



# Market Efficiency Update

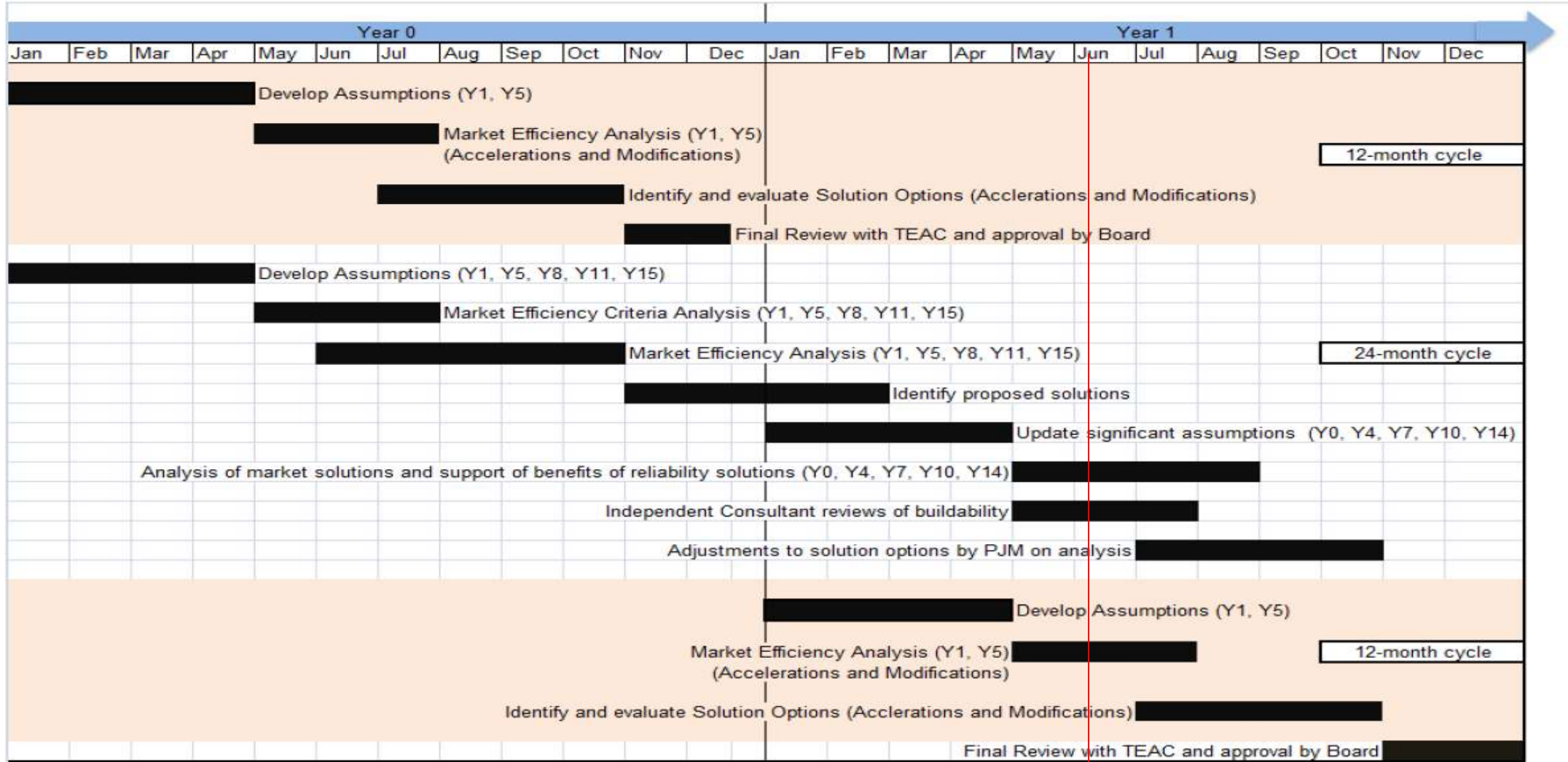
Transmission Expansion Advisory Committee  
June 8, 2017



- Where we are
- Analysis strategy
- Interregional Projects
- RPM Projects
- Next Steps



# Where we are - Market Efficiency Timeline





## Where we are – High level Summary

- Long term proposal window: Closed on Feb 28, 2017 (completed)
- Mid-cycle update of major assumptions: Jan 2017 – June 2017 (90% completed)
  - Load forecast, Fuel and Emissions forecasts, Generation expansion, Network topology
    - Only updating the most significant changes, not full update
  - AEP Supplemental project and RPM \$0 cost projects are included
    - Target posting Mid June, 2017
- Analysis of proposed solutions: June 2017 - Oct 2017 (in-progress)
  - Independent consultant review of cost and ability to build
  - Review of analysis with TEAC: Jun 2017 - Nov 2017
- Determination of final projects: Dec 2017
  - Final review with TEAC and Board approval
  - Projects may be approved earlier if analysis and review complete

- **PJM & MISO proposal windows closed February 28**
- **96 Market Efficiency Proposals**
  - 52 Greenfield
    - \$15.8M - \$371.3M
  - 44 Upgrades
    - \$0 - \$192.07M
- **20 proposing entities** (including 6 combinations of joint proposals)
- **8 interregional proposals received by both RTOs**
  - 3 upgrades
  - 5 greenfield
  - 6 proposing entities
  - Cost range \$1 – 198 Million



- **Strategy**

- Interregional projects will be analyzed first since interregional coordination is required
  - Both energy and any capacity benefits will be examined
  - RPM projects impacting interregional facilities will be included in the analysis
- PPL projects will be analyzed next
- Baltimore projects will be analyzed after PPL
- Any slam dunk type projects maybe analyzed in parallel with the above
  - Slam dunk is generally classified as low cost upgrades, with significant B/C, and with minimum competition
- All other regional projects will be analyzed last

- **Goal**

- PJM efforts for interregional, PPL and slam dunks to be presented at Oct, 2017 board meeting
- Baltimore and other projects to be presented at Dec, 2017 board meeting

# Interregional Projects

- 7 Projects:**

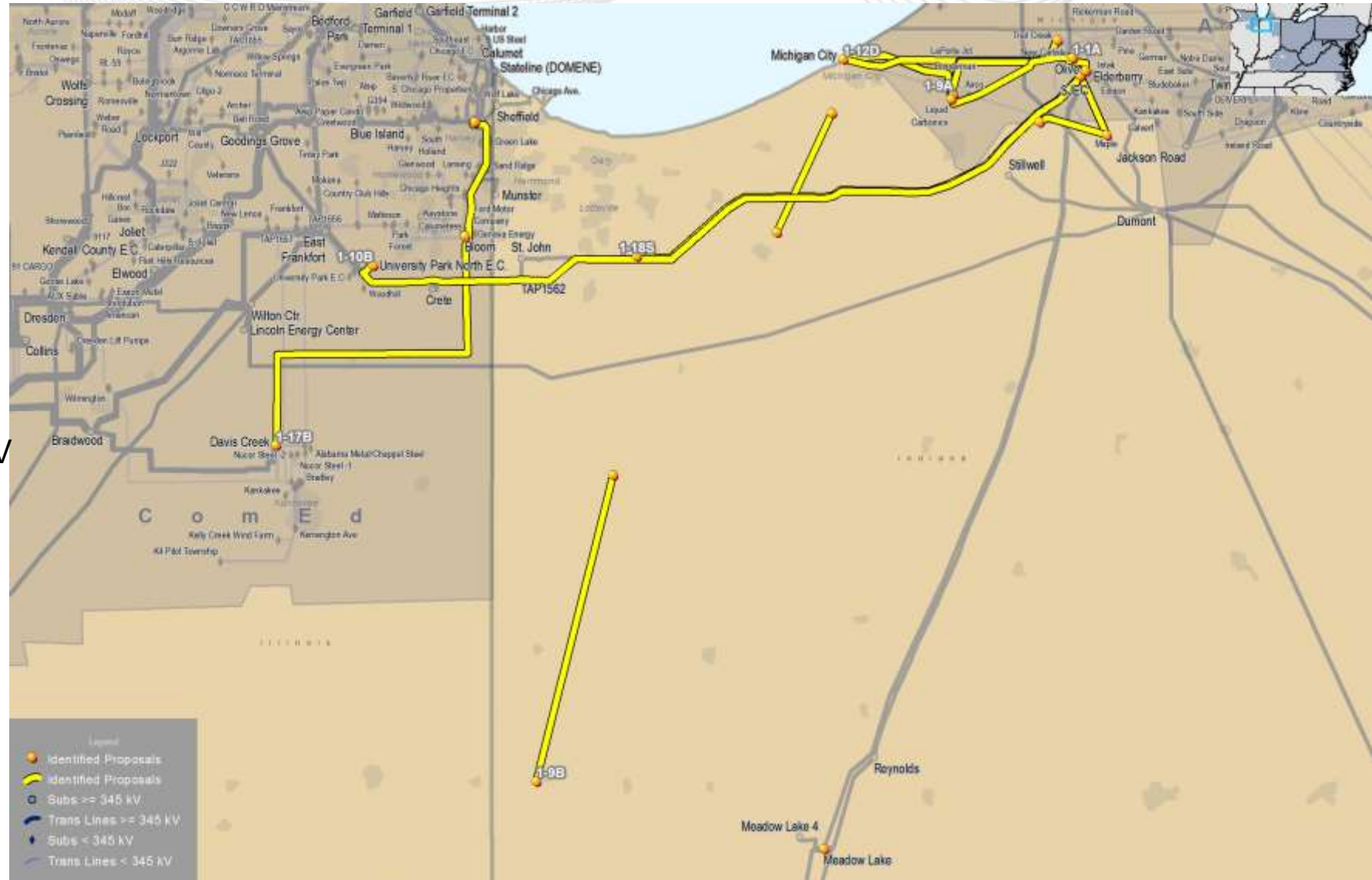
- 1-1A, 1-9A, 1-9B, 1-10B, 1-12D, 1-17B, 1-18S

- Cost:**

- From \$1.00 M to \$197.97 M

- ME Constraints:**

- BOSSERMAN - OLIVE 138 kV
- PAXTON - GIFFORD 138 kV





- AEP has planned a supplemental project that impacts the Olive – Bosserman market efficiency constraint
- Supplemental projects are:
  - Not needed for reliability criteria, market efficiency, or operational performance
  - Funded wholly by Transmission Owner
  - No PJM approval needed
- This supplemental project is included in the Market Efficiency base case and all submitted projects to address Olive-Bosserman constraint will be evaluated under this assumption

**Supplemental Project: Olive-Bosserman 138 kV**  
**Previously Presented at 4/13/2017 TEAC and 4/21/2017 Western SRTEAC**

Problem Statement/Driver:

The LaPorte Junction - New Carlisle 34.5 kV circuit has a vintage from 1930s and is wood pole construction. Between 2010-2015, ~2 million customer minutes of interruption (CMI) were recorded at Silver Lakes station. There are 183 open conditions, 95 of which are category A conditions on the ~20 mile long line.

Indiana and Michigan Power Company has requested to convert Silver Lake and Springville to 138 kV operation.

This project would also resolve congestion on the Olive-Bosserman 138 kV identified during MISO-PJM JOA market efficiency studies in addition to addressing the a potential overload identified on this facility during the PJM 2021 RTEP. It was submitted (without the new distribution station additions) to the PJM reliability and market efficiency windows.

