Reliability Analysis Update

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Transmission Expansion Advisory Committee

Tuesday, August 10, 2021

Changes to Existing Projects

Baseline Reliability Projects

AEP Transmission Zone
B3139 – B3141, B3220 Replacement

B3139 - B3141 (Originally Presented 10/17/2019, 11/14/2019 TEAC **)**
B3220 (Originally Presented 7/7/2020 and 11/4/2020 TEAC**)**

Driver: : AEP Buchanan units 1 and 2 Deactivation

Original Scope:

- **B3139:** Rebuild the Garden Creek - Whetstone 69 kV line (approx. 4 mile)
- **B3140:** Rebuild the Whetstone - Knox Creek 69 kV line (3.1 mile)
- **B3141:** Rebuild the Knox Creek - Coal Creek 69 kV line (2.9 mile)
- **B3220:** Install 14.4 MVAR Capacitor Bank at Whitewood 138 KV

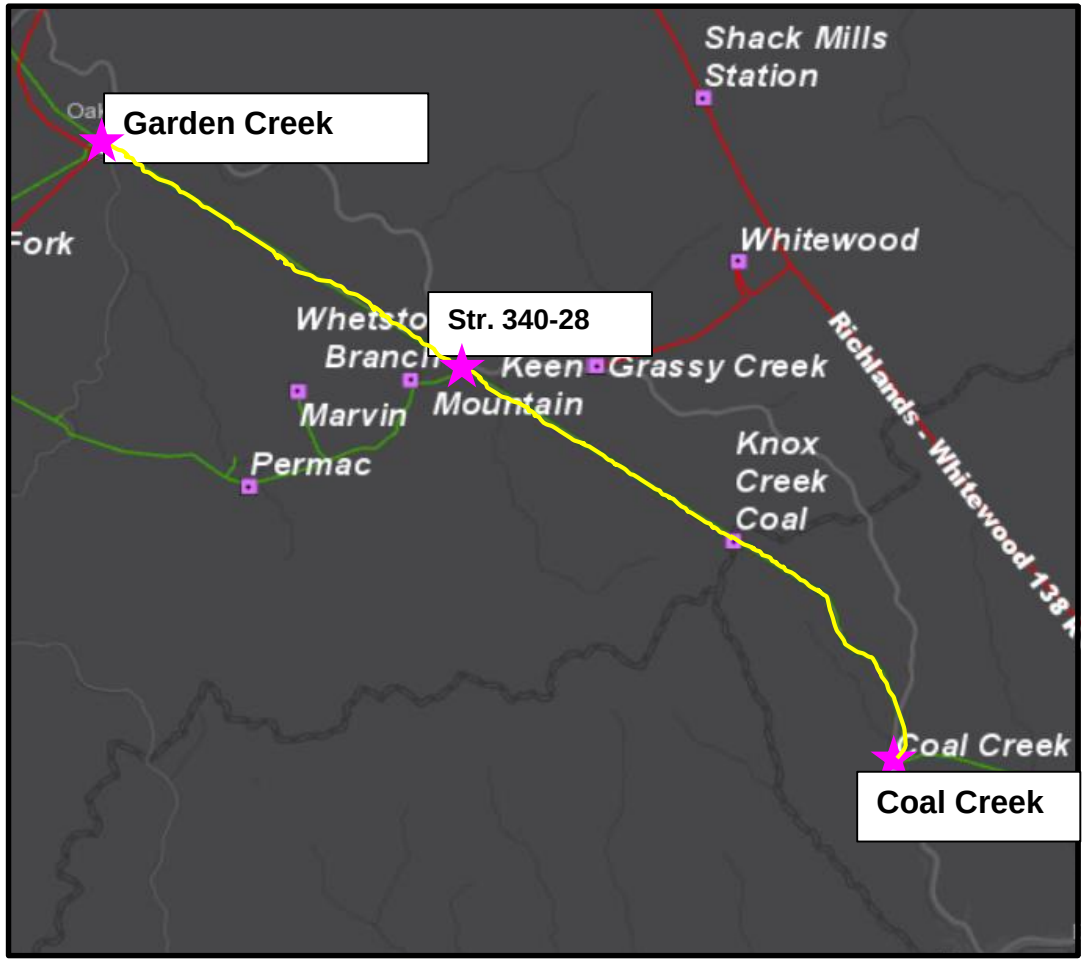
Original Presented Estimated Total Cost: $33.2 M
Updated Functional Estimated Total Cost: $28.66M

