Reliability Analysis Update
PJM West

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Sub Regional RTEP Committee – PJM West

October 18, 2024

2024 RTEP
First Read
Baseline Reliability Projects

APS Transmission Zone: Baseline 2024 RTEP Window 1

Process Stage: First Read

Criteria: Winter N-1-1

Assumption Reference: 2024 RTEP assumptions

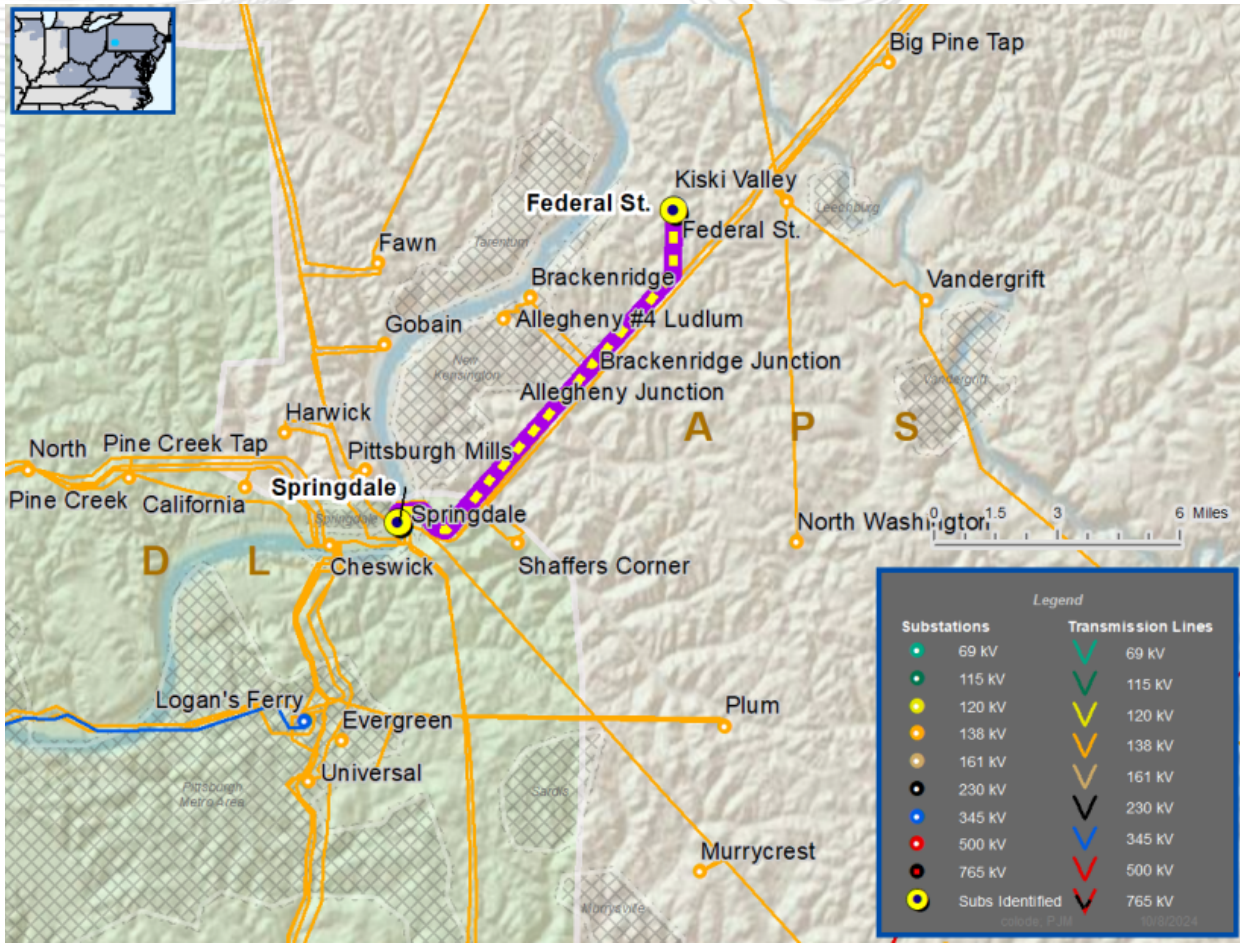
Model Used for Analysis: 2029 RTEP cases

Proposal Window Exclusion: Less than 200 kV

Problem Statement:

2024W1-N11-WT1 and 2024W1-N11-WT2

In 2029 RTEP Winter case, the Springdale to Federal St 138 kV line is overloaded for N-1-1 outages.



APS Transmission Zone: Baseline 2024 RTEP Window 1

Proposed Solution: At Federal Street Substation:
- Install (3) 138 kV CCVTs on the 138 kV bus.
- Remove the Transformer 1 CO-6 138 kV Phase relay overcurrent relays.
- Install (1) SEL-421 relay on the high side of Transformer 1.
- Install foundations, conduit, and grounding for new CCVTs.
- Install cables between CCVTs and relay.

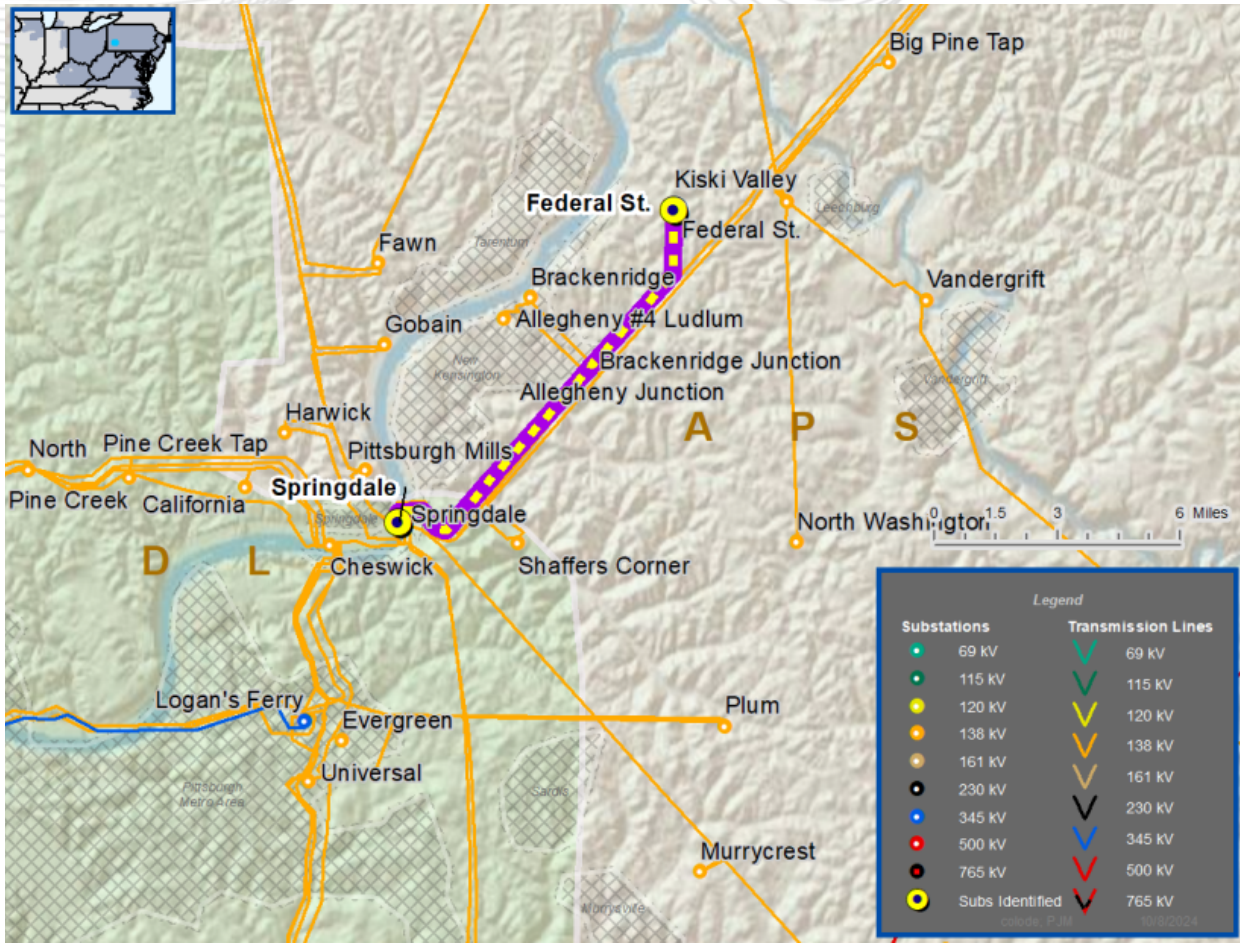
Estimated Cost: $0.69 M

Required IS Date: 12/1/2029

Projected IS Date: 06/01/2029

Facility Rating:

Branch	Existing Facility Ratings – SN/SE/WN/WE (MVA)	Preliminary Facility Ratings – SN/SE/WN/WE (MVA)
Federal St – Springdale 138 kV	166/166/166/166	268/333/323/416



DLCO Transmission Zone: Baseline 2024 RTEP Window 1

Process Stage: First Read

Criteria: Summer Generator Deliverability

Assumption Reference: 2024 RTEP assumptions

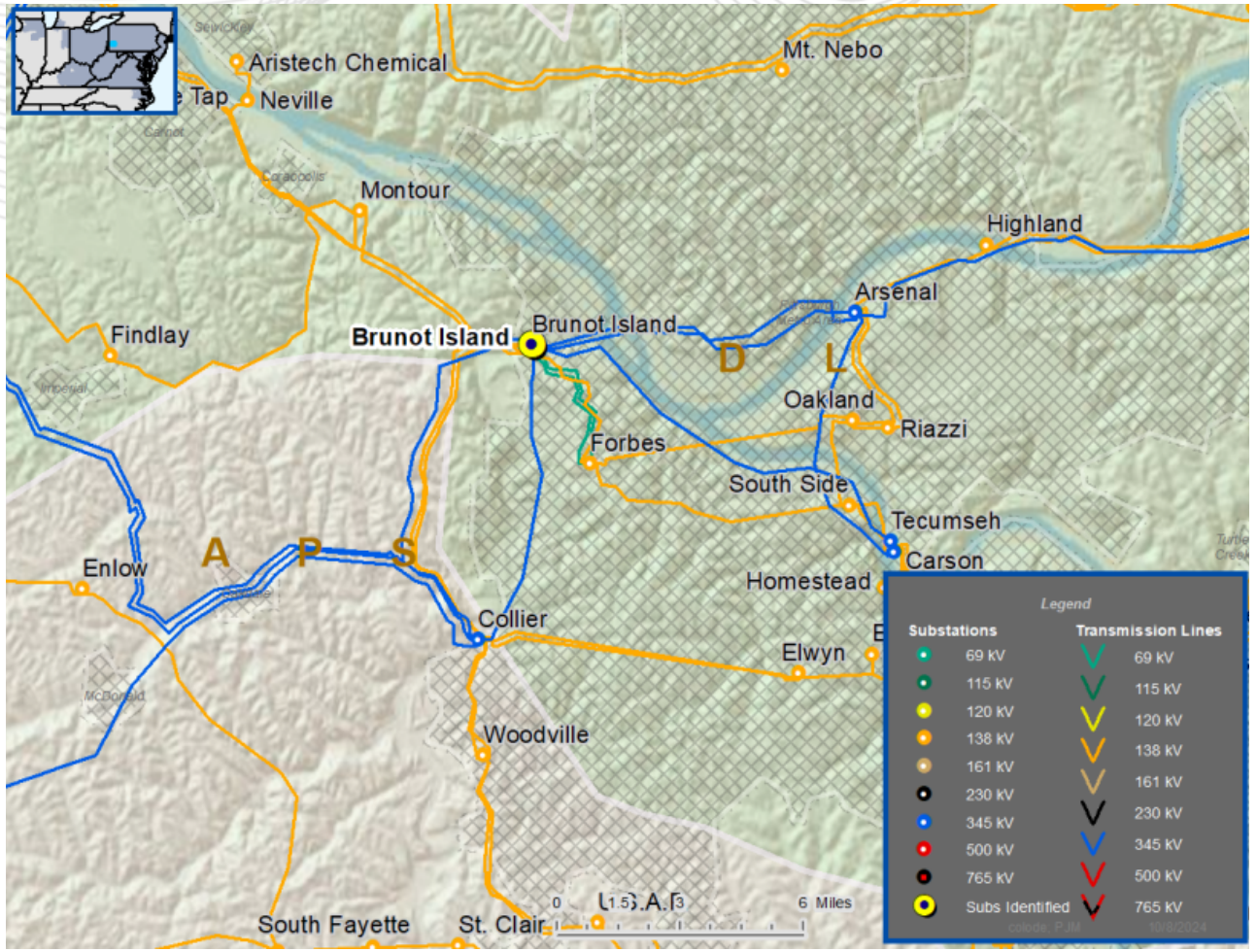
Model Used for Analysis: 2029 RTEP cases

Proposal Window Exclusion: Substation Equipment Exclusion

Problem Statement:

2024W1-GD-S889

In 2029 RTEP summer case, the Brunot Island 2-12 138 kV tie breaker is overloaded for N-2 outage.



DLCO Transmission Zone: Baseline 2024 RTEP Window 1

Proposed Solution:
Replace two 138 kV disconnect switches with 3000 amp disconnect switches and replace a portion of the stranded conductor on the #2 138 kV Bus with aluminum pipe bus.

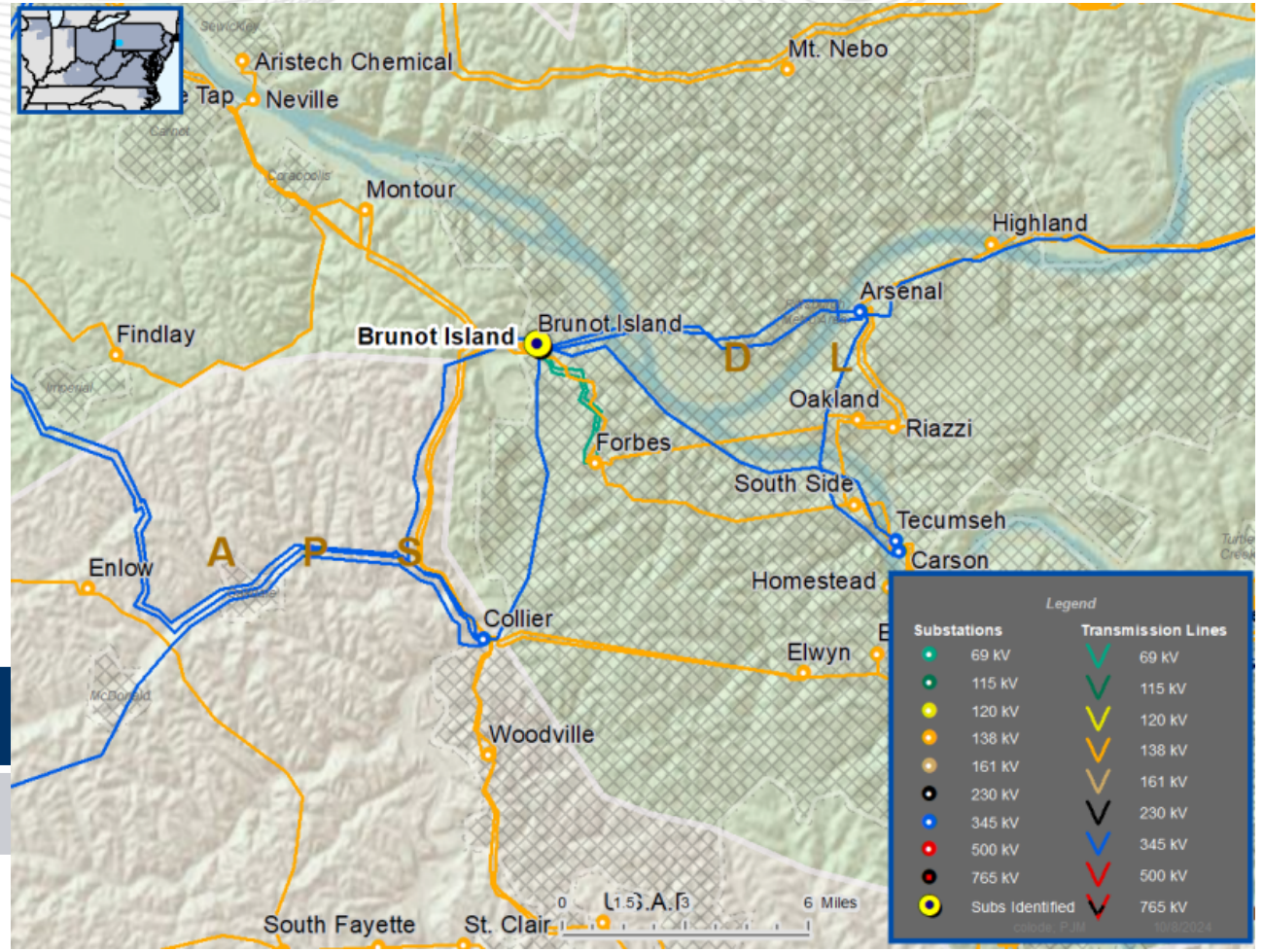
Estimated Cost: $8.0 M

Required IS Date: 6/1/2029

Projected IS Date: 12/31/2028

Facility Rating:

Branch	Existing Facility Ratings – SN/SE/WN/WE (MVA)	Preliminary Facility Ratings – SN/SE/WN/WE (MVA)
Brunot Island 2-12 Bus tie breaker 138 kV	385/458/454/478	643/696/696/696



AEP Transmission Zone: Baseline Cloverdale 138kV XT8 Circuit Switcher Replacement

Process Stage: First Read

Criteria: Short Circuit

Assumption Reference: 2024 RTEP assumptions

Model Used for Analysis: 2026 & 2029 RTEP Short Circuit base cases

Proposal Window Exclusion: Below 200kV

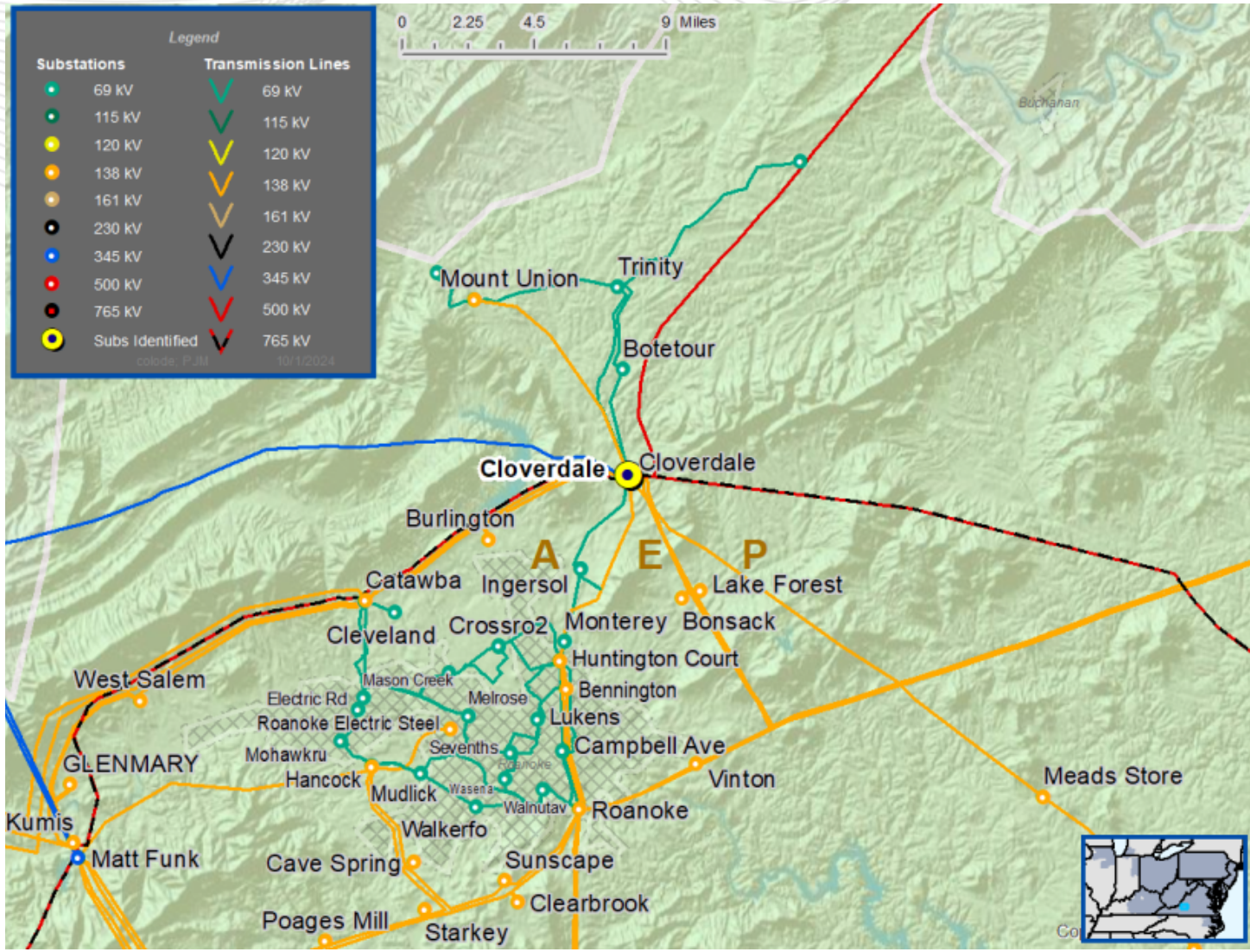
Problem Statement:

FG: 2024W1-SC-1

In both 2026 and 2029 RTEP Short Circuit base cases, the Cloverdale 138kV circuit switcher XT8 is identified as being over duty.

Existing Facility Rating:

Circuit Switcher	Interrupting Rating (kA)
138kV Circuit Switcher XT8	40



AEP Transmission Zone: Baseline Cloverdale 138kV XT8 Circuit Switcher Replacement

Proposed Solution:

Replace over duty Cloverdale 138kV circuit switcher XT8 with a 63 kA circuit breaker.

Estimated Cost: $1.0M

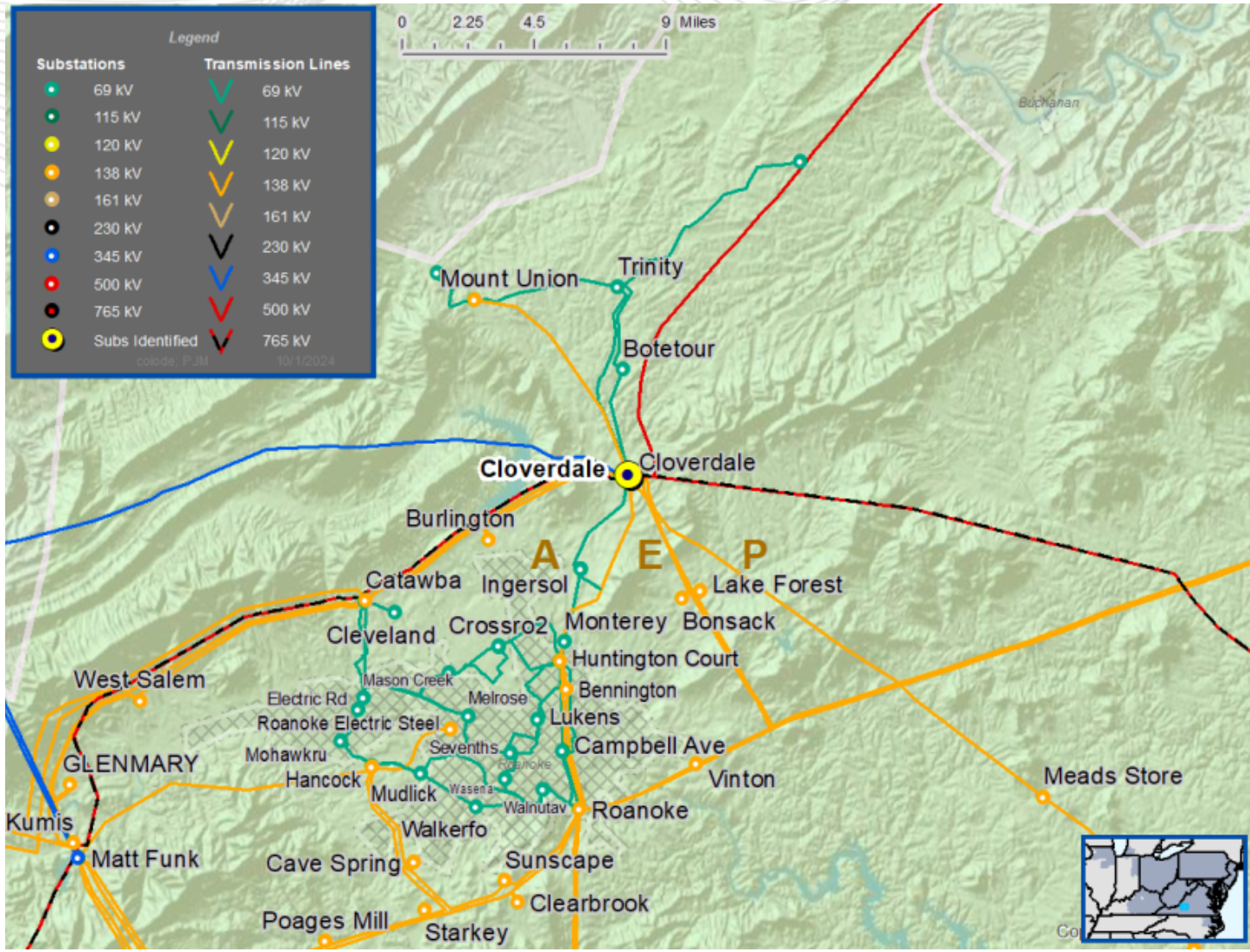
Preliminary Facility Rating:

Circuit Breaker	Interrupting Rating (kA)
138kV breaker XT8	63

Alternative: Considering the location of the equipment and limited scope to resolve the issue, no other alternatives were identified as viable.