Recommended Solution:

Construct two 138/12 kV distribution stations, Bootjack and Marquette, to replace Silver Lake 34.5 kV and Springville 69 kV stations. (S1279.1)

Cut the existing Olive – Bosserman line into New Carlisle station. (S1279.2)

Rebuild sections of the LaPorte Junction-New Carlisle/New Buffalo 34.5 kV line to 138 kV to establish Bootjack-Olive 138 kV circuit. (S1279.3)

Install a three way phase over phase switch, called Kuchar, near Liquid Carbonics station and construct a new 138 kV line between Bootjack and Kuchar. (S1279.4)

Construct a 138 kV extension to Marquette station by tapping the Bosserman-Liquid Carbonics 138 kV line. (S1279.5)

Alternatives:

Rebuild ~20 mile long New Carlisle – LaPorte Junction 34.5 kV utilizing existing line ROW corridor. This alternative was not selected because it did not provide the operational flexibility & efficiency and customer service benefits provided by the preferred option. Estimated cost: ~\$32M

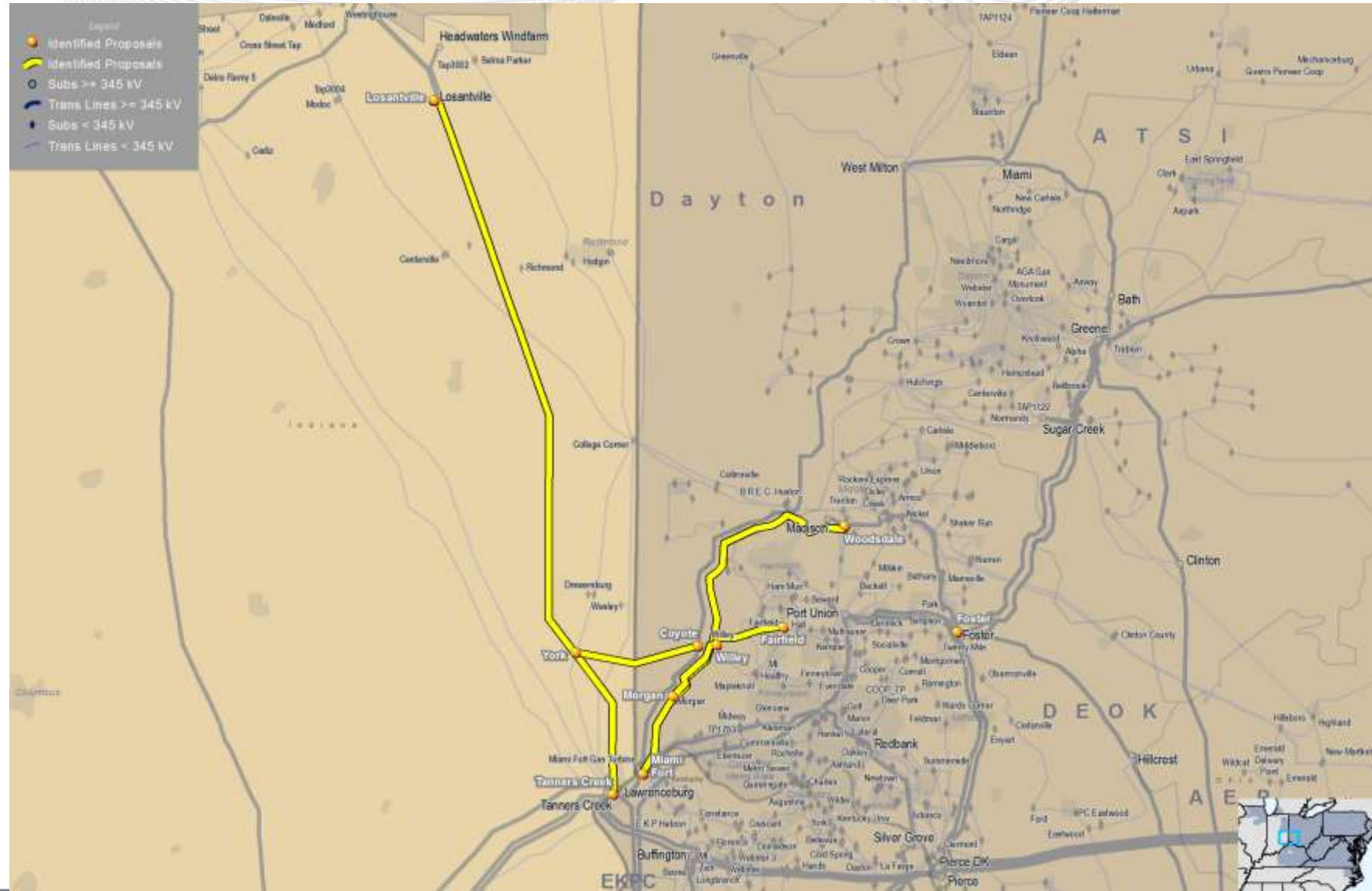
Cost Estimate: \$36.786M

Projected IS date: 12/1/2019

Status: Conceptual



- **1 Project:**
  - 1-13H
- **Cost:**
  - \$71.88 M
- **ME Constraint:**
  - TANNERS CREEK - MIAMI FORT 345 kV
- **2020/2021 RPM BRA Results**
  - DEOK LDA binding with Tanners Creek - Miami Fort 345KV as limiting CETL constraint



- PJM will determine its benefits based on PJM regional process and metrics
- Once PJM's analysis is concluded results will be shared with MISO
  - MISO will share its analysis efforts with PJM
- RTOs will compute B/C ratios
  - Cost shall be divided to each RTO based on pro rata share of benefits
  - Each RTO will compute B/C based on its regional formula
    - Use 15 year stream of benefits
    - Use average discount rate to move benefits to in service year
      - PJM: 7.4%, MISO: 7.1% and **Average: 7.25**
- Projects must meet the B/C criterion in each RTO
- RTOs will identify the best solution

**Project ID: 201617\_1-1A**

Proposed by: WPPI

Proposed Solution: Interregional  
 Provide a second New Carlisle-Olive 138 kV circuit. Upgrade substation equipment at New Carlisle and Olive substations.

kV Level: 138 kV

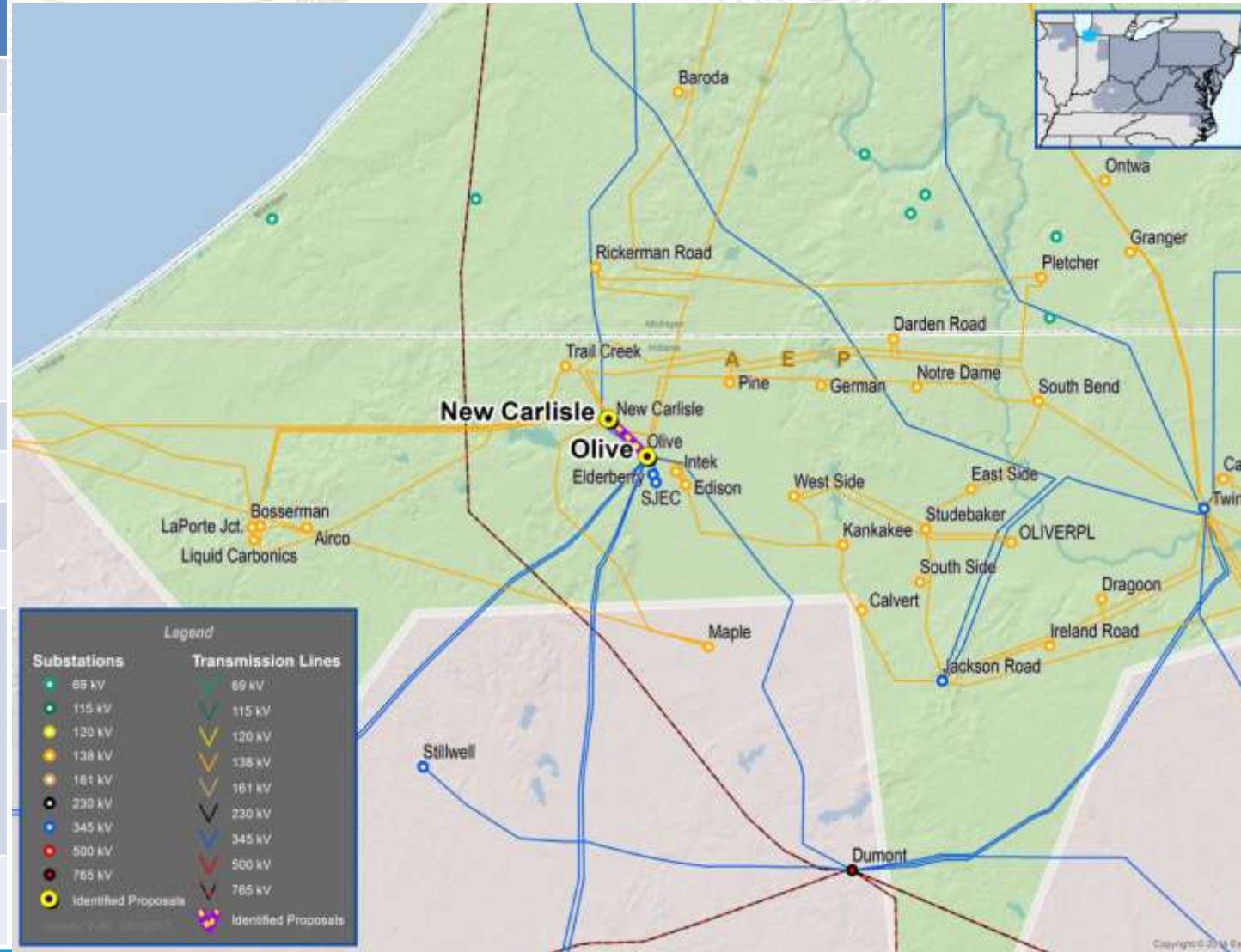
In-Service Cost (\$M): \$2.5

In-Service Date: 2019

Target Zone: AEP

ME Constraints:  
 OLIVE - BOSSERMAN 138 kV

Notes: See supplemental project Olive – Bosserman discussion in the Reliability Update presentation at April TEAC.



## Project ID: NIPSCO 1-9A

Proposed by: NIPSCO

Proposed Solution: Interregional Reconductor existing NIPSCO line section between AEP Bosserman and Olive 138 kV substations. Reconductor existing NIPSCO line section between AEP Bosserman and New Carlisle 138 kV substations.

