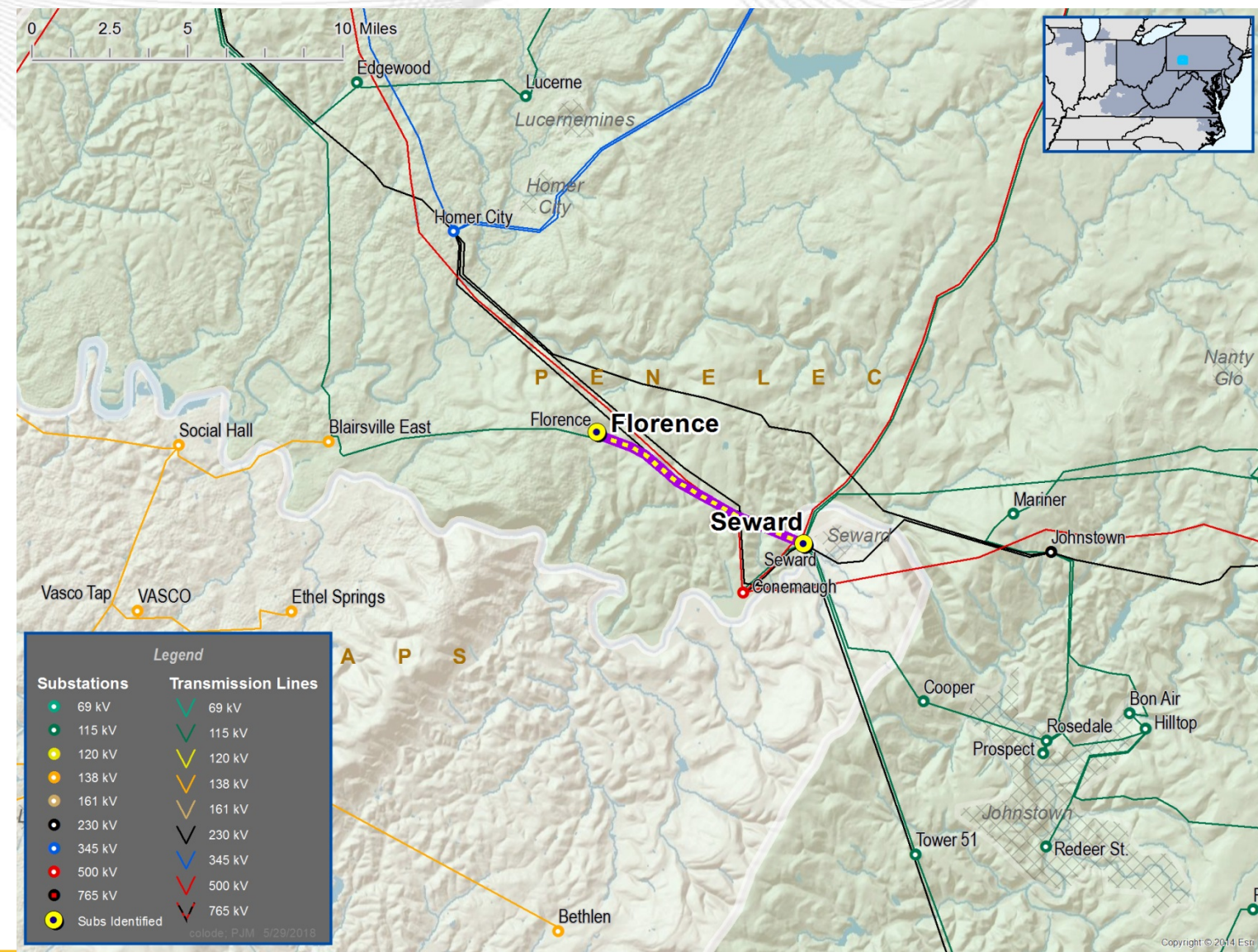
- Existing baseline **b2951.1**, **b2951.2**, and **b2951.3**- Upgrade terminal equipment at Seward SS, replace line tuner, coax, relay and carrier set at Shelocta SS, replace Seward/Shelocta line CVT, tuner, coax, and line relaying at Blairsville East SS.

Required IS Date: 06/01/2020

Projected IS Date: 10/19/2018

Original Required IS Date: 06/01/2022

Original TEAC Date: 10/31/2017



Problem Statement: Generation Deliverability

- Wolf Hills - Keywood 138 kV line is overloaded for the following contingencies:
 - Breaker Failure: Loss of Broadford 765/500 kV transformer, Baker - Broadford 765 kV line, and Sullivan – Broadford 500 kV line.
 - Single: Loss of Loss of Broadford 765/500 kV transformer, and Sullivan – Broadford 500 kV line.

Recommended Solution:

- Existing baseline **b2938** - Perform a sag mitigation on the Broadford – Wolf Hills 138kV circuit to allow the line to operate to a higher maximum temperature.

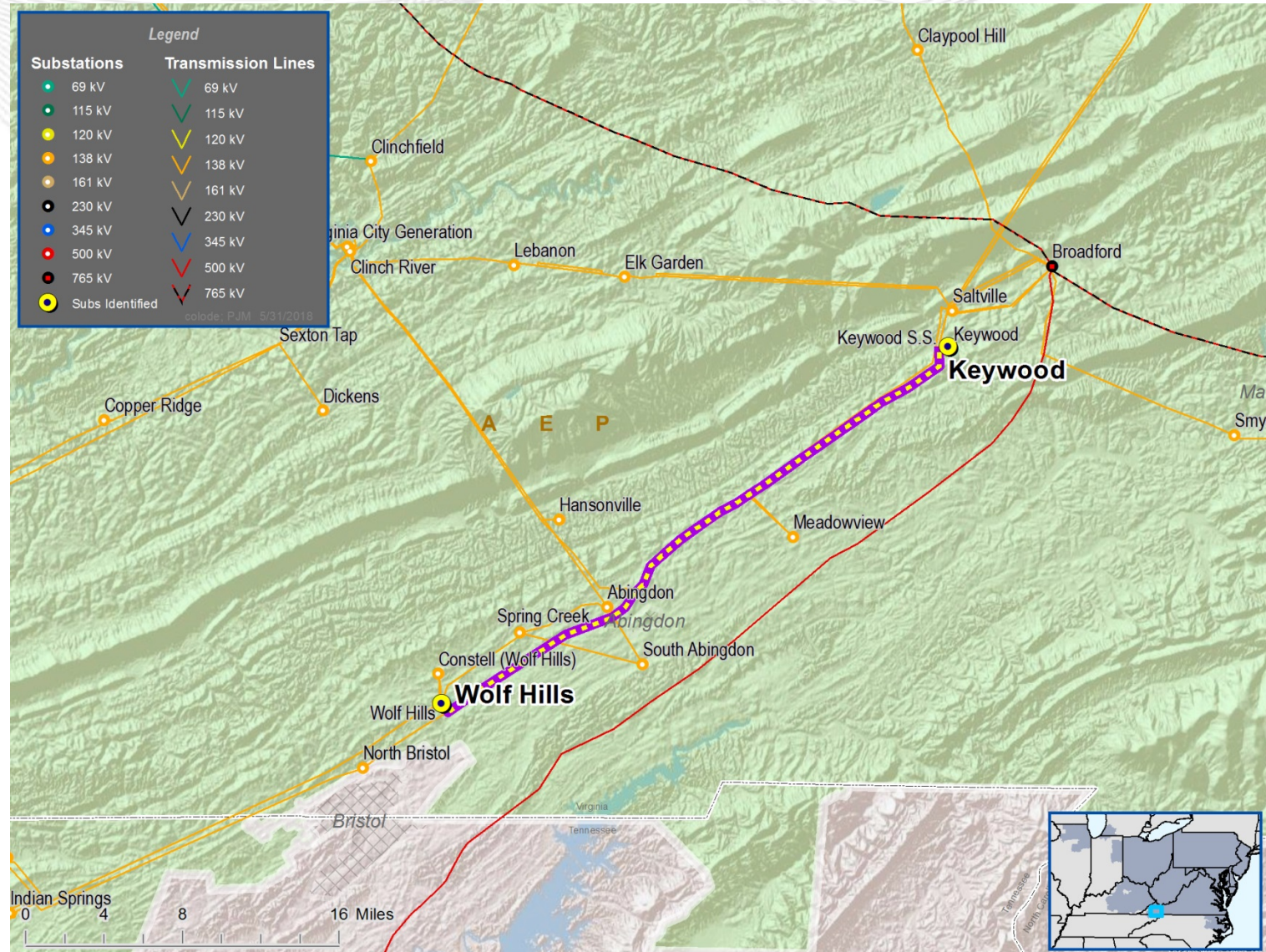
Required IS Date: 06/01/2021

Projected IS Date: 06/01/2022

* Operating measures identified to mitigate reliability impacts in interim

Original Required IS Date: 06/01/2022

Original TEAC Date: 09/11/2017





APS Transmission Zone

Problem Statement: Generation Deliverability

- Keystone - Cabot 500 kV line is overloaded for the single contingency for loss of the Yukon – South Bend 500 kV line.

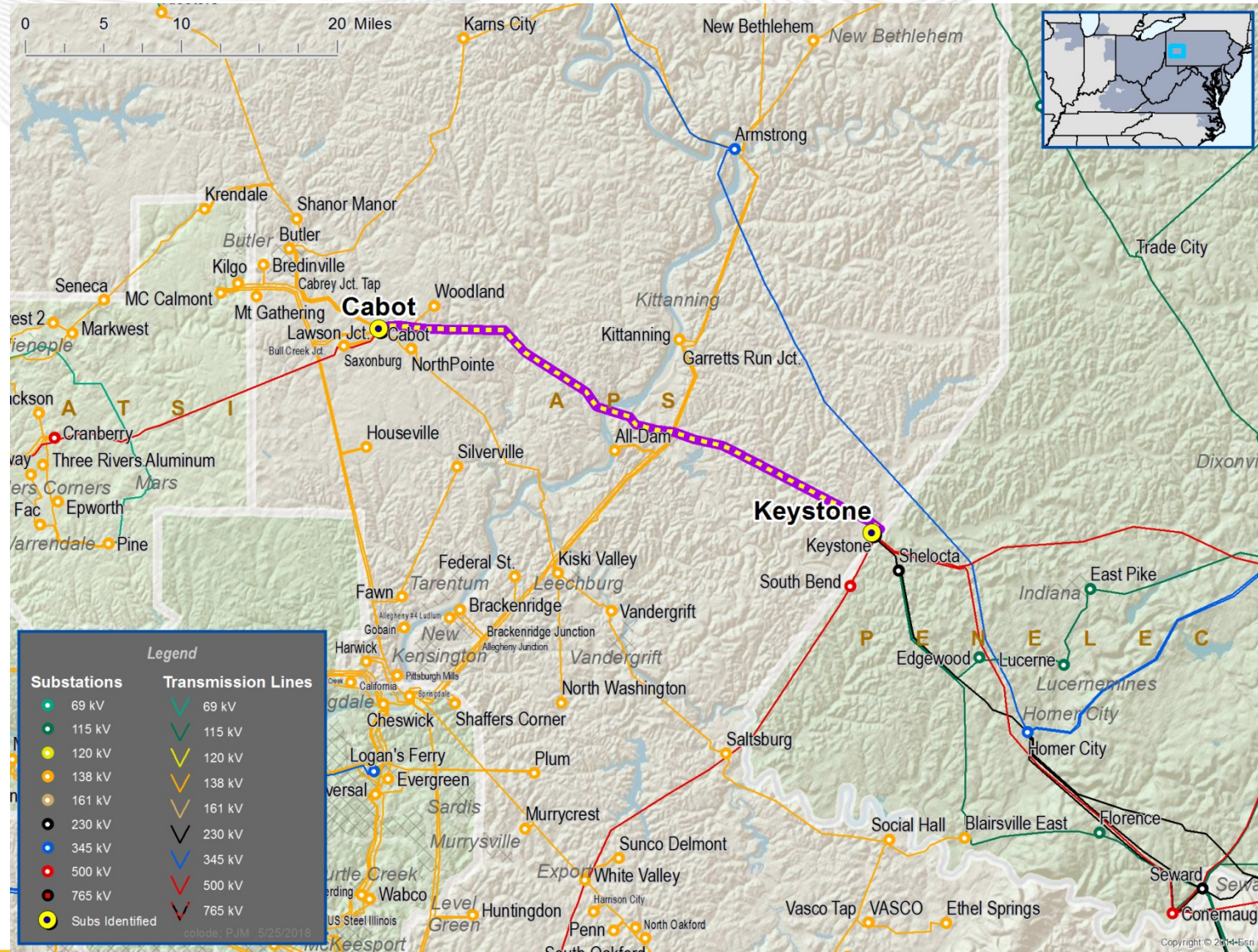
Recommended Solution:

