

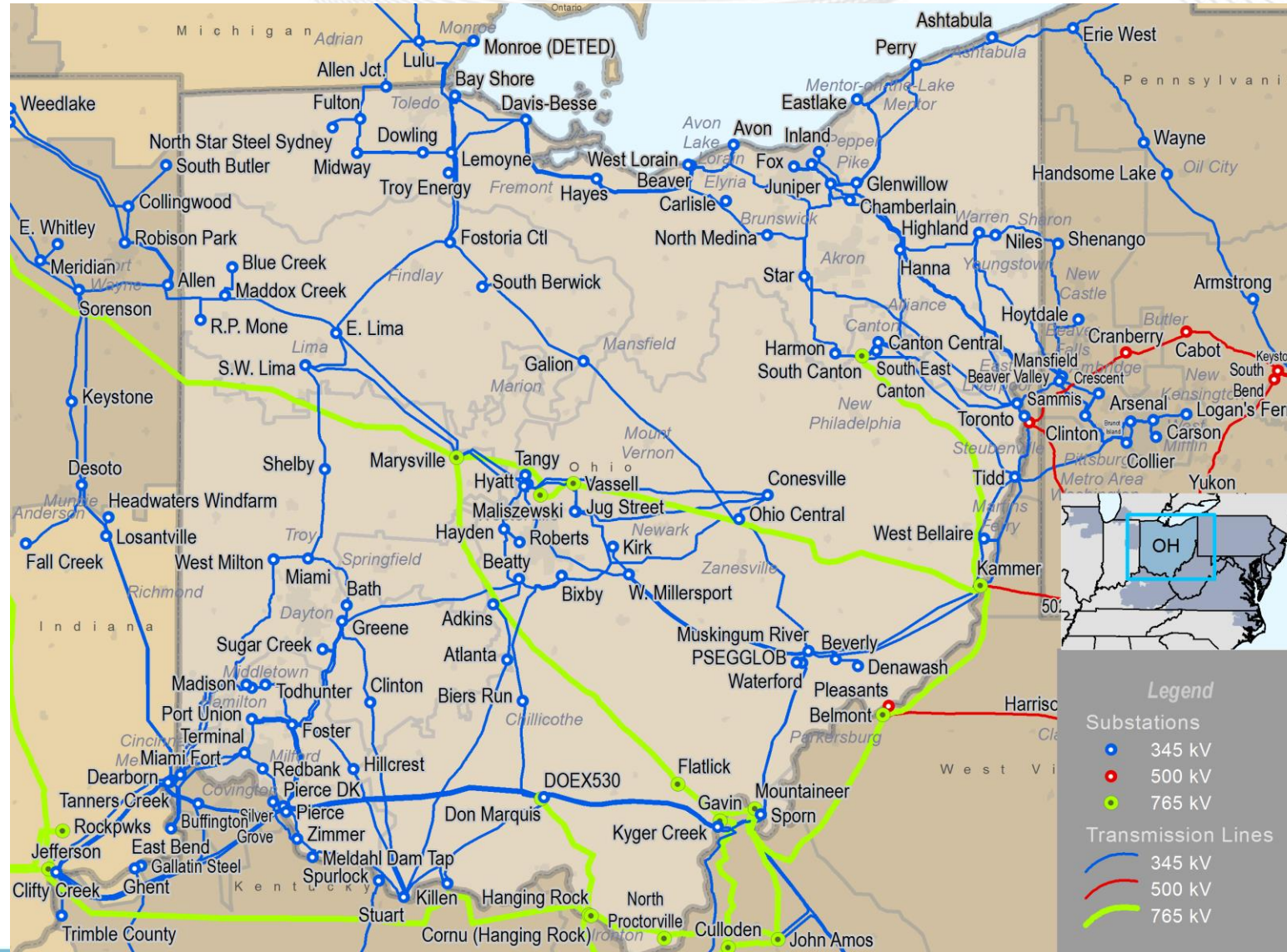
July 2016

# Ohio State Report

## 1. Planning

- Generation Portfolio Analysis
- Transmission Analysis
- Load Forecast
- Gas Pipeline Information

- **Existing Capacity:** Natural gas represents approximately 34 percent of the total installed capacity in Ohio while coal represents approximately 56 percent. This differs from PJM where natural gas and coal are relatively even at 34 and 35 percent respectively.
- **Interconnection Requests:** There are 7,000 MW of new Ohio natural gas generation in the PJM queue. Natural gas represents 90 percent of new interconnection requests in Ohio.
- **Deactivations:** Approximately 2,800 MW of capacity in Ohio retired in 2015. This represents 27 percent of the 10,200 MW that retired RTO-wide in 2015.
- **Load Forecast:** Ohio load growth is nearly flat, averaging less than .9 percent per year over the next 10 years. This aligns with PJM RTO load growth projections.
- **Natural Gas:** About 20 percent (1,700 MW) of Ohio's natural gas generation is behind a local distribution company.



