

Sub Regional RTEP Committee: Western AEP Supplemental Projects

August 16, 2021

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 Leesville, VA Area

Need Number: AEP-2021-AP028

Process Stage: Needs Meeting 8/16/2021

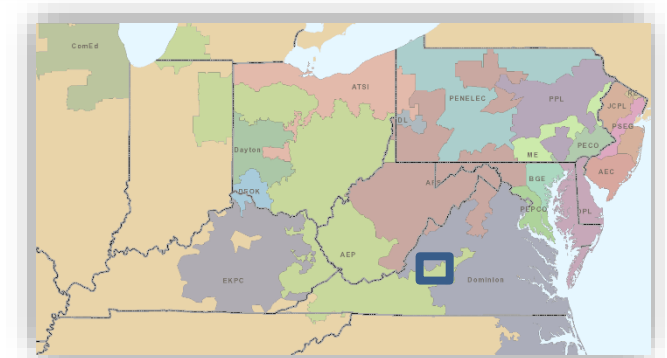
Supplemental Project Driver: Equipment Condition/Performance/Risk

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

Problem Statement:

Leesville Station:

- The 138 kV circuit breaker “A” is a 145-PA-40-20 type breaker manufactured in 1990. This circuit breaker has experienced 4 low SF6 gas level malfunctions since November 2012. The expected life of the bushing gaskets and door inspection port seals is 25 years; this unit has reached this age. Seals that are no longer adequate can cause SF6 leaks to become more frequent. The manufacturer provides no support for this 145-PA family of circuit breakers, and spare parts for this breaker type are not available.
- Leesville Station is configured as a “lonesome breaker” configuration with CB “A” providing protection for both the Smith Mountain and Altavista Lines. CB “A” is located physically in the Altavista bay. The Smith Mountain line has MOAB “X” for sectionalizing. Leesville Hydro ties into Leesville with MOAB “Y”. This configuration consists of three overlapping zones of protection for the transformer, bus and line.
- Motor mechanisms and switches for MOABs “X” and “Y” are of an obsolete style in need of replacement due to lack of spare parts.
- 18 of the 22 relays (82% of all station relays) are in need of replacement. These are comprised of 13 electromechanical type and 5 static type relays which have significant limitations with regards to fault data collection and retention. In addition, these relays lack vendor support. The 5 static relays include the SLY-81 and SLYG-81 model types, which are the only remaining relays of this type on the AEP system; these relays are PRC-005 compliance applicable. There are concerns with mis-operation risk and the possibility for reduced protection on the lines in the case of any SLY-81 and SLYG-81 relay failure.
- The Leesville-Altavista 138 kV circuit is a tie-line with Dominion with concerns related to the associated electromechanical relaying and potential mis-ops.
- There are 2 wood pole structures with down guys in use to run station service and control cable from the station to the hydro facilities via lashed messenger wire. The structures are deteriorated and down guys are blocking access in the station.
- Non-standard metering located on the low side of the generation step-up transformers do not capture potential auxiliary load use



Need Number: AEP-2021-IM027

Process Stage: Needs Meeting 08/16/2021

Supplemental Project Driver: Equipment Condition/Performance/Risk

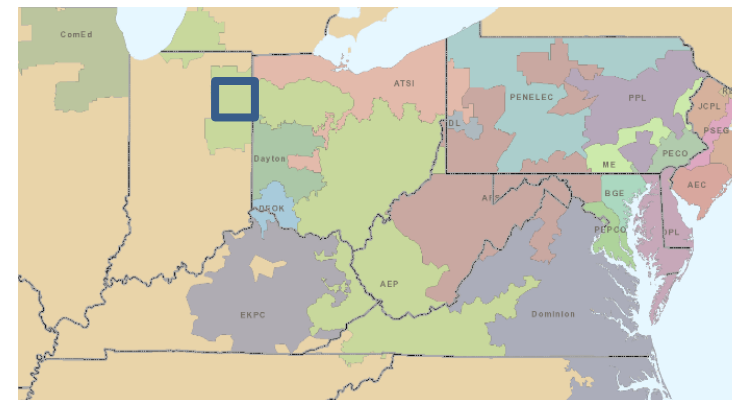
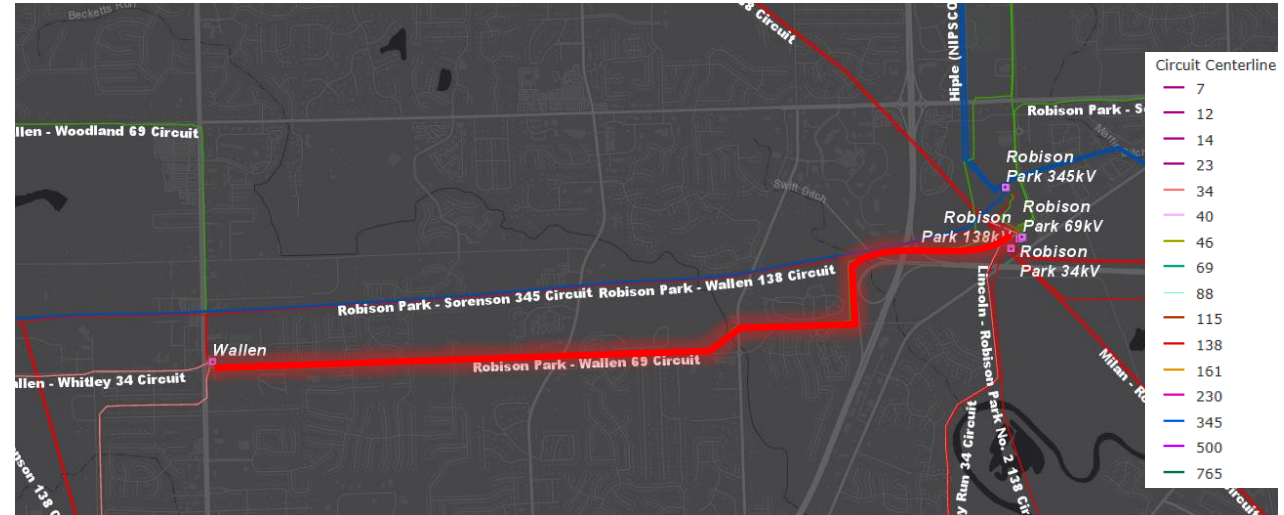
Specific Assumption Reference: AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 13)

Model: N/A

Problem Statement:

Robison Park – Wallen 69kV line (3.24 miles):

- 14 of the 44 structures are original 1930 Steel Lattice
- There are 7 wood poles with significant insect and wood pecker damage, with insulators that are pulling away and flashed insulators.
- Remainder of structures are steel monopole and are in acceptable condition at this time.
- 2.96 miles of line is original 1930s vintage 300,000 CM CU conductor
- Since 2015 there have been 5 momentary and 1 permanent outages
- 7 wood structures fail NESC Grade B, AEP Strength requirements and ASCE structural strength standards



Need Number: AEP-2021-IM029

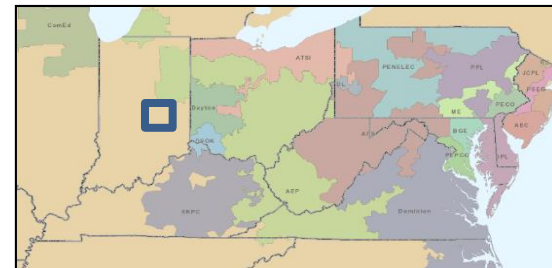
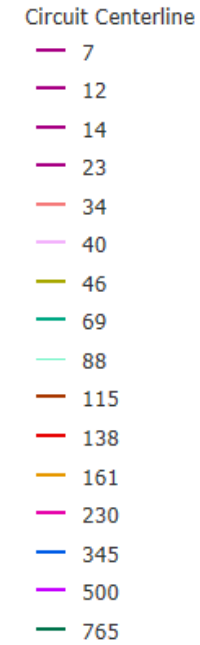
Process Stage: Need Meeting 08/16/2021

Project Driver: Customer Service

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

Problem Statement:

A customer has requested new transmission service in Muncie, Indiana by March 2022. Anticipated load is 16.16 MVA.



