Transmission Expansion Advisory Committee Meeting

2010 Market Efficiency Analysis Results Update

December 8, 2010

Market Efficiency Update

- Base Results updated to reflect following:
  - Inclusion of Conemaugh-Seward 230 KV and Conemaugh 500/230 KV Transformer upgrade (b1153)
  - Modeling of Wind as Dispatchable
    - Model reflects government tax credit of $21/MWh
    - Wind will turn off if economically justified
    - Reflective of actual market conditions
    - Eliminates solution abnormalities

Market Simulation Results Updated – Congestion by Constraint

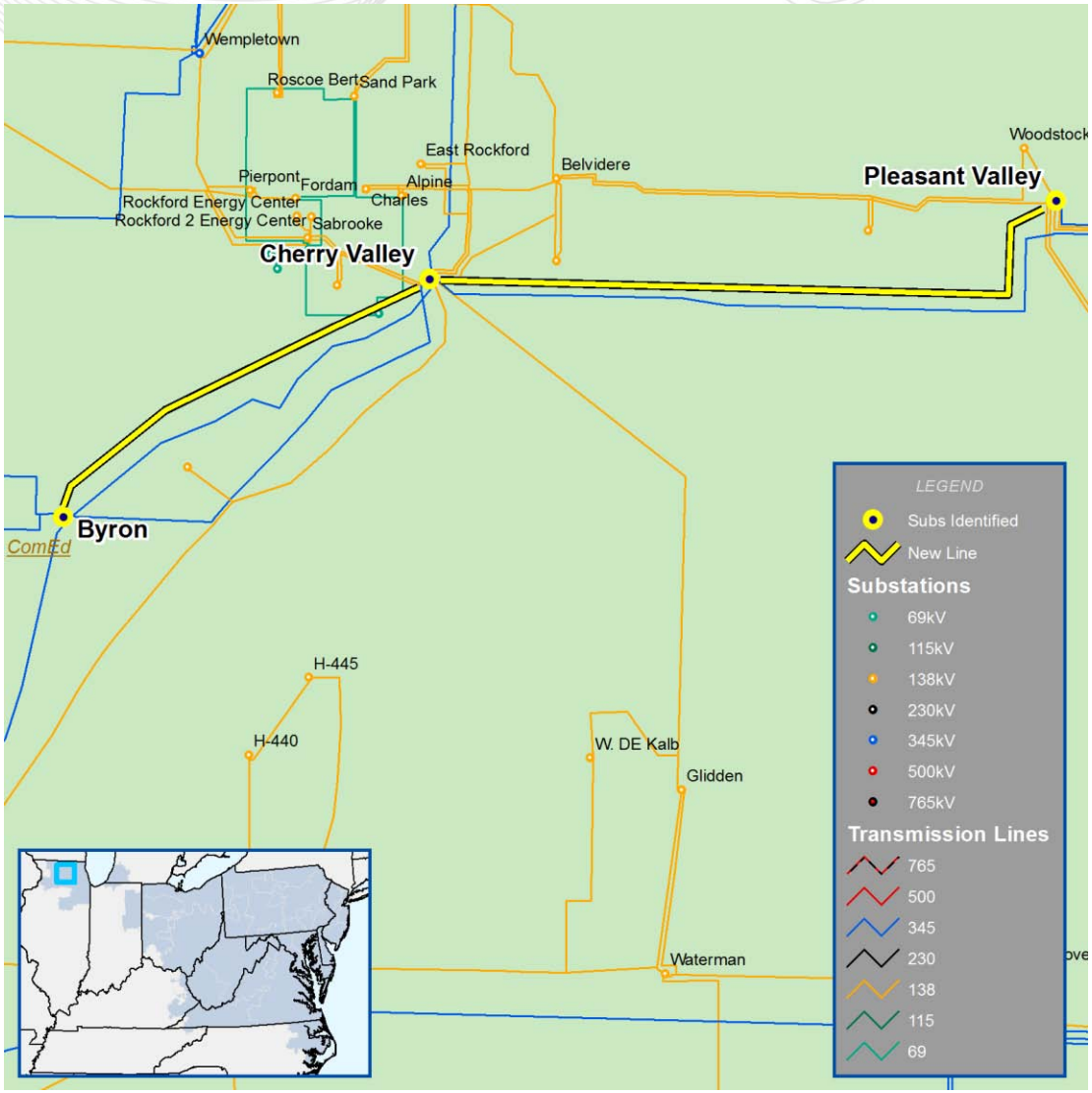
	2010 Study Year		2013 Study Year		2016 Study Year		2019 Study Year	
	2010 As-Is System Topology		2014 System Topology (without PATH, MAPP, Susquehanna-Roseland, Branchburg-Roseland-Hudson)		2014 System Topology (without Branchburg-Roseland-Hudson)		2014 System Topology (without Branchburg-Roseland-Hudson)	
Constraint	Frequency (Hours)	Market Congestion ($millions)	Frequency (Hours)	Market Congestion ($millions)	Frequency (Hours)	Market Congestion ($millions)	Frequency (Hours)	Market Congestion ($millions)
AP South Interface	4625	$398.8	5987	$897.8	4330	$783.6	4368	$766.6
MAREN;RT - P VAL; R	86	$0.2	767	$31.9	2663	$210.6	4242	$1,093.0
50045005 Interface	3804	$311.5	697	$45.0	1267	$111.7	1543	$202.0
01BLACKO - 01BEDNGT	3821	$362.0	72	$8.2	42	$5.0	30	$3.2
Eastern Interface	317	$11.2	2070	$232.9	88	$11.2	117	$4.6
Central Interface	170	$4.5	1294	$70.1	1091	$45.0	1818	$106.9
01DOUBS - 01DOUBS	472	$208.3	0	$0.0	11	$0.0	27	$6.5
ALTOONA - BEAR RCK	2205	$49.1	2613	$76.3	495	$24.9	719	$55.6
8LEXNGTN - 8DOOMS	620	$124.2	350	$65.8	12	$1.3	32	$7.0
05CLOVRD - 8LEXNGTN	1200	$45.3	1943	$97.8	110	$3.8	308	$16.6
3HALIFAX - 3MT LREL	1	$0.0	164	$17.3	244	$50.9	422	$75.0
CDR GV F - CLIFTN K	3609	$1.5	7070	$19.9	5920	$73.5	6109	$28.8
CHERR; B - CHERR;2M	0	$0.0	77	$3.0	185	$12.7	316	$105.0
Western Interface	33	$0.9	1679	$96.2	0	$0.0	0	$0.0
6CLOVER - 8CLOVER	235	$8.6	1238	$31.5	251	$9.4	620	$22.1
01PRNTY - 8MT STM	1412	$56.6	0	$0.0	0	$0.0	0	$0.0
E FRA; B - CRETE;BP	1614	$28.8	1228	$15.5	101	$0.6	317	$10.2
TODD - VIENN_69	0	$0.0	0	$0.0	89	$12.0	140	$30.4
8PL VIEW - 6PL VIEW	0	$0.0	0	$0.0	1	$0.0	61	$37.1
02SAMMIS - 01WYLIE	1153	$7.5	1236	$8.6	1203	$13.6	49	$0.2
15ELRM 5 - 01MITCHL	1677	$15.4	751	$5.5	537	$5.6	124	$1.7
8NO ANNA - 8MORRSVL	0	$0.0	0	$0.0	0	$0.0	123	$25.1
8MT STM (T157_TAP) - 01DOUBS	115	$16.2	107	$23.8	0	$0.0	0	$0.0
LINWOOD - CHICHST2	0	$0.0	0	$0.0	220	$11.8	199	$9.4
BRADFRD2 - PLANBRK1	2	$0.0	13	$1.7	20	$3.0	22	$13.3
PRINTZ - RIDLEY	0	$0.0	4	$0.1	10	$1.4	50	$15.6
SOLPT 44 - RIV2339	87	$0.8	60	$4.2	97	$5.9	208	$6.2
SANDY34T - H.RDGE16	0	$0.0	2	$0.0	10	$0.2	77	$13.9
8LOUDOUN - 6LOUDOUN	0	$0.0	0	$0.0	0	$0.0	4	$10.4
RL_138N - HARES CR	0	$0.0	0	$0.0	20	$2.9	47	$5.4
01MITCHL - 01UNIONJ	0	$0.0	127	$1.8	126	$2.1	150	$3.6
JUNI BU2 - DAUP TR2	4	$0.0	157	$3.9	2	$0.0	164	$3.3
WATER;3B - W DEK;3T	53	$0.9	43	$0.8	124	$2.5	112	$2.2
LORET;B - PONTI; B	0	$0.0	19	$1.3	7	$0.1	58	$4.7
ATHENIA - BERGEN	0	$0.0	118	$1.4	172	$3.0	159	$1.3
CHERR; R - E ROC;RT	0	$0.0	0	$0.0	2	$0.1	6	$5.3
Grand Total		$1,675.1		$1,774.8		$1,412.1		$2,705.1