- Replace terminal equipment at both Keystone and Cabot 500kV ends (**b3010: SN 3683 MVA / SE 4514 MVA**)

Estimated Project Cost: \$0.26M

Required IS Date: 06/01/2021

Projected IS Date: 06/01/2021



Problem Statement: Generation Deliverability

- Yukon 500/138 kV #2, #3 and #4 transformers are overloaded for the following bus (first two) and breaker failure contingencies:
 - Loss of the Yukon #1 and #3 transformers
 - Loss of the Yukon #2 and #4 transformers
 - Loss of the Yukon #1 and #3 transformers, and the Yukon - Rhodes Lane 500 kV line
 - Loss of the Yukon #1 and #3 transformers, and the Yukon - Rhodes Lane 500 kV line

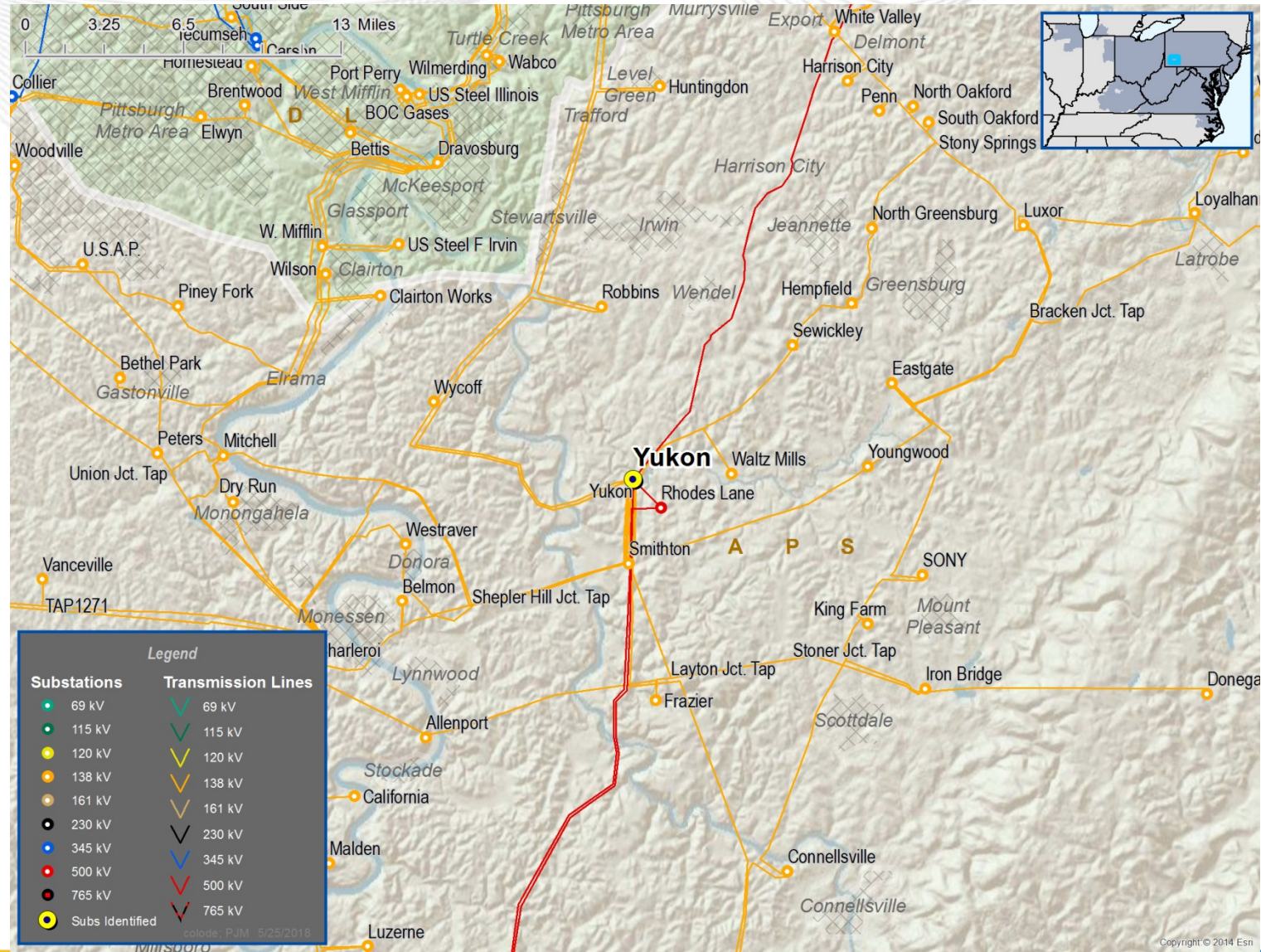
Recommended Solution:

- Replace four Yukon 500/138 kV transformers with three transformers with higher ratings, and reconfigure 500 kV bus (**b3006: SN 1096 MVA / SE 1376 MVA**).

Estimated Project Cost: \$55.65M

Required IS Date: 06/01/2021

Projected IS Date: 06/01/2021



Problem Statement: Generation Deliverability

- Cabot - Butler 138 kV line is overloaded for the single contingency for loss the Yukon – South Bend 500 kV line.

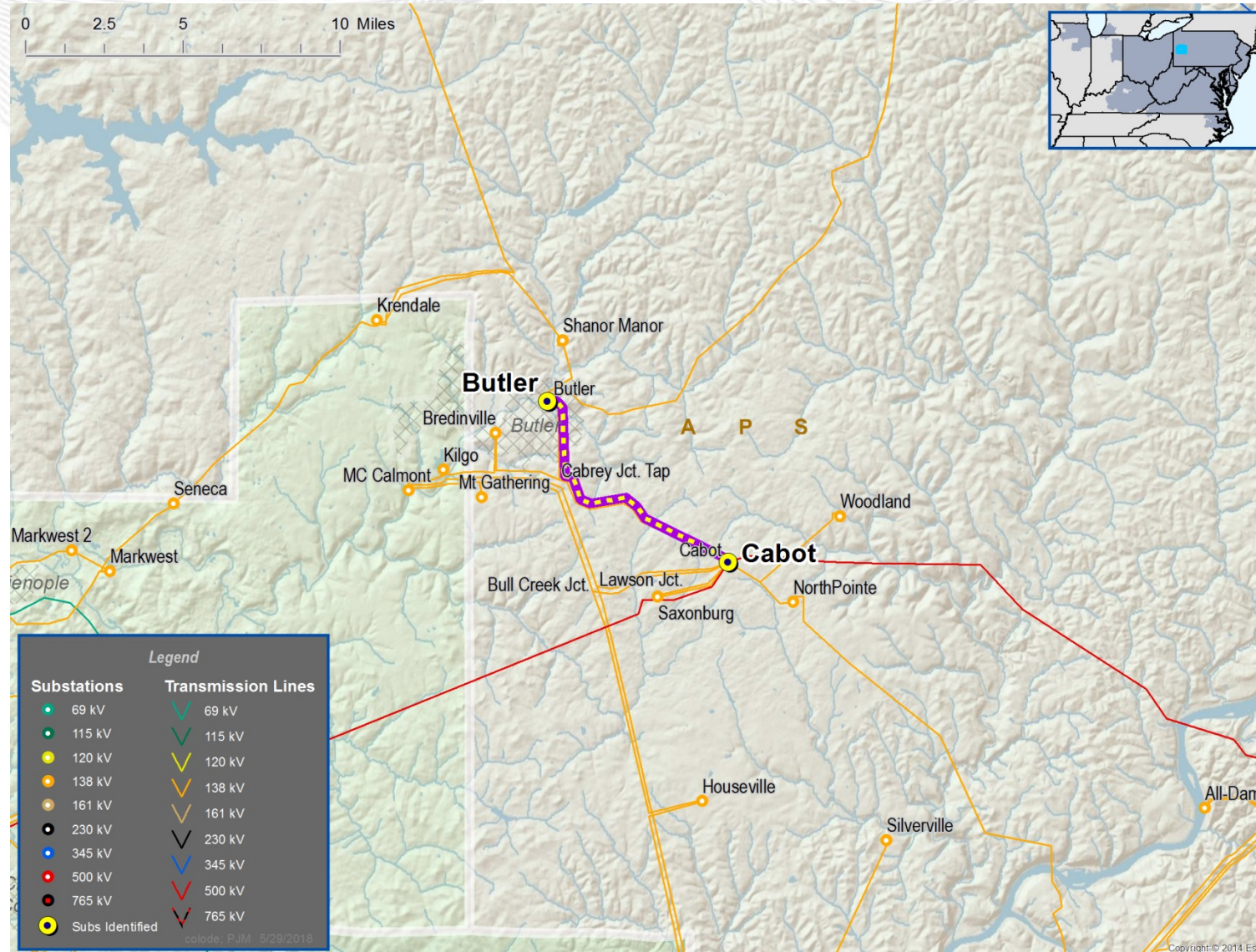
Recommended Solution:

- Reconductor 3.1 mile 556 ACSR portion of Cabot to Butler 138 kV with 556 ACSS and upgrade terminal equipment (**b3005: SN 308 MVA / SE 376 MVA**)

Estimated Project Cost: \$4.5M

Required IS Date: 06/01/2021

Projected IS Date: 06/01/2021



Problem Statement: Generation Deliverability

- Vasco Tap - Edgewater Tap 138 kV line is overloaded for the single contingency for loss of the Yukon – South Bend 500 kV line.