Need Number: AEP-2021-OH041

Process Stage: Need Meeting 08/16/2021

Project Driver: Equipment Material/Condition/Performance/Risk; Customer Service

Specific Assumption Reference: AEP Guidelines for Transmission Owner Identified Needs; AEP Connection Requirements (AEP Assumptions Slides 12-13)

Problem Statement:

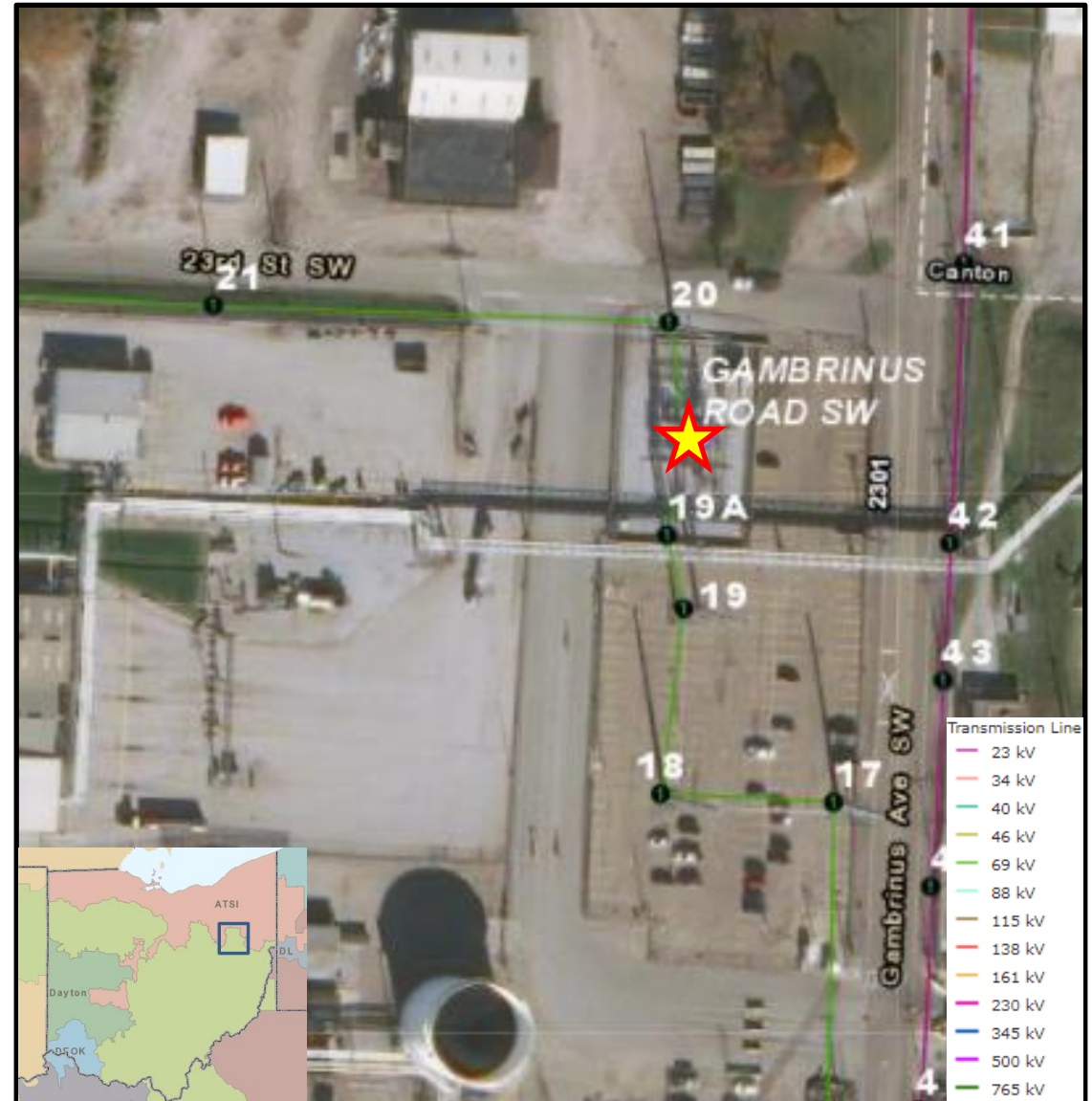
Gambrinus Road Station 69kV:

Equipment Material/Condition/Performance/Risk:

Circuit Breaker: T (69 kV)

- Breaker Age: 1978
- This breaker is oil filled without oil containment; oil filled breakers have much more maintenance required due to oil handling that their modern, SF6 counterparts do not require.

Relays: 42 of the 44 relays (95% of all station relays) are in need of replacement. All 42 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.



Need Number: AEP-2021-OH041

Process Stage: Need Meeting 08/16/2021

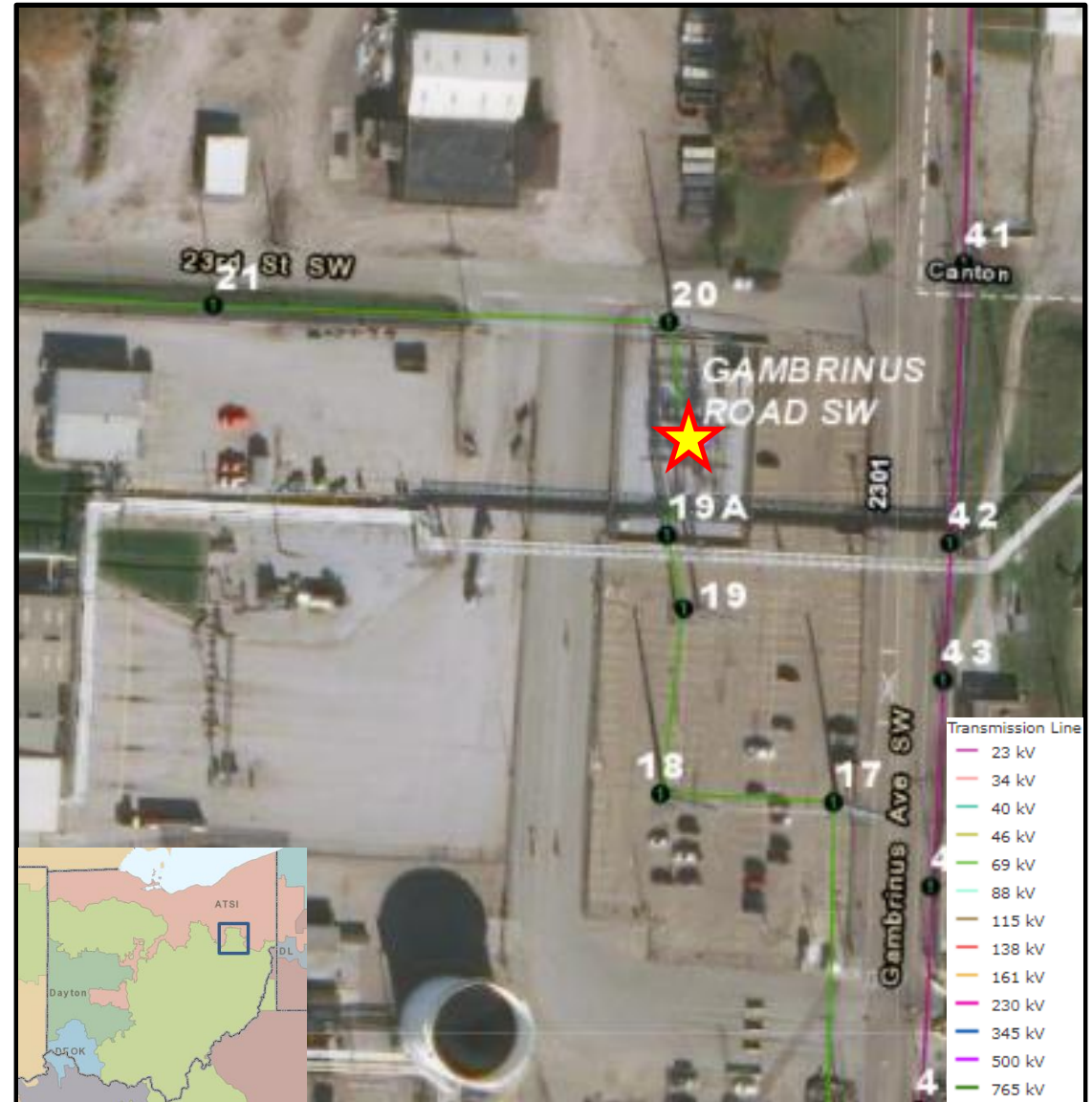
Problem Statement Continued:

The control house has asbestos and various maintenance issues. The station entry is in a congested industrial area, along with minimal drive-path width, resulting in labor constraints and safety issues for field personnel. The station fence is not built to current AEP standards. Station cables are direct-buried in the ground, leaving them more vulnerable to failure over time.

The 69kV revenue metering is a legacy 2-element style, not the current 3-element metering. All of the 69kV connections use a legacy pilot wire communications channel.