Required IS Date: 6/1/2026

Projected IS Date: 6/1/2026



AEP Transmission Zone: Baseline Sunnyside 138kV BB CB Replacement

Process Stage: First Read

Criteria: Short Circuit

Assumption Reference: 2024 RTEP assumptions

Model Used for Analysis: 2026 & 2029 RTEP Short Circuit base cases

Proposal Window Exclusion: Below 200kV

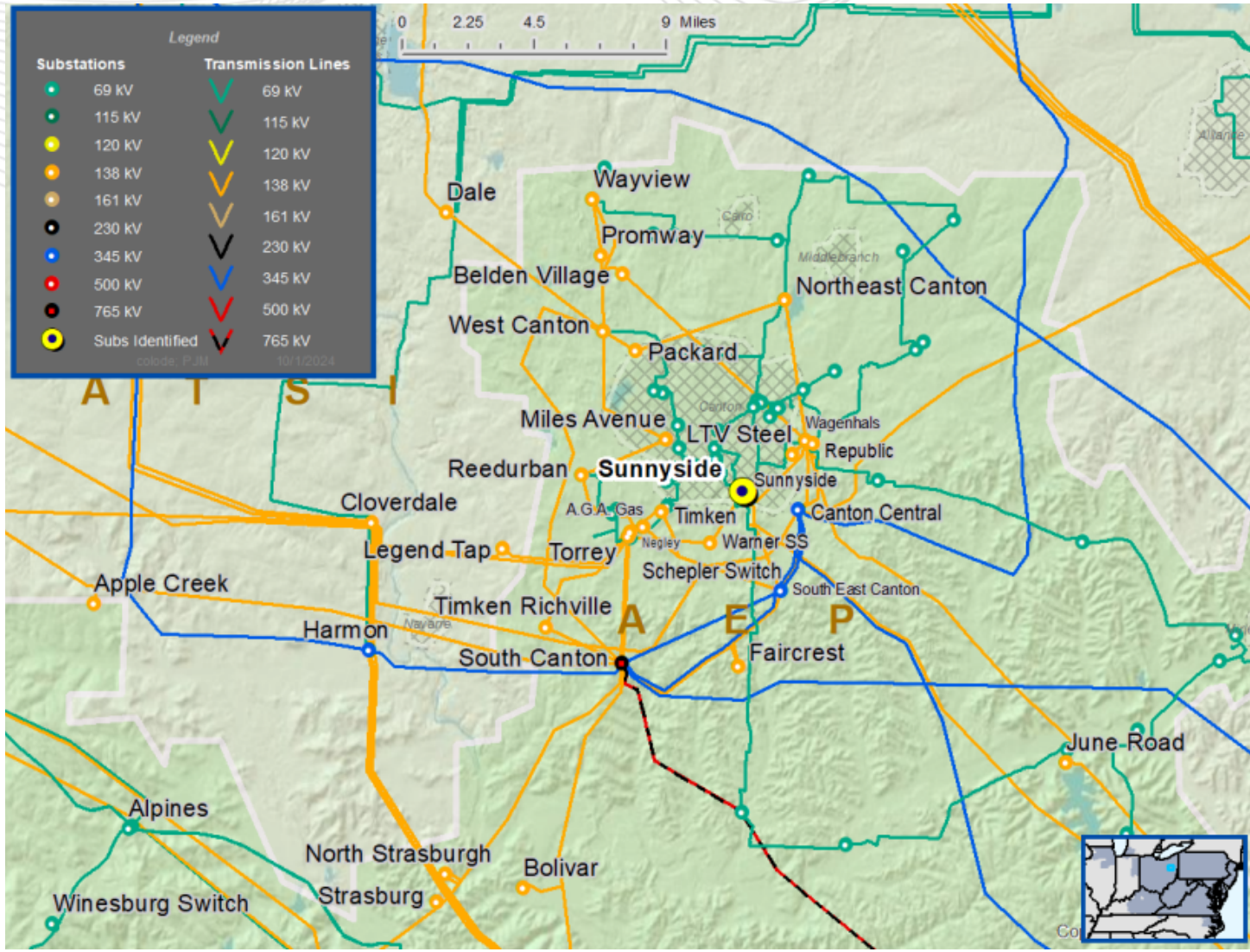
Problem Statement:

FG: 2024W1-SC-3

In both 2026 and 2029 RTEP Short Circuit base cases, the Sunnyside 138kV breaker BB is identified as being over duty.

Existing Facility Rating:

Circuit Breaker	Interrupting Rating (kA)
138kV breaker BB	40



AEP Transmission Zone: Baseline Sunnyside 138kV BB CB Replacement

Proposed Solution:

Replace over duty Sunnyside 138kV circuit breaker BB with a 63 kA circuit breaker.

Estimated Cost: $1.0M

Preliminary Facility Rating:

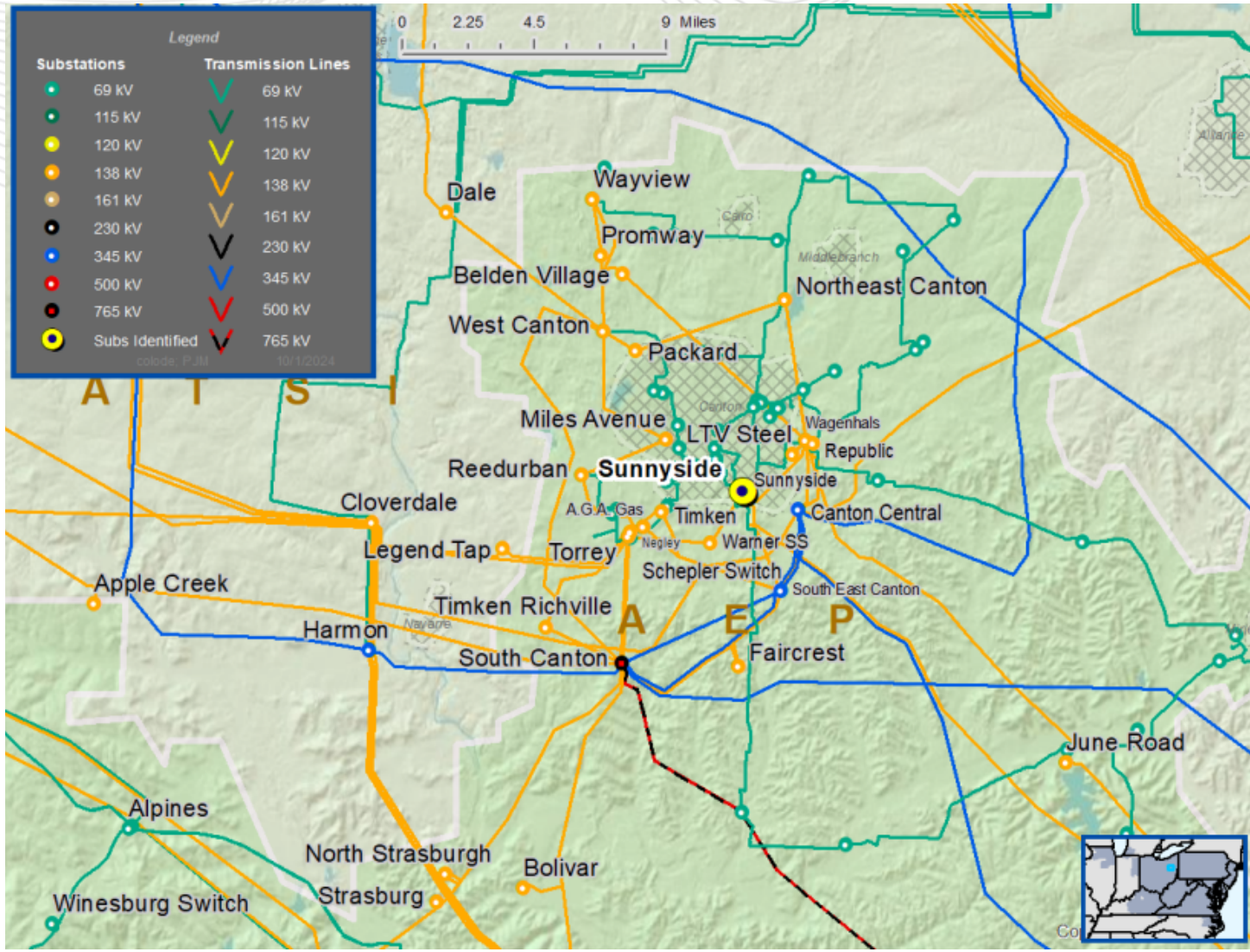
Circuit Breaker	Interrupting Rating (kA)
138kV breaker BB	63

Alternatives:

A reactor could be installed to reduce short circuit fault current but could have unintended load flow consequences. Considering the limited scope to replace the breaker, a reactor option was eliminated.

Required IS Date: 6/1/2026

Projected IS Date: 6/1/2026



AEP Transmission Zone: Baseline
Greentown 138kV CS-XT5 Circuit Switcher Replacement

Process Stage: First Read

Criteria: Short Circuit

Assumption Reference: 2024 RTEP assumptions

Model Used for Analysis: 2026 & 2029 RTEP Short Circuit base cases

Proposal Window Exclusion: Below 200kV

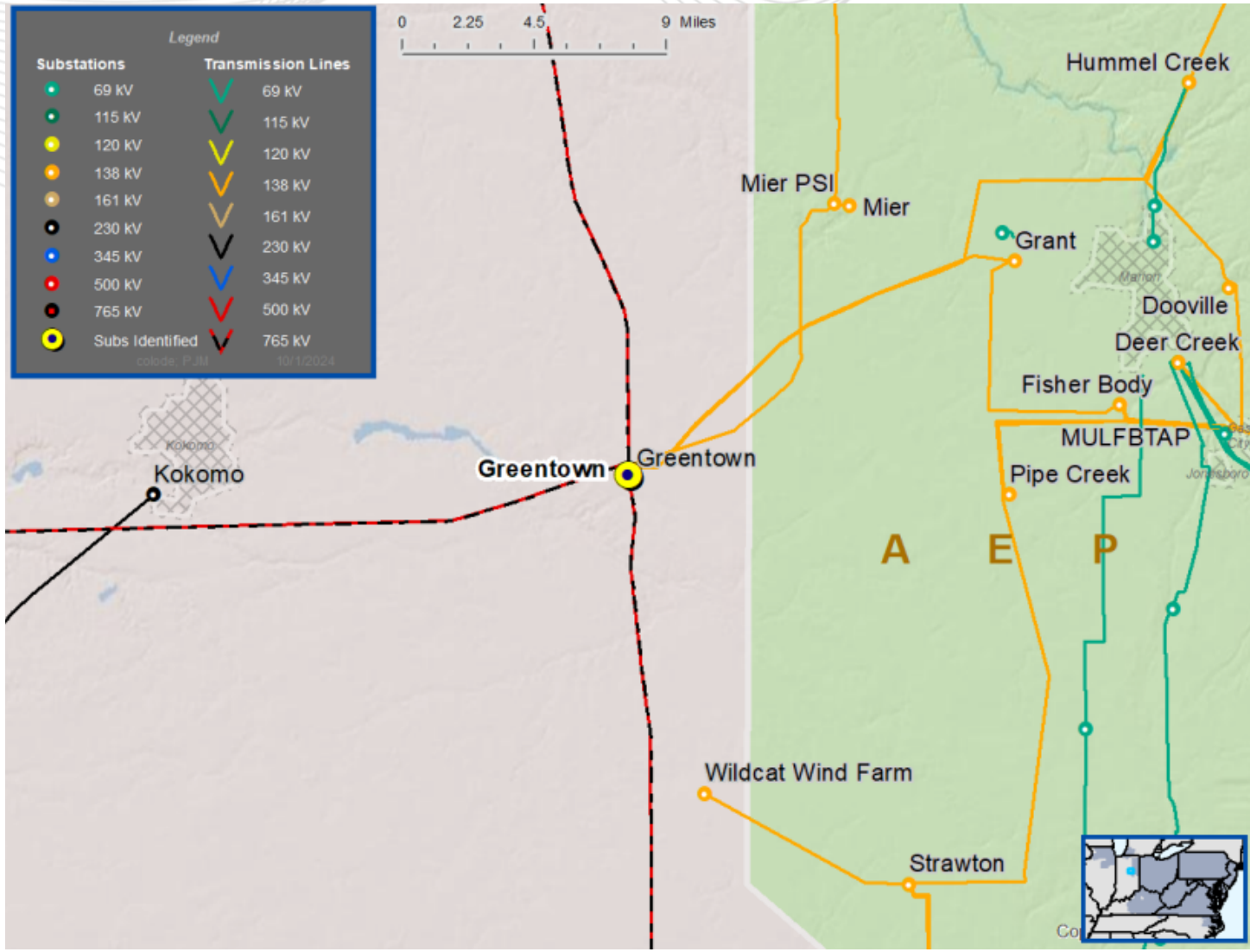
Problem Statement:

FG: 2024W1-SC-42

In both 2026 and 2029 RTEP Short Circuit base cases, the Greentown 138kV circuit switcher CS-XT5 is identified as being over duty.

Existing Facility Rating:

Circuit Breaker	Interrupting Rating (kA)
138kV breaker CS-XT5	40



AEP Transmission Zone: Baseline
Greentown 138kV CS-XT5 Circuit Switcher Replacement

Proposed Solution:

Replace over duty Greentown 138kV circuit switcher CS-XT with a 63 kA circuit breaker.

Estimated Cost: $1.0M

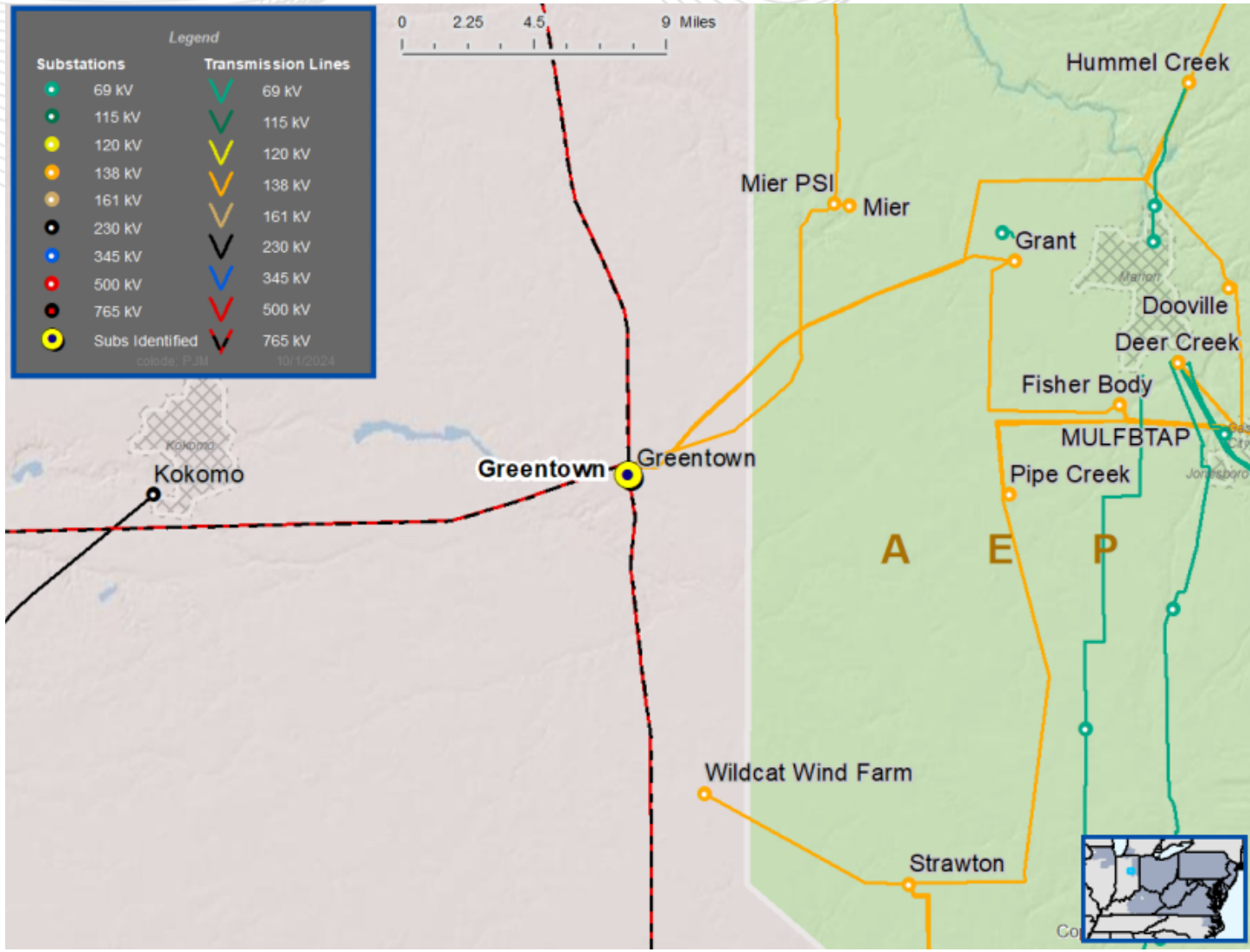
Preliminary Facility Rating:

Circuit Breaker	Interrupting Rating (kA)
138kV breaker XT8	63

Alternatives: N/A

Required IS Date: 6/1/2026

Projected IS Date: 6/1/2026



AEP Transmission Zone: Baseline
Jacksons Ferry 138kV L Circuit Switcher Replacement

Process Stage: First Read

Criteria: Short Circuit

Assumption Reference: 2024 RTEP assumptions

Model Used for Analysis: 2026 & 2029 RTEP Short Circuit base cases

Proposal Window Exclusion: Below 200kV

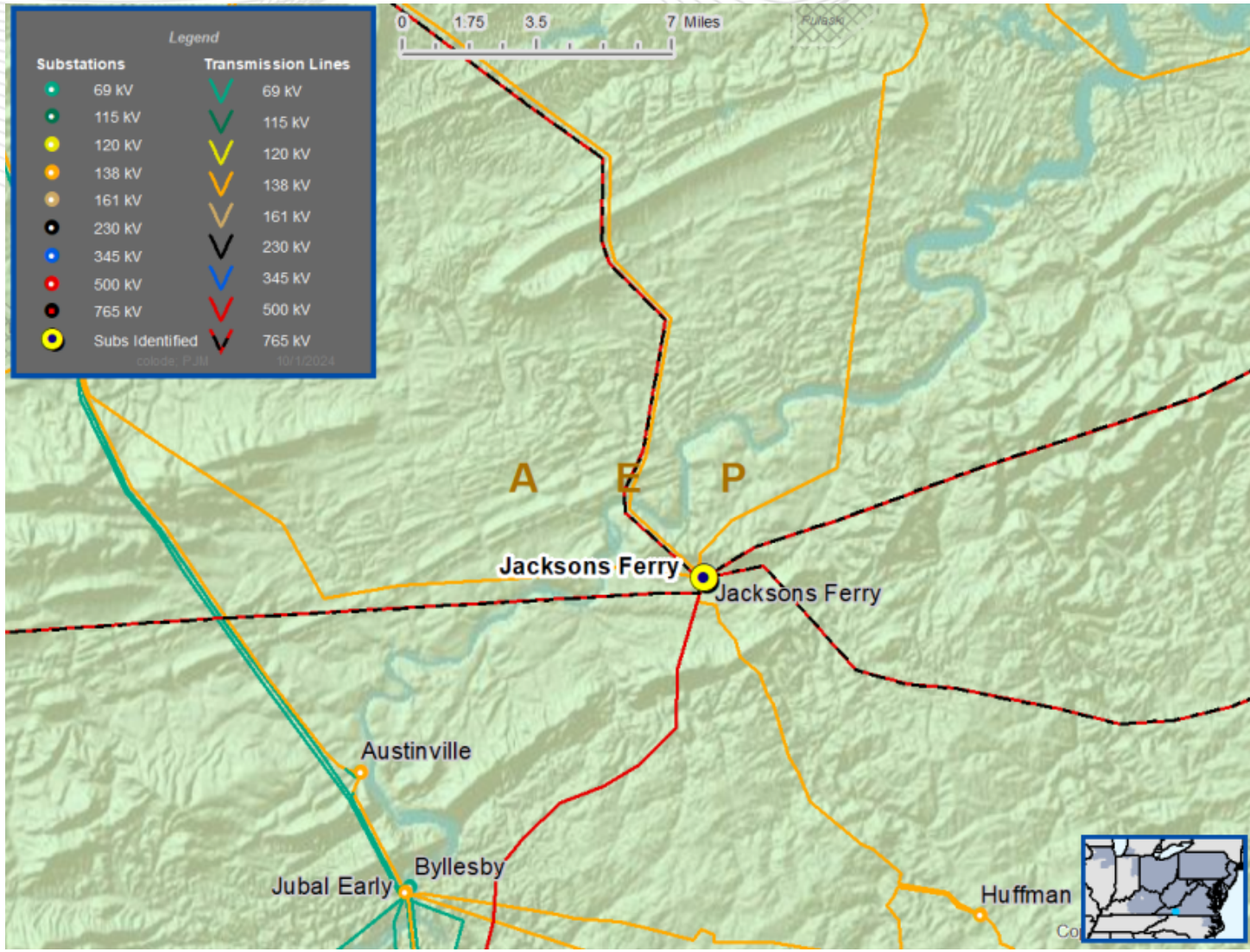
Problem Statement:

FG: 2024W1-SC-31

In both 2026 and 2029 RTEP Short Circuit base cases, the Jacksons Ferry 138kV circuit switcher L is identified as being over duty.

Existing Facility Rating:

Circuit Breaker	Interrupting Rating (kA)
138kV breaker L	40



AEP Transmission Zone: Baseline
Jacksons Ferry 138kV L Circuit Switcher Replacement

Proposed Solution:

Replace over duty Jacksons Ferry 138kV circuit switcher L with a 63 kA circuit breaker.

Estimated Cost: $1.0M

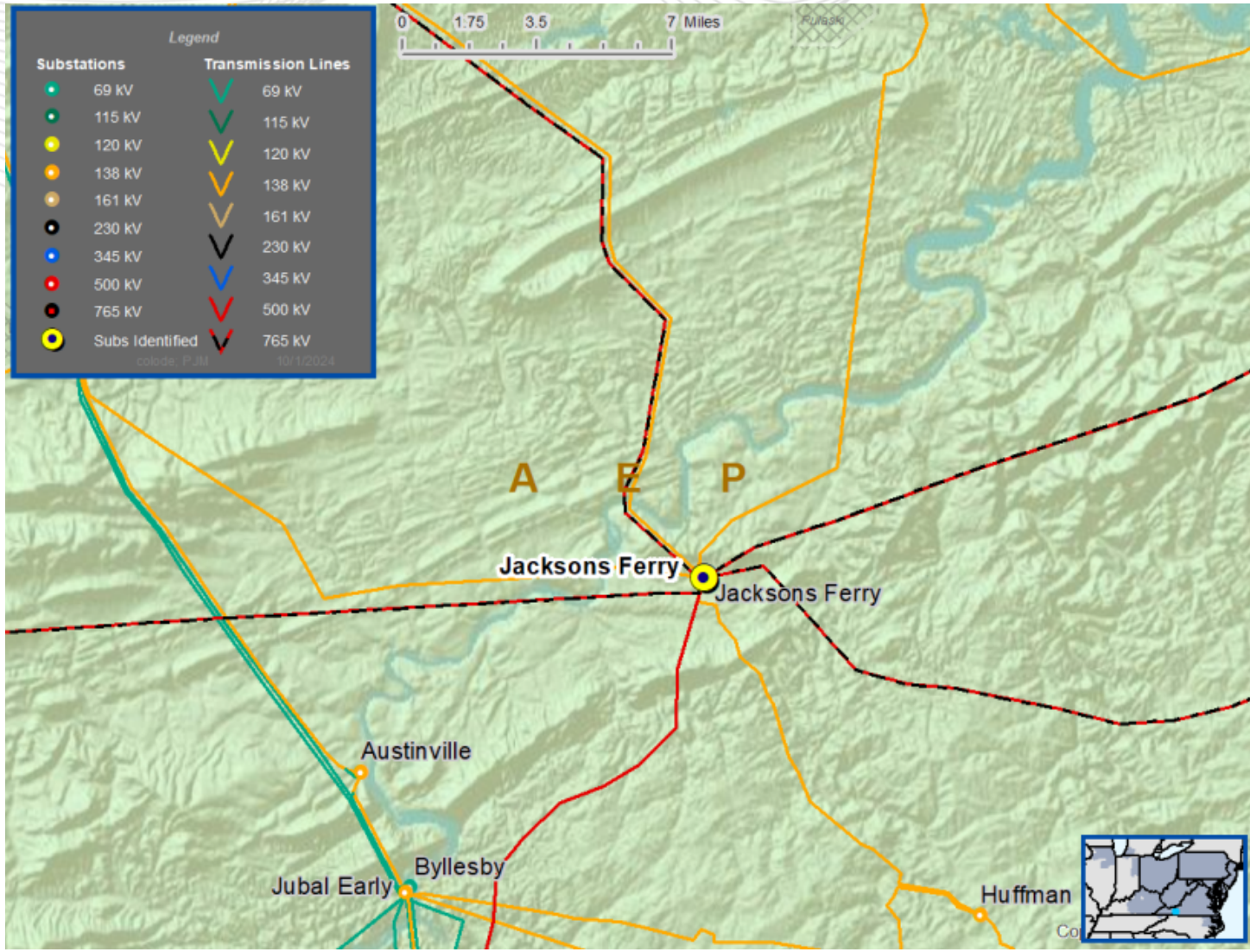
Preliminary Facility Rating:

Circuit Breaker	Interrupting Rating (kA)
138kV breaker L	63

Alternatives: Considering the location of the equipment and limited scope to resolve the issue, no other alternatives were identified as viable.