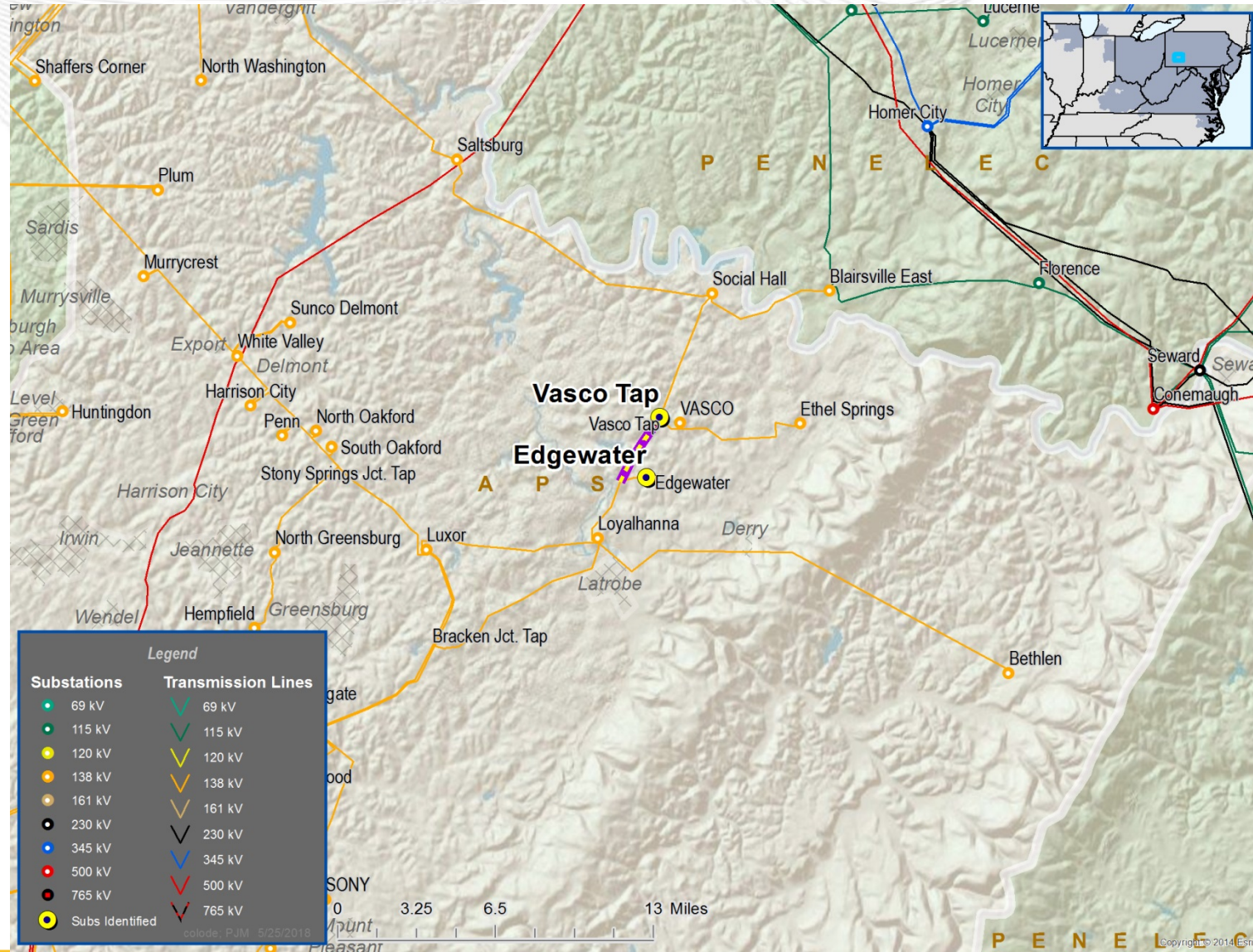
Recommended Solution:

- Reconductor Vasco Tap - Edgewater Tap 138 kV line with 336 ACSS (b3013: SN 252 MVA / SE 291 MVA).

Estimated Project Cost: \$5M

Required IS Date: 06/01/2021

Projected IS Date: 06/01/2021





PENELEC Transmission Zone

Problem Statement: Generation Deliverability

- Blairsville - Social Hall 138 kV line, Blairsville 138/115 kV transformer, and Blairsville-Blairsville East 115 kV line are overloaded for the single contingency for the Keystone – Cabot 500 kV line

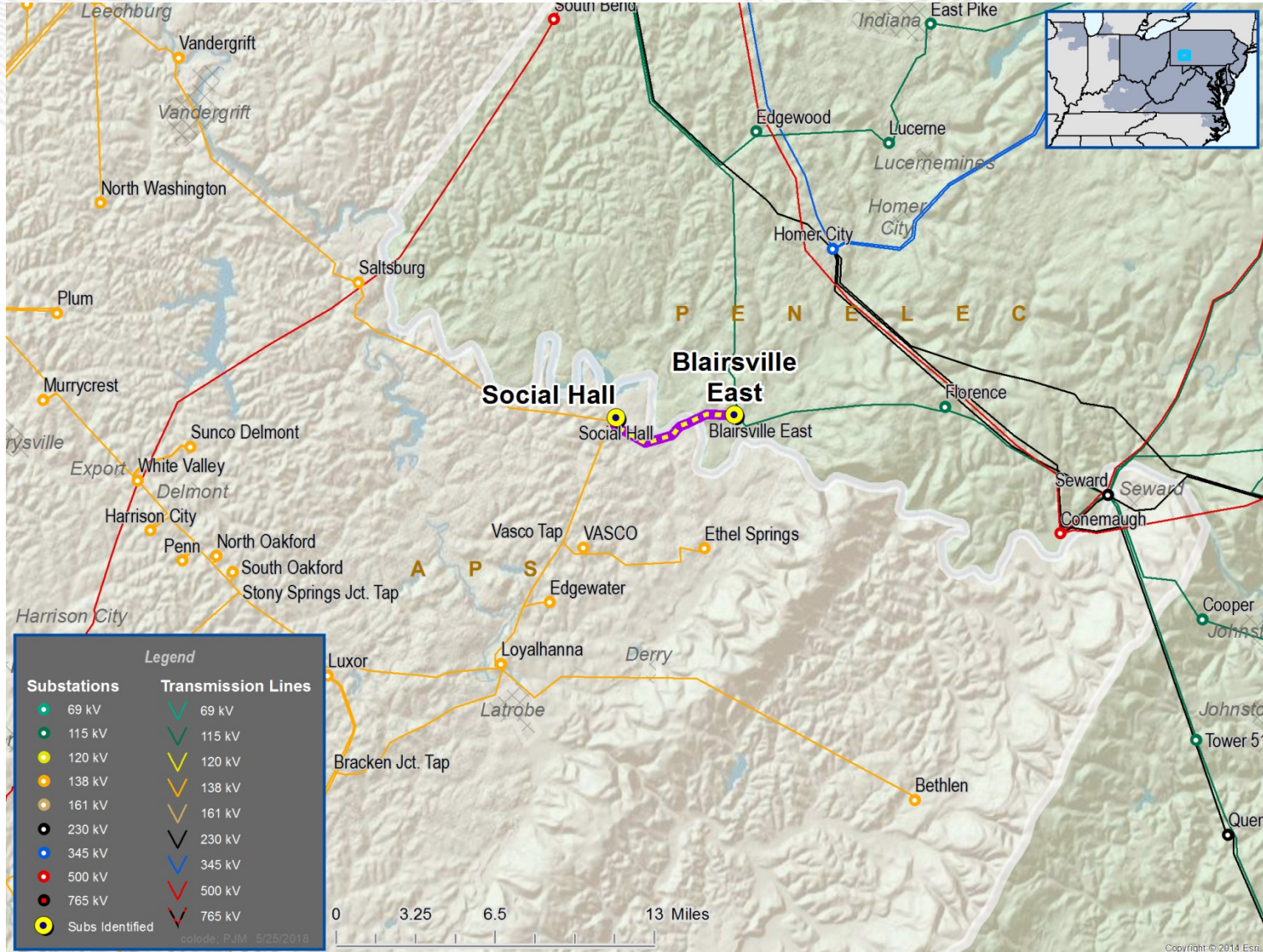
Recommended Solution:

- Reconductor Blairsville – Social Hall 138 kV line with 636 ACSS, and upgrade terminal equipment (**b3007.1 and b3007.2: SN 387 MVA / SE 444 MVA**).
- Upgrade transformer terminal equipment at Blairsville East 115 kV side (**b3008: SN 291 MVA / SE 364 MVA**).
- Upgrade terminal equipment at Blairsville East 115kV tap (**b3009: SN 339 MVA / SE 406MVA**).

Estimated Project Cost: \$6.85M

Required IS Date: 06/01/2021

Projected IS Date: 06/01/2021



Problem Statement: Generation Deliverability

- Shelocta 230/115 kV transformer is overloaded for the breaker failure contingency for loss of the Glory - Seward 115 kV, Jackson RD - Seward 115 kV, Seward - Cooper 115 kV, Seward - Conemaugh 115 kV, Seward - Florence 115 kV, Seward - Tower 115 kV, Seward 230/115 kV transformer, and Seward 115/23 kV transformer.

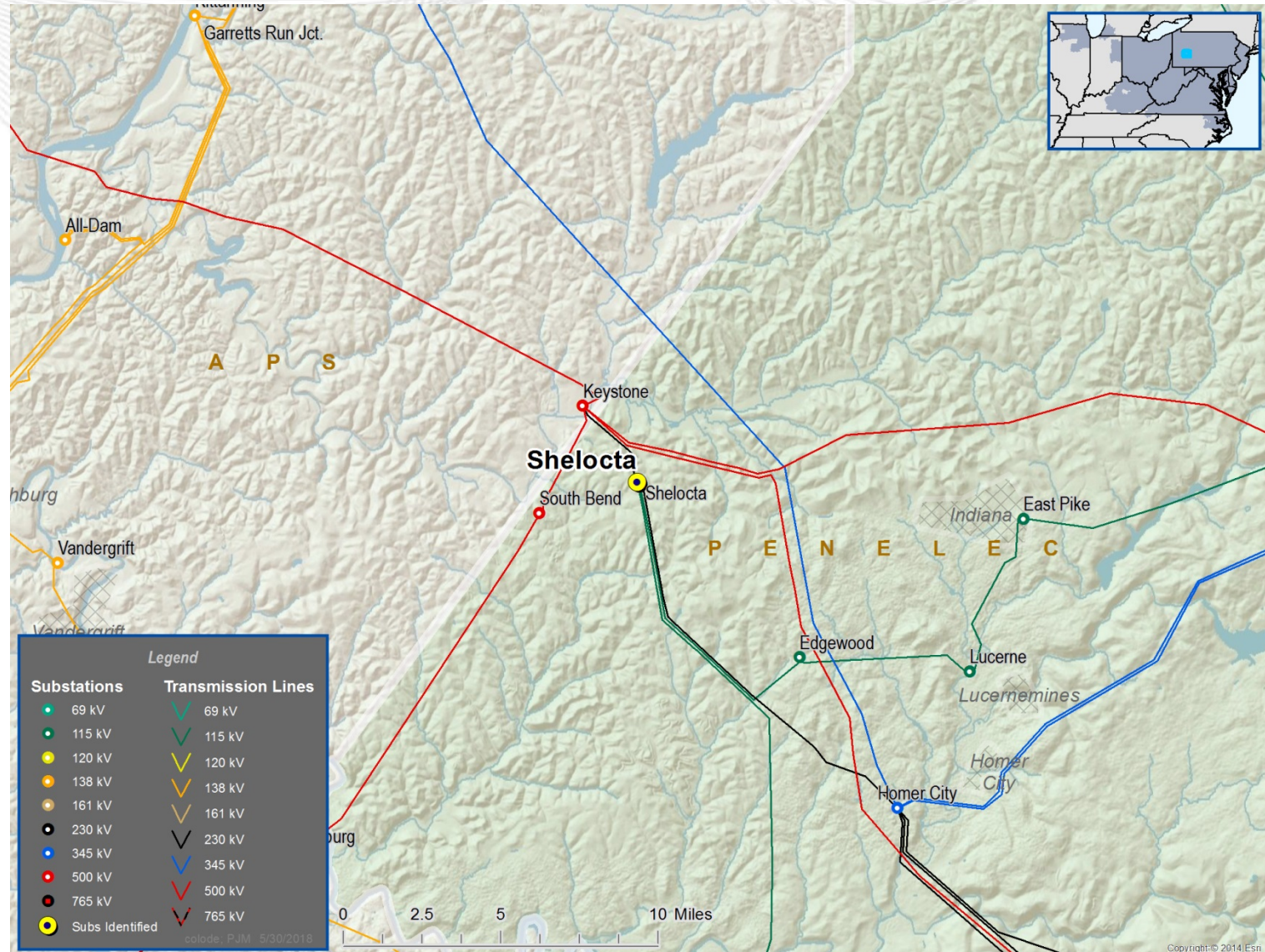
Recommended Solution:

- Replace transformer with a larger unit and construct a 230 kV ring bus (**b3014: SN 406 MVA / SE 456 MVA**).

