Sub Regional RTEP Committee: Western
AEP Supplemental Projects

December 16, 2021

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

Need Number: AEP-2021-IM034

Process Stage: Solution Meeting 12/16/2022

Previously Presented: 11/19/2021

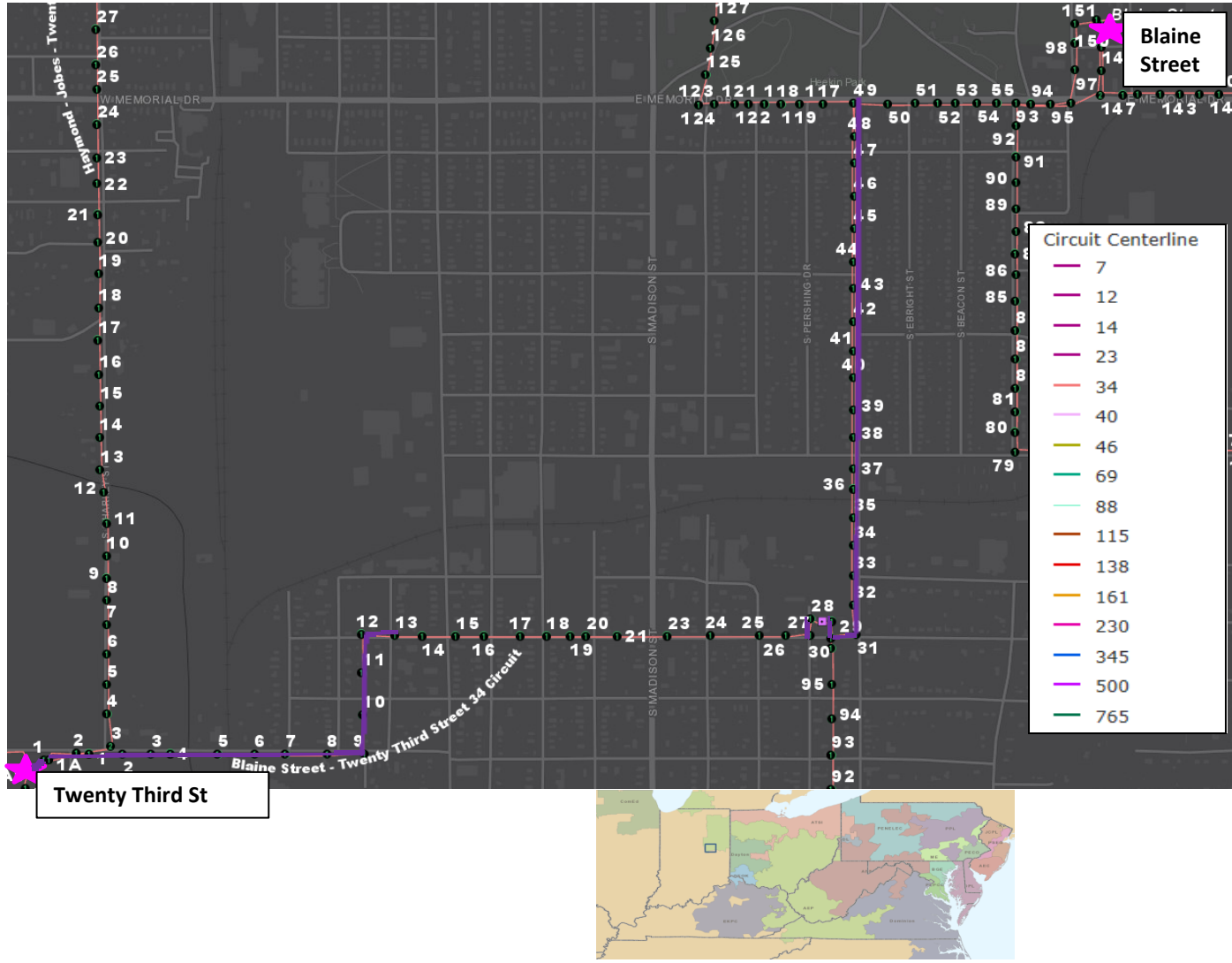
Project Driver: Equipment Material Condition, Performance and Risk

Specific Assumption Reference: AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions slide 13)

Problem Statement:

Twenty Third Street – Blaine Street 34.5 kV (Vintage 1976)

- Length of Line: 1.20 miles
- Total structure count: 54 with 42 dating back to original installation.
- Original Line Construction Type: Wood pole structure with cross arm construction.
    - Porcelain vertical post insulators
- Conductor Type:
    - 556,500 CM ALUM/1350 19 Dahlia
    - 795,000 CM ALUM/1350
- Condition Summary
    - Number of open conditions: 5 structure open conditions
        - Open conditions include broken pole, shielding grounding improperly installed and missing ground lead wires.
        - Based on the ground crew assessment , for 30 structures, approximately 67% of the poles assessed have moderate to heavy shell damage, insect damage or woodpecker damage. Approximately 50% of the poles assessed have heart rot. Some structures are near buildings or railroad right of way. Access likely limited to railroad right of way that can result in restoration delays for access permission and flagging protection. Wires attachment and distribution equipment are heavy on some structures. Slow wood pole restoration.
        - The grounding method utilizes butt wraps on every other structure, providing reduced lightening protection for the line.