Required IS Date: 6/1/2026

Projected IS Date: 6/1/2026



AEP Transmission Zone: Baseline Hartford Transformer Tap Change Replacement

Process Stage: First Read

Criteria: TO 715 Criteria Violation

Assumption Reference: 2024 RTEP assumptions

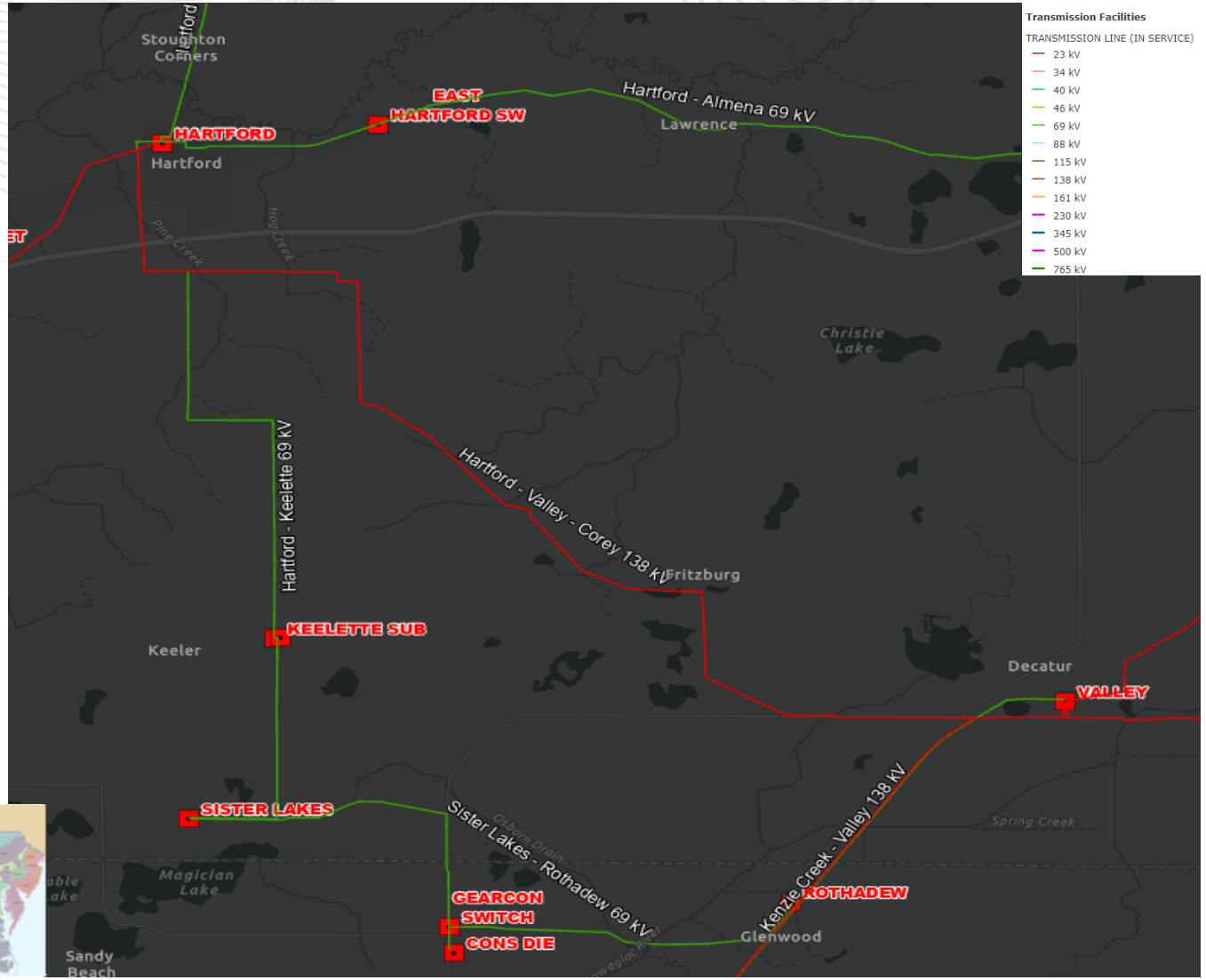
Model Used for Analysis: 2024 RTEP Light Load base case

Proposal Window Exclusion: Below 200kV

Problem Statement:

FGs: 2024-W1-AEP-VM27, 2024-W1-AEP-VM28, 2024-W1-AEP-VM29

In the 2029 RTEP Light load case, AEP identified high voltage violations at Hartford, Keelette Switch and Sister Lakes 34.5kV buses for a single contingency.



AEP Transmission Zone: Baseline Hartford Transformer Tap Change Replacement

Proposed Solution:

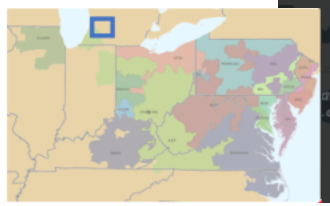
Adjust the tertiary tap on the Hartford 138/69/34.5 kV transformer 1 and on Hartford 138/69/12 kV transformer 4 to eliminate the high voltage issues and avoid circulating current

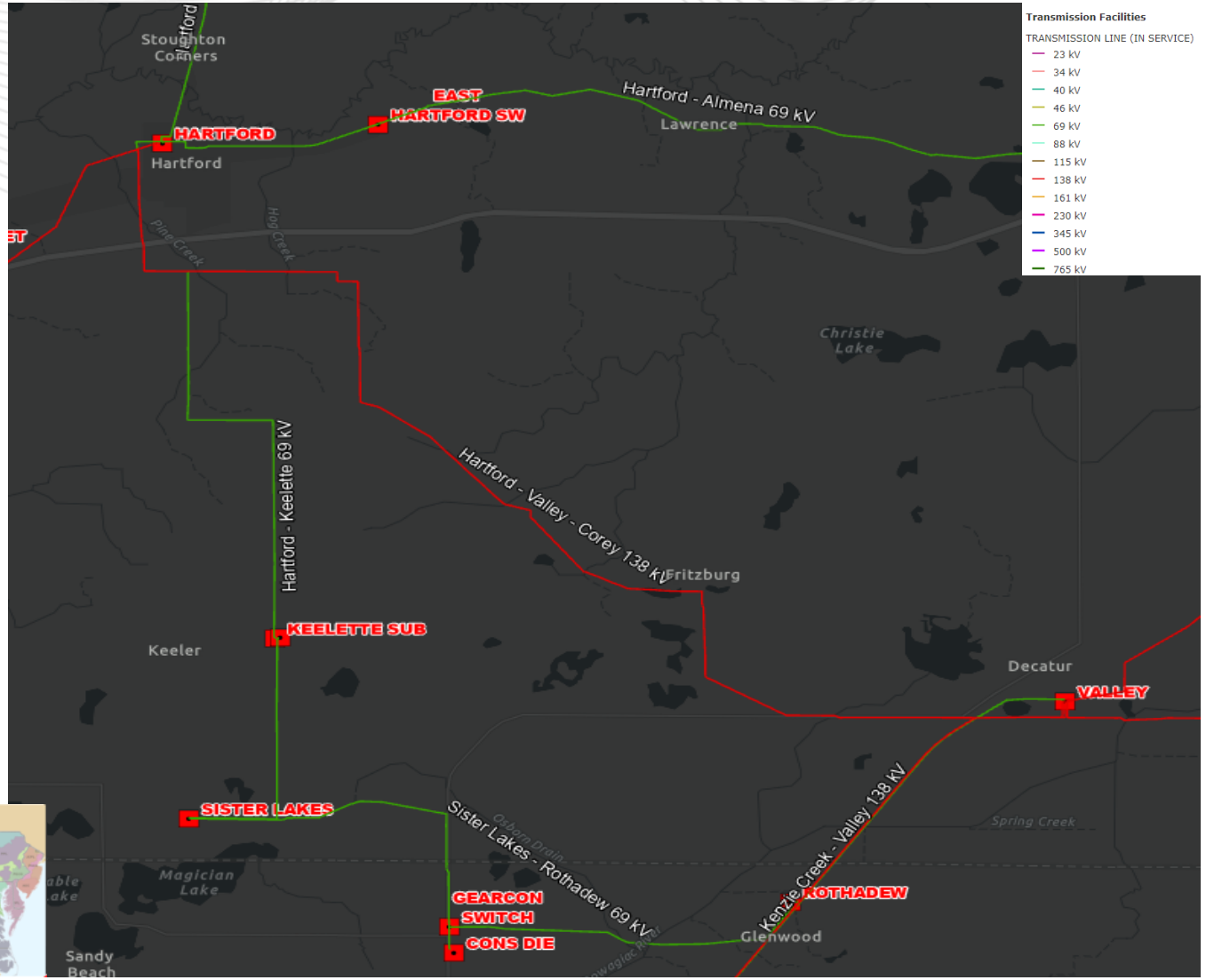
Estimated Cost: $0.1M

Alternatives: A 34.5 kV reactor could be installed at Hartford station to reduce voltage during light load periods. However, this alternative is more expensive and not needed due to the proposed solution.

Required IS Date: 4/15/2029

Projected IS Date: 6/1/2026





AEP Transmission Zone: Baseline Benwood 69kV A CB Replacement

Process Stage: First Read

Criteria: TO 715 Criteria Violation

Assumption Reference: 2024 RTEP assumptions

Model Used for Analysis: 2026 & 2029 RTEP Short Circuit base cases

Proposal Window Exclusion: Below 200kV

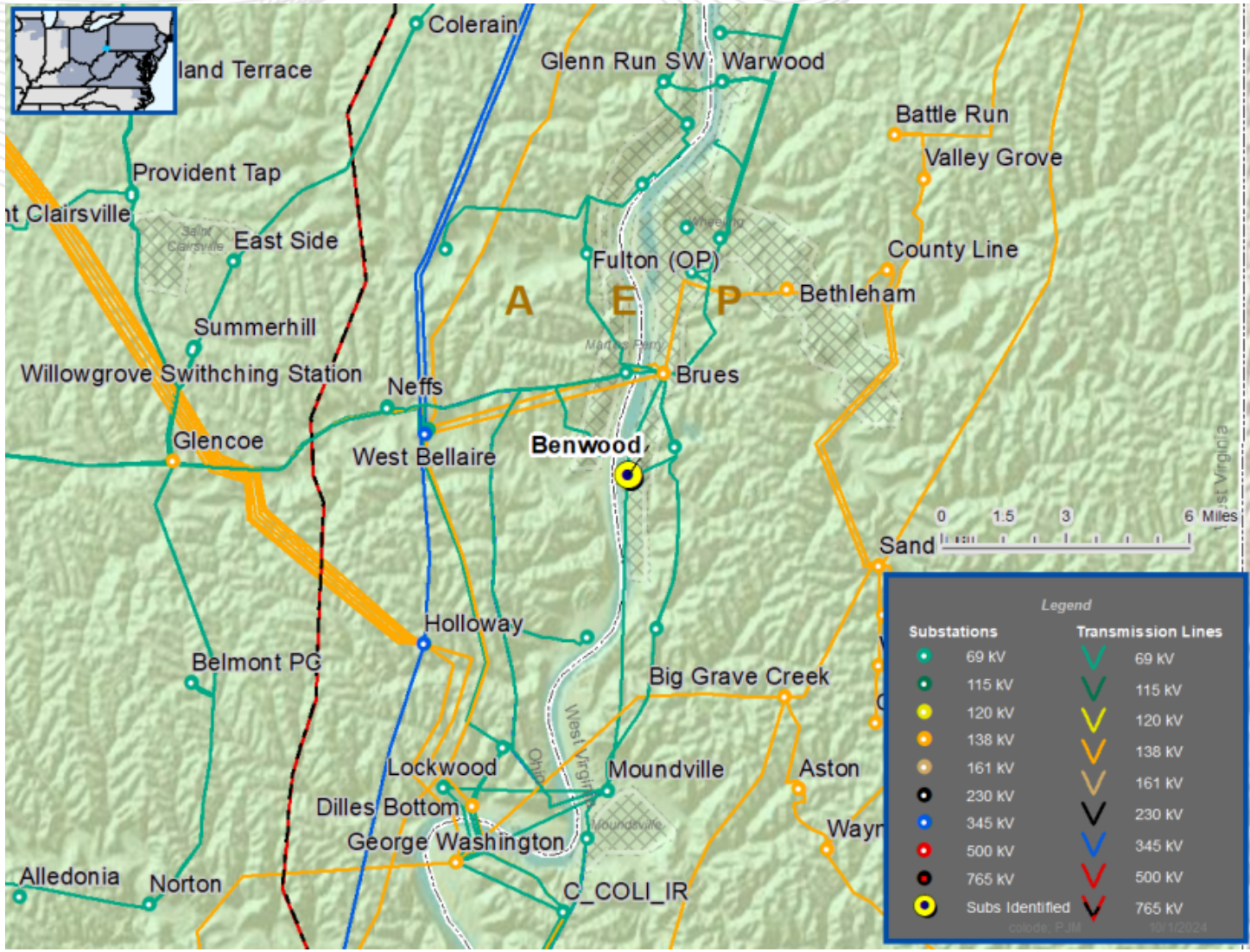
Problem Statement:

FG: 2024W1-AEP-SC2

In both 2026 and 2029 RTEP Short Circuit base cases, the Benwood 69kV breaker A is identified under FERC Form 715 as being over duty.

Existing Facility Rating:

Circuit Breaker	Interrupting Rating (kA)
69kV breaker A	12.6



AEP Transmission Zone: Baseline Benwood 69kV A CB Replacement

Proposed Solution:

Replace over duty Benwood 69kV circuit breaker A with a 40 kA circuit breaker.

Estimated Cost: $1.0M

Preliminary Facility Rating:

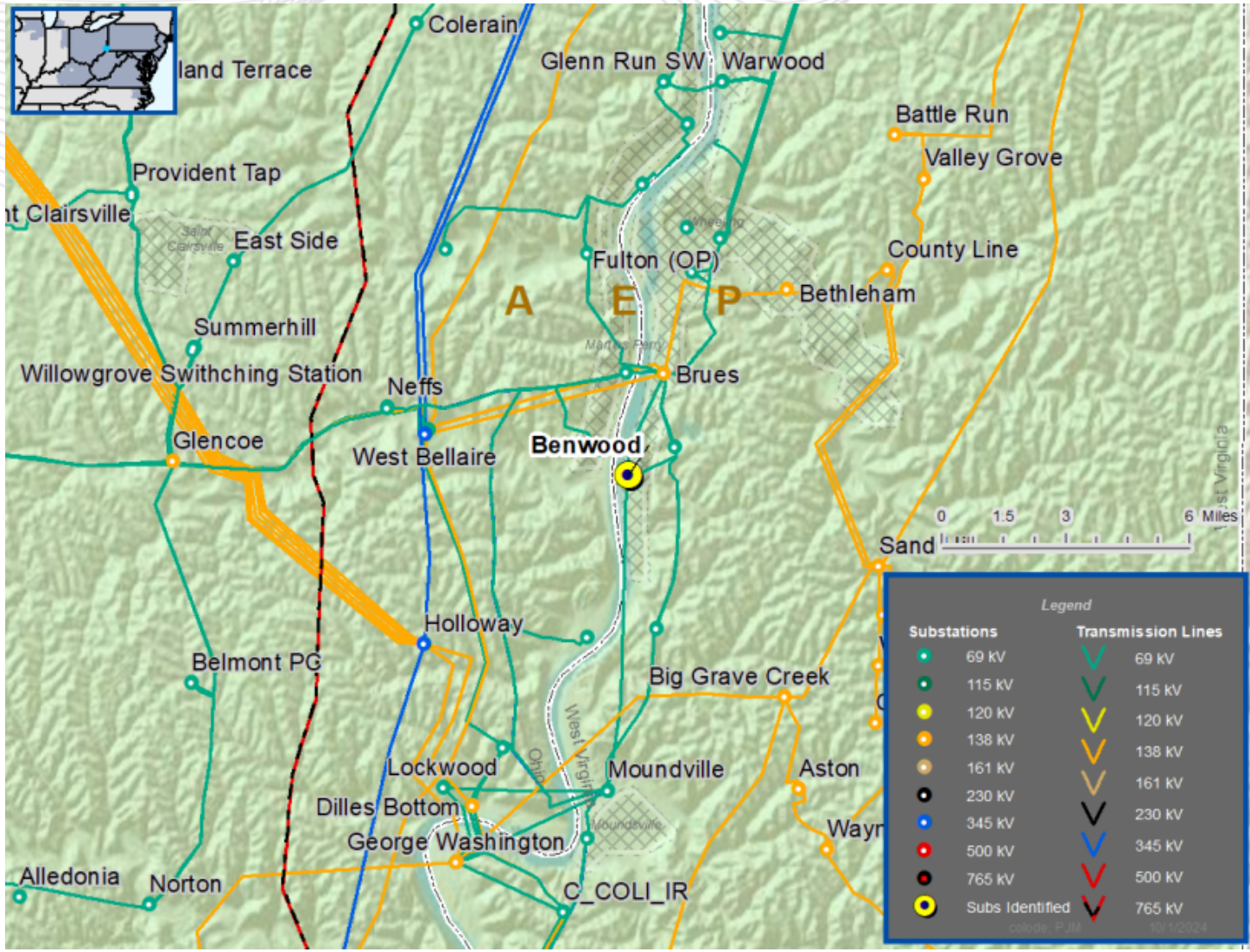
Circuit Breaker	Interrupting Rating (kA)
69kV breaker A	40

Alternative: A reactor could be installed to reduce short circuit fault current availability, but may cause other load flow issues. Considering the limited scope of the proposed solution, a reactor was deemed not prudent or viable.

Ancillary Benefits: Circuit breaker 'A' at Benwood station is an oil breaker of FK type that was originally manufactured in 1965.

Required IS Date: 6/1/2026

Projected IS Date: 6/1/2026



AEP Transmission Zone: Baseline Van Wert 69kV D CB Replacement

Process Stage: First Read

Criteria: TO 715 Criteria Violation

Assumption Reference: 2024 RTEP assumptions

Model Used for Analysis:2026 & 2029 RTEP Short Circuit base cases

Proposal Window Exclusion: Below 200kV

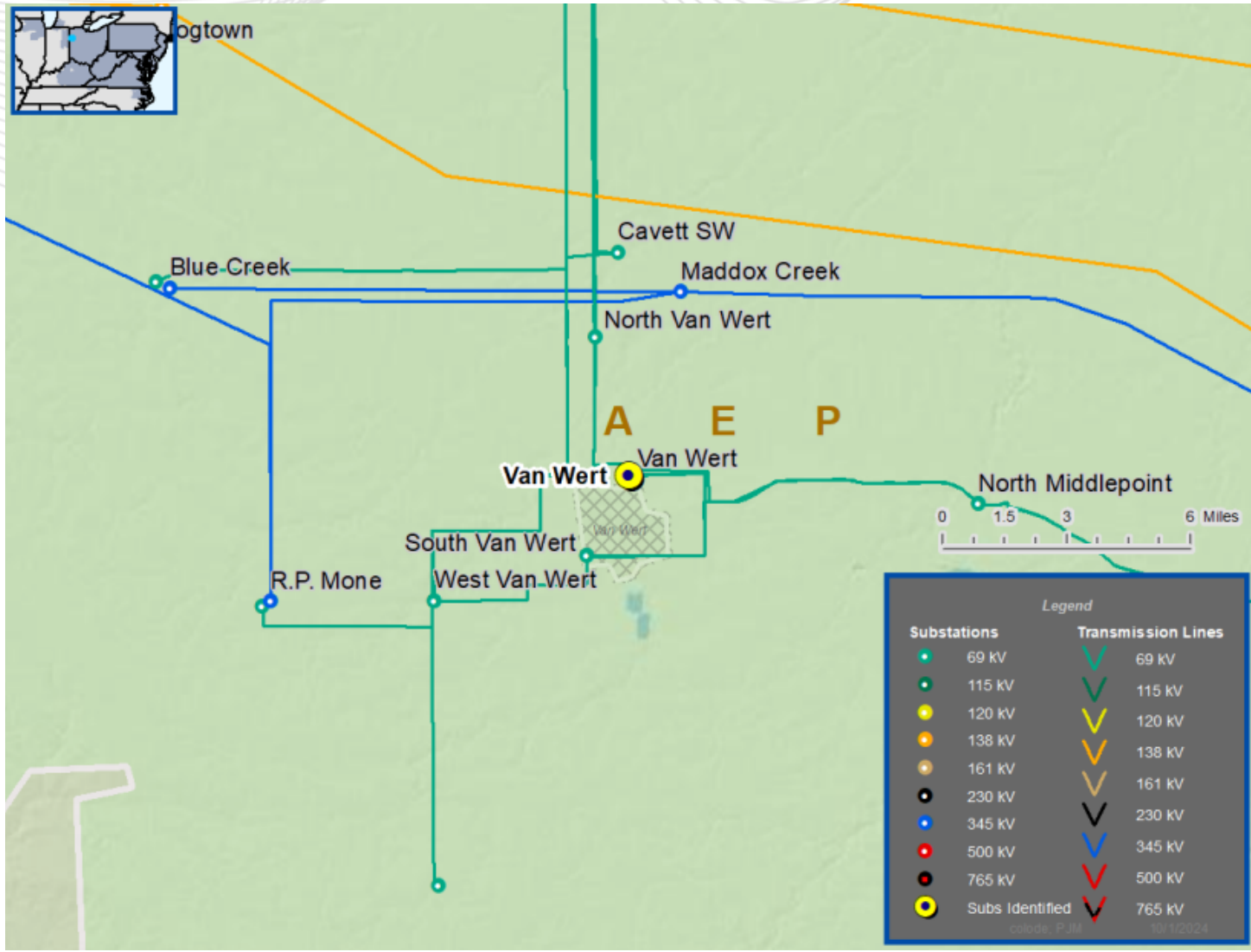
Problem Statement:

FG: 2024W1-AEP-SC3

In both 2026 and 2029 RTEP Short Circuit base cases, the Van Wert 69kV breaker D is identified under FERC Form 715 as being over duty.

Existing Facility Rating:

Circuit Breaker	Interrupting Rating (kA)
69kV breaker D	8.82



AEP Transmission Zone: Baseline Van Wert 69kV D CB Replacement

Proposed Solution:

Replace the over duty Van Wert 69kV circuit breaker D with a 40 kA circuit breaker.

Estimated Cost: $1.0M

Preliminary Facility Rating:

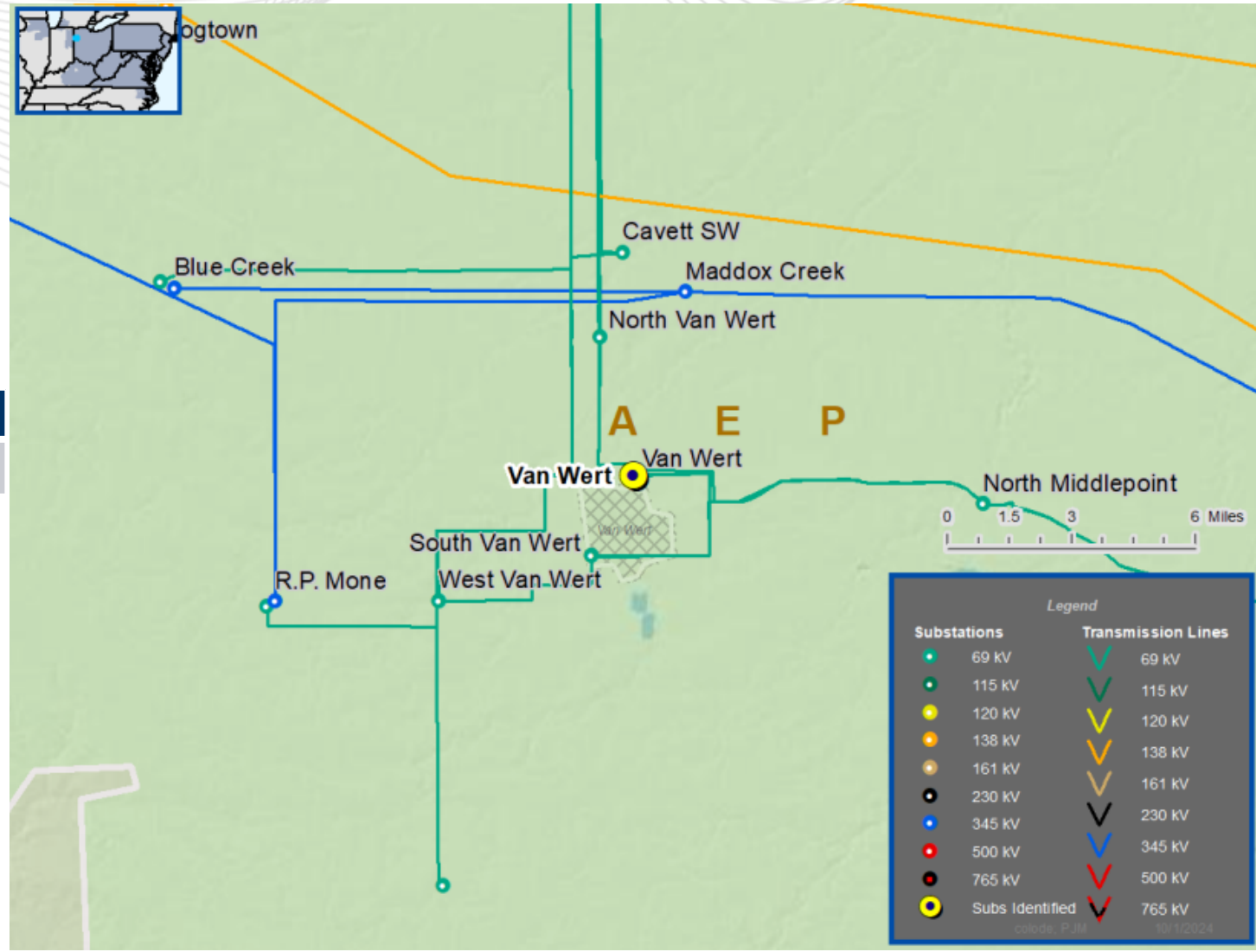
Circuit Breaker	Interrupting Rating (kA)
69kV breaker D	40

Alternatives: A reactor could be installed to reduce short circuit fault current, but could also have unintended load flow consequences. Considering the limited scope to replace the breaker, a reactor was eliminated from consideration.