Estimated Project Cost: \$4.8M

Required IS Date: 06/01/2021

Projected IS Date: 06/01/2021





PENELEC Transmission Zone

Problem Statement: Generation Deliverability

- Glade - Warren 230 kV, Warren - Corry East 115 kV and Corry East - Four Mile 115 kV lines are overloaded for the single contingency for loss of the Erie South East - Warren 230 kV line.

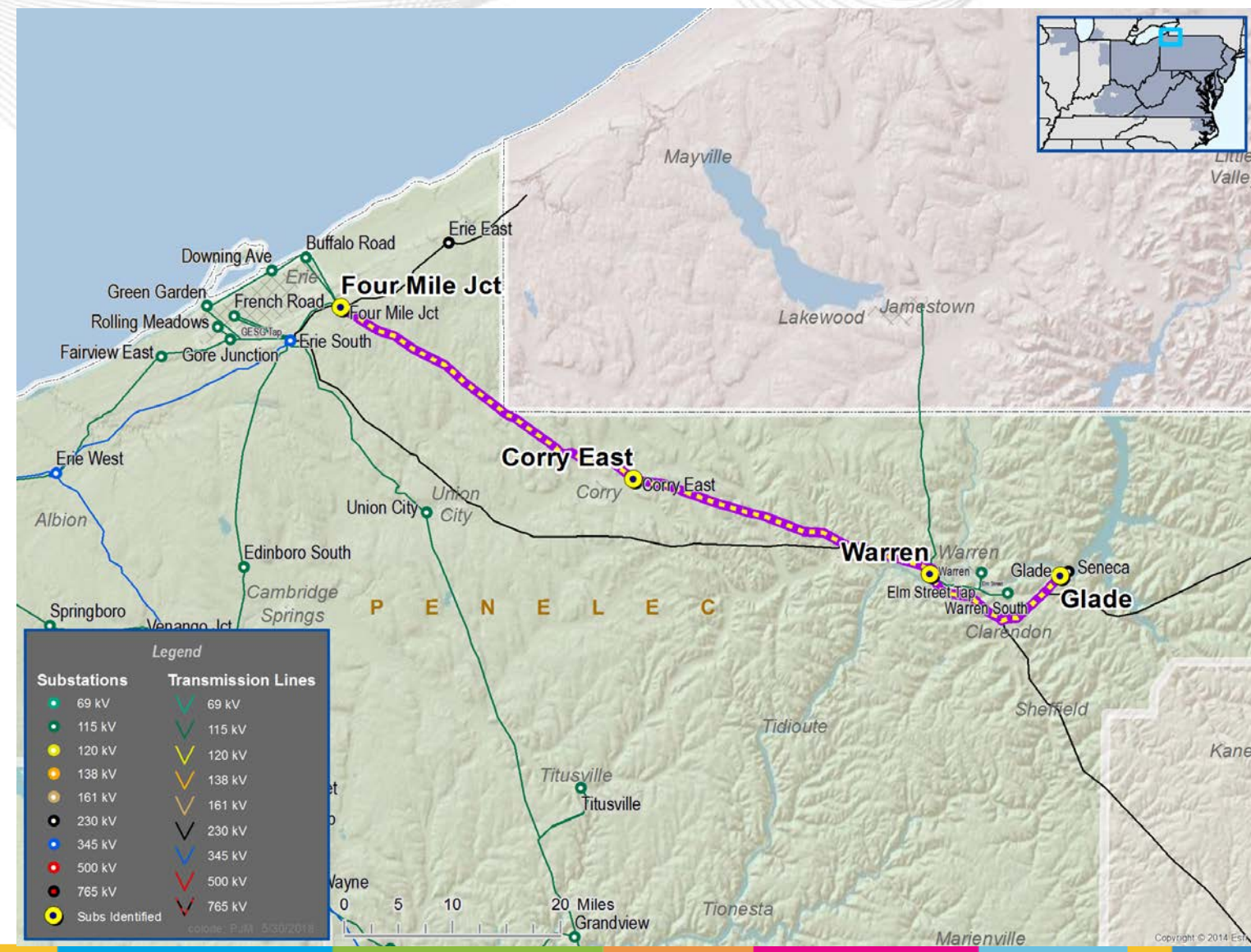
Recommended Solution:

- Rebuild the Glade - Warren 230 kV line with 1033 ACSS (b3017.1, b3017.2, b3017.3: SN 855 MVA / SE 984 MVA).
- Replace terminal equipment on the Warren - Corry East 115 kV line (b3024: SN 202 MVA / SE 245 MVA).
- Replace terminal equipment on the Corry East - Four Mile 115 kV line (b3016 SN 202 MVA / SE 245 MVA).

Estimated Project Cost: \$33.5M

Required IS Date: 06/01/2021

Projected IS Date: 06/01/2021



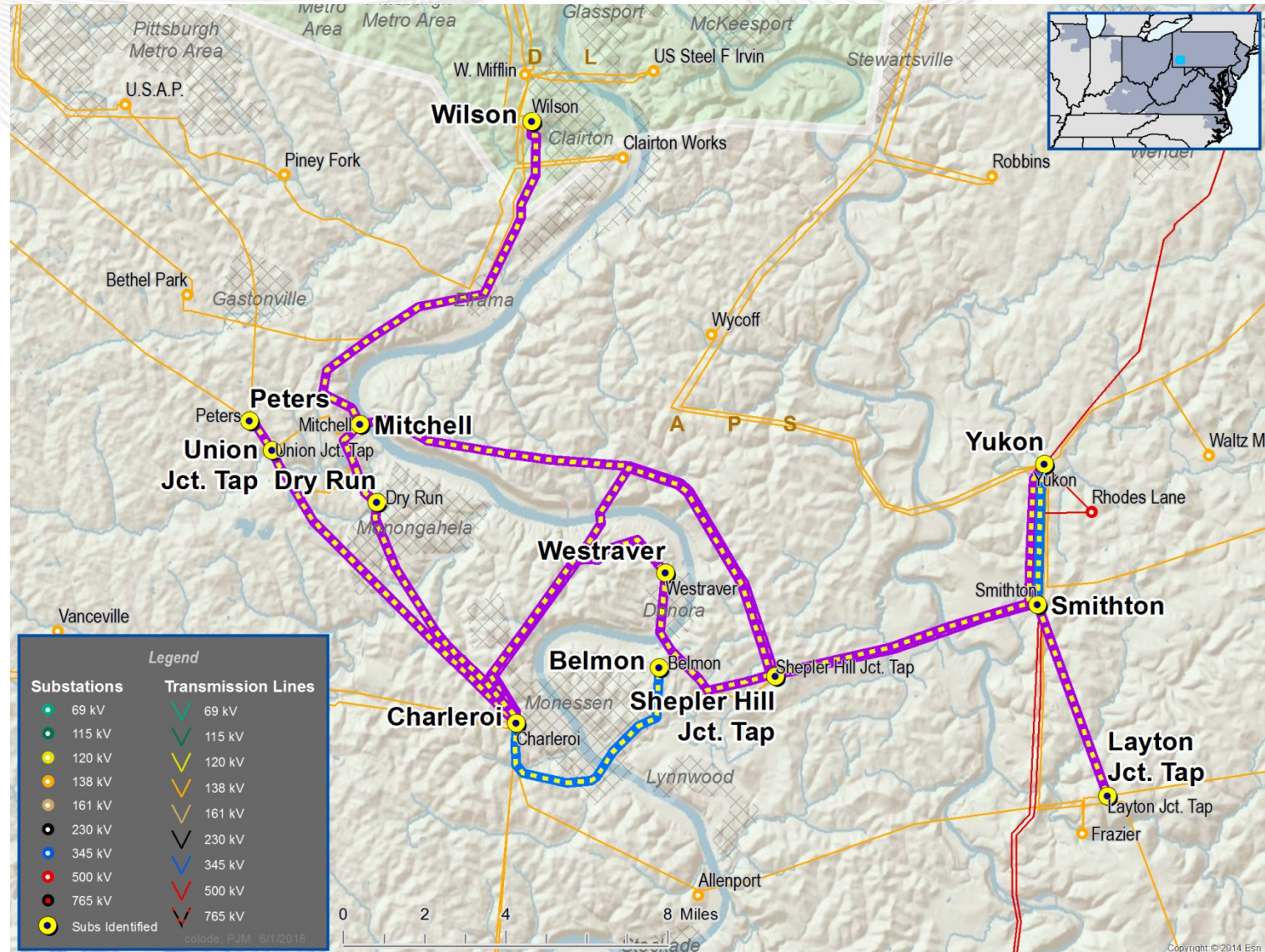


APS and Duquesne Transmission Zones

Problem Statement: Generation Deliverability

- Belmon - Charleroi 138 kV, Yukon - Smithton #61 138 kV lines are overloaded for the following tower contingencies:
 - Loss of Yukon - Charleroi 138 kV and Yukon - Westraver 138 kV lines.
 - Loss of Charleroi - Westraver 138 kV and Charleroi - Yukon 138 kV lines.