Market Efficiency Projects

COMED AREA

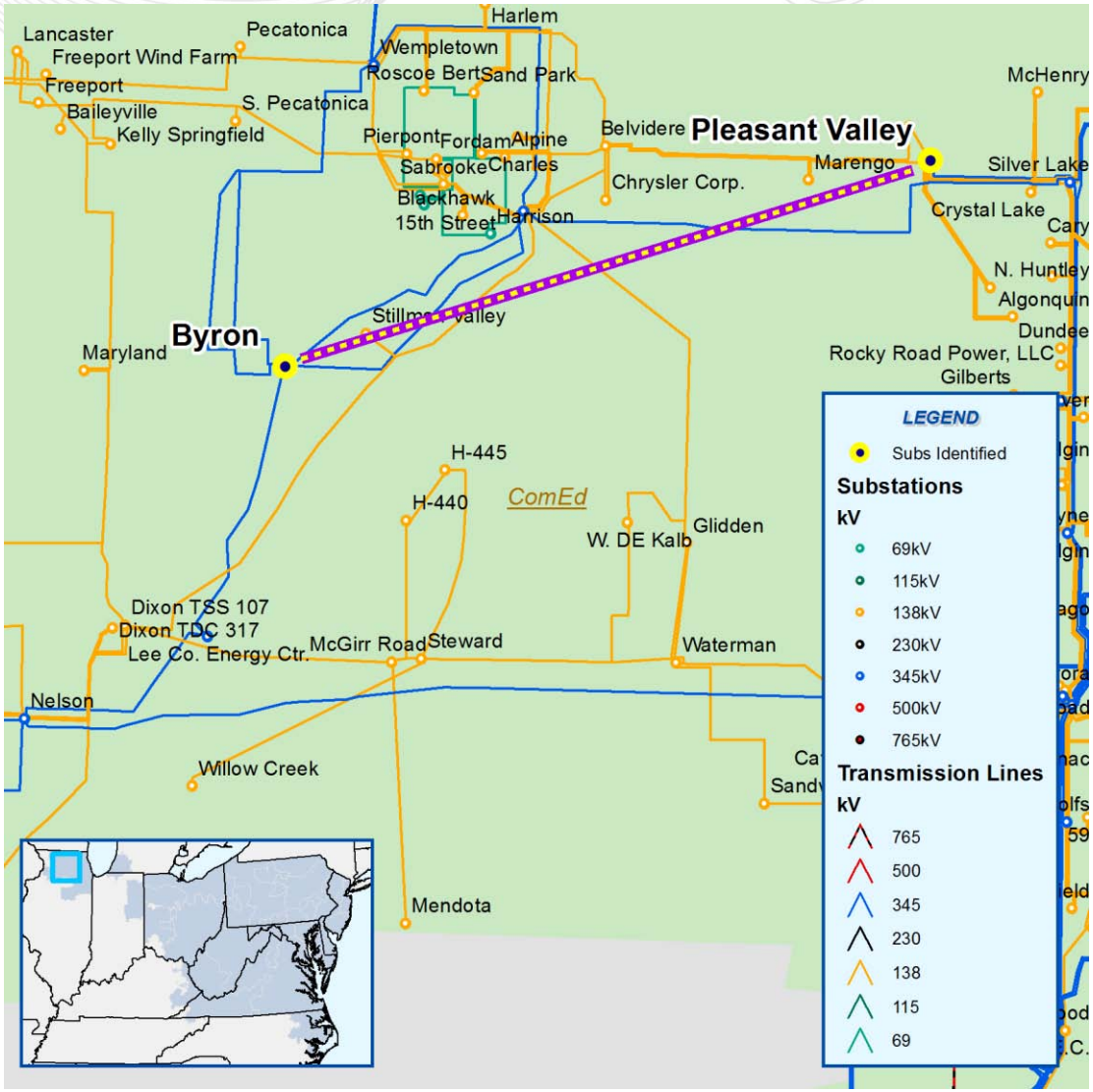
Market Efficiency Proposed Projects: COMED Zone

