Sub Regional RTEP Committee: Western
AEP Supplemental Projects

December 18, 2020

Needs

Stakeholders must submit any comments within 10 days of this meeting in order to provide time necessary to consider these comments prior to the next phase of the M-3 process

AEP Transmission Zone M-3 Process
Perry County, KY

Need Number: AEP-2020-AP047

Process Stage: Need Meeting 12/18/2020

Project Driver: Equipment Material/Condition/Performance/Risk

Specific Assumption Reference: AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 8)

Problem Statement:

Hazard – Bonnyman 69kV #1
Original Install Date (Age): 1940

Length of Line: 9.5 mi

Total structure count: 49

Original Line Construction Type: Wood

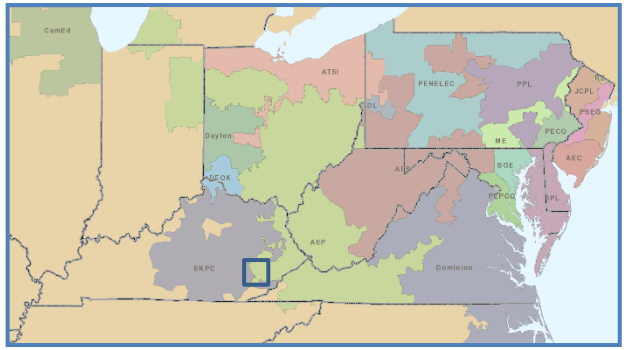
Conductor Type: 336,400 ACSR

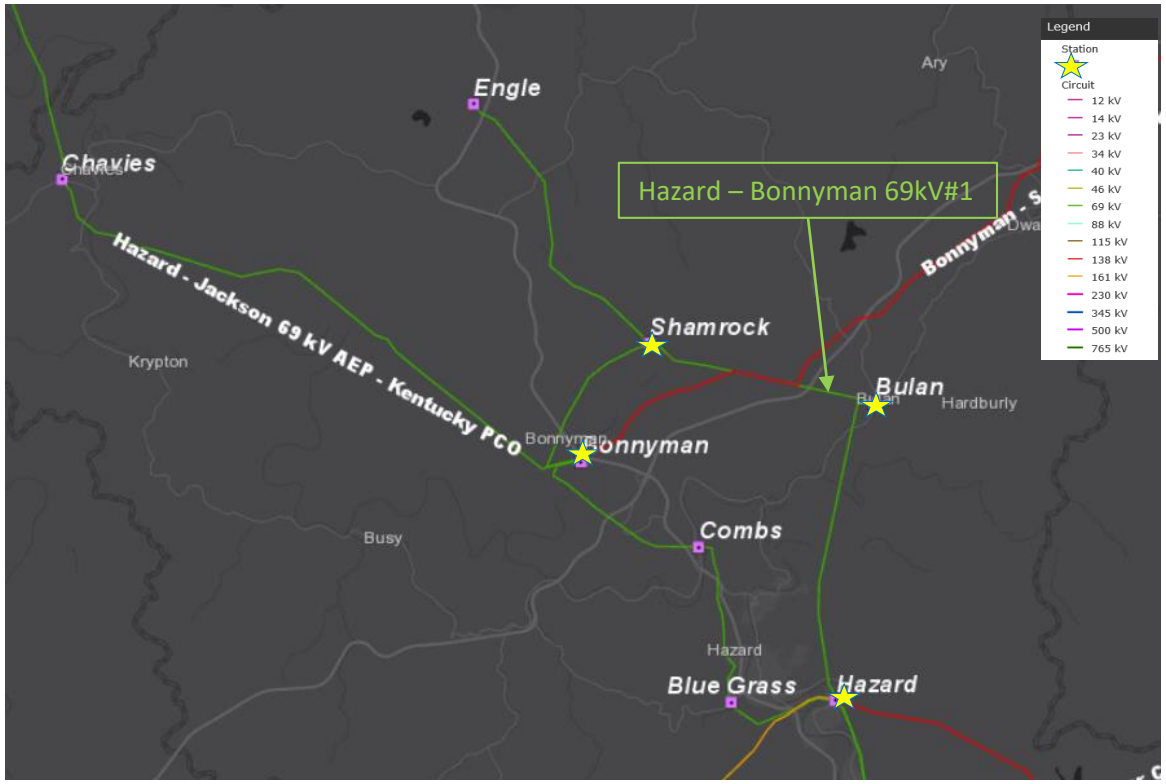
Momentary/Permanent Outages and Duration: 10 Momentary and 3 permanent Outage

CMI (last 5 years only): 185,875 minutes

Line Conditions

- 22 structures with at least one open condition, 45% of the structures on this circuit.
- 45 structure related open conditions: crossarms and poles including rot, damaged, insect damaged, woodpecker hole, burnt, and bowed conditions.
- 3 shield wire conditions with damaged and broken strands.
- 1 broken ground wire lead
- 2 broken insulators





AEP Transmission Zone M-3 Process
Allen County, Ohio

Need Number: AEP-2020-OH046

Process Stage: Need Meeting 12/18/2020

Project Driver:

Customer Service

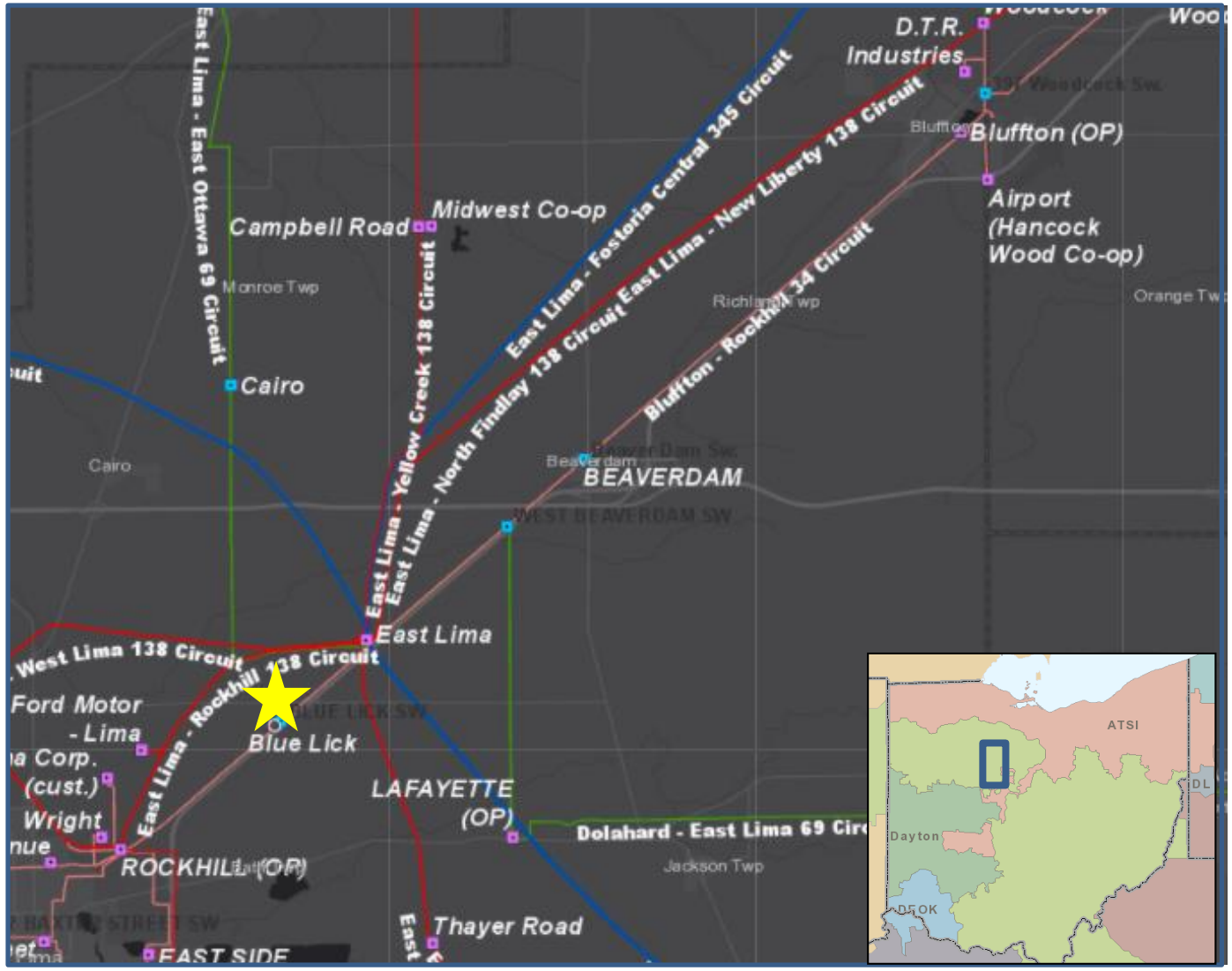
Specific Assumption Reference:

AEP Guidelines for Transmission Owner Identified Needs

Problem Statement:

Customer Service:

- **Station/Area Name:** Bluelick Switch 34.5 kV
- **Load:** 3.185MW Existing/3.7MW projected by 2029
- **Customer Request:** The customer has requested to upgrade their existing delivery point from 34.5 kV to 69 kV.
- **Requested In-service Date:** 6/1/2024



AEP Transmission Zone M-3 Process
Licking County, OH

Need Number: AEP-2020-OH048

Process Stage: Needs Meeting 12/18/2020

Supplemental Project Driver:
Customer Service

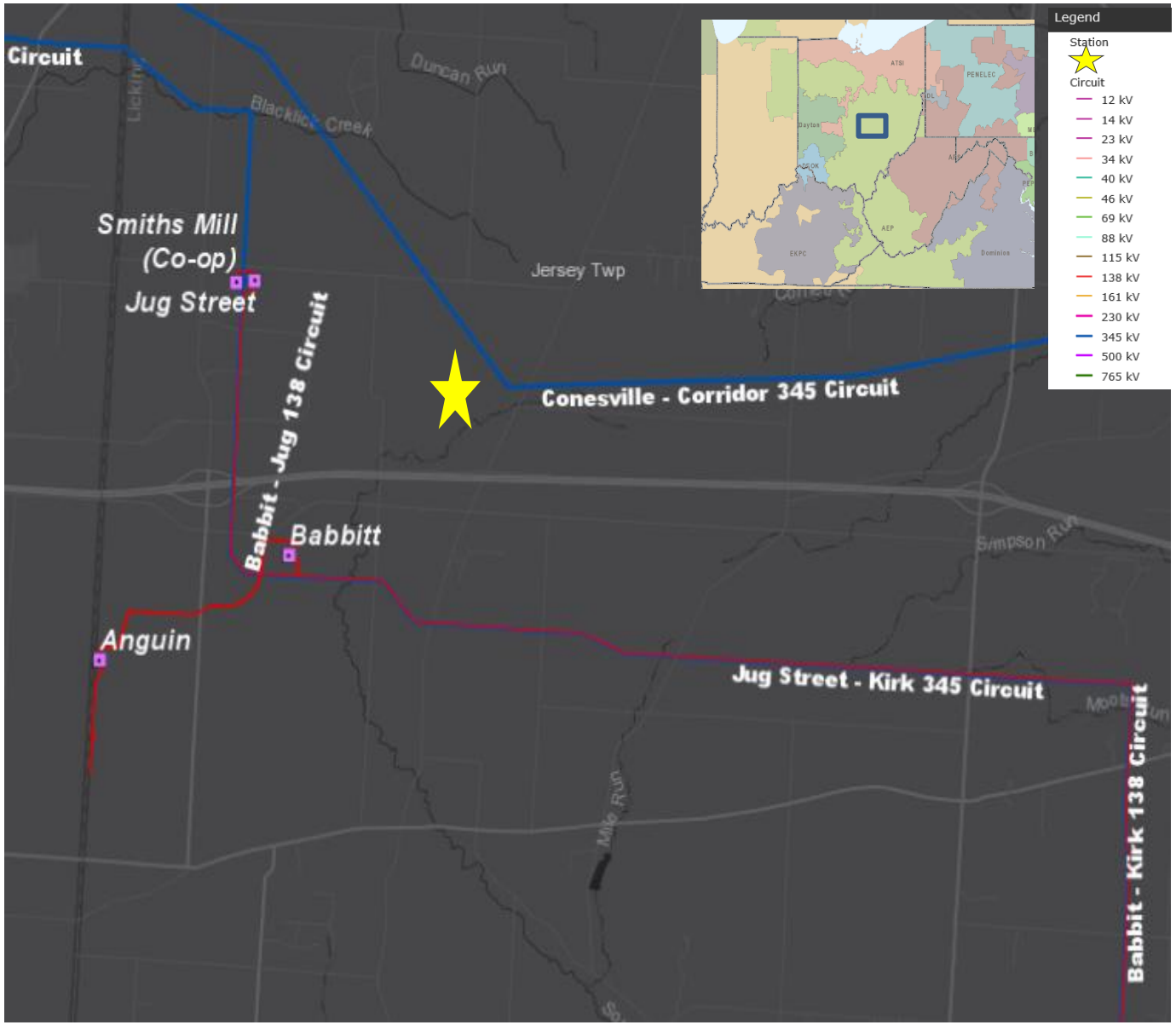
Specific Assumption Reference:
AEP Connection Requirements for the AEP Transmission System (AEP Assumptions Slide 7)

Problem Statement:

Customer Service:

- A customer has requested transmission service at a site just south of the existing Conesville – Corridor 345 kV circuit in New Albany, OH.
- The customer has indicated an initial peak demand of 64 MW with an ultimate capacity of up to 256 MW at the site.

Model: 2025 RTEP



AEP Transmission Zone M-3 Process
Pickaway County Area, Ohio

Need Number: AEP-2020-OH049

Process Stage: Needs Meeting 12/18/2020

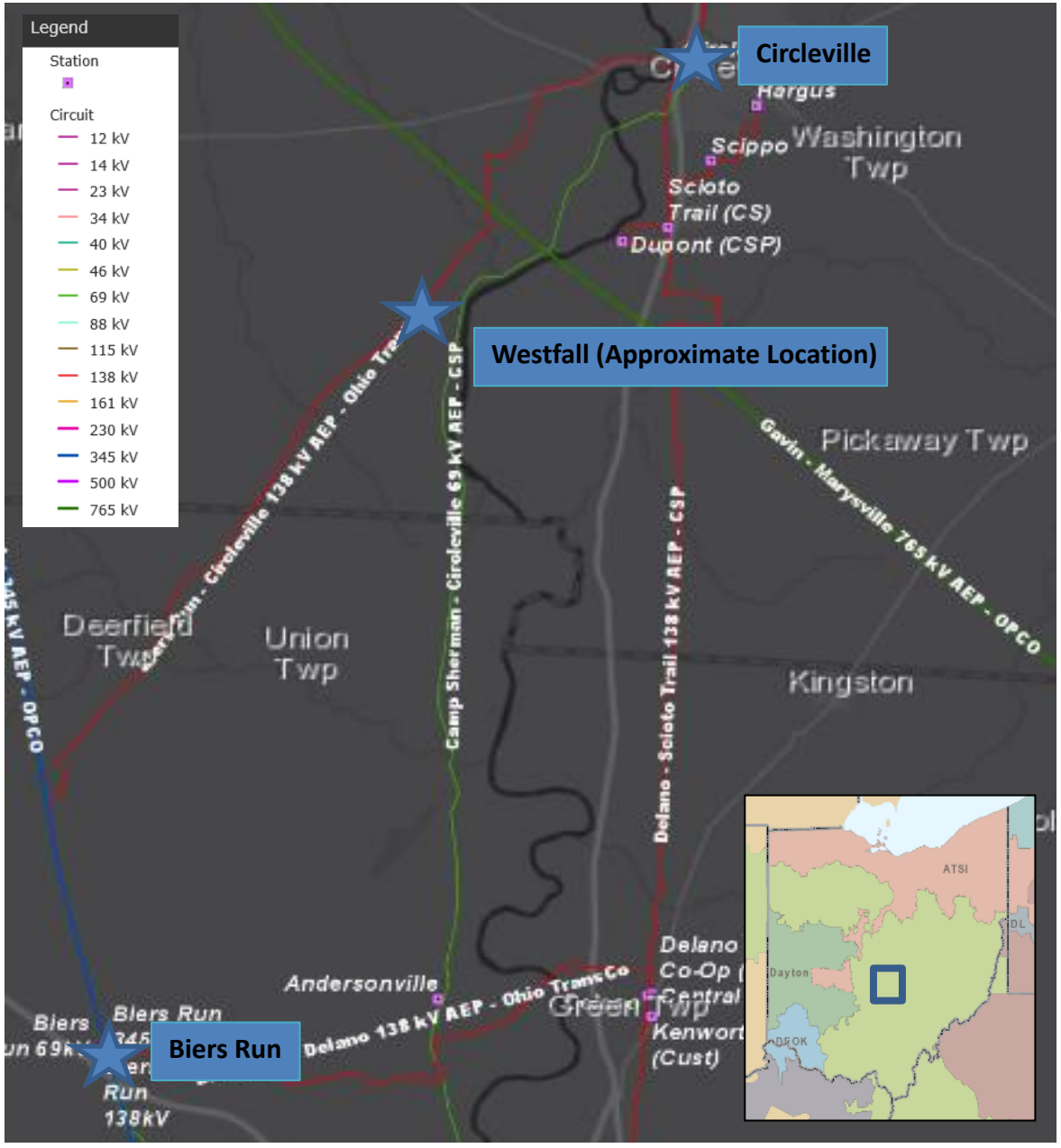
Supplemental Project Driver:
Customer Service

Specific Assumption Reference:
AEP Connection Requirements for the AEP Transmission System (AEP Assumptions Slide 7)

Problem Statement:
Westfall Delivery Point (SCP) 138kV:

- Buckeye Power Inc., on behalf of South Central Power Company, has requested transmission service in Wayne Township, Pickaway County, Ohio.
- SCP currently has a radial 69 kV line served out of AEP's West Lancaster Station with a load of approximately 42.5 MW in 2022 and growth at a rate of 2% per year.
- South Central Power Company would like a new transmission delivery point on the on the other end of this long 69 kV radial line (44 miles of exposure; 5 delivery points).
- Service is requested by March 2022.