Required IS Date: 06/01/2021



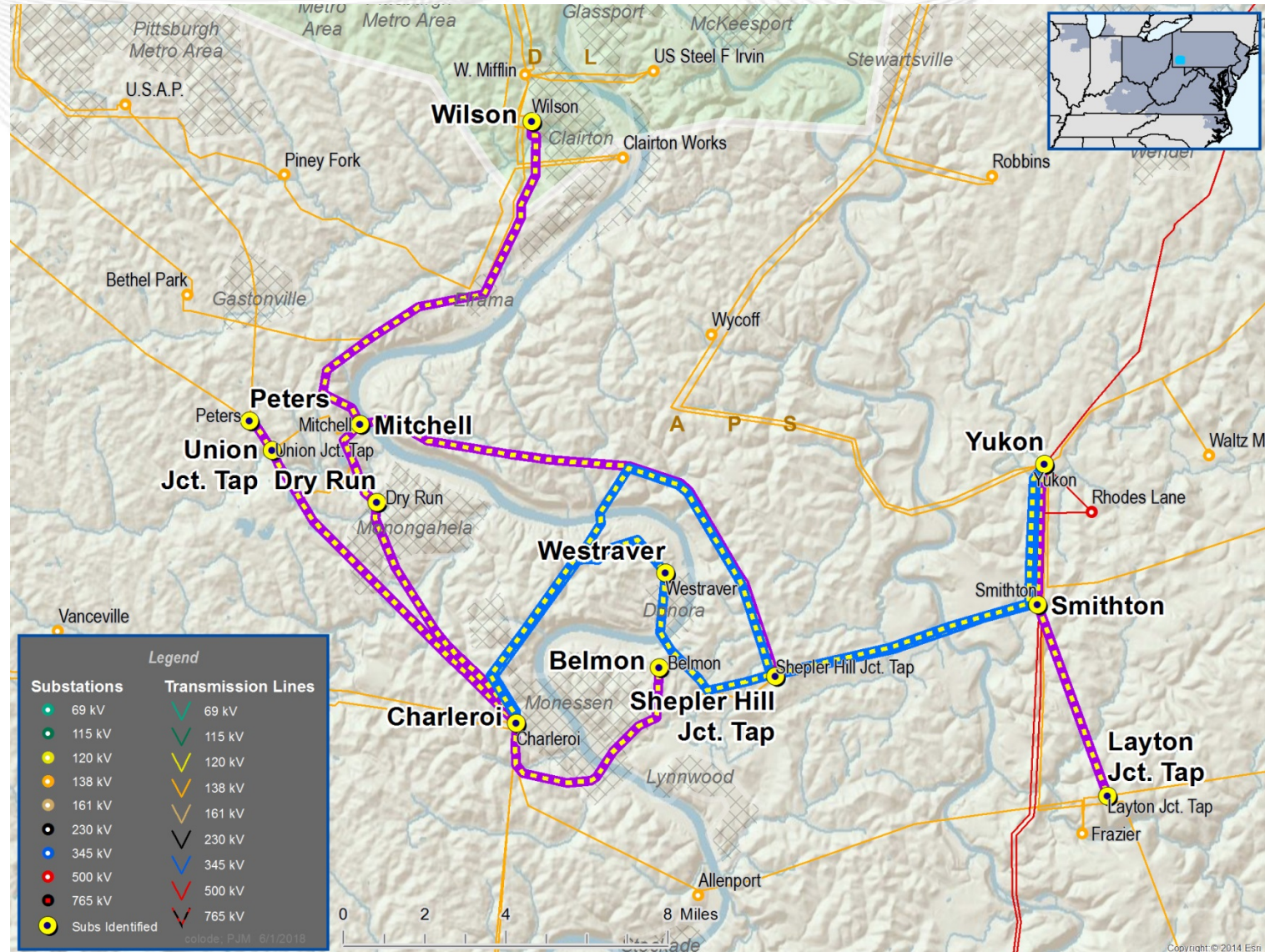


APS and Duquesne Transmission Zones

Problem Statement: Generation Deliverability

- Yukon - Westraver 138 kV , Westraver - Charleroi 138 kV, and Yukon - Charleroi 138 kV lines are overloaded for the following contingencies:
 - Tower contingency for loss of Frazier - Layton Jct 138 KV, Iron Bridge - Layton Jct 138 kV, Layton Jct - Smithton #61 138 kV, Mitchell - Shepler Hill Jct 138 kV, Belmon - Shepler Hill Jct 138 kV, Shepler Hill Jct - Smithton #62 138 kV, Smithton #61 – Yukon 138 kV, and Smithton#62 - Yukon 138 kV lines
 - Breaker failure contingency for loss of Mitchell - Union Jct 138 kV, Mitchell - Shepler Hill Jct 138 kV, Mitchell - Charleroi 138 kV lines.

Required IS Date: 06/01/2021

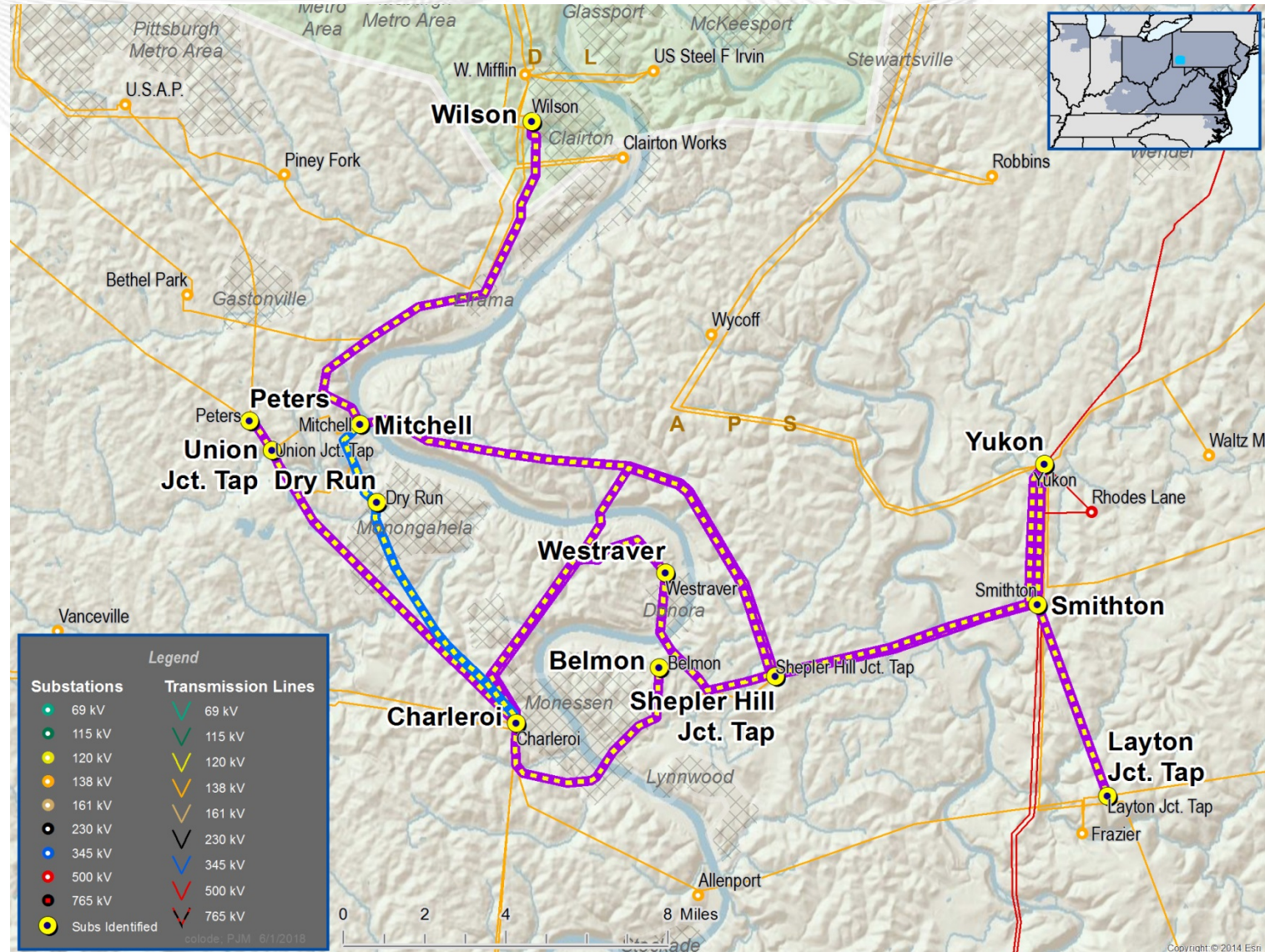


APS and Duquesne Transmission Zones

Problem Statement: Generation Deliverability

- Charleroi - Dry Run 138 kV and Dry Run - Mitchell 138 kV lines are overloaded for the bus contingency for the following contingencies:
 - Bus contingency for loss of Mitchell - Shepler Hill Jct 138 kV, Mitchell - Charleroi 138 kV, Mitchell - Union Jct 138 kV lines, and Mitchell 138/25 KV transformer.
 - Breaker failure contingency for loss of Mitchell - Union Jct 138 kV, Mitchell - Shepler Hill Jct 138 kV, Mitchell - Charleroi 138 kV lines.

Required IS Date: 06/01/2021

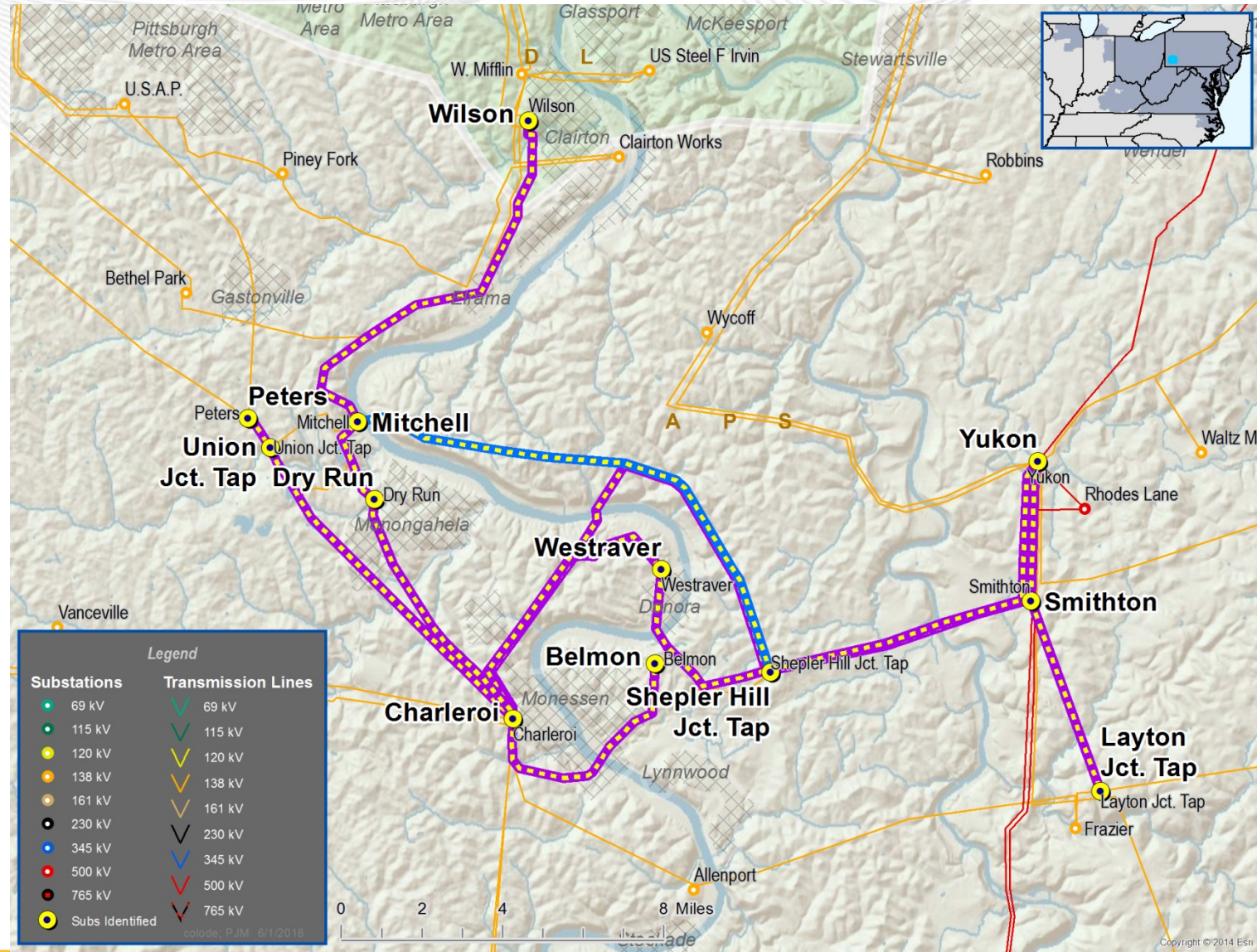


APS and Duquesne Transmission Zones

Problem Statement: Generation Deliverability

- Shepler Hill Jct - Mitchell 138 kV line is overloaded for the following breaker failure contingencies:
 - Loss of Mitchell - Charleroi 138 kV, Charleroi - Yukon 138 kV, Charleroi - Union Jct 138 kV, Charleroi - Gordon 138 kV, Allenport - Charleroi 138 kV, Belmon - Charleroi 138 kV lines.
 - Loss of Charleroi - Union Jct 138 kV, Charleroi - Westraver 138 kV, Allenport - Charleroi 138 kV, and Belmon - Charleroi 138 kV lines.

