

Transmission Expansion Advisory  
Committee (TEAC)  
Recommendations to the PJM Board

PJM Staff Whitepaper  
October 2012



October 16, 2012

## EXECUTIVE SUMMARY

The Operating Agreement includes a requirement to identify and resolve constraints, or available transfer capability shortages that prevent the simultaneous feasibility of stage 1A Auction Revenue Rights. PJM staff identified a number of constraints that would prevent the simultaneous feasibility of stage 1A Auction Revenue Rights. A new 345 kV transmission line from the Byron Station to Wayne substation in the Commonwealth Edison transmission zone was recommended to address the constraints. The estimated cost for the project is \$109.6 Million and is expected to be placed in-service by June 2015. The report that follows describes the drivers for the project and the alternatives that were considered.

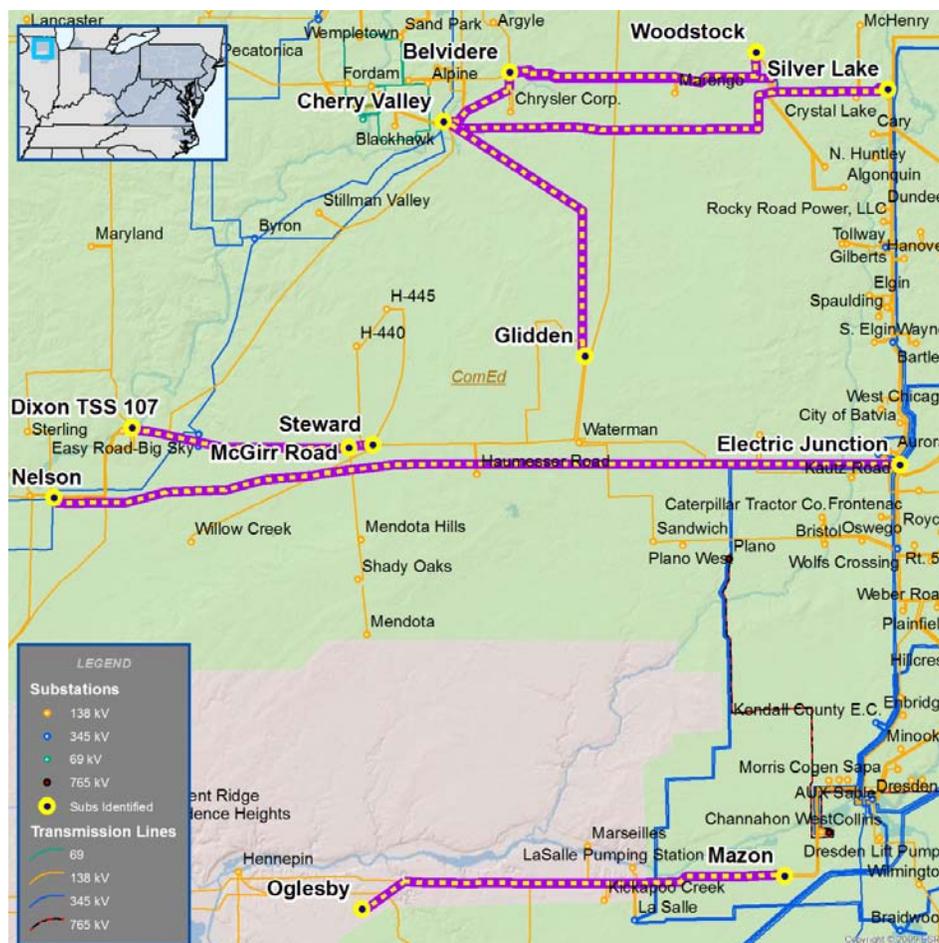
### Background

Auction Revenue Rights (ARRs) are entitlements that are allocated annually to Firm Transmission Service Customers that entitle the holder to receive an allocation of the revenues (or charges) from the annual Financial Transmission Right (FTR) auction. FTRs are financial instruments awarded to bidders in FTR Auctions that entitle the holder to a stream of revenues (or charges) based on the hourly Day Ahead congestion price differences across the path. ARRs provide a revenue stream to the firm transmission customer to offset the purchase price of FTRs. Stage 1A ARRs protect native load utilization of the transmission system providing long-term certainty against congestion. ARRs must be simultaneously feasible to ensure that annual FTR auction revenues are sufficient to cover ARR target allocations.

Schedule 6 of the Operating Agreement requires PJM to identify transmission system enhancements needed to ensure the system can support the simultaneous feasibility of all stage 1A ARRs. PJM staff identified a number of constraints in the Commonwealth Edison transmission zone that would limit the simultaneous feasibility of stage 1A ARRs. The constraints are summarized in the table below.