Required IS Date: 6/1/2023

Presented Projected IS Date: 6/1/2023
Updated Projected IS Date: 12/15/2023

Reason for the delay:

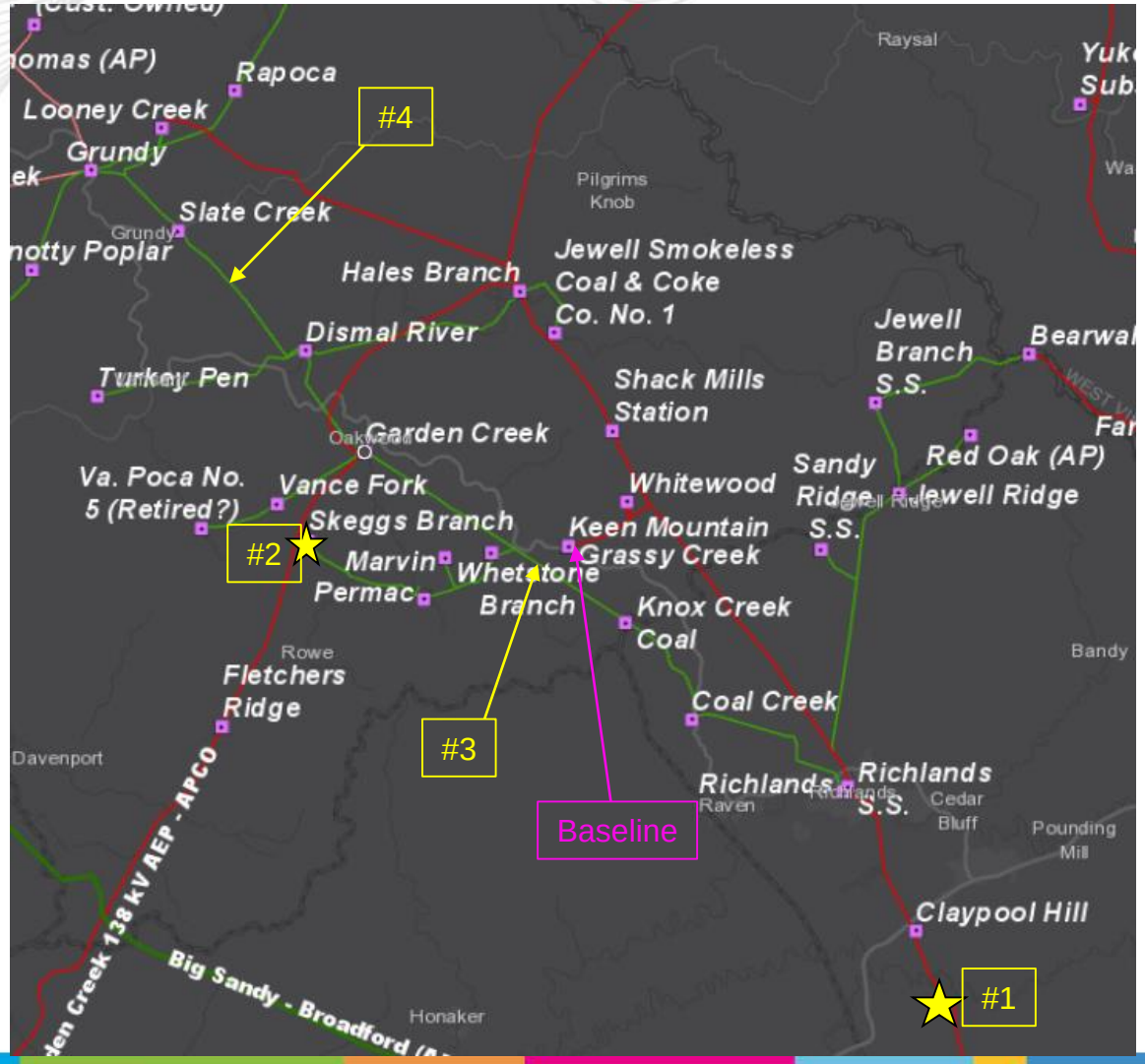
- The schedule does not allow adequate time to complete the bat portal netting during September/October of 2021. This cannot be shifted to the next survey window due to the start of construction in July of 2022 to meet the current in-service date.
- The schedule does not allow for time of year restrictions for tree clearing due to endangered bat species.