Required IS Date: 06/01/2021

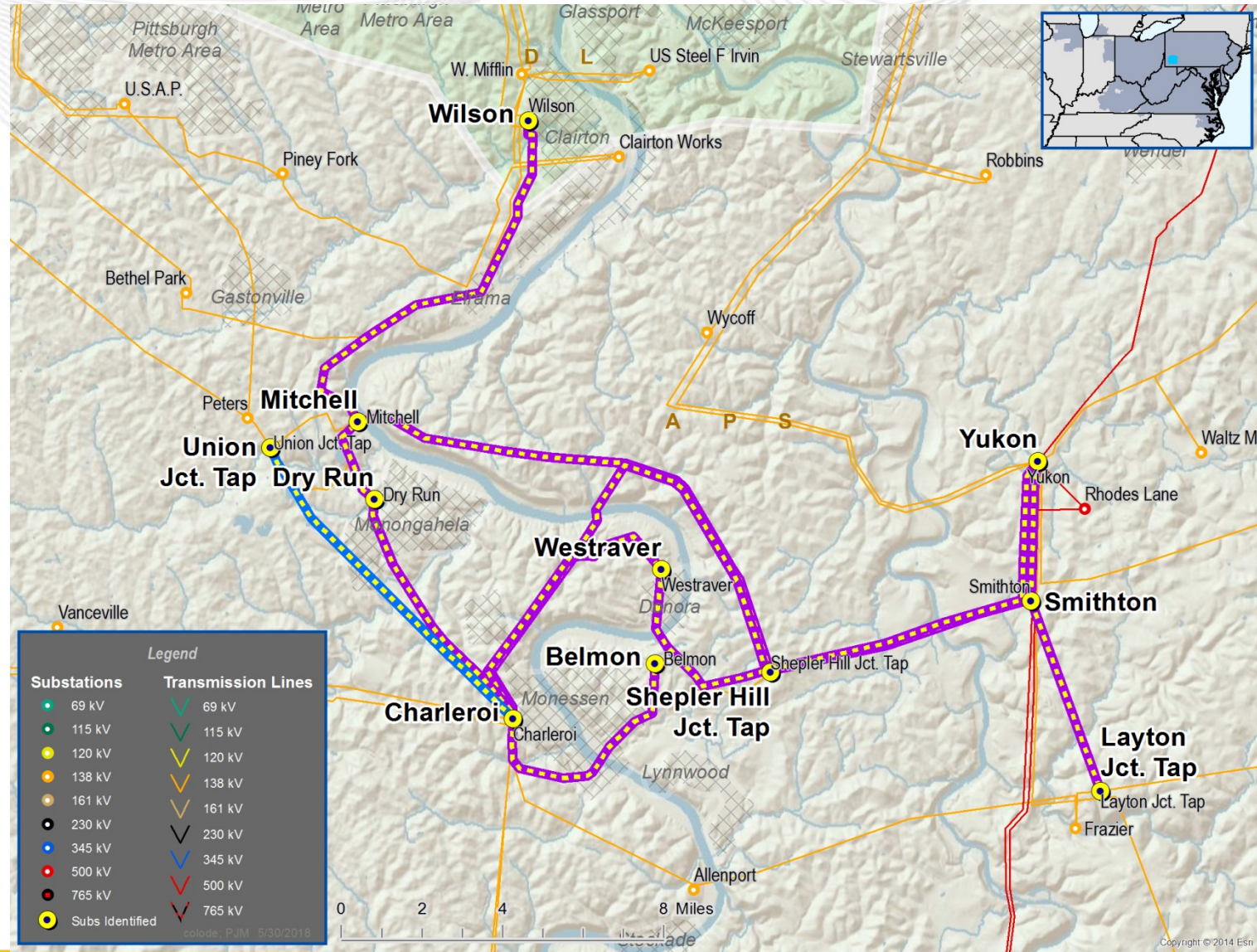


APS and Duquesne Transmission Zones

Problem Statement: Generation Deliverability

- Charleroi 138 kV - Union Jct 138 KV line is overloaded for the following tower contingencies:
 - Loss of Mitchell - Charleroi and Mitchell - Dry Run 138 KV lines
 - Loss of Mitchell - Charleroi and Charleroi - Dry Run 138 kV lines.
- Union Jct - Peters 138 KV line is overloaded for the single contingency for loss of Mitchell - Wilson 138 kV line.

Required IS Date: 06/01/2021



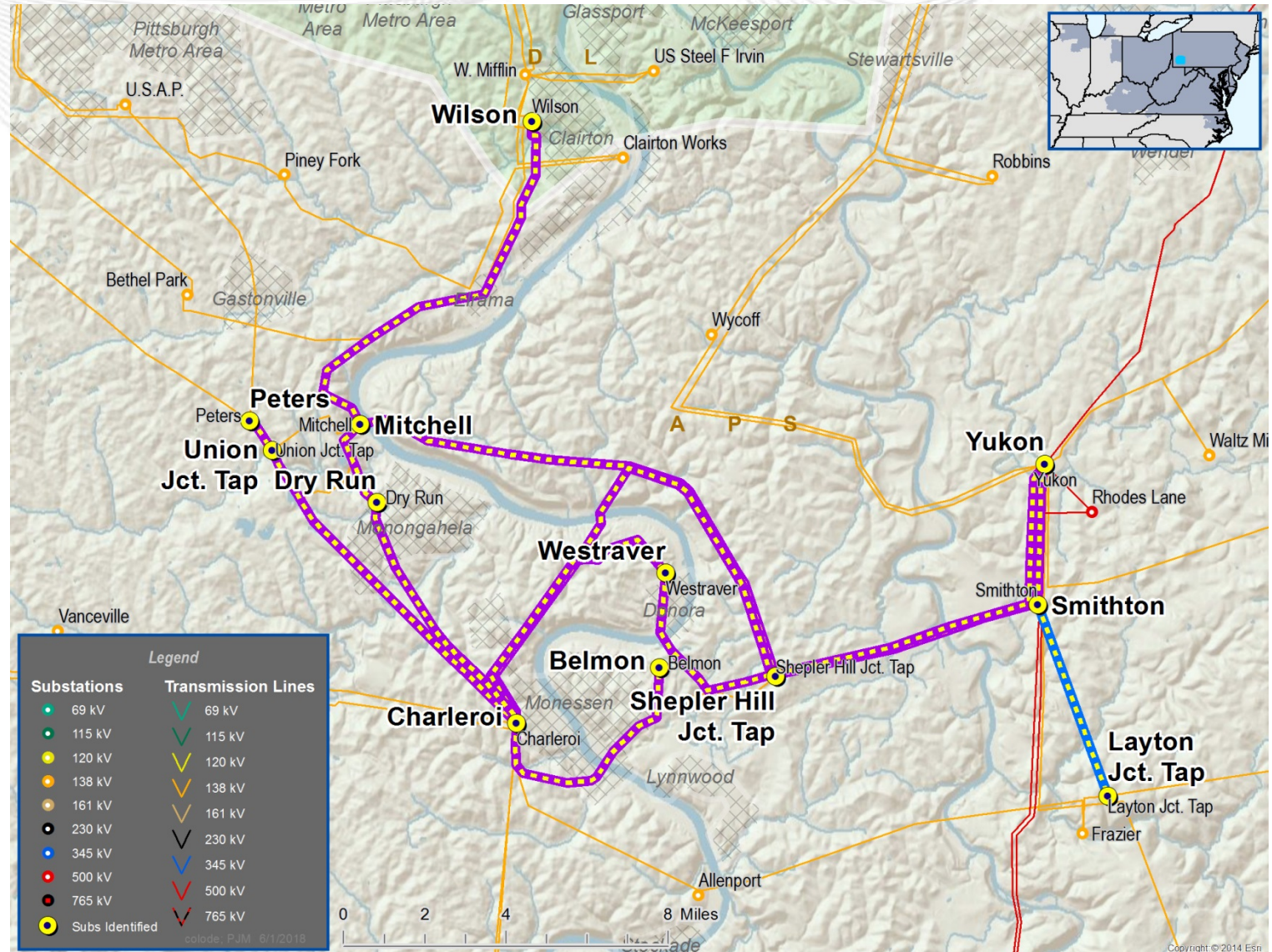


APS and Duquesne Transmission Zones

Problem Statement: Generation Deliverability

- Smithton #61 - Layton Jct 138 kV line is overloaded for the tower contingency for loss of Charloroi - Yukon 138 kV and Westraver - Yukon 138 kV lines.

Required IS Date: 06/01/2021



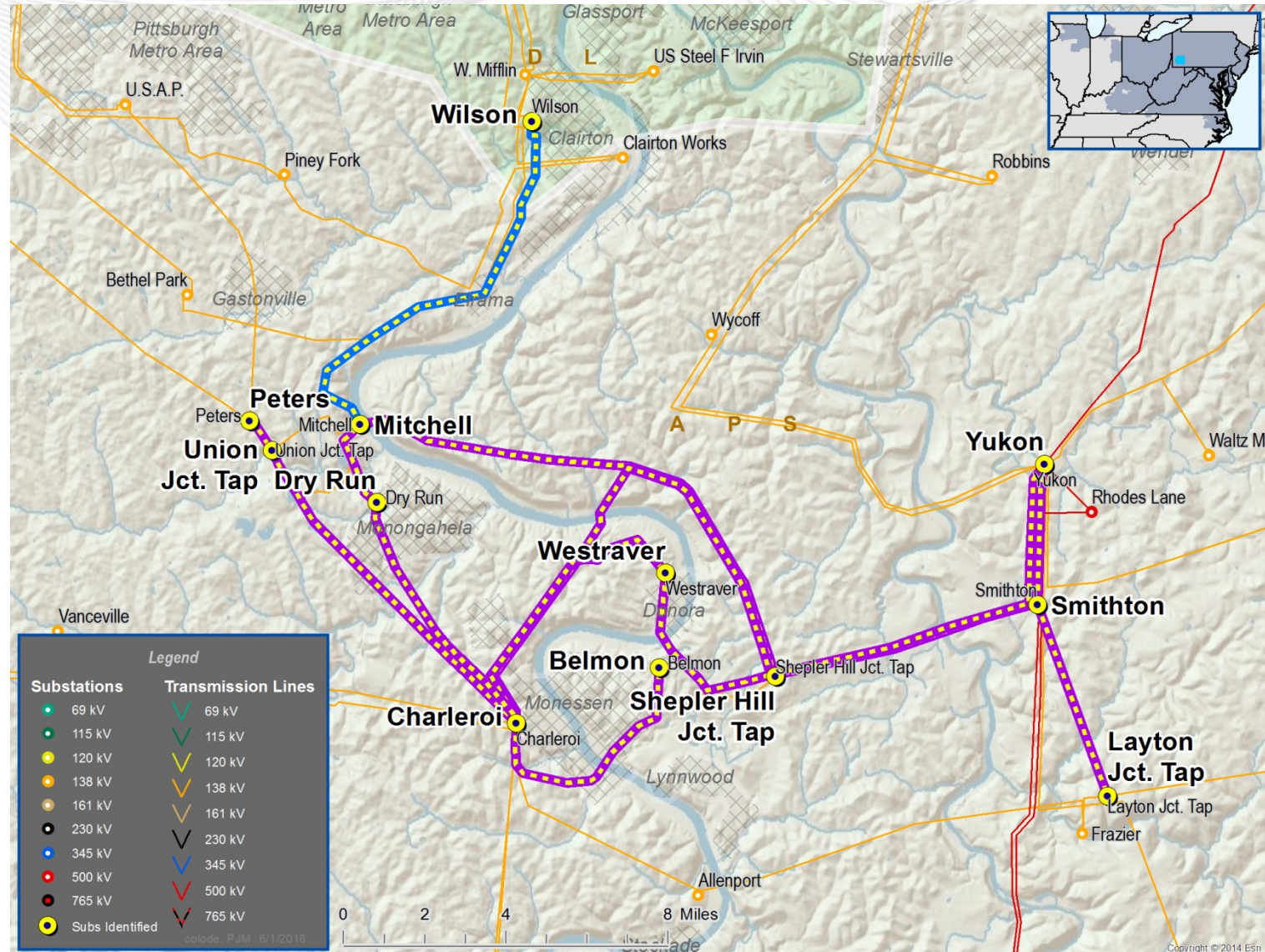


APS and Duquesne Transmission Zones

Problem Statement: Generation Deliverability

- Mitchell - Wilson 138 kV line is overloaded for the following single contingencies:
 - Loss of Keystone - Cabot 500 kV line
 - Loss of Cabot - Cranberry 500 kV line
 - Loss of Cheswick unit 1
 - Loss of Peters - Union Jct 138 kV