Stage 1A ARR 10 Year Analysis - Constraints Infeasible After 10 Year Projection	
Constraint	Contingency
Belvidere - Woodstock 138 kV	Cherry Valley - Silver Lake 345 kV
Cherry Valley - Silver Lake 345 kV	Nelson - Electric Junction 345 kV
Dixon - McGirr Road 138 kV	Nelson - Electric Junction 345 kV
Cherry Valley - Belvidere 138 kV circuit # 15623	Cherry Valley - Silver Lake 345 kV
Belvidere - Pleasant Valley 138 kV circuit # 15623	Cherry Valley - Silver Lake 345 kV
Cherry Valley - Belvidere 138 kV circuit # 15624	Cherry Valley - Silver Lake 345 kV
Belvidere - Pleasant Valley 138 kV circuit # 15624	Cherry Valley - Silver Lake 345 kV
Cherry Valley - Silver Lake 345 kV	All facilities in service
Nelson - Electric Junction 345 kV	Cherry Valley - Silver Lake 345 kV
Cherry Valley 345/138 kV TR #81	Cherry Valley - Silver Lake 345 kV
Steward - McGirr Road 138 kV	Nelson - Electric Junction 345 kV
Oglesby - Mazon 138 kV	Nelson - Electric Junction 345 kV
Cherry Valley - Glidden 138 kV	Cherry Valley - Silver Lake 345 kV

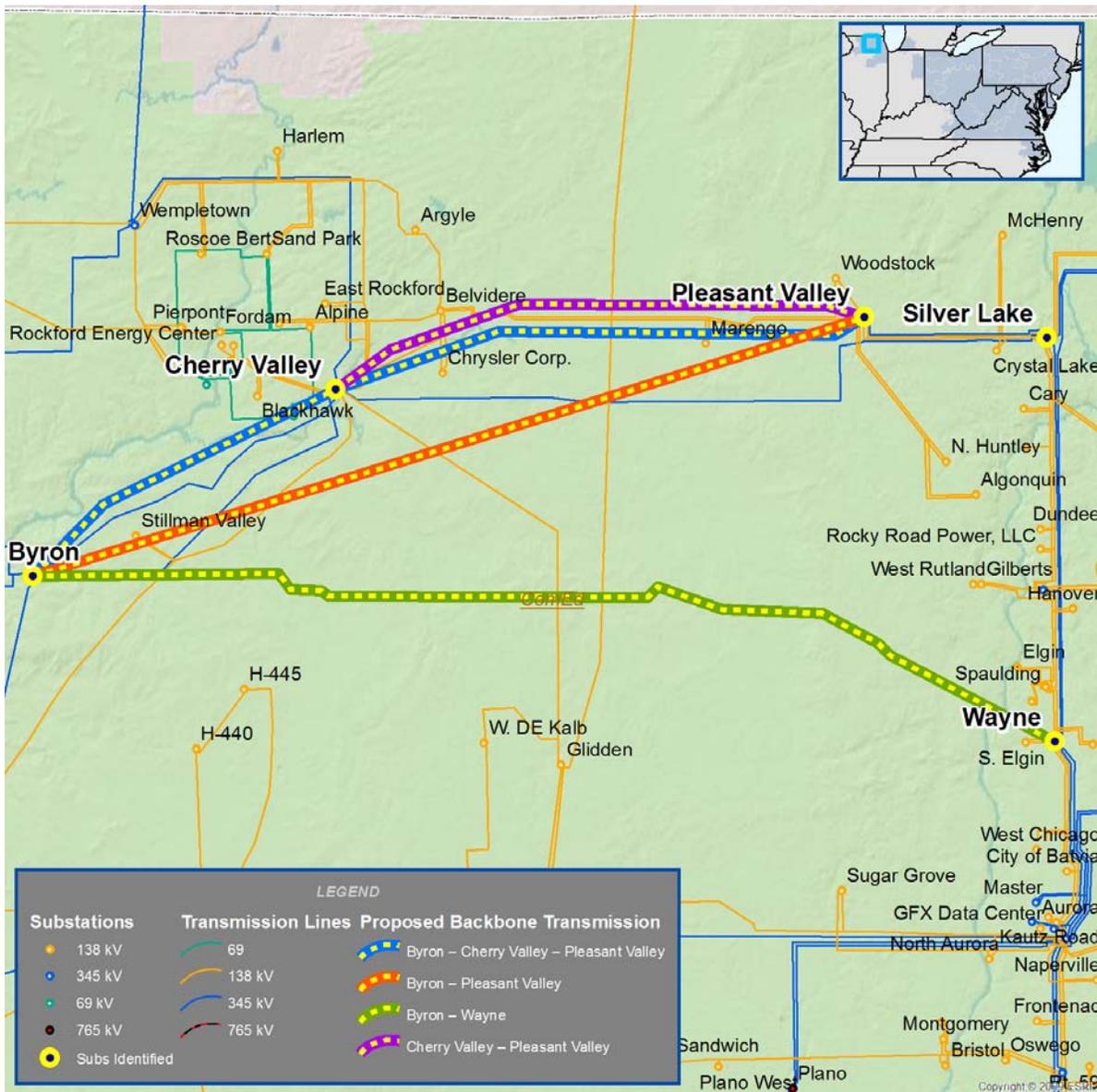
The constrained facilities are shown on the map below.