Customer Service:

The Gambrinus Road station serves an oil refinery customer with a peak demand of 44 MW. The station is served by only two remote 69kV sources, leaving it vulnerable to outages when maintenance must be performed on either of the two sources.



Need Number: AEP-2021-OH042

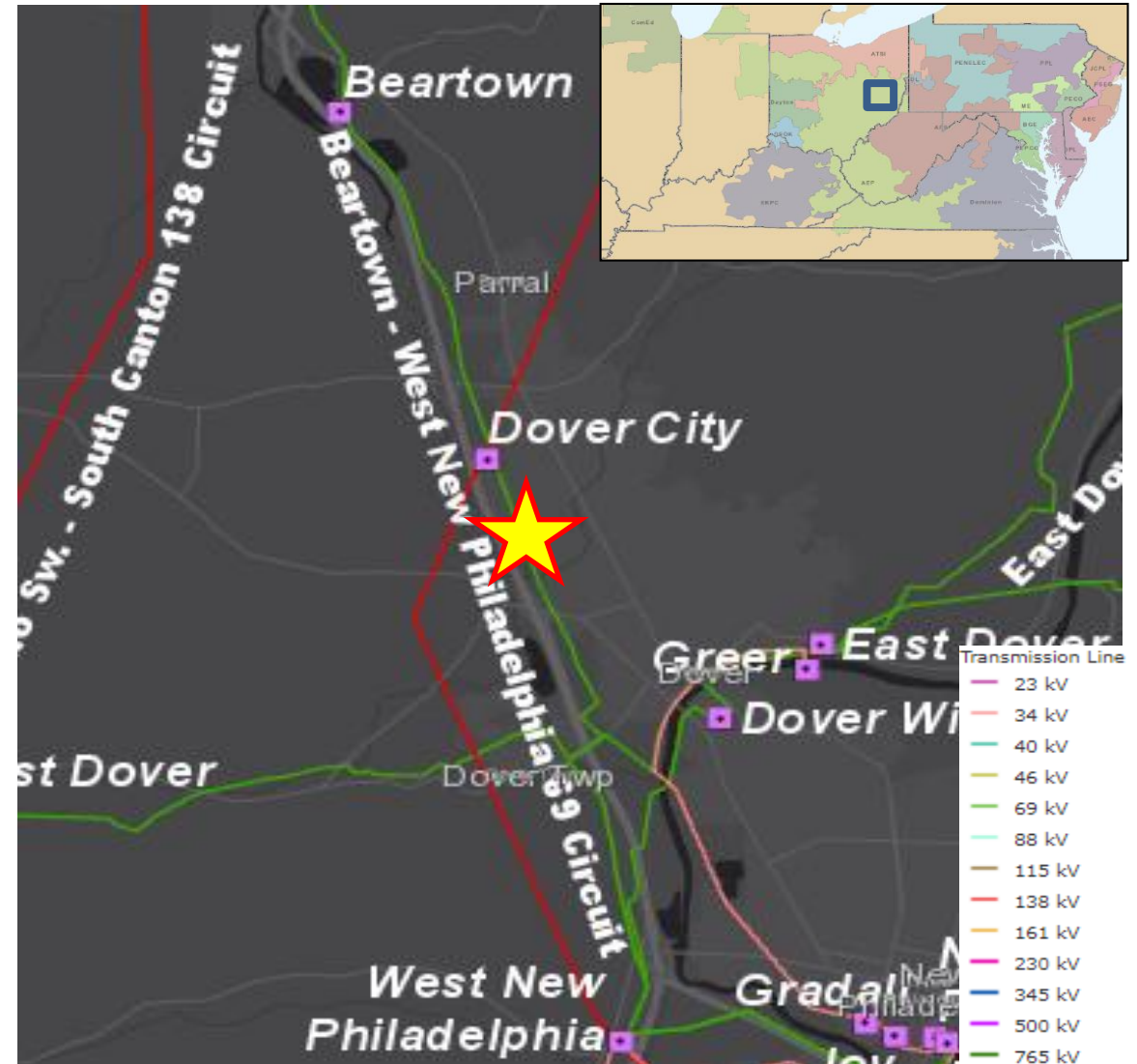
Process Stage: Need Meeting 08/16/2021

Project Driver: Customer Service

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

Problem Statement:

An industrial customer in Dover, Ohio has requested new transmission service. The expected peak demand is 3 MW, with a requested in-service-date of December 2021.



Need Number: AEP-2021-OH045

Process Stage: Need Meeting 8/16/2021

Project Driver:

Equipment Material/Condition/Performance/Risk

Specific Assumption Reference:

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

Problem Statement:

East Broad Street 138kV

40 kV CB-37, 138 kV CB-4, & 138 kV CB-7

- Breaker Age: 1954 (CB-37) & 1979 (CB-4 & CB-7)
- Interrupting Medium: Oil
- Fault Operations: 15 (CB-7)
- Additional: The three 40kV/138kV circuit breakers, CB-37, CB-4 and CB-7, are oil filled FK type breakers. These breakers are oil filled without oil containment; oil filled breakers have much more maintenance required due to oil handling. CB-7 has exceeded the manufacturer's recommended number of full fault operations.

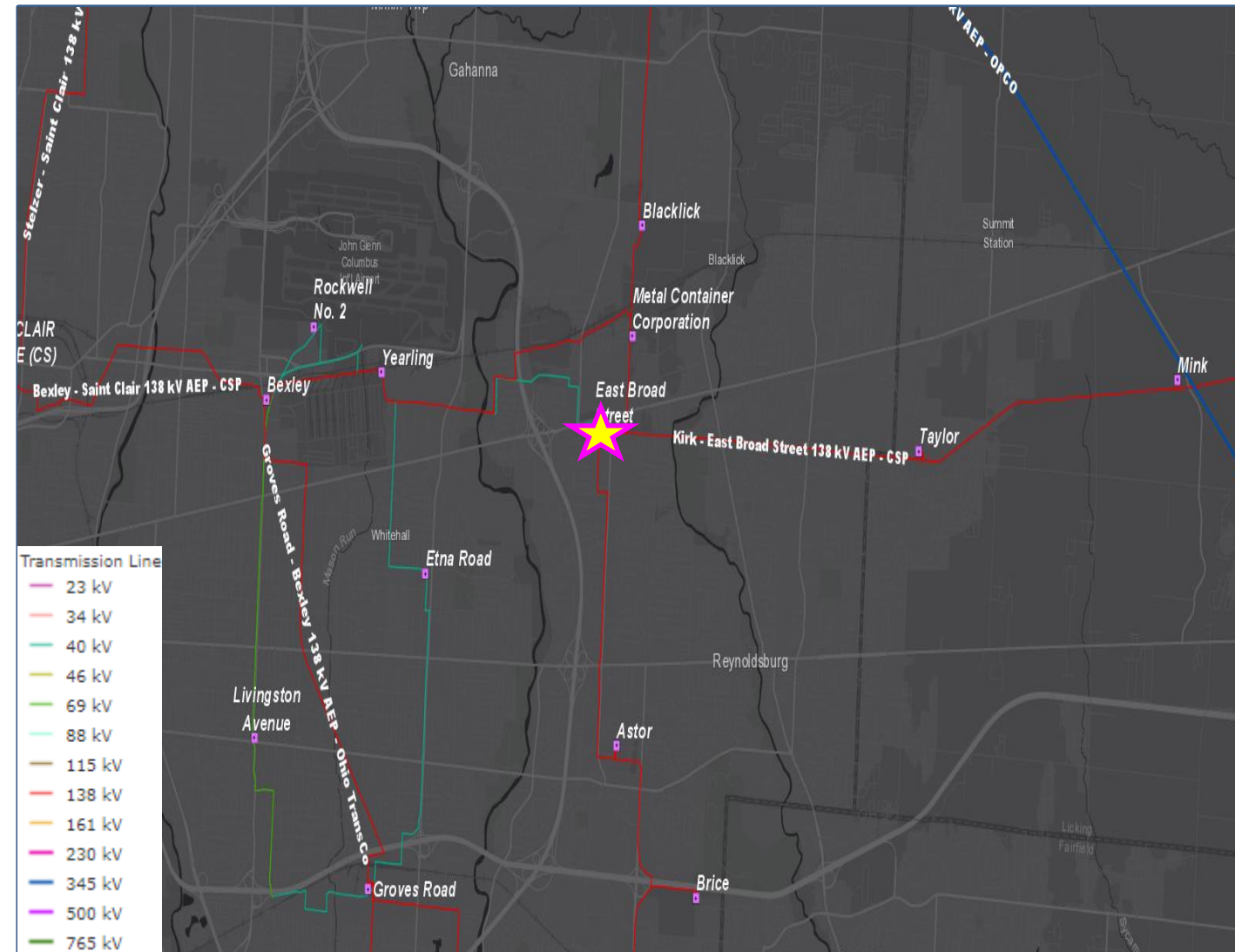
138 kV CB-110

- Breaker Age: 1970
- Interrupting Medium: Oil
- Fault Operations: 16
- Additional: The one 138kV, CB-110, is an oil filled 1380GM type breaker. This breaker is oil filled without oil containment; oil filled breakers have much more maintenance required due to oil handling. CB-110 has exceeded the manufacturer's recommended number of full fault operations.