AEP Transmission Zone M-3 Process
Twenty Third Street Improvements

Need Number: AEP-2021-IM034

Process Stage: Solution Meeting 12/16/2022

Previously Presented: Needs Meeting 11/19/2021

Project Driver: Equipment Material Condition, Performance and Risk

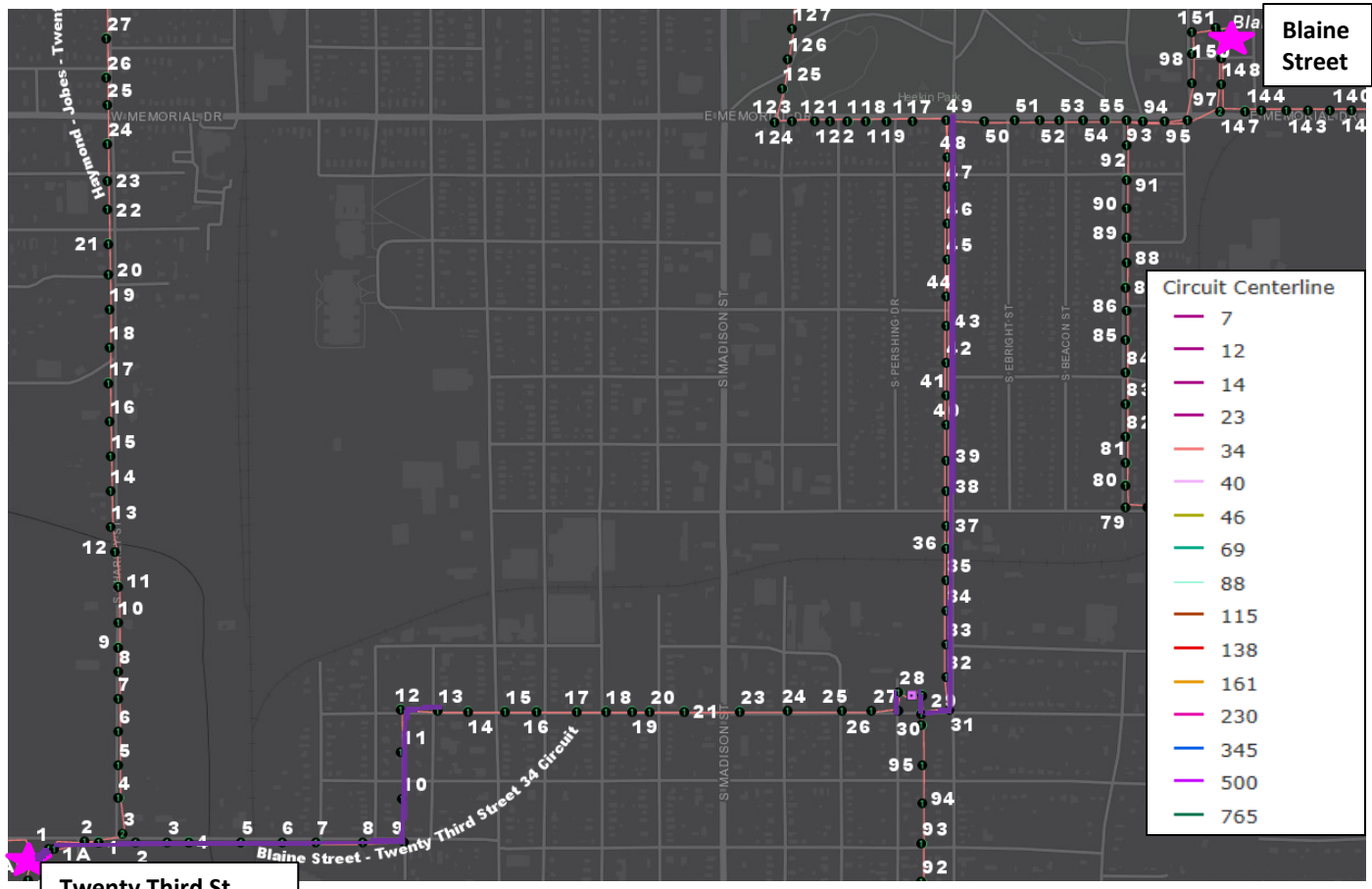
Specific Assumption Reference: AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions slide 13)

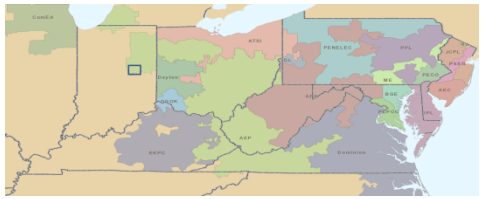
Problem Statement: Twenty Third Street 138/34.5 kV transformer #1:

- Install date: 1965
- Dielectric strength breakdown due to elevated moisture levels from gasket leaks or breakdown in oil or paper/pressboard insulation. This impairs the unit's ability to withstand electrical faults.
- Aging insulating paper material become brittle allowing for increased susceptibility of short circuit faults causing failure of the main tank.
- Bushings are at risk of failure due to aging bushings and changes of bushing dielectric data. Failure of the bushings may cause a failure or loss of service of the transformer.

Twenty Third Street 138/34.5 kV transformer #2:

- Install date: 1970
- Dielectric strength breakdown due to elevated moisture levels from gasket leaks or breakdown in oil or paper/pressboard insulation. This impairs the unit's ability to withstand electrical faults.
- Aging insulating paper material become brittle and recent trends on Ethane and Methane indicating overheating temperatures within the tank , will impair the unit's ability to withstand future short circuit
- All bushings showed major changes in bushing power factor from original values. The low side and tertiary bushings are GE Type U which have shown increased power factor over time and have been known to fail violently. Bushings are at risk of failure due to aging bushings and changes of bushing dielectric data. Failure of the bushings may cause a failure or loss of service of the transformer.





AEP Transmission Zone M-3 Process
Twenty Third Street Improvements

Need Number: AEP-2021-IM034

Process Stage: Solution Meeting 12/16/2022

Proposed Solution:

Twenty Third Street – Blaine Street 34.5 kV:

Rebuild ~1.20 miles of 34.5 kV line with 556.5 ACSR 26/7 Dove. The following cost includes the line rebuild, line removal, Telecom and ROW.
Cost: $7M

Twenty Third Street station:

Replace the Twenty Third Street 138/34.5 kV transformer #1 and transformer #2 with two 138/69/34.5 kV 90 MVA transformers. The following cost includes install and removal.

Cost: $5.36M

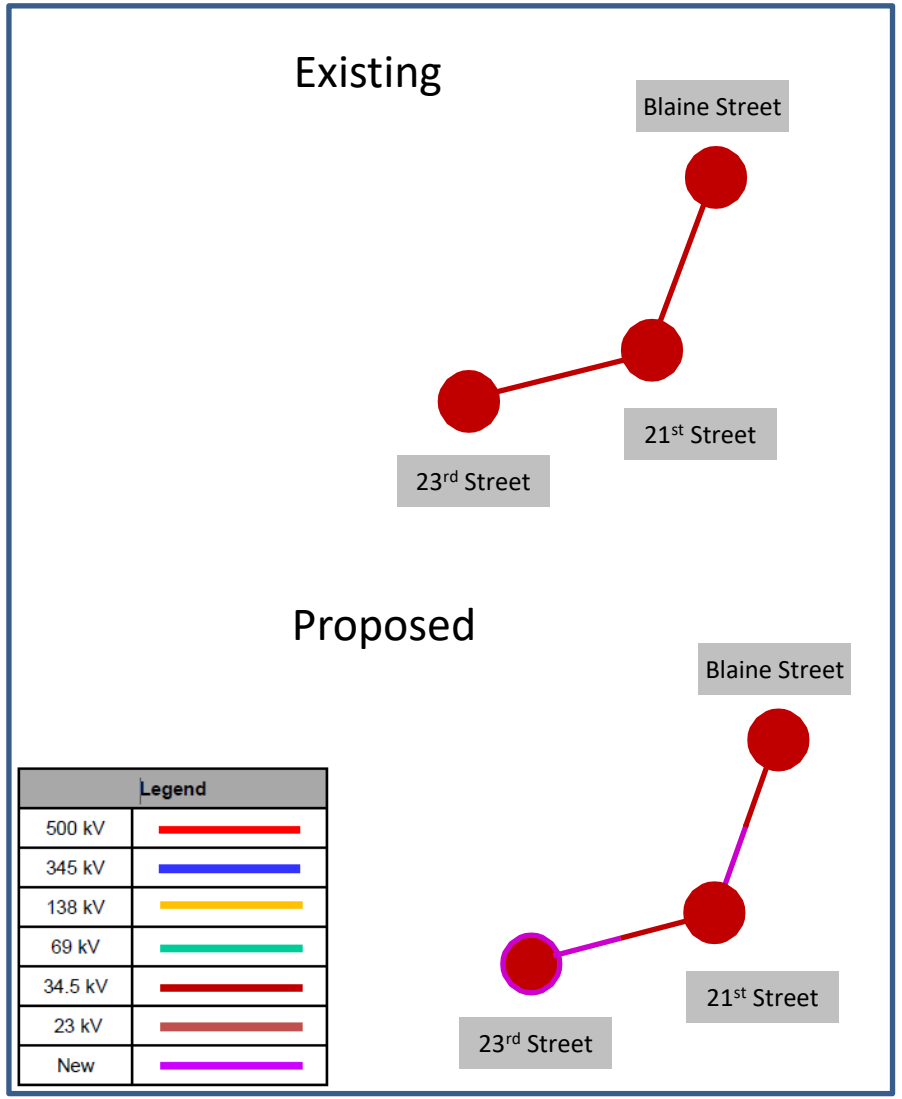
Total Cost: $12.36M

Alternatives considered:

Retiring the line is not an option as it serves the Twenty First Street load and there are no alternatives to serve it as it is located in a congested residential area. Additionally, installing one transformer at Twenty Third Street to replace the two 138/34 kV transformers is not the best option due to operational concerns and outage restrictions. Twenty Third Street station and Delaware station are the main sources for the distribution network in the Muncie area. Reducing the Twenty Third Street station to one transformer would be unfavorable due to the distribution system configuration. A forced outage on radialized transmission line would result in a large portion of the city of Muncie being outaged with no options for recovery.