Ancillary Benefits: Replaces a 1950s FK type oil breaker

Required IS Date: 6/1/2026

Projected IS Date: 6/1/2026



AEP Transmission Zone: Baseline Mount Vernon 69kV A and S CB Replacements

Process Stage: First Read

Criteria: TO 715 Criteria Violation

Assumption Reference: 2024 RTEP assumptions

Model Used for Analysis: 2026 & 2029 RTEP Short Circuit base cases

Proposal Window Exclusion: Below 200kV

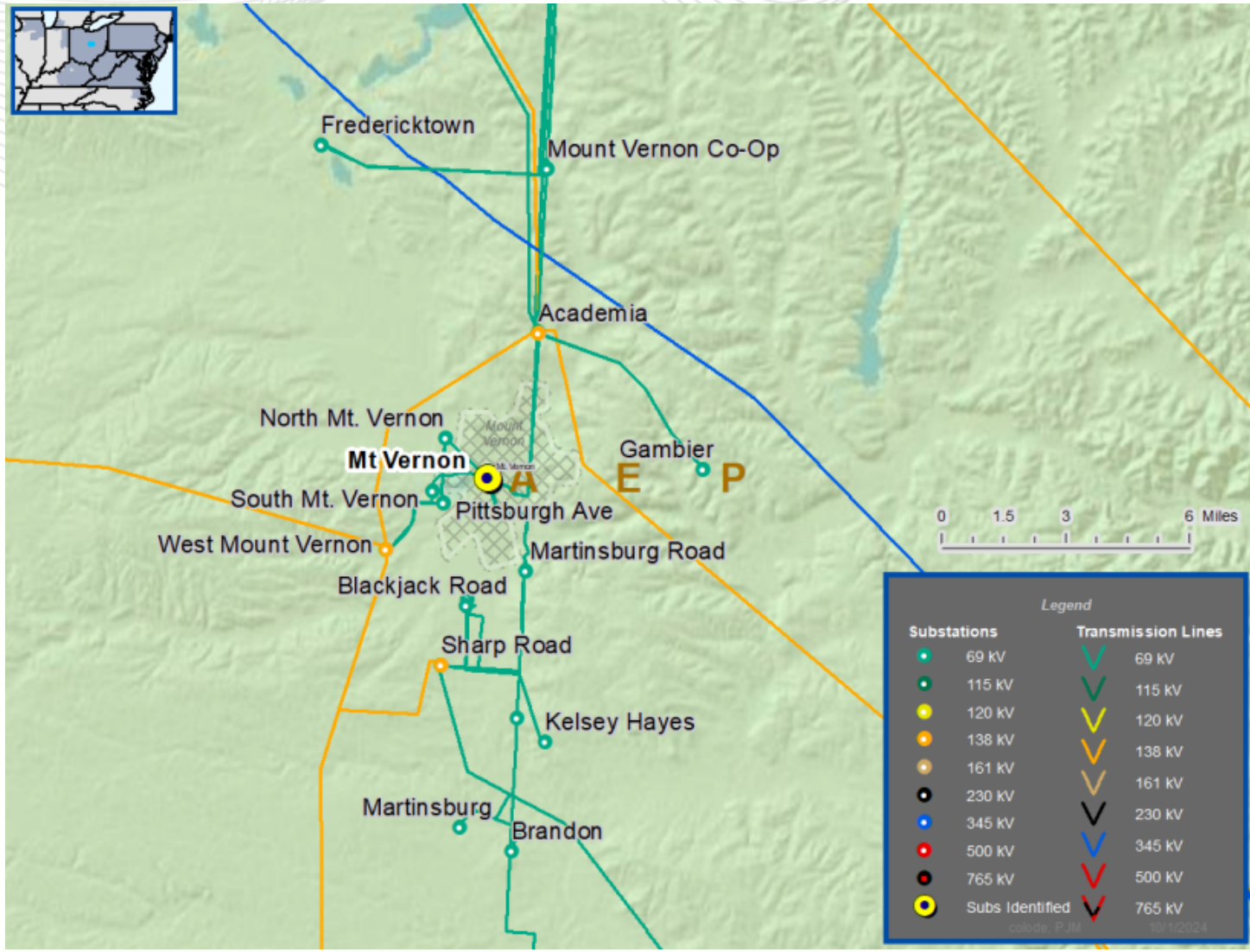
Problem Statement:

FGs: 2024W1-AEP-SC4, -SC5

In both 2026 and 2029 RTEP Short Circuit base cases, the Mount Vernon 69kV breakers A and S are identified under FERC Form 715 as being over duty.

Existing Facility Rating:

Circuit Breaker	Interrupting Rating (kA)
69kV breaker A	12.6
69kV breaker S	10



AEP Transmission Zone: Baseline Mount Vernon 69kV A and S CB Replacements

Proposed Solution:

Replace over duty Mount Vernon 69kV circuit breakers A and S with 40 kA circuit breakers.

Estimated Cost: $2.0M

Preliminary Facility Rating:

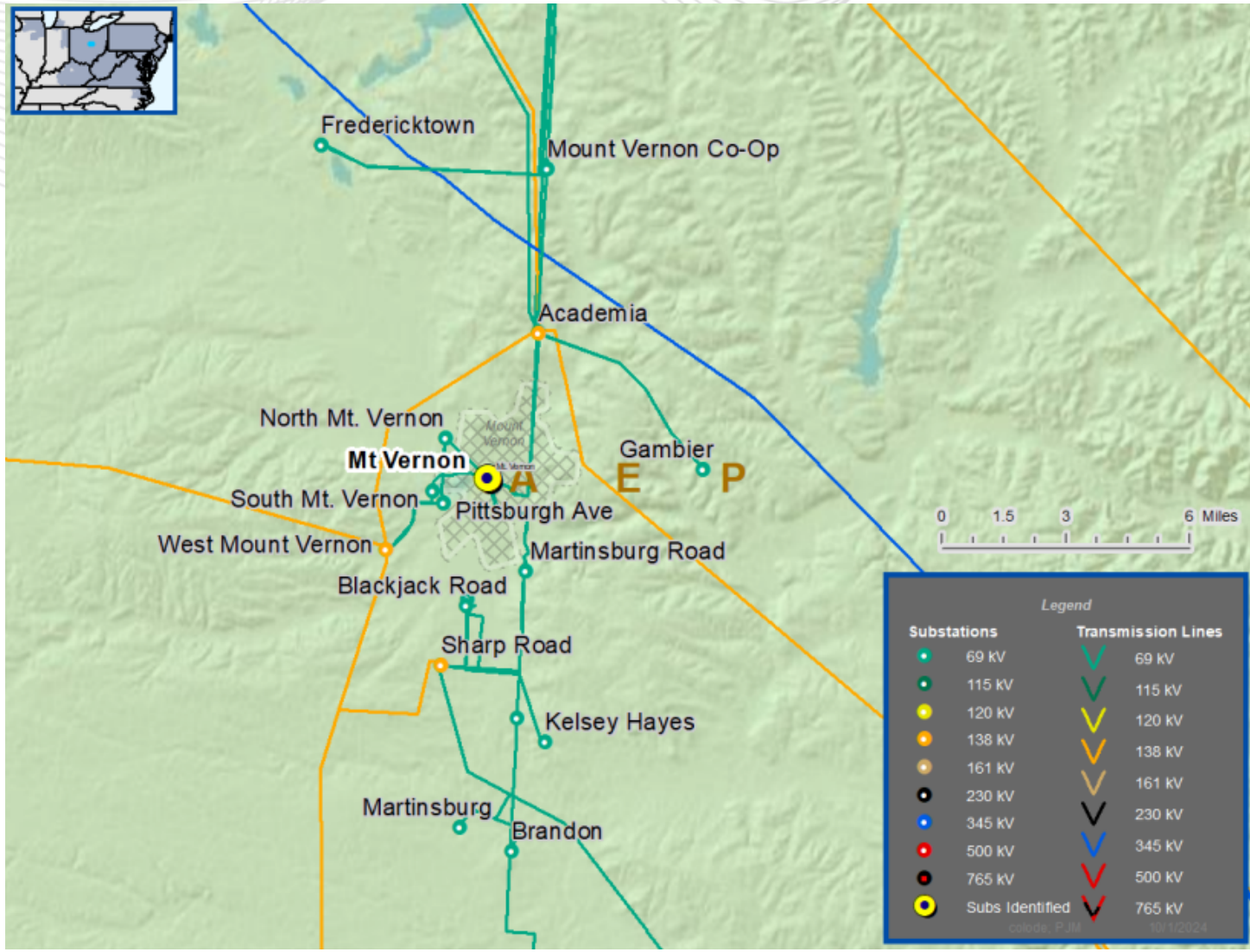
Circuit Breaker	Interrupting Rating (kA)
69kV breaker A	40
69kV breaker S	40

Alternatives: A reactor could be installed to reduce short circuit fault current, but could have other unintended load flow consequences. Considering the limited scope to replace the breakers and the overlap with previously identified supplemental needs, a reactor was eliminated from consideration.

Ancillary Benefits: Solution proposes to replace FK type oil breakers manufactured in the 1950's.

Required IS Date: 6/1/2026

Projected IS Date: 6/1/2026



AEP Transmission Zone: Baseline
Schroyer Avenue 69kV M and N CB Replacements

Process Stage: First Read

Criteria: TO 715 Criteria Violation

Assumption Reference: 2024 RTEP assumptions

Model Used for Analysis: 2026 & 2029 RTEP Short Circuit base cases

Proposal Window Exclusion: Below 200kV

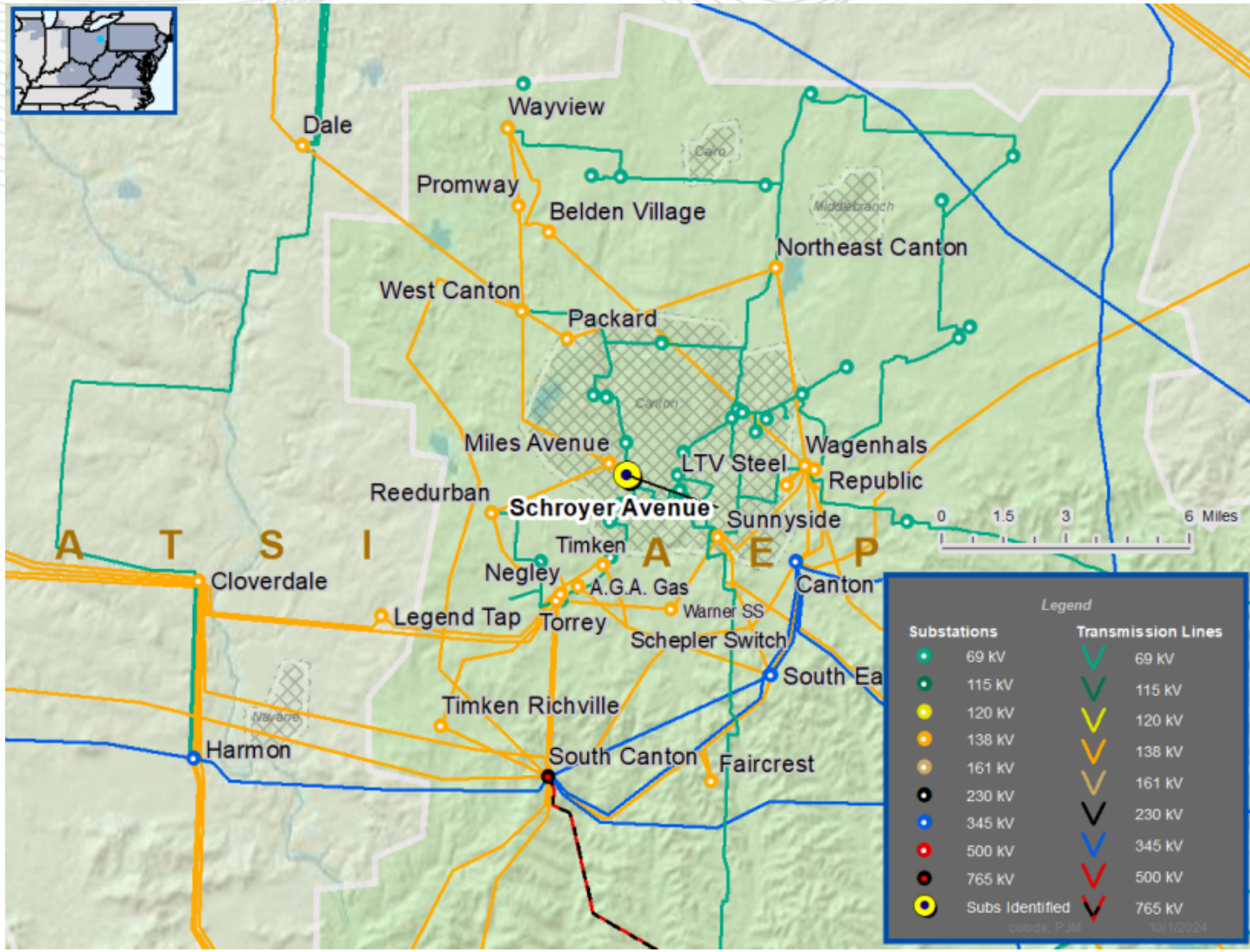
Problem Statement:

FGs: 2024W1-AEP-SC6, -SC7

In both 2026 and 2029 RTEP Short Circuit base case, the Schroyer Avenue 69kV breakers M and N are identified under FERC Form 715 as being over duty.

Existing Facility Rating:

Circuit Breaker	Interrupting Rating (kA)
69kV breaker A	21
69kV breaker S	19



AEP Transmission Zone: Baseline
Schroyer Avenue 69kV M and N CB Replacements

Proposed Solution:

Replace over duty Schroyer Avenue 69kV circuit breakers M and N with 40 kA circuit breakers.

Estimated Cost: $2.0M

Preliminary Facility Rating:

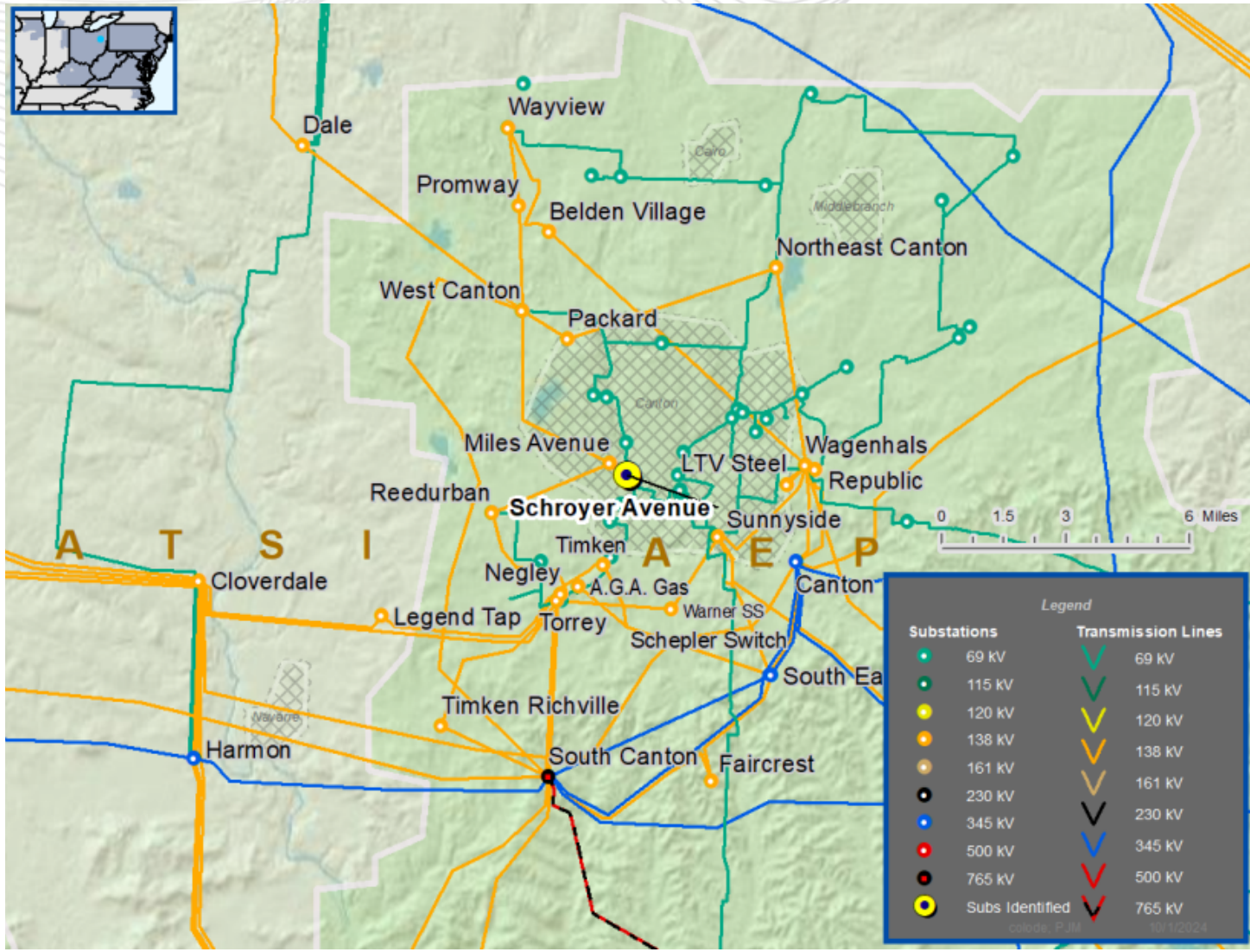
Circuit Breaker	Interrupting Rating (kA)
69kV breaker M	40
69kV breaker N	40

Alternatives: A reactor could be installed to reduce short circuit fault current, but could have unintended load flow consequences. Considering the limited scope of the required upgrades, a reactor was eliminated from consideration.

Ancillary Benefits: Replaces two oil breakers from the 1960s

Required IS Date: 6/1/2026

Projected IS Date: 6/1/2026



AEP Transmission Zone: Baseline Greenleaf Cap Bank

Process Stage: First Read

Criteria: TO 715 Criteria Violation

Assumption Reference: 2024 RTEP assumptions

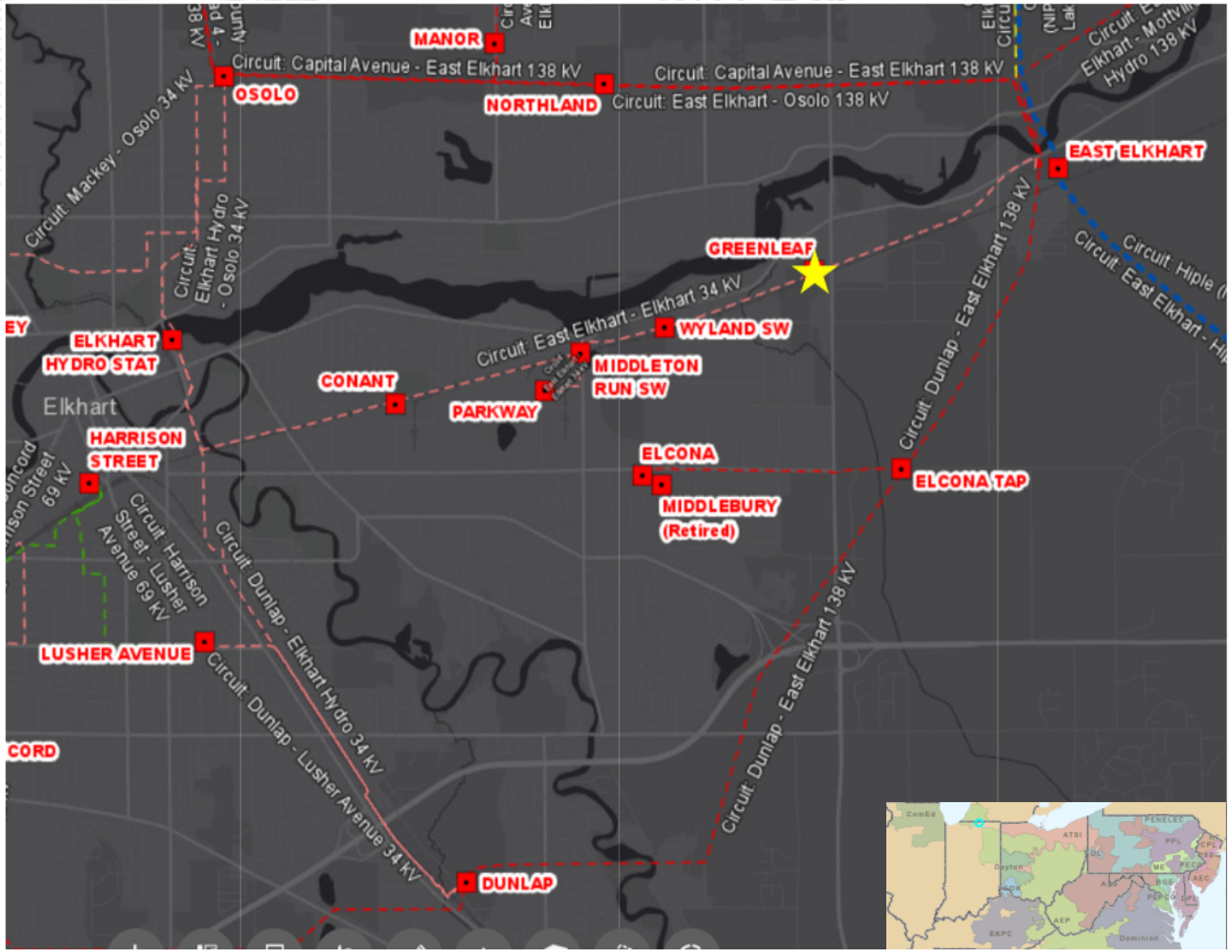
Model Used for Analysis: 2029 RTEP Summer base case

Proposal Window Exclusion: Below 200kV

Problem Statement:

FGs: 2024-W1-AEP-VD1 through VD6

In the 5-year 2029 RTEP Summer base case, the Greenleaf, Conant, Middlebury, Wyland, Parkway, and Middleton Run 34.5kV buses have voltage drop violations for a N-1-1 contingency pair.



AEP Transmission Zone: Baseline Greenleaf Cap Bank

Proposed Solution:

Install a 34.5 kV 12 MVAR cap bank and a 45 kA circuit breaker at Greenleaf.

Estimated Cost: $1.314M

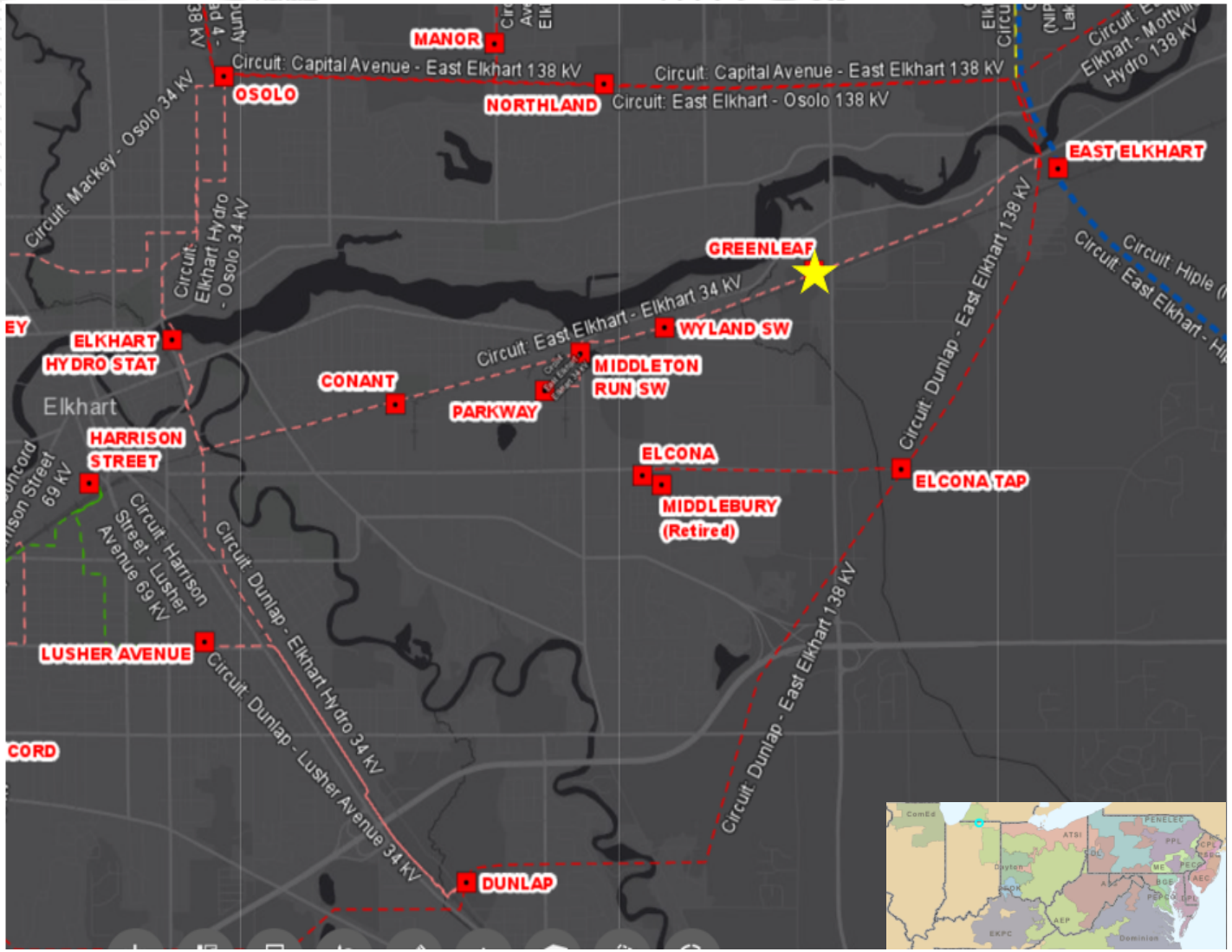
Preliminary Facility Rating:

Circuit Breaker	Interrupting Rating (kA)
34.5kV cap breaker	45

Alternatives: Considering the availability of land and space at Greenleaf station and the proposed cost of the upgrade, no other viable transmission alternates were identified.