Model: 2025 RTEP



Solutions

Stakeholders must submit any comments within 10 days of this meeting in order to provide time necessary to consider these comments prior to the next phase of the M-3 process

AEP Transmission Zone M-3 Process
Towhee Switch

Need Number: AEP-2019-OH049

Process Stage: Solutions Meeting 12/18/2020

Previously Presented:

Need Meeting 09/25/2019

Supplemental Project Driver:

Customer Service

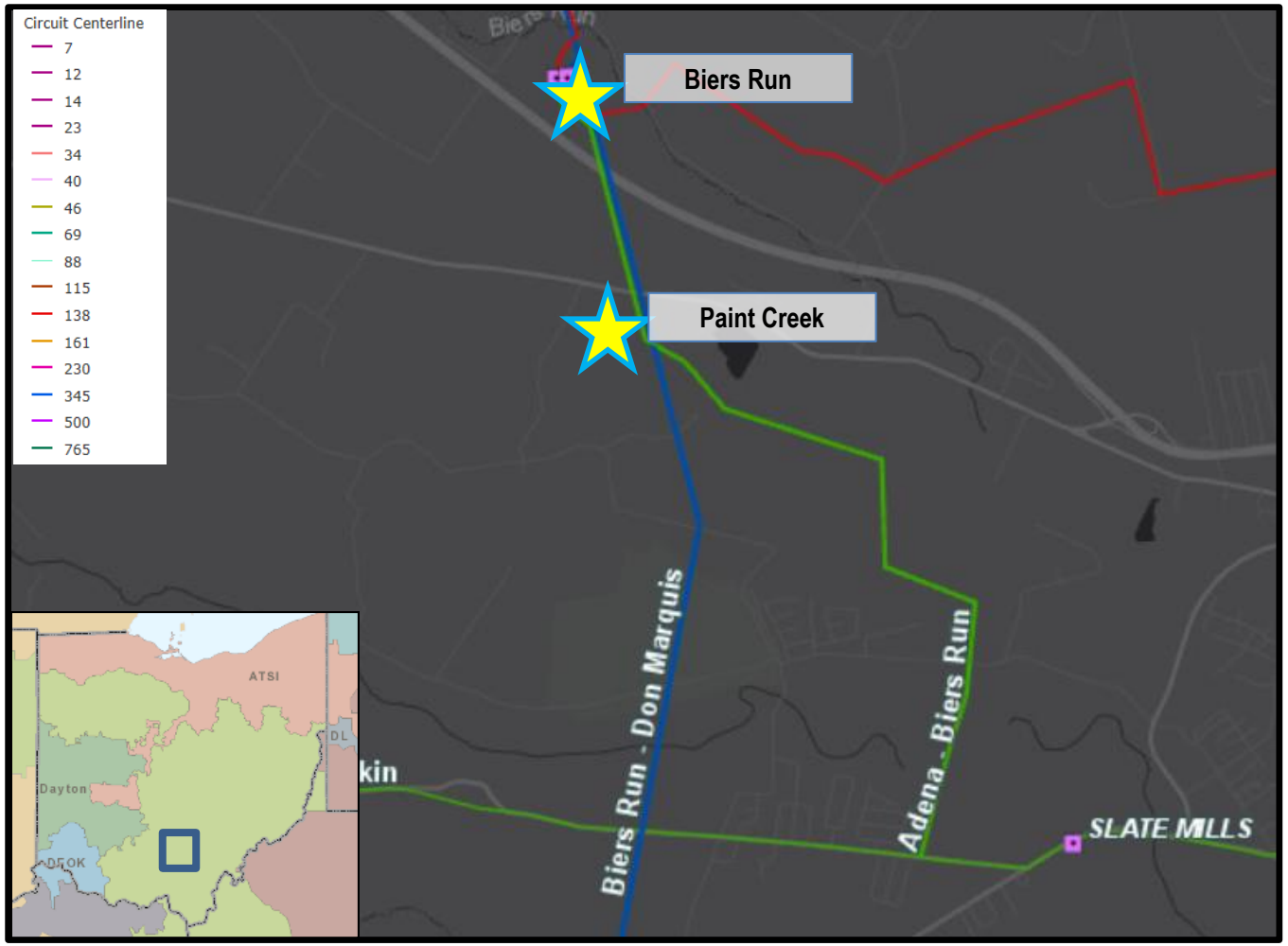
Specific Assumption Reference:

AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 7)

Problem Statement:

- South Central Power is requesting a new 69 kV delivery point at Paint Creek to alleviate several highly loaded distribution circuits out of SCP's Anderson & Budd Co. stations.
- Peak load:12MW (Winter)
- Requested ISD September 1, 2020

Model: 2024 RTEP



AEP Transmission Zone M-3 Process
Towhee Switch

Need Number: AEP-2019-OH049

Process Stage: Solutions Meeting 12/18/2020

Proposed Solution:

Install a new 3-way 1200 A 69kV switch (Towhee Switch) with Auto-Sectionalizing, MOABs, and SCADA to serve the new Paint Creek Delivery Point. Install low side metering at Paint Creek customer station. **Estimated Cost: $0.5M**

Tie Towhee Switch into the Biers Run – Buckskin 69kV circuit. **Estimated Cost: $0.1M**

Install approximately 0.1 mile radial line extension connecting Towhee Switch to the structure outside SCP's Paint Creek Substation. **Estimated Cost: $0.1M**

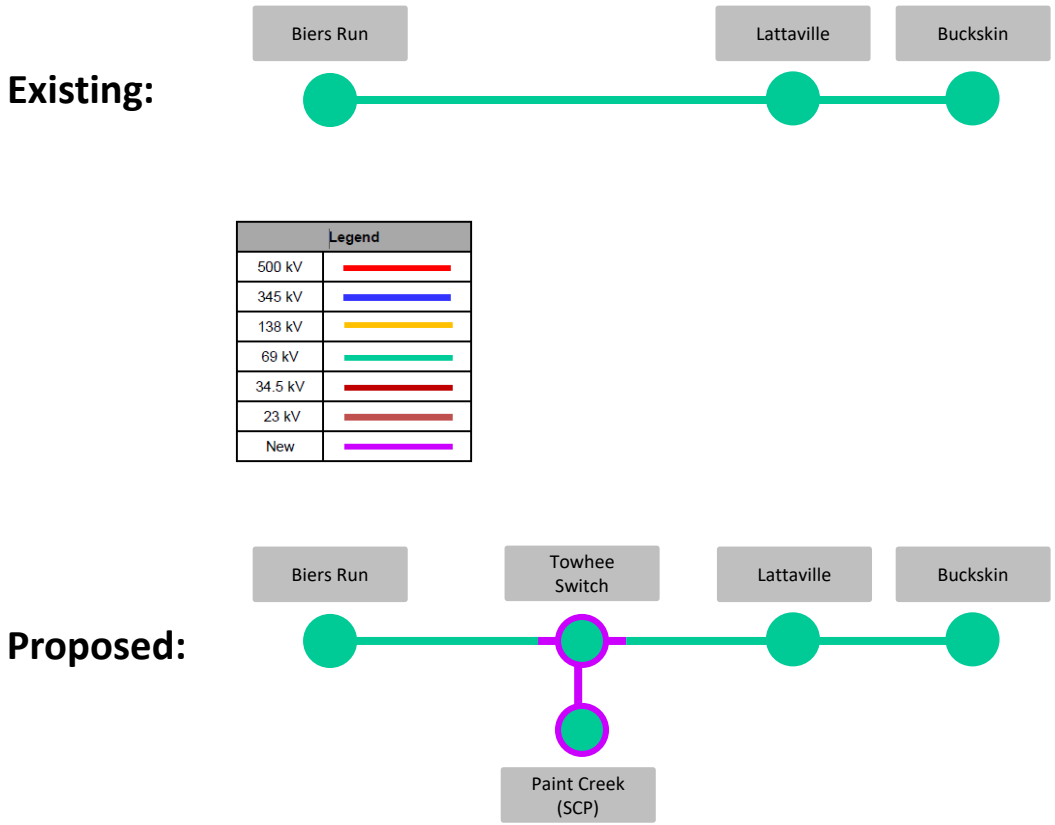
Total Estimated Transmission Cost: $0.7M

Alternatives:

Considering the location of the requested station and the proximity to the line, no other alternatives were considered.

Projected In-Service: 06/30/2022

Project Status: Engineering



AEP Transmission Zone M-3 Process
Hemlock – Bryson 69kV

Need Number: AEP-2020-OH017

Process Stage: Solutions Meeting 12/18/2020

Previously Presented: Need Meeting 03/19/2020

Project Driver:

Customer Service

Specific Assumption Reference:

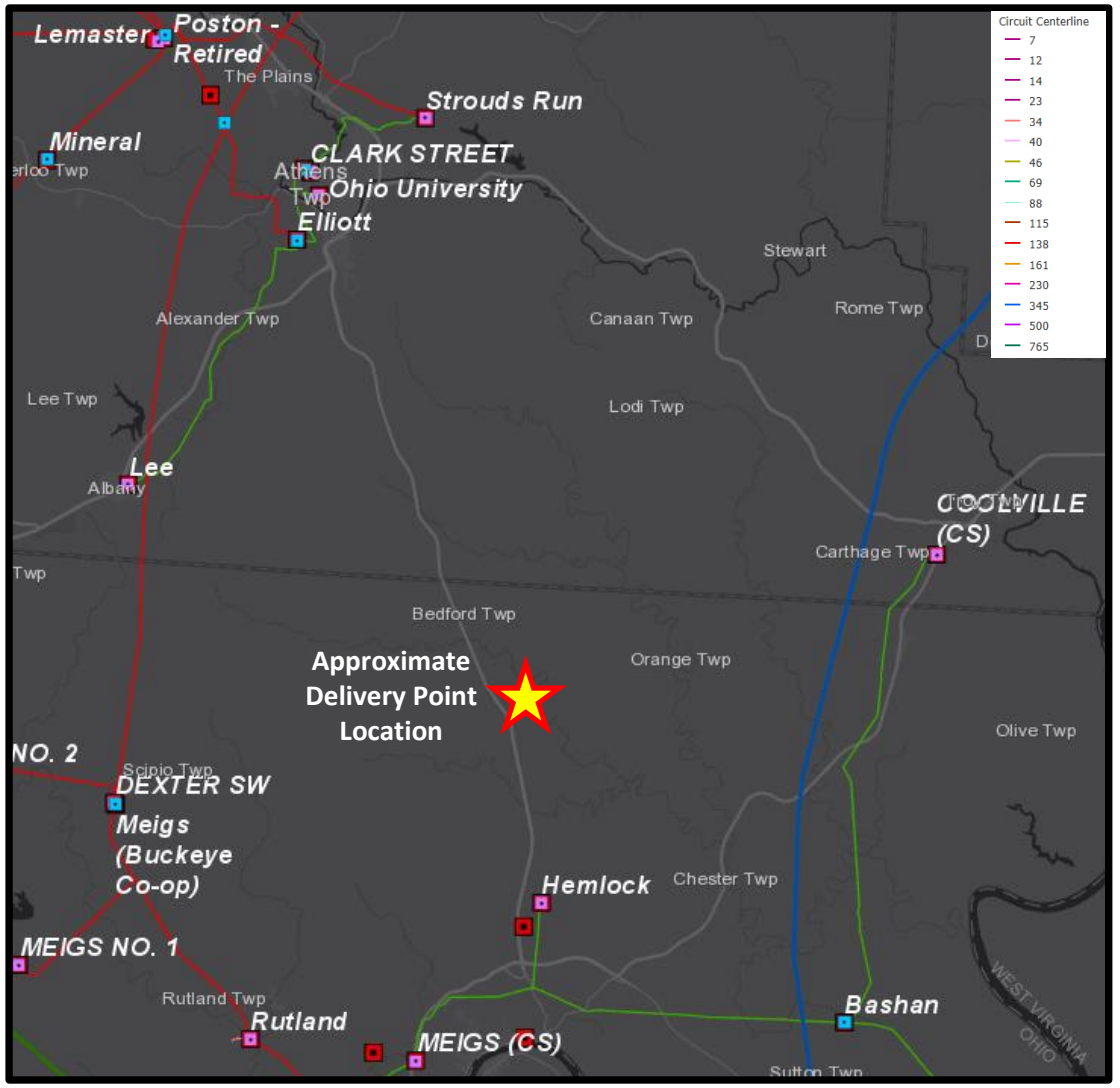
AEP Connection Requirements for the AEP Transmission System (AEP Assumptions Slide 7)

Problem Statement:

Customer Service:

- Buckeye Rural Electric Cooperative, Inc. has requested 69kV service to a new delivery point near AEP's Hemlock station by December 2022. Anticipated load is approximately 2.6 MW of transferred load.

Model: 2024 RTEP



AEP Transmission Zone M-3 Process
Hemlock – Bryson 69kV

Need Number: AEP-2020-OH017

Process Stage: Solutions Meeting 12/18/2020

Proposed Solution:

Install a greenfield 3-way 69 kV 1200 A phase over phase switch (Bryson Switch) with Auto-Sectionalizing, MOABs, and SCADA to serve the new requested delivery point.

Install metering at the proposed customer station. **Estimated Cost: $0.7M**

Build a ~4.3 miles of greenfield single circuit 69kV transmission line between Hemlock – Bryson Switch with 556 ACSR conductor. **Estimated Cost: $9.4M**

At Hemlock station, install a new 69kV 3000 A 40kA circuit breaker towards Bryson Switch. **Estimated Cost: $1.1M**

Total Estimated Transmission Cost: $11.2M

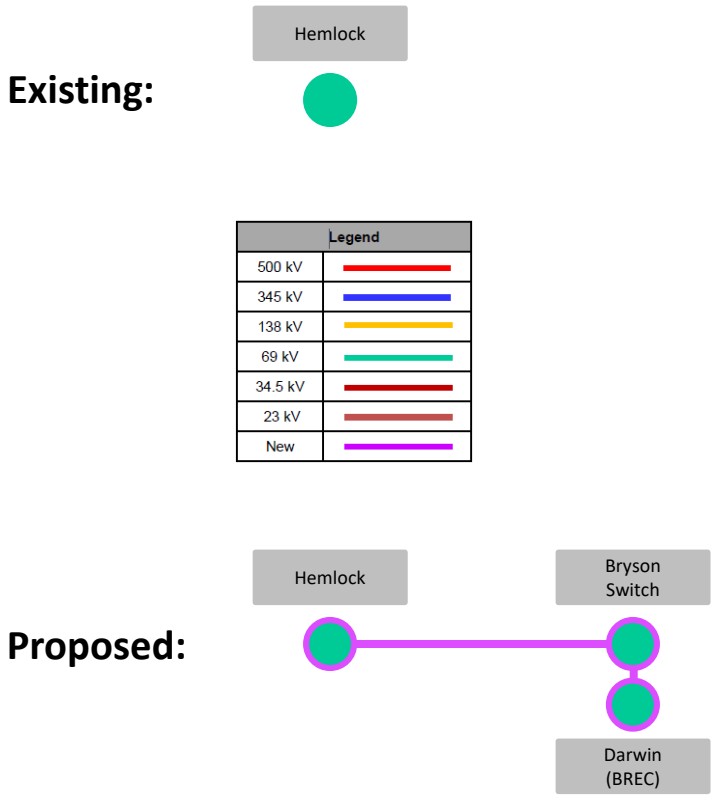
Alternatives Considered:

Serve Darwin from the Dexter – Lemaster – Elliott 138 kV circuit via a ~ 10 mile 138 kV line, 138 kV three way phase over phase switch on the Dexter – Lemaster Elliott 138 kV circuit and a 138 kV two way switch outside of the Darwin Co-op station.

Estimated Transmission Cost: $35M

Projected In-Service: 12/15/2022

Project Status: Engineering



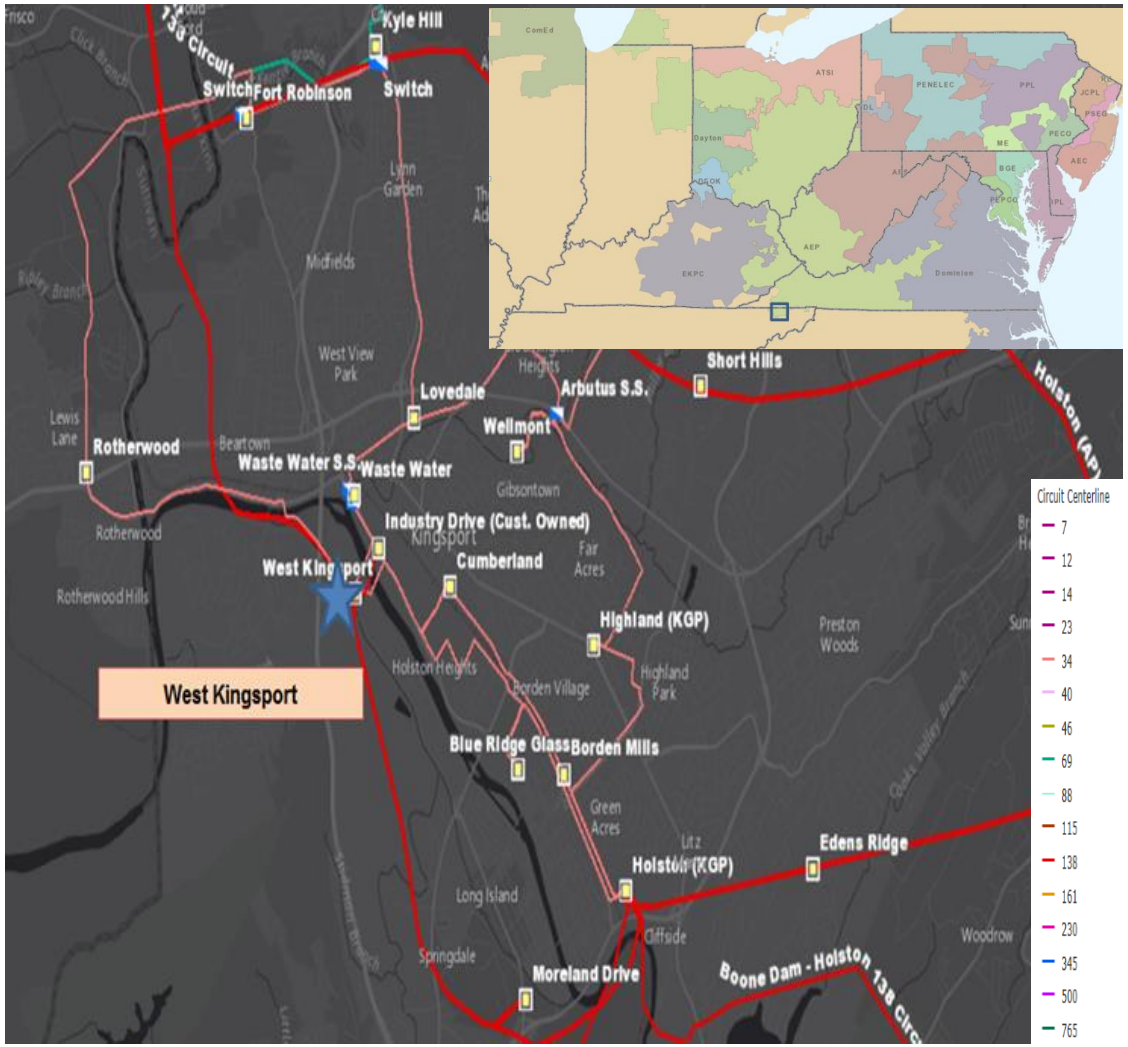
AEP Transmission Zone: Supplemental Kingsport, TN

Need Number: AEP-2018-AP017
Process Stage: Solutions Meeting 12/18/2020
Previously Presented: Needs Meeting 1/11/2019
Supplemental Project Driver: Equipment Condition/Performance/Risk
Specific Assumption References: AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 8)
Problem Statement:

138 kV circuit breaker 'E' at West Kingsport station is a type FX-11 breaker, which is one of only two remaining circuit breakers of this class on the AEP system . Due to a lack of spare replacement parts, it is not possible to maintain the breaker in the event of a failure. Breaker 'E' has had historical issues with gas leaks. In addition, this circuit breaker has experienced 30 fault operations exceeding the manufacturers recommendation 10.