kV Level: 138 kV

In-Service Cost (\$M): \$8.00

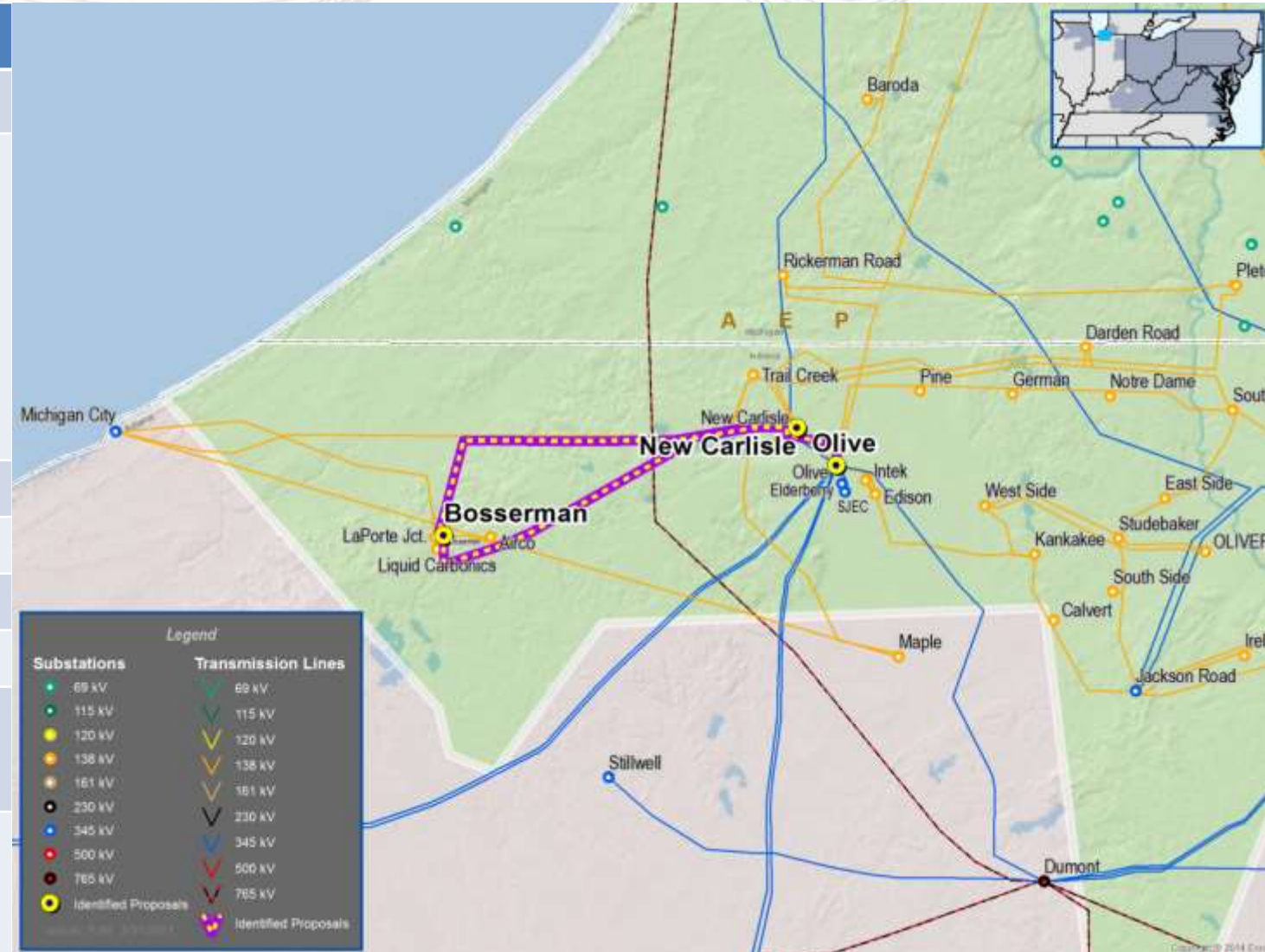
In-Service Date: 2019

Target Zone: AEP NIPSCO

ME Constraints:

OLIVE - BOSSERMAN 138 kV

Notes: See supplemental project Olive – Bosserman discussion in the Reliability Update presentation at April TEAC.



**Project ID: 201617\_1-9B**

Proposed by: NIPSCO

Proposed Solution: Greenfield, Interregional  
 New NIPSCO line section between Thayer and Morrison 138 kV substations.

kV Level: 138 kV

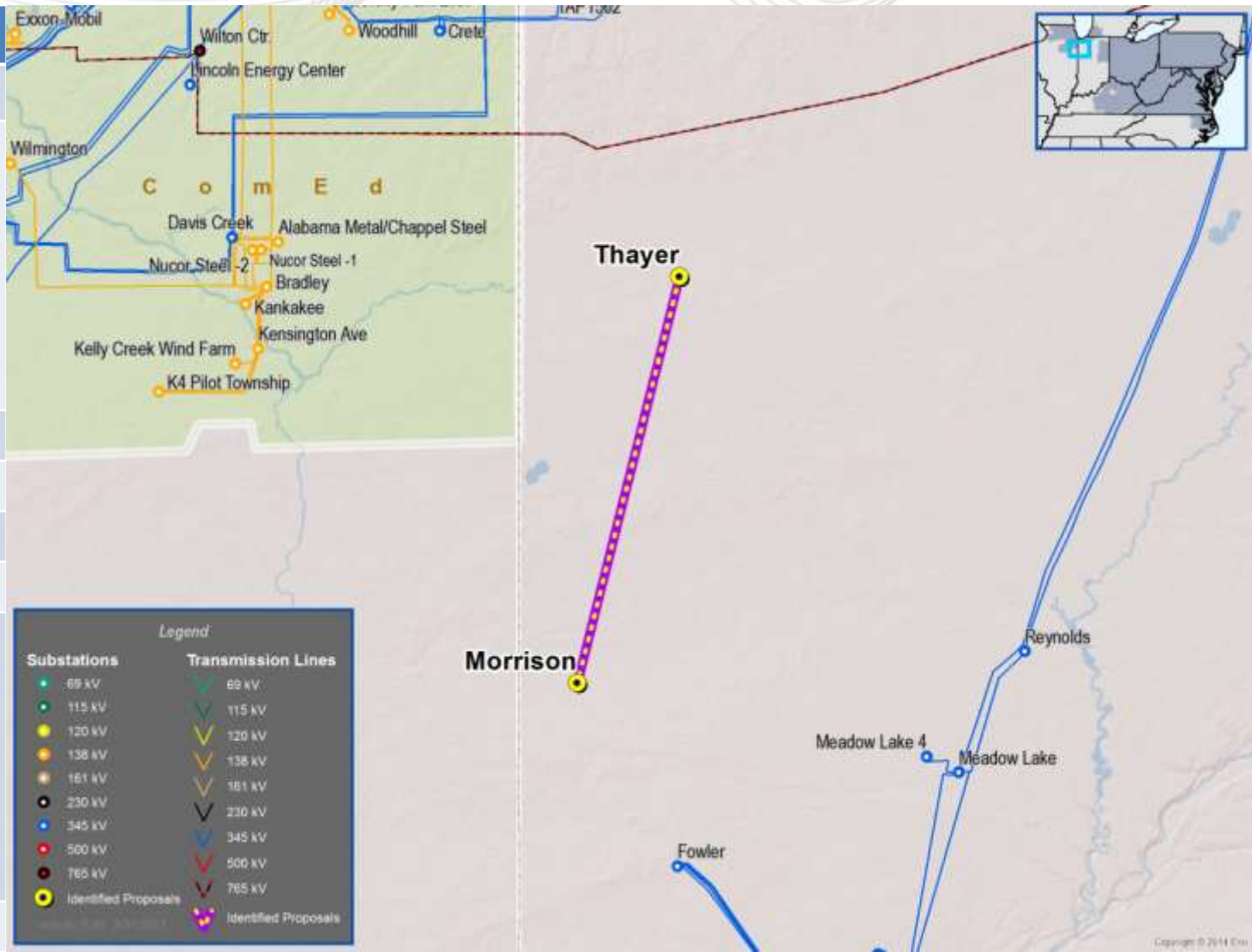
In-Service Cost (\$M): \$42.50

In-Service Date: 2022

Target Zone: AML ComEd NIPSCO

ME Constraints:  
 PAXTON - GIFFORD 138 kV

Notes:



**Project ID: 201617\_1-10B**

Proposed by: Nextera

Proposed Solution: Greenfield, Interregional  
 Cut the University Park - Olive 345 kV and tie into a new 345/138 kV substation (Rolling Prairie). Cut the Maple - New Carlisle 138 kV and Maple - LNG 138 kV lines and tie into the new substation.

kV Level: 138 kV

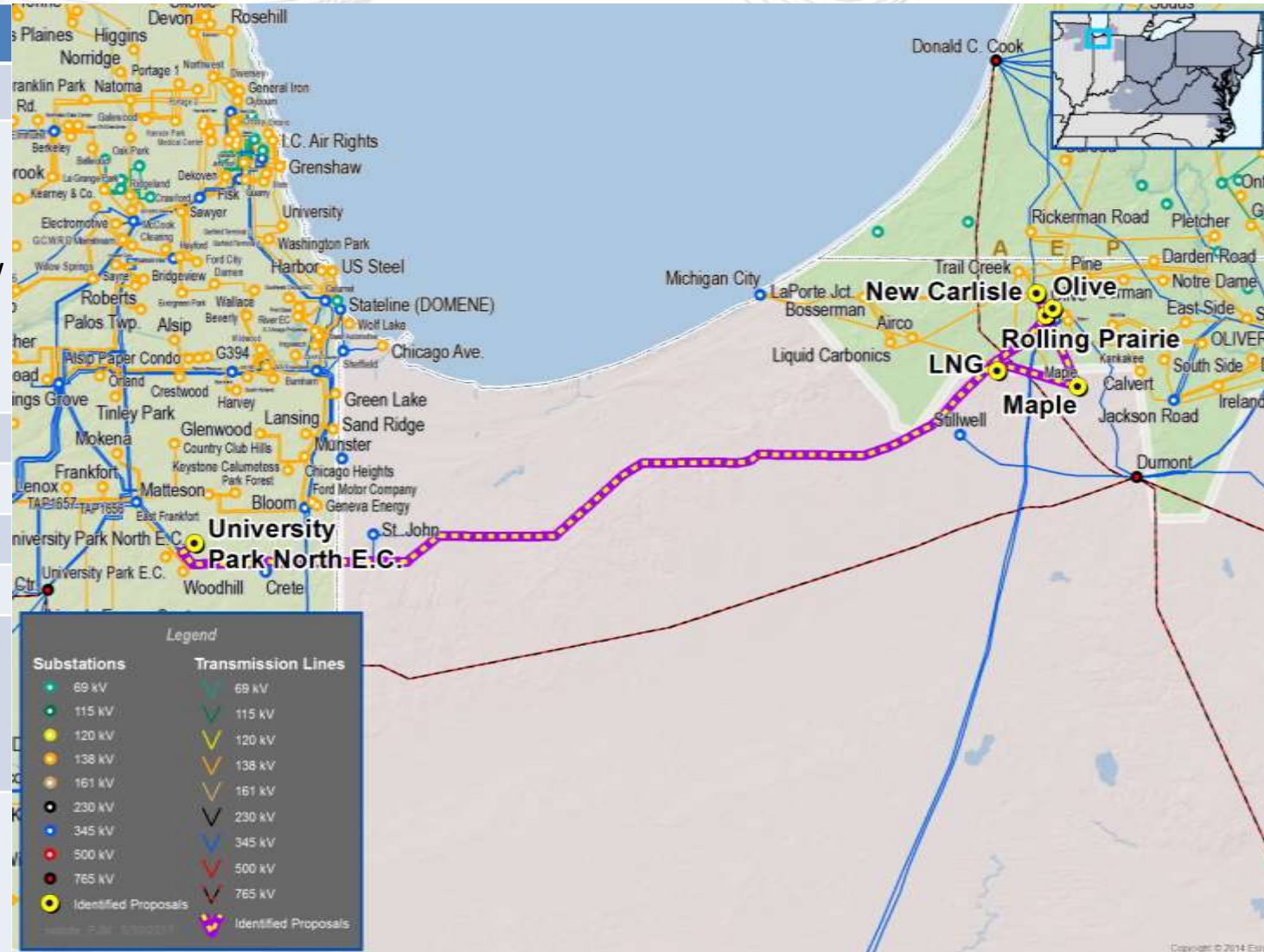
In-Service Cost (\$M): \$19.2

In-Service Date: 2021

Target Zone: AEP

ME Constraints:  
 BOSSERMAN - OLIVE 138 kV

Notes: Notes: See supplemental project Olive – Bosserman discussion in the Reliability Update presentation at April TEAC.