- BCP Transmission Project submitted by LS Power for new single 345 kV line from Byron to Cherry Valley to Pleasant Valley.
- Expected IS date: 6/1/2015
- LS Power estimated project Costs: $100-$125 million
- Results:
  - Benefit/Cost ratio= 1.57
  - 1.57>1.25 - Pass



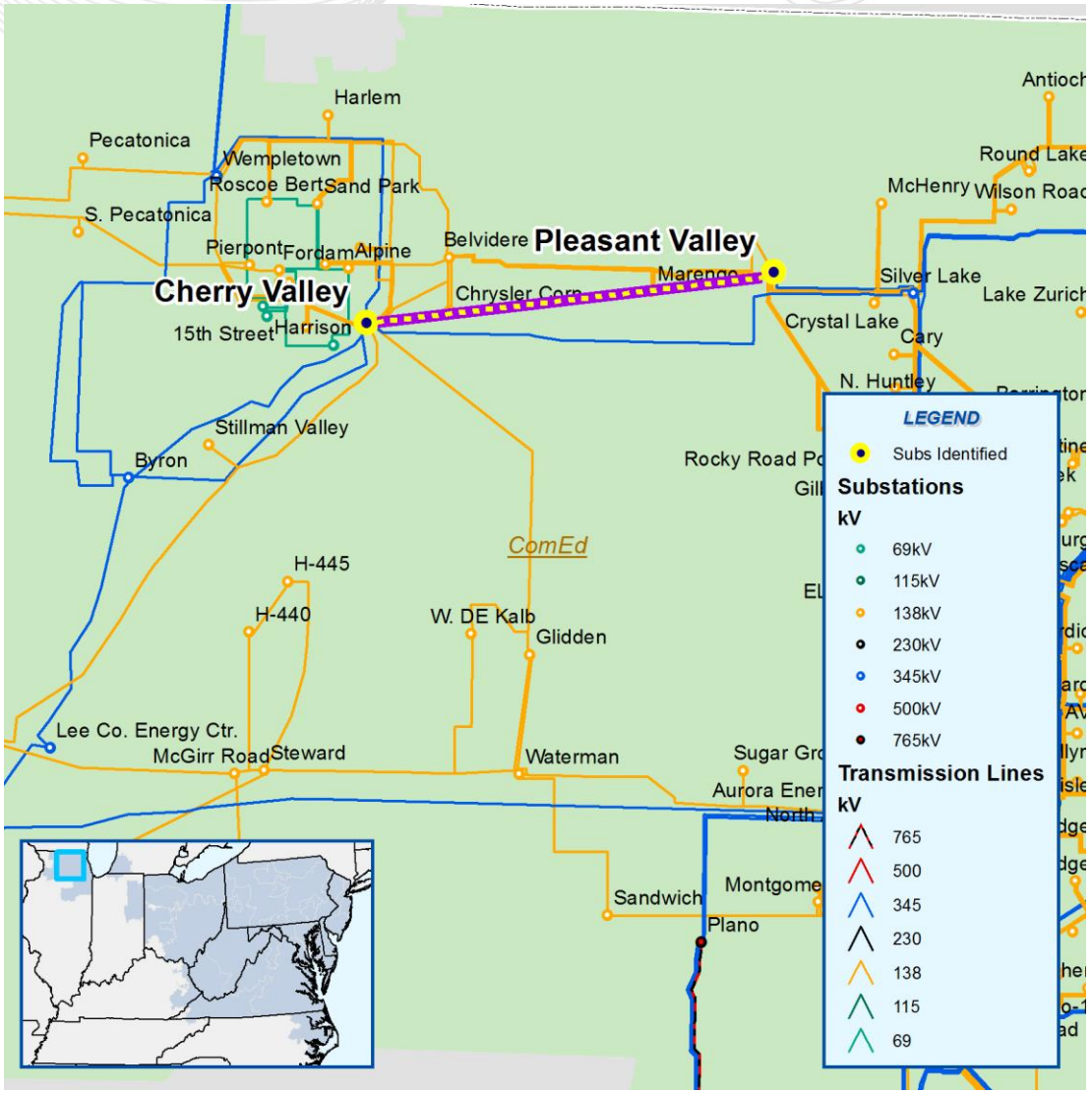
Market Efficiency Proposed Projects: COMED Zone

- Variation of BCP Transmission Project submitted by LS Power for new single 345 kV line from Byron to Pleasant Valley.
- Expected IS date: 6/1/2015
- LS Power estimated project Costs: $90-$120 million
- Results:
  - Benefit/Cost ratio= 2.02
  - 2.02>1.25 - Pass