AEP Transmission Zone
B3139 – B3141, B3220 Replacement

Supplemental Needs identified in the area

1. Salmon substation (AEP-2021-AP003, Needs Meeting 1/15/2021)
2. Skeggs Branch Substation (AEP-2021-AP013, Needs Meeting 3/19/2021)
3. Garden Creek – Richlands – Skeggs Branch 69kV line (AEP-2021-AP014, Needs Meeting 3/19/2021)
4. Dismal River – Grundy – Looney Creek 69kV (AEP-2021-AP002, Needs Meeting 1/15/2021)

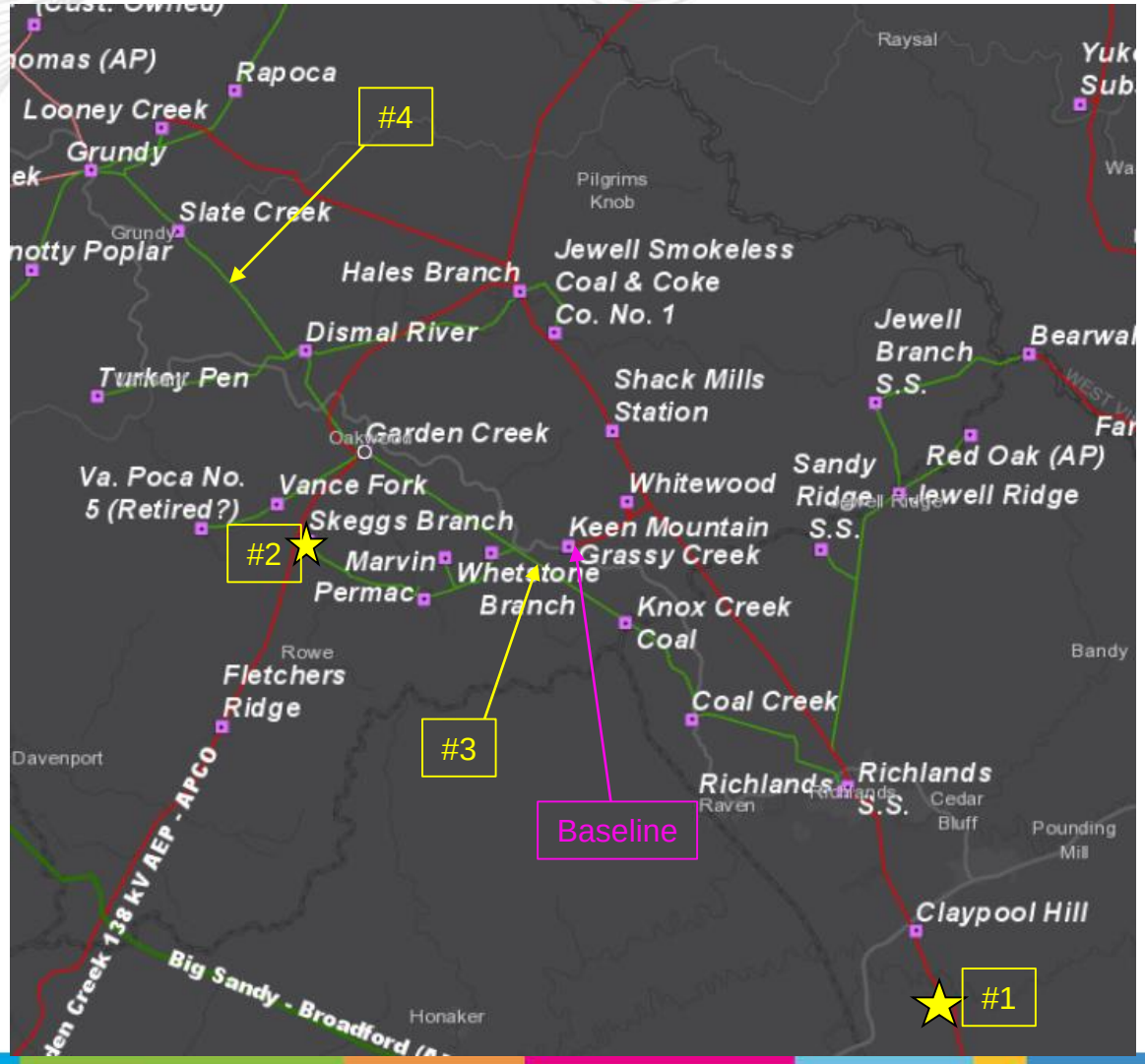


AEP Transmission Zone
B3139 – B3141, B3220 Replacement

Current B3139 –B3141 and B3220

Supplemental needs Addressed:

- Part of AEP-2021-AP014
  - Garden Creek – Coal Creek 69kVline section



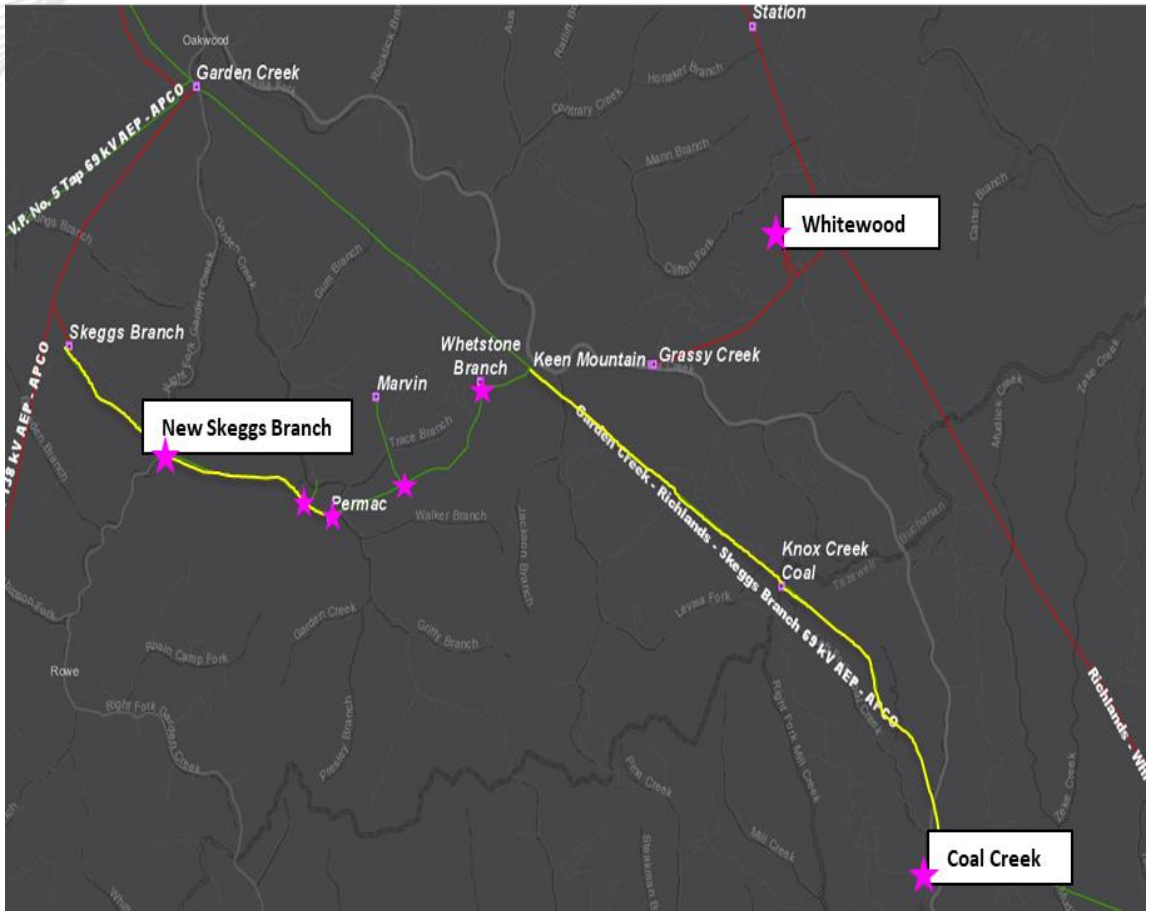
AEP Transmission Zone
B3139 – B3141, B3220 Replacement