Projected In-Service: 10/15/2026

Project Status: Scoping



AEP Transmission Zone M-3 Process
Union County, Ohio

Need Number: AEP-2021-OH040

Process Stage: Solutions Meeting 12/16/2022

Previously Presented:

Needs Meeting 7/16/2021,

Updated Needs Meeting 1/21/2022

Project Driver:

Customer Service

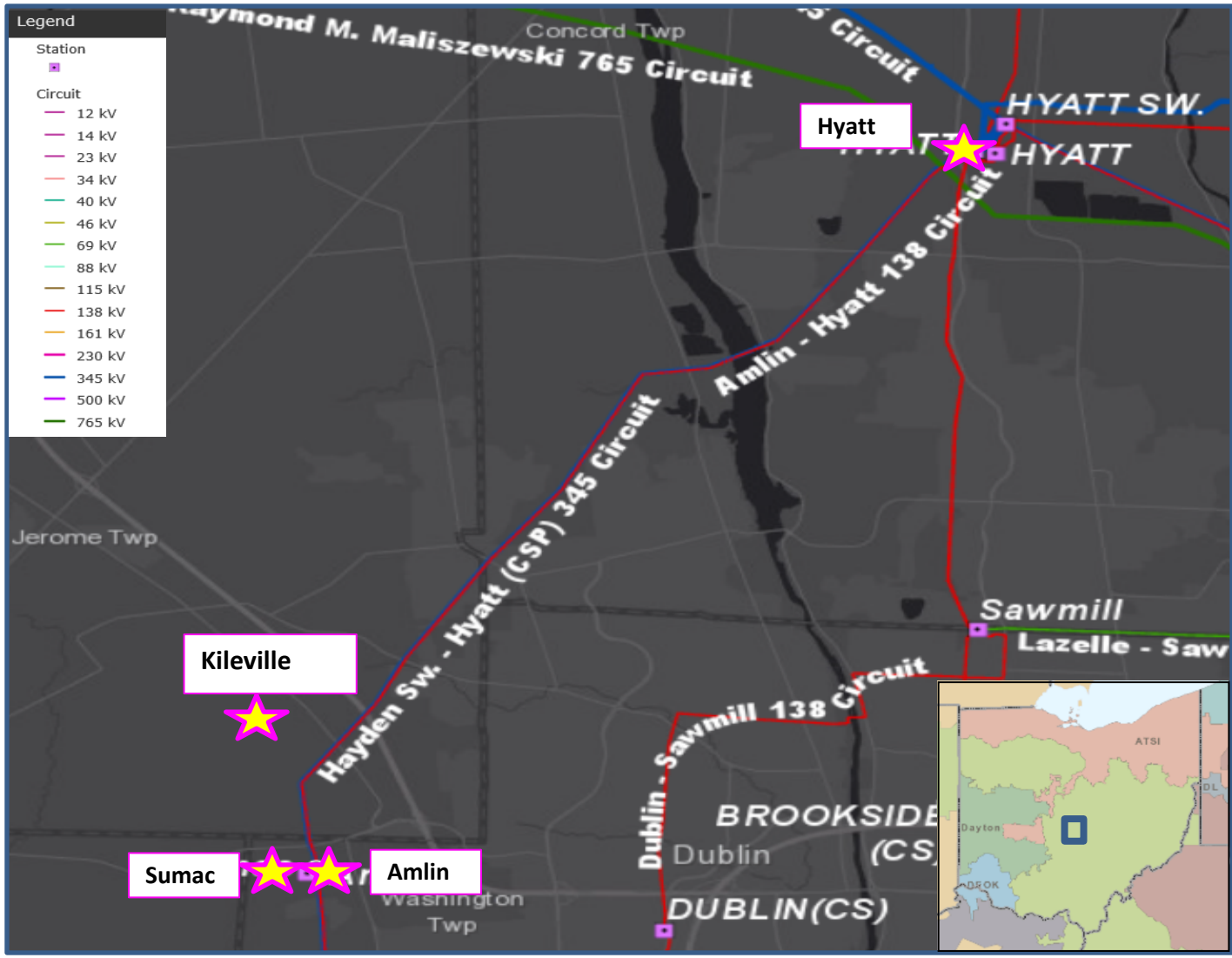
Specific Assumption Reference:

AEP Connection Requirements for the AEP Transmission System (AEP Assumptions Slide 12)

Problem Statement:

<u>Kileville Delivery Point 138 kV:</u>

- Buckeye Power Inc., on behalf of Union Rural Electric Cooperative Inc., has requested new transmission service in Plain City, Ohio.
- The delivery point will primarily be used to serve a large data center customer with high potential for rapid load growth. The Initial load will be 106 MW with a potential future peak load demand of ~~240~~ 258 MW.
- The customer recently communicated a much more aggressive load ramp/build out schedule that would put their peak load at approximately 160 MW by the middle of 2024 at the site.



AEP Transmission Zone M-3 Process
Union County, Ohio

Need Number: AEP-2021-OH040

Process Stage: Solutions Meeting 12/16/2022

Proposed Solution:

- **Kileville 138 kV Station**: Greenfield 138kV breaker and a half station configuration with 4 partial strings built initially due to physical arrangement of the station. Seven (7) 138kV 4000A 63kA circuit breakers will be installed initially. **Estimated Cost: $9.79 M**
- **Kileville Extension 138 kV**: Cut in to the existing Amlin – Hyatt 138 kV circuit and construct ~0.15 miles of new double circuit line to the proposed Kileville Station. Extend the telecom fiber into Innovation station for relaying/communication. **Estimated Cost: $5.33 M**
- **Kileville-Shire (Customer) 138 kV:** Two tie lines to the customer's facility. **Estimated Cost: $0.05 M**
- **Amlin & Hyatt 138 kV Stations:** Remote end relay settings work. **Estimated Cost: $0.677 M**
- **Temporary Kileville Skid Station:** Temporary customer power required. **Estimated Cost: $0.00 M**