# Planning

## Generation Portfolio Analysis

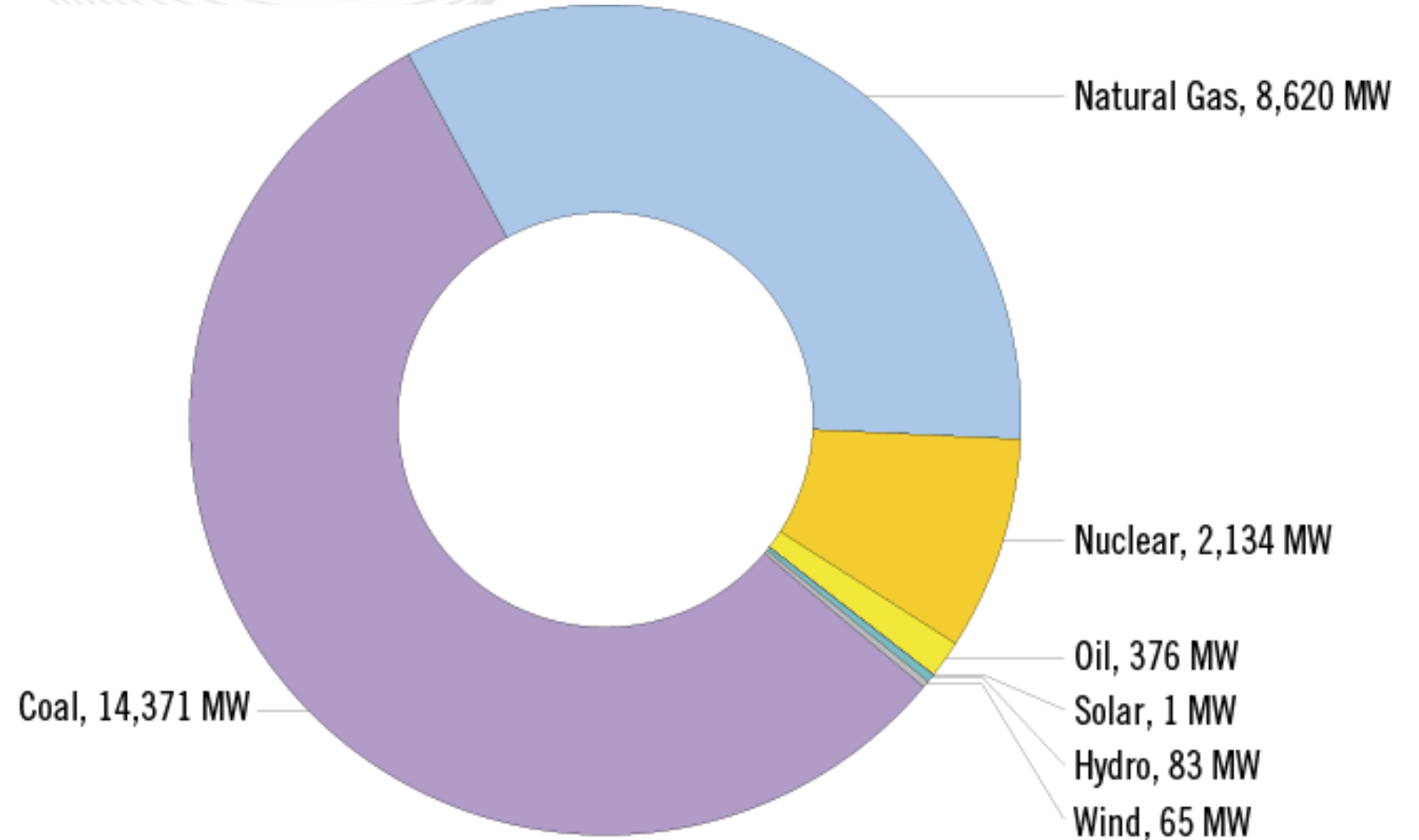


# Ohio - Existing Installed Capacity

(Capacity Rights, December 31, 2015)

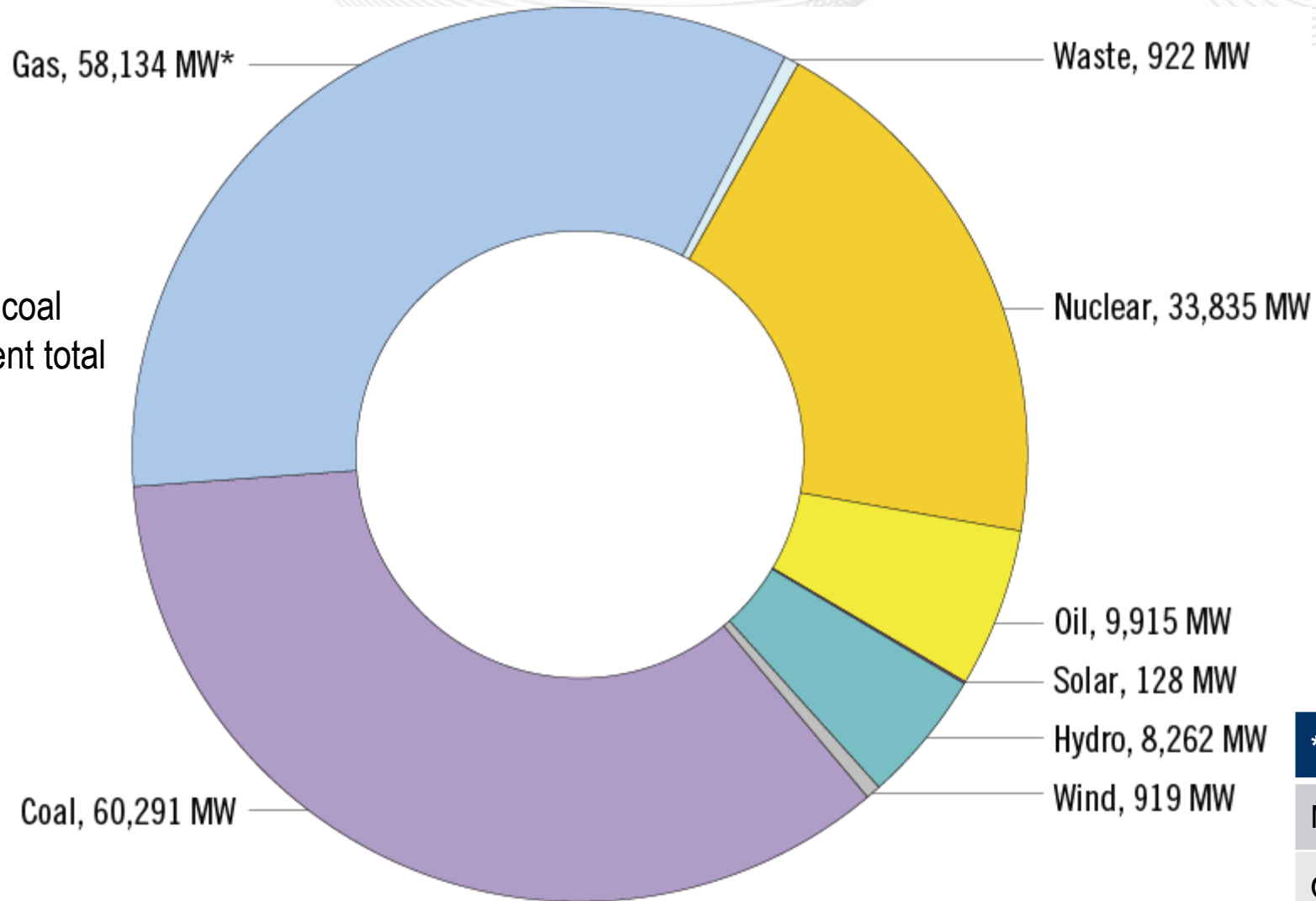
The Ohio territory contains more coal (56%) compared to PJM as a whole (34%).