## Project ID: 201617\_1-12D

Proposed by: AEP NIPSCO

Proposed Solution: Interregional

Terminate Olive-Bosserman 138 kV line at New Carlisle. Rebuild the 34.5 kV line between New Carlisle and Silver Lake as double circuit 138 kV, operating one circuit as 34.5 kV while extending the other at 138 kV with a new circuit to Liquid Carbonics. Establish an Olive-Liquid Carbonics-Bosserman 138 kV line. Rebuild the Michigan City-Trail Creek-Bosserman 138 kV.

kV Level: 138 kV

In-Service Cost (\$M): \$41.86

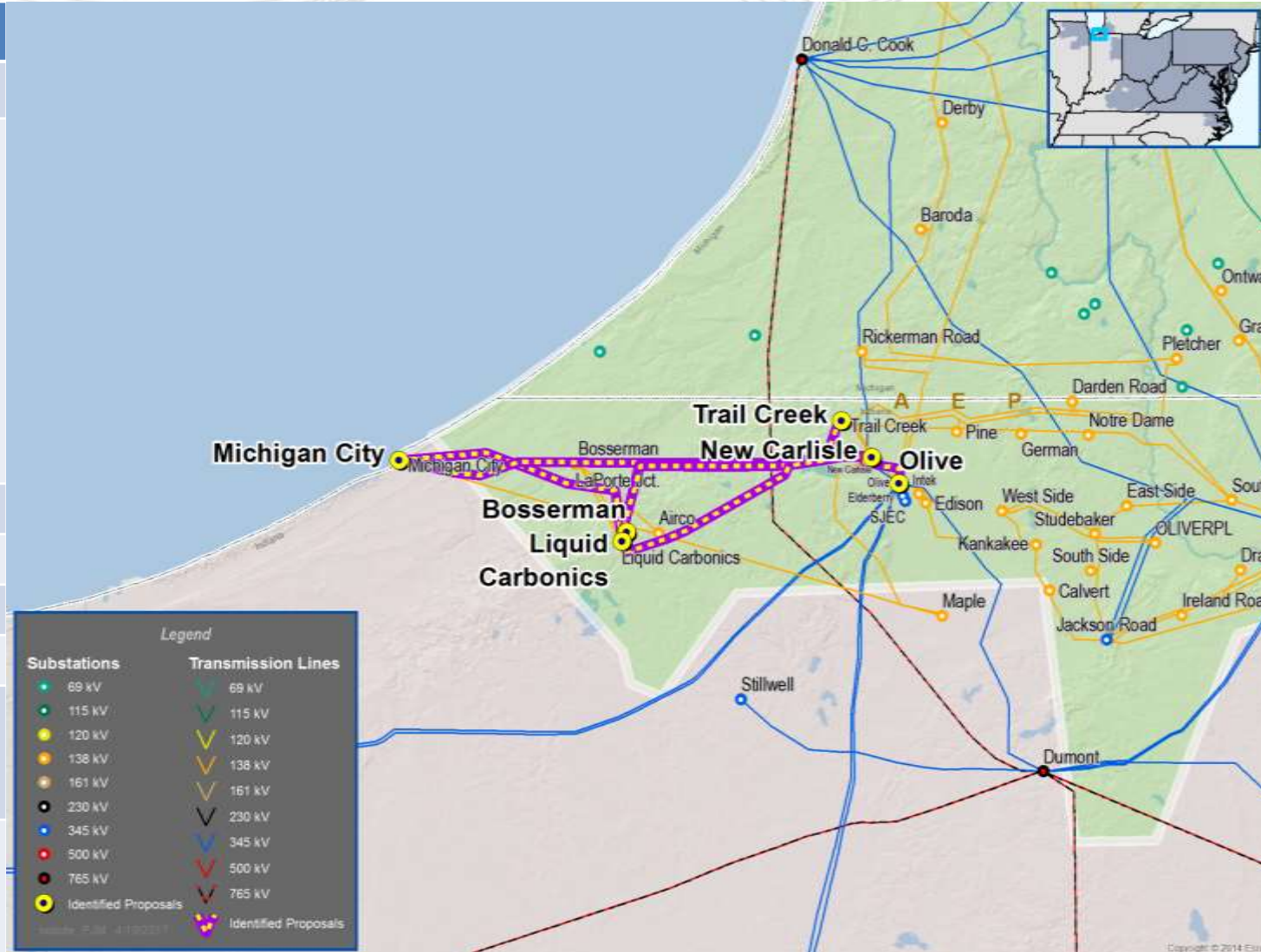
In-Service Date: 2021

Target Zone: AEP

ME Constraints:

OLIVE - BOSSERMAN 138 kV

Notes: See supplemental project Olive – Bosserman discussion in the Reliability Update presentation at April TEAC.



**Project ID: 201617\_1-13H**

Proposed by: Transource

Proposed Solution: Greenfield, Interregional  
 Tap the Tanners Creek - Losantville 345 kV line and build a new 345 kV switchyard (York). Tap the Miami Fort - Woodsdale 345 kV line and build a new 345/138 kV substation (Coyote) next to Wiley 138kV switchyard. Build a new 345 kV line between York and Coyote stations. Expand Wiley 138 kV switchyard by tying the Coyote 345/138 kV transformer into the Wiley 138 kV yard. Loop the Morgan-Fairfield 138 kV line into Wiley 138 kV station. Install a new 345/138 kV transformer at Foster substation.

kV Level: 138/345 kV

In-Service Cost (\$M): \$71.89

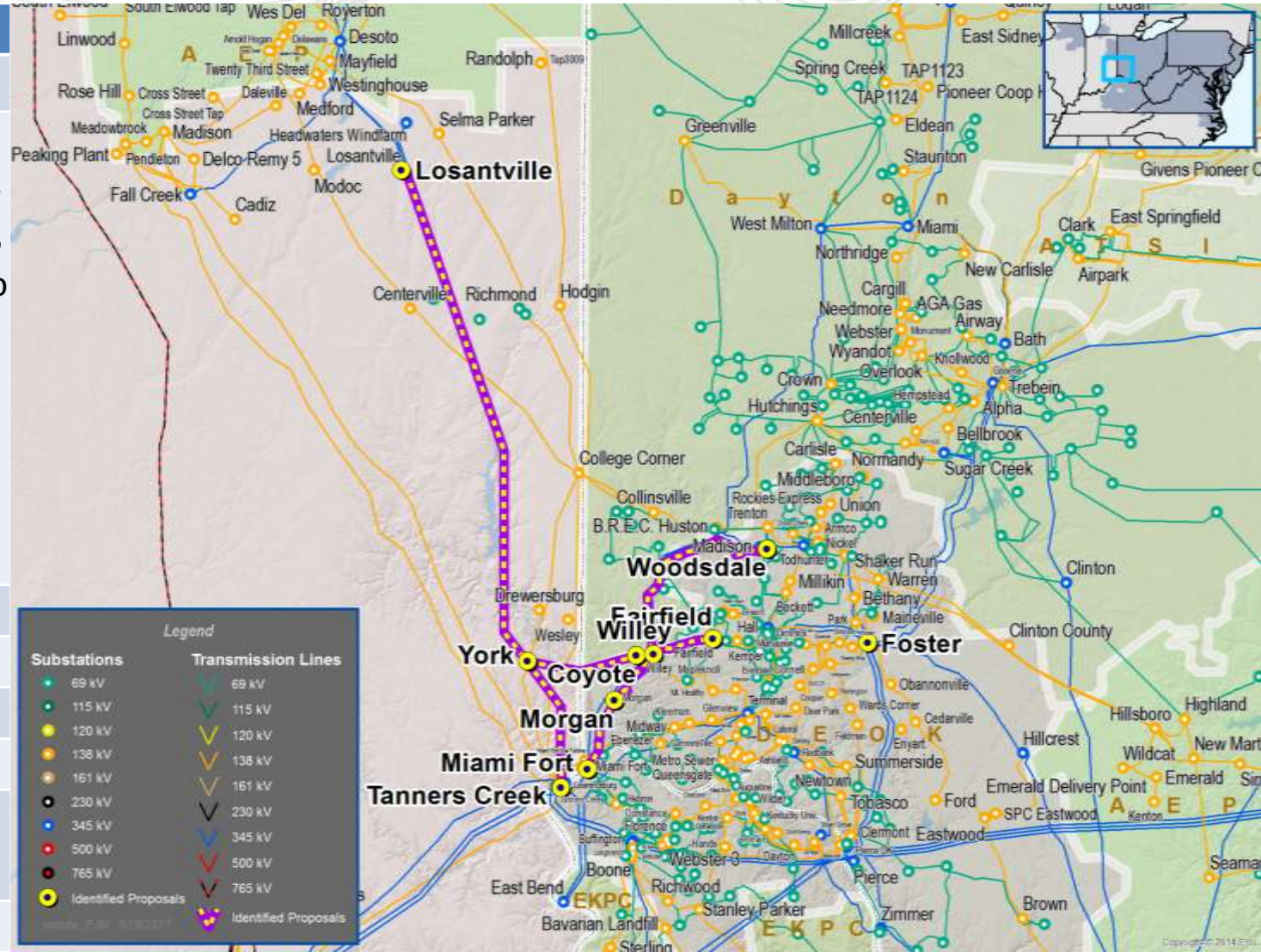
In-Service Date: 2021

Target Zone: DEOK

ME Constraints:

TANNERS CREEK - MIAMI FORT 345 kV

Notes:



**Project ID: 201617\_1-17B**

Proposed by: AEP Exelon

Proposed Solution: Greenfield, Interregional  
 Build a new 345 kV switchyard (Pike Creek). Build a new Meadow Lake - Pike Creek 345 kV double circuit line. Loop the Bloom - Davis Creek 345 kV line and Burnham - Davis Creek 345 kV line into Pike Creek switchyard.

kV Level: 345 kV

In-Service Cost (\$M): \$197.97

In-Service Date: 2021

Target Zone: ComEd

ME Constraints:

OLIVE - BOSSERMAN 138 kV + RPM Benefits

Notes: See supplemental project Olive – Bosserman discussion in the Reliability Update presentation at April TEAC.



## Project ID: 201617\_1-18S

Proposed by: Northeast Transmission Development

Proposed Solution: Greenfield, Interregional  
 Tap the Green Acres - Olive 345 kV line and build a new 345/138 kV substation (Coffee Creek). Loop the Flint Lake to Luchtman Road 138 kV line into Coffee Creek.