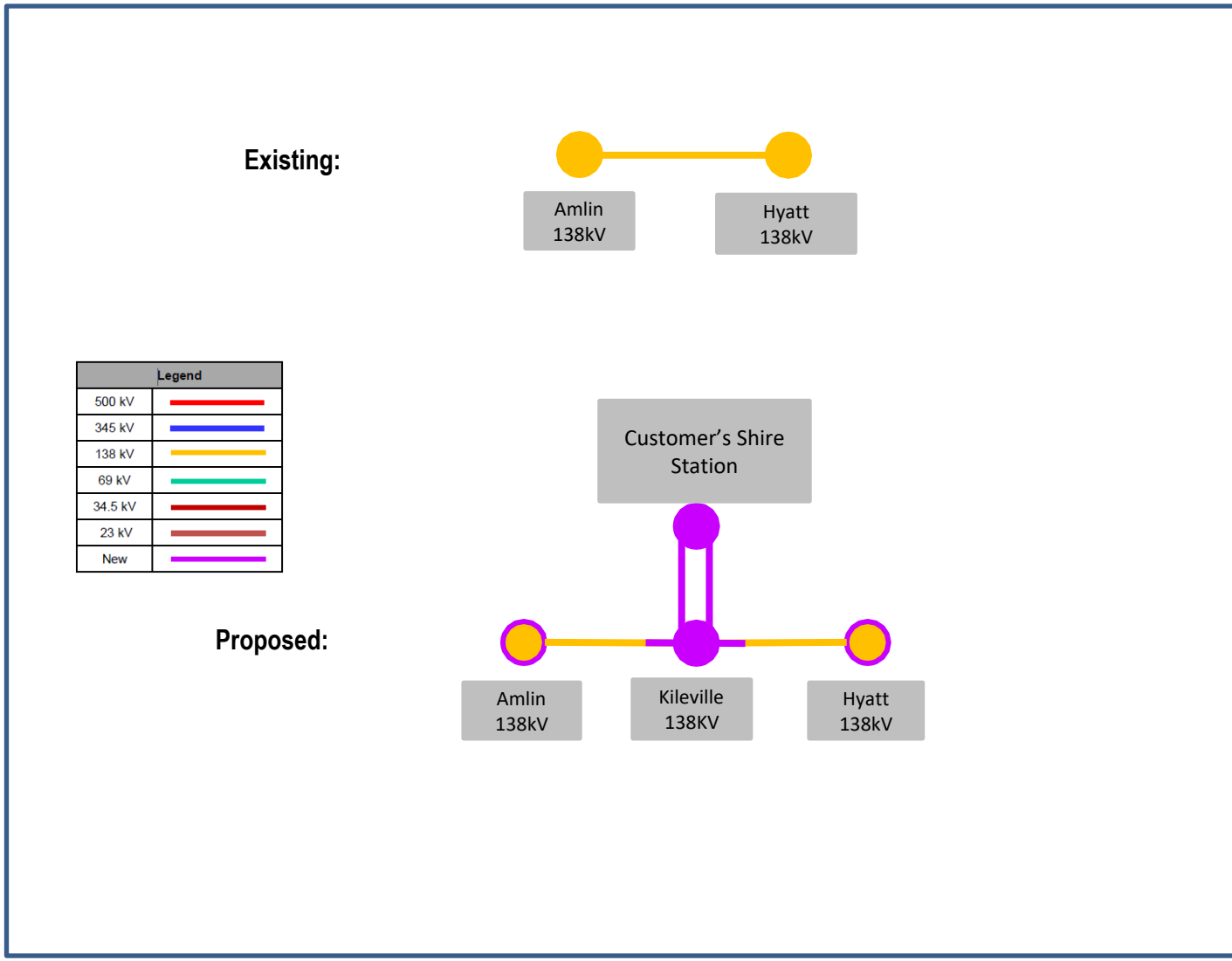
Total Estimated Transmission Cost: $15.85 M

Alternatives Considered:
Considering the location and timing of the initial load request, no other viable alternates were identified.

Projected In-Service: 7/31/2023

Project Status: Scoping/Engineering

Model: RTEP 2027



AEP Transmission Zone M-3 Process
West Coshocton Station Upgrade

Need Number: AEP-2021-OH048

Process Stage: Solution Meeting 12/16/2022

Previously Presented: Need Meeting 9/17/2021

Project Driver:

Equipment Material/Condition/Performance/Risk

Specific Assumption Reference:

AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 13)

Problem Statement:

West Coshocton Station:

138 kV Circuit Switcher "CS-1A"

- Breaker Age: 1975
- Interrupting Medium: SF6
- Fault Operations: 40 (manufacturer recommended limit is 10)
- Additional: The 138 kV Mark III circuit switcher CS – 1A have limited spare part availability and are no longer vendor supported. These models have experienced 47 recorded malfunctions from July 2001 to August 2019. Failed operational components including high contact resistance, gas loss, and interrupter failure represent the majority of these malfunctions. The expected life span of bushing gaskets and door inspection ports on these units based on AEP experience is only 25 years. The current age of this remaining fleet indicates that the existing gaskets and door inspection ports are at risk for increasing gas loss over time.

Transformer # 3 (138/69 kV, 50 MVA)

- Transformer Age: 1966
- Additional: The tertiary bushing needs replaced. The cooling fans are open cage, which is not OSHA rated. Pumps are leaking and rusted. There is no oil containment. Asbestos has been found in the internal wiring. The oil needs drained, gaskets on the radiators and pumps need replaced, and flange valves need repacked as they are leaking

Relaying

- Currently, 26 of the 27 relays (96% of all station relays) are in need of replacement. All 26 of these are of the electromechanical type which have significant limitations with regards to spare part availability and fault data collection and retention. In addition, these relays lack of vendor support.

AEP Transmission Zone M-3 Process
West Coshocton Station Upgrade

Need Number: AEP-2021-OH048

Process Stage: Solution Meeting 12/16/2022

Previously Presented: Need Meeting 9/17/2021

Proposed Solution:

Rebuild the West Coshocton 138-69kV station, with a 138kV 3-breaker ring bus, a new 138-69kV transformer (90 MVA nameplate), and a single 69kV breaker. A new control building will also be installed. Remove the existing station facilities. **Total Estimated Transmission Cost: $10.17M**

Alternatives Considered:

Keep a 138kV straight-bus design and replace equipment in the existing location. However, outage constraints and the availability of property on location allow for a build in the clear option to help with outage scheduling and maintaining clearance distances within the station.

Ancillary Benefits:

Addresses a 3-terminal line (Ohio Central-West Coshocton-Black Diamond 138kV) and multiple zones of protection at West Coshocton. Three-terminal lines are more difficult to reliably protect and more prone to misoperations.

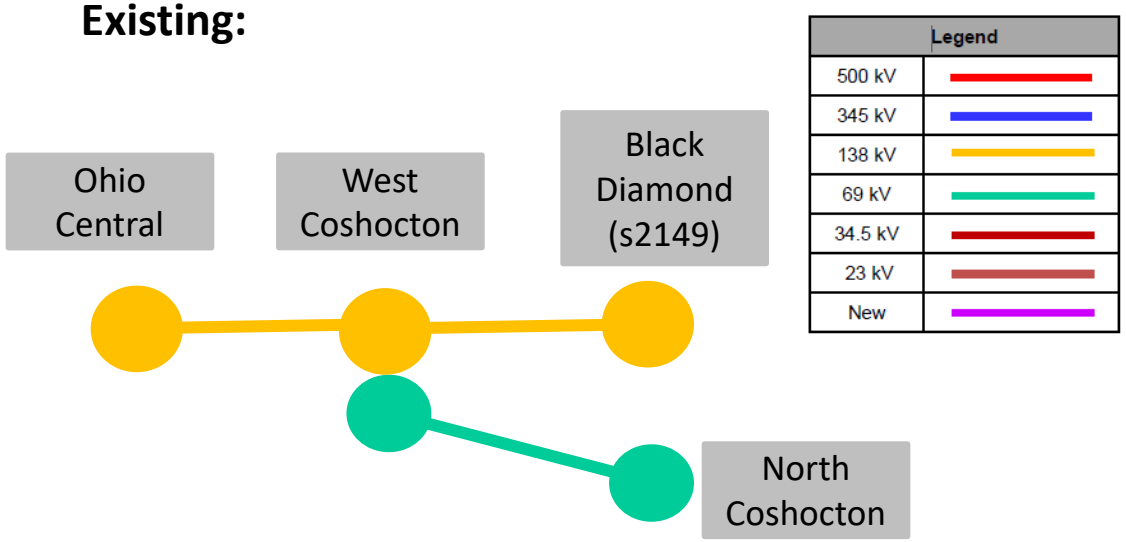
Projected In-Service:

12/1/2025

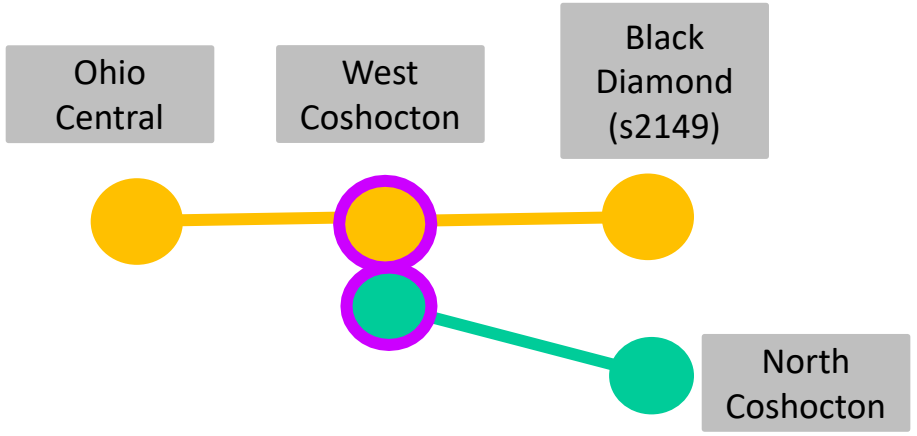
Project Status: Scoping

Model: 2027 PJM RTEP

Existing:



Proposed:



AEP Transmission Zone M-3 Process
Green Chapel

Need Number: AEP-2022-OH029

Process Stage: Solutions Meeting 12/16/2022

Previously Presented:

Need Meeting 04/22/2022

Project Driver:

Customer Service

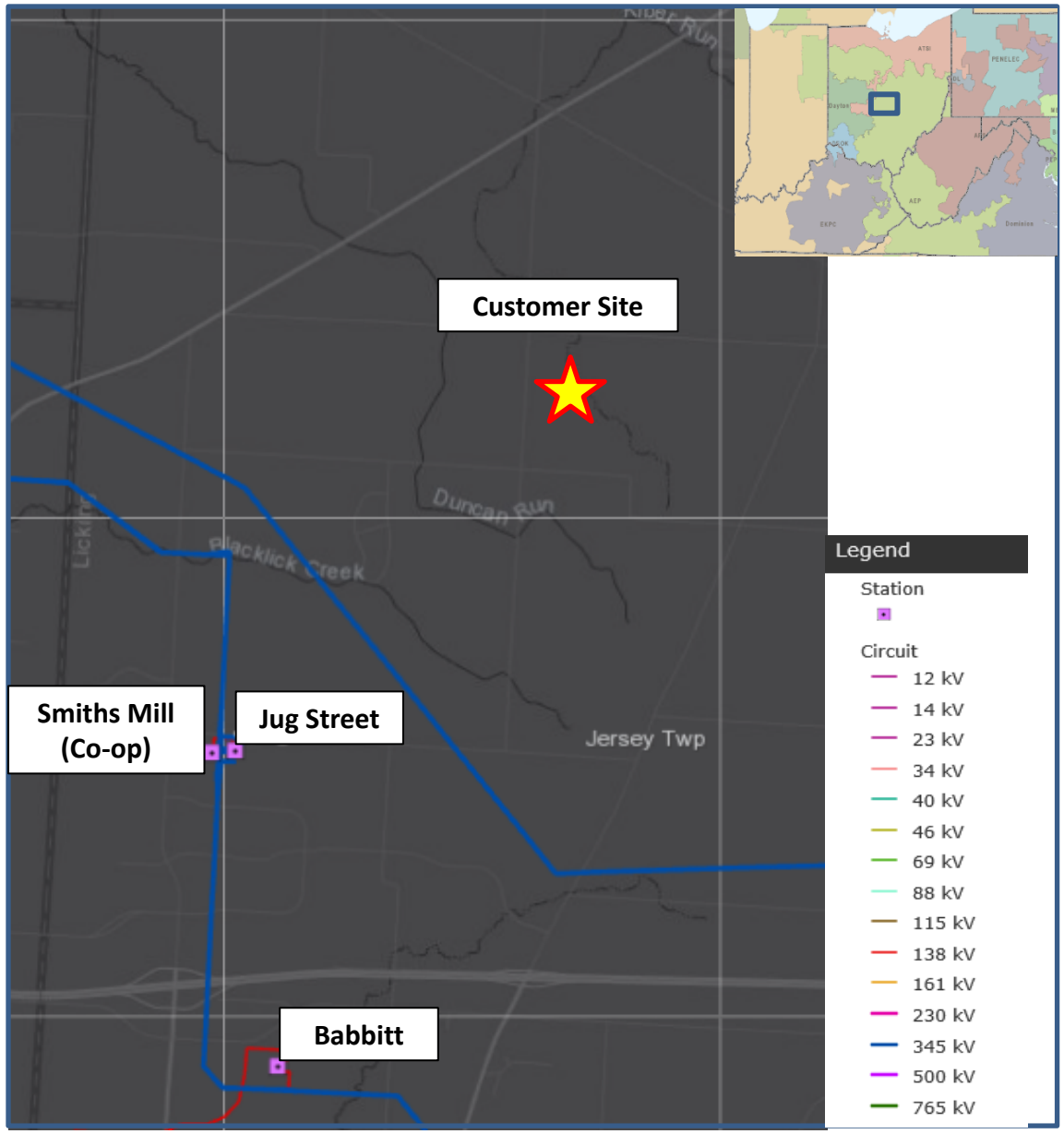
Specific Assumption Reference:

AEP Connection Requirements for the AEP Transmission System (AEP Assumptions Slide 12)

Problem Statement:

Customer Service:

- A customer has requested distribution service at a site Northeast of AEP's existing Jug Street station in New Albany, OH.
- The customer has indicated an initial peak demand of ~~430~~ 440 MW with an ultimate capacity of up to ~~1,500~~ 1,560 MW at the site.
- The customer has a requested an in-service date of May 31st 2024.