* Gas Contains	
Natural Gas	8,565 MW
Other Gas	55 MW



# PJM - Existing Installed Capacity

(Capacity Rights, December 31, 2015)



In PJM, natural gas and coal make up nearly 70 percent total installed capacity.

## \* Gas Contains

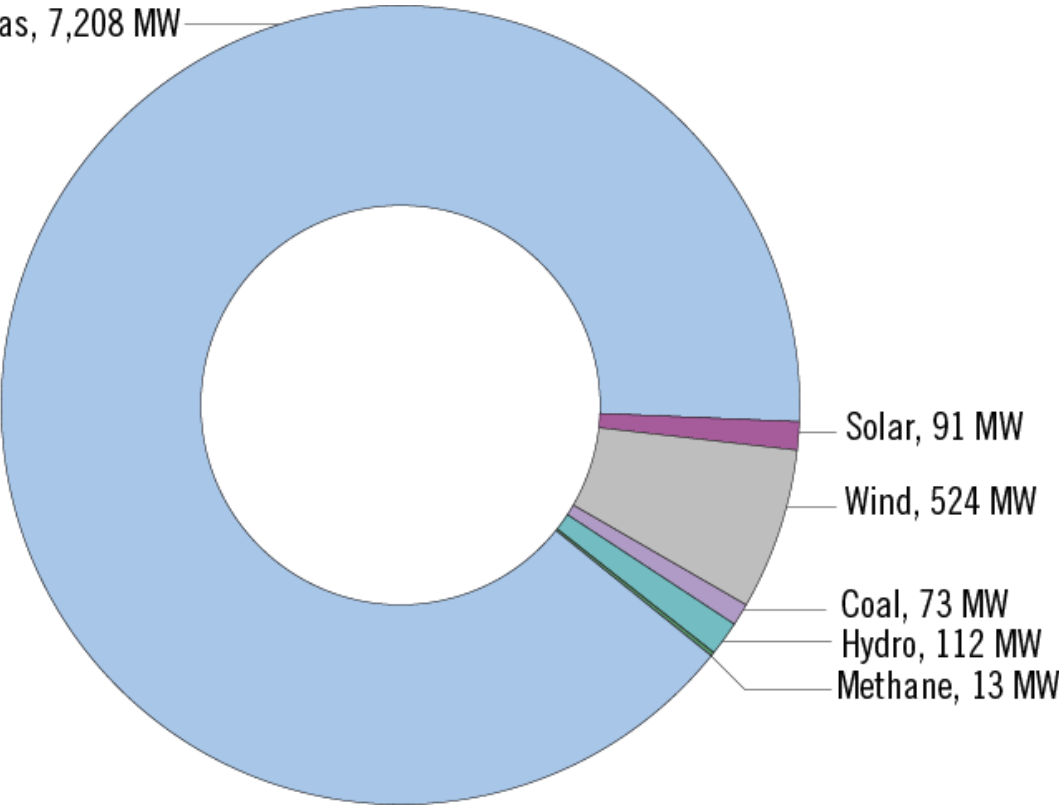
Natural Gas	57,735 MW
Other Gas	399 MW



Natural gas represents more than 90 percent of new interconnection requests in Ohio.