kV Level: 138/345 kV

In-Service Cost (\$M): \$17.4

In-Service Date: 2021

Target Zone: AEP

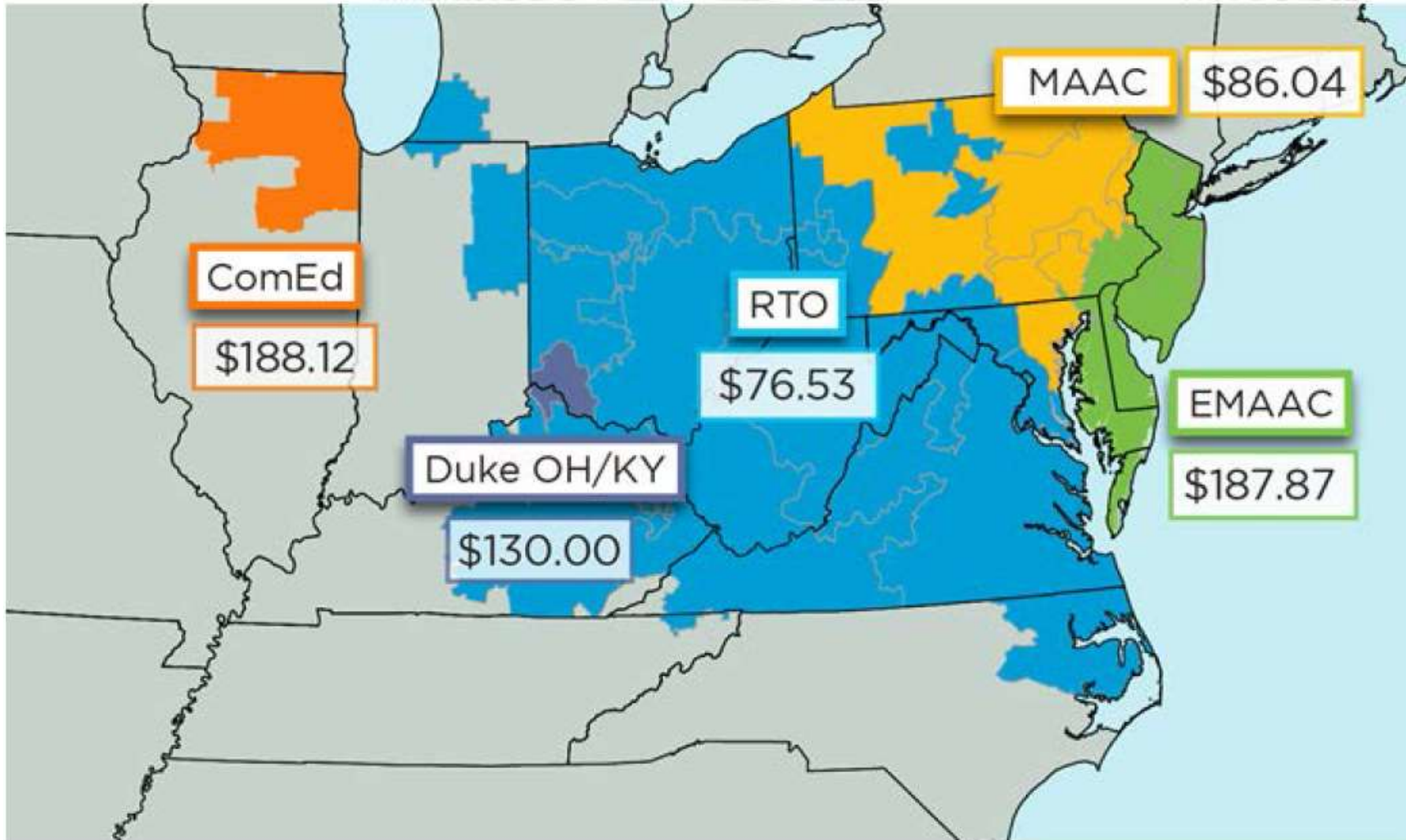
ME Constraints:  
 OLIVE - BOSSERMAN 138 kV

Notes: See supplemental project Olive – Bosserman discussion in the Reliability Update presentation at April TEAC.

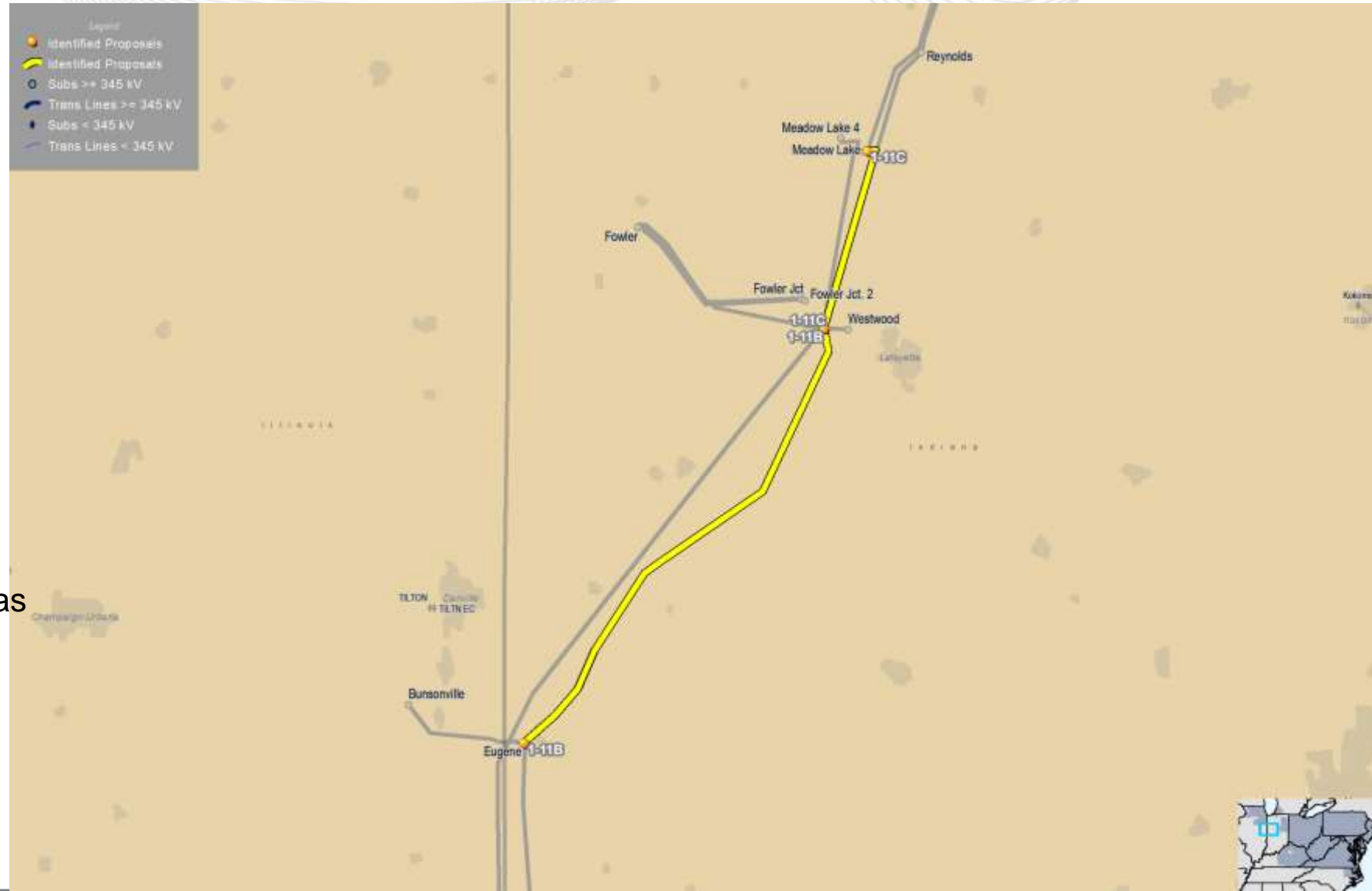


# RPM Projects

- The Reliability Pricing Model Benefit component of the Benefit/Cost Ratio:
  - Evaluates capacity market benefits of a proposed market efficiency project
  - Reliability Pricing Benefit for Regional Projects =  $[.50] * [\text{Change in Total System Capacity Cost}] + [.50] * [\text{Change in Load Capacity Payment}]$
  - Reliability Pricing Benefit for Lower Voltage Projects =  $[1.0] * [\text{Change in Load Capacity Payment}]$
- RPM Benefits Study Process:
  - Determine if upgrades impact CETL values
  - Run RPM auction for multiple study years using updated CETL values
  - Measure Benefits for 15 year period
- Total Benefits = Energy Benefits + RPM Benefits



- **2 Projects:**
  - 1-11B, 1-11C
- **Cost:**
  - \$ 0 Cost
  - Will be included in base case
- **ME Constraints:**
  - EUGENE - DEQUIN 345 kV
  - DEQUIN - MEADOW 345 kV
- **2020/2021 RPM BRA Results**
  - COMED LDA binding with Eugene - Dequin 345 kV line as limiting CETL constraint
- **Note:**
  - These proposals are accelerations the previously approved baseline projects b2776 and b2777





**Project ID: 201617\_1-11B**

Proposed by: AEP

**Proposed Solution:**  
Accelerate the previously approved baseline project to reconductor the Dequine-Eugene 345 kV and substation work at Dequine.

kV Level: 345 kV

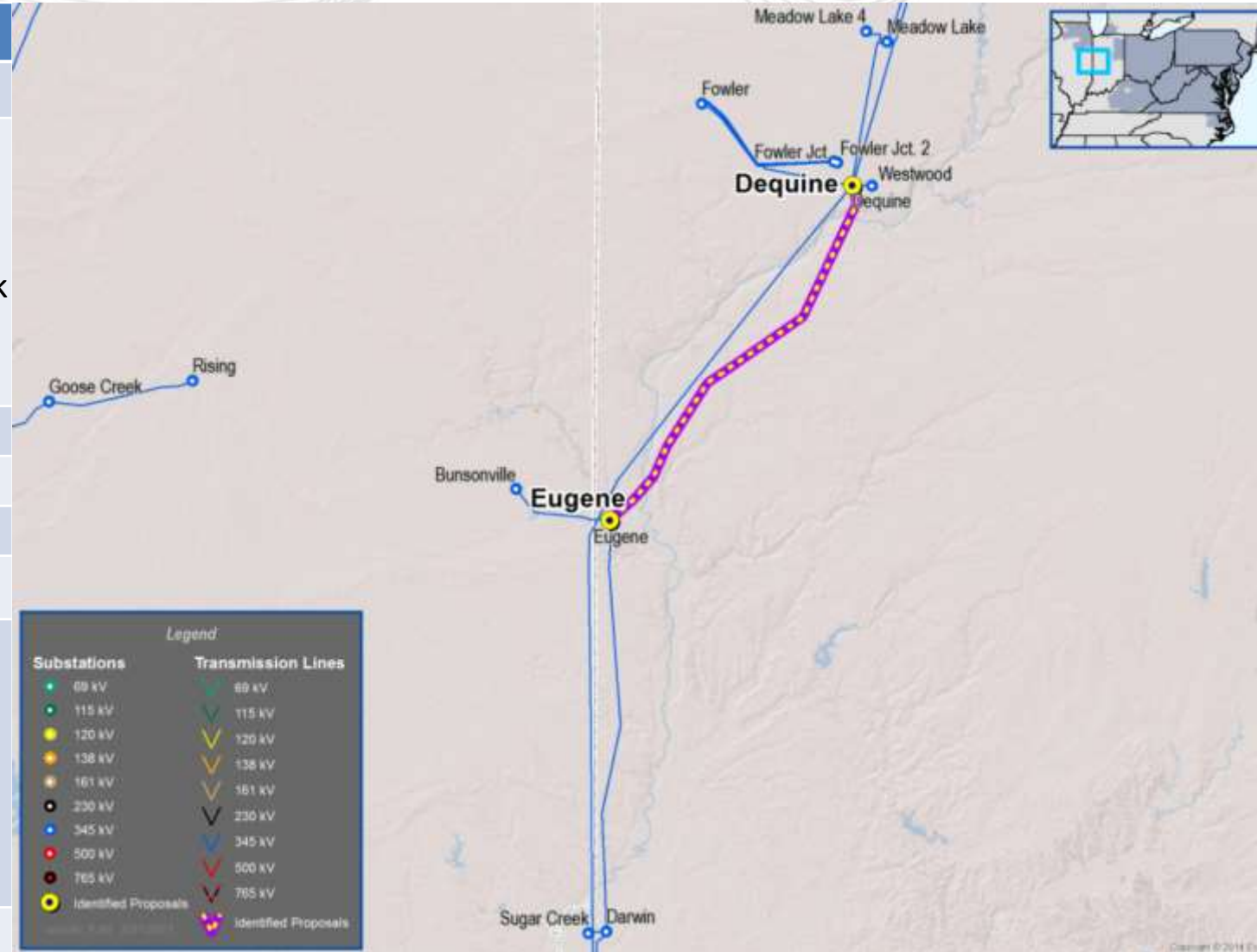
In-Service Cost (\$M): 0

In-Service Date: 2019

Target Zone: AEP

**ME Constraints:**  
EUGENE - DEQUIN 345 kV + RPM Benefits

Notes: See approved baseline upgrade b2777



**Project ID: 201617\_1-11C**

Proposed by: AEP

**Proposed Solution:**  
Accelerate the previously approved baseline project to reconductor the Dequine - Meadow Lake 345 kV #2 line and substation work at Dequine.