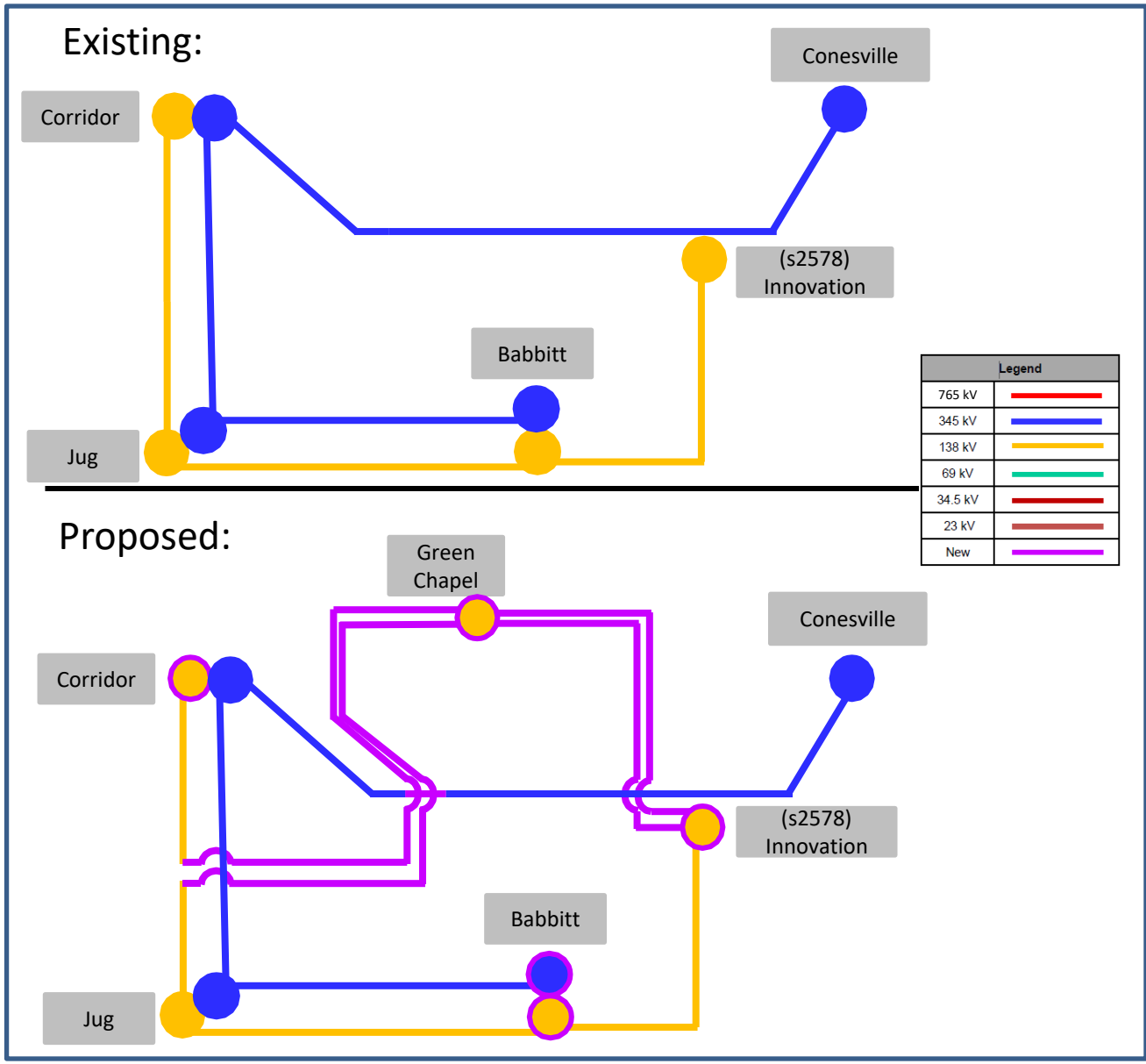
AEP Transmission Zone M-3 Process
Green Chapel

Need Number: AEP-2022-OH029

Process Stage: Solutions Meeting 12/16/2022

Proposed Solution:

- **Green Chapel 138 kV**: Construct a greenfield station with 19 - 138kV, 90 kA, 4000 A circuit breakers in breaker and half bus configuration. **Estimated Cost: $27.57 M**
- **Innovation 138 kV**: Build out the remaining 2 breaker & half strings at the station and install 4 - 138 kV 4000A 80kA circuit breakers. **Estimated Cost: $3.91 M**
- **Green Chapel – Innovation 138 kV**: Construct ~2.1 miles of double circuit 138kV transmission line from Innovation Station to Green Chapel Station utilizing 2-bundled ACSS Curlew 1033.5 (54/7) conductor SE rating 1123 MVA. **Estimate Cost: $12.6 M**
- **Green Chapel Extension 138 kV**: Construct ~2.6 miles of double circuit 138kV transmission line extending from Jug - Corridor 138 kV line to Green Chapel station utilizing 2-bundled ACSR Falcon 1590 (54/19) conductor SE rating 1118 MVA to match the existing conductor on the Corridor-Jug line. **Estimate Cost: $15.6 M**
- **Jug – Corridor 138/345 kV:** Additional structures and dead ends will be required on the existing Jug – Corridor double circuit line to accommodate the extension eastward to Green Chapel as the 138 kV circuit is on the west side of the structures. **Estimate Cost: $3.6 M**
- **Conesville - Corridor 345kV**: Modify the existing 345kV line structures to enable appropriate height for the new line to Green Chapel Station. **Estimated Cost: $1.97 M**



AEP Transmission Zone M-3 Process
Green Chapel

Proposed Solution - continued:

- **Babbitt 345/138 kV**: Install a second 675 MVA, 345/138 kV transformer to address overloading Jug Street 345/138 kV transformer under N-1-1 contingencies as a result of this customer load interconnection. Cost: **$16.0 M**
- **Corridor 138 kV**: Replace 3000A breakers CB-104C & 104S with 4000 A breakers. This addresses N-1-1 overloading on those breakers as a result of this customer load interconnection. **Estimated Cost: $2.0M**
- **West Lancaster 138 kV**: Install high and low side sectionalizing on the two 138/69 kV transformers. This addresses, due to lack of sectionalizing, N-1-1 overloading on 69 kV lines as a result of this customer load interconnection. **Estimated Cost: $3.5 M**