Several alternative projects were initially evaluated to determine their effectiveness at resolving the ARR insufficiency issue. Alternative projects considered included:

- New Byron – Wayne 345 kV circuit
- New Byron – Cherry Valley – Pleasant Valley 345 kV circuit
- New Byron – Cherry Valley 345 kV circuit
- New Cherry Valley to Pleasant Valley 345 kV circuit
- New Byron – Pleasant Valley 345 kV circuit

These alternative projects are hi-lighted in the map on the following page.



Stage 1A ARR feasibility analysis showed that the Byron – Wayne 345 kV project resolved all of the ARR insufficiency issues. Analysis of the other alternatives showed that they either did not resolve all of the ARR insufficiency issues or created additional violations. The Byron – Pleasant Valley 345 kV circuit proposal noted above was later modified to include additional 345/138 kV transformation at Pleasant Valley and Silver Lake as well as terminal equipment upgrades on the Pleasant Valley – Silver Lake 345 kV line. With these additions, the Byron – Pleasant Valley 345 kV project performed comparably to the Byron – Wayne 345 kV project in terms of addressing the ARR insufficiency issues.

Reliability analysis of the two projects was also done to ensure that the resulting system would be compliant with all reliability criteria. The reliability analysis of the Byron – Wayne alternative was found to be compliant with all reliability criteria. The Byron - Pleasant Valley 345 kV proposal, in addition to requiring the additional transformation and terminal equipment upgrades noted above also created a reliability criteria violation on the Pleasant Valley – Silver Lake 138 kV line. The thermal violation on this line would require new larger conductors be installed on the approximately seven mile long line.

The two projects were further compared for a number of other factors including cost, operational performance, right-of-way requirements, and route diversity. The cost of the Byron – Wayne project is estimated to be \$109.6 Million. The cost estimate for the Byron – Pleasant Valley 345 kV project ranges from \$108.8 Million to \$120.8 Million depending on the final design of the additional transformation required at Pleasant Valley and Silver Lake. In addition the cost to install new conductors on the Pleasant Valley to Crystal Lake 138 kV line would need to be added to these costs. From an operational performance perspective, both projects would simplify or eliminate a number of special protection relay systems related to the Byron station. All of the right-of-way would need to be secured for the Byron – Pleasant Valley project. Over 70% of the right-of-way has been secured for the Byron – Wayne project. The project comparison is summarized in the table below.

	Byron – Pleasant Valley 345 kV	Byron – Wayne 345 kV
<b>ARR Performance</b>	Meets requirement	Meets requirement
<b>Reliability Analysis Performance</b>	Final scope of Transformer work may increase cost. Also spare equipment strategy may increase cost.	No additional upgrades required.
<b>Cost</b>	(\$108.8 M “low transformer estimate” or \$120.8 M “high transformer estimate”)* + Pleasant Valley – Crystal Lake 138 kV Reconductor cost	\$109.6
<b>Mileage</b>	~52**	57.16
<b>Time Estimate***</b>	2.5 years	2.5 years
<b>SPS Elimination</b>	Extra source at Byron improves stability at Byron	
<b>Right of Way Ownership, Rights or Control</b>	0% - must obtain all	Over 70%
<b>Route Diversity</b>	Existing Route	New Route

\* Cost estimate dependant on final cost estimate of the additional transformer work at 2 locations

\*\* Mileage estimate based on previous Byron – Cherry Valley – Pleasant Valley study

\*\*\* Dependant on permit applications through required agencies

### Review by the Transmission Expansion Advisory Committee (TEAC)

The results of the analyses summarized in this report were reviewed with the TEAC over several meetings throughout 2012. The most recent analysis, along with recommended solution, was reviewed at the September 13, 2012 meeting. Written comments were requested to be submitted to PJM communicating any concerns with the recommendation and any alternative transmission solutions for consideration.

### Cost Allocation

Cost allocation for projects required to address ARR insufficiency is defined in section 1.5.6 of the Operating Agreement. The allocation is based on individual transmission zone flow contribution on the infeasible facilities. The allocations for this project are summarized in the table below.

Zone	Stage 1A 10-year Cost Allocation for Byron-Wayne
COMED	92.90%
AEP	4.10%
APS	2.20%
DAY	0.40%
DOM	0.20%
ATSI	0.10%
AECO	0%
BGE	0%
DEOK	0%
DPL	0%
DUQ	0%
JCPL	0%
METED	0%
PECO	0%
PENELEC	0%
PEPCO	0%
PPL	0%
PSEG	0%
	100.00%

**Board Approval**

The PJM Board approved the new Byron to Wayne 345 kV transmission line and associated cost allocations at their meeting on October 16, 2012.