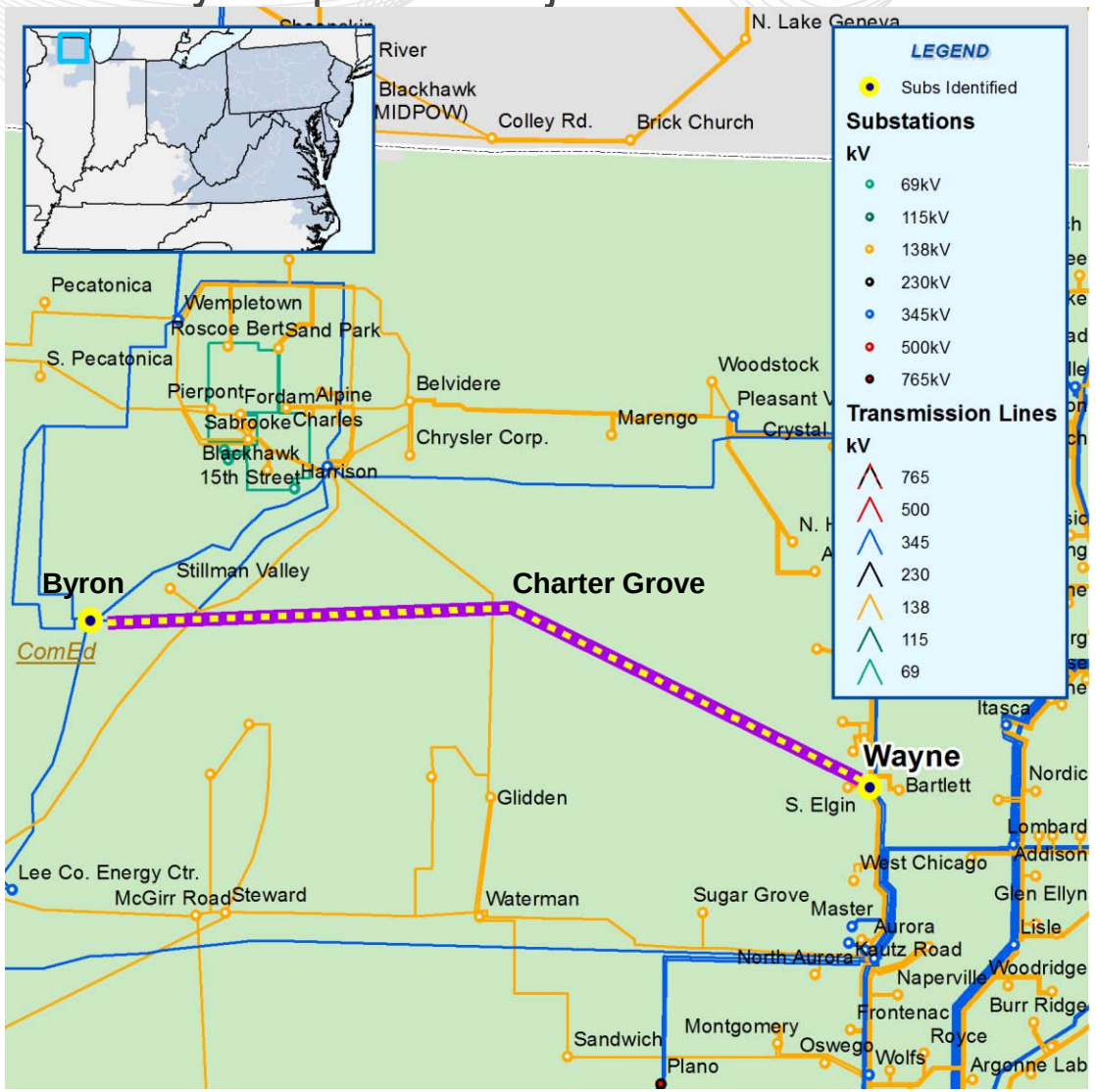
Market Efficiency Proposed Projects: COMED Zone

- Variation of BCP Transmission Project submitted by LS Power for new single 345 kV line from Cherry Valley to Pleasant Valley.
- Expected IS date: 6/1/2015
- LS Power estimated project Costs: $60-$75 million
- Results:
  - Benefit/Cost ratio= 3.04
  - 3.04>1.25 - Pass
  - High congestion on Byron-Cherry Valley 345 KV ckt.



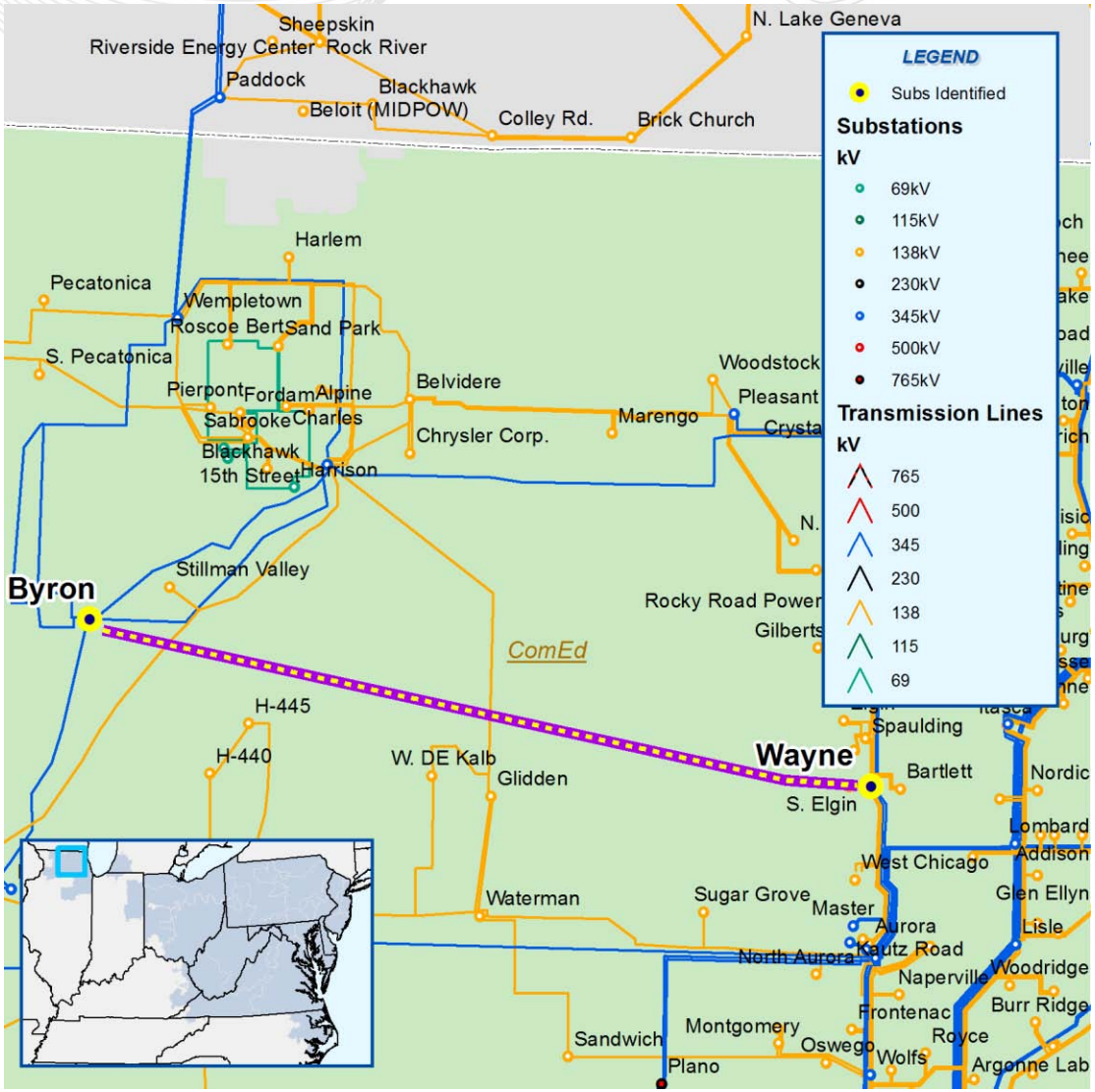
Market Efficiency Proposed Projects: COMED Zone