Required IS Date: 6/1/2029

Projected IS Date: 6/1/2029



AEP Transmission Zone: Baseline Firebrick – Jefferson 69kV Reconductor

Process Stage: First Read

Criteria: TO 715 Criteria Violation

Assumption Reference: 2024 RTEP assumptions

Model Used for Analysis: 2029 RTEP Summer base case

Proposal Window Exclusion: Below 200kV

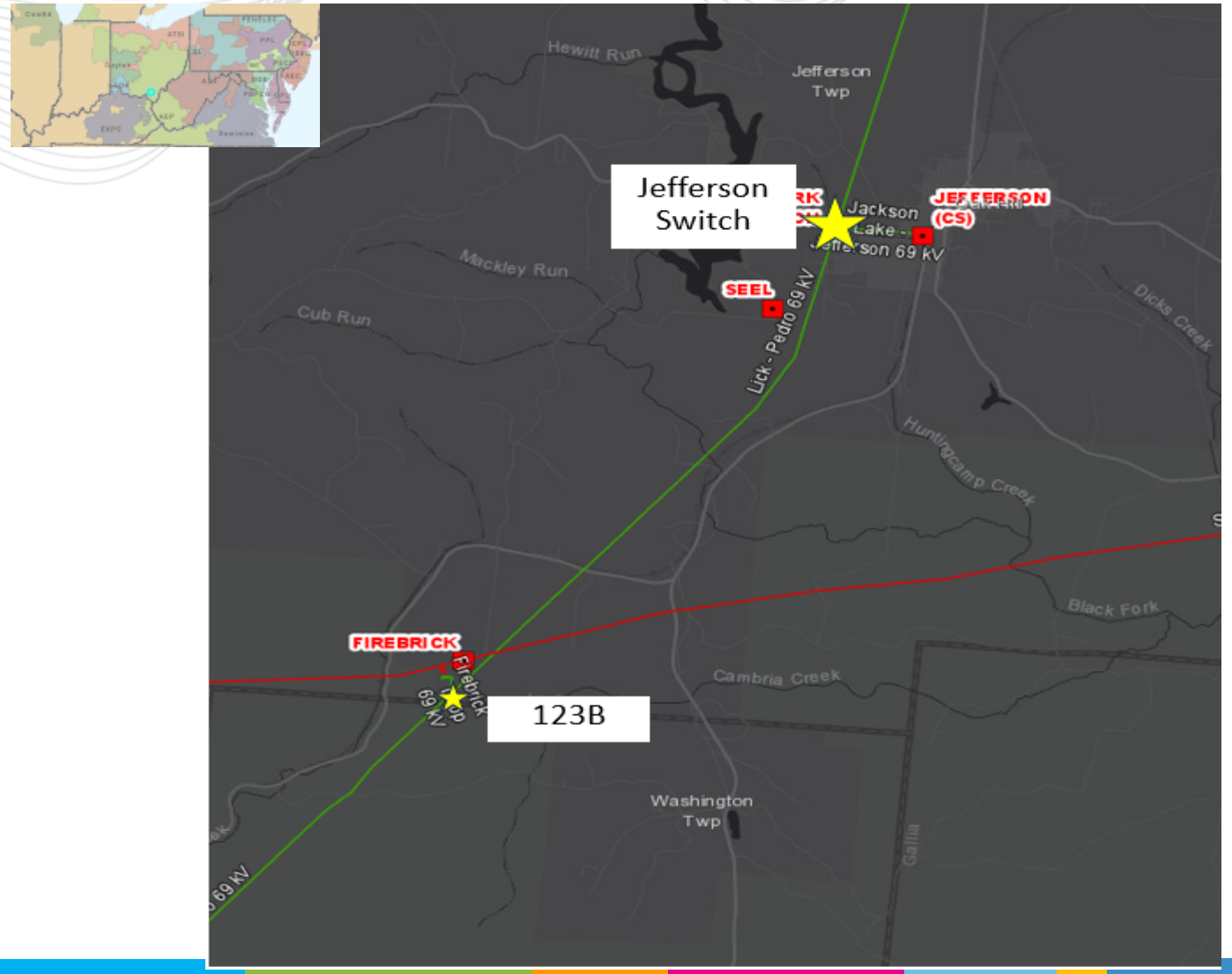
Problem Statement:

FGs: 2024W1-AEP-T11 through T13

In the 5-year 2029 RTEP Summer base case, the Firebrick-Jefferson Switch 69 kV branch is overloaded under for multiple N-1-1 contingency pairs.

Existing Facility Rating:

Branch	SN/SE/WN/WE (MVA)
Firebrick - Jefferson (69KV)	50/50/63/63



AEP Transmission Zone: Baseline Firebrick – Jefferson 69kV Reconductor

Proposed Solution:

Reconductor ~3.95 miles of ACSR 6/1 Penguin (4/0) on the Firebrick-Jefferson Switch 69 kV branch with ACSR 556.6 26/7. Remote End (Line protection settings) would need to be updated at Firebrick and Lick. Replace 600A Switches at Jefferson and replace 477 AA 19 sub conductor at Firebrick.

Estimated Cost: $8.5M

Preliminary Facility Rating:

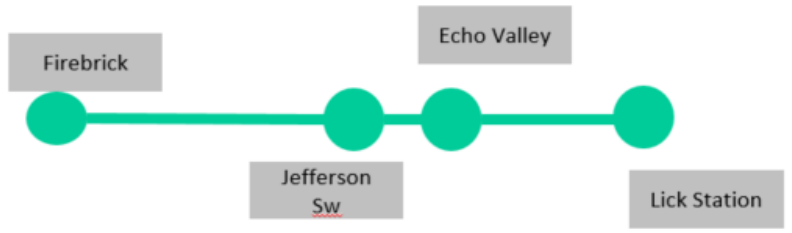
Branch	SN/SE/WN/WE (MVA)
Firebrick - Jefferson (69kV)	102/129/129/135

Alternatives: A complete rebuild was considered, but the majority of the structures on the line were replaced in 2008. Instead, the project will look to replace the existing conductor with targeted structure replacements along the line to accommodate a larger conductor.

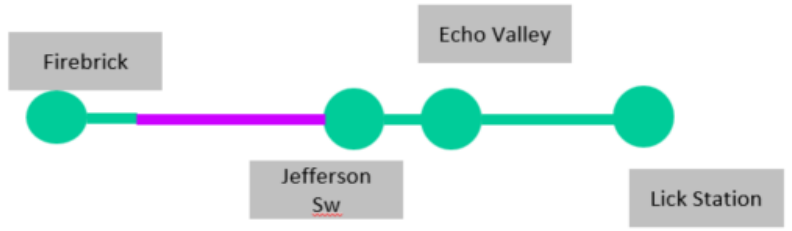
Required IS Date: 6/1/2029

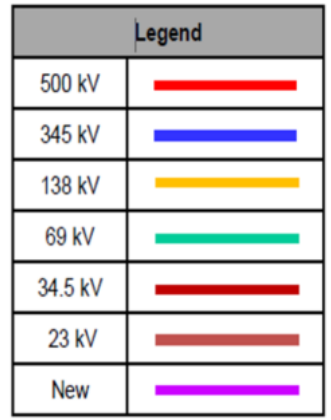
Projected IS Date: 4/1/2029

Existing:



Proposed:





AEP Transmission Zone: Baseline Richlands Cap 69kV Bank Installation

Process Stage: First Read

Criteria: TO 715 Criteria Violation

Assumption Reference: 2024 RTEP assumptions

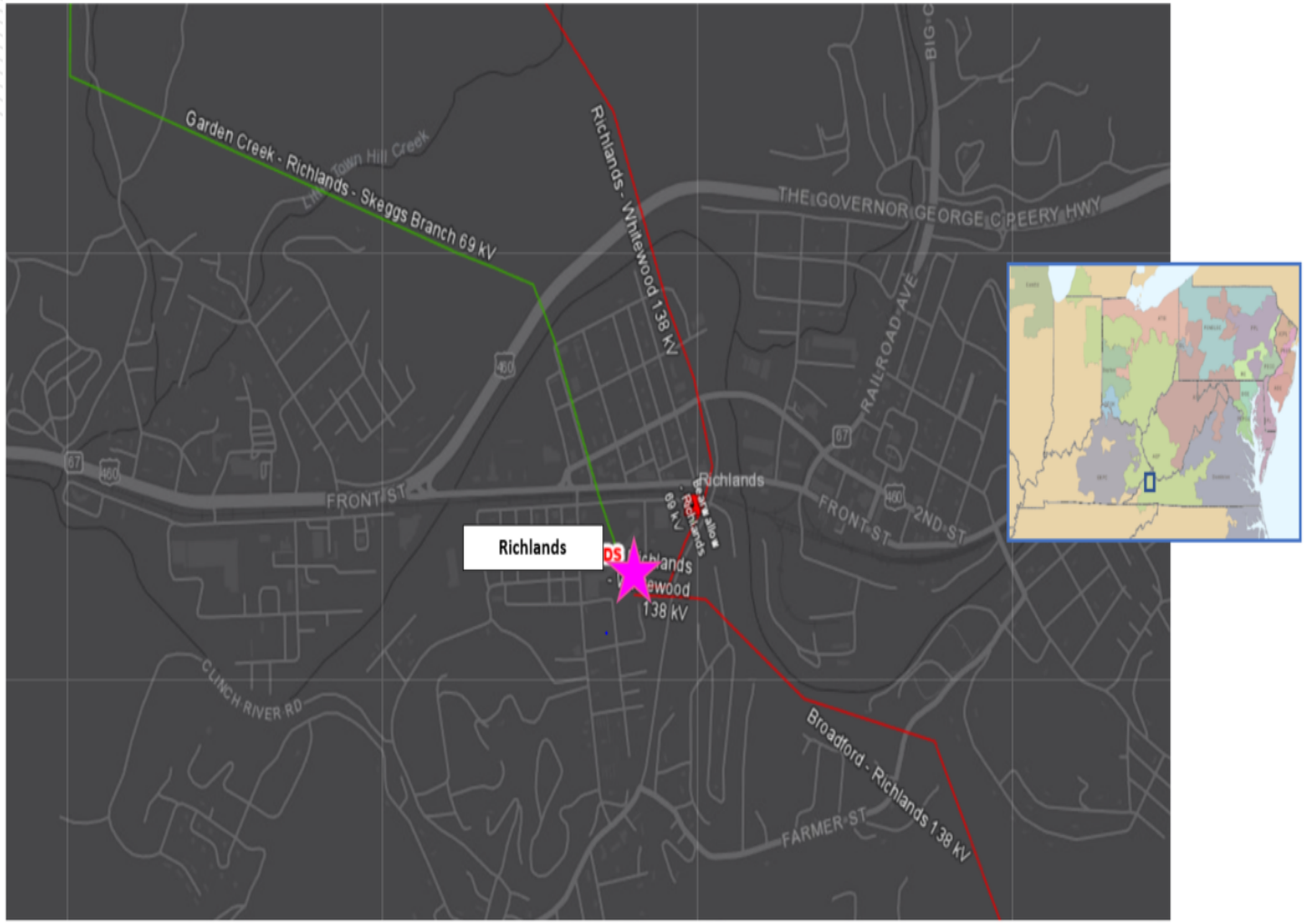
Model Used for Analysis: 2029 RTEP Winter base case

Proposal Window Exclusion: Below 200kV

Problem Statement:

FGs: 2024W1-AEP-VD45, 2024W1-AEP-VD46

In the 5-year 2029 RTEP Winter base case, the voltage drop violations at Richlands and Town of Richlands stations are identified under for a N-1-1 contingency pair.



AEP Transmission Zone: Baseline Richlands 69kV Cap Bank Installation

Proposed Solution:

Install a 69kV 11.5MVar capacitor bank at Richlands station with a circuit switcher.

Estimated Cost: $1.0M

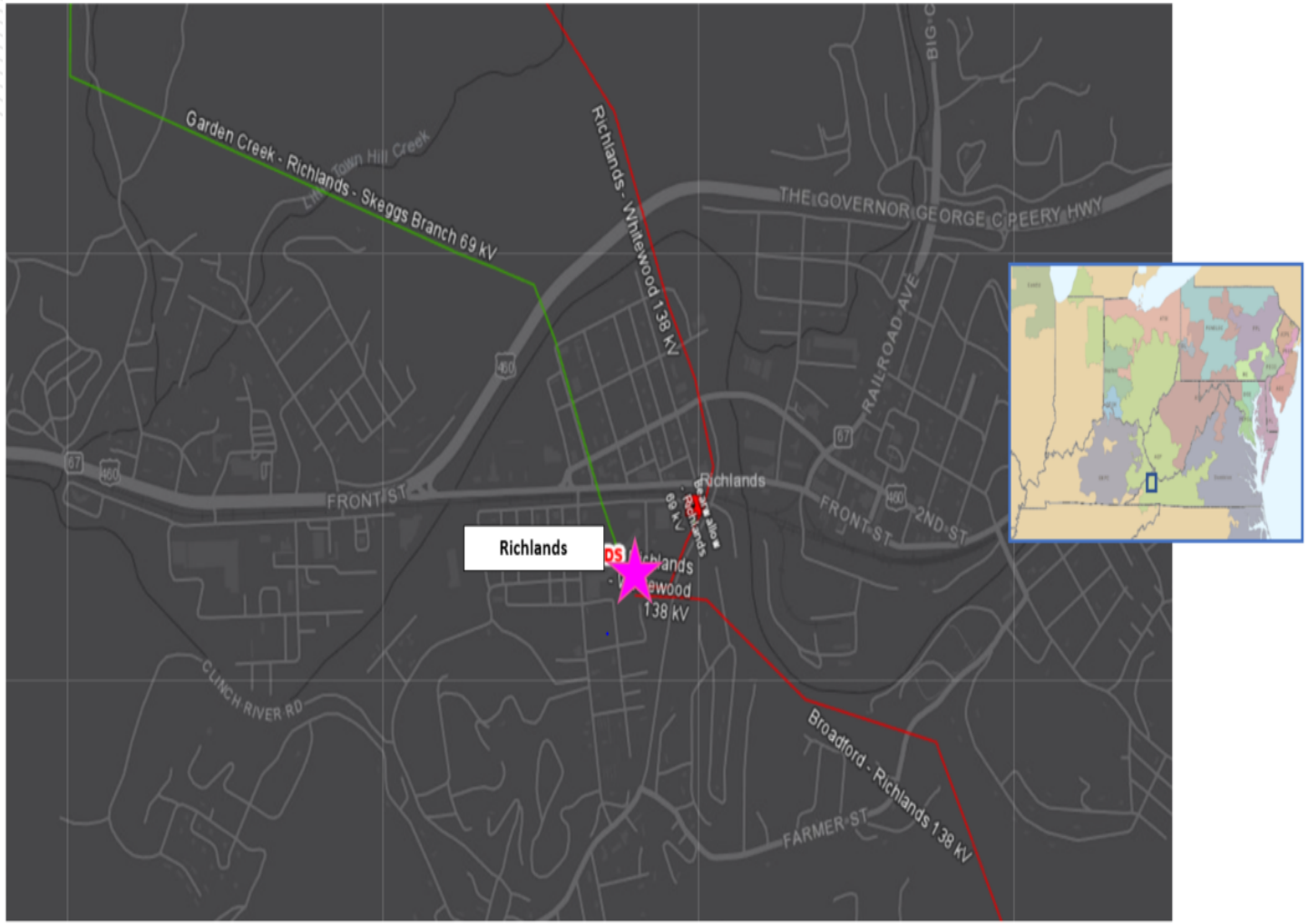
Preliminary Facility Rating:

Circuit Switcher	Capacity (KA)
Richlands 69kV circuit switcher EE	40

Alternatives: Considering the limited scope and cost of the proposal, no other viable alternatives were identified.

Required IS Date: 12/1/2029

Projected IS Date: 12/1/2029



AEP Transmission Zone: Baseline
Toronto – South Toronto Tap 69kV Reconductor

Process Stage: First Read

Criteria: TO 715 Criteria Violation

Assumption Reference: 2024 RTEP assumptions

Model Used for Analysis: 2029 RTEP Summer base case

Proposal Window Exclusion: Below 200kV

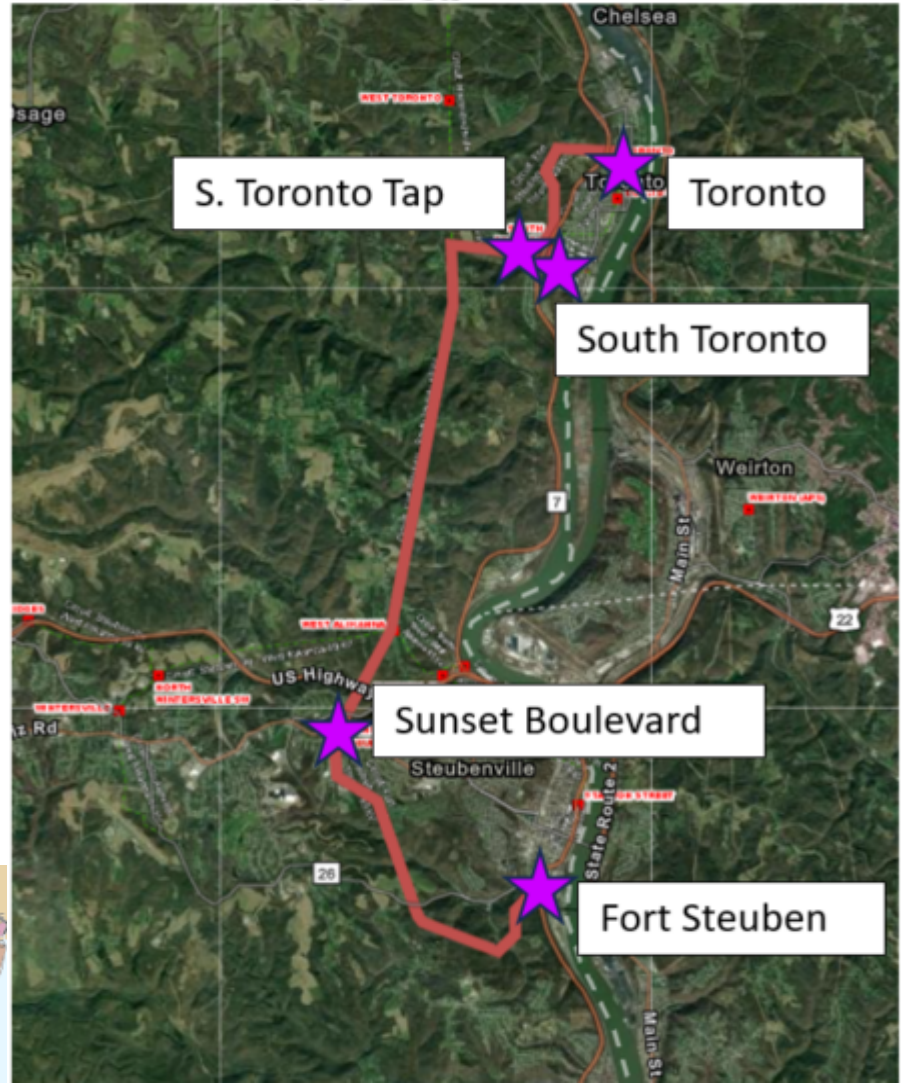
Problem Statement:

FG: 2024-W1-AEP-T8

In the 5-year 2029 RTEP Summer base case, the line section between South Toronto station and the South Toronto Tap 69 kV is overloaded under for a N-2 contingency.

Existing Facility Rating:

Branch	SN/SE/WN/WE (MVA)
South Toronto - South Toronto (138)	50/50/63/63
South Toronto - South Toronto Tap (69)	50/50/63/63



AEP Transmission Zone: Baseline
Toronto – South Toronto Tap 69kV Reconductor

Proposed Solution:

Replace line conductor, ~0.11 miles of 4/0 ACSR 6/1 conductor with 556.5 26/7 between South Toronto and the South Toronto Tap.
Estimated Cost: 0.50M

Upgrade the wave trap, CCVTs, switches, and station conductor at South Toronto station currently limiting the line to South Toronto Tap.
Estimated Cost: 0.60M

Total Estimated Cost: $1.1M

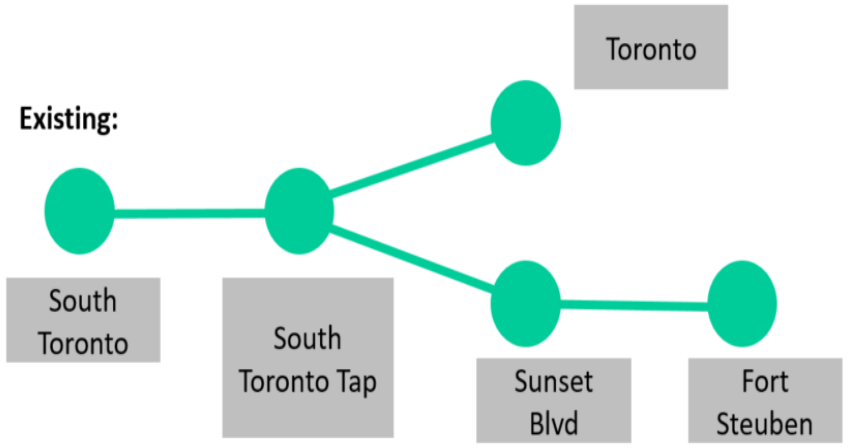
Preliminary Facility Rating:

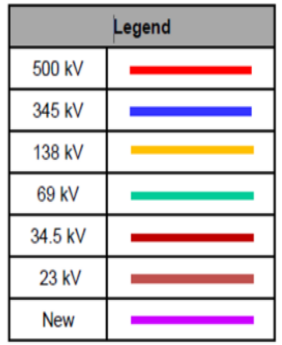
Branch	SN/SE/WN/WE (MVA)
South Toronto - South Toronto (138)	151/151/196/196
South Toronto - South Toronto Tap (69)	151/151/196/196

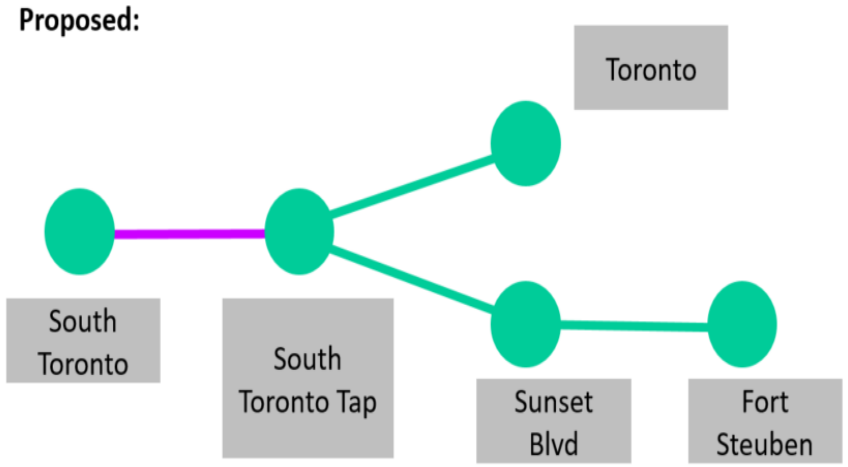
Alternatives: Considering the limited scope and the requirement mitigation, no other viable alternatives were identified.

Required IS Date: 6/1/2029

Projected IS Date: 6/1/2029







AEP Transmission Zone: Baseline Beatty 69kV Cap Bank

Process Stage: First Read

Criteria: TO 715 Criteria Violation

Assumption Reference: 2024 RTEP assumptions

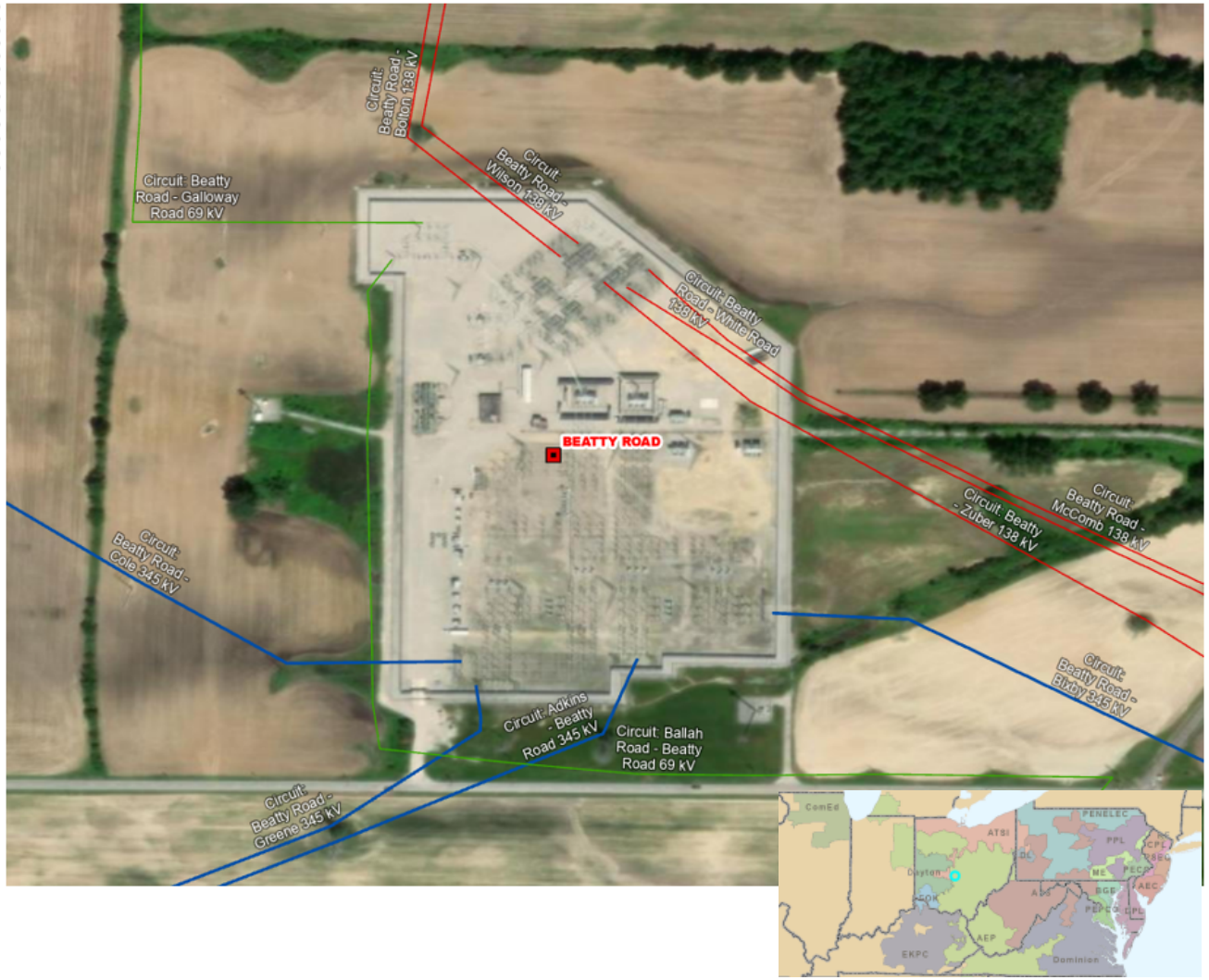
Model Used for Analysis: 2029 RTEP Summer/Winter base cases

Proposal Window Exclusion: Below 200kV

Problem Statement:

FGs: 2024W1-AEP-VD7 through VD44, 2024W1-AEP-VM1 through VM26

In the 5-year 2029 RTEP Summer/Winter base cases, low voltage and voltage drop violations at the Galloway, Beatty, Clark Lakes , Ballah SS, Madison, Deer Creek, Texas Eastern, Dry Run SS, Darbyville, Big Darby SS 69kV buses are identified under for a N-2 contingency pair.