138 kV CB-3

- Breaker Age: 1976
- Interrupting Medium: Oil
- Fault Operations: 13
- Additional: The one 138kV, CB-3, is an oil filled ALP type breaker. This breaker is oil filled without oil containment; oil filled breakers have much more maintenance required due to oil handling. CB-3 has exceeded the manufacturer's recommended number of full fault operations.

AEP Transmission Zone M-3 Process Columbus, OH



Problem Statement (continued):

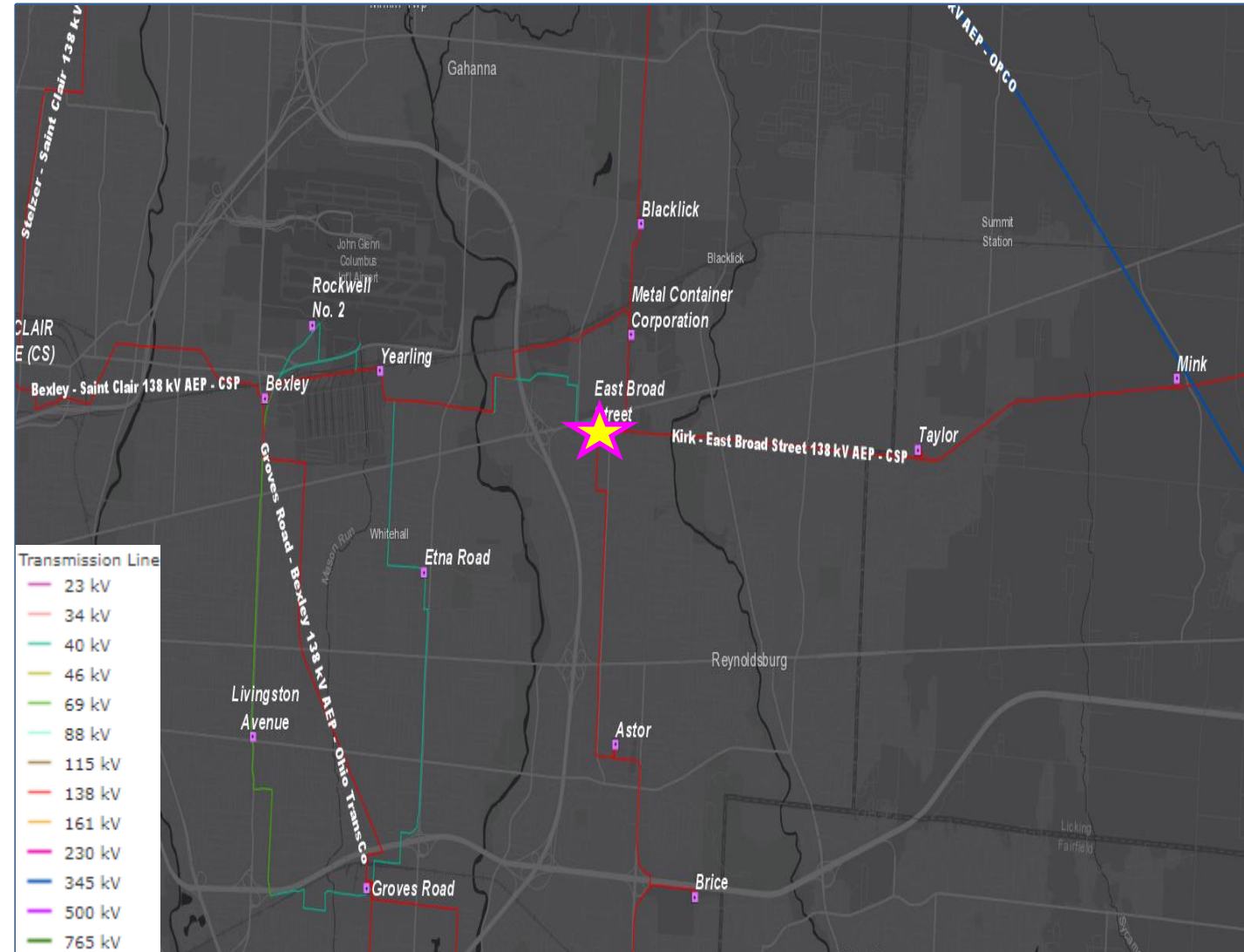
138 kV CS-DD

- Breaker Age: 1995
- Interrupting Medium: SF6
- Additional: The one 138kV circuit switcher, CS-DD, is an SF6 Mark II type switcher. The MARK II family of circuit switchers have limited spare part availability and are no longer vendor supported. Currently in-service circuit switchers of this model family 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.

40 kV CS-C1

- Breaker Age: 1995
- Interrupting Medium: Vacuum
- Additional: The one 40kV circuit switcher, CS-C1, is a vacuum VBM type switcher. This model family has experienced malfunctions including failing to trip due to pole malfunction: worn out stops on the control yoke or solenoid nylon pin binding does not allow it to trip due to corrosion, loose bolts, and/or broken poles. In addition, these vacuum-medium breakers perform poorly in cold weather, leading to more malfunctions.

Relays: 84 of the 120 relays (70% of all station relays) are in need of replacement. 77 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. There are 7 microprocessor based relays commissioned between 2007 and 2009 and may have firmware that is unsupported.



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

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AEP Transmission Zone: Supplemental Harber Station

Need Number: AEP-2021-IM024

Previously Presented: Needs Meeting 05/21/2021

Process Stage: Solutions Meeting 08/16/2021

Supplemental Project Driver: Customer Request

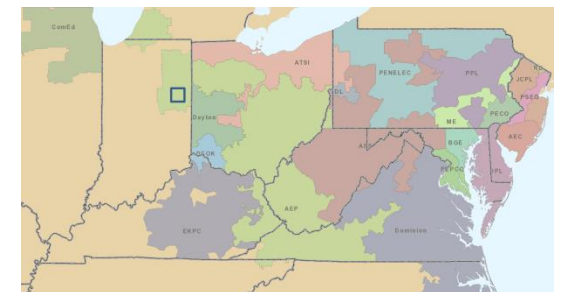
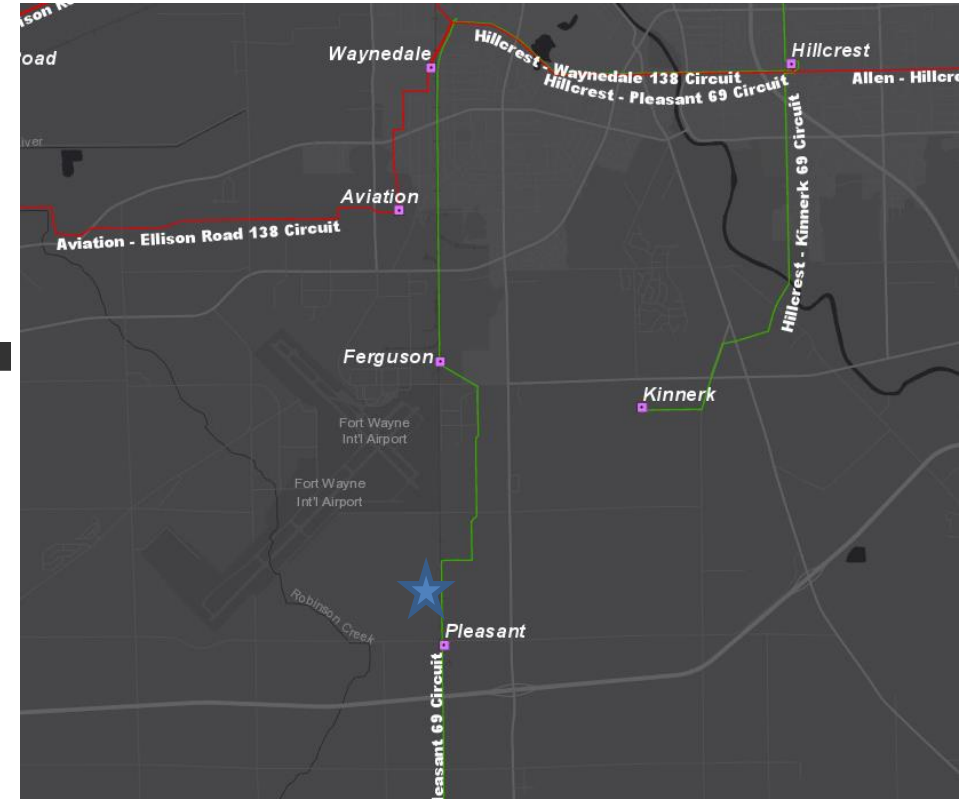
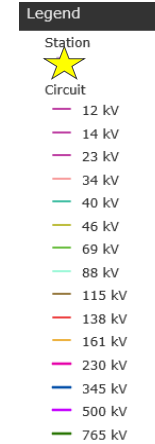
Specific Assumptions Reference: AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 12)