Required IS Date: 06/01/2021



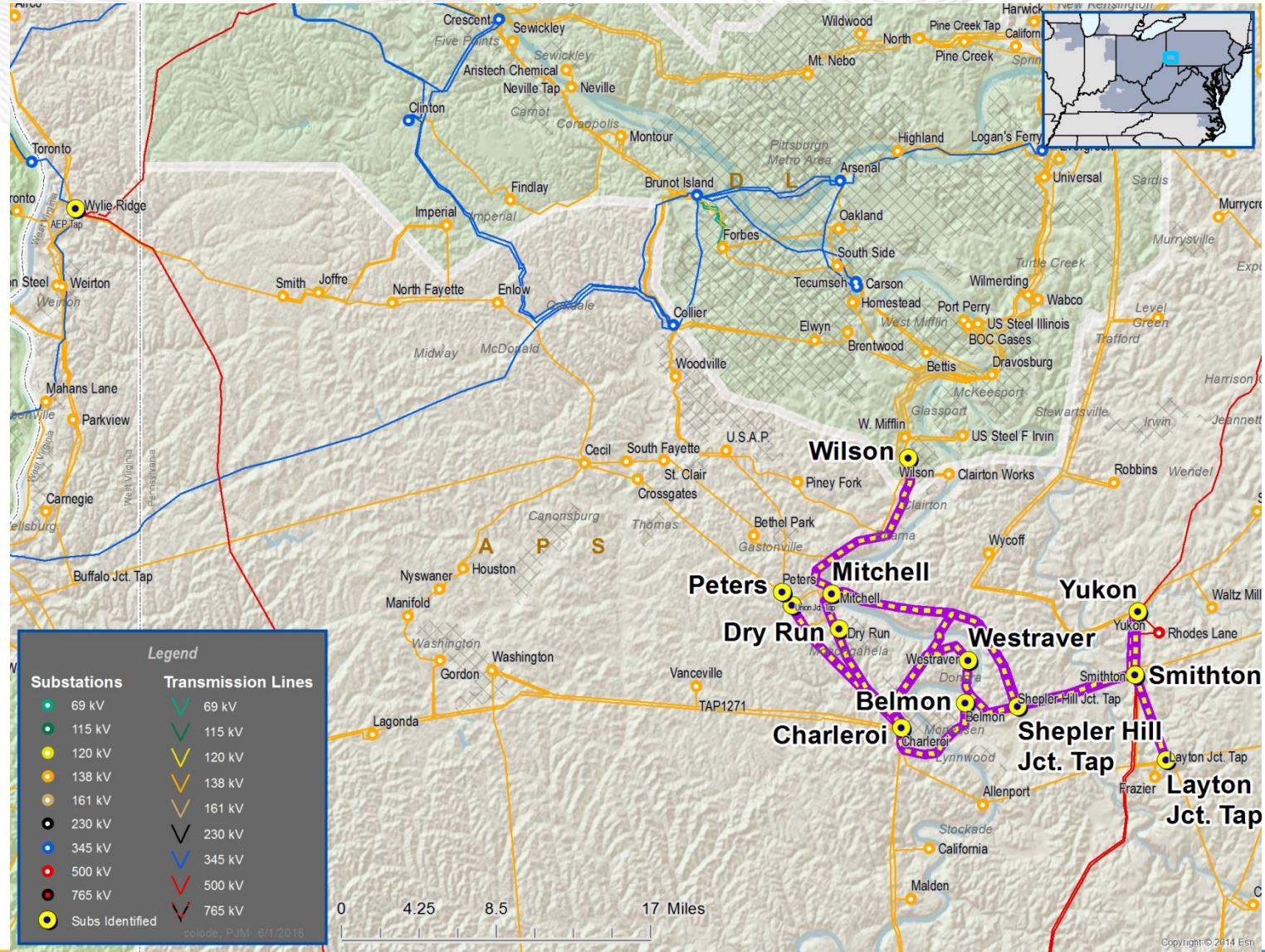


APS and Duquesne Transmission Zones

Problem Statement: Generation Deliverability

- Wylie Ridge 500/345 kV transformer is overloaded for the breaker failure for loss of Wylie Ridge - AA2-121 Tap 138 kV, and Wylie Ridge #5, #6 500/345 kV transformers.

Required IS Date: 06/01/2022



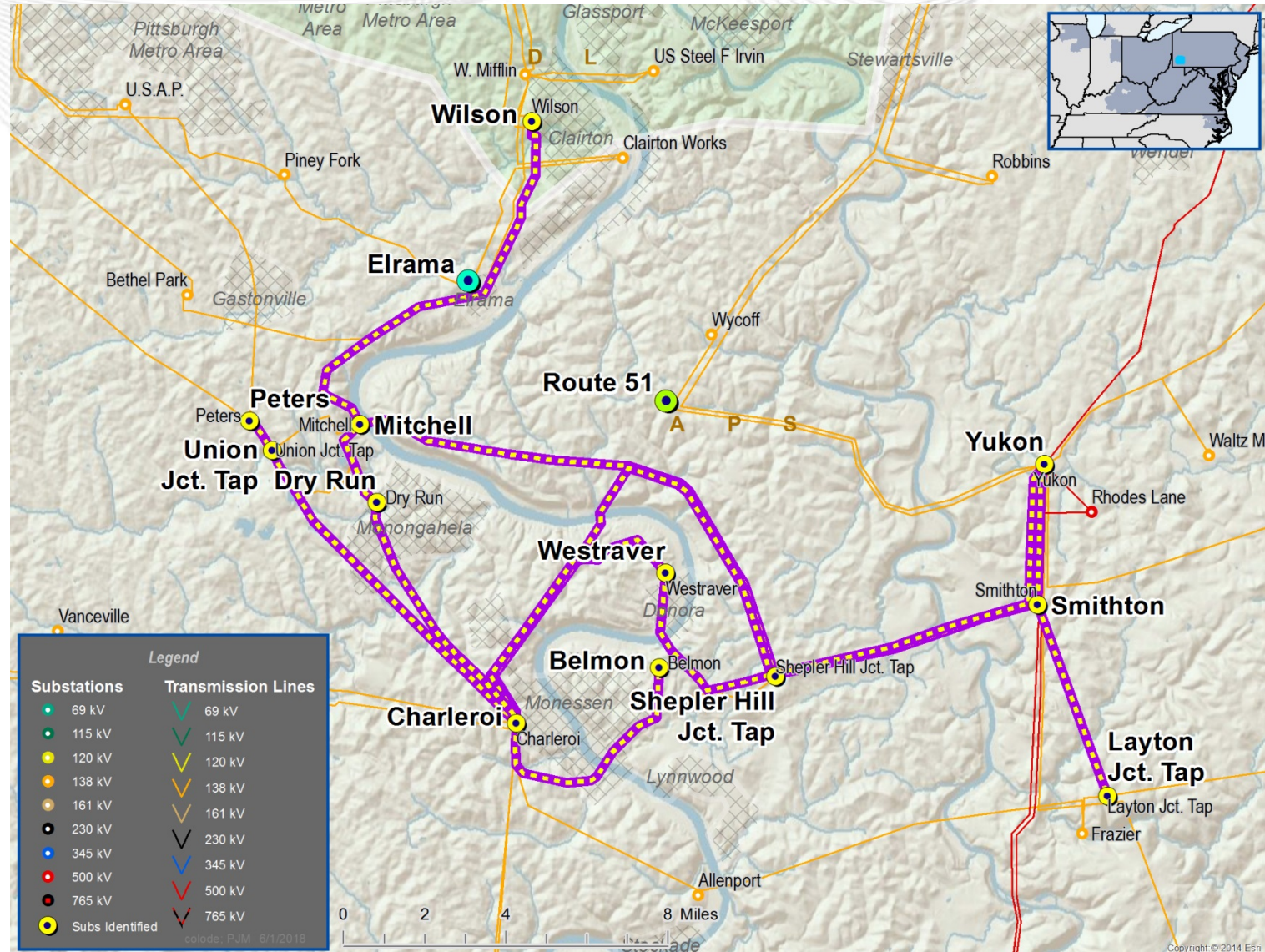
Recommended Solution:

- Construct new Route 51 substation in APS and connect 10 138 kV lines to new substation (b3011.1).
- Upgrade terminal equipment at Yukon to increase rating on four Yukon to Route 51 138 kV lines
 - b3011.2: SN 308 MVA / SE 376 MVA
 - b3011.3: SN 297 MVA / SE 365 MVA
 - b3011.4: SN 297 MVA / SE 365 MVA
 - b3011.5: SN 308 MVA / SE 376 MVA
- Upgrade remote end relays for Yukon - Allenport - Iron Bridge 138 kV line (b3011.6: SN 234 MVA / SE 297 MVA).