AEP Transmission Zone: Baseline Beatty 69kV Cap Bank

Proposed Solution:

At Beatty Road substation, install a 69kV 23 Mvar capacitor bank along with the 69kV cap bank breaker.

Estimated Cost: $2.25M

Preliminary Facility Rating:

Circuit Breaker	SN/SE/WN/WE (kA)
Beatty Road Capacity 69kV breaker	40

Alternatives: A second 138/69 kV transformer could be installed at Beatty; considering the low cost and smaller scope of the proposed solution, the transformer option was not chosen.

Required IS Date: 6/1/2029

Projected IS Date: 6/1/2029

AEP Transmission Zone: Baseline Haviland Station Upgrades

Process Stage: First Read

Criteria: TO 715 Criteria Violation

Assumption Reference: 2024 RTEP assumptions

Model Used for Analysis: 2029 RTEP Winter base case

Proposal Window Exclusion: Below 200kV

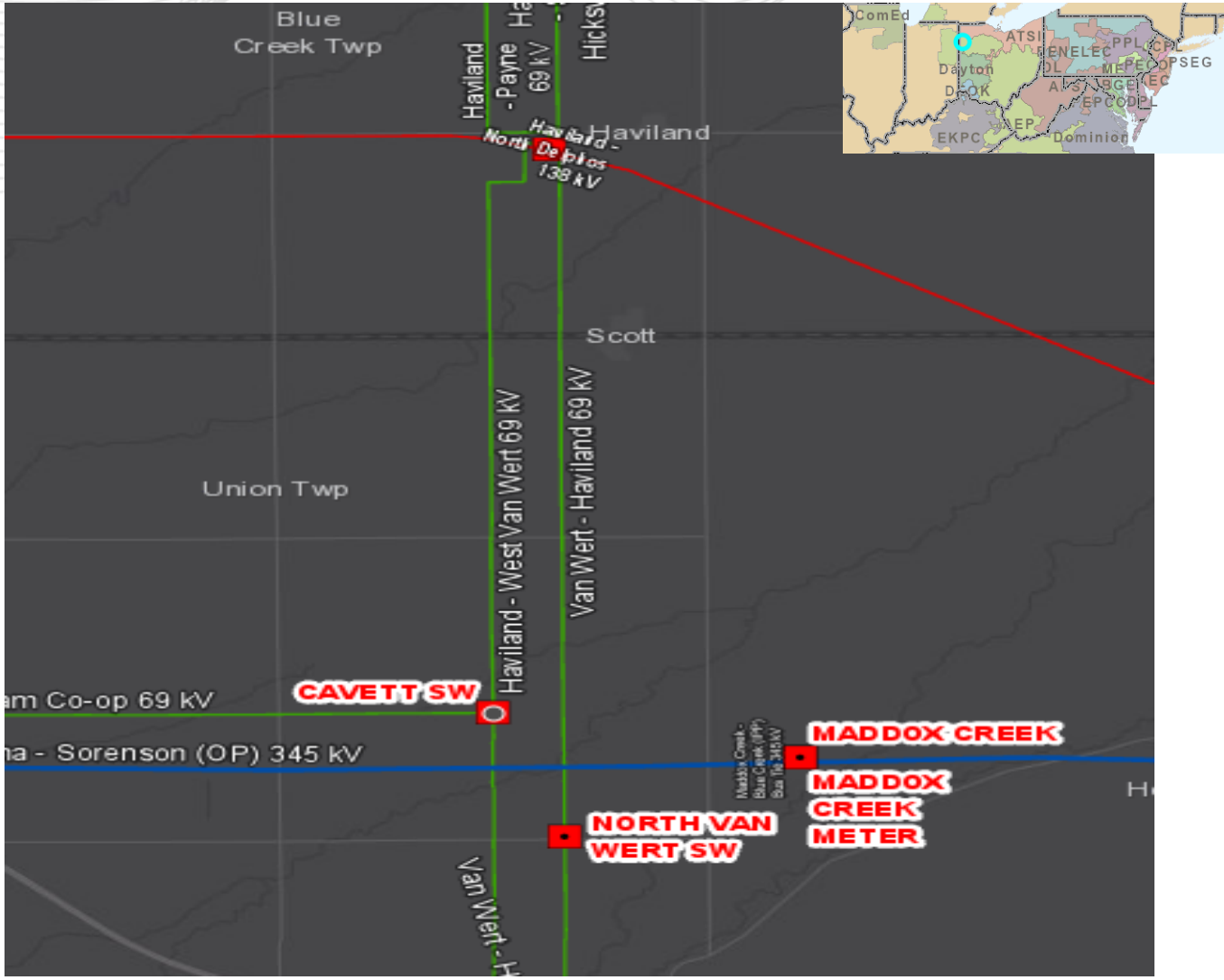
Problem Statement:

FGs: 2024W1-AEP-T14 through T25

In the 5-year 2029 RTEP Winter base case, the Haviland - Cavett and Haviland - North Van Wert 69 kV branches are overloaded under multiple contingencies.

Existing Facility Rating:

Branch	SN/SE/WN/WE (MVA)
Cavett - Haviland (69)	57/57/57/57
Haviland - North Van Wert (69)	82/85/85/85



AEP Transmission Zone: Baseline Haviland Station Upgrades

Proposed Solution:

Replace the 69 kV station equipment, including relays, conductor, and switches at Haviland station in order to address identified overloads on the lines to North Van Wert and Cavett.

Estimated Cost: $0.8M

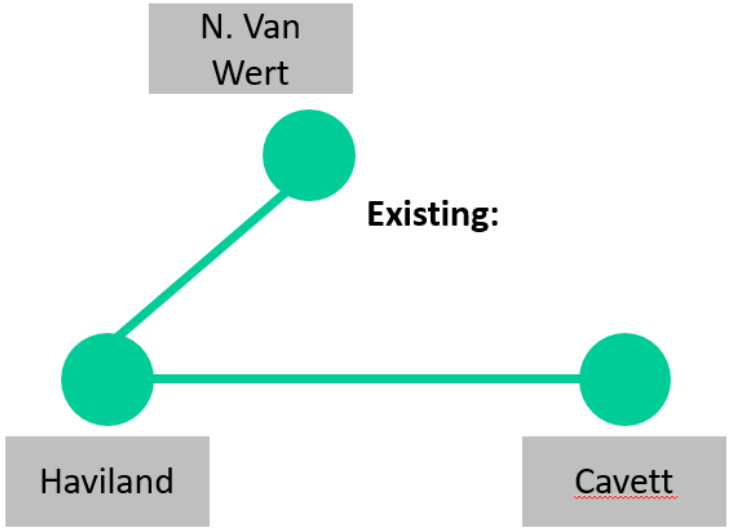
Preliminary Facility Rating:

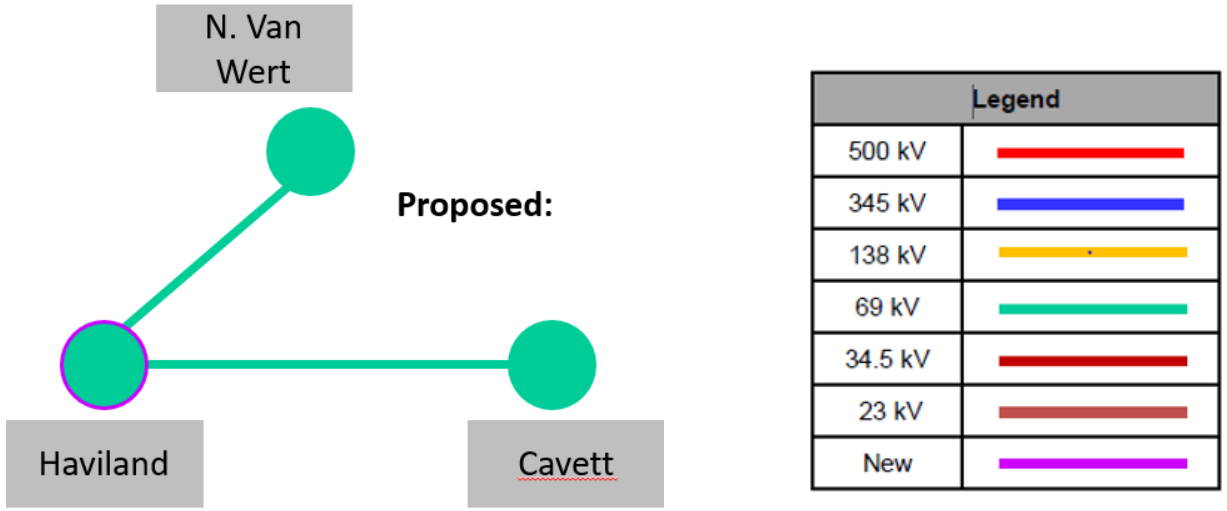
Branch	SN/SE/WN/WE (MVA)
Cavett - Haviland (69)	129/180/162/202
Haviland - North Van Wert (69)	129/129/162/162

Alternatives: Considering the limited scope and cost of the upgrade, no other viable transmission alternates were identified.

Required IS Date: 12/1/2029

Projected IS Date: 4/1/2029





AEP Transmission Zone: Baseline East Leipsic – AE2-072 (Lammer) Sag Study and Mitigation

Process Stage: First Read

Criteria: Summer Gen Deliv, Summer/Winter IPD

Assumption Reference: 2024 RTEP assumptions

Model Used for Analysis: 2029 RTEP Summer/Winter base cases

Proposal Window Exclusion: Below 200kV

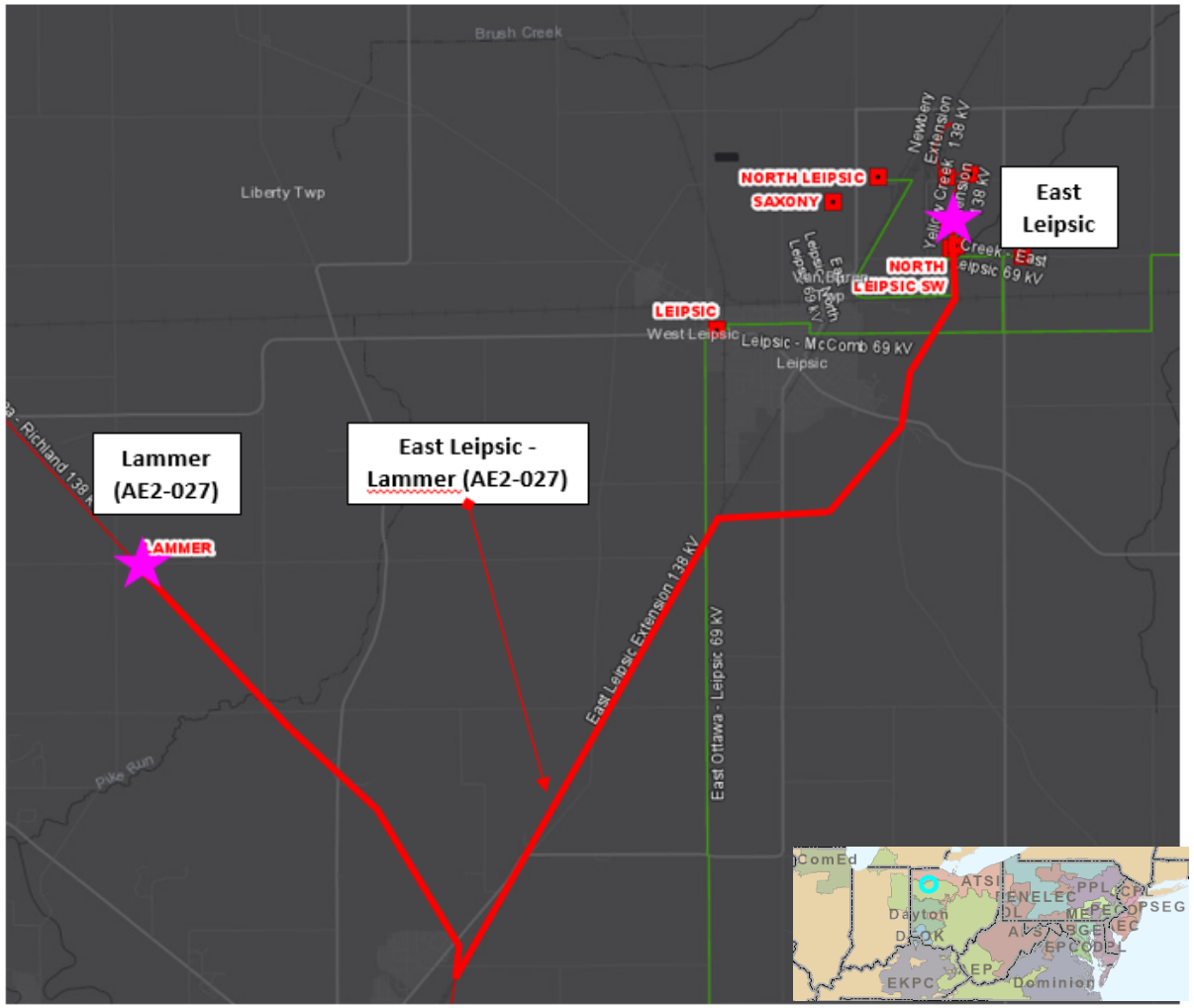
Problem Statement:

FGs: 2024-W1-GD-S882, 2024-W1-IPD-S80, 2024-W1-IPD-W1

In the 5-year 2029 RTEP Summer Gen Deliv and Summer/Winter IPD tests, The line conductor between East Leipsic and AE2-072 (Lammer) 138 kV is overloaded for a N-2 contingency pair.

Existing Facility Rating:

Branch	SN/SE/WN/WE (MVA)
East Leipsic - Lammer (138)	223/223/281/281



AEP Transmission Zone: Baseline
East Leipsic – AE2-072 (Lammer) Sag Study and Mitigation

Proposed Solution:

Preform sag study and complete mitigations on the 138 kV line between East Leipsic and the AE2-072 tap (Lammer) to allow line's conductor to operate to its maximum operating temperature (MOT).

Estimated Cost: $2.5M

Preliminary Facility Rating:

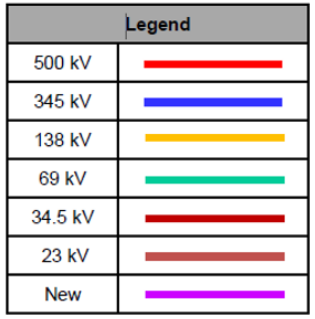
Branch	SN/SE/WN/WE (MVA)
East Leipsic - Lammer (138)	223/310/281/349

Alternatives: Considering the limited scope to address the violation, no other viable transmission alternates were identified.

Required IS Date: 6/1/2029

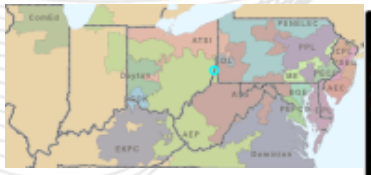
Projected IS Date: 4/1/2029

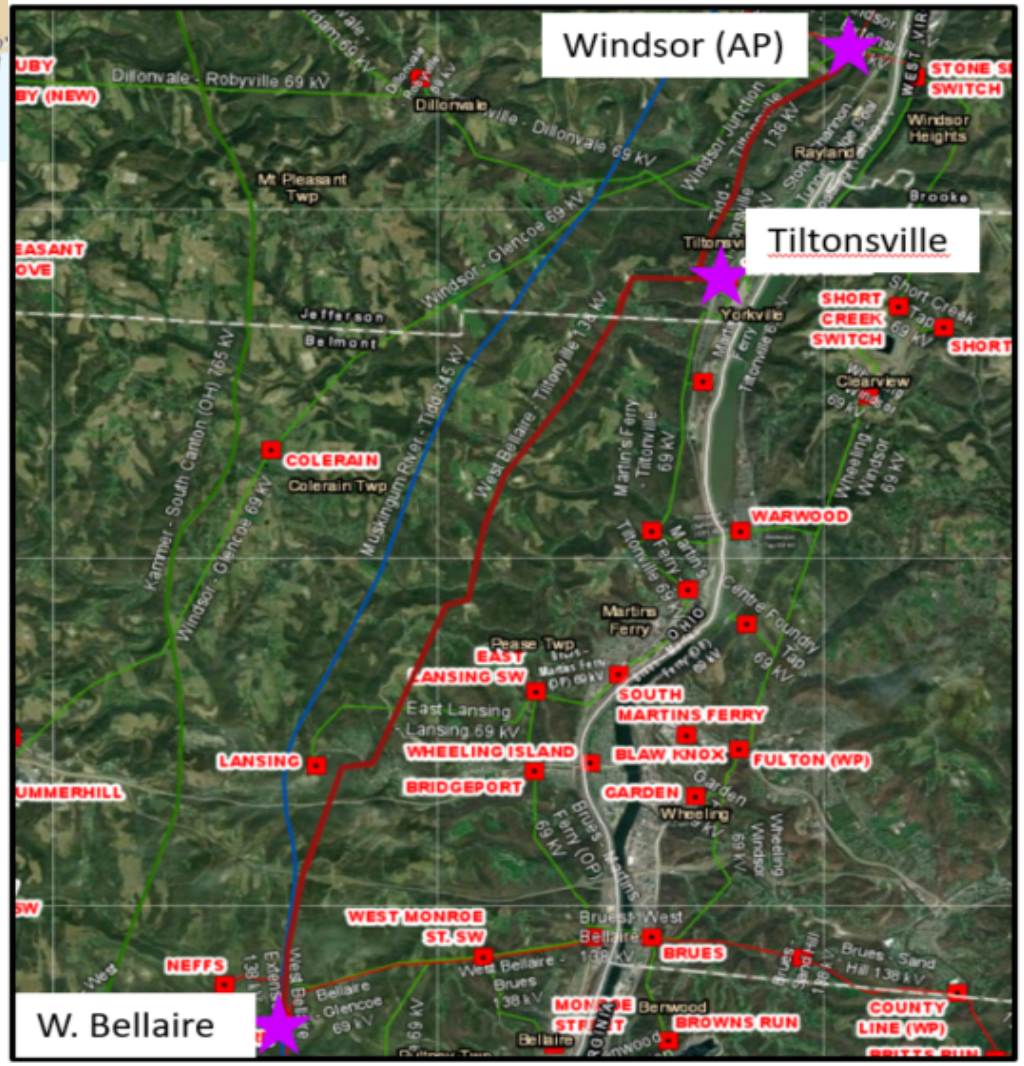
Existing:



Proposed:

AEP Transmission Zone: Baseline Tiltonsville Upgrades





Process Stage: First Read

Criteria: Summer Gen Deliv, Summer IPD

Assumption Reference: 2024 RTEP assumptions

Model Used for Analysis: 2029 RTEP Summer/Winter base cases

Proposal Window Exclusion: Below 200kV

Problem Statement:

FGs: 2024-W1-GD-S368, 2024-W1-GD-S489, 2024-W1-GD-S877, 2024-W1-IPD-S87, 2024-W1-IPD-S88

In the 5-year 2029 RTEP Summer Gen Deliv and IPD tests, the Tiltonsville - Windsor Junction 138 kV branch is overloaded for multiple N-2 contingencies.

Existing Facility Rating:

Branch	SN/SE/WN/WE (MVA)
Tiltonsville (AEP) - Windsor (FE) (138)	329/361/419/421

AEP Transmission Zone: Baseline Tiltonsville Upgrades

Proposed Solution:

Replace limiting station equipment at Tiltonsville station to increase the rating on the branch to Windsor.

Estimated Cost: $0.8M

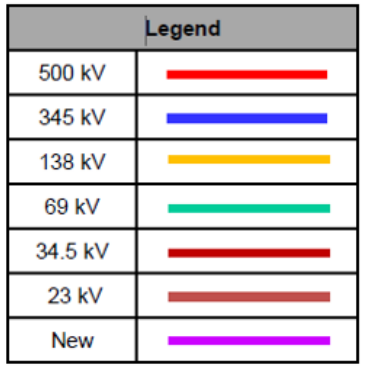
Preliminary Facility Rating:

Branch	SN/SE/WN/WE (MVA)
Tiltonsville (AEP) - Windsor (FE) (138)	329/413/419/421

Alternatives: Considering the limited station scope and cost of the upgrade, no other viable transmission alternates were identified.

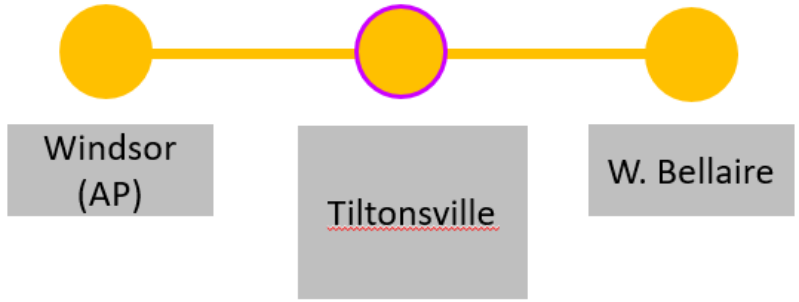
Required IS Date: 6/1/2029

Projected IS Date: 4/1/2029



Existing:

Proposed:



AEP Transmission Zone: Baseline South Coshocton Station Upgrades

Process Stage: First Read

Criteria: Summer Gen Deliv

Assumption Reference: 2024 RTEP assumptions

Model Used for Analysis: 2029 RTEP Summer base case

Proposal Window Exclusion: Substation Equipment Exclusion and Below 200kV Exclusion

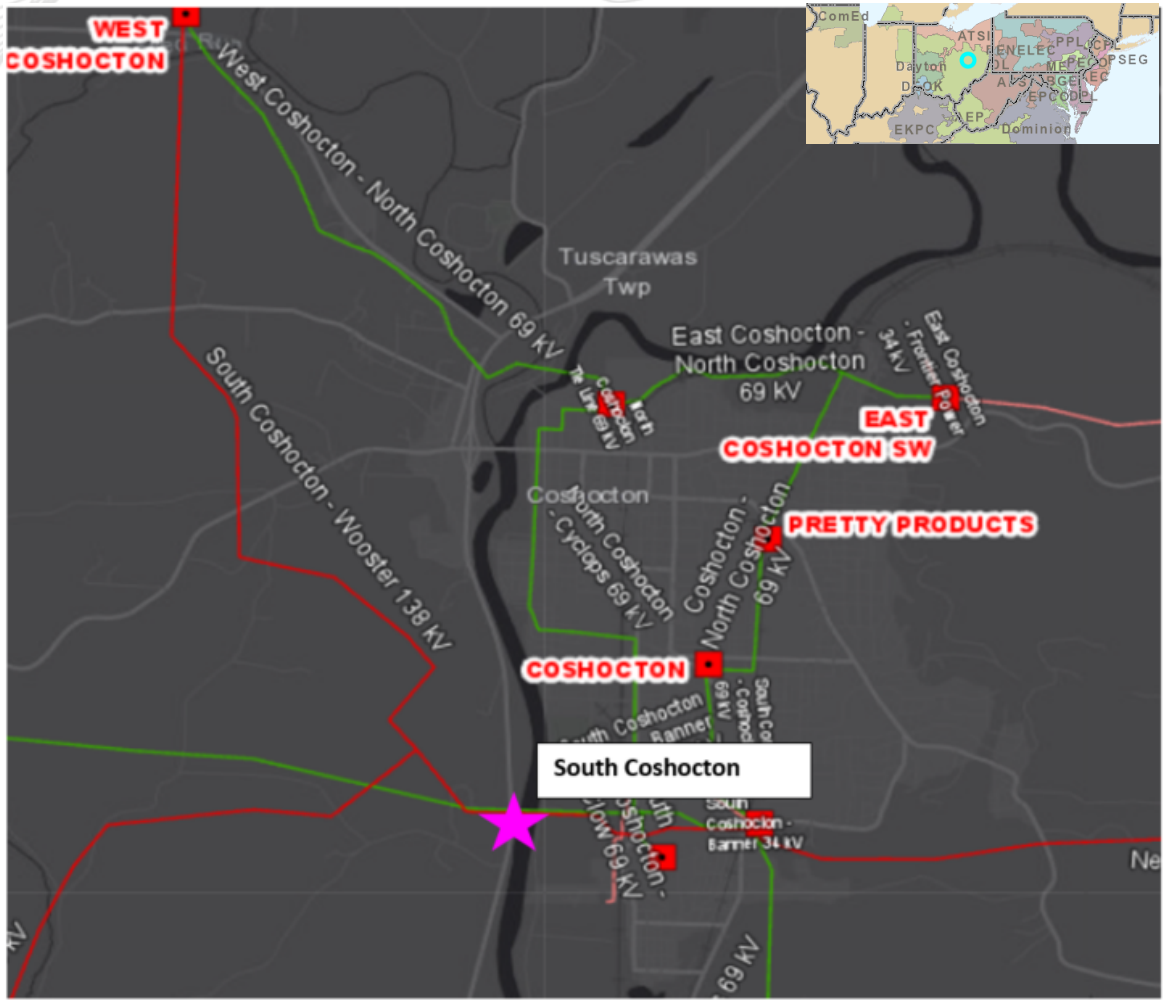
Problem Statement:

FG: 2024-W1-GD-S485

In the 5-year 2029 RTEP Summer Gen Deliv test, the Ohio Central - South Coshocton 138 kV line is overloaded for a N-2 contingency.

Existing Facility Rating:

Branch	SN/SE/WN/WE (MVA)
Ohio Central - Coshocton (138)	136/167/173/200



AEP Transmission Zone: Baseline South Coshocton Station Upgrades

Proposed Solution:

Replace station conductor at South Coshocton138kV station currently limiting the branch to Ohio Central.

Estimated Cost: $0.2M

Preliminary Facility Rating:

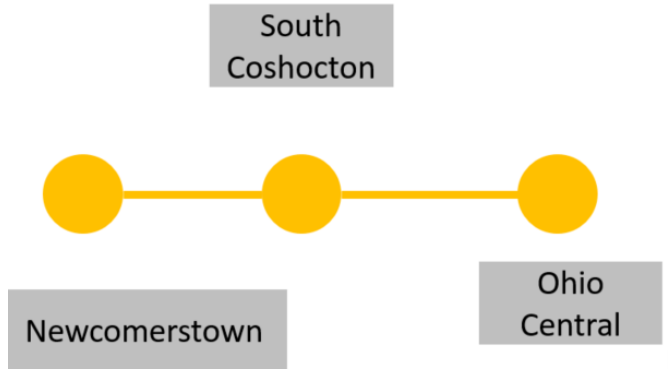
Branch	SN/SE/WN/WE (MVA)
Ohio Central - Coshocton (138)	185/223/281/281

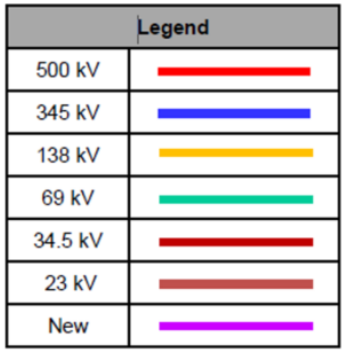
Alternatives: Considering the limited station scope and cost of the upgrade, no other viable transmission alternates were identified.