Problem Statement:

New 69kV Delivery

- Wabash Valley Power Authority has requested a new delivery point to help serve their growing load in the southern Fort Wayne, IN area. The station will feed 4MW initially and is expected to grow to 5MW by 2025.

Model: 2025 RTEP



Need Number: AEP-2021-IM024

Process Stage: Solution Meeting 8/16/2021

Proposed Solution:

Deptmer 69kV Switch:

Install a PoP Switch to feed the new Harber Load. Both switch and load are built to 138kV standards but operated at 69kV

Estimated Cost: \$0.6M

Hillcrest – Pleasant 69kV:

Cut Deptmer Switch into the 69kV line.

Estimated Cost: \$0.5M

Deptmer – Harber 69kV Radial:

Install a new 2 span radial to the Harber load. Radial will be built to 138kV standards

Estimated Cost: \$0.6M

Total Estimated Cost: \$ 1.7 Million

Alternatives:

Build new load connection from Pleasant substation. This connection would require a box bay expansion at Pleasant, would require a longer radial as well as line crossings and would stop this load from being able to move to 138kV. For these reasons, this option was not chosen.

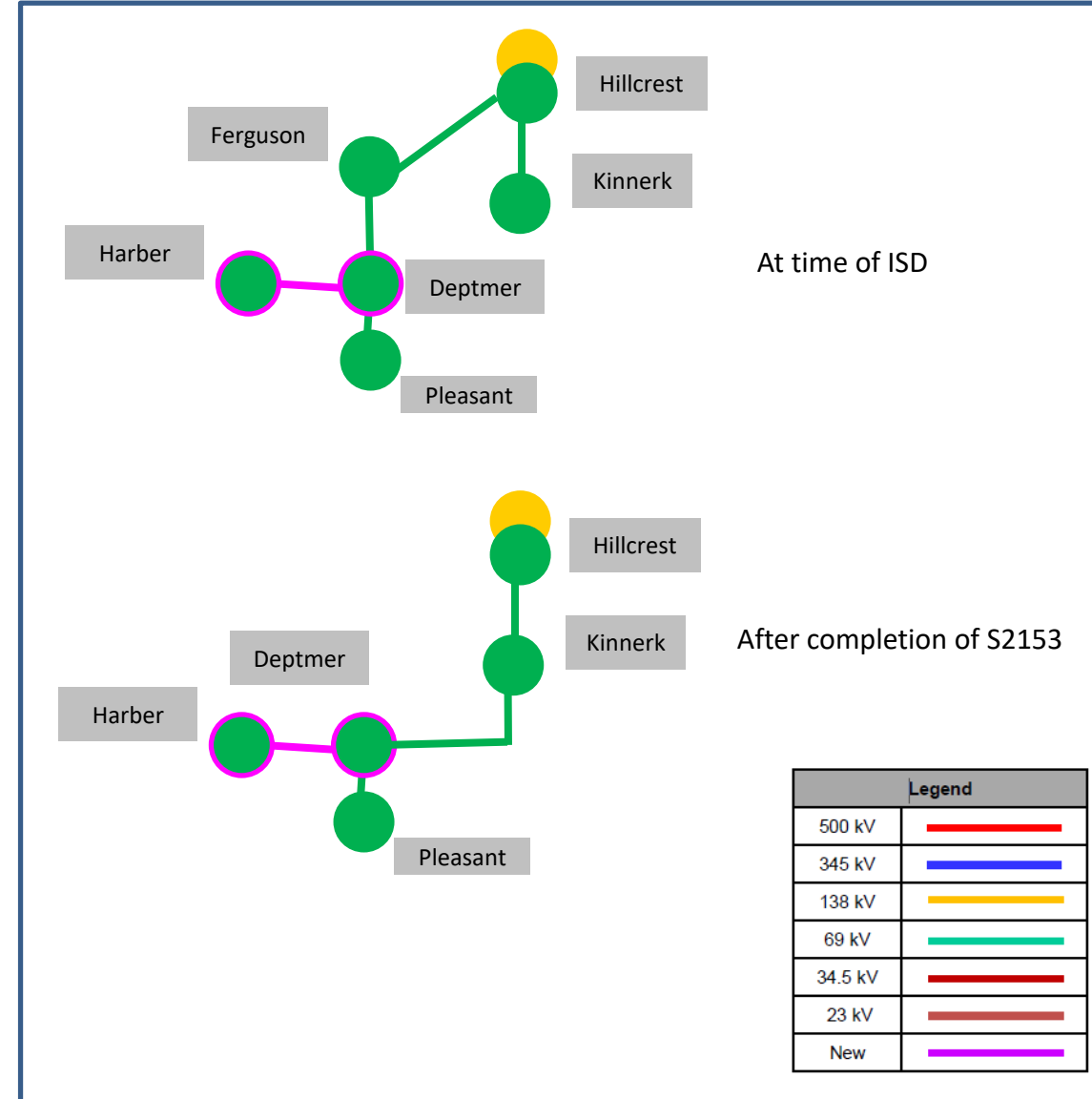
Ancillary Benefits:

With project S2153 a majority of this line will be built to 138kV standards. Building this delivery to 138kV will mean this station can go to 138kV operation if needed as the expected load growth continues in this area.

Projected In-Service: 02/21/2022

Project Status: Scoping

AEP Transmission Zone: Supplemental Harber Station



AEP Transmission Zone: Supplemental Sturgis Area Improvements

Need Number: AEP-2018-IM019

Process Stage: Solution Meeting 8/16/2021

Previously Presented: Needs Meeting 1/11/19

Supplemental Project Driver: Equipment Condition/Performance

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

Problem Statement:

Mottville Hydro Station –

- 1975 vintage 34.5kV grounding transformers carbon dioxide is at IEEE level 3
- PCB's and obsolete bushings

Moore Park Station -

- CB C is a 23 year old 69kV SF6 Breaker (ABB – 72PM31-20)
 - 38 fault operations
 - 38 recorded instances of SF6 additions since 2006

Stubey Road Station –

- Transformer high side ground switch

Sturgis Station –

- CB A and B 63 year old oil CBs with 37 and 28 fault operations, respectively
 - Replacement parts are very difficult to find for these legacy units

Moore Park Tap 69 kV –

- 1960s vintage wood structures
 - 20 poles identified with structural integrity concerns
 - Part of a three terminal line (~9 miles)

Sturgis – Howe (NIPSCO tie) –

- Vintage 1950s wood cross arm construction with suspended insulators (~3 mi)
- low capability 4/0 ACSR



Need Number: AEP-2018-IM019

Process Stage: Solution Meeting 8/16/2021

Previously Presented: Needs Meeting 1/11/19

Supplemental Project Driver: Operational

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

Problem Statement:

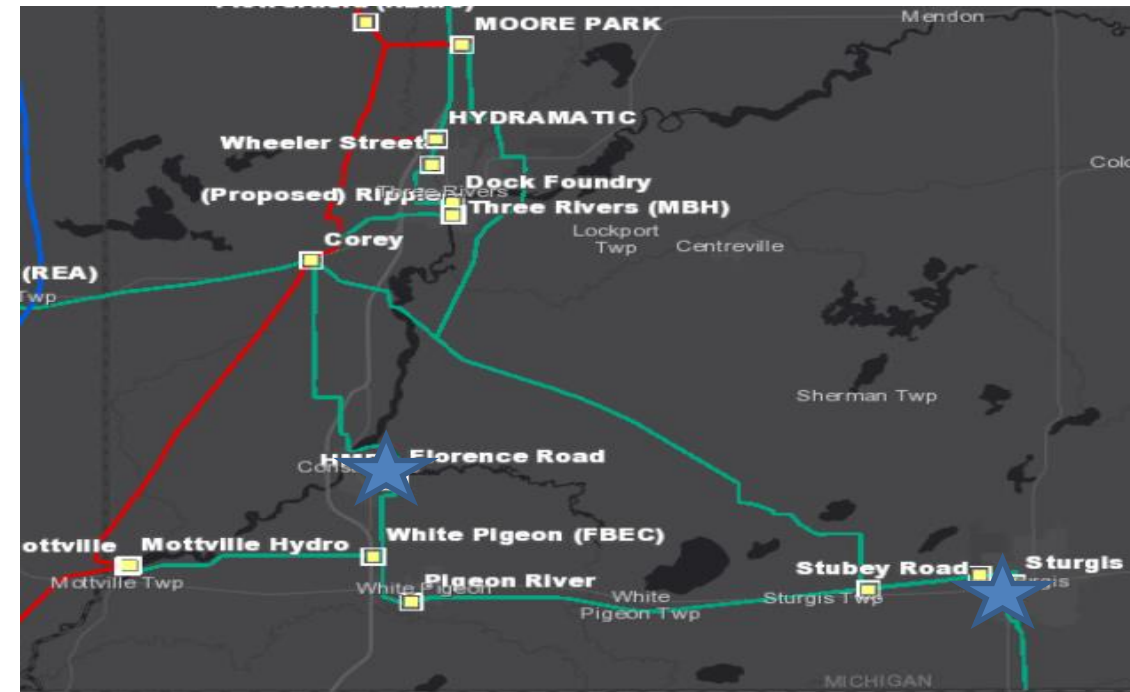
HMD Station –

- Permanently jumpered disconnects on main bus

Sturgis – Howe (NIPSCO tie)

- Outage constrained – difficult to outage due to local dependence

AEP Transmission Zone: Supplemental Sturgis Area Improvements



AEP Transmission Zone: Supplemental Sturgis Area Improvements

Need Number: AEP-2020-IM007

Process Stage: Solution Meeting 8/16/2021

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

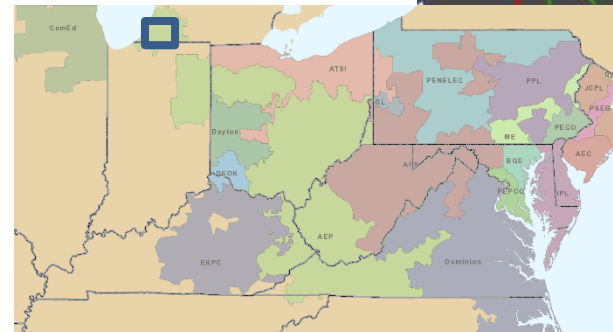
Problem Statement:

Moorepark 69kV Tap line:

- 9.02 miles of 1967 wood pole structure with horizontal insulators
- 94 structures with at least one open condition (52% of the line)
 - Open conditions include pole damage such as cracked, insect damage, rot heart and woodpecker holes, shielding/grounding conditions related to broken, missing or stolen ground wires, and broken or burnt insulators
- Since 2014 8 momentary and 1 permanent outages
 - 7 due to weather (lightning/thunderstorm) demonstrating poor shielding
- This line is a three terminal line which is hard to coordinate from a relaying perspective and is prone to misoperations

Moorepark (138/69kV) Station:

- 69kV circuit breaker (1) installed in 2006 with 41 documented malfunction records due to low SF6. This breaker has exceeded the designed number of fault operations.
- (1) 2030-69 Cap Switcher with no gas monitor. The AEP system has experienced numerous malfunctions of this type of cap switcher due to gas loss, interrupter failures, operating mechanism failures and trip or reclose failures.



AEP Transmission Zone: Supplemental Sturgis Area Improvements

Need Number: AEP-2020-IM021

Process Stage: Solution Meeting 8/16/2021

Previously Presented: Needs Meeting 09/11/2020

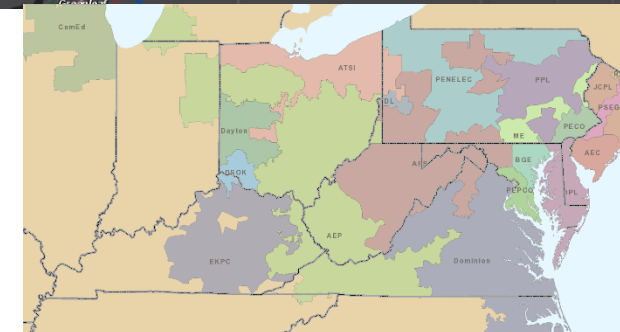
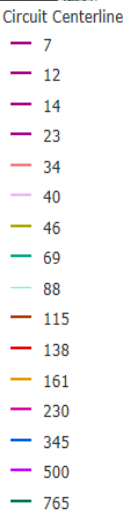
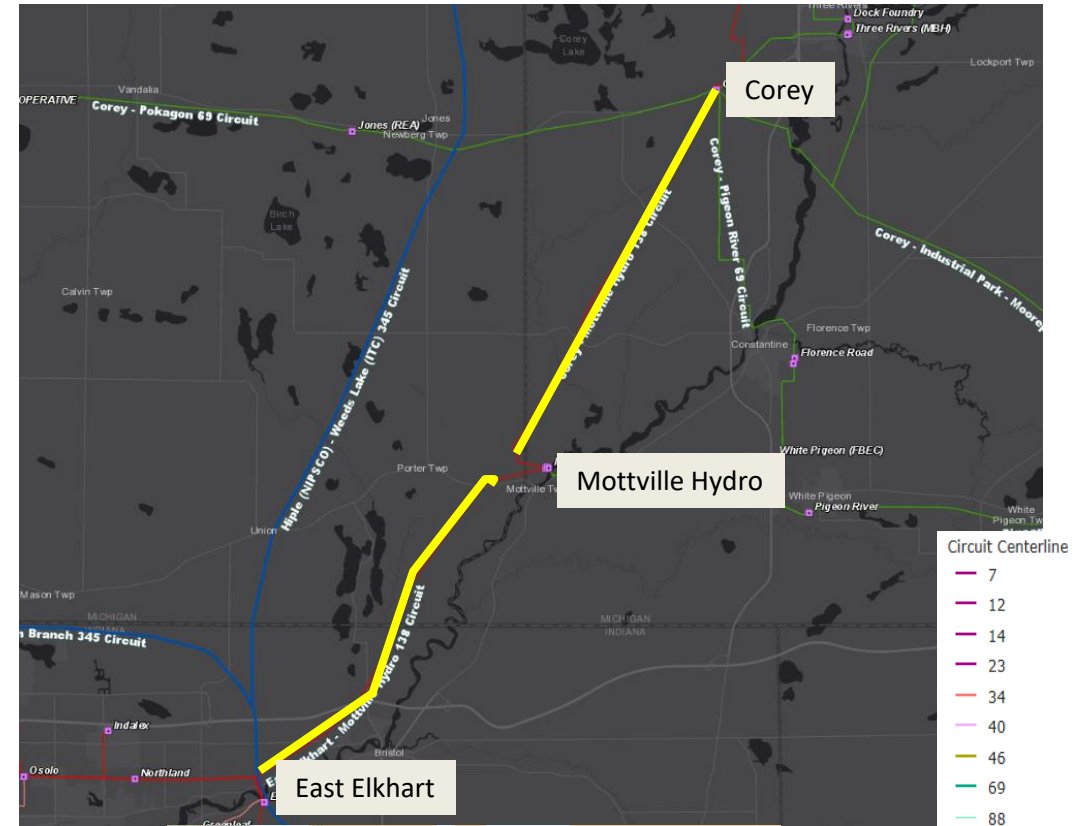
Supplemental Project Driver: Equipment Condition/Performance/Risk

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

Problem Statement:

East Elkhart- Mottville Hydro- Corey 138kV

- 16.3 miles consisting of 1960's wood pole H frame structures with vertical insulators
 - 88% of structures are original
 - 100% of conductor is original
- Since 2014 there have been
 - 3 momentary outages on Corey-Mottville Hydro 138kV
 - 2 momentary outages on East Elkhart-Mottville Hydro 138kV
- The line contains 36 open conditions including burnt or broken insulators and broken or missing ground lead wire
 - Leads to poor lightning performance (3 outages caused by lightning)
 - Shielding angle does not meet current AEP shielding requirements
 - The grounding utilizes butt wraps which are not current AEP standards
- Field assessment found 45% of the structures assessed with at least one condition. Conditions included cracked and split cross arms, upper pole and knee brace decay, woodpecker damage and flashed insulators
- Insulators don't meet CIFO and minimum leakage requirements