Total MW Capacity by Fuel Type

Natural Gas, 7,208 MW

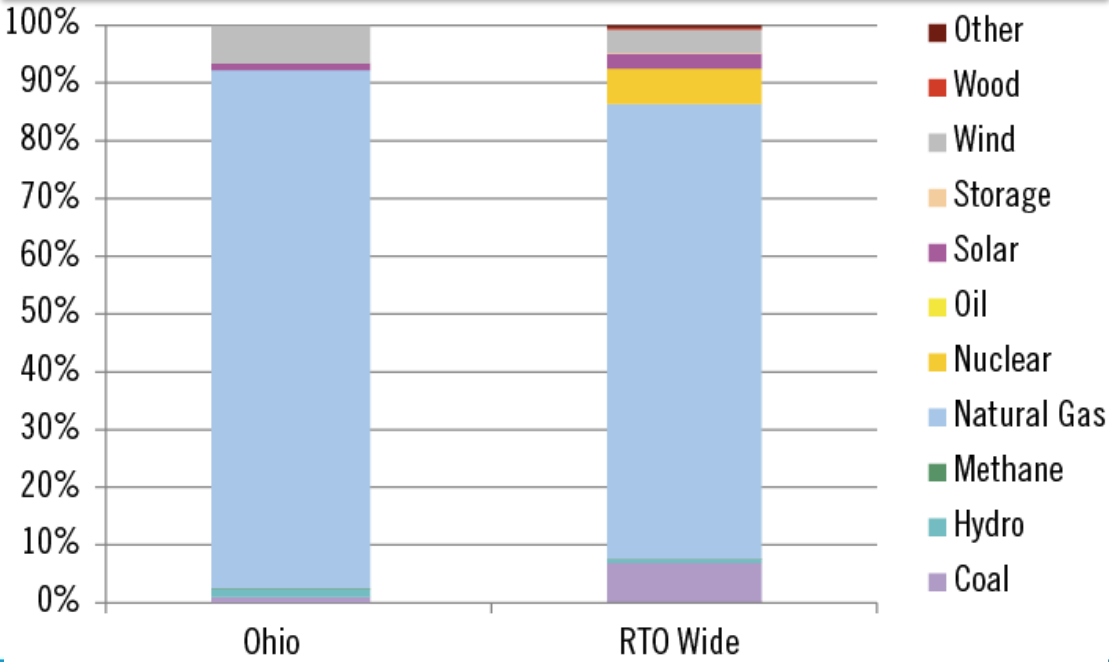


# Ohio - Interconnection Requests

(Requested Capacity Rights, December 31, 2015)

	MW	# of Projects
Active	5,496.3	43
Under Construction	2,327.4	21
Suspended	198.2	11
Total	8,021.9	75

Fuel as a Percentage of Projects in Queue





# Ohio - Interconnection Requests

(Requested Capacity Rights, December 31, 2015)

	Active		In Service		Executed final agreement (ISA/WMPA)		Under Construction		May have executed final agreement		Total Sum	
					Suspended				Withdrawn			
	MW	# of Projects	MW	# of Projects	MW	# of Projects	MW	# of Projects	MW	# of Projects	MW	# of Projects
Biomass	0.0	0	0.0	0	0.0	0	0.0	1	0.0	1	0.0	2
Coal	61.0	2	288.5	16	0.0	0	12.0	1	8,783.0	13	9,144.5	32
Diesel	0.0	0	7.0	1	0.0	0	0.0	0	0.0	0	7.0	1
Hydro	0.0	0	0.0	0	0.0	0	112.0	1	76.2	8	188.2	9
Methane	12.5	4	45.3	6	0.0	1	0.8	2	20.6	6	79.2	19
Natural Gas	5,144.9	14	730.0	10	0.0	0	2,063.5	6	4,448.5	17	12,386.9	47
Nuclear	0.0	0	16.0	1	0.0	0	0.0	0	0.0	0	16.0	1
Oil	0.0	0	0.0	0	0.0	0	0.0	0	5.0	1	5.0	1
Solar	55.3	4	1.0	1	19.7	4	16.5	3	229.3	29	321.7	41
Storage	0.0	8	0.0	5	0.0	0	0.0	2	0.0	7	0.0	22
Wind	222.6	11	30.0	1	178.5	6	122.6	5	1,142.5	49	1,696.3	72
Wood	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0
Other	0.0	0	0.0	0	0.0	0	0.0	0	341.0	3	341.0	3
<b>Total</b>	<b>5,496.3</b>	<b>43</b>	<b>1,117.7</b>	<b>41</b>	<b>198.2</b>	<b>11</b>	<b>2,327.4</b>	<b>21</b>	<b>15,046.1</b>	<b>134</b>	<b>24,185.8</b>	<b>250</b>

All MWs that enter the queue and either went into service, near operation or withdrew.  
(18,688MW)

# Ohio - Progression History Interconnection Requests

(Requested Capacity Rights, 2004 - 2015)



Following interconnection agreement (ISA/WMPA) execution 3,220 MW of capacity withdrew from PJM's interconnection process. Another 2,526 MW have executed agreements but were not in service as of December 31, 2015 (*Suspended or Under Construction*). Overall, 6% of requested capacity in Ohio reaches commercial operation. The PJM average over this time is 10%

# Ohio – 2015 Generation Deactivations

(Capacity, As of December 31, 2015)

Unit	MW Capacity	TO Zone	Age	Actual/Projected Deactivation Date
Ashtabula 5	244	ATSI	53	4/11/2015
Eastlake 1	132	ATSI	58	4/9/2015
Eastlake 2	132	ATSI	58	4/9/2015
Eastlake 3	132	ATSI	57	4/9/2015
Lake Shore 18	245	ATSI	49	4/13/2015
Lake Shore EMD	0	ATSI	48	4/15/2015
Hutchings 1	53	Dayton	63	6/1/2015
Hutchings 2	50	Dayton	63	6/1/2015
Hutchings 3	59	Dayton	62	6/1/2015
Hutchings 5	58	Dayton	60	6/1/2015
Hutchings 6	57	Dayton	59	6/1/2015
Muskingum River 1	190	AEP	58	6/1/2015
Muskingum River 2	190	AEP	57	6/1/2015
Muskingum River 3	205	AEP	54	6/1/2015
Muskingum River 4	205	AEP	53	6/1/2015

## Summary:

- Approximately 2,800 MW of capacity in OH retired in 2015. This represents more than 27 percent of the 10,200 MW that retired RTO-wide in 2015.
- The average unit age was 55 years.