Holistic Alternative:

- **Rebuild Skeggs Branch** substation in the clear as Coronado substation Establish New 138kV and 69kV Buses. Install 138/69kV 130 MVA transformer, 138kV Circuit Switcher, 69kV breaker. Retire Existing Skeggs Branch substation **$ 6.315 M**
- **New ~1.2 mi 138kV extension** to new Skeggs Branch substation location. **$ 4.62 M**
- **Install 46.1 MVAR Cap bank** at Whitewood substation along with a 138kV breaker. **$ 1.05 M**
- **Rebuild ~9 mi 69kV line** from new Skeggs branch station to Coal Creek 69kV line. **6-wire the short double circuit** section between Whetstone Branch and Str. 340-28 to convert the line to single circuit. **Retire** Garden Creek to Whetstone Branch 69kV line section. **$ 26.25 M**
- **Retire** Knox Creek SS. **$ 0.06 M**
- **Retire** Horn Mountain SS. This will be served directly from 69kV bus at New Skeggs branch Substation. **$ 0.05 M**
- **At Clell SS,** Replace (2) 600A POP Switches and Poles with single 2 Way 1200A POP Switch and Pole. **$ 0.34 M**
- **At Permac,** Replace 600A Switch and structure with 2 Way 1200A POP Pole Switch and pole. **$ 0.31 M**
- **At Marvin SS,** Replace 600A Switch and structure with 2 Way 1200A POP Pole Switch and pole**. $ 0.31 M**
- **At Whetstone Branch substation**, Replace 69KV 600A 2 Way POP Switch with 69KV 1200A 2 Way POP Switch. Remove 69KV to Skeggs Branch (Switch "22" POP). **$ 0.568 M**
- **At Garden Creek substation,** Remove 69KV Richlands (via Coal Creek) line (Circuit Breaker F and disconnect switches) and update relay settings. **$ 0.138 M**
- **Remote End work** at Clinch River substation. **$0.08 M**
- **Remote End work** at Clinchfield substation. **$0.08 M**

Total Estimated Cost: $40.171 M

Projected IS Date: 12/15/2023



Supplemental needs Addressed:

- AEP-2021-AP013: Skeggs Branch substation needs.
- Part of AEP-2021-AP014
  - N.O. at Permac station.
  - Improved sectionalizing capability for multiple substations (Twin Valley SS, Marvin, Clell) being hard tapped to 69kV Line or operated radially.
  - Three – terminals at Whetstone Branch.
  - Garden Creek-Coal Creek line condition
- Part of AEP-2021-AP003: Accommodates New Salmon substation load addition.