AEP Transmission Zone: Supplemental Sturgis Area Improvements

Need Number: AEP-2018-IM019 & AEP-2020-IM007 & AEP-2020-IM021

Process Stage: Solution Meeting 8/16/2021

Proposed Solution:

East Elkhart – Mottville Hydro 138kV: Rebuild the ~10 miles of 1950’s wood on the East Elkhart – Mottville Hydro 138kV line using 795 Drake ACSR. **Estimated Cost: \$31M**

Mottville Hydro – Corey 138kV: Retire the ~9 mile 138kV line. **Estimated Cost: \$4.25M**

Moore Park 69kV Tap: Retire the ~9 mile 69kV line. **Estimated Cost: \$2.8M**

Moore Park 69kV SW: Retire the 69kV POP Sw. **Estimated Cost: \$0.2M**

Moore Park 69kV Station: Install a 90MVA 138/69kV XFR with a high side switcher and low side CB. 69kV CB “C” will be replaced with the 69kV CB “B”. Replace 69kV cap switcher “BB”

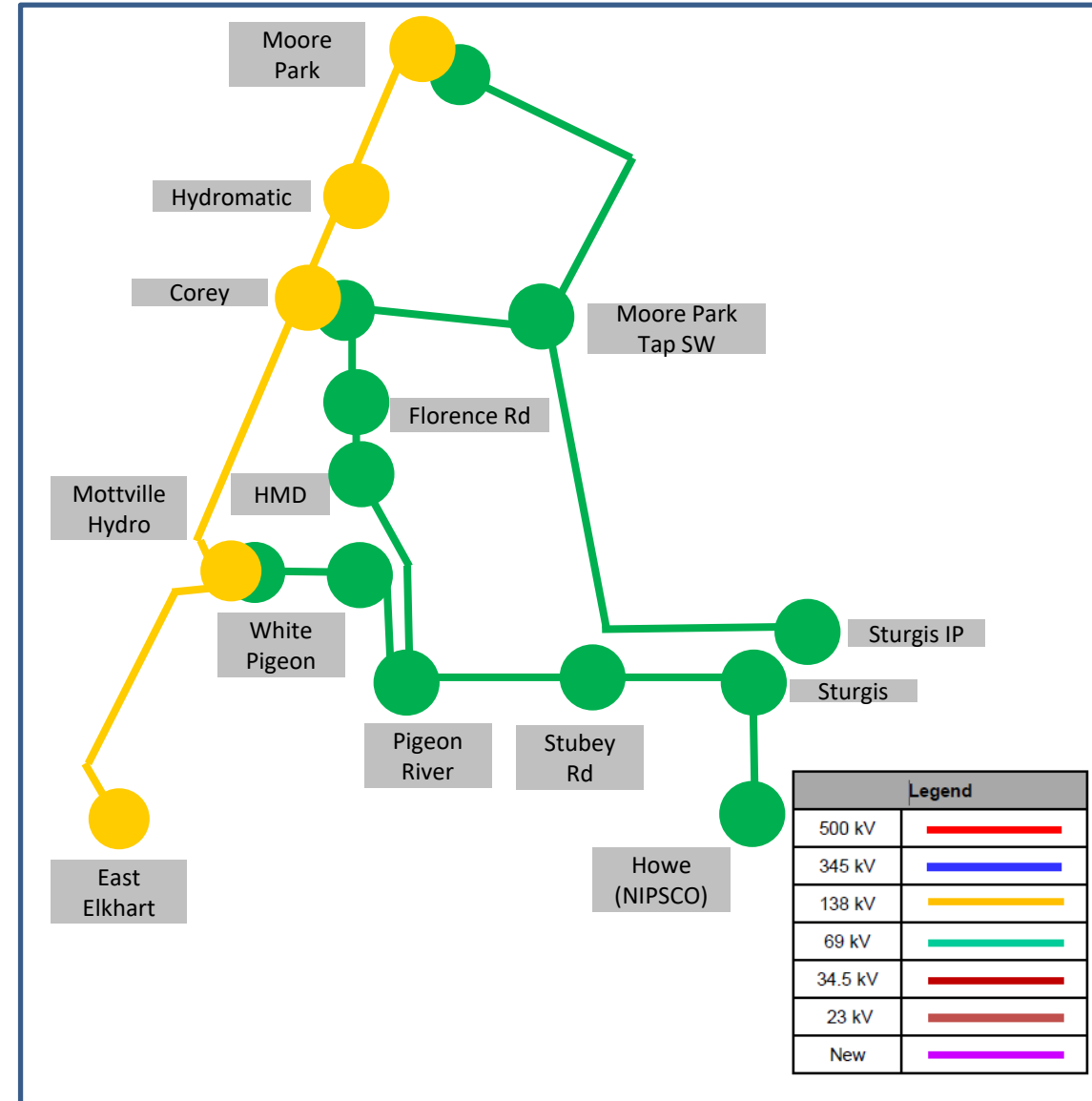
Estimated Cost: \$4.6M

Sturgis 69kV Station: Retire Sturgis 69kV station. **Estimated Cost: \$.9M**

Stubey Rd 138/69kV Station: Expand station to include (6) 69kV CB’s in a ring , (4) 138kV CB’s in a ring, (2) 138/69kV 130MVA XFR’s and (2) 17.6Mvar 69kV Cap Banks. Reterminate the Sturgis IP line into Stubey Road. Reterminate the Corey line into Stubey Road to energize the line at 138 kV. **Estimated Cost: \$18.9M**

Howe (Nipsco) – Sturgis 69kV: Retire the ~2.9 mile 69kV line. **Estimated Cost: \$1.9M**

Mottville Hydro – Stubey Rd 138kV: Re-energize the existing line from Mottville – Pigeon River to 138kV and construct a new ~8.9 mile 138kV line between Pigeon River and Stubey Road to re-establish the 138 kV through path to Corey station. **Estimated Cost: \$23.7M**



AEP Transmission Zone: Supplemental Sturgis Area Improvements

Need Number: AEP-2018-IM019 & AEP-2020-IM007 & AEP-2020-IM021

Process Stage: Solution Meeting 8/16/2021

Proposed Solution (Cont):

Pigeon River 69kV Station: Remove 69kV CB “K” from Pigeon River to re-use at Stubey Rd.

Estimated Cost: \$0.4M

Mottville Hydro 138/69kV Station: Remove 69kV CB “D” from Mottville Hydro to re-use at Stubey Rd. **Estimated Cost: \$0.4M**

Corey 138/69kV Station: Remove 69kV CB “C” from Corey to re-use at Stubey Rd. **Estimated Cost: \$0.4M**