- Variation of BCP Project Submitted by COMED for new single 345 KV line from Byron–Charter Grove-Wayne with 345/138 KV transformer at new Charter Grove station that ties into the W. De Kalb-Cherry Valley 138 KV ckt.
- Expected IS date: 6/1/2015
- Estimated Costs: $275 million
- Results:
  - Benefit/Cost ratio= 0.71
  - 0.71<1.25 - Fail



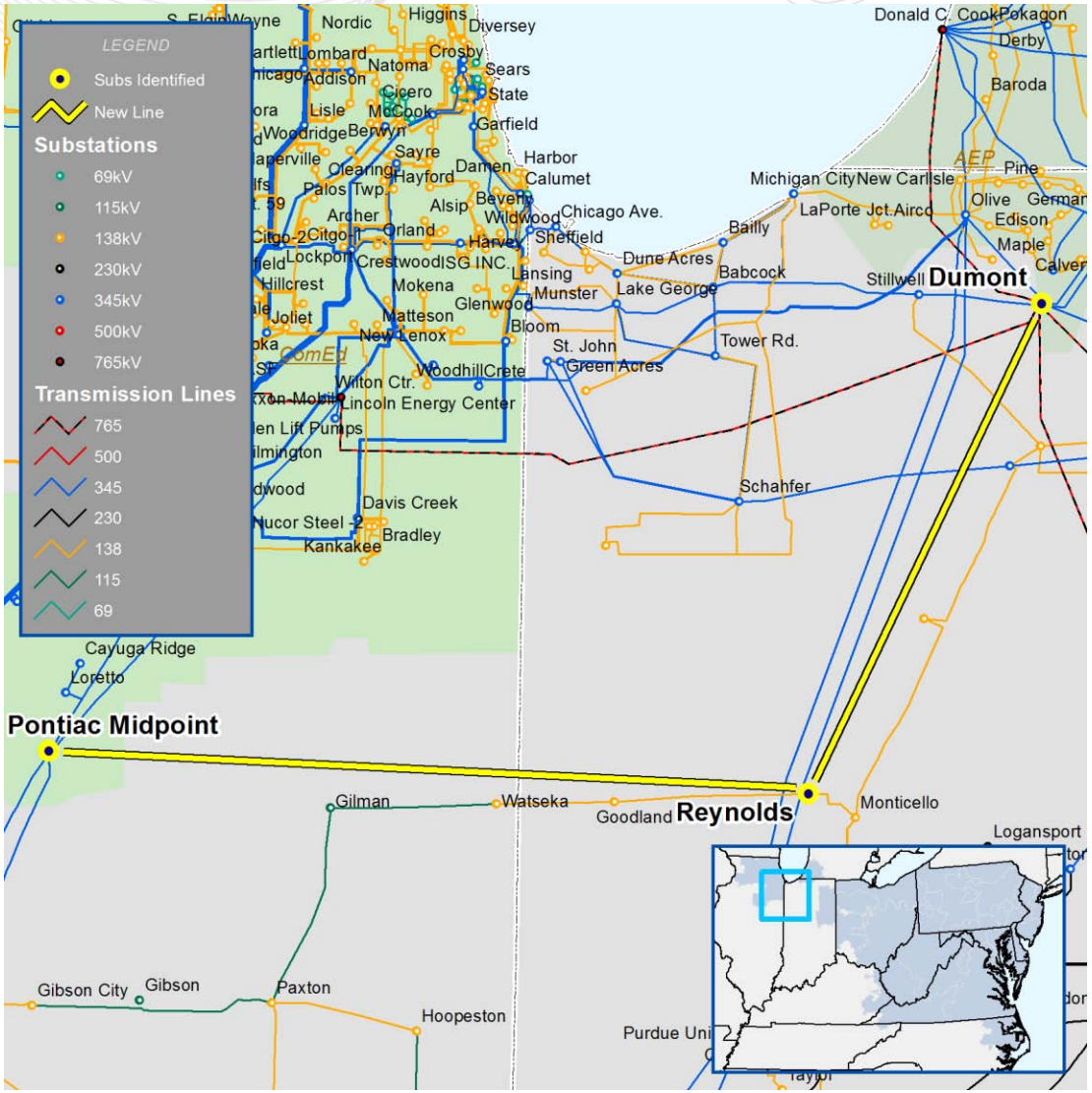
Market Efficiency Proposed Projects: COMED Zone