Cost Comparison: Solve the same baseline needs and additional supplemental needs

B3139 –B3140, B3220 estimated cost: $28.6 M
Additional Supplemental estimated cost: $17.42 M
Total estimated cost: $46.02 M

Projected IS Date: 12/15/2023

Baseline Alternative estimated cost: $40.13 M
Additional Supplemental estimated cost: $1 M
Total estimated cost: $41.13 M

Projected IS Date: 12/15/2023

Besides ~$5 M cost saving, the proposed alternative allows for less future work and mitigates duplicity of the Transmission line and substation work in a rugged and mountainous terrain. By rebuilding the line and adding sectionalizing to the Skeggs Branch-Whetstone line as proposed in the alternate, the line between Garden Creek and Whetstone can be retired completely. All additional supplemental work not addressed by the scope change will be presented through the M-3 process as those solutions are developed.

Cancelation: ATSI Transmission Zone

- **Reason for cancellation:** Updated analysis show voltage levels within acceptable range due to shift in flows caused by an upgrade on the Leroy Center – Mayfield 345 kV line (B3152).

- **Original recommendation from 9/10/2015:**

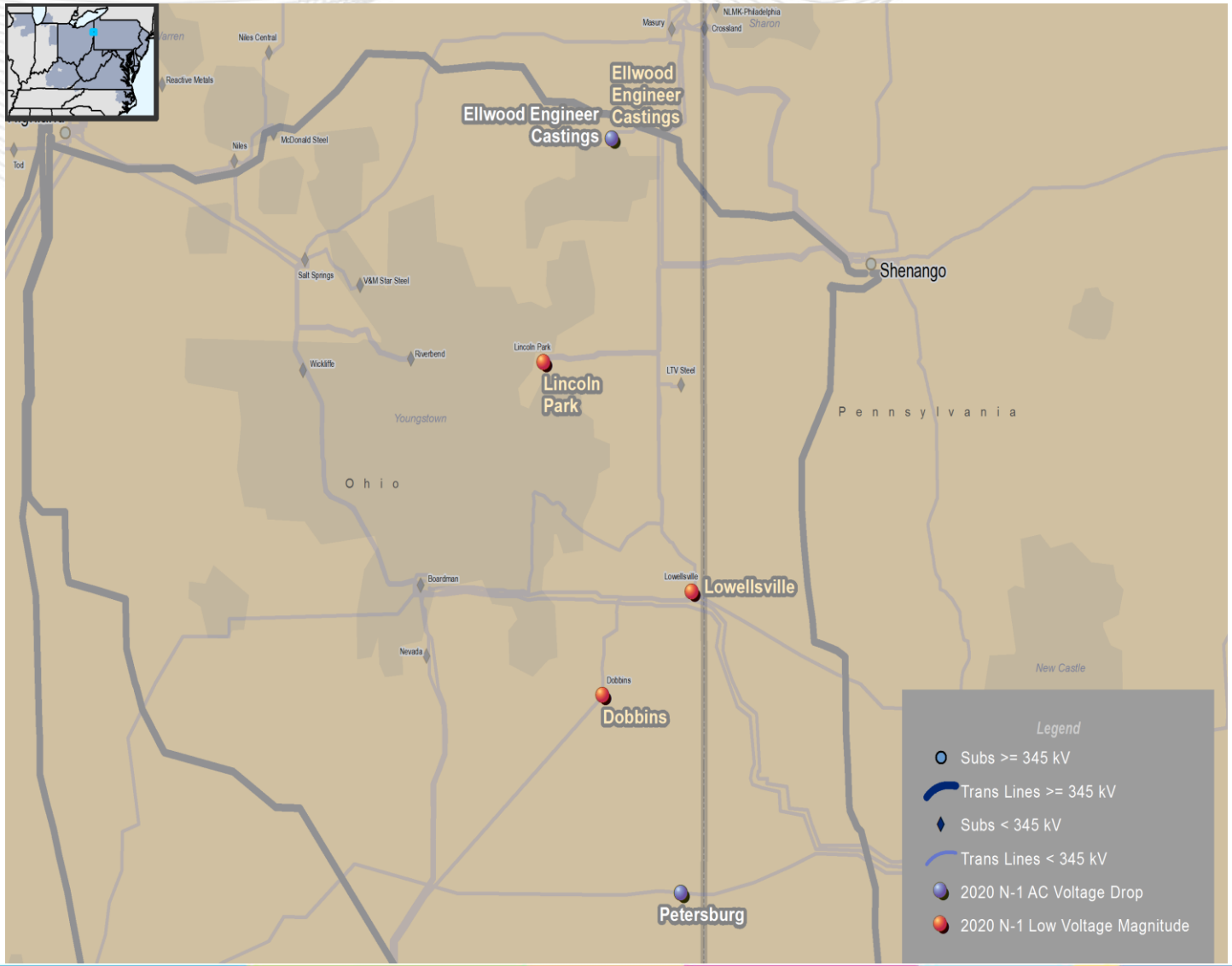
- **Baseline Voltage Violation (FG# N1-VM2 - VM13, N1-VD2 and VD3):**
- Voltage magnitude and drop violation on the Dobbins, Ellwood, Lincoln Park, Lowellsville and Pennant 138 kV substations for several contingencies.