# Ohio – 2015 Generation Deactivations

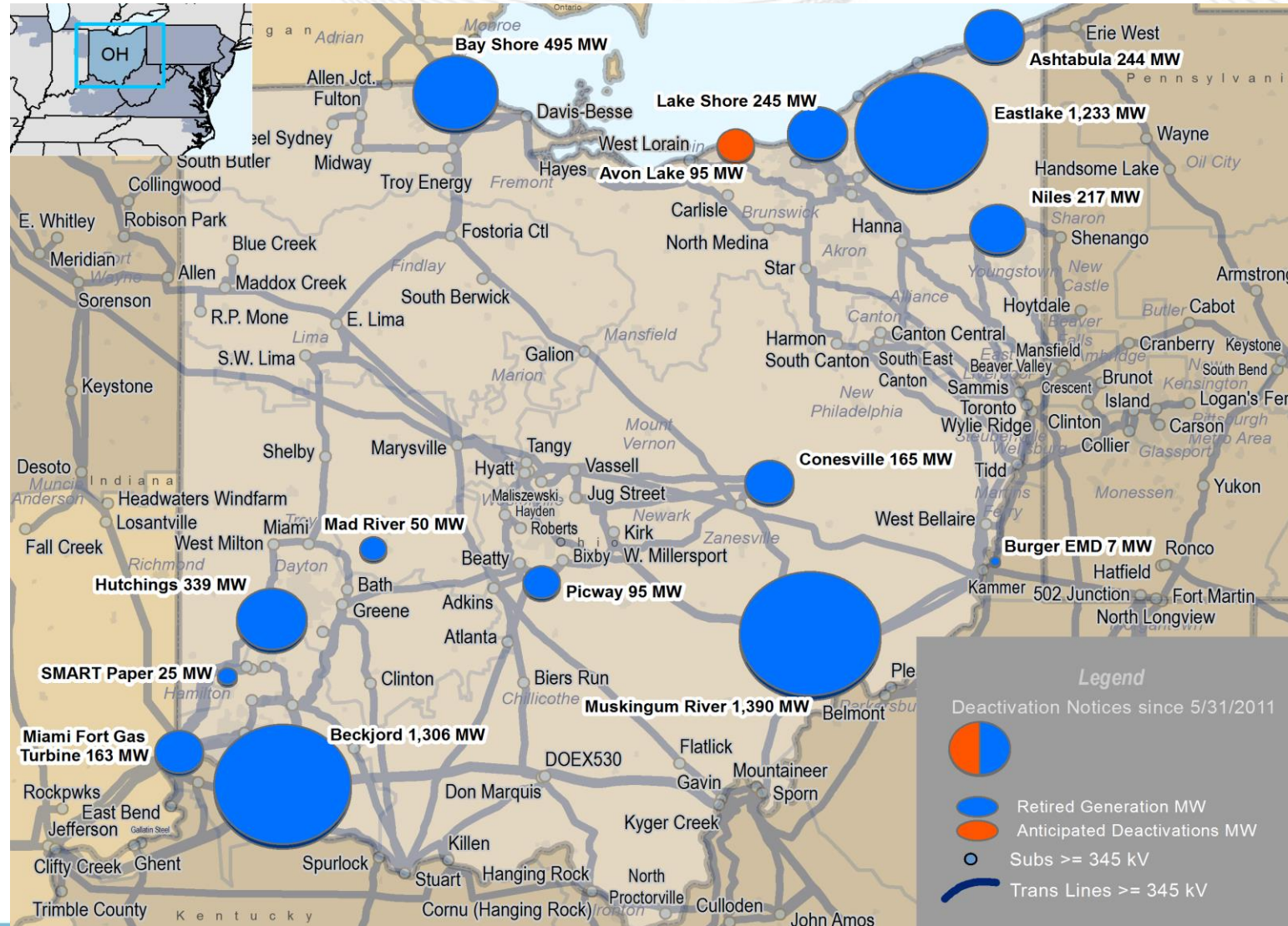
(Capacity, As of December 31, 2015)

Unit	MW Capacity	TO Zone	Age	Actual/Projected Deactivation Date
Picway 5	95	AEP	56	6/1/2015
Muskingum River 5	600	AEP	45	6/1/2015
Miami Fort 6	163	DEOK	54	6/1/2015
Burger EMD	7	ATSI	42	9/18/2015
<b><i>Generation announcing retirement in 2015</i></b>				
Avon Lake 7	94.7	ATSI	66	4/16/2016



# Ohio – Generation Deactivations

(MW Capacity, As of December 31, 2015)



Known generating unit deactivation requests in Ohio between January 1, 2011 and December 31, 2015.