- Variation of COMED and BCP Transmission Project submitted by LS Power for new single 345 kV line from Byron - Wayne.
- Expected IS date: 6/1/2015
- LS Power estimated project Costs: $150-$200 million
- Results:
  - Benefit/Cost ratio= 1.08
  - 1.08<1.25 - Fail



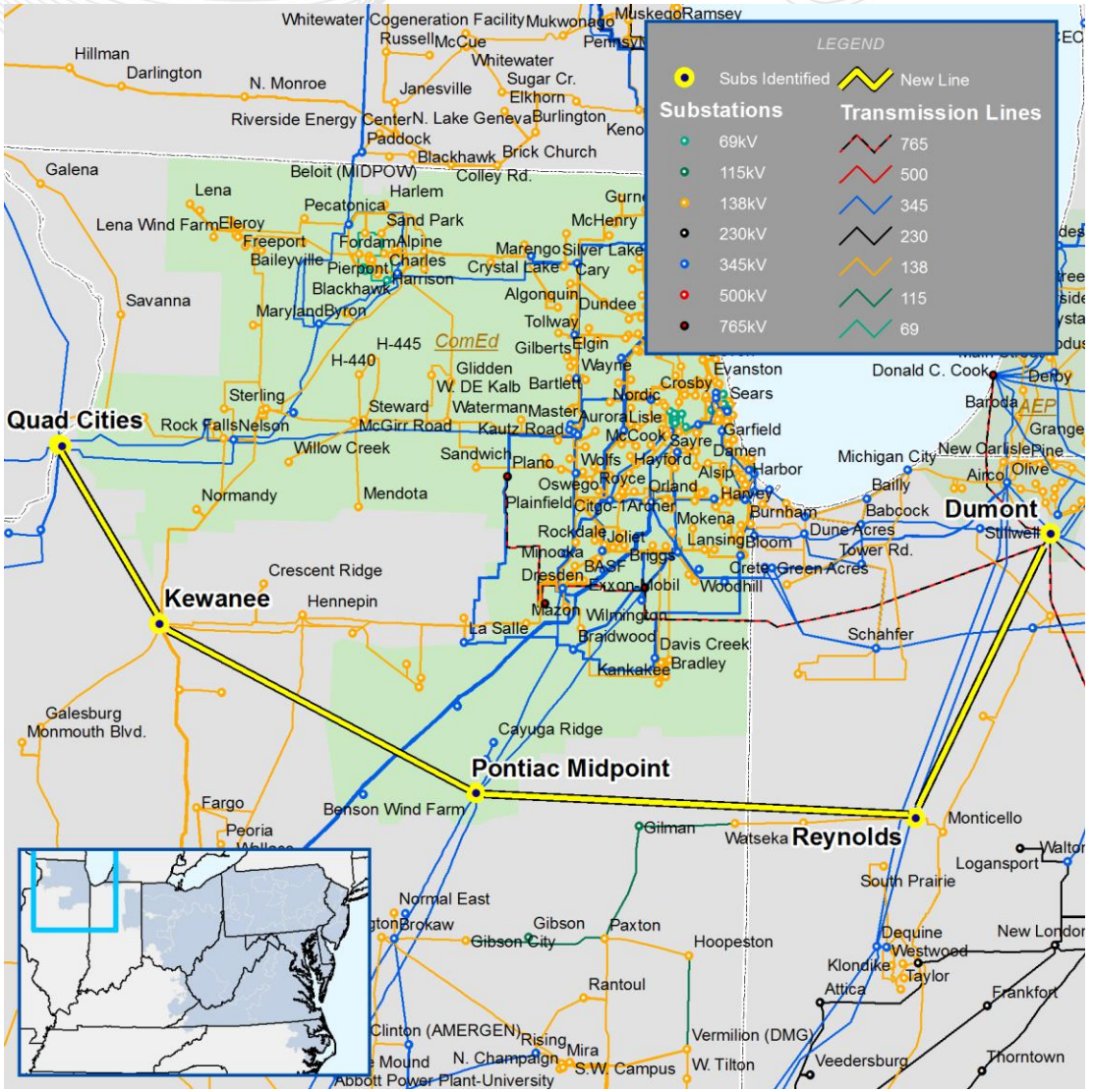
Market Efficiency Proposed Projects: COMED Zone

- LaSalle Transmission Project submitted by LS Power for new single or double 345 kV line from Pontiac Midpoint to Reynolds to Dumont (V4-026)
- Expected IS date: 6/1/2014.
- LS Power estimated project Costs.
  - $255-$275 million single circuit
  - $325-$345 million double circuit
- Results:
  - Benefit/Cost ratio single ckt=.08
    - .08<1.25 - Fail
  - Benefit/Cost ratio double ckt=.08
    - .08<1.25 - Fail



Market Efficiency Proposed Projects: COMED Zone

- La Fayette Transmission Project submitted by LS Power for new single or double 345 kV line from Quad Cities to Kewanee to Pontiac Midpoint to Reynolds to Dumont along with 345/138 KV transformers at Kewanee station
- Expected IS date: 6/1/2015
- LS Power estimated project Costs.
  - $500-$540 million single circuit
  - $635-$675 million double circuit
- Results:
  - Benefit/Cost ratio single ckt=.36
    - .36<1.25 - Fail
  - Benefit/Cost ratio double ckt=.33
    - .33<1.25 - Fail



Summary COMED AREA Proposed Upgrades

Proposed Projects	Expected ISD	Expected Costs* ($ millions)	Benefit/Cost Ratio**	Results	Notes
Byron-Cherry Valley-Pleasant Valley 345 KV	6/1/2015	112.5	1.57	Pass	
Byron-Pleasant Valley 345 KV	6/1/2015	105	2.02	Pass	Optimal configuration pending cost review
Cherry Valley - Pleasant Valley 345 KV	6/1/2015	67.5	3.04	Pass	High congestion created on Byron-Cherry Valley 345 KV line
Byron - Charter Grove- Wayne 345 KV, Charter Grove 345/138 KV TX.	6/1/2015	275	0.71	Fail	
Byron - Wayne 345 KV	6/1/2015	175	1.08	Fail	
Lasalle Project Single Circuit: Pontiac Midpoint -Reynolds-Dumont 345 KV	6/1/2014	265	0.08	Fail	
Lasalle Project Double Circuit: Pontiac Midpoint -Reynolds-Dumont 345 KV	6/1/2014	335	0.08	Fail	
LaFayette Project Single Circuit: Quad Cities-Kewanee-Pontiac Midpoint-Reynolds-Dumont 345 KV, Kewanee 345/138 KV TX	6/1/2015	520	0.36	Fail	
LaFayette Project Double Circuit: Quad Cities-Kewanee-Pontiac Midpoint-Reynolds-Dumont 345 KV, Kewanee 345/138 KV TX	6/1/2015	655	0.33	Fail	
Byron - Pleasant Valley 345 KV + Lasalle Project Single Circuit	6/1/2015	370	0.66	Fail	