Currently dissimilar zones of protection exist at the West Kingsport between the 138 kV bus #1, 138 kV circuit towards North Bristol (~25 miles), and the 138 kV service point towards the Royal Ordnance Ammunitions Plant.

The existing configuration at West Kingsport station results in an outage of the entire 138 kV yard and all customers served from the station for a failure of 138 kV circuit breaker 'G'.



AEP Transmission Zone: Supplemental
Sullivan County, Kingsport, Tennessee

Need Number: AEP-2019-AP019

Process Stage: Solutions Meeting 12/18/2020

Previously Presented: Needs Meeting 05/20/2019

Supplemental Project Driver:

Equipment Material/ Condition/Performance/Risk

Specific Assumption References:

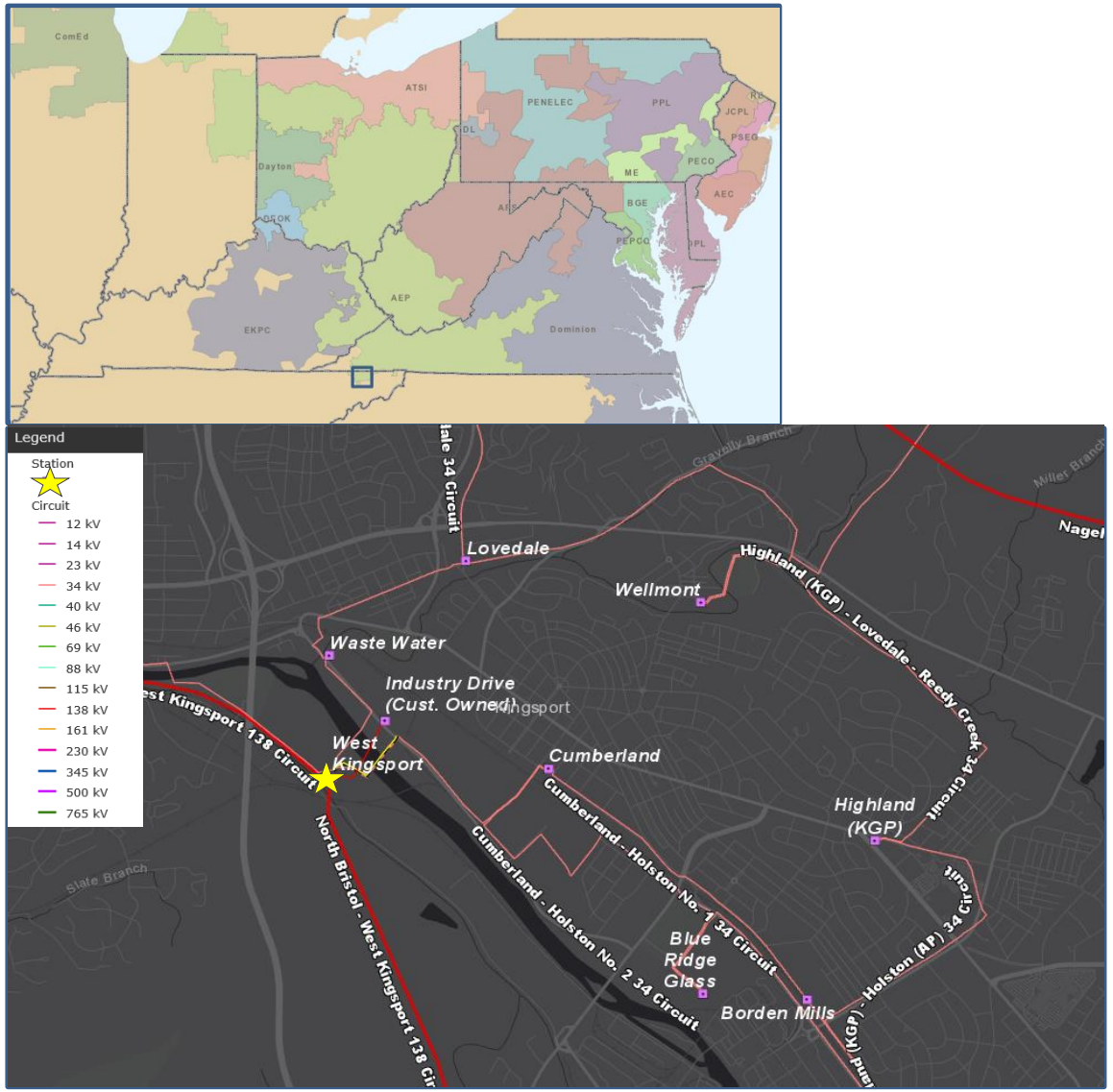
AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 8)

Problem Statement:

West Kingsport 34.5 kV

34.5 kV Circuit breakers A, C, and F

- FK type oil breakers. (1955, 1955, and 1966 vintage)
- These are oil breakers that are difficult to maintain due to the required oil handling. There is an increased potential for oil spills during routine maintenance and failures with these types of breakers.
- Other drivers include damage to bushings and an excessive number of fault operations exceeding the manufacturer's recommendations.
- Have experienced 26, 26, and 21 fault operations respectively. The manufacturer's recommendation for this type of breaker is 10.



AEP Transmission Zone M-3 Process
Kingsport, TN

Need Number: AEP-2018-AP017, AEP-2019-AP019
Process Stage: Solutions Meeting 12/18/2020

Proposed Solution:
West Kingsport Station Work: Install five 138 kV 40 kA 3000A CBs and reconfigure existing Bus #2 to a breaker and a half arrangement. Note that the replacement of breaker E was accelerated due to a customer request and constrained outages and is currently in service to feed Industry Drive. Replace existing 34.5 kV CBs A, C and F with three new 69 kV-rated 3000A 40 kA breaker — to be energized at 34.5kV. Replace existing 34.5kV bus structures with new box bays built to 69kV. Remove existing 34.5 KV 14.4 MVAR Cap bank and Cap Bank Switcher. **Estimated Cost: ~$9.2M**

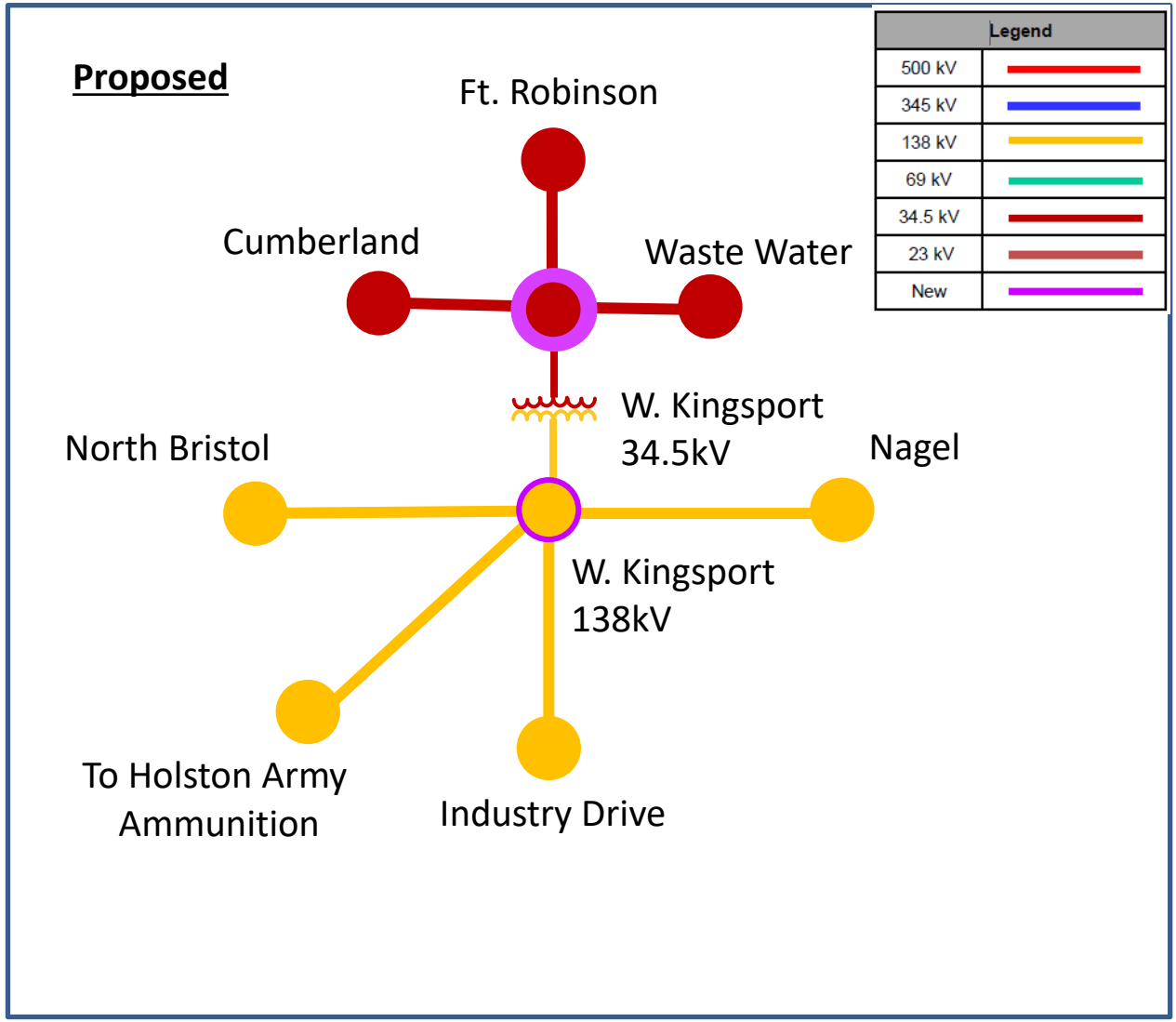
Line work and ROW required to relocate the North Bristol and Industry Drive 138KV lines at West Kingsport Station into the new configuration. This includes installing 3 structures (2 tower structures and 1 custom Steel Pole) to bring North Bristol Circuit in and relocate the Industrial Drive Circuit to final string of breakers. This also includes re-terminating the Ft. Robinson-West Kingsport 34kV line, Cumberland- West Kingsport 34.5kV Line and the Waste Water- West Kingsport 34kV Line into new station bays. **Estimated Cost: ~$4.2 M**

Total Estimated Transmission Costs: $13.4M

Alternative:
Build the 138 kV yard at West Kingsport station in the clear. Install three new 69 kV-rated 3000A 40 kA breakers — to be energized at 34.5kV. This option is not prudent from a cost perspective. **Estimated Cost: $21.5M**

Projected IS Date: 7/20/2023

Project Status: Engineering



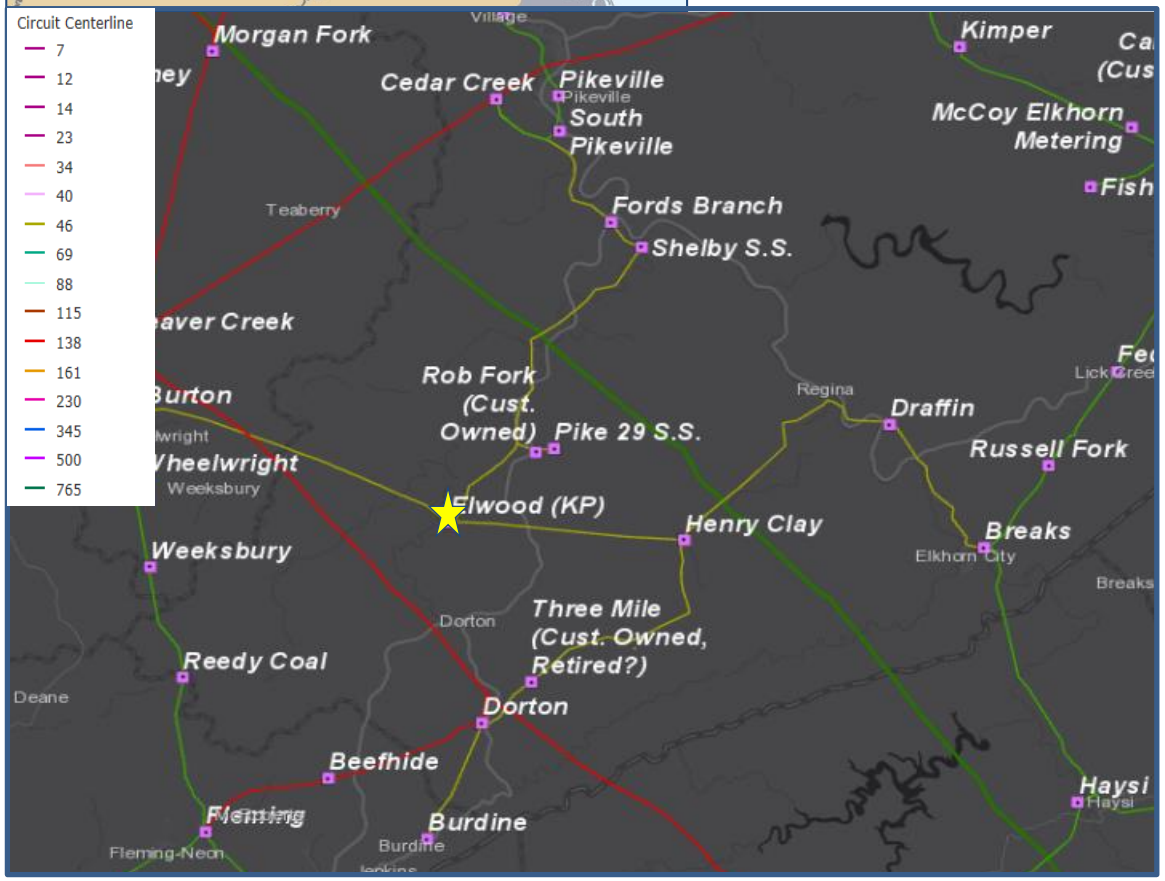
Need Number: AEP-2020-AP009

Process Stage: Solutions Meeting 12/18/2020

Previously Presented: Needs Meeting 02/21/2020
Supplemental Project Driver: Equipment Condition/Performance/Risk, Operational Flexibility
Specific Assumptions Reference: AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 8)
Problem Statement:

Elwood 46kV Station:
46 kV Circuit Breakers A,B, and C

- 1960's vintage FZO-69-1500P type oil circuit breakers.
- Fault Ops: CB A (33), CB B (83), and CB C (105). Recommended : 10
- Other drivers: damage to bushings, spare part availability, historical reliability, and lack of vendor support of the breakers.
- There are 8 remaining FZO-69-1500P circuit breakers on the AEP system, including the 3 at this station.
- 86% of the relays (36/42) at the station are electromechanical, which have significant limitations with regards to fault data collection and retention and have no spare part availability due to a lack vendor support.



AEP Transmission Zone M-3 Process
Pike County, Kentucky

Need Number: AEP–2020-AP011

Process Stage: Solutions Meeting 12/18/2020

Previously Presented: Needs Meeting 02/21/2020

Supplemental Project Driver:

Equipment Material/ Condition/Performance/Risk, Operational Flexibility and Efficiency

Specific Assumption References:

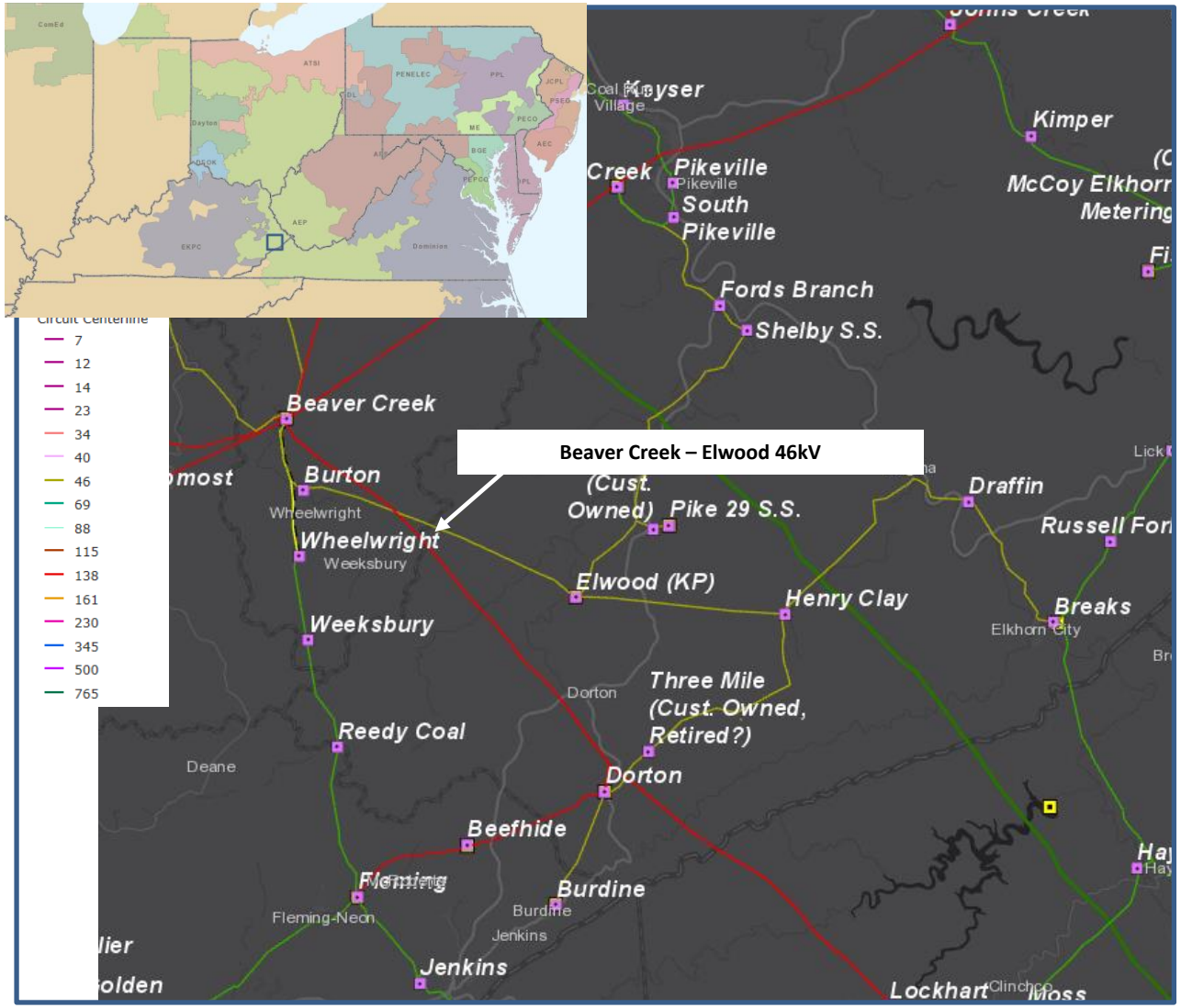
AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 8)

Model: N/A

Problem Statement:

Beaver Creek – Elwood 46kV:

- Original Install Date: 1930s vintage
- Length of Line: ~10.48 mi
- Total structure count: 60
- Original Line Construction Type: Wood
- Conductor Type: 336 ACSR
- Momentary/Permanent Outages and Duration: 18 Momentary and 1 permanent Outage
- CMI (last 5 years only): 269,070 minutes
- Number of open conditions: 34 open conditions on 20 unique structures.
- Open conditions include crossarms and poles with rot top, woodpecker damage and leaning-in-line conditions.