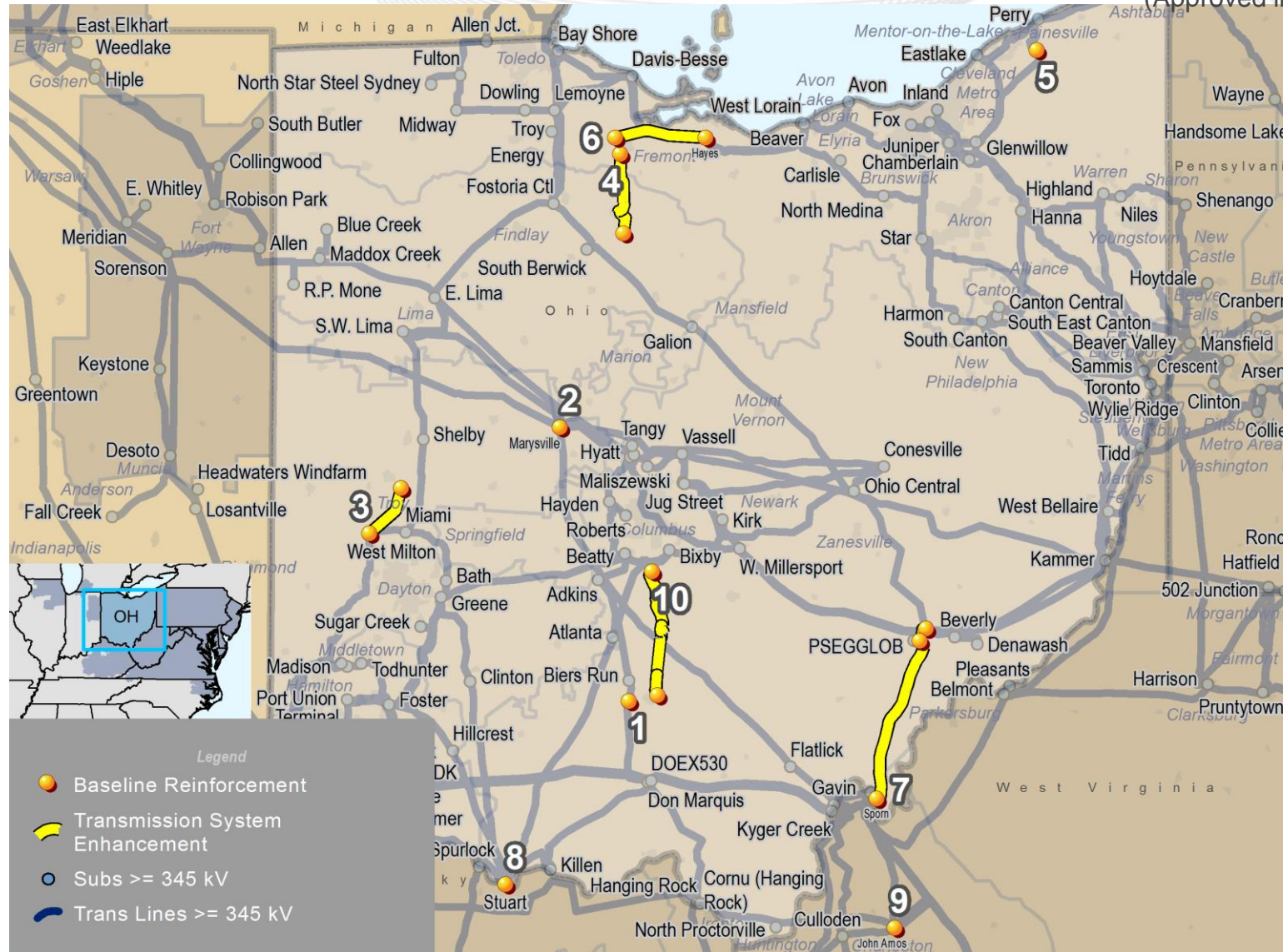


# Planning

## Transmission Infrastructure Analysis

# Ohio - RTEP Baseline Projects

(Approved in 2015, greater than \$10 million)



*Baseline Projects* are transmission enhancements identified as part of reliability criteria tests, operational performance issues and market efficiency studies that identify upgrade need driven by thermal, voltage, short circuit, stability and light load issues

			OH Baseline Project Driver								
Map ID	Project ID	Project	Baseline Load Growth / Deliverability & Reliability	Congestion Relief – Economic	Operational Performance	Generator Deactivation	TO Criteria Violation	Date	Cost (\$M)	TO Zone(s)	2015 TEAC Review
1	b1032.1	Construct a new 345/138/69 kV station on the Marquis - Bixby 345 kV line near the intersection with Ross - Highland 69 kV			●			9/30/2016	\$89.3	AEP	
2	b1570	Add a 345/69 kV transformer at AEP Marysville 345 kV bus			●			6/1/2018	\$16	Dayton	
3	b1572	Construct a new 138 kV line from West Milton to Eldean			●			6/1/2018	\$16	Dayton	
4	b1667	Establish Melmore as a switching station with both 138 kV circuits terminating at Melmore. Extend the double circuit 138 kV line from Melmore to Fremont Center			●			4/30/2016	\$18	AEP	

# Ohio - RTEP Baseline Projects

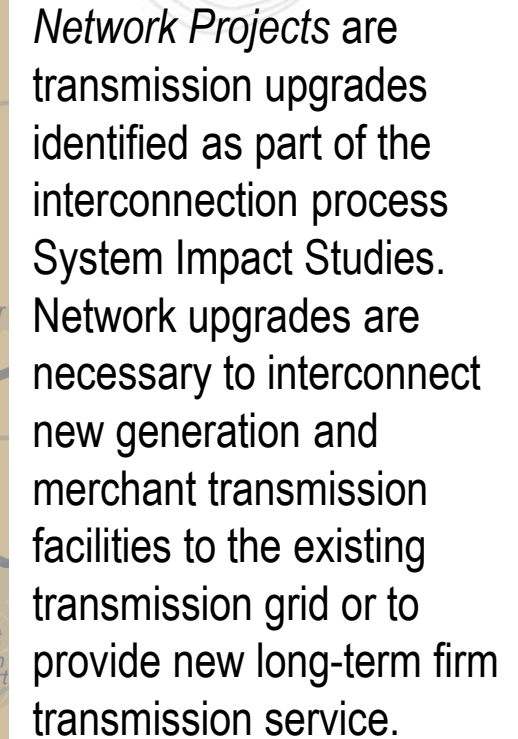
(Approved in 2015, greater than \$10 million)

			OH Baseline Project Driver								
Map ID	Project ID	Project	Baseline Load Growth / Deliverability & Reliability	Congestion Relief – Economic	Operational Performance	Generator Deactivation	TO Criteria Violation	Date	Cost (\$M)	TO Zone(s)	2015 TEAC Review
5	b1937	Build a new Leroy Center 345/138 kV substation by looping in the Perry – Harding 345 kV line			●			6/1/2016	\$46	ATSI	
6	b1959	Build a new West Fremont-Groton-Hayes 138kV line			●			8/31/2018	\$45	ATSI	
7	b2017	Reconductor or rebuild Sporn - Waterford - Muskingum River 345 kV line			●			6/1/2016	\$200	AEP	
8	b2176	Change the tap setting on the Stuart 345/138 kV transformer from 1.00 pu to 1.025 pu			●			6/1/2017	\$15	Dayton	