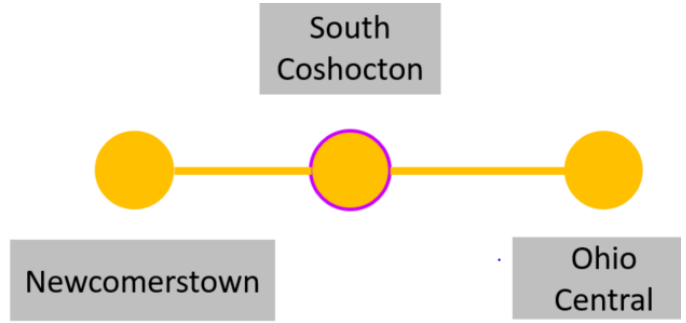
Required IS Date: 6/1/2029

Projected IS Date: 4/1/2029

Existing:







AEP Transmission Zone: Baseline Kenny - Roberts 138kV Relay Upgrades

Process Stage: First Read

Criteria: Summer Gen Deliv/IPD and Base case analysis, Summer/Winter N-1-1

Assumption Reference: 2024 RTEP assumptions

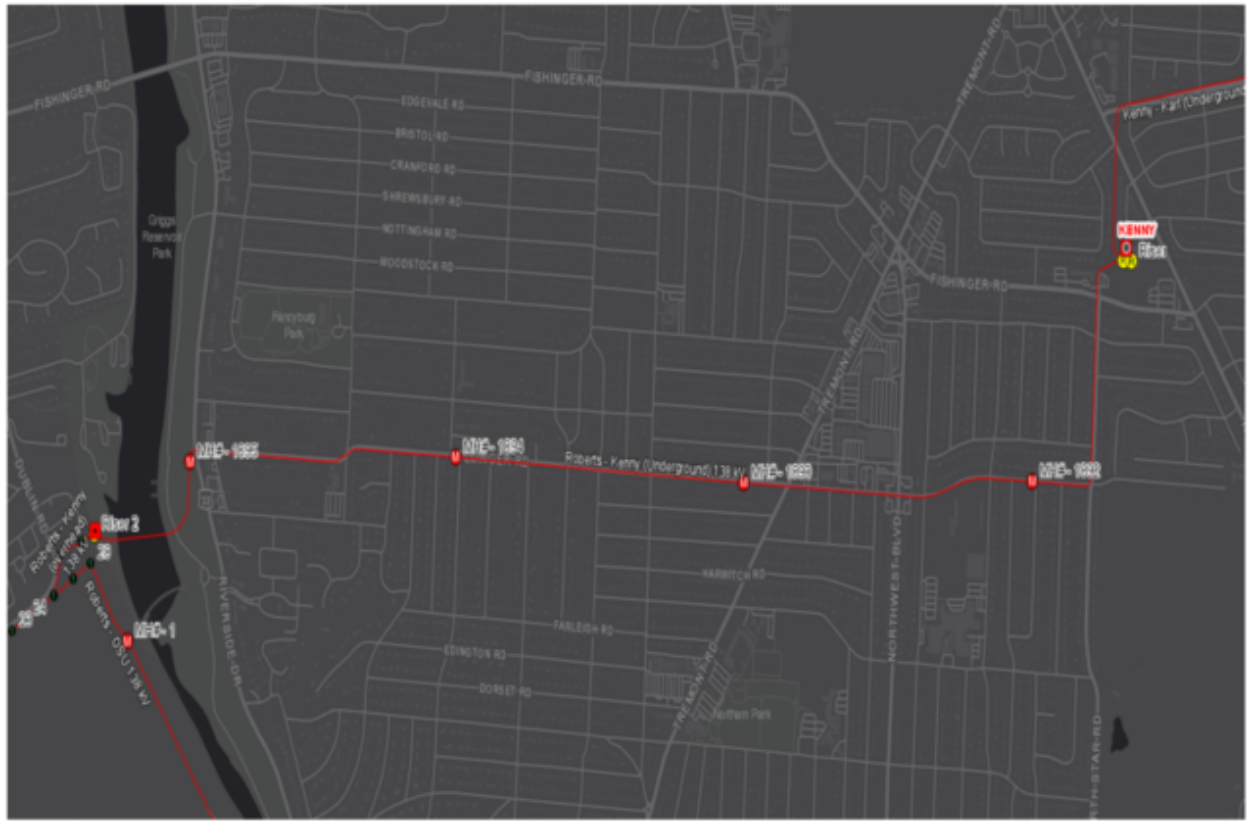
Model Used for Analysis: 2029 RTEP Summer/Winter base cases

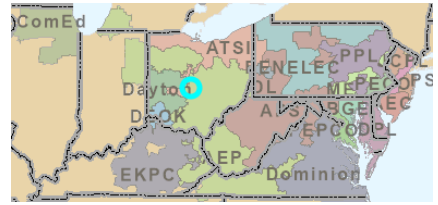
Proposal Window Exclusion: Substation Equipment Exclusion and Below 200kV Exclusion

Problem Statement:

FGs: 2024-W1-GD-S300, 2024-W1-GD-S302, 2024-W1-GD-S303, 2024-W1-GD-S311, 2024-W1-GD-S320, 2024-W1-GD-S56, 2024-W1-GD-S57, 2024-W1-GD-S7, 2024-W1-GD-S760, 2024-W1-GD-S777, 2024-W1-GD-S793, 2024-W1-GD-S8, 2024-W1-GD-S81, 2024-W1-GD-S869, 2024-W1-GD-S881, 2024-W1-GD-S887, 2024-W1-GD-S888, 2024-W1-GD-S891, 2024-W1-IPD-S20 through S41, 2024-W1-IPD-S47, 2024-W1-IPD-S49, 2024-W1-IPD-S52, 2024-W1-IPD-S64 through S69, 2024-W1-N1-ST110, 2024-W1-N1-ST115, 2024-W1-N1-ST116, 2024-W1-N1-ST20 through ST31, 2024-W1-N1-ST52, 2024-W1-N1-ST68, 2024-W1-N1-ST82, 2024-W1-N1-ST83, 2024-W1-N1-ST94, 2024-W1-N1-ST95, 2024-W1-N11-WT3, 2024-W1-N11-WT4, 2024-W1-N11-WT7, 2024-W1-N11-WT8

In the 5-year 2029 RTEP Summer Gen Deliv/IPD, Base case analysis, and Summer/Winter N-1-1 tests, the Kenny – Roberts 138 kV line is overloaded for multiple contingencies.





Existing Facility Rating:

Branch	SN/SE/WN/WE (MVA)
Kenny - Roberts (138)	184/184/184/184

AEP Transmission Zone: Baseline
Kenny - Roberts 138kV Relay Upgrades

Proposed Solution:

Perform relay upgrades at Kenny 138 kV to raise the CT & Relay thermal limits that are currently limiting the line to Roberts.

Estimated Cost: $0.4M

Preliminary Facility Rating:

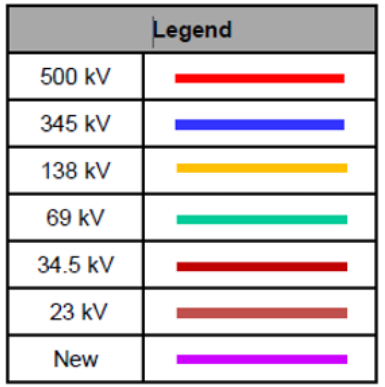
Branch	SN/SE/WN/WE (MVA)
Kenny - Roberts (138)	213/311/221/318

Alternatives: Considering the limited scope and cost of the upgrade, no other viable transmission alternates were identified.

Required IS Date: 6/1/2029

Projected IS Date: 4/1/2029

Existing:



Proposed:

AEP Transmission Zone: Baseline Tidd Station Upgrades

Process Stage: First Read

Criteria: Summer Gen Deliv

Assumption Reference: 2024 RTEP assumptions

Model Used for Analysis: 2029 RTEP Summer base case

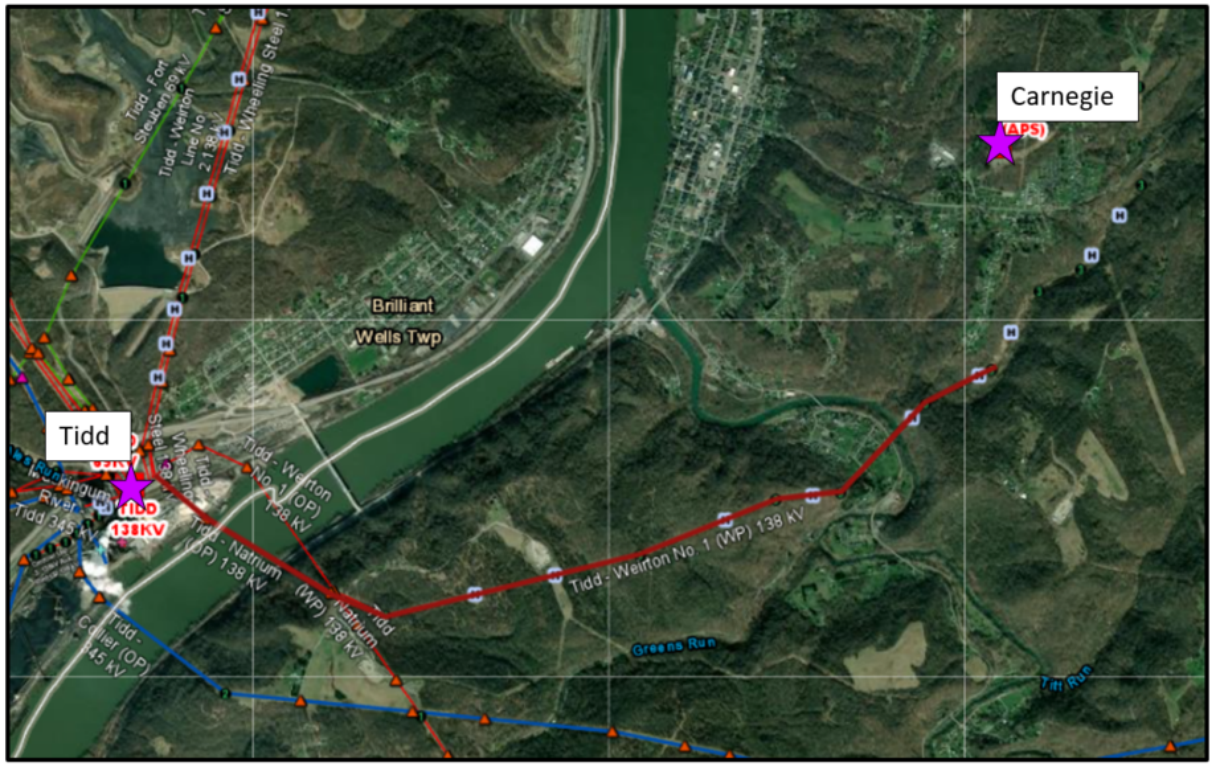
Proposal Window Exclusion: Substation Equipment Exclusion

Problem Statement:

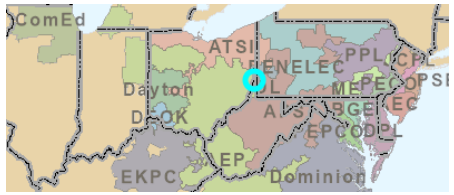
FGs: 2024-W1-GD-S477, 2024-W1-GD-S895

In the 5-year 2029 RTEP Summer Gen Deliv test, the Tidd – Carnegie 138 kV line is overloaded for multiple contingencies.

Existing Facility Rating:



Branch	SN/SE/WN/WE (MVA)
Tidd (AEP) - Carnegie (FE) (138)	187/240/247/285



AEP Transmission Zone: Baseline Tidd Station Upgrades

Proposed Solution:

Replace the limiting 138kV station conductor at Tidd on the line to Carnegie (FE).

Estimated Cost: $0.5M

Preliminary Facility Rating:

Branch	SN/SE/WN/WE (MVA)
Tidd (AEP) - Carnegie (FE) (138)	200/254/253/293

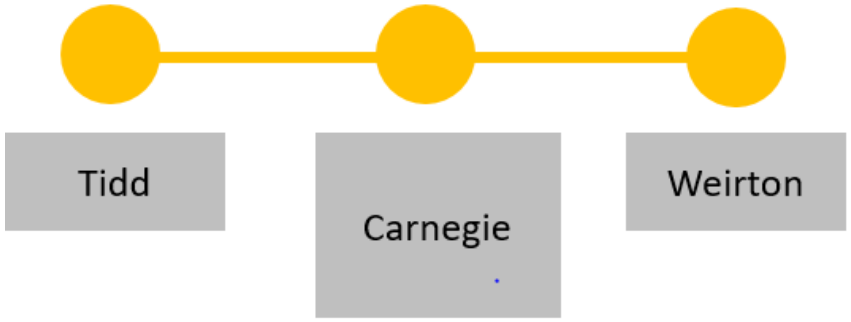
Alternatives: Considering the limited station scope and cost of the upgrade, no viable transmission alternates were identified.

Required IS Date: 6/1/2029

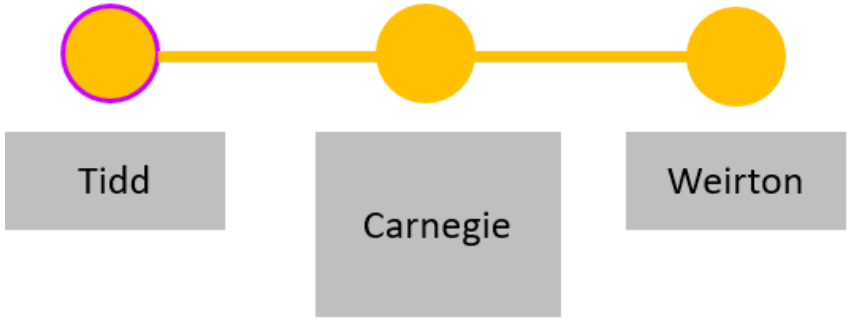
Projected IS Date: 4/1/2029

Legend	
500 kV	
345 kV	
138 kV	
69 kV	
34.5 kV	
23 kV	
New	

Existing:



Proposed:



AEP Transmission Zone: Baseline Skimmer Cap Bank Settings Adjustments

Process Stage: First Read

Criteria: TO 715 Criteria

Assumption Reference: 2024 RTEP assumptions

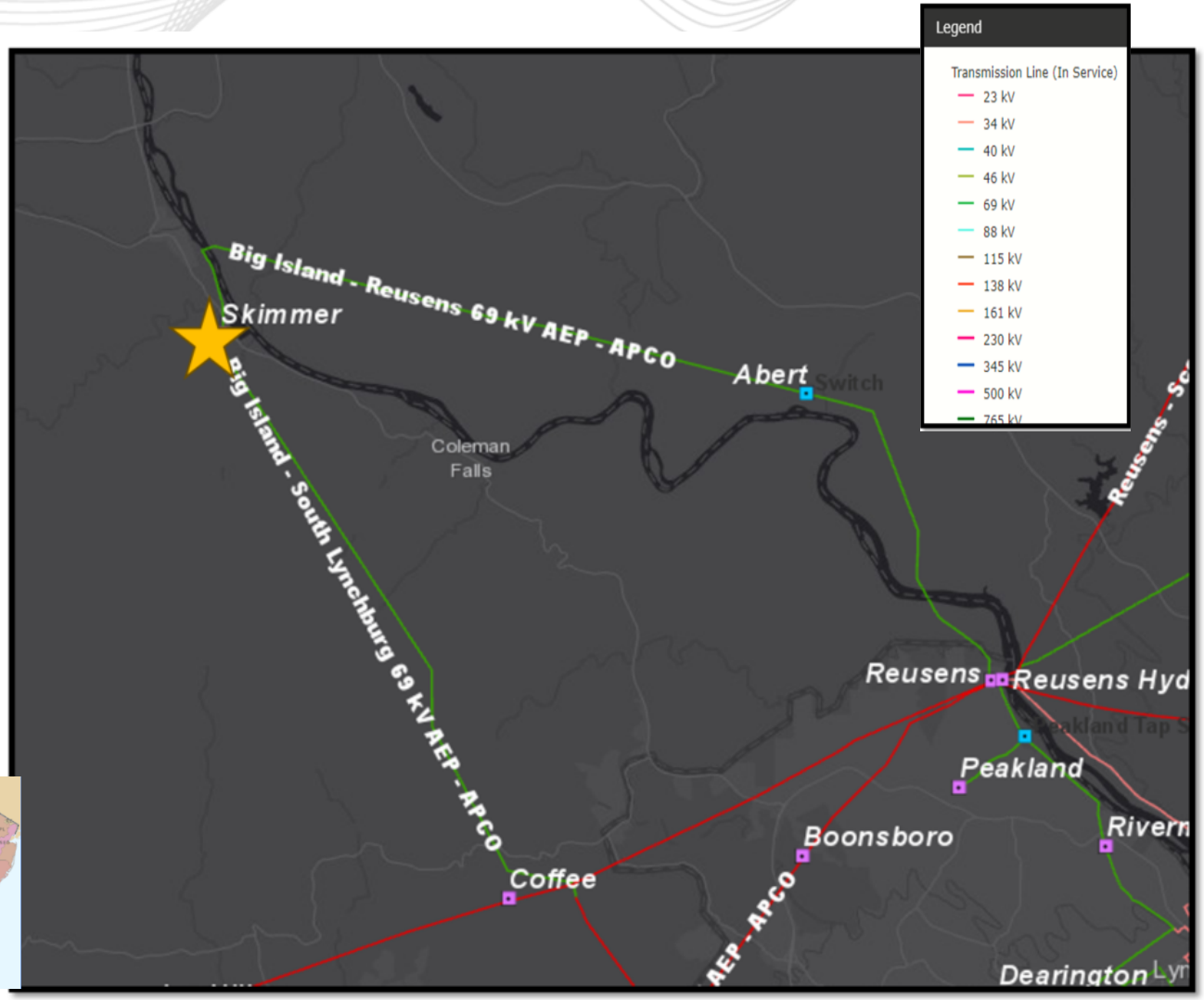
Model Used for Analysis: 2029 RTEP Winter base case

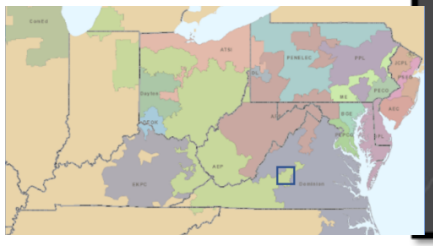
Proposal Window Exclusion: Below 200kV

Problem Statement:

FGs: 2024-W1-AEP-VD47 through VD50

In the 5-year 2029 RTEP Winter base case, voltage drop violation is identified at the Skimmer 69kV bus for multiple N-1-1 contingency pairs.





AEP Transmission Zone: Baseline Skimmer Cap Bank Settings Adjustments

Proposed Solution:

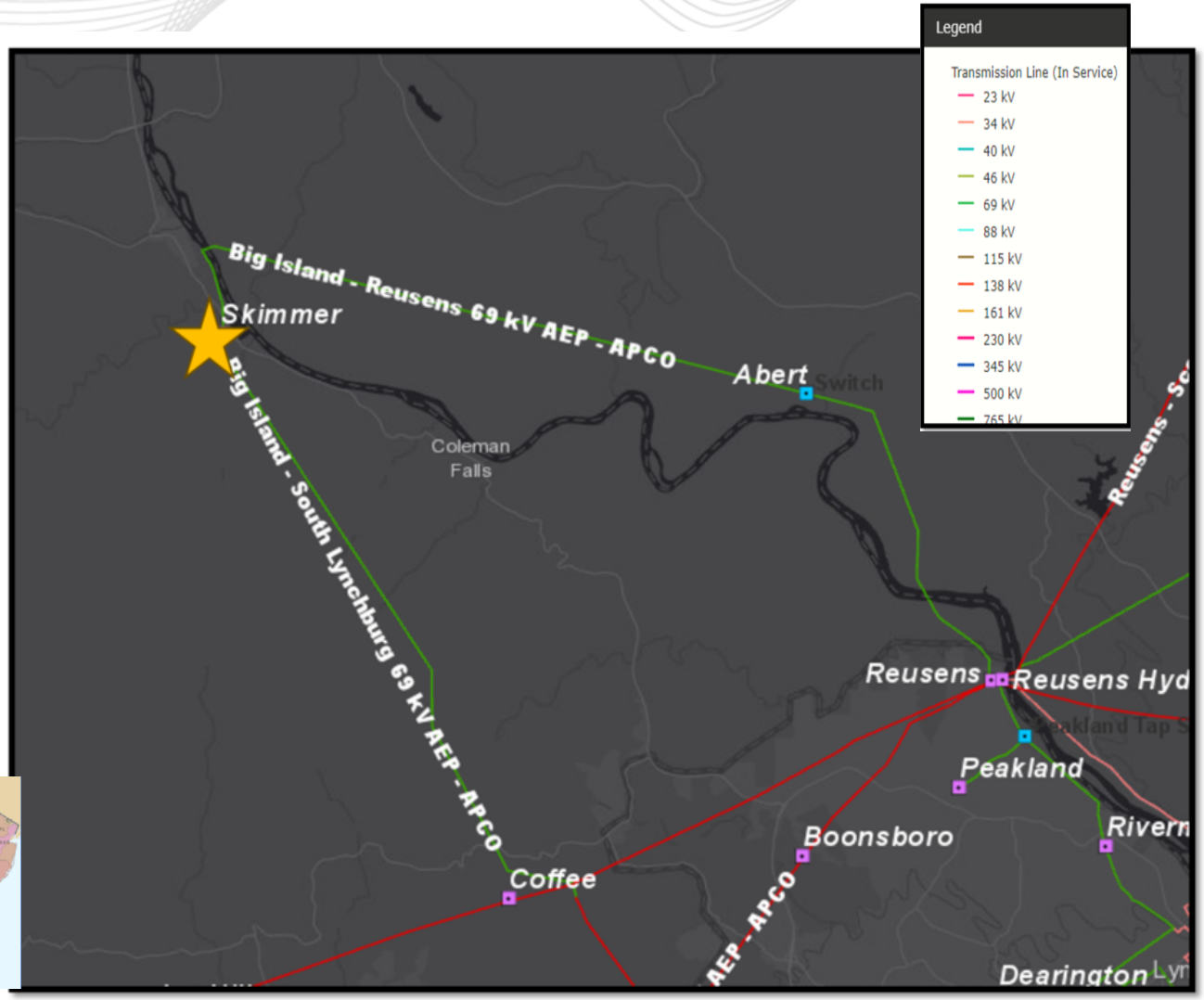
Adjust the 69kV Skimmer capacity bank voltage settings.

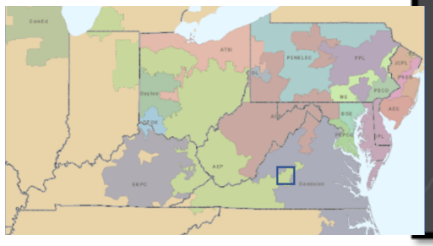
Estimated Cost: $0.1M

Alternatives: Considering the location of the equipment and limited scope to resolve the issue, no other alternatives were identified as viable.

Required IS Date: 12/1/2029

Projected IS Date: 6/1/2029





AEP Transmission Zone: Baseline Buchanan – Keen Mountain Upgrade

Process Stage: First Read

Criteria: Winter Gen Deliv

Assumption Reference: 2024 RTEP assumptions

Model Used for Analysis: 2029 RTEP Winter base case

Proposal Window Exclusion: Below 200kV

Problem Statement:

FG: 2024-W1-GD-W11

In the 5-year 2029 RTEP Winter Gen Deliv test, the Buchanan – Keen Mountain 138kV line is overloaded in the base case.

Existing Facility Rating:.

Branch	SN/SE/WN/WE (MVA)
Buchanan - Keen Mountain (138)	86/86/86/86

AEP Transmission Zone: Baseline Buchanan – Keen Mountain Upgrade

Proposed Solution:

Upgrade the CT thermal limit at Buchanan station on the Buchanan-Keen Mountain 138 kV line.

Estimated Cost: $0.1M

Preliminary Facility Rating:

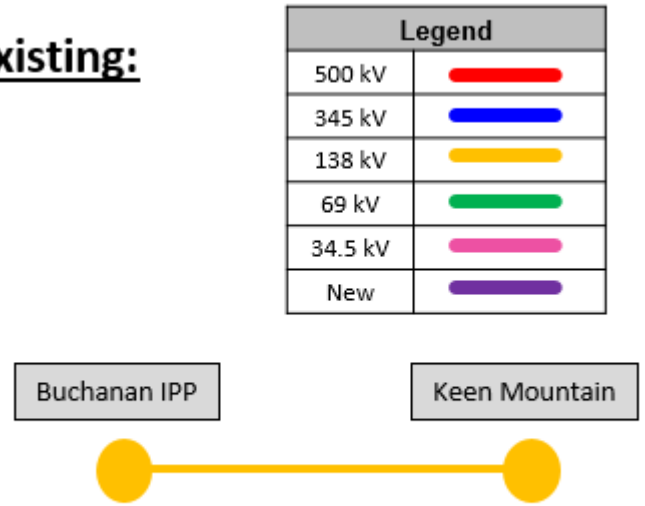
Branch	SN/SE/WN/WE (MVA)
Buchanan - Keen Mountain (138)	179/179/179/179

Alternatives: Considering the limited scope to upgrade and location of the equipment setting the limit on the line, no other alternatives were identified as prudent or viable.