kV Level: 345 kV

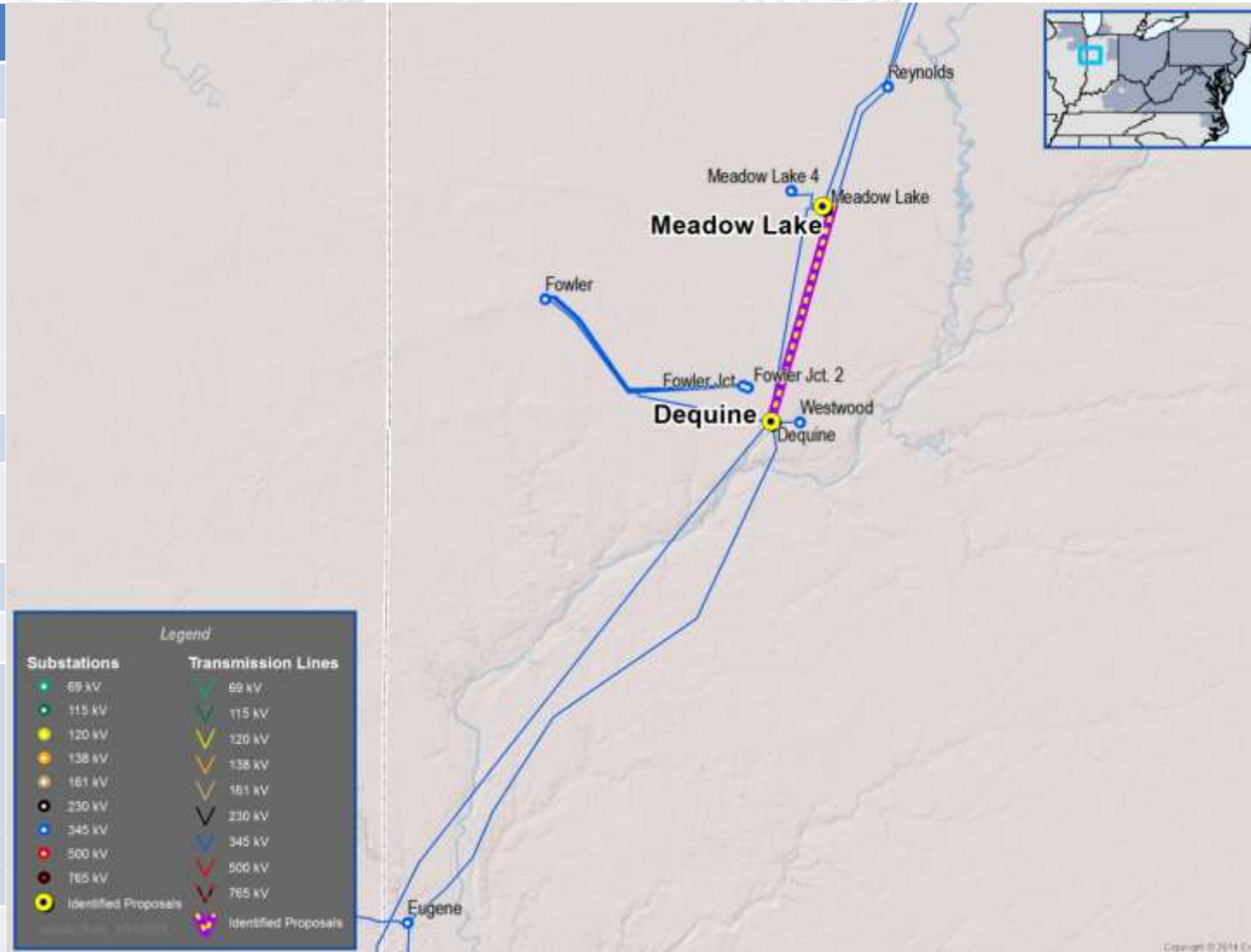
In-Service Cost (\$M): 0

In-Service Date: 2019

Target Zone: AEP

**ME Constraints:**  
DEQUIN - MEADOW 345 kV + RPM Benefits

Notes: See approved baseline upgrade b2776



- **3 Projects:**
  - 1-3A, 1-3B, 1-17A
- **Cost:**
  - From \$0.84 M to \$66.90 M
- **RPM Constraints:**
  - E. FRANKFORT - UNIVERSITY PARK 345 kV
  - PONTIAC - BROKAW 345 kV
- **2020/2021 RPM BRA Results**
  - COMED LDA binding with Eugene - Dequin 345 kV line as limiting CETL constraint



**Project ID: 201617\_1-3A**

Proposed by: ComEd

Proposed Solution:  
Upgrade capacity on E. Frankfort - University Park 345 kV line.

kV Level: 345 kV

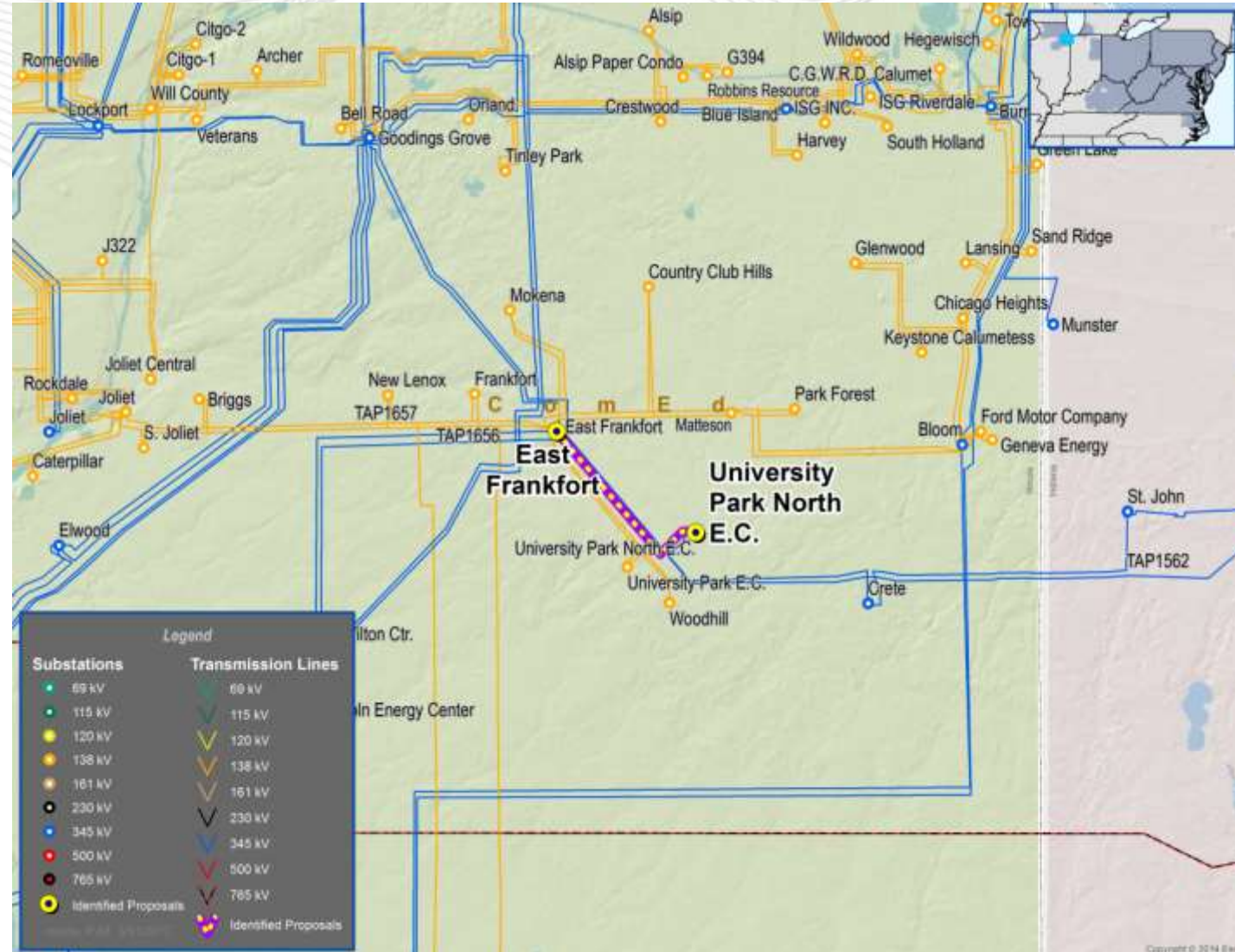
In-Service Cost (\$M): \$0.84

In-Service Date: 2021

Target Zone: ComEd

ME Constraints:  
E. FRANKFORT - UNIVERSITY PARK 345 kV + RPM Benefits

Notes:



**Project ID: 201617\_1-3B**

Proposed by: ComEd

Proposed Solution:  
Upgrade substation equipment at Pontiac Midpoint station to increase capacity on Pontiac-Brokaw 345 kV line.

kV Level: 345 kV

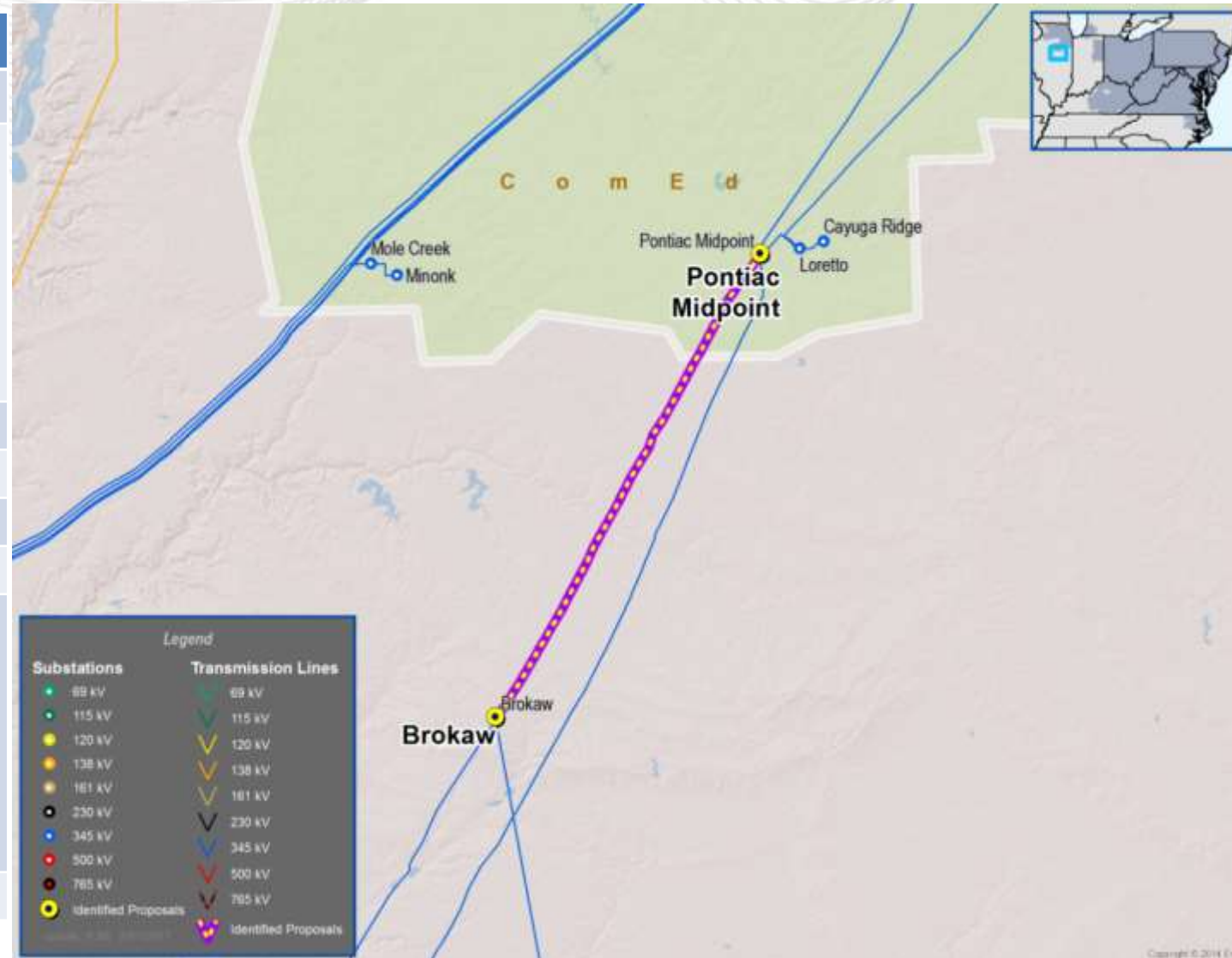
In-Service Cost (\$M): \$5.62

In-Service Date: 2021

Target Zone: ComEd

ME Constraints:  
PONTIAC - BROKAW 345 kV + RPM Benefits

Notes:



**Project ID: 201617\_1-17A**

Proposed by: AEP Exelon

Proposed Solution: Greenfield

Build a new 345 kV switchyard (Cottage Grove). Loop in the University Park North EC - Olive 345 kV line, Crete - St. John 345 kV line, Davis Creek - Bloom 345 kV line and Davis Creek - Burnham 345 kV line. Substation upgrades at Bloom and Burnham substations. Upgrade the University Park North-Olive 345 kV line.

kV Level: 345 kV

In-Service Cost (\$M): \$66.90

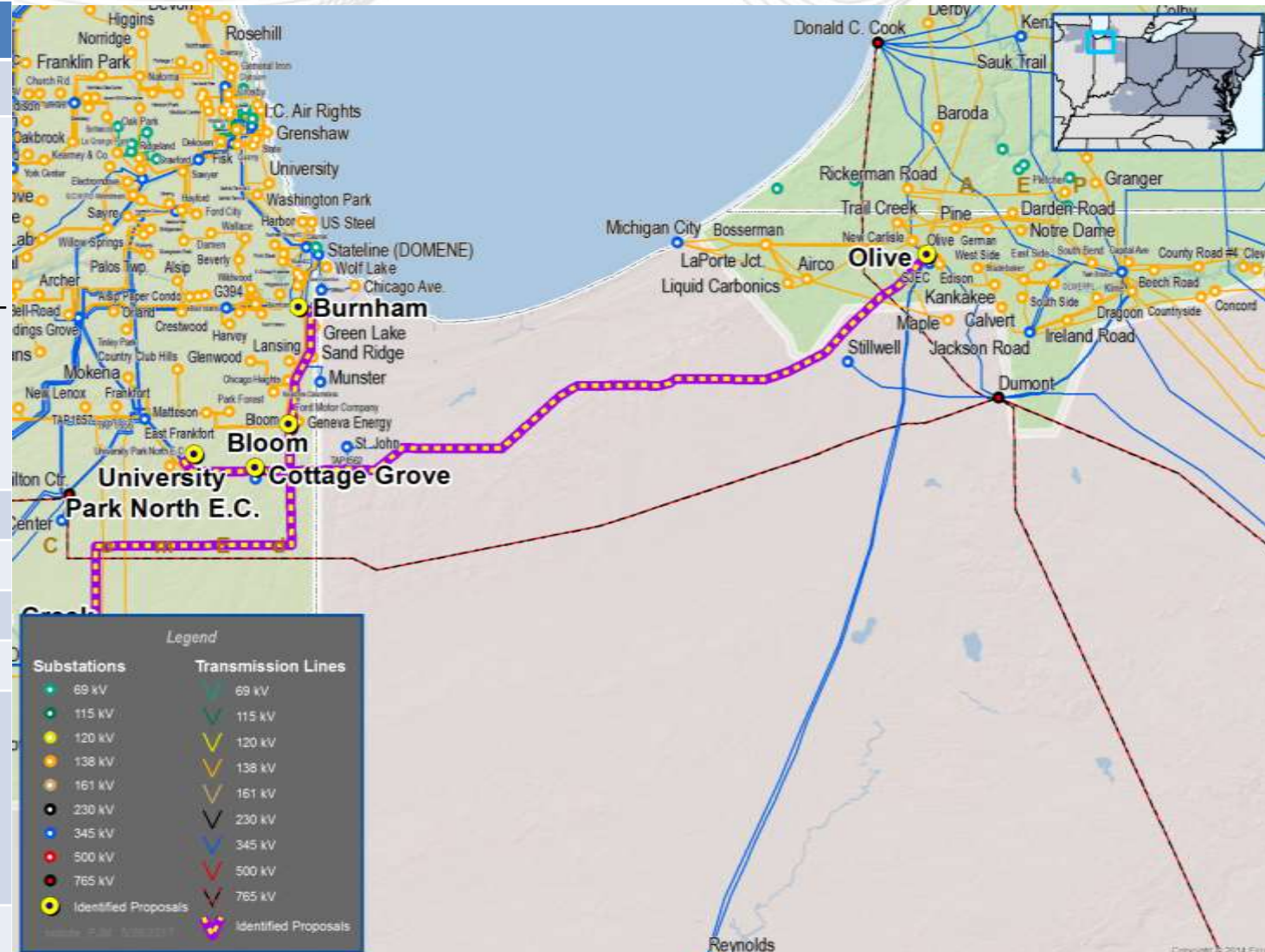
In-Service Date: 2021

Target Zone: ComEd

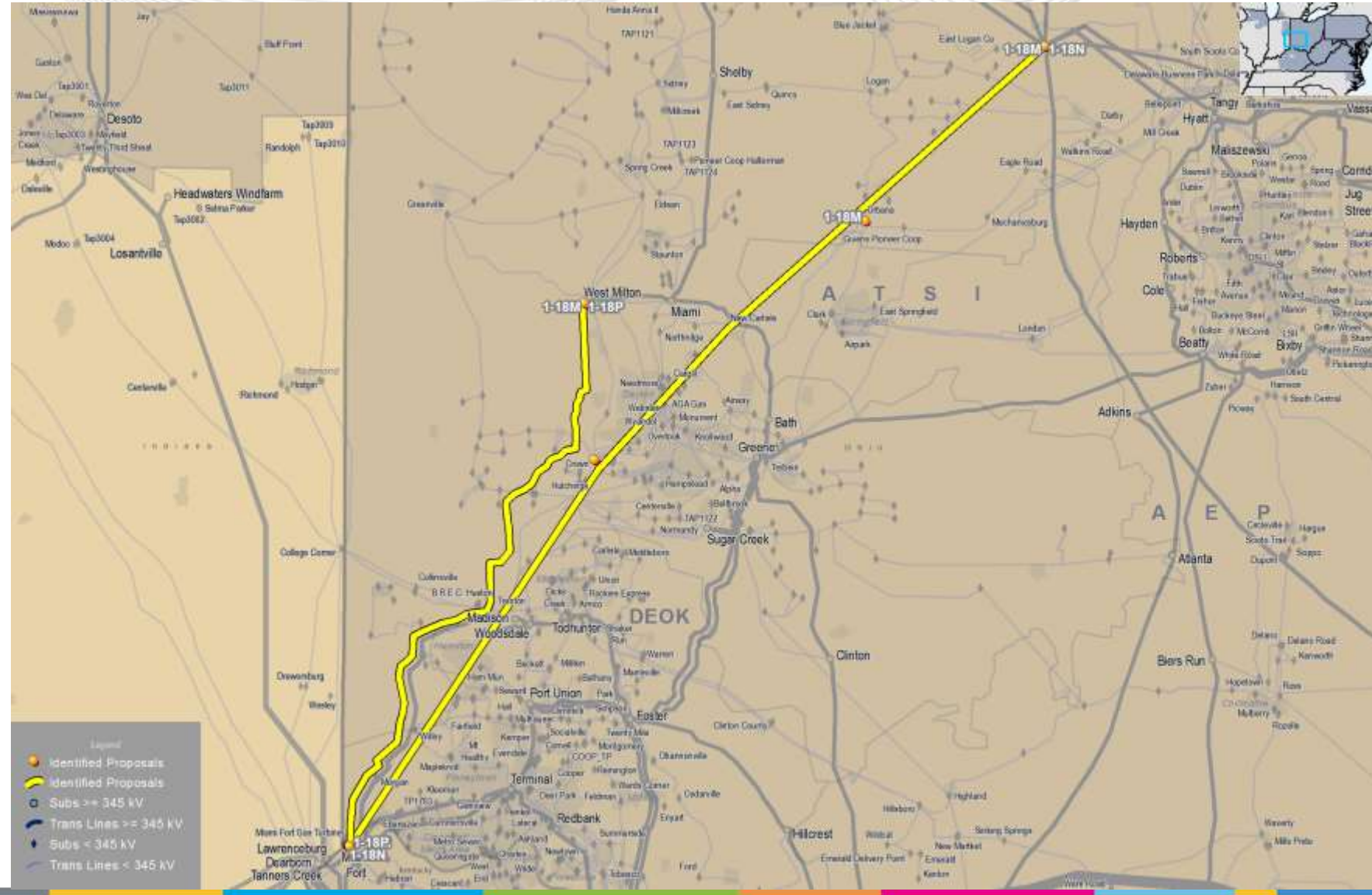
ME Constraints:

E. FRANKFORT - UNIVERSITY PARK 345 kV + RPM Benefits

Notes:



- **3 Projects:**
  - 1-18M, 1-18N, 1-18P
  
- **Cost:**
  - From \$19.70 M to \$117.30 M
  
- **RPM Constraints:**
  - Dayton LDA RPM
  
- **No need for analysis**
  - Dayton LDA did not bind



## Project ID: 201617\_1-18M

Proposed by: Northeast Transmission Development

Proposed Solution: Greenfield

Build a new 345/138 kV substation (Bull Branch) near Urbana  
 138/69 kV substation. Build a new Marysville - Bull Branch  
 345 kV line and a new Miami - Bull Branch 345 kV line.