- **Alternatives considered:**
  - 2015_1-4B ($1.015 M)
  - 2015_1-8AA ($12 M)
  - 2015_1-8AB ($6 M)
  - 2015_1-8AC ($6 M)

- **Recommended Solution:**
  - Install 26.4 MVAR capacitor and associated terminal equipment at Lincoln Park 138 kV substation. (2015_1-4B)
    (B2675)

- **Estimated Project Cost:** $1.015 M

- **Required IS Date:** 6/1/2020



Cancellation: APS Transmission Zone

Reason for cancellation: This project is being cancelled as the violations will need to go through the competitive window. The violations will be posted in the 2021 Window 1 (B3229).

Process Stage: First Review

Criteria: APS N-1-1 Voltage Drop Criteria

Assumption Reference: 2025 RTEP assumption

Model Used for Analysis: 2025 RTEP Winter

Problem Statement: In the 2020 RTEP 2025 Winter N-1-1 analysis the loss of the Milesburg - Moshannon 230 kV line followed by the loss of the Shingletown #82 230-46 kV transformer results in a voltage drop violation at the Shingeltown 230 kV bus of 12.5%.

Violations were posted as part of the 2020 Window 1: FG# APS-VD45, APS-VD46

Existing/Proposed Facility Ratings:

(SN/SE/WN/WE)	Dale Summit - Shingletown	Lewistown-Shingletown	Shawville-Shingletown
Before	489/554/558/612	520/621/619/710	489/554/558/612
After	617/754/699/894	546/666/619/790	546/666/618/790