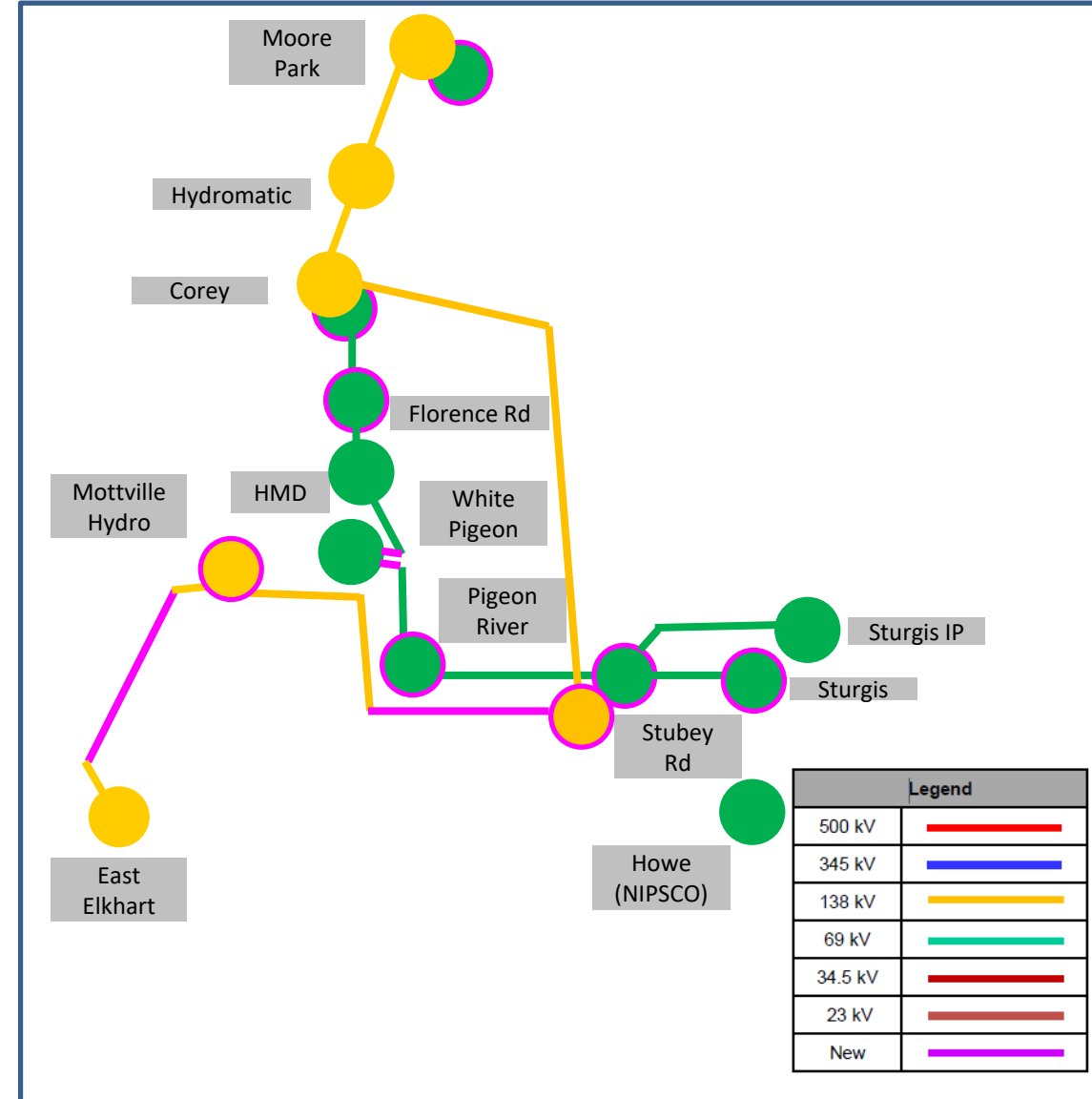
White Pigeon 69kV Ext: Build new 69kV .2 mile extension from Corey – Pigeon River to the existing White Pigeon Station. **Estimated Cost: \$1.7M**

Florence Rd 69kV Station: Replace the line switches at Florence Rd. **Estimated Cost: \$0M (Distribution Cost)**

Total Estimated Transmission Cost: \$91.15M

Ancillary Benefits:

Moves the 138 kV source into the long 69 kV network and utilizes the lines already built to 138 kV to their capability and allows for the retirement of 9 miles of 138 kV line and 9 miles of 69 kV line. Under various outages on the AEP system, the tie to NIPSCO is opened to prevent overloading on the NIPSCO system. From the 7/1/2020-7/1/2021 time period, this line was open on 119 separate days. Because of this NIPSCO operational procedure, under N-1-1 this area drops 71MW of load. By introducing the 138 kV source at Stubey Road, the proposed solution allows for the retirement of 18 total miles of line that would otherwise need to be rebuilt and eliminates the three terminal line out of Moore Park.



AEP Transmission Zone: Supplemental Sturgis Area Improvements

Need Number: AEP-2018-IM019 & AEP-2020-IM007 & AEP-2020-IM021

Process Stage: Solution Meeting 8/16/2021

Alternatives Considered:

In addition to the AEP supplemental improvements, improve the NIPSCO system to eliminate issues under various outage scenarios. This would include retirement of the Moore Park tap, station work at Moore Park, the East Elkhart – Corey 138kV rebuild, a smaller expansion of Stubey Rd 69kV and a rebuild/reroute of AEP’s portion of the Howe – Sturgis 69kV line. In addition to this, Nipso would have to rebuild their ~3 miles of the Howe – Sturgis line and increase the rating on their ~3.5 mile Howe – North Lagrange line and their ~2 mile North Lagrange – Lagrange 69kV line. Due to the increased cost for the overall solution, this option was not chosen.

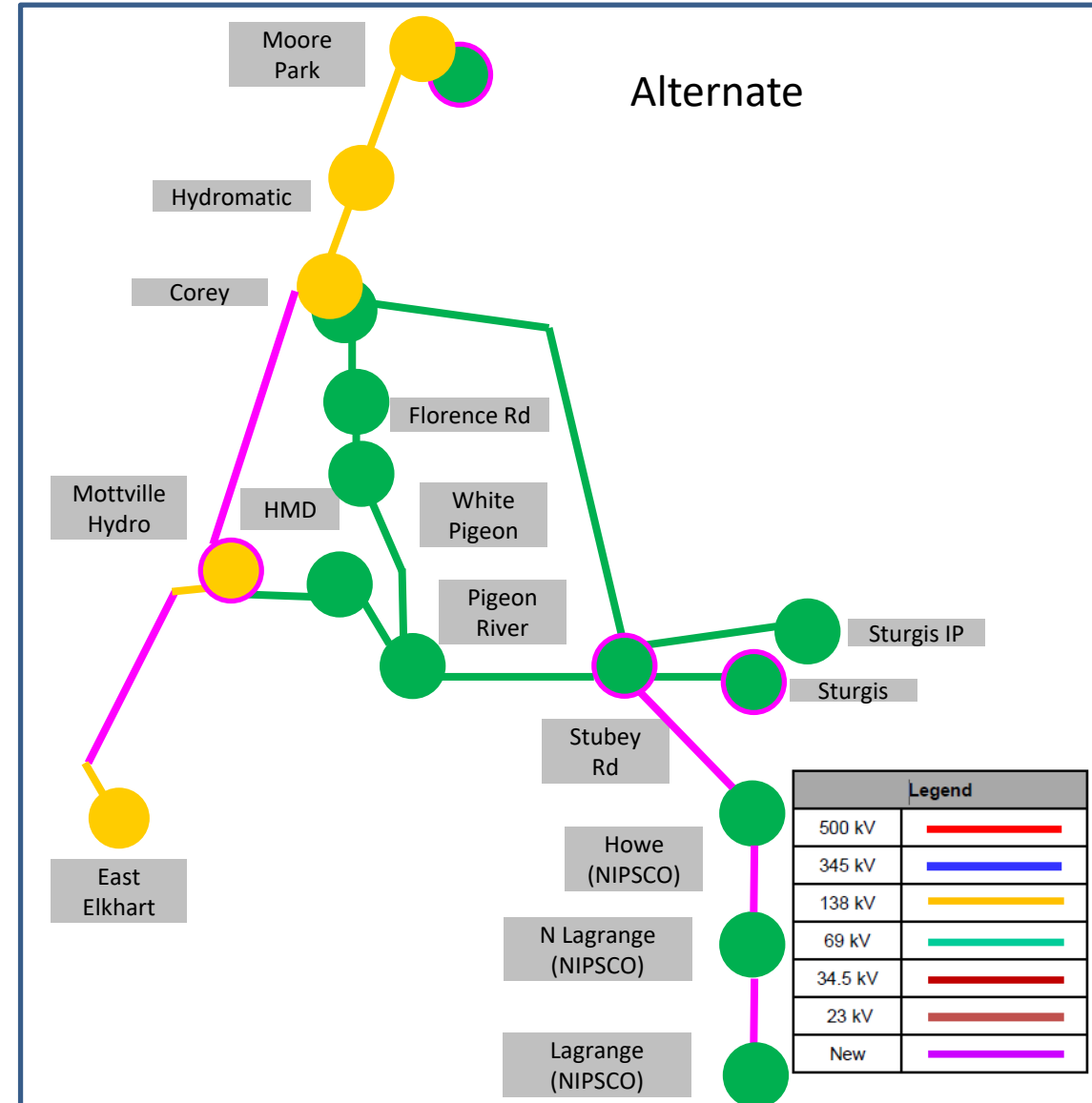
Estimated AEP Cost: \$90.3M

Estimated NIPSCO Cost: \$21.3M

Total Estimated Cost: \$111.6M

Projected In-Service: 3/25/2025

Project Status: Scoping



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

8/3/2021 – V1 – Original version posted to pjm.com

8/4/2021 – V2 – Remove Slides #12 and #13

10/14/2021 – V3 – Slides #21, Corrected Estimate Total Cost

10/19/2021 – V4 – Slides #19-22, Corrected Need# from AEP-2020-IM020 to AEP-2020-IM021