AEP Transmission Zone M-3 Process
Pike County, Kentucky

Need Number(s): AEP-2020-AP009, AEP–2020-AP011
Process Stage: Solutions Meeting 12/18/2020
Proposed Solution:

- Construct a greenfield 69/12 KV Osborne Station to replace Burton Station, including a high-side 69KV Phase Over Phase switch, fiber connectivity, a circuit switcher, and one 69/12kV 12/16/20MVA transformer and associated distribution feeders. **Estimated Transmission Cost: $0.74M** Note: Cost does not include the Distribution scope of work.

- Construct a greenfield 138KV Myra Station to replace Elwood Station. Install 138KV double box bay with two 138kV circuit breakers and line exits to Fremont & Beaver Creek. Install 138/34.5 kV transformer with high-side circuit switcher and associated 34.5kV breakers. Install fiber connectivity for upgraded relaying. **Estimated Transmission Cost: $3.43 M** Note: Cost does not include the Distribution scope of work.

- Remote end relaying work at Beaver Creek substation. Remove 46KV Elwood Line 46kV circuit breaker "G“ and associated equipment. **Estimated Transmission Cost: $0.17 M**

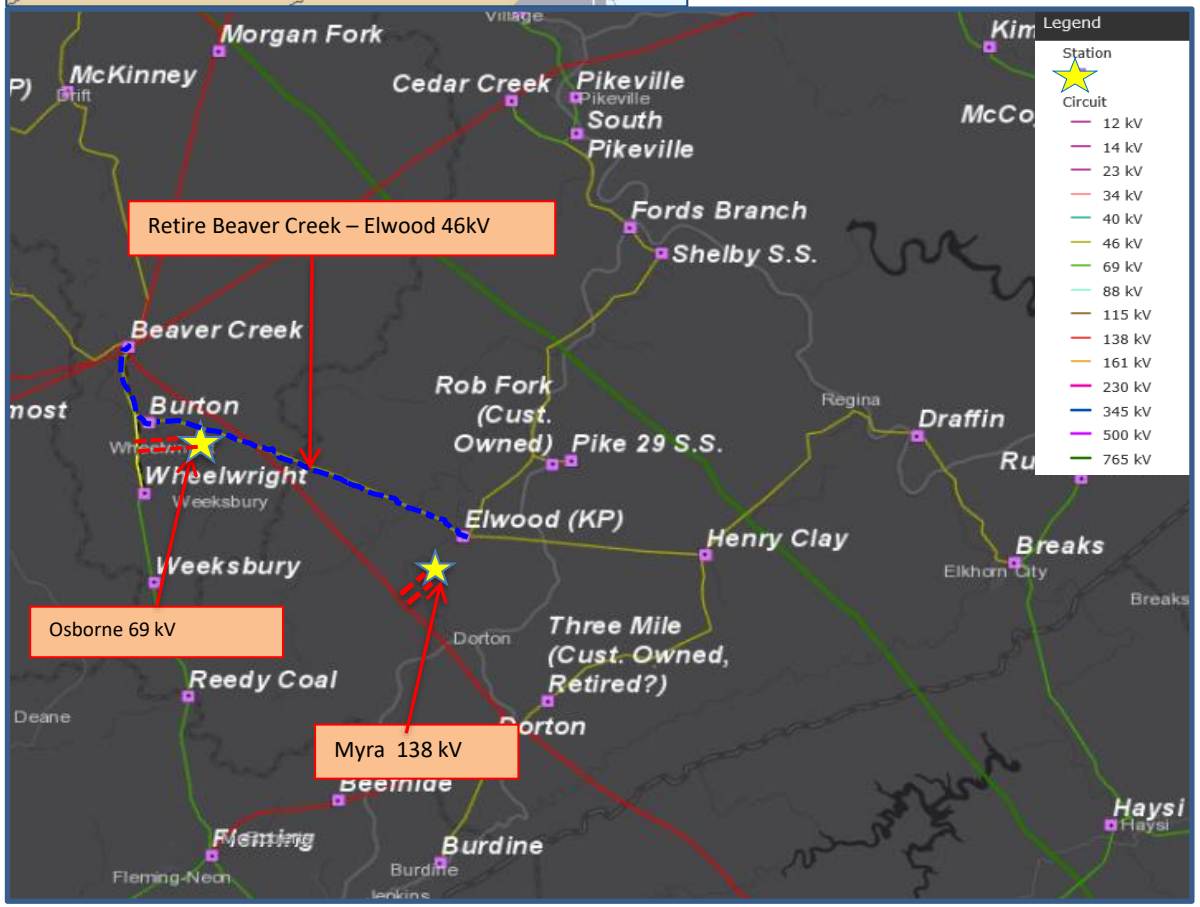
- Remote end relaying work at Fremont substation. **Estimated Transmission Cost: $0.42 M**

- At Burton station, retire and remove all existing equipment. **Estimated Transmission Cost: $0M**

- At Elwood station, retire and remove all existing equipment. **Estimated Transmission Cost: $0 M**

- Construct a new ~0.5 mi double circuit 69 kV line to the proposed Osborne substation. **Estimated Cost: $2.56 M**

- Reconfigure the existing Beaver Creek - Fleming 69kV line to facilitate the construction of the new double circuit Osborne 69kV line to feed the proposed Osborne Substation. **Estimated Cost: $1.22 M**



AEP Transmission Zone M-3 Process
Pike County, Kentucky

Proposed Solution (Cont.):

- Construct a new ~2 mi double circuit 138 kV line to the proposed Myra substation. **Estimated Cost: $8.8 M**
- Reconfigure the existing Beaver Creek - Fremont 138kV circuit to facilitate the construction of the new double circuit Myra Extension 138kV Line to feed the proposed Myra Substation. **Estimated Cost: $1 M**
- Install two replacement structures in order to bypass Elwood station. Transfer wires from old structure to new structure. Tie new structure to Cedar Creek-Henry Clay 46kV Line. **Estimated Cost: $1.35 M**
- Retire ~10.48 mi Beaver Creek – Elwood 46kV line. **Estimated Cost: $6.47 M**

Total Estimated Transmission Cost: $26.16M

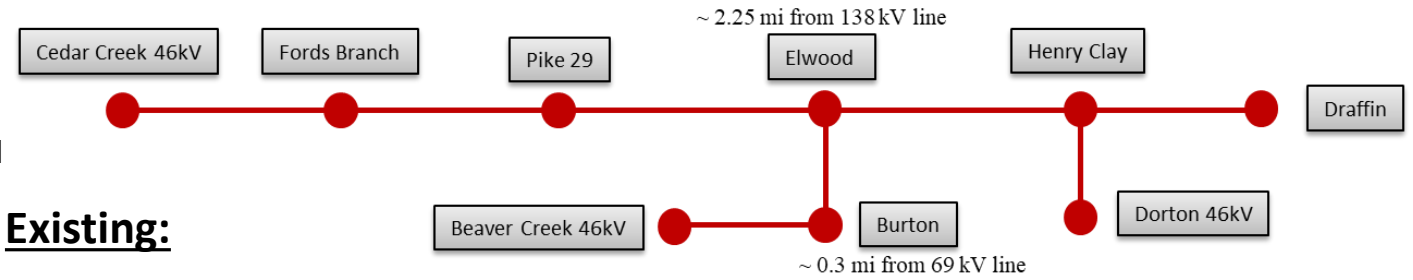
Alternative considered:

Rebuild ~10.48 mi of 46kV Beaver Creek – Elwood line to 69kV standards in new ROW augmented ROW. Retire existing Beaver Creek – Elwood 46 kV line. Replace CB A,B and C at Elwood substation.
Estimated Alternative Cost: $40 M

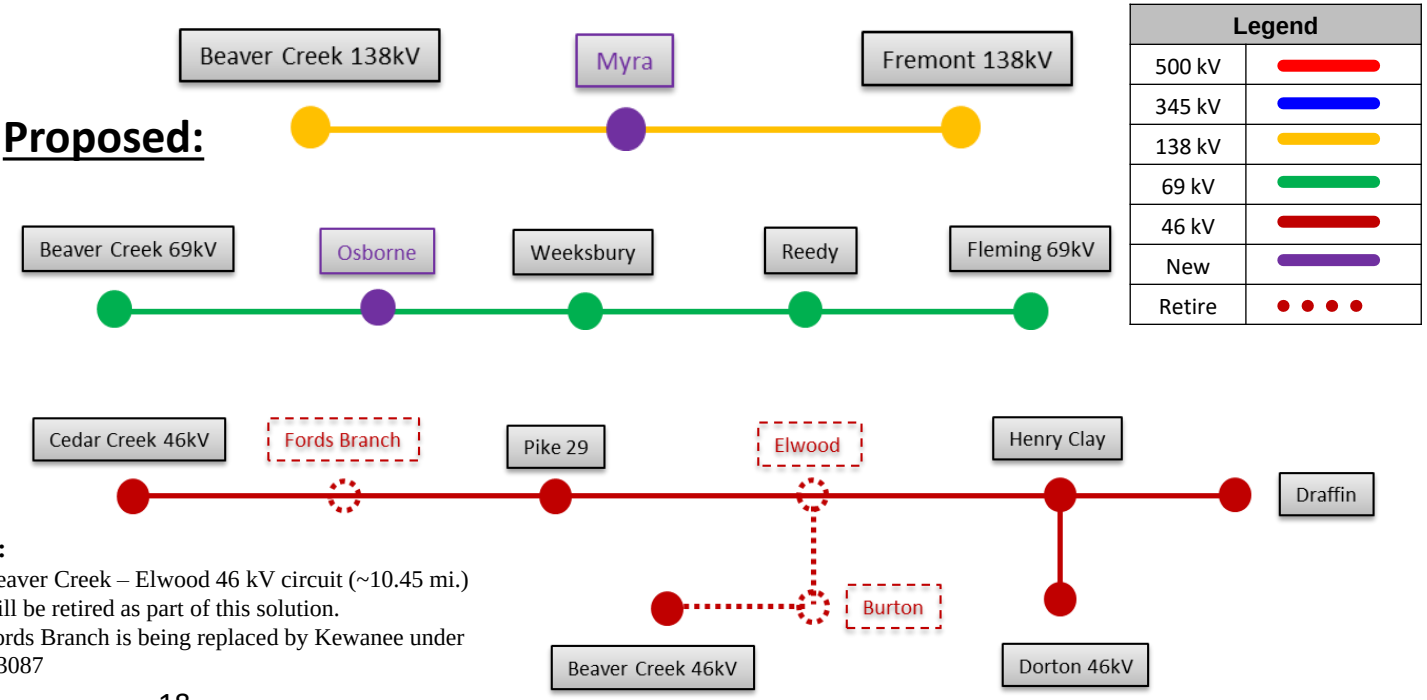
Projected In-Service: 11/31/2024

Project Status: Scoping

Existing:



Proposed:



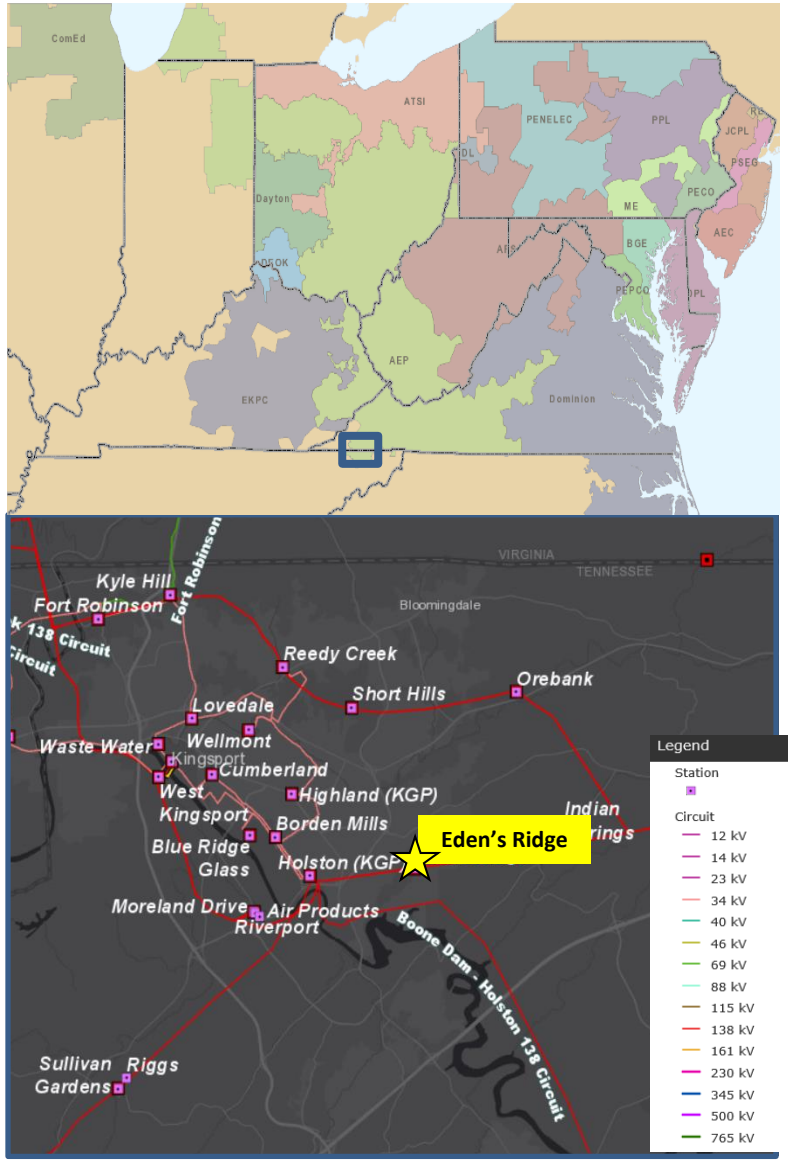
Note:

- Beaver Creek – Elwood 46 kV circuit (~10.45 mi.) will be retired as part of this solution.
- Fords Branch is being replaced by Kewanee under B3087

AEP Transmission Zone M-3 Process
Kingsport, TN

Need Number: AEP-2020-AP030
Process Stage: Solution Meeting 12/18/2020
Previously Presented: Needs Meeting 04/20/2020
Supplemental Project Driver: Customer Service
Specific Assumption References: AEP Connection Requirements for the AEP Transmission System (AEP Assumptions Slide 7)
Problem Statement:

Appalachian Power Co. (Distribution) has requested adding a new 25 MVA 138/12KV transformer at Eden's Ridge Station to serve growing load in the Kingsport area.



AEP Transmission Zone M-3 Process
Kingsport, TN

Need Number: AEP-2020-AP030
Process Stage: Solution Meeting 12/18/2020
Supplemental Project Driver: Customer Service
Specific Assumption References: AEP Connection Requirements for the AEP Transmission System (AEP Assumptions Slide 7)

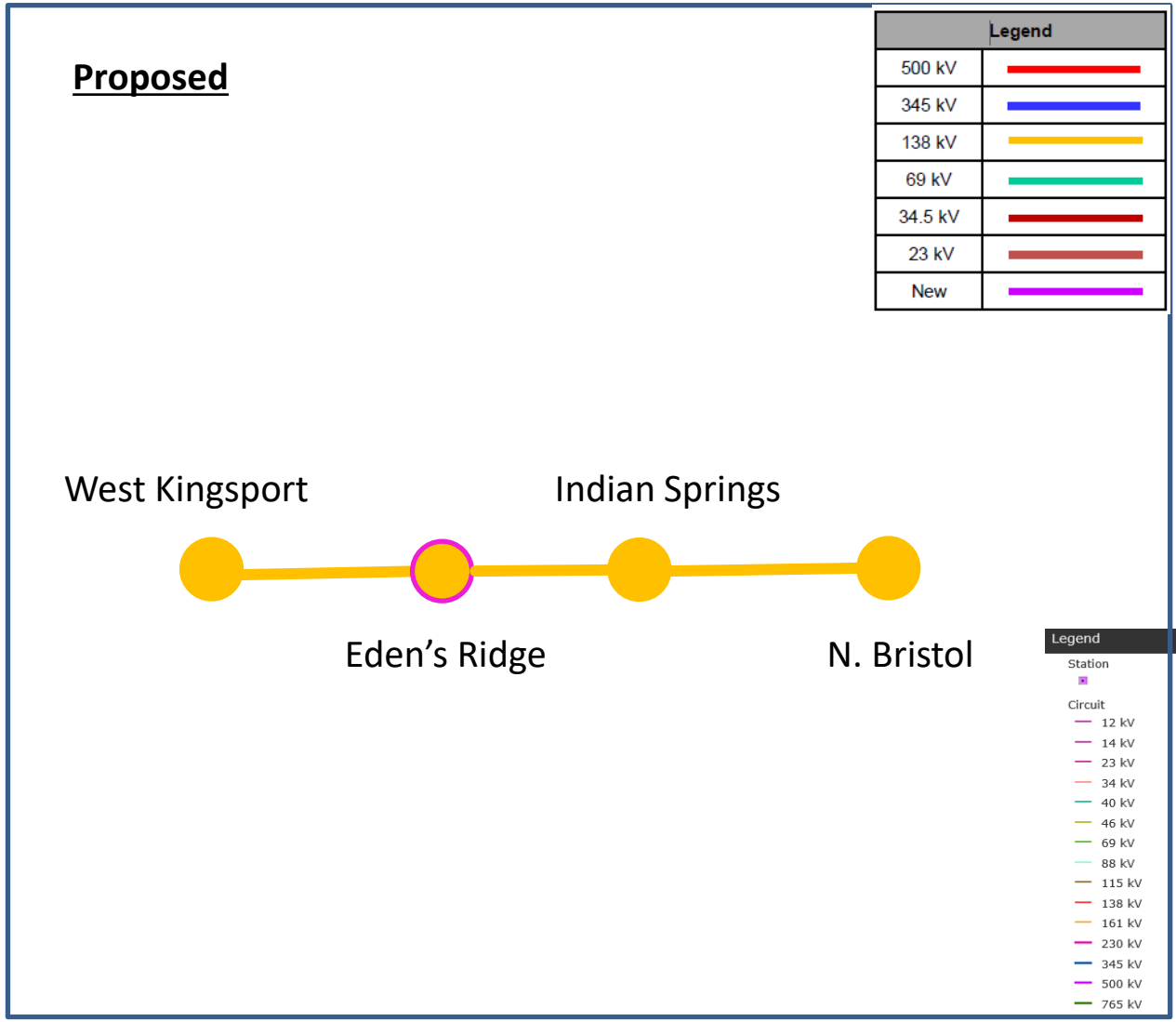
Proposed Solution:

- **Eden's Ridge Station**: Expand the station to install a 138kV box bay replacing the phase over phase switching structure and replace line switches with motor operated switches and CCVTs **Estimated Cost: $1.5M**
  - Note: Cost does not include Distribution scope of work to install circuit switchers, a new transformer, and new feeder breaker and exits.