Estimated Project Cost: \$27.6M

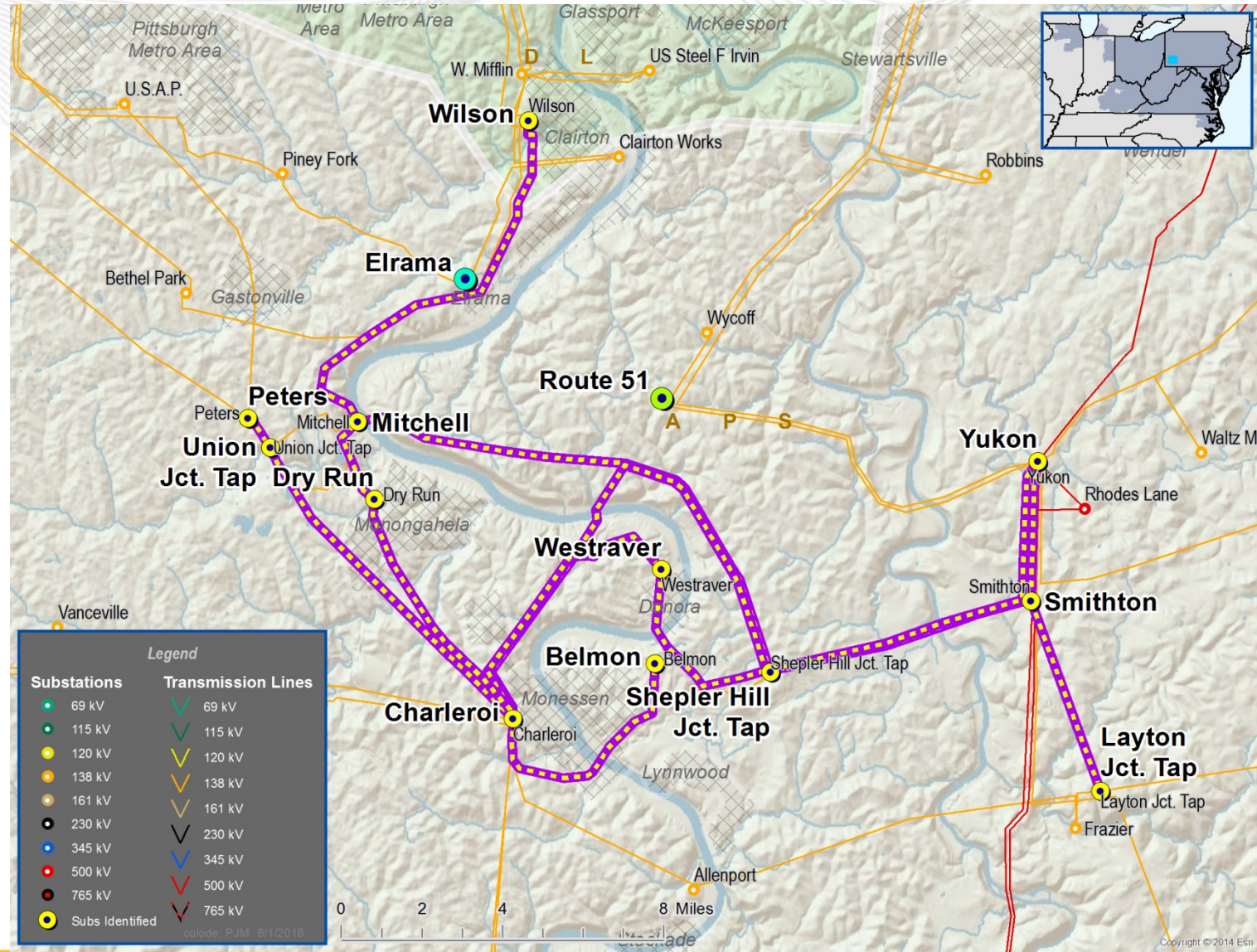
Required IS Date: 06/01/2021

Projected IS Date: 06/01/2021



Recommended Solution :

- Construct new Elrama substation in Duquesne and connect 7 138 kV lines to new substation (**b3015.1**).
- Reconductor the Elrama - Wilson 138 kV line with 2x795 ACSS (**b3015.2: SN 719 MVA SE 719 MVA**).
- Reconductor the Dravosburg - West Mifflin 138 kV line with 795 ACSS (**b3015.3: SN 382 MVA / SE 385 MVA**).
- Run new conductor with 796 ACSS over existing tower to establish a new Dravosburg - Elrama 138 kV line (**b3015.4: SN 395 MVA / SE 419 MVA**).





Duquesne Transmission Zone

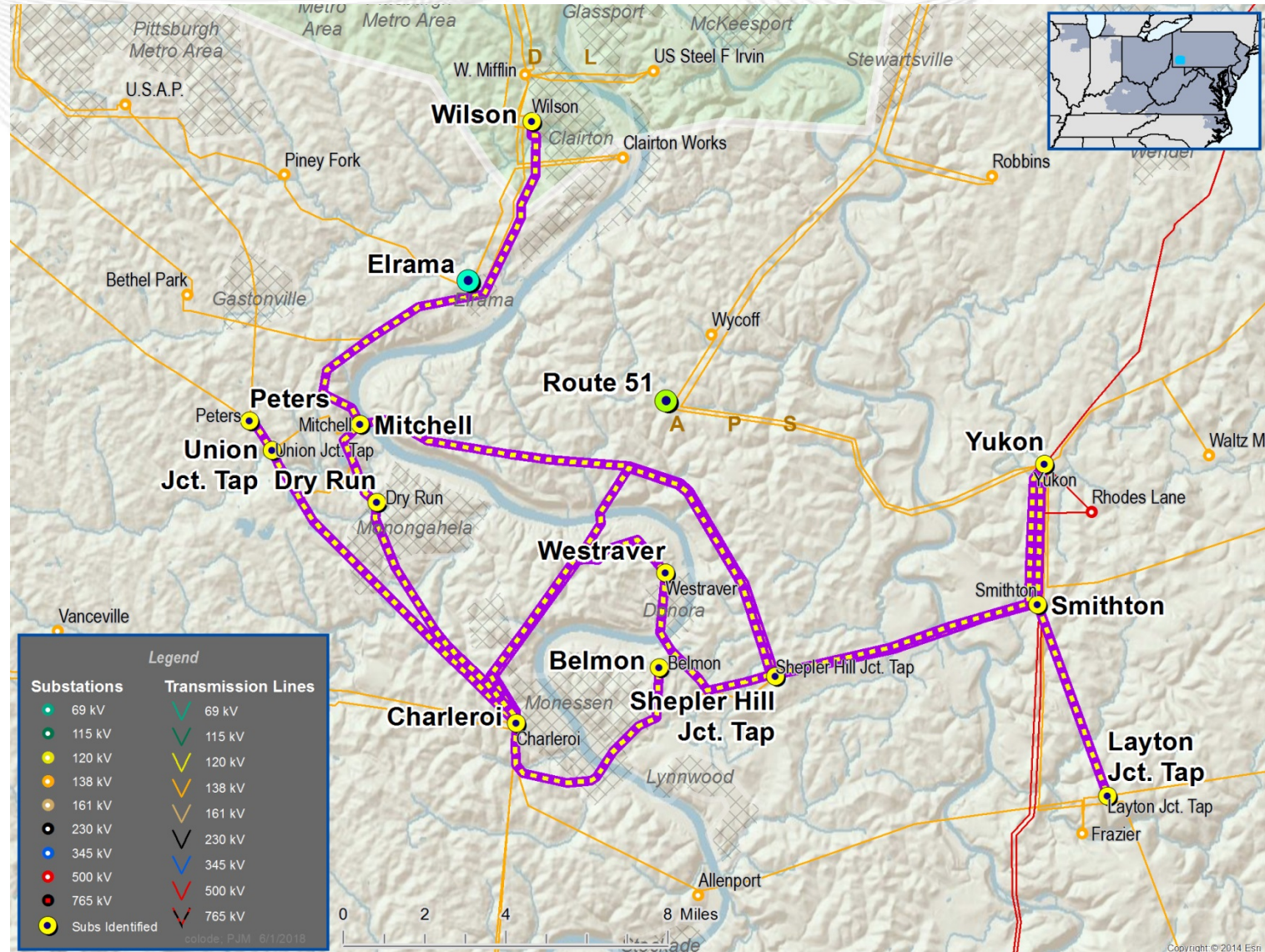
Recommended Solution (continued):

- Reconductor the Elrama - Mitchell 138 kV line with 2x795 ACSS (**b3015.5** and **b3015.6: SN 498 MVA / SE 590 MVA**).
- Reconductor the Wilson - West Mifflin 138 kV line with 795 ACSS (**b3015.7: SN 395 MVA / SE 419 MVA**).

Estimated Project Cost: \$35.5M

Required IS Date: 06/01/2021

Projected IS Date: 06/01/2021





APS and Duquesne Transmission Zones

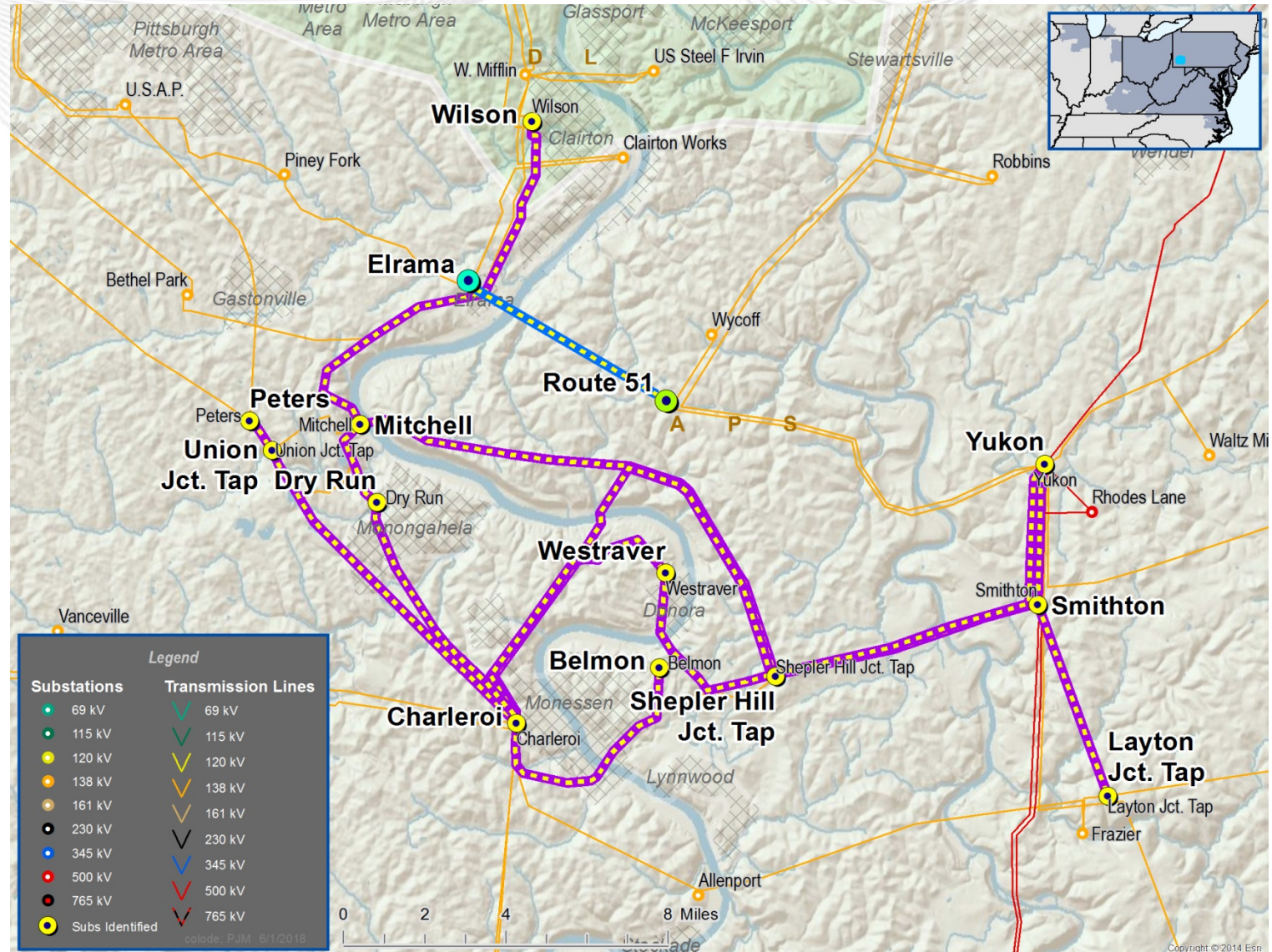
Recommended Solution:

- Construct two new 138 kV tie lines with 2x 954 ACSR between Route 51 and Elrama. (b3012.1 and b3012.2: SN 1002 MVA / SE 1154 MVA).

Estimated Project Cost: \$9.2M

Required IS Date: 06/01/2021

Projected IS Date: 06/01/2021



- V1 – 6/1/2018 – Original Slides Posted.
- V2 – 6/5/2018 – Added the ratings for new baseline projects.
- V3 – 6/6/2018 – Added conductor types and contingencies, and fixed the cost and descriptions.
- V4 – 6/15/2018 – Fixed the projected IS date for b2951.1 and b2951.2
- V5 – 6/18/2018 – Fixed baseline upgrade ID numbers on Slide 15