Total Estimated Transmission Cost: $86.75M

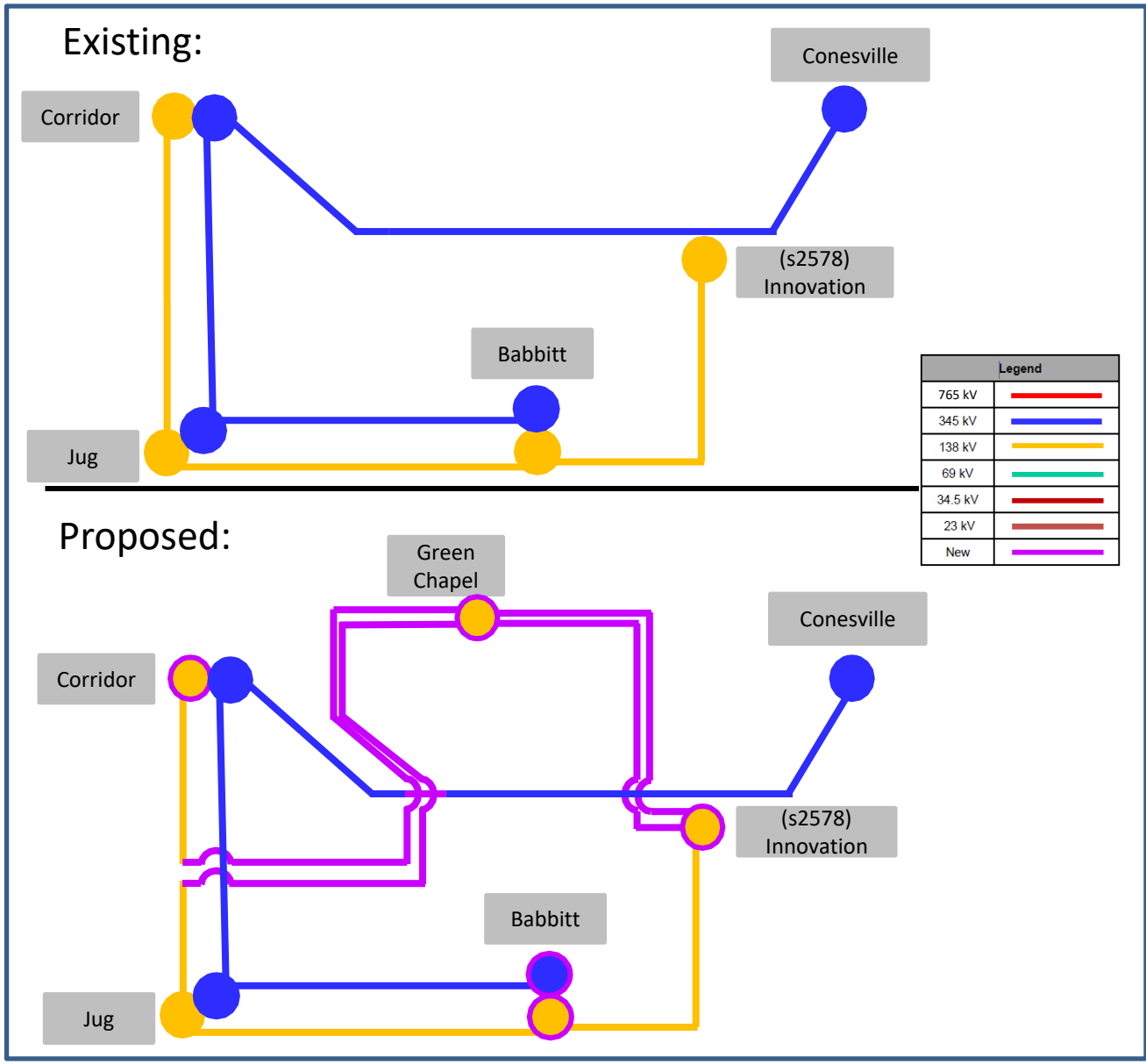
Alternatives Considered:

No other viable alternatives considered given the location and timing of the service request.

Projected In-Service: 5/31/2024

Project Status: Scoping/Engineering

Model: 2027 RTEP



AEP Transmission Zone M-3 Process
Jug Station Capacity Expansion

Need Number: AEP-2022-OH062

Process Stage: Solutions Meeting 12/16/2022

Previously Presented:

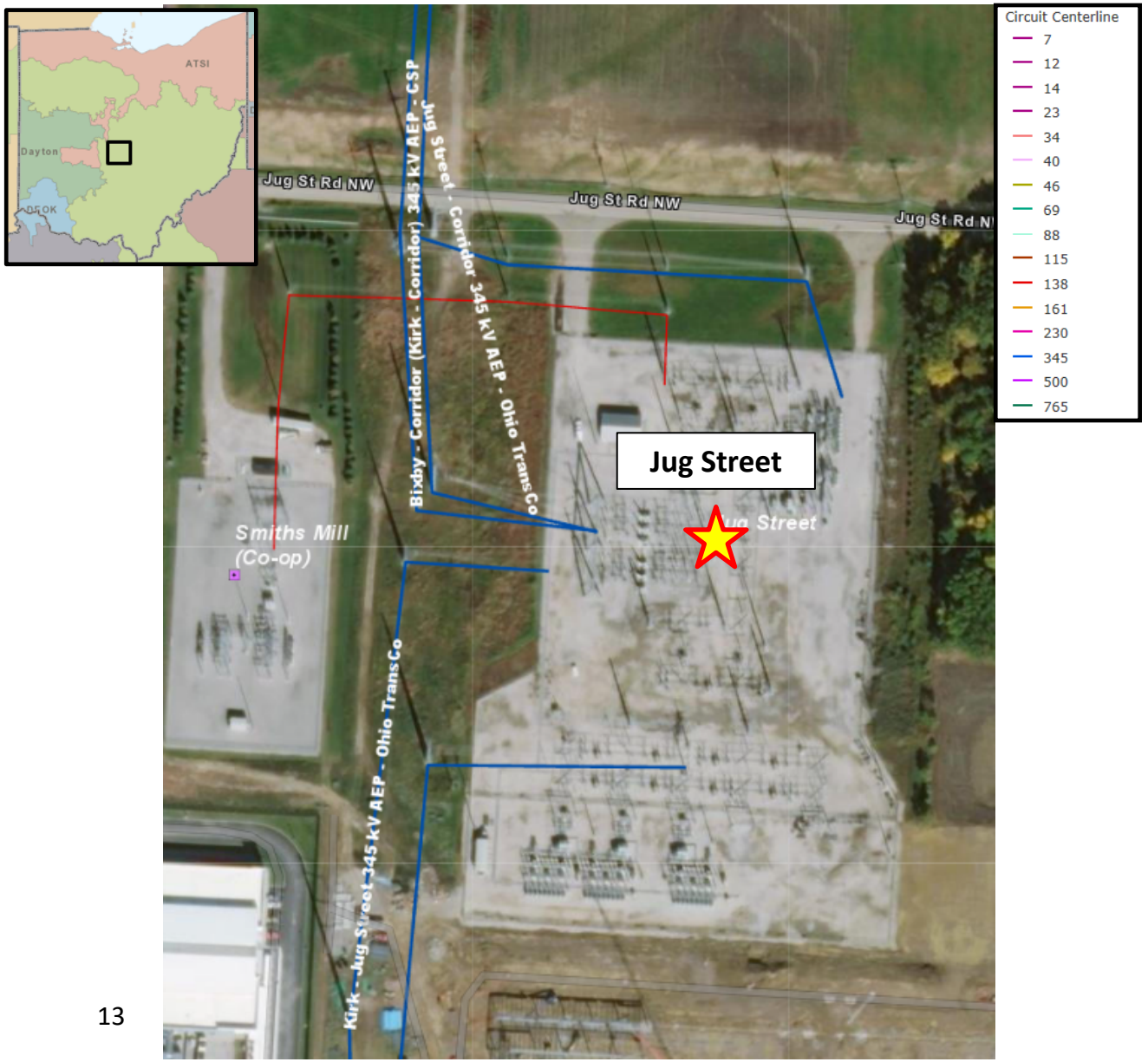
Need Meeting 08/19/2022

Project Driver: Customer Service

Service Specific Assumption Reference: AEP Connection Requirements for the AEP Transmission System (AEP Assumptions Slide 12)

Problem Statement:

AEP Ohio has requested to add capacity at Jug Street station, due to continuous load growth in the area. The anticipated peak load is approximately 58 MVA. The requested in-service date is June 2024.



AEP Transmission Zone M-3 Process
Jug Station Capacity Expansion

Need Number: AEP-2022-OH062

Process Stage: Solutions Meeting 12/16/2022

Proposed Solution:

- Jug station 138 kV: Install 1 - 138kV 80kA 4000A circuit breaker in the open F position on the ring bus to accommodate a new distribution transformer at the station. **Cost: $0.678 M**

Alternatives Considered:

- No cost-effective alternatives identified considering the location and timing of the request.