- Line work on the North Bristol-West Kingsport 138kV circuit to terminate onto the Edens' Ridge Station new 138kV box bay. **Estimated Cost: $2.5M**

Total Estimated Transmission Cost: ~$4M

Projected IS Date: 4/30/2023
Project Status: Engineering



AEP Transmission Zone M-3 Process
Clifford, VA Area

Need Number: AEP-2020-AP031

Process Stage: Solutions Meeting 12/18/2020

Previously Presented: Needs Meeting 5/22/2020

Supplemental Project Driver: Equipment Material/Condition/Performance/Risk

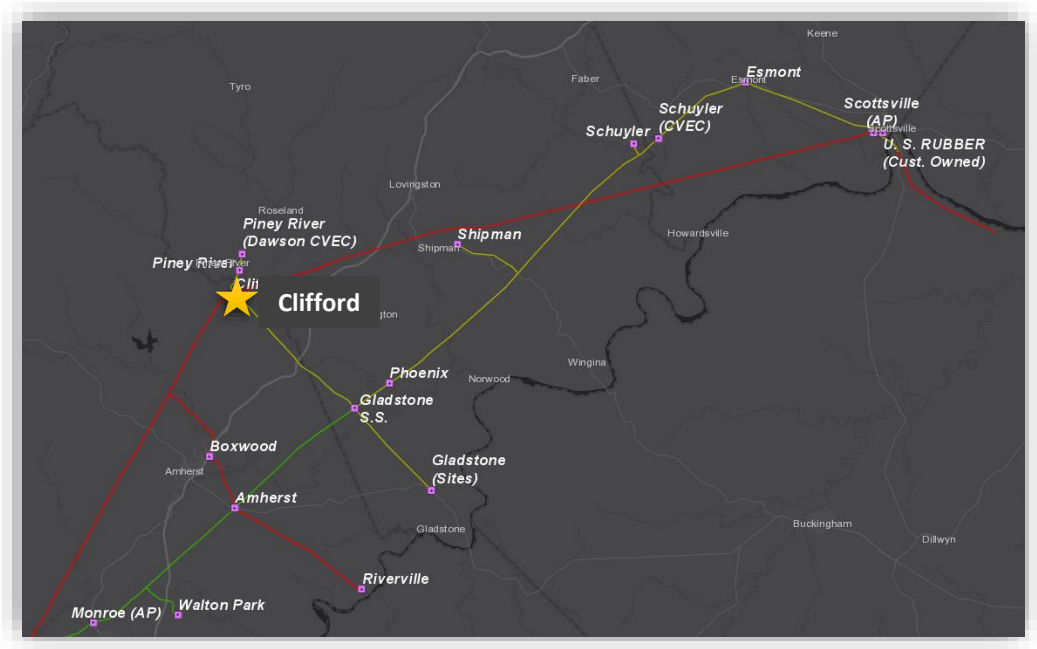
Specific Assumption Reference: AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 8)

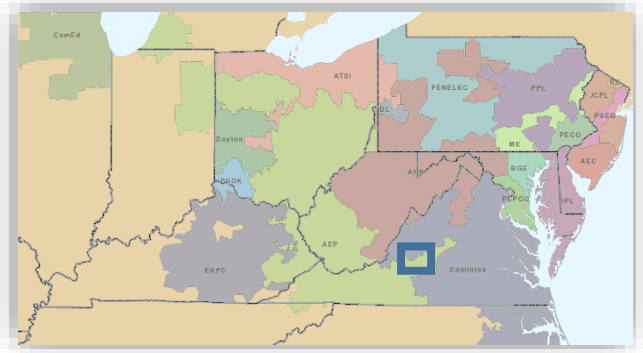
Problem Statement:

Clifford Station:

- 138/69/46 kV Transformer #1
  - 1963 Vintage Transformer
  - Elevated levels of Acetylene have been documented indicating increased decomposition of the paper insulating materials. The presence of acetylene indicates electrical discharge faults of high energy have occurred within the main tank causing electrical breakdown of the unit.
  - Due to deteriorated gaskets at the radiator headers, this unit is leaking oil.

- 138/46 kV Transformer #3
  - 1950 Vintage Transformer
  - An upward trend in insulation power factor indicates an increase in particles within the oil and the dielectric strength of the insulation system (oil and paper) are in poor condition, impairing the unit's ability to withstand electrical faults.





AEP Transmission Zone M-3 Process
Clifford, VA Area

Need Number(s): AEP-2020-AP031

Process Stage: Solutions Meeting 12/18/2020

Proposed Solution:

- Clifford Station: Replace the existing 138/69-46 kV, 50 MVA transformer #1 and 138/46 kV, 20 MVA transformer #3 with two 138/46 kV, 30 MVA transformers.
    - **Estimated Cost: $5.9 M**

Ancillary Benefits:

This project will be coordinated with B3608 addressing all the needs as one holistic solution

Alternatives Considered:

- Only install one 138/46 kV transformer instead of two as proposed. This alternative raised the following concerns:
    - The only 138/46 kV mobile transformer is located in Charleston, WV and is in need of maintenance
    - Purchase of a new 138/46 kV mobile would be too large to fit in the station
    - Clifford Station is 2-3 hours away from the nearest service center, which could lead to prolonged outages in case of any transformer outage at the station. Load from the station cannot be transferred elsewhere.
- Estimated Cost: $3.7M

Projected In-Service: 10/31/2022

Project Status: Scoping

No Bubble Diagram
Station Work Only

AEP Transmission Zone M-3 Process
Scottsville, VA Area

Need Number: AEP-2020-AP032

Process Stage: Solutions Meeting 12/18/2020

Previously Presented: Needs Meeting 5/22/2020

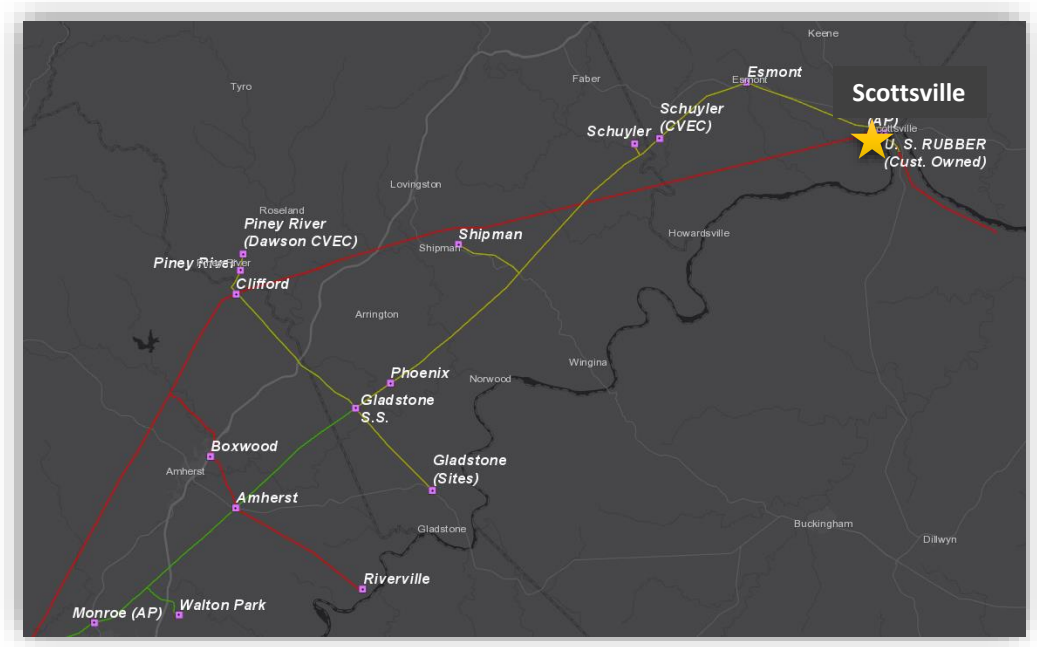
Supplemental Project Driver: Equipment Material/Condition/Performance/Risk

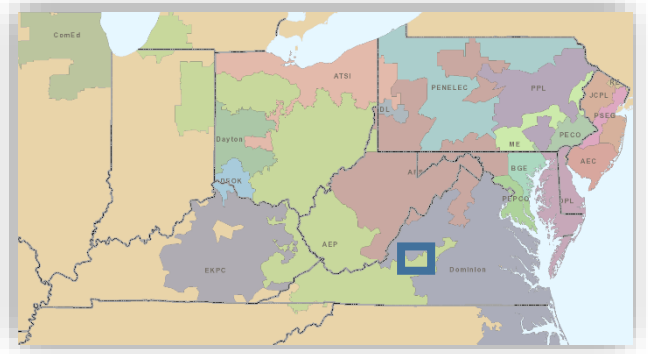
Specific Assumption Reference: AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 8)

Problem Statement:

Scottsville Station:

- 138/46 kV Transformer #1 (connected in parallel with T2)
  - 1950 Vintage Transformer
  - Unit has low levels of dielectric strength, indicating an increase in particles within the oil which decreases the ability to withstand fault events, leading to damage to the paper insulation.
  - Observed high oil power factor and low oil dielectric strength are strong indications of elevated moisture in the oil.
- 138/46 kV Transformer #2 (connected in parallel with T1)
  - 1954 Vintage Transformer
  - Elevated levels of carbon dioxide and ethane indicate excessive decomposition of the paper insulating materials.
  - An upward trend in insulation power factor indicates an increase in particles within the oil and the dielectric strength of the insulation system (oil and paper) are in poor condition, impairing the unit's ability to withstand electrical faults.
- 138/46 kV Transformer #5
  - 1950 Vintage Transformer
  - This transformer is the source for documented excessive sound and complaints from nearby home owners, which required a sound abatement wall.





AEP Transmission Zone M-3 Process
Scottsville, VA Area

Need Number: AEP-2020-AP046

Process Stage: Solutions Meeting 12/18/2020

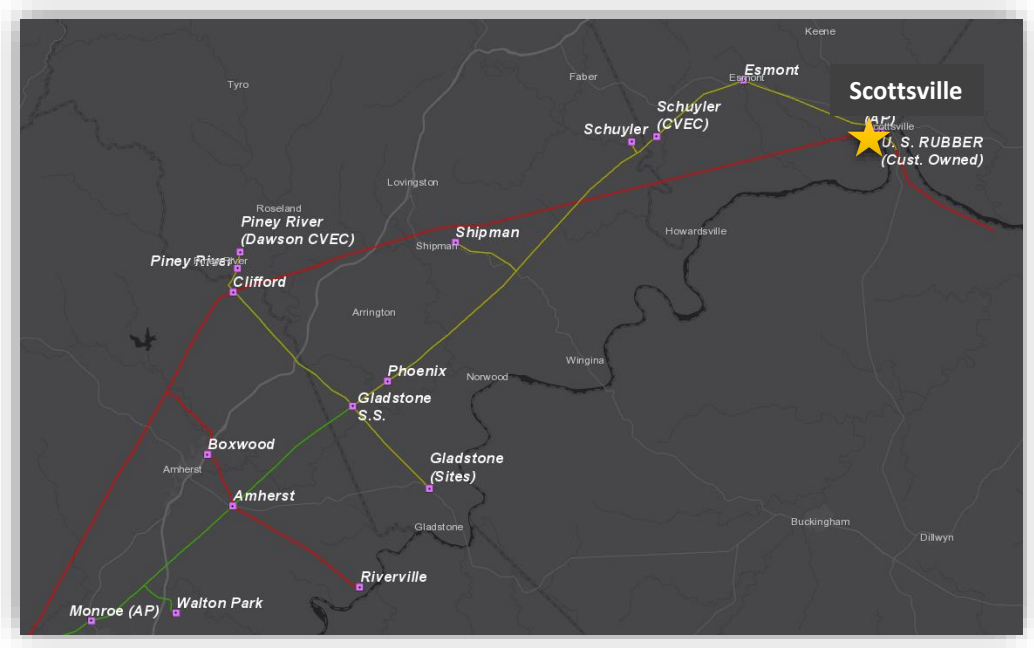
Previously Presented: Needs Meeting 11/20/2020

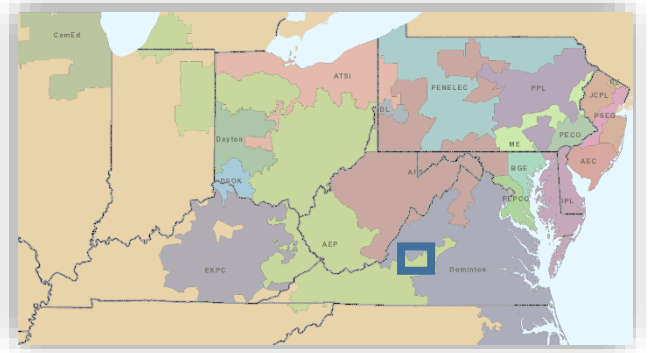
Supplemental Project Driver: Customer Service/Equipment Condition/Performance/Risk

Specific Assumption Reference: AEP Connection Requirements for the AEP Transmission System (AEP Assumptions Slide 7), AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 8)

Problem Statement:

- **Scottsville Station**
  - AEP Distribution is requesting additional load serving capability at Scottsville Station
  - 46 kV Circuit Breaker E:
    - 72EPB-31.5-20 Type, SF-6 filled breaker manufactured in 1992
    - This circuit breaker has experienced 116 fault operations, exceeding the manufacturer's designed number of 15 full fault operations. Each of these fault operations is likely not at the full fault current rating of the circuit breaker, but with each fault operation of any magnitude comes accelerated aging.
    - Since 2003, there have been 24 gas leak malfunction records associated with CB E at Scottsville
    - These model types have historically exhibited bad gas leaks, bushing failures, and CT cores getting wet.





Need Number(s): AEP-2020-AP032, AEP-2020-AP046

Process Stage: Solutions Meeting 12/18/2020

Proposed Solution:

- At Scottsville station, replace the existing 138/46 kV, 20 MVA transformer #1 & #2 (connected in parallel) and 138/46 kV, 20 MVA transformer #5 with two 138/46 kV, 30 MVA transformers; replace 46/12 kV, 5 MVA transformer #3 with 46/12 kV, 20 MVA transformer; replace 46 kV circuit breaker E; add 12 kV circuit breaker & feeder. A ring bus configuration was considered but there is no additional room at the station to accommodate a ring. Therefore, a straight bus configuration is proposed.
    - **Estimated Cost: $7.0 M**

Alternatives Considered:

- Only install one 138/46 kV transformer instead of two as proposed. This alternative raised the following concerns:
    - The only 138/46 kV mobile transformer is located in Charleston, WV and is in need of maintenance
    - Purchase of a new 138/46 kV mobile would be too large to fit in the station
    - Scottsville Station is 2-3 hours away from the nearest service center, which could lead to prolonged outages in case of any transformer outage at the station.

Estimated Cost: $5.6 M

Ancillary Benefits:

This project will be coordinated with B3608 addressing all the needs as one holistic solution

Projected In-Service: 10/31/2022

Project Status: Scoping

No Bubble Diagram
Station Work Only

AEP Transmission Zone M-3 Process
Niles Area - West

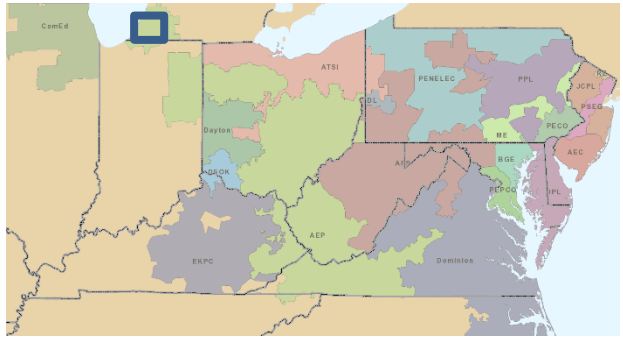
Need Number: AEP-2020-IM003
Process Stage: Solutions Meeting 12/18/2020
Previously Presented: Needs Meeting 02/21/2020
Supplemental Project Driver: Equipment Condition/Performance/Risk
Specific Assumption Reference: AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 8)
Model: N/A
Problem Statement:

Buchanan Hydro Station:

- Buchanan Hydro station has flooded twice in the last 5 years causing the 12kV load to be dropped from the station.
- (2) FK-type Oil filled breakers, AEP has common failure modes for these types of breakers with compressor failures, valve defects, reclose failures and charging motor failures.
    - Both breakers installed in 2003
    - Breaker A has exceeded the designed number of fault operations
- (2) CF-Type oil filled breakers. This model family has experienced major malfunctions associated with their hydraulic mechanisms which have led to several failures to close and other types of mis-operations.
    - Both breakers have exceed the designed number of fault operations
- Transformer #1 was installed in 1964. The transformer has elevated levels of carbon dioxide and ethylene, there is indication of overheating faults occurring in the main tank which have further degraded the insulating paper materials. There is also indication of capacitive layer deterioration.
- Transformer #2 was installed in 1965. The age of the unit's insulation materials can lead to susceptibility of short circuit faults which may cause failure in the main tank. The transformer has elevated levels of carbon dioxide and ethylene, there is indication of overheating faults occurring in the main tank which have further degraded the insulating paper materials

Buchanan Hydro –Clark Equipment Tap 34.5kV:

- 1.36 miles of 1954 and 1984 wood pole cross arm line
- 10 unique structures (26%) with at least one open condition
- Open conditions include pole or cross arm with rot conditions

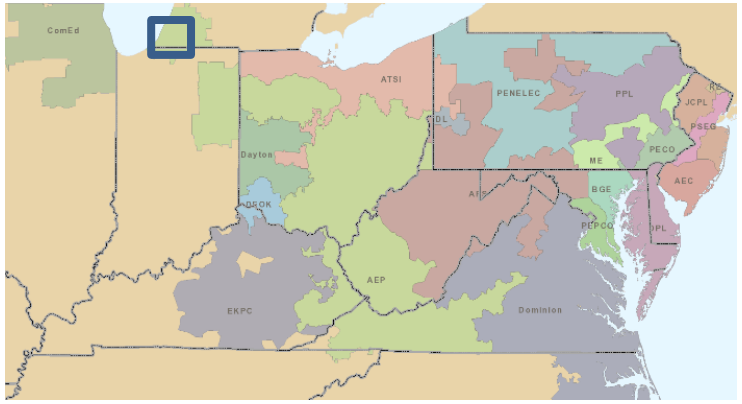


AEP Transmission Zone M-3 Process
Niles Area - West

Need Number: AEP-2020-IM009
Process Stage: Solutions Meeting 12/18/2020
Previously Presented: Needs Meeting 02/21/2020
Supplemental Project Driver: Equipment Condition/Performance/Risk
Specific Assumption Reference: AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 8)
Model: N/A
Problem Statement:

Bridgman-Pletcher 69kV line:

- 7.7 miles of 1964 wood pole line
- 57 unique structures (46%) with at least one open conditions relating to structure and conductor issues
- Open conditions include rotted poles, burnt or broken insulators, split or damaged poles or broken conductor strands, woodpecker damage and guy/ground wire damage



Need Number: AEP-2020-IM003, AEP-2020-IM009
Process Stage: Solution Meeting 12/18/2020

Proposed Solution:

Rebuild the 7.7 mile long Bridgman-Pletcher line with 556 ACSR conductor. **Estimated Cost: $18.8M**

Install new 69/34.5kV Bucktown station to replace Buchanan Hydro station. Install new 69/34.5kV transformer with (2) 34.5kV line breakers and a (4) 69kV breaker ring bus. **Estimated Cost: $10.4M**

Retire 1 mile of 4/0 copper conductor from Buchanan Hydro to Clark Equipment and Jack's Post customer. Construct 0.1 miles of 34.5 kV line from Jack's Post to new Bucktown station. **Estimated Cost: $1.5M**

At Buchanan Hydro station, retire the Transmission and Distribution equipment. Install one new 34.5kV breaker for line protection to Bucktown to continue service to the hydro plant. **Estimated Cost: $1.3M**

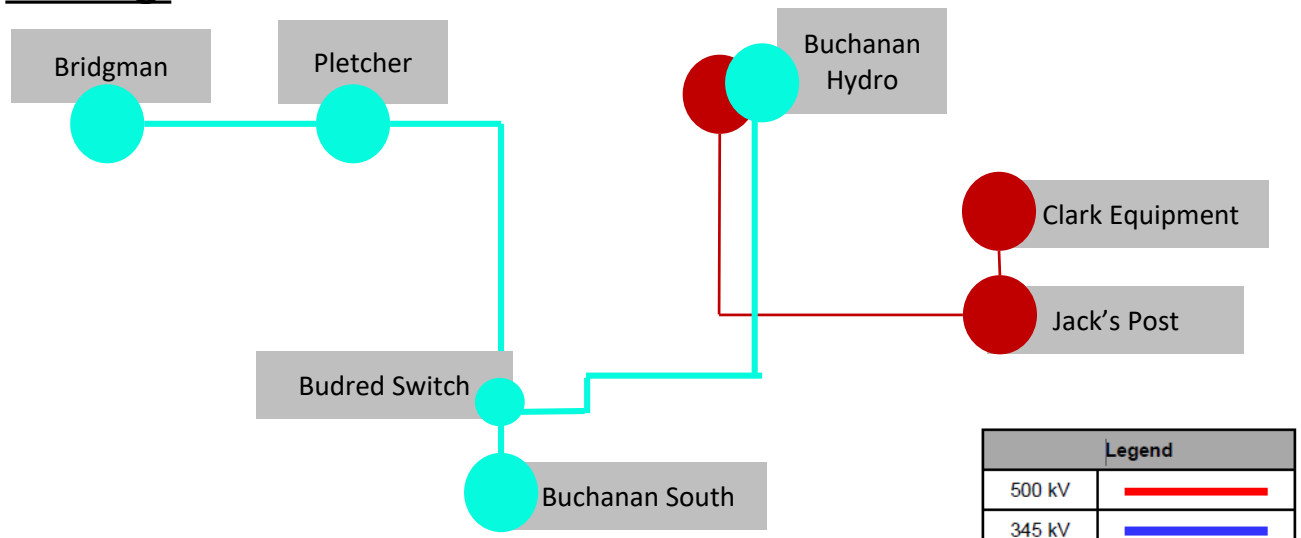
Total Transmission Estimated Cost: $32M

Alternatives:
Rebuild Buchanan Hydro Station in place. This was not selected as the scope due to the flooding concerns at Buchanan Hydro station. With the generation there AEP is not able to retire this station however AEP is able to remove most of the equipment at the station.

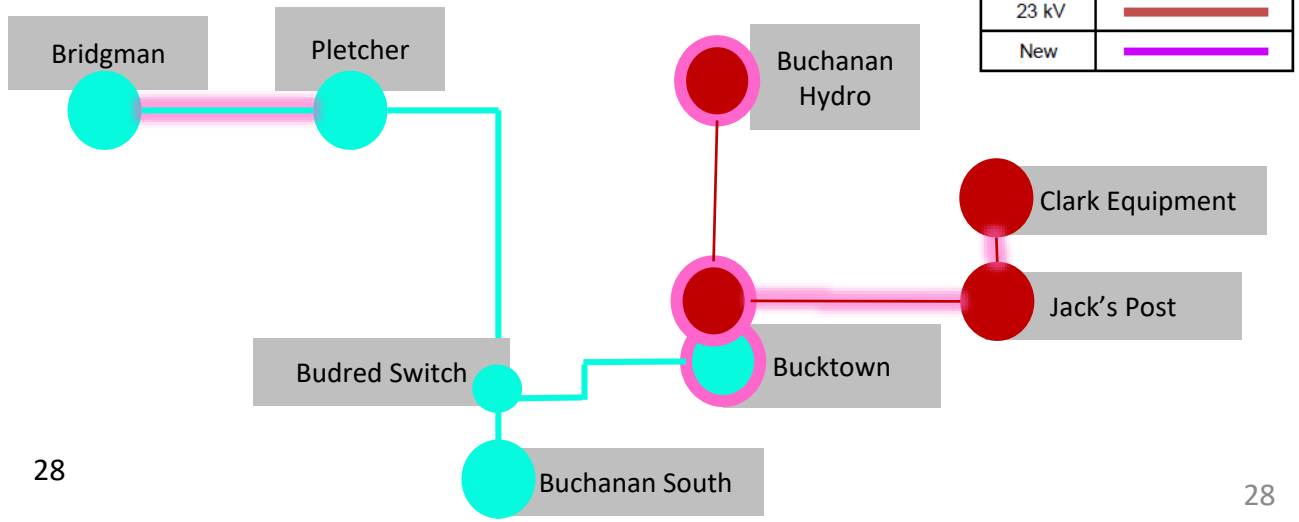
Proposed IS Date: 02/14/2024

Project Status: Scoping

Existing:



Proposed:



AEP Transmission Zone M-3 Process
Ross County, Ohio

Need Number: AEP-2020-OH043

Process Stage: Solutions Meeting 12/18/2020

Previously Presented: Need Meeting 10/16/2020

Project Driver:

Equipment Material/Condition/Performance/Risk, Operational Flexibility and Efficiency

Specific Assumption Reference:

AEP Guidelines for Transmission Owner Identified Needs (slide 8)

Problem Statement:

The condition of Slate Mills is very unsafe; the structures have been deemed a failure the week of August 17th 2020. Much of the wooden structures are in a state where collapse could easily happen. Any attempt at repair would be dangerous and might precipitate the collapse that we would be trying to mitigate.

AEP Transmission Zone M-3 Process
Slate Mills

Need Number: AEP-2020-OH043

Process Stage: Solutions Meeting 12/18/2020

Proposed Solution:

At Slate Mills, rebuild the existing 3-way switch as a In-Out Box Bay with 2-2000A switches on the line exits. **Estimated Cost: $0.8M**

Re-terminate the Ross – Highland 69kV line into the rebuilt station. **Estimated Cost: $0.7M**

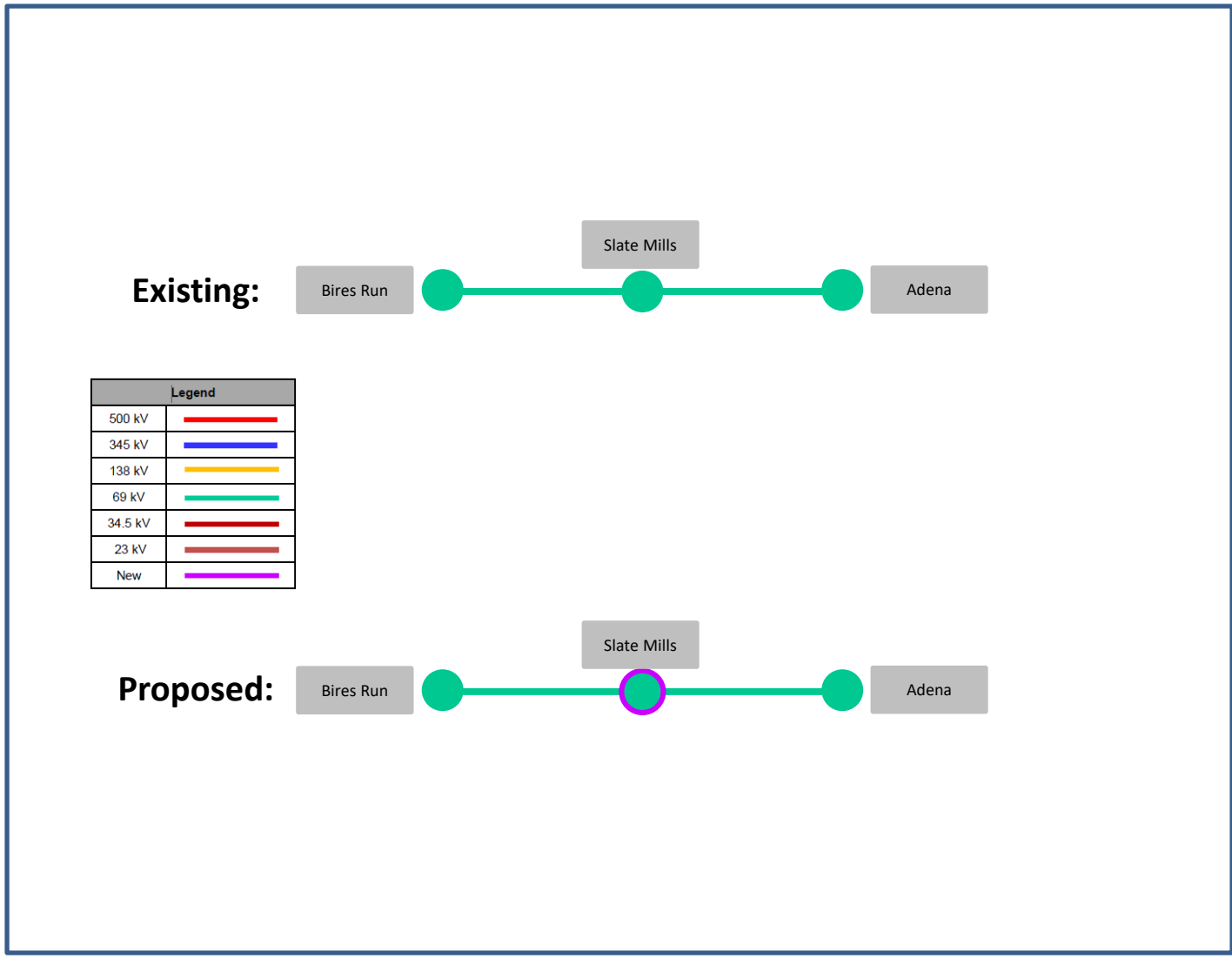
Remote end relay and coms work at Adena, Biers Run, & Ross. **Estimated Cost: $0.7M**

Total Estimated Transmission Cost: $2.2M

Alternatives Considered:

The urgency of the project left only two options, rehab the existing station or replace the station. Due to the deteriorated condition of the wood pole support structures at Slate Mills along with constructability and outage constraints, rehab was not considered a viable alternative, leaving only the replacement option. Box bay construction was used for Slate Mills instead of a phase over phase because the line is very close to the distribution station. In accordance with our guidelines the proposal is to build an in and out to save cost. **Projected In-Service:** 12/31/2021

Project Status: Scoping

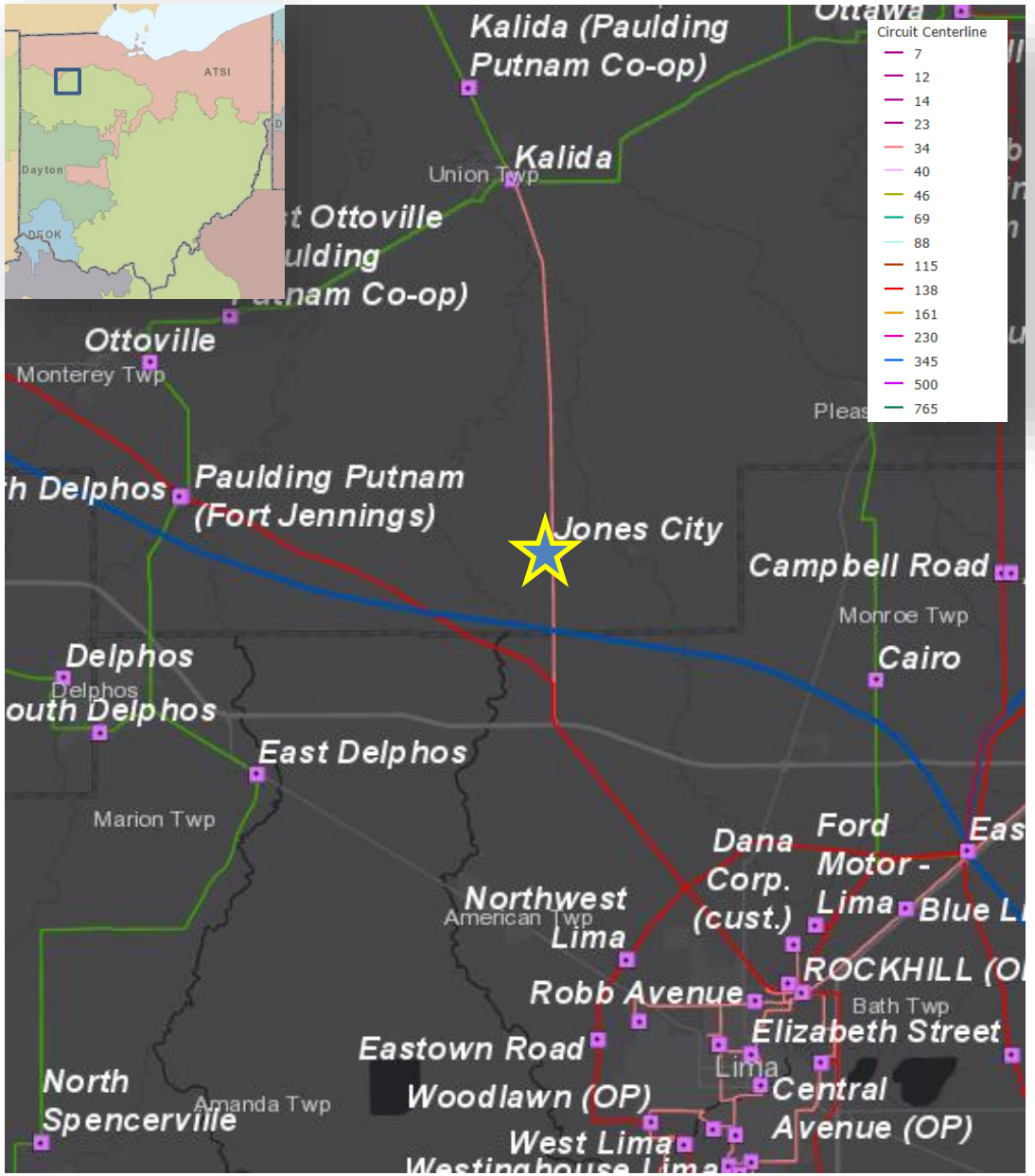


AEP Transmission Zone M-3 Process
Putnam/Hancock County

Need Number: AEP-2020-OH021
Process Stage: Solution Meeting 12/18/2020
Previously Presented: Need Meeting 4/20/2020
Project Driver:
Equipment Material/Condition/Performance/Risk, Customer Service
Specific Assumption Reference:
AEP Guidelines for Transmission Owner Identified Needs
Problem Statement:
Line Name: Kalida – Rockhill 34.5 kV

- **Original Install Date (Age):** 1923
- **Length of Line:** 17.22 miles
- **Total structure count:** 451
- **Original Line Construction Type:** Wood Monopoles
  - 96% of structures are from 1923, remaining 4% from 2000's.
  - Short wood poles susceptible to vegetation outages outside of the ROW.
  - Wooden Crossarm construction with vertical post insulators.
- **Conductor Type:** #1 Copper from 1923 (99%), remaining 795 ACSR (<1%)
- **5 Year Outage History**
  - **Momentary/Permanent Outages**: 2 Momentary
  - **CMI:** 222,797
- **Condition Summary**
  - **Number of open conditions:** 6
- **Additional Information**
  - The line is insulated with vertical post insulators which do not meet current AEP standards for CIFO and minimum leakage distance requirements.
  - The line shielding angle on the typical tangent structure is measured at 45 °, which is inadequate for AEP current shielding angle requirements.
  - The wood structure's current age is 191% of the 95% Probability of Failure (POF) of 51 years. The shield wire's current age is 134% of the 95% POF of 72 years. The insulator's current age is 111% of the 95% POF of 87 years. The POF values are based on CEATI Report No T144700-3257

Customer Service: AEP Ohio has requested new service to replace their existing Jones City Station, which has conditions on the AEP Ohio assets (Transformer is 70 years old with existing conditions).



AEP Transmission Zone M-3 Process
Putnam/Hancock County

Need Number: AEP-2020-OH021

Process Stage: Solutions Meeting 12/18/2020

Proposed Solution:

Transmission Line Description:

- Remove and Retire the existing Lima – Kalida line asset (~17 miles). Top off poles for distribution underbuilt. **$16.6 M**

Station Description:

- **Jones City Station:** Remove all equipment from the existing Jones City 34.5 kV station and retire the station. **$0 (No Transmission Cost)**
- **Gomer Station:** Cut in the North Delphos – East Side 138 kV line and install a 138 kV Box Bay with two 138 kV, 3000A auto-sectionalizing MOABs to provide service to AEP Ohio's new Gomer Delivery Point. **$3.43 M**

Total Transmission Cost: $20.03 M

Alternatives Considered:

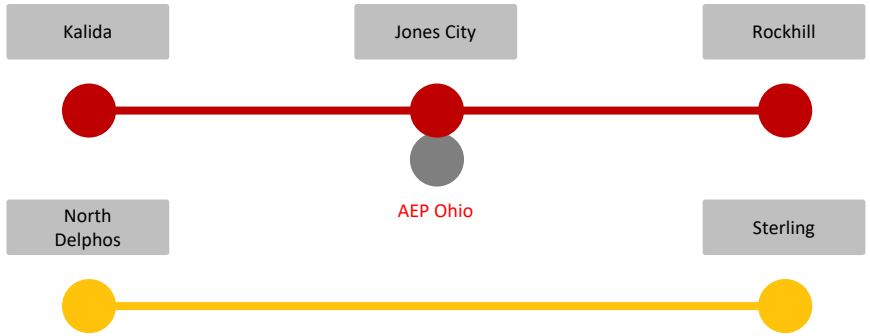
1. Expand the Kalida station to add a position to terminate the new line from Roselms (as part of the s2215 project) and rebuild 17.2 miles of the Kalida – Rockhill 34.5 kV circuit. This option will be more expensive due to the additional cost of the Kalida station expansion and 17 miles of line rebuild.
2. Box bay construction was used for Gomer instead of a phase over phase because the line is very close to the proposed distribution station. In accordance with our guidelines the proposal is to build an in and out to save cost.