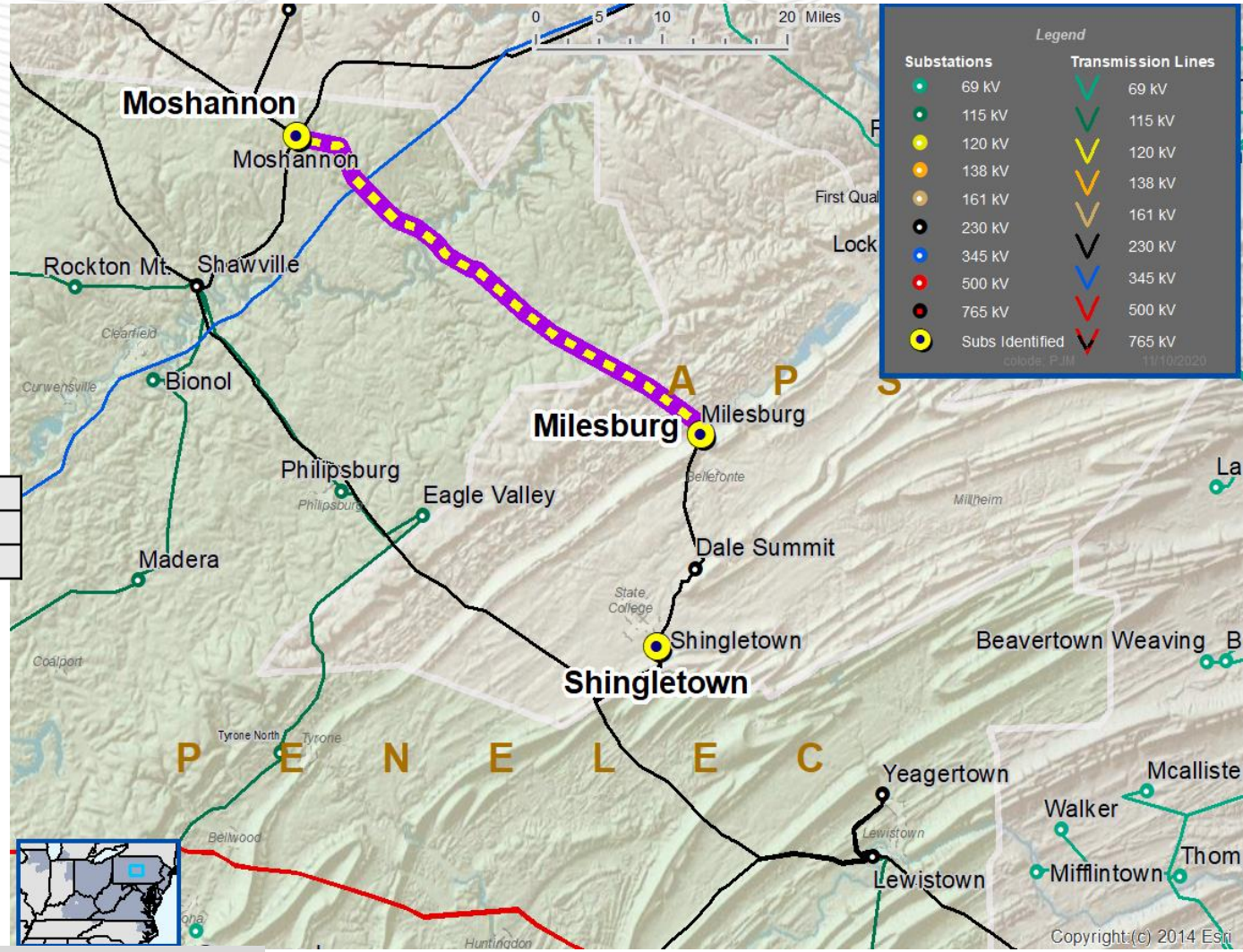
Proposed Solution:
At Shingletown Substation (APS Zone) convert the 230 kV station to a six breaker ring bus. Re-use and re-install the existing capacitor. Install SCADA control. Install new wave traps on Shawville and Dale Summit line exits.

At Shawville Substation (PN Zone) replace the wave trap and substation conductor.

At Lewistown Substation (PN Zone) install direct transfer trip relaying to be compatible with the new Shingletown ring bus relaying.
Estimated Cost: $12.2 M

Alternatives: N/A

Required In-Service: 12/31/2025



SN / SE / WN / WE: Summer Normal / Summer Emergency / Winter Normal / Winter Emergency

2021 RTEP

- Current schedule (currently targeting the schedule below)
  - Window 1
    - Opened July 2, 2021
    - Anticipated Close: August 31, 2021
    - Post updates to models and violations as required

2021 SAA Proposal Window to Support NJ OSW

2021 SAA Proposal Window Scope

- PJM is soliciting project proposals to build the necessary transmission to meet New Jersey's goal of facilitating the delivery of a total of 7,500 MW of offshore wind through 2035
  - Anticipated Schedule
    - Open Window April 15
    - Pre-bid meeting May 5
    - Close Window September 17 (updated)

Contact

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Reliability Analysis Update

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Revision History

Version No.	Date	Description
1	8/5/2021	• Original slides posted
2	8/6/2021	• Slide #6, Added Split costs and updated the total estimated cost • Slide #7, Update the total estimated cost (consistent with Slide #6)
3	8/6/2021	• Added Baseline number in slide 9
4	8/27/2021	• Slide #6, Corrected total estimated cost