			OH Baseline Project Driver								
Map ID	Project ID	Project	Baseline Load Growth / Deliverability & Reliability	Congestion Relief – Economic	Operational Performance	Generator Deactivation	TO Criteria Violation	Date	Cost (\$M)	TO Zone(s)	2015 TEAC Review
9	b2230	Replace existing 150 MVAR reactor at Amos 765 kV substation on Amos – N. Proctorville - Hanging Rock with 300 MVAR reactor			●			12/7/2016	20	AEP	
10	b2256	Upgrade approximately 36 miles of 138 kV through path facilities between Harrison 138kV station and Ross 138KV station in Ohio			●			12/31/2017	130	AEP	





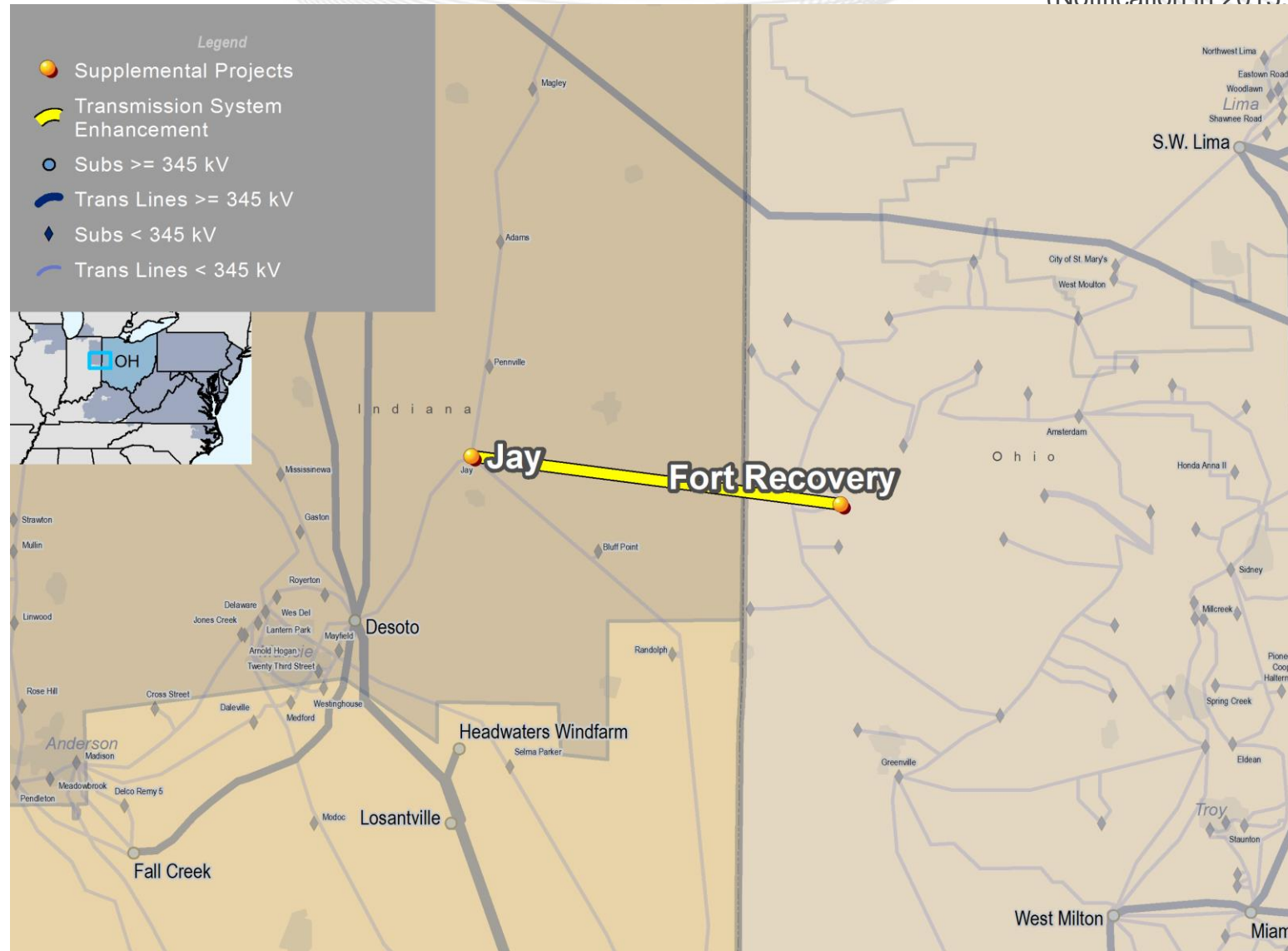
# Ohio - RTEP Network Projects

(Approved in 2015, greater than \$10 million)

		OH Network Project Drivers			Date	Cost (\$M)	TO Zone(s)	2015 TEAC Review
		Generation Interconnection	Merchant Transmission Interconnection	Long-Term Firm Transmission Service				
n3960	Construct new 345kV (Stemple) station switchyard	Y2-050			6/1/2017	\$13.15	AEP	

# Ohio - TO Supplemental Projects

(Notification in 2015 greater than \$10 million)