Projected In-Service: 4/15/2022

Project Status: Engineering

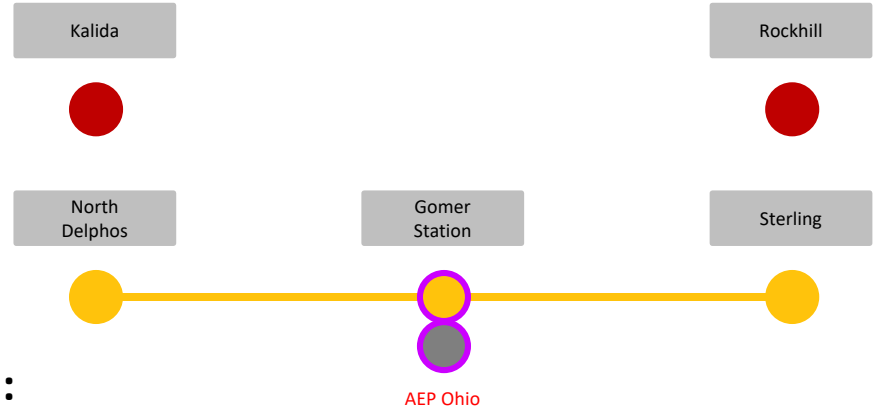
Model: 2025 RTEP

Existing Configuration:



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

Future Configuration:



AEP Transmission Zone: Supplemental
Sullivan County, Kingsport, Tennessee

Need Number: AEP-2019-AP020

Process Stage: Solutions Meeting 12/18/2020

Previously Presented: Needs Meeting 05/20/2019

Supplemental Project Driver:

Equipment Material/ Condition/Performance/Risk

Specific Assumption References:

AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 8)

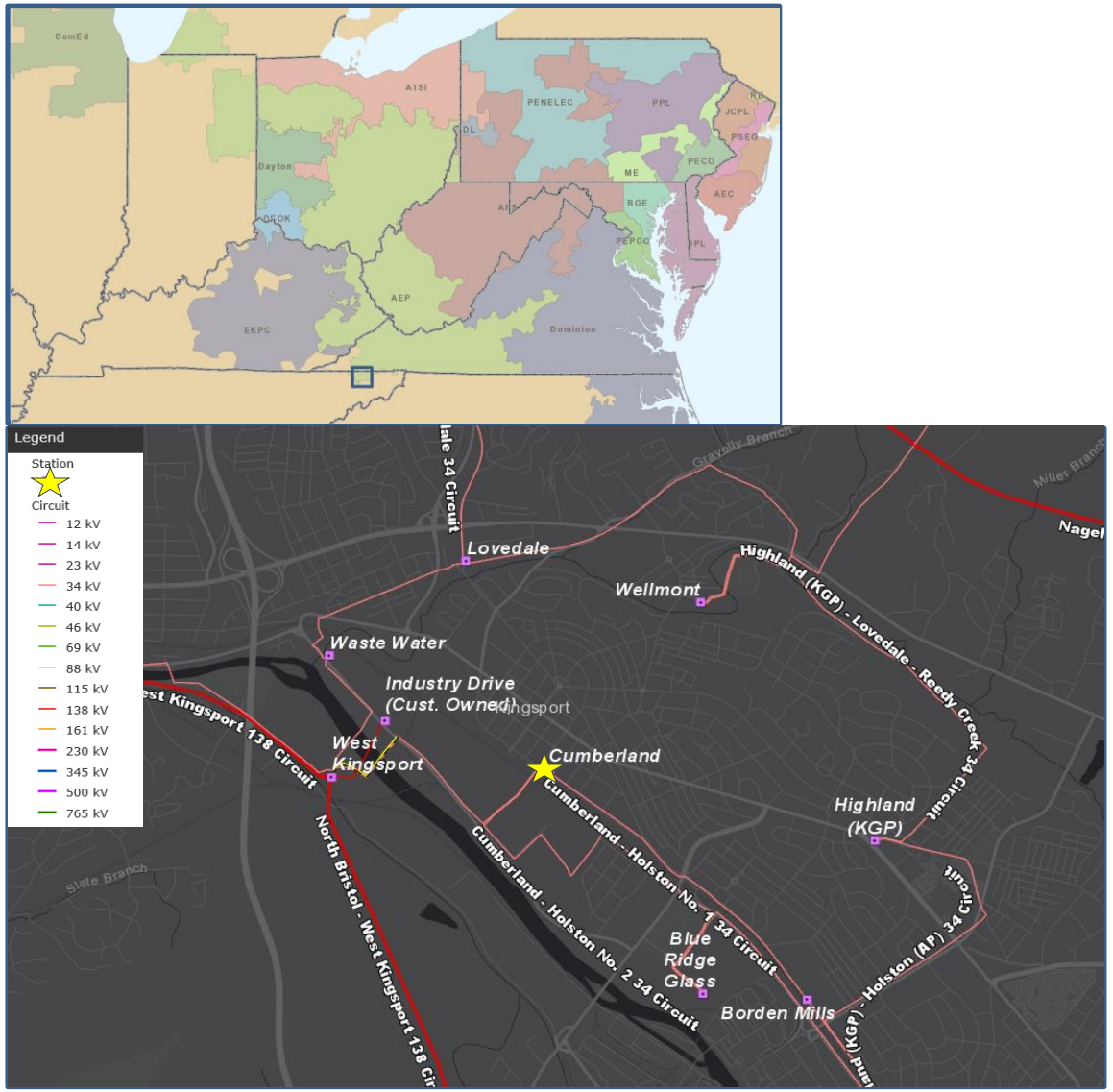
Problem Statement:

Cumberland Station

34.5 kV Circuit breakers A, B, and N

- FK type oil breakers. (1956, 1956, and 1954 vintage)
- These are oil breakers that are difficult to maintain due to the required oil handling. There is an increased potential for oil spills during routine maintenance and failures with these types of breakers.
- Other drivers include damage to bushings and an excessive number of fault operations exceeding the manufacturer's recommendations.
- Have experienced 40, 34, and 15 fault operations respectively. The manufacturer's recommendation for this type of breaker is 10.

- S&C Circuit Switcher 'AA'
  - No gas monitor, sister units on the AEP system have a history of gas loss, interrupter failures, and operating mechanism failures.



AEP Transmission Zone M-3 Process
Kingsport, TN

Need Number: AEP-2019-AP020
Process Stage: Solutions Meeting 12/18/2020

Proposed Solution:
Cumberland Station Work: Replace existing 34.5 kV CBs A, B, and N with three new 69 kV 3000 A 40kA breakers operated at 34.5kV. Replace existing cap switcher AA with a new 34.5 kV cap switcher. A ring bus configuration was considered but due to space constraints in the station footprint, this configuration was not possible. Therefore, the breakers will be replaced in their existing locations.

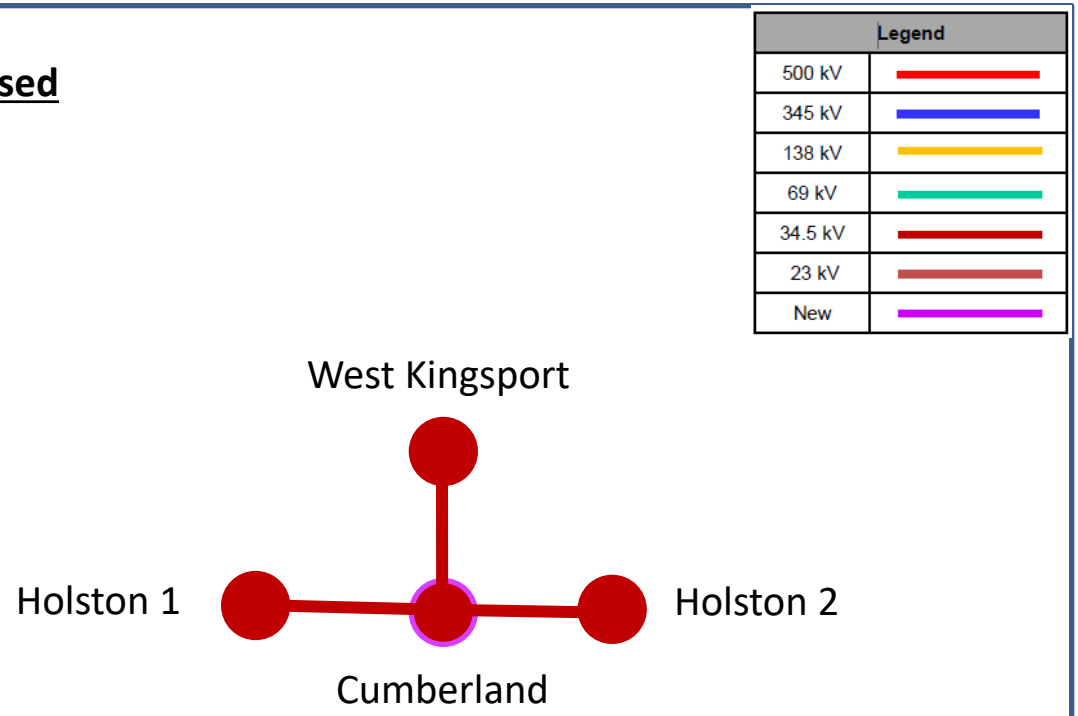
Total Estimated Transmission Cost:~$2.4M

Alternative:
Build ~1 mile of 138KV double circuit line from West Kingsport station to create an IN/OUT to a new Cumberland station. Rebuild Cumberland station to 138 kV standards in the clear. Install two new 138KV 3000A 40 kA breakers. Install a new 138/12 KV transformer. **Estimated Cost: ~$11.8M**

Projected IS Date: 07/20/2023

Project Status: Engineering

Proposed



AEP Transmission Zone: Supplemental
Washington, Virginia

Need Number: AEP-2020-AP024

Process Stage: Solutions Meeting 12/18/2020

Previously Presented: Needs Meeting 03/19/2020

Supplemental Project Driver: Equipment Condition/Performance/Risk

Specific Assumption Reference:

AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 8)

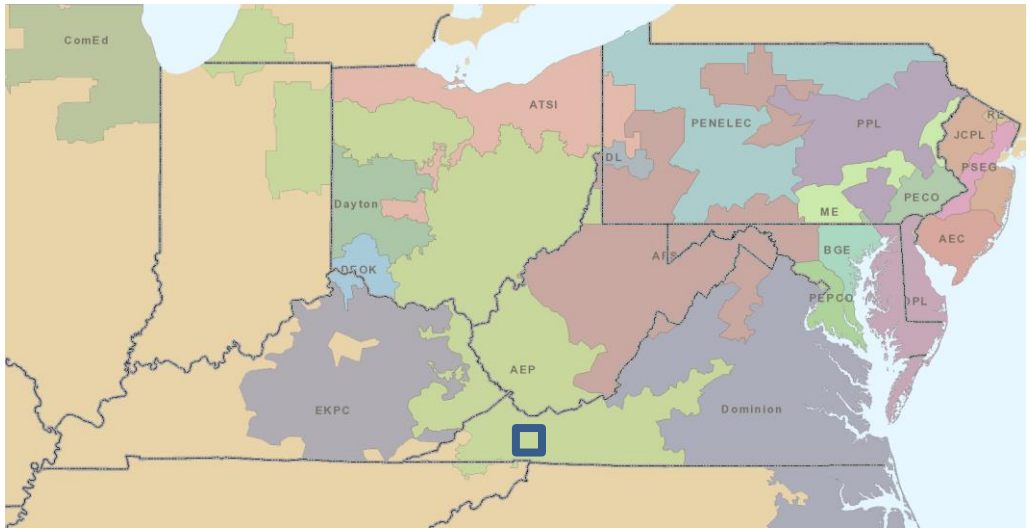
Problem Statement:

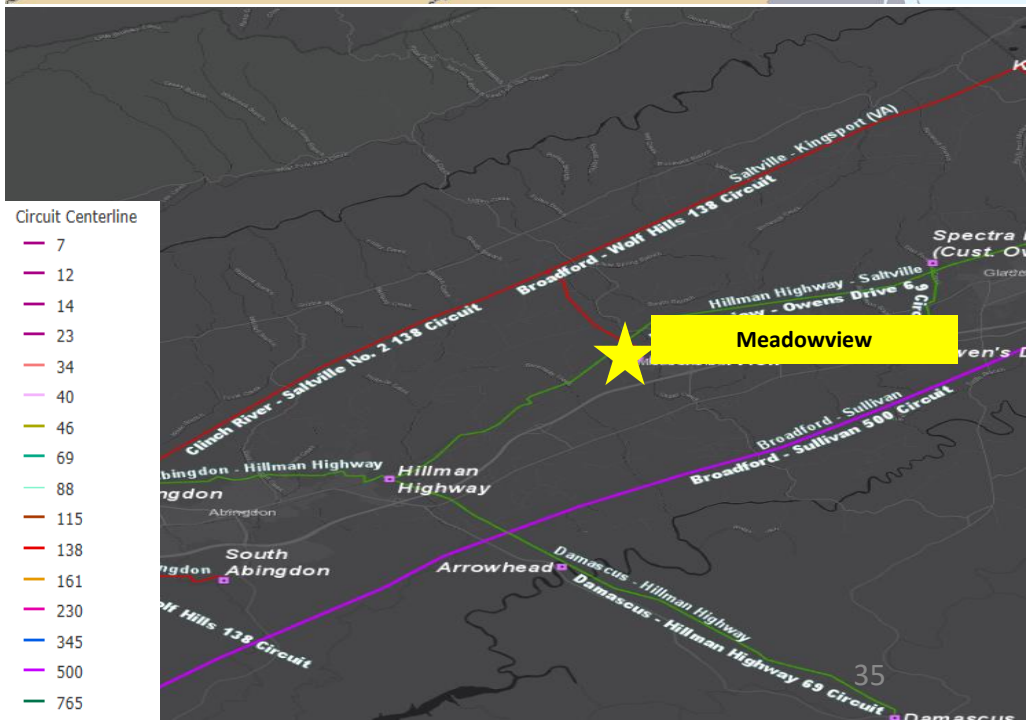
Station

Meadowview Station

Transformer 2 (138/69-34.5 KV):

- Transformer 2 is 39 years old with indications of brittle insulation materials
- There are elevated levels of Carbon Dioxide, which is indicative of high decomposition of the paper insulating materials.
- The decomposition of the paper insulation impairs the unit's ability to withstand short circuit or through fault events.





AEP Transmission Zone: Supplemental
Washington, Virginia

Need Number: AEP-2020-AP035

Process Stage: Solutions Meeting 12/18/2020

Previously Presented: Needs Meeting 06/19/2020

Supplemental Project Driver: Equipment Condition/Performance/Risk

Specific Assumption Reference:

AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 8)

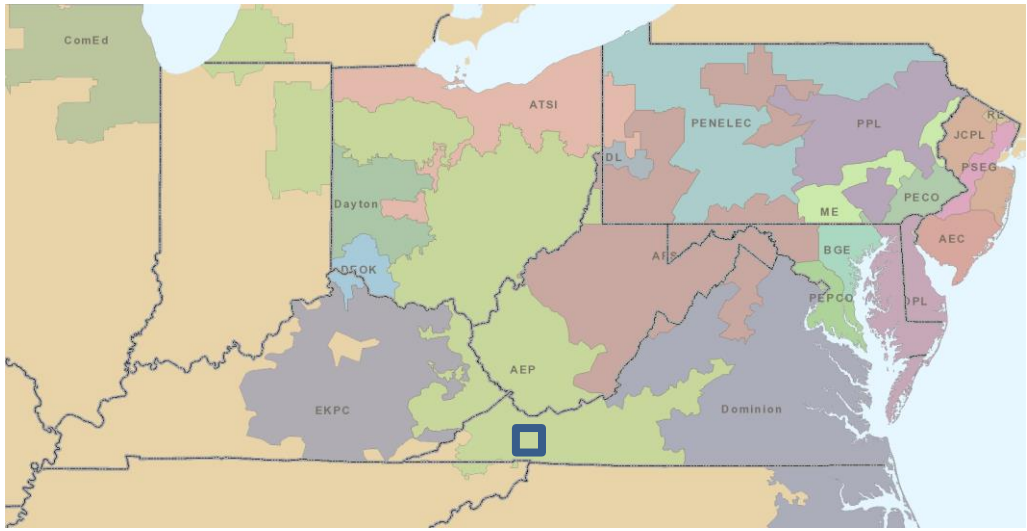
Problem Statement:

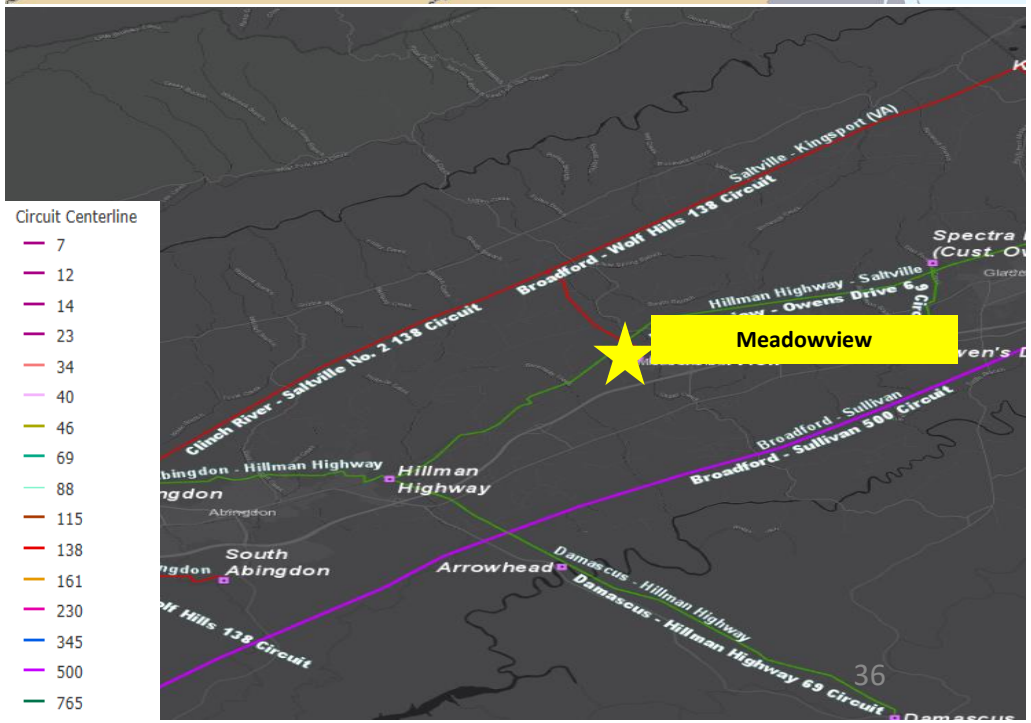
Station

Meadowview Station

Circuit Breakers F&G (69 KV) Concerns:

- Circuit Breakers F and G are 23 years old, 72PM31-20 type, SF6 filled breakers.
- Circuit Breakers F and G have experienced 88 and 72 total fault operations, respectively, exceeding manufacturer's recommended number full fault operations of 6.
- Circuit breakers of this type across the AEP system have had reports of moisture ingress into the breaker tank, which leads to increased maintenance and a higher risk of failure.
- This model type of breakers have experienced five catastrophic failures.
- There are documented issues with failures to close due to burned up coils, and 98 malfunction records related to SF6 gas leaks.