* Costs greater than $50 million require independent review

**Benefit/cost ratio must exceed 1.25 and is calculated as NPV Benefit/NPV Cost for 15 years starting from projected in-service date.

Summary COMED AREA Proposed Upgrades

- Byron-Cherry Valley-Pleasant Valley (BCP) upgrade and all variations fix 10-year ARR Stage 1A infeasibility issues.

- Cherry Valley–Pleasant Valley 345 KV upgrade has highest Benefit/Cost ratio but creates additional $169 million in congestion on Byron-Cherry Valley 345 KV circuit.
  - Upgrade would require additional reinforcements to address this new congestion that is avoided with alternative project that also passes Benefit/Cost Test.
  - Byron-Cherry Valley upgrade already part of another variation.

- Byron - Pleasant Valley 345 KV is optimal configuration from markets perspective.
  - Eliminates congestion in COMED seen in Market Efficiency Analysis.
  - Highest Benefit/Cost ratio that passes and does not create additional congestion problems
  - Independent review of costs necessary since expected costs of $105 million exceed $50 million.

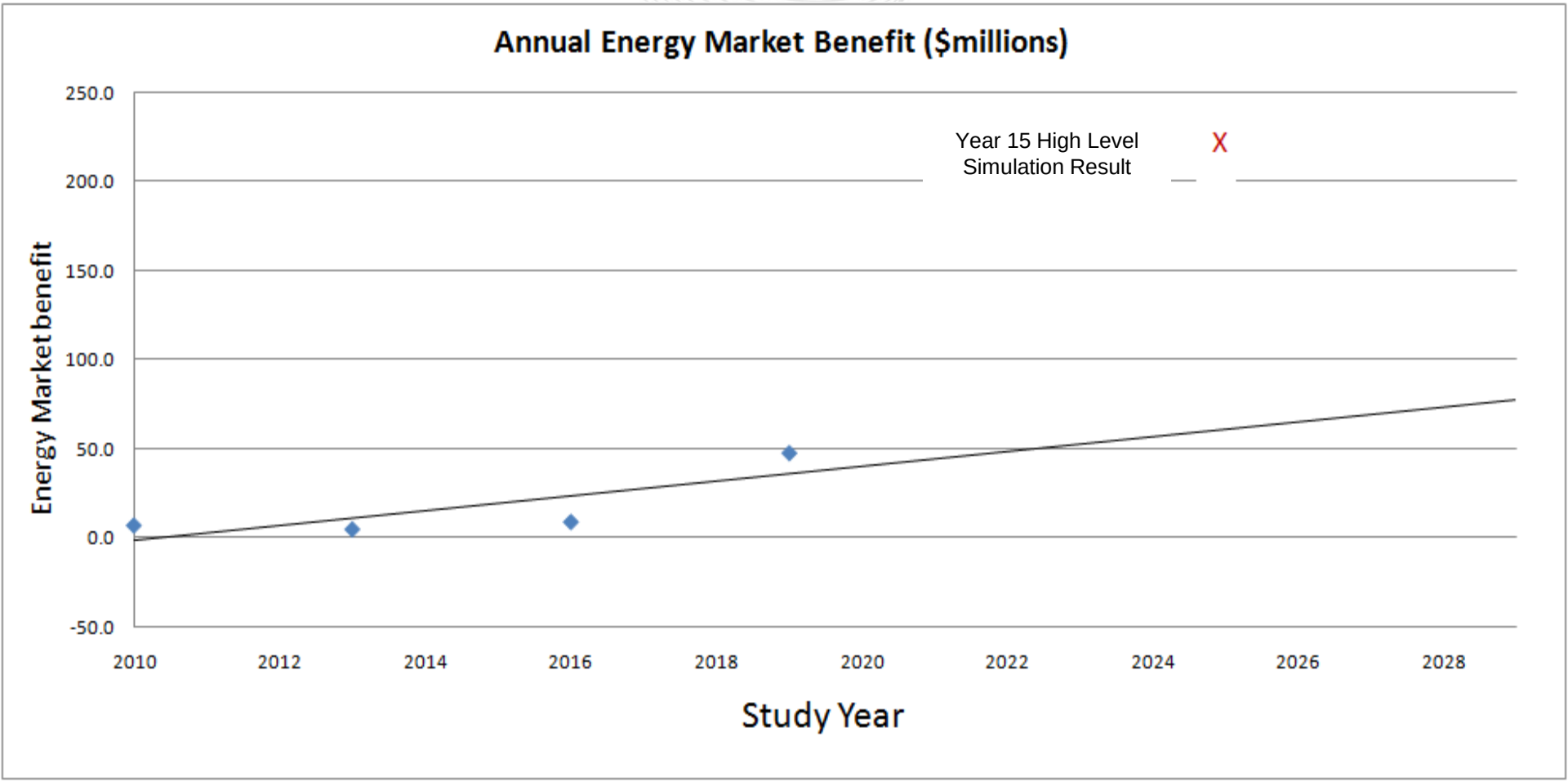
Benefit/Cost Analysis

- Cost/Benefit Analysis Byron-Pleasant Valley 345 KV
  - Upgrade: New Byron– Pleasant Valley 345 KV line.
  - Expected in-service date is 2015
  - Expected Cost = $105 million