Required IS Date: 12/1/2029

Projected IS Date: 12/1/2025

Existing:



Proposed:

ComEd Transmission Zone: Baseline
Kewanee 138kV L7411 (74 7411) CB Replacement

Process Stage: First Review

Criteria: Short Circuit

TEAC/SRRTEP assumptions: 2024 RTEP assumptions

Model Used for Analysis: 2026 & 2029 RTEP short circuit cases

Proposal Window Exclusion: Below 200 kV Exclusion

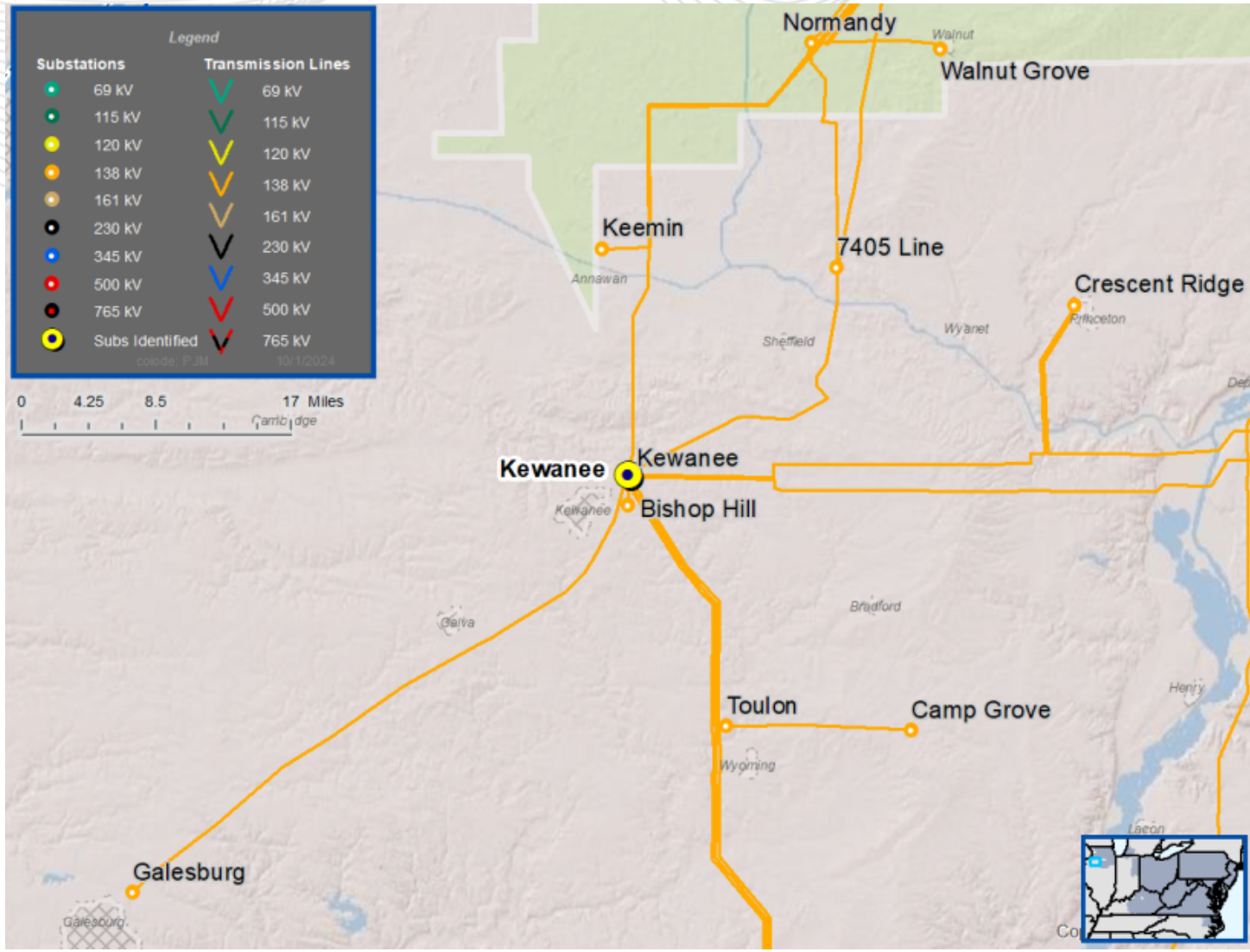
Problem Statement:

FG: 2024-W1-SC-60

In both 2026 and 2029 RTEP Short Circuit base case, the Kewanee 138 kV L7411 (74 7411) circuit breaker is identified as being over duty.

Existing Facility Rating:

Breaker	Capacity (kA)
74 7411 (138)	20.92



ComEd Transmission Zone: Baseline
Kewanee 138kV L7411 (74 7411) CB Replacement

Proposed Solution: Replace the Kewannee 138 kV kV L7411 circuit breaker with a SF6 circuit breaker.

Estimated Cost: $1.101 M

Preliminary Facility Rating:

Breaker	Capacity (kA)
74 7411 (138)	63

Alternatives:

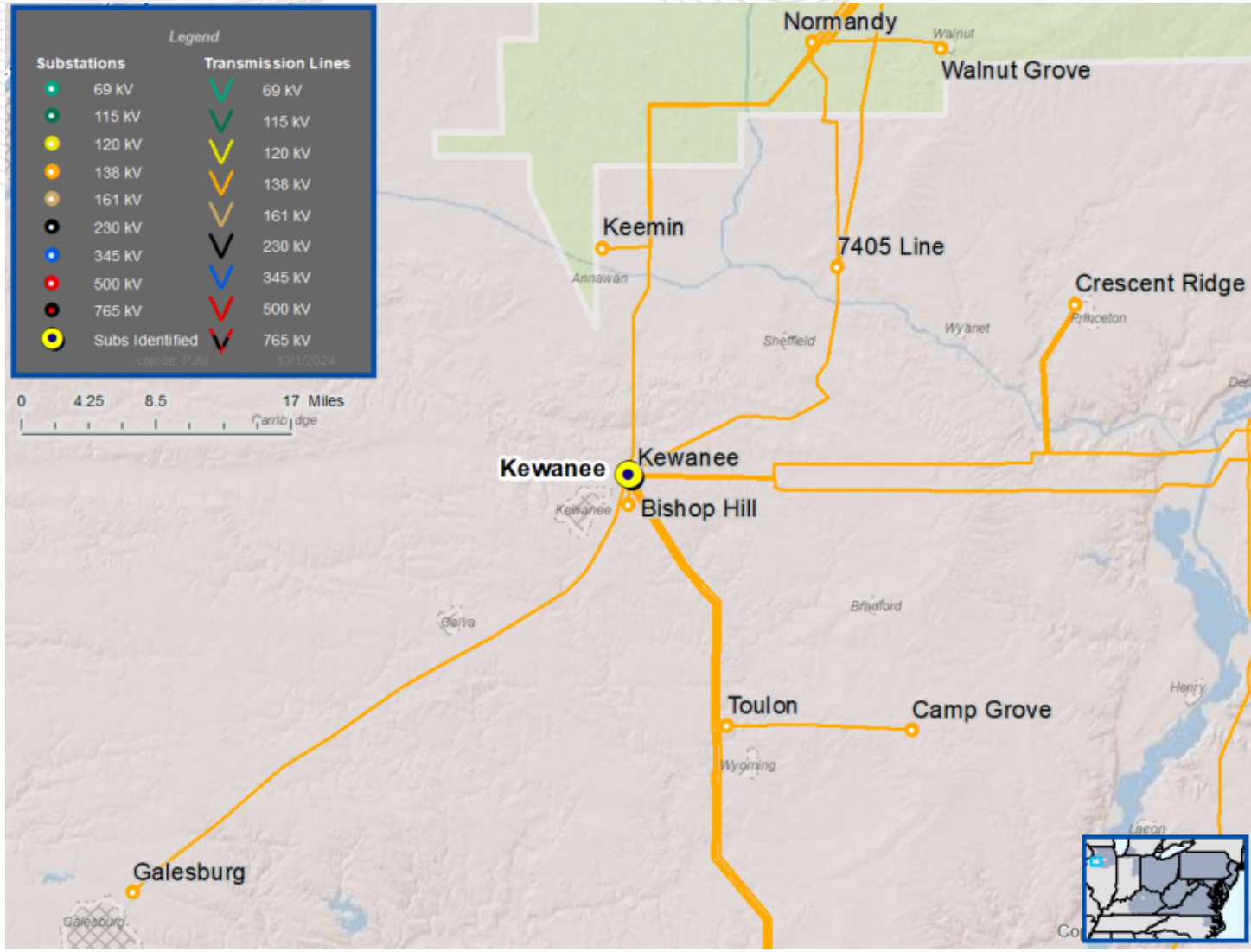
N/A

Ancillary Benefits:

Replacing obsolete oil circuit breaker with new gas circuit breaker.

Required In-Service: 6/1/2026

Projected IS Date: 6/1/2026



ComEd Transmission Zone: Baseline Electric Junction to W541 Reconductor

Process Stage: First Review

Criteria: Baseline Load Growth Deliverability & Reliability

TEAC/SRRTEP assumptions: 2024 RTEP assumptions

Model Used for Analysis: 2029 RTEP Summer base case

Proposal Window Exclusion: Below 200 kV Exclusion

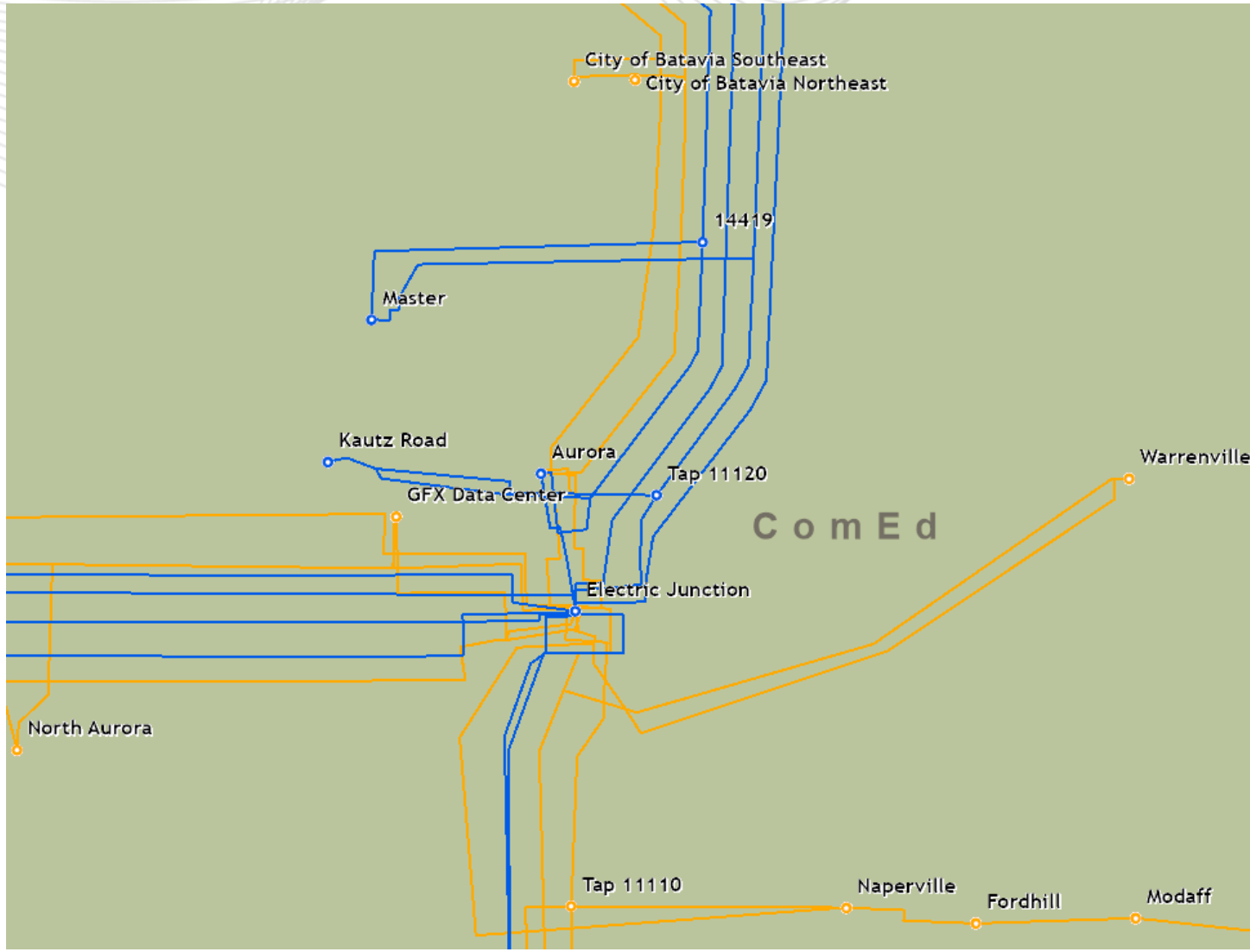
Problem Statement:

FG: 2024-W1-N11-ST19, 2024-W1-N11-ST35, 2024-W1-N11-ST38

In the 2029 RTEP Summer case, the Electric Junction-ESS W541 (Gfx Data Center) 138 kV line is overloaded for multiple N-1 outages.

Existing Facility Rating:

Branch	SN/SE/WN/WE (MVA)
Electric Junction - W541 (345)	351/449/421/500
Electric Junction - W541 Tap (138)	351/449/421/500



ComEd Transmission Zone: Baseline Electric Junction to W541 Reconductor

Proposed Solution:

- Reconductor 138 kV line from Electric Junction to W541. **Estimated Cost: 1.38M**
- Replace 2" tubular bus, 2-500 KCMIL Cu and 1113 KCMIL ACSR/AA on bus 2 and line terminal of 138kV L11106 at TSS 111 Electric Junction with bus that meets or exceeds a minimum thermal capability of 2036/2236/2690A (487/534/643MVA) SN/SE/SLD. **Estimated Cost: 0.28M**

Total Estimated Cost: $1.657 M

Preliminary Facility Rating:

Branch	SN/SE/WN/WE (MVA)
Electric Junction - W541 (345)	486/534/527/571
Electric Junction - W541 Tap (138)	486/534/527/571

Alternatives:

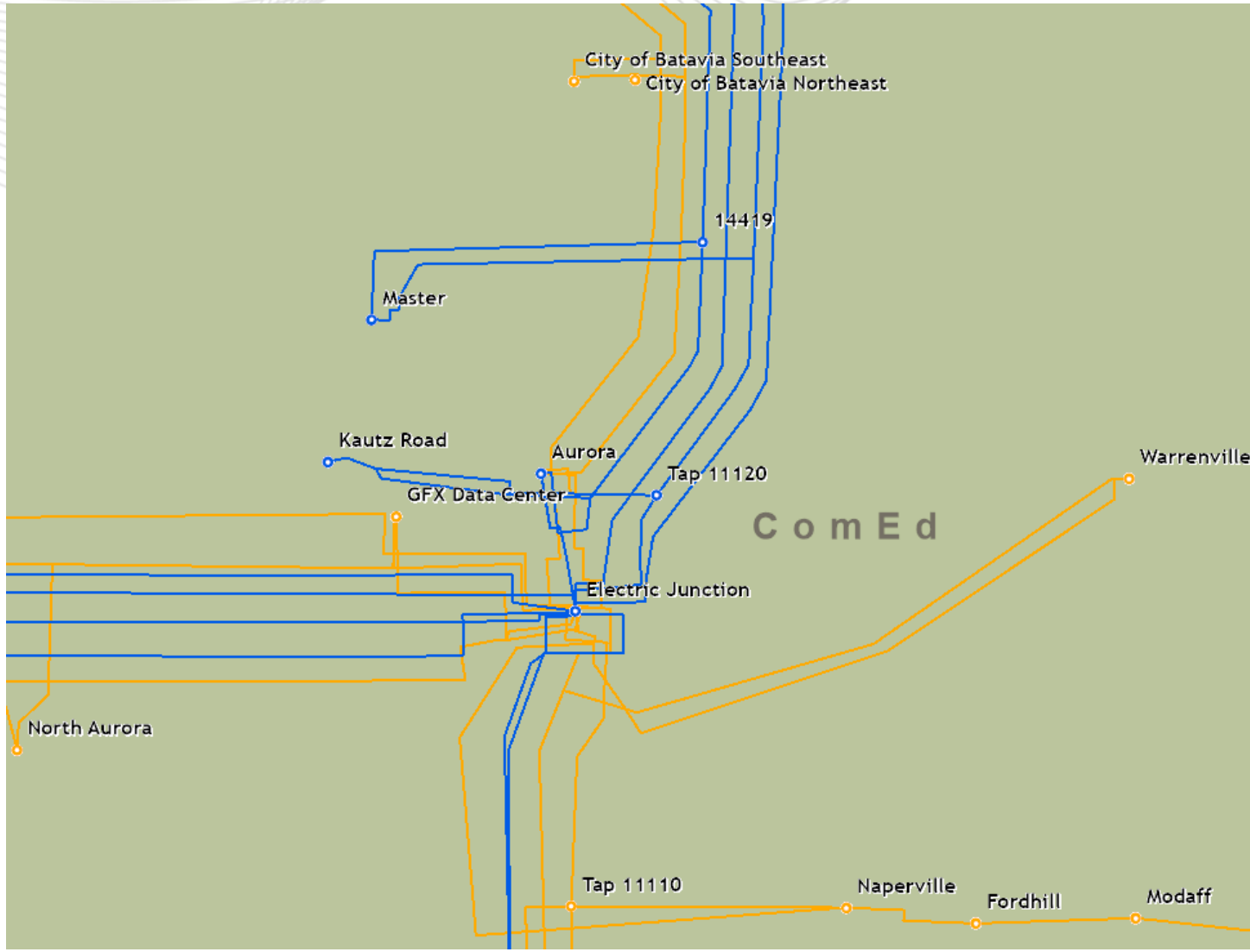
N/A

Ancillary Benefits:

N/A

Required In-Service: 6/1/2029

Projected IS Date: 6/1/2029



ComEd Transmission Zone: Baseline Kewanee Bus 1

Process Stage: First Review

Criteria: Baseline Load Growth Deliverability & Reliability

TEAC/SRRTEP assumptions: 2024 RTEP assumptions

Model Used for Analysis: 2029 RTEP Light Load base case

Proposal Window Exclusion: Substation Equipment Exclusion

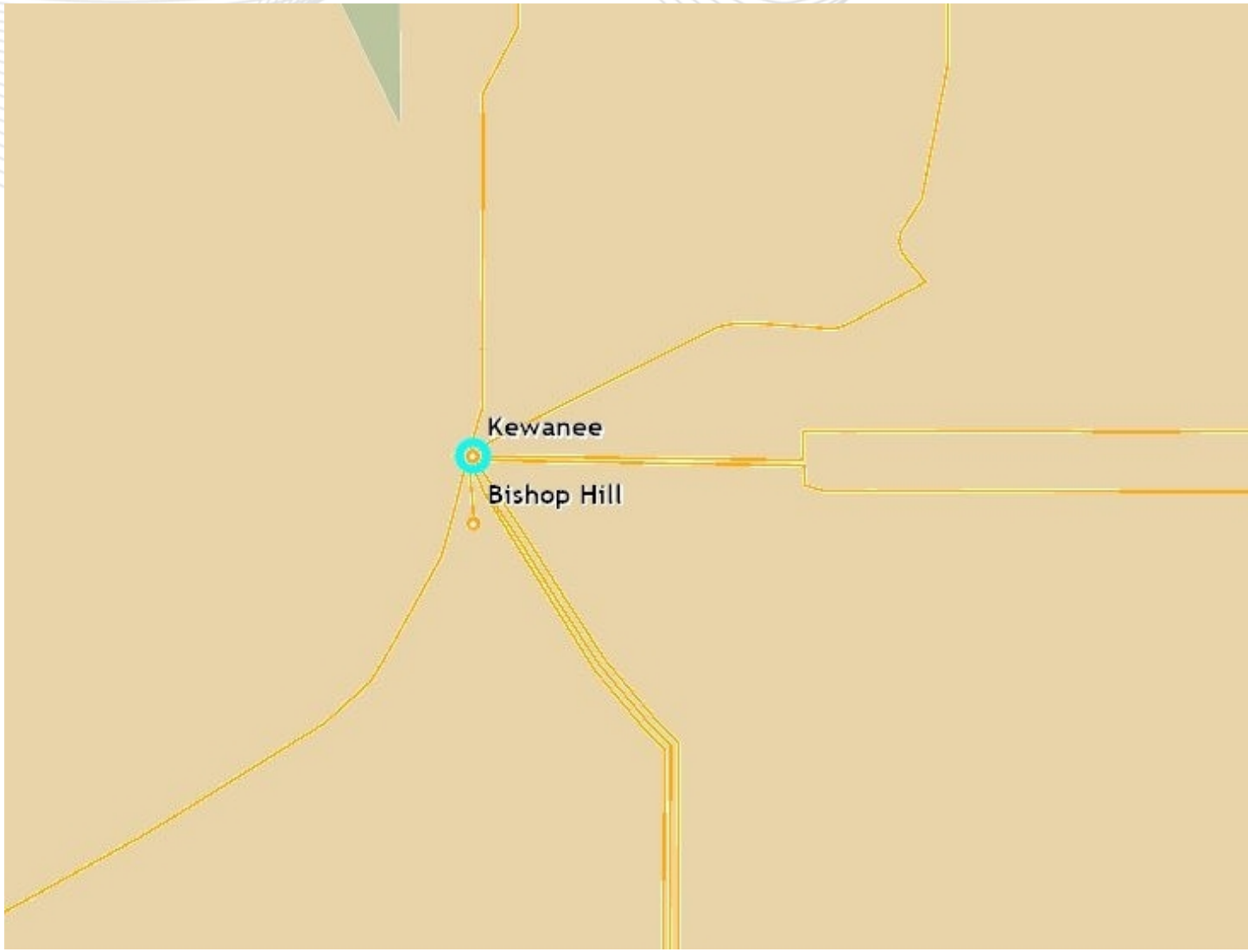
Problem Statement:

FG: 2024-W1-GD-LL25

In the 2029 RTEP Light Load case, the Kewanee 138 kV bus No. 1 is overloaded for a N-1 outage.

Existing Facility Rating:

Branch	SN/SE/WN/WE (MVA)
Kewanee - Kewanee (138)	190/246/235/279



ComEd Transmission Zone: Baseline Kewanee Bus 1

Proposed Solution: Replace the 300 copper conductor with 1113 kcmil ACSR conductor on Kewanee bus No. 1.

Estimated Cost: $0.204 M

Preliminary Facility Rating:

Branch	SN/SE/WN/WE (MVA)
Kewanee - Kewanee (138)	351/449/421/500

Alternatives:

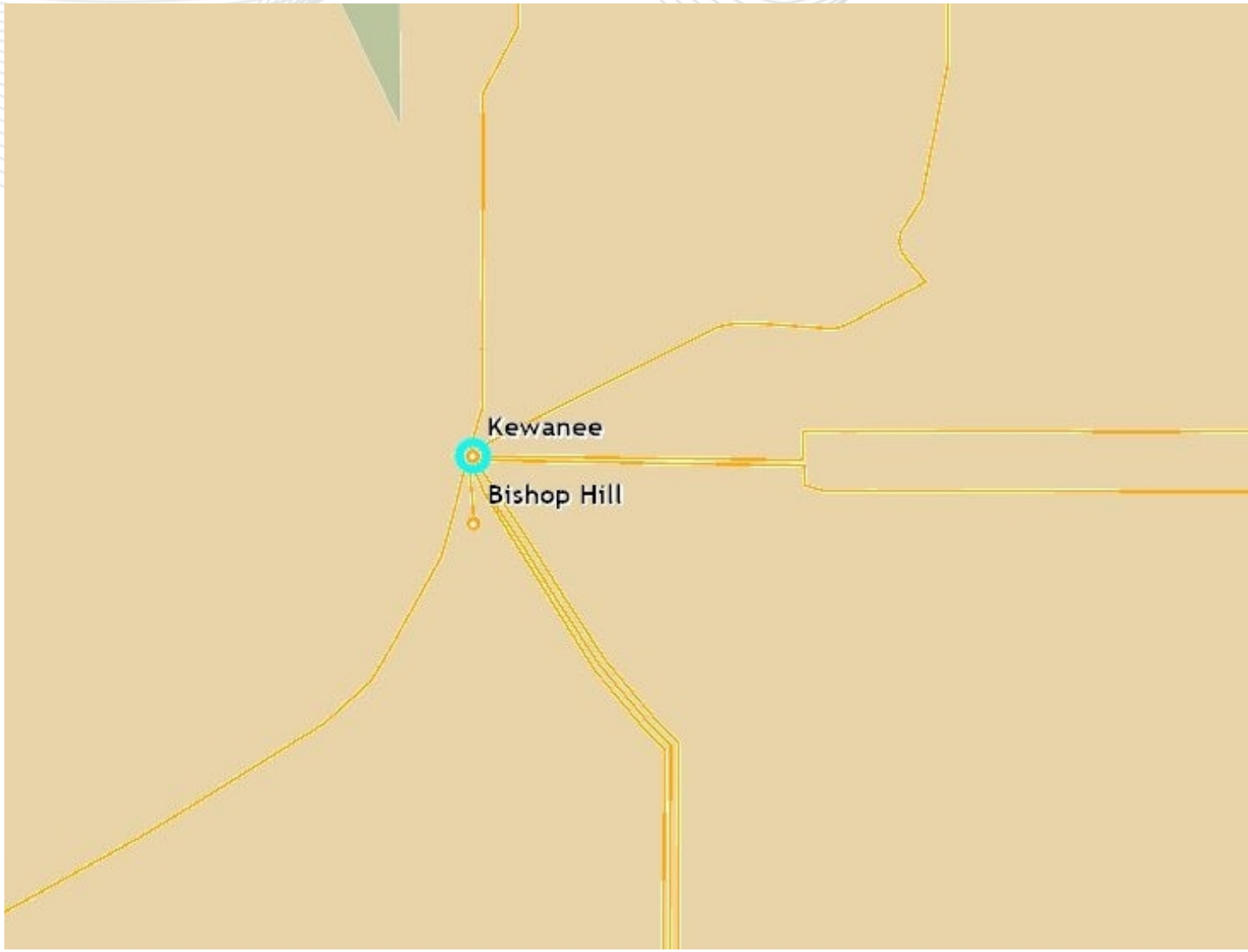
N/A

Ancillary Benefits:

Removes all of the remaining 300 Cu bus at Kewanee substation

Required In-Service: 4/15/2029

Projected IS Date: 4/15/2029



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Reliability Analysis Update

Revision History

Version No.	Date	Description
1	October 15, 2024	• Original slides posted
2	October 18, 2024	• Slide #39, #40, #49 and #50, corrected the subtitle of the slides

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