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AEP Transmission Zone: Supplemental Washington County, Virginia

Need Number: AEP-2020-AP025

Process Stage: Solutions Meeting 12/18/2020

Previously Presented: Needs Meeting 03/19/2020

Supplemental Project Driver: Equipment Condition/Performance/Risk

Specific Assumption Reference:

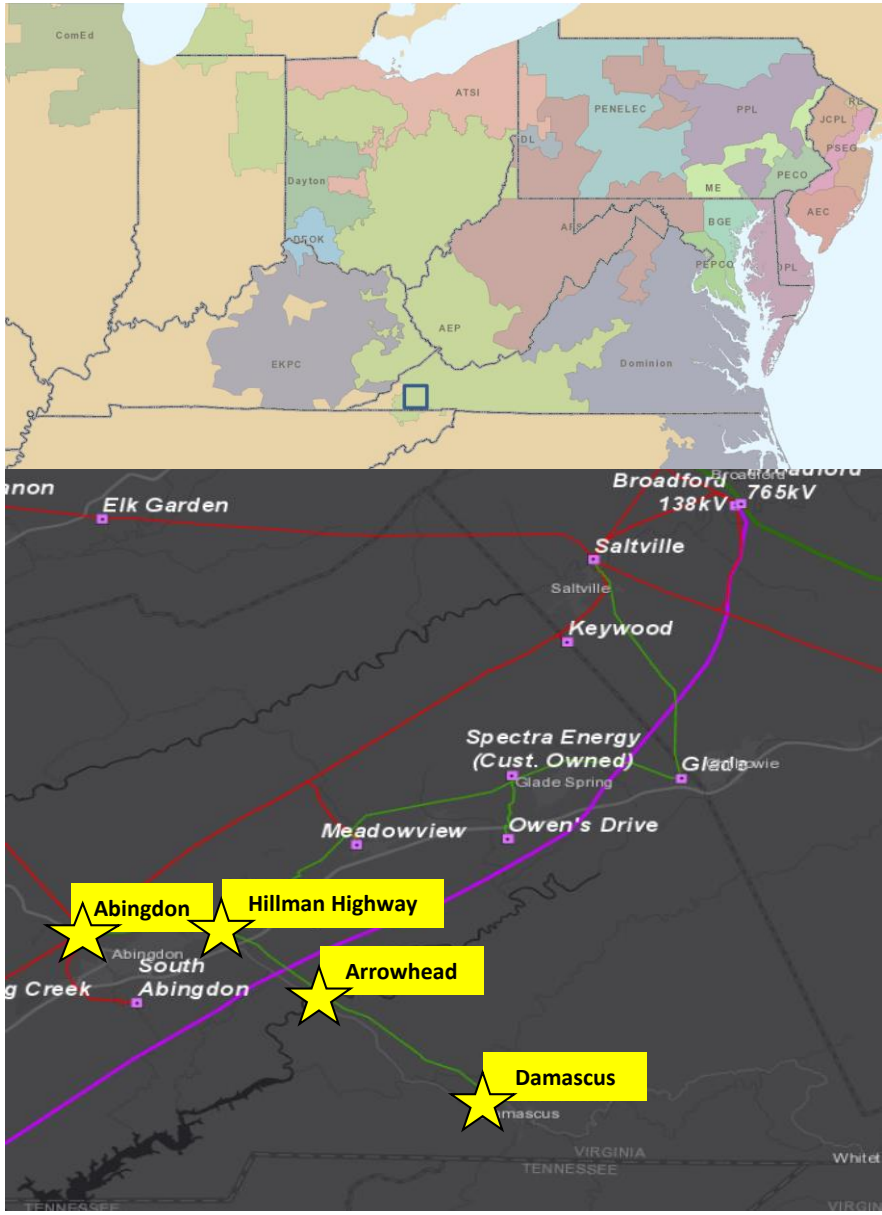
AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 8)

Problem Statement:

Abingdon Area

- There is approximately 25 MVA of nontransferable load on the ~10 mile radial line between Hillman Highway – Damascus stations

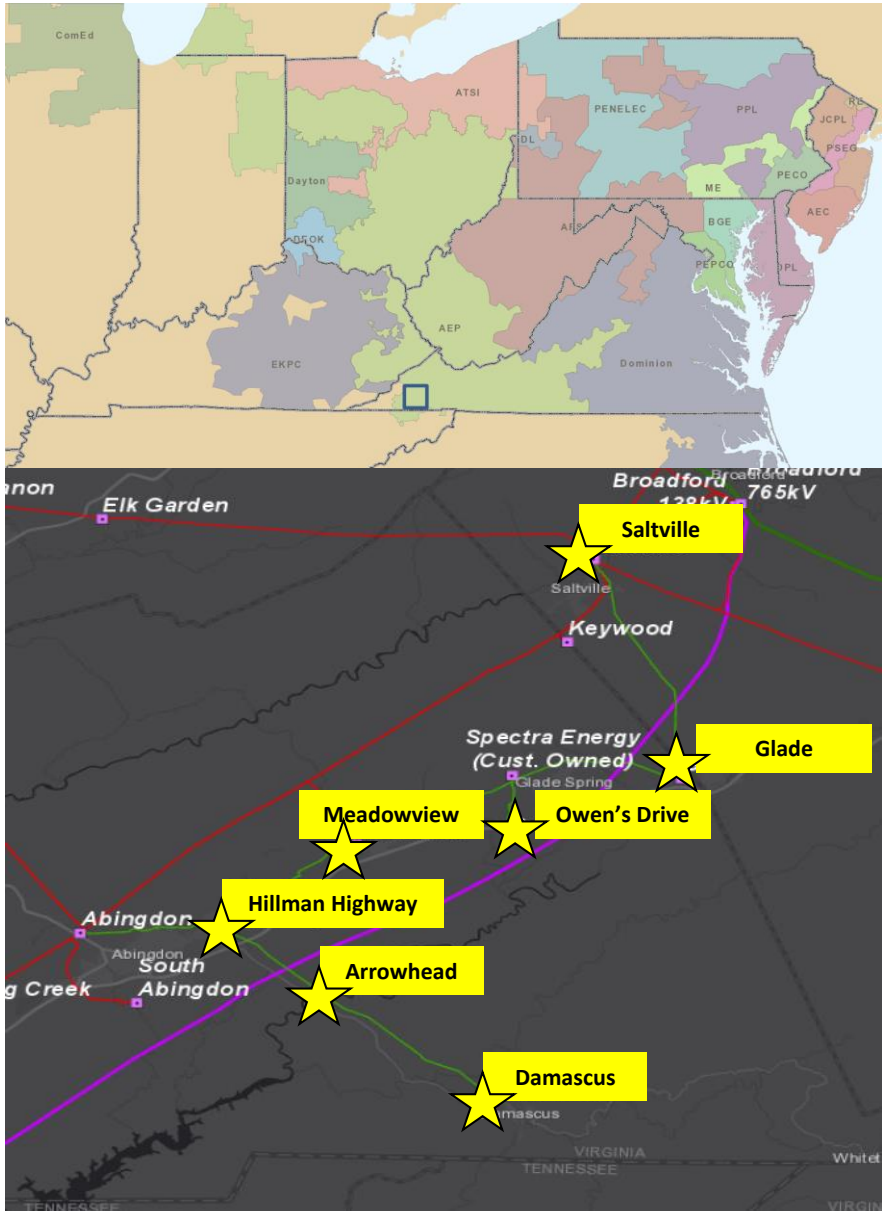
- Abingdon — Hillman Highway 69 KV (installed in 1969)
  - Length: ~ 5 Miles
  - Original Construction Type: Wood
  - Conductor Type: 52% 4/0 ACSR 6/1 (Penguin), 20% 556,600 CM ALUM, 14% 336,400 CM ALUM 19
  - Momentary/Permanent Outages: 3/8 (5 years)
  - Total structure count: 71
  - Number of open conditions: 70
  - Open conditions include: structure, broken conductor strands, broken/burnt insulators, shield wire, hardware.
  - Unique structure count with open conditions: 44 (62%)
    - Affected crossarms and poles show signs of rot, woodpecker holes, bowed, twisted conditions, broken and loose bayonets, loose, broken, and rusted guys, and loose insulators.



AEP Transmission Zone: Supplemental
Washington County, Virginia

Problem Statement (continued)

- Hillman Highway — Saltville 69 KV (installed in 1951)
  - Length: ~ 23 Miles
  - Original Construction Type: Wood
  - Conductor Type: 37% 336,400 CM ACSR 30/7 (Oriole), 32% 219,900 CM ACSR 8/7 (219AC), 29% 336,400 CM ALUM 19
  - Momentary/Permanent Outages: 10/5 (5 years)
  - Total structure count: 243
  - Number of open conditions: 70
  - Unique structure count with open conditions: 42 (17%)
    - Affected cross-arms and poles show signs of rot, woodpecker damage, leaning in-line poles, corrosion, and insect damage.



AEP Transmission Zone: Supplemental
Washington County, Virginia

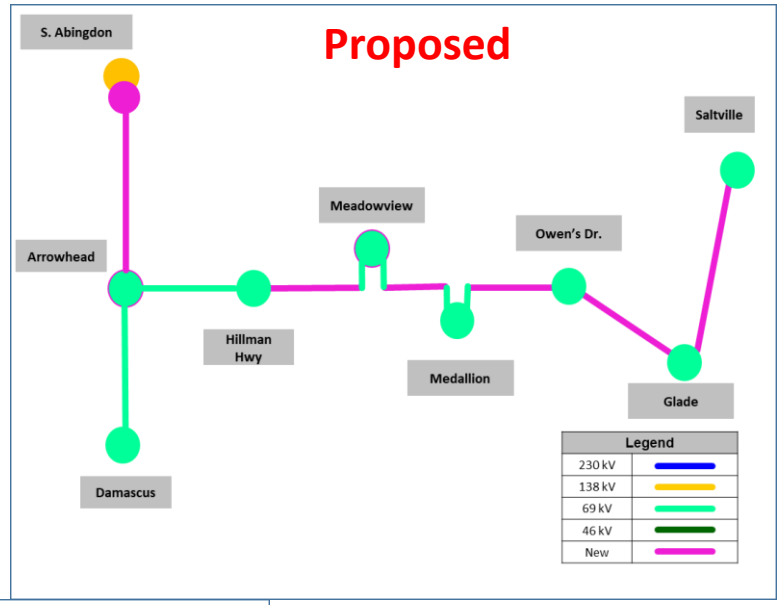
Need Number: AEP-2020-AP025 AEP-2020-AP024, AEP-2020-AP035

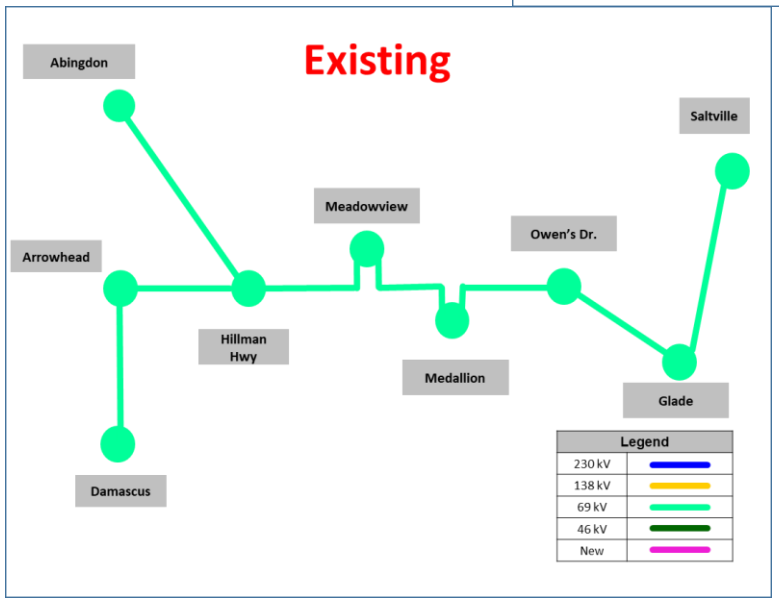
Process Stage: Solutions Meeting: 12/8/2020

Proposed Solution:

- At Meadowview station, replace 69KV circuit breakers F&G with new 69kV 3000A 40kA breakers. Due to limited space at the station on the existing footprint, the 69 kV bus is proposed as a straight bus instead of a ring bus. **Estimated Cost: $1.86M**
- At South Abingdon, install a new 90 MVA 138/ 69KV transformer bank. **Estimated Cost: $3.4M**
- Construct a new 69kV line from South Abingdon to Arrowhead (~6.6 miles) (SN:129 MVA, SE: 180 MVA, WN: 162 MVA, WE: 202 MVA). **Estimated Cost: $20.2M**
- At Arrowhead station, install three 69kV 3000A 40kA breakers towards Damascus, Hillman Highway, and South Abingdon. **Estimated Cost: $2.2M**
- Retire the 69kV section of line from Abingdon to Hillman Highway (~5 miles). **Estimated Cost: $6.2M**
- Rebuild ~23 miles of the Hillman Highway – Saltville 69 kV line (SN:129 MVA, SE: 180 MVA, WN: 162 MVA, WE: 202 MVA). **Estimated Cost: $57.5M**
- Retire ~23 miles of the Hillman Highway – Saltville 69 kV line. **Estimated Cost: $6.9M**
- Hillman Highway Remote End Work**. Estimated Cost: $0.1 M**
- At Abingdon station, retire 138/69-12kV transformer bank #1 and associated equipment. **Estimated Cost: $0.3M**

Estimated Cost: $98.66M





AEP Transmission Zone: Supplemental
Washington County, Virginia

Need Number: AEP-2020-AP025, AEP-2020-AP024, AEP-2020-AP035

Process Stage: Solutions Meeting: 12/18/2020

Ancillary benefits:

Solution will be worked in conjunction with baseline project B3278, which will replace the Meadowview transformer.

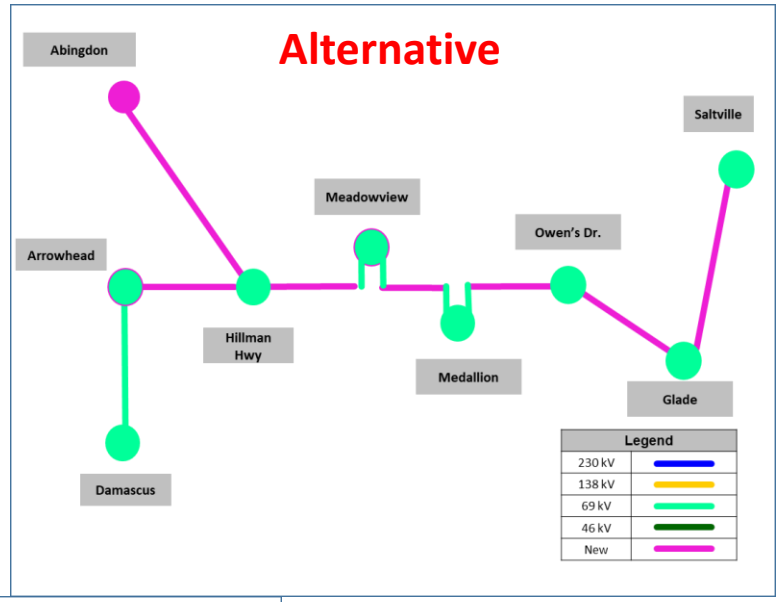
Alternatives Considered:

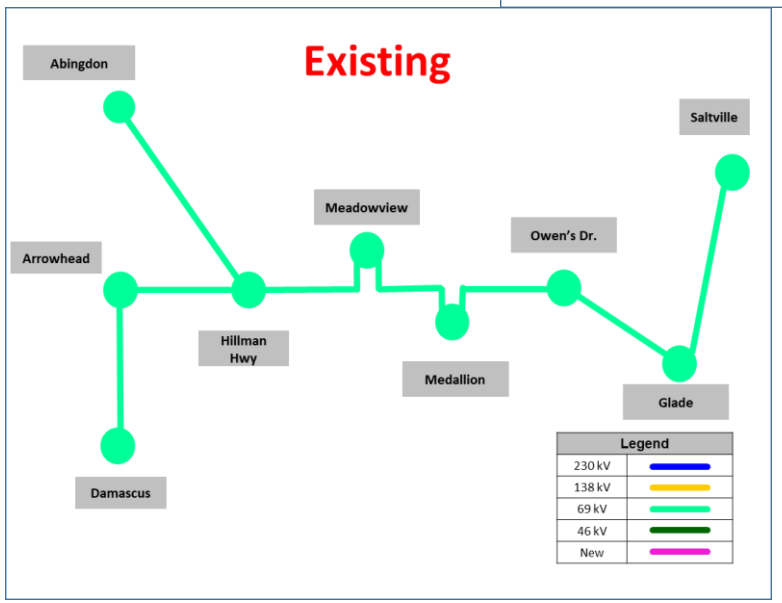
- Rebuild the line between Abingdon and Hillman Highway instead of the greenfield portion between Arrowhead and South Abingdon. The line route between Abingdon and Hillman Hwy goes through historic downtown Abingdon and presents large siting concerns. **Estimated Cost: $110 M**

- Loop existing stations into the 138 kV line nearby. The cost for re-routing the double circuit 138 kV and converting all the stations along the path is cost prohibitive.

Project Status: Scoping

Projected In-Service: 7/01/2024





Appendix

High Level M-3 Meeting Schedule

Assumptions

Activity	Timing
Posting of TO Assumptions Meeting information	20 days before Assumptions Meeting
Stakeholder comments	10 days after Assumptions Meeting

Needs

Activity	Timing
TOs and Stakeholders Post Needs Meeting slides	10 days before Needs Meeting
Stakeholder comments	10 days after Needs Meeting

Solutions

Activity	Timing
TOs and Stakeholders Post Solutions Meeting slides	10 days before Solutions Meeting
Stakeholder comments	10 days after Solutions Meeting

Submission of Supplemental Projects & Local Plan

Activity	Timing
Do No Harm (DNH) analysis for selected solution	Prior to posting selected solution
Post selected solution(s)	Following completion of DNH analysis
Stakeholder comments	10 days prior to Local Plan Submission for integration into RTEP
Local Plan submitted to PJM for integration into RTEP	Following review and consideration of comments received after posting of selected solutions

Revision History

12/8/2020 – V1 – Original version posted to pjm.com

12/16/2020 – V2 – Slide #28, Corrected the Need number

4/7/2021 – V3 – Slide #18, Corrected the total cost to match the sum of the split costs

– Slide #32, Corrected the total cost to match the sum of the split costs

4/11/2022 – V4 – Slide #4, Corrected the Need date