Year	Production Cost Benefit ($ millions)	Load Energy Payment Benefit ($ millions)	Energy Market Benefit ($ millions)
2010	3.2	15.52	6.9
2011	3.8	11.68	6.2
2012	4.4	7.84	5.4
2013	5.0	4.00	4.7
2014	7.2	3.55	6.1
2015	9.3	3.09	7.5
2016	11.5	2.64	8.8
2017	25.2	13.44	21.7
2018	38.9	24.24	34.5
2019	52.5	35.04	47.3
2020	46.4	24.79	39.9
2021	51.5	26.70	44.1
2022	56.7	28.60	48.3
2023	61.8	30.51	52.4
2024	67.0	32.42	56.6
2025	72.1	34.32	60.8
2026	77.3	36.23	65.0
2027	82.4	38.14	69.1
2028	87.6	40.04	73.3
2029	92.7	41.95	77.5
Cumulative Present Value (2015 thru 2029)	415.7	209.3	353.8

Benefit/Cost Analysis

Cost/Benefit Analysis Byron-Pleasant Valley 345 KV



Cost/Benefit Analysis Byron-Pleasant Valley 345 KV

- Upgrade: New Byron– Pleasant Valley 345 KV line

  – Summary
  - Cumulative Present Value of annual benefit equals $353.8 million (70% NPV of Production Cost Benefit ($415.7 million) + 30% NPV of Load Benefit ($209.3 million))
  - Cumulative Present Value of project annual revenue requirement equals $174.9 million
    – Based on project cost of $105 million, discount rate of 7.7%, annual carrying charge of 19.1%, and 2015 in-service date.
  - Benefit/Cost Ratio equals 2.02
  - 2.02 >1.25

Next Steps

COMED AREA Upgrades

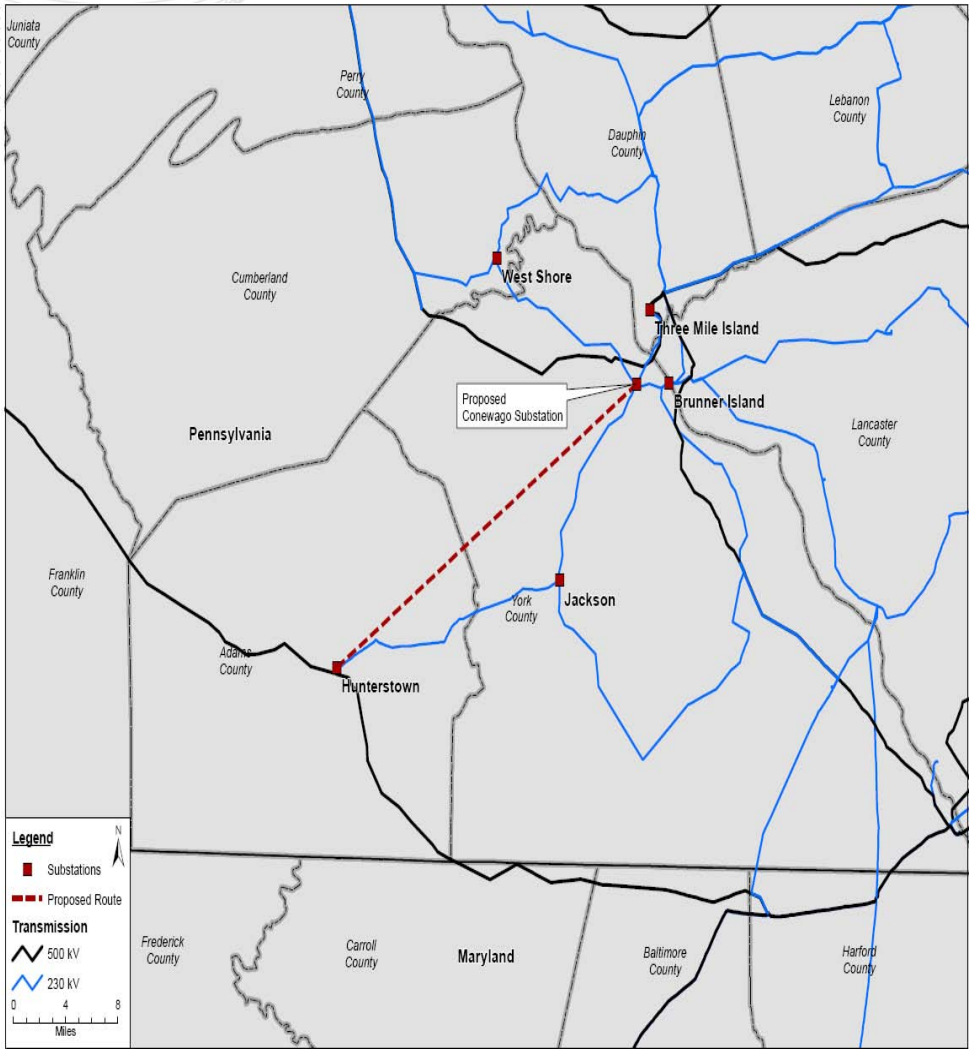
- Perform Independent Review of costs associated with Byron-Pleasant Valley 345 KV upgrade and alternative projects
- Perform sensitivity analysis on key input assumptions for Byron-Pleasant Valley 345 KV upgrade
- Run reliability analysis on all upgrades
- Based on cost review, sensitivity analysis, and reliability analysis will determine recommendation to PJM board

Future

- Study additional requested Market Efficiency Project shown on next slide
- Determination of assignment for recommended projects – outside of scope of TEAC

Market Efficiency Proposed Projects: PENELEC Zone

- Liberty East Transmission Project submitted by LS Power:
  - New 500/230 KV TX at Hunterstown.
  - New Conewago 230 KV substation connecting Jackson-Three Mile Island 230 KV and West Shore-Brunner Island 230 KV in York County.
  - New Single or Double 230 KV circuit from Hunterstown-Conewago
- Expected IS date: 6/1/2015
- LS Power estimated project Costs.
  - $110-$140 million single circuit
  - $130-$165 million double circuit
- Results: Under Study



Map and route developed by LS Power for illustrative purposes only.