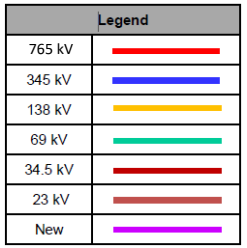
Projected In-Service: 06/01/2024

Project Status: Scoping/Engineering

Model: 2027 RTEP

Existing:

Proposed:



AEP Transmission Zone M-3 Process
Findlay, Ohio

Need Number: AEP-2022-OH065
Process Stage: Solutions Meeting 12/16/2022
Previously presented: Need Meeting 9/16/2022

Supplemental Project Driver:

Customer Service

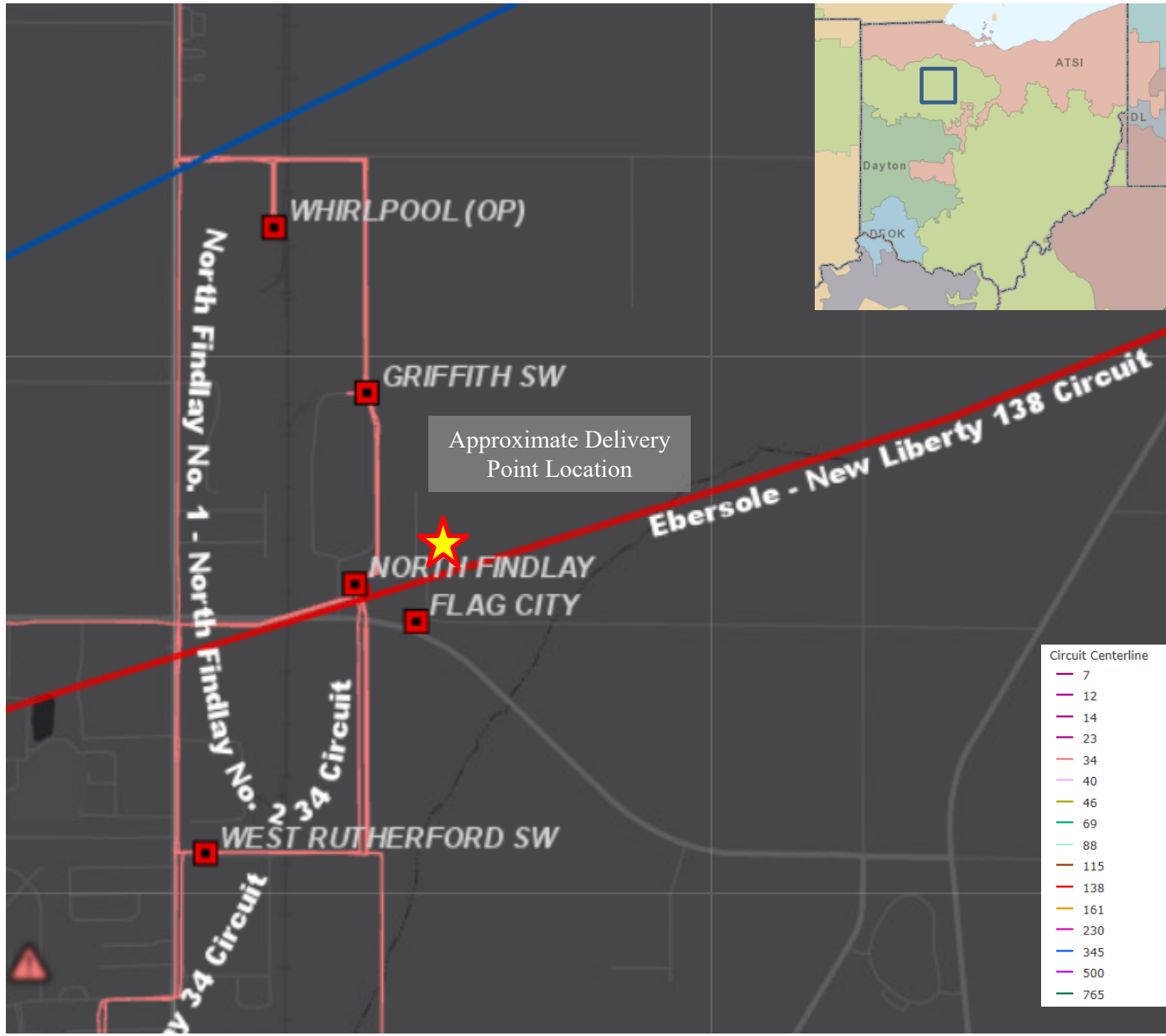
Specific Assumption Reference:

AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions slide 12)

Problem Statement:

Customer Service:

- A customer has requested transmission service at a site east of AEP's North Findlay site in Findlay, Ohio
- The customer has indicated an initial temporary load of 30MVA.
- The customer has requested an ISD of 12/23/2022



AEP Transmission Zone M-3 Process
North Findlay Customer Temp Service

Need Number: AEP-2022-OH065
Process Stage: Solutions Meeting 12/16/2022

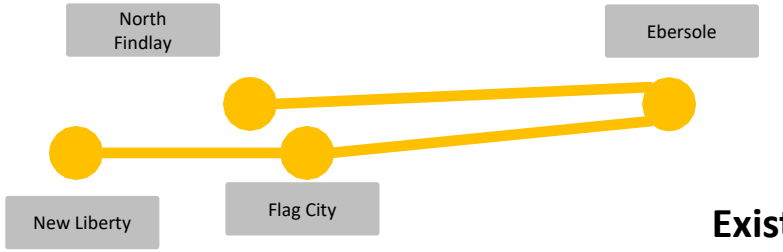
Proposed Solution:

- Install a hard tap on the North Findlay - Ebersol circuit near the customer's station. Install in-line dead ends to support sectionalizing around this hard tap. From the Hard tap structure install one span of radial 138kV line to the customer's station.

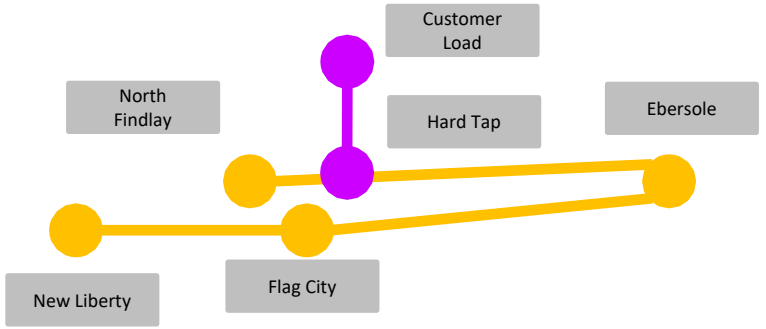
Total Estimated Transmission Cost: $0 (This work is fully reimbursable)

Alternatives Considered:
Due the accelerated in service date and temporary nature of the this load a hard tap is the most cost-effective temporary service plan.
Model: PJM 2027 RTEP case
Projected In-Service: 03/17/2023
Project Status: Scoping

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



Existing



Proposed

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

12/5/2022 – V1 – Original version posted to pjm.com

12/15/2022 – V2 – Removed original slides 15&16 (solution for AEP-2022-OH065)

12/16/2022 – V3 – Added back original slides 15&16 (solution for AEP-2022-OH065)