# Ohio - TO Supplemental Projects

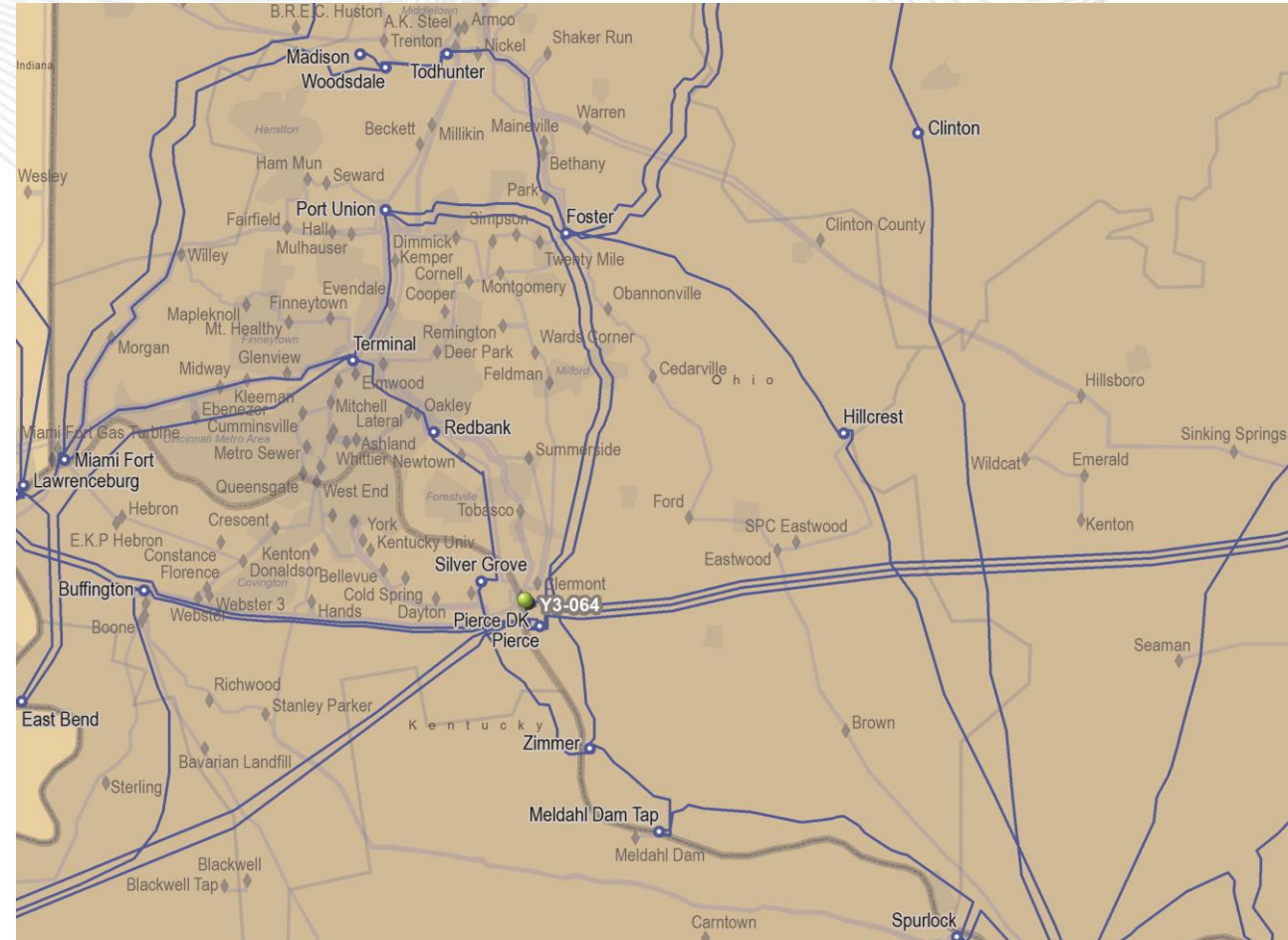
(Notification in 2015, greater than \$10 million)

		OH Supplemental Projects			
Project ID	Project	Date	Cost (\$M)	TO Zone(s)	2015 TEAC Review
s0326	Build Jay (AEP) - Fort Recovery 138 kV circuit	6/1/2018	\$11	Dayton	



# Ohio - Merchant Transmission Project Requests

(December 31, 2015)



Queue	Project Name	MW	Status	Schedule	TO
Y3-064	Pierce-Beckjord 138 kV	160	Active	4/1/2019	DEOK



# Planning

## Load Forecast

Transmission Owner	Summer Peak (MW)			Winter Peak (MW)		
	2016	2026	Growth Rate (%)	2015/16	2025/26	Growth Rate (%)
American Electric Power Company *	10,663	11,536	0.8%	10,431	10,252	1.0%
American Transmission Systems, Inc. *	12,048	12,506	0.4%	9,836	10,160	0.5%
Dayton Power and Light	3,403	3,647	0.7%	2,848	3,083	0.8%
Duke Energy Ohio and Kentucky *	4,469	4,812	0.7%	3,635	3,986	0.8%
PJM RTO	130,243	140,912	0.8%	152,131	161,891	0.6%

\* PJM notes that AEP, ATSI and Duke Energy serve load other than in Ohio. The Summer Peak and Winter Peak MW values in this table each reflect an estimated amount of forecasted load to be served by each of those transmission owners solely in Ohio. Estimated amounts were calculated based on the average share of each transmission owner's real-time summer and winter peak load located in Ohio over the past five years.

# Operations

## Gas Pipeline Information

Gas Generators	Dual Fuel Capable (MW)	Total Generator (MW)
Connected to Interstate Pipelines	1,300	6,900 (80%)
Behind the Local Distribution Company	700	1,700 (20%)
<b>Total Gas Fired Generators</b>	<b>2,000</b>	<b>8,600</b>

Interstate Pipelines	Local Distribution Companies
ANR Pipeline	Dominion East Ohio
Columbia Gas Transmission (COL)	Duke Energy Ohio
Dominion Transmission (DTI)	Vectren Corporation
Panhandle Eastern Pipe Line Company	
Tennessee Gas Pipeline (TGPL)	
Texas Eastern Transmission - Spectra Energy (TETCO)	
Texas Gas Transmission	
Transcontinental Gas Pipe Line (Transco)	