Connect the Bull Branch 138kV to Urbana 138/69 kV  
 substation. Tap the West Milton - Miami Fort 345 kV line and  
 build a new 345/138 kV substation (Spring Run). Build a new  
 Spring Run - Crown 138 kV line.

kV Level: 138/345 kV

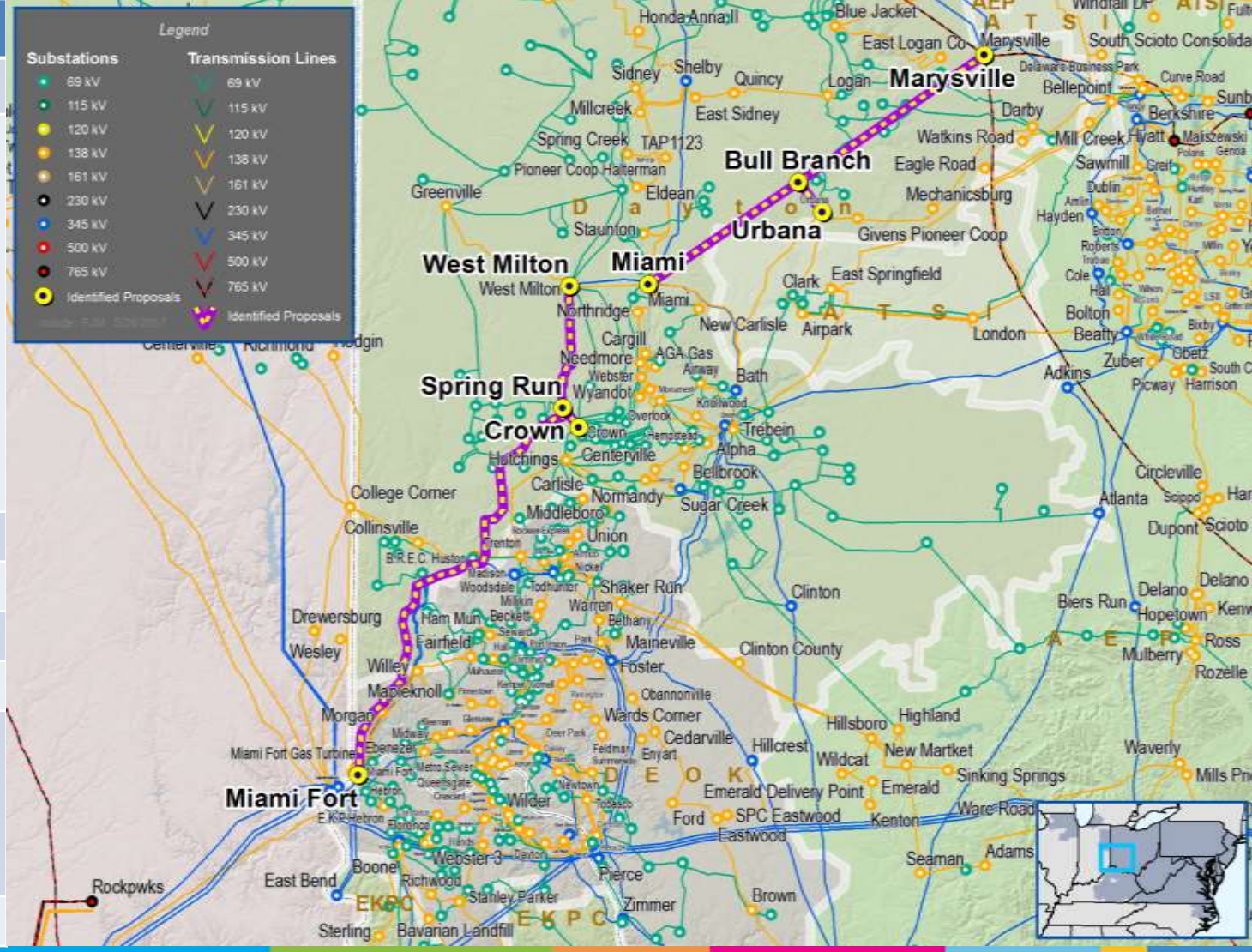
In-Service Cost (\$M): \$117.30

In-Service Date: 2021

Target Zone: AEP

ME Constraints:  
 Dayton LDA RPM Benefits

Notes:





## Project ID: 201617\_1-18N

Proposed by: Northeast Transmission Development

Proposed Solution: Greenfield

Build a new 345/138 kV substation (Bull Branch) near Urbana  
 138/69 kV substation. Build a new Marysville - Bull Branch  
 345 kV line and a new Miami - Bull Branch 345 kV line.  
 Connect the Bull Branch 138 kV to Urbana 138/69 kV  
 substation.

kV Level: 138/345 kV

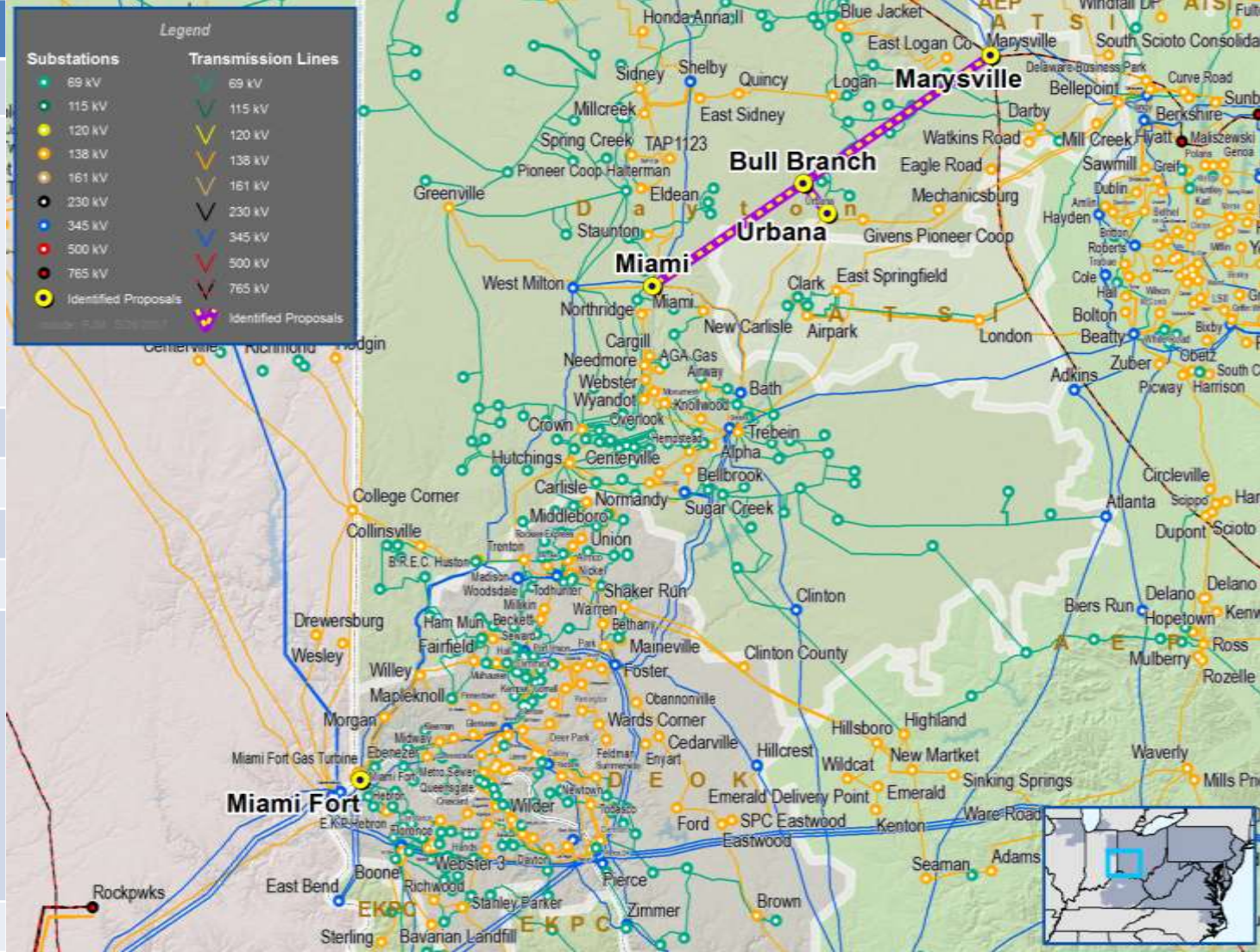
In-Service Cost (\$M): \$97.70

In-Service Date: 2021

Target Zone: AEP

ME Constraints:  
 Dayton LDA RPM Benefits

Notes:



**Project ID: 201617\_1-18P**

Proposed by: Northeast Transmission Development

Proposed Solution: Greenfield

Tap the West Milton - Miami Fort 345 kV line and build a new 345/138 kV substation (Spring Run). Build a new Spring Run - Crown 138 kV line.

kV Level: 138/345 kV

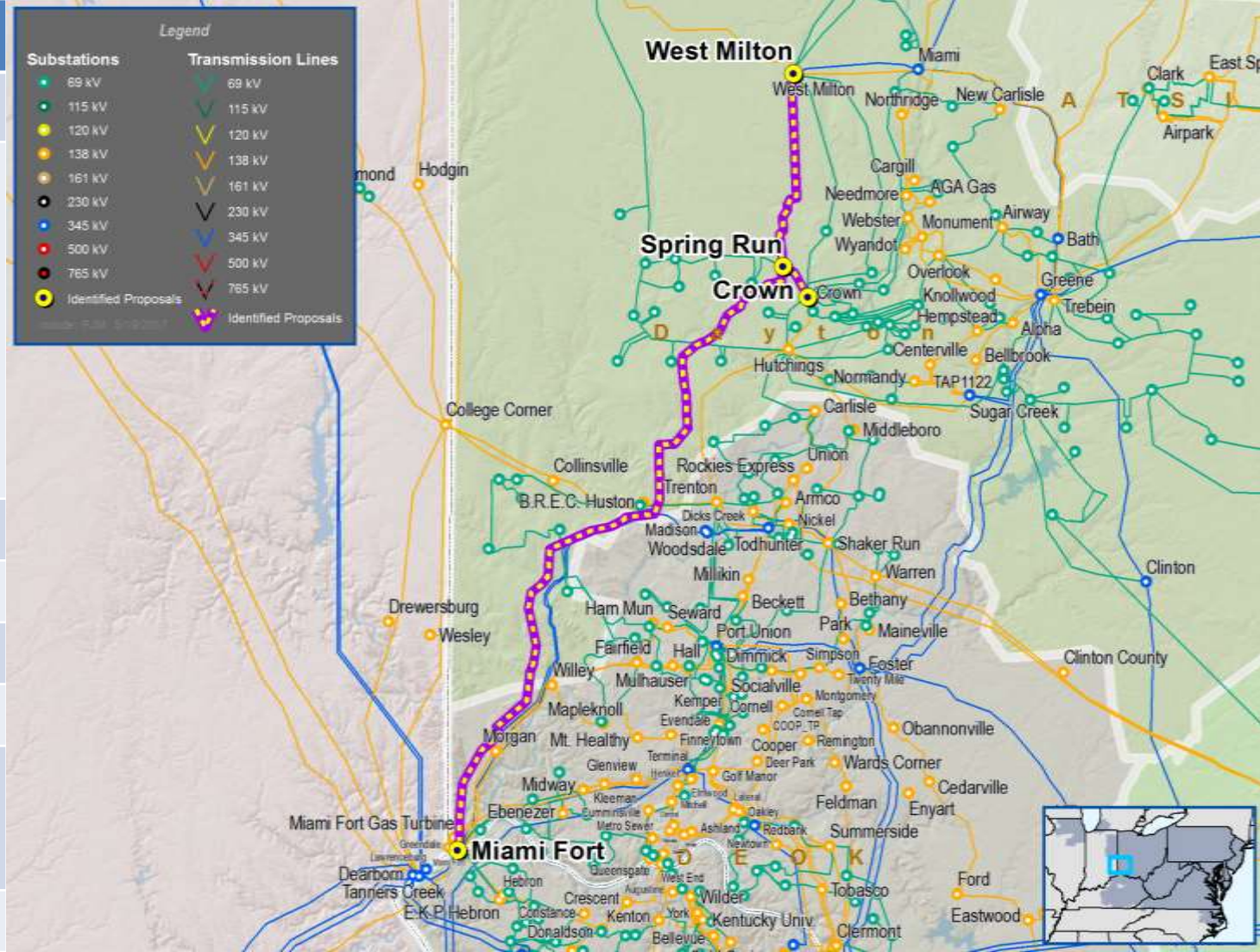
In-Service Cost (\$M): \$19.70

In-Service Date: 2021

Target Zone: Dayton

ME Constraints:  
Dayton LDA RPM Benefits

Notes:



Milestone	Schedule 2016 - 2017
Post Mid-Cycle Update Scenarios	Mid June, 2017
Reevaluation Approved Market Efficiency Projects	June - July 2017
Proposed projects analysis - Interregional, PPL and slam dunks	June – October 2017
Proposed projects analysis - BGE and other	August – December 2017
Acceleration Analysis	July – November 2017
Final TEAC Review and Board Approval	December 2017

- Revision History
  - V1 – 6/5/2017 – Original Version Posted to PJM.com