



# 2018 Indiana State Infrastructure Report

(January 1, 2018 – December 31, 2018)

May 2019

This report reflects information for the portion of Indiana within the PJM service territory.

## 1. Planning

- Generation Portfolio Analysis
- Transmission Analysis
- Load Forecast

## 2. Markets

- Capacity Market Results
- Market Analysis

## 3. Operations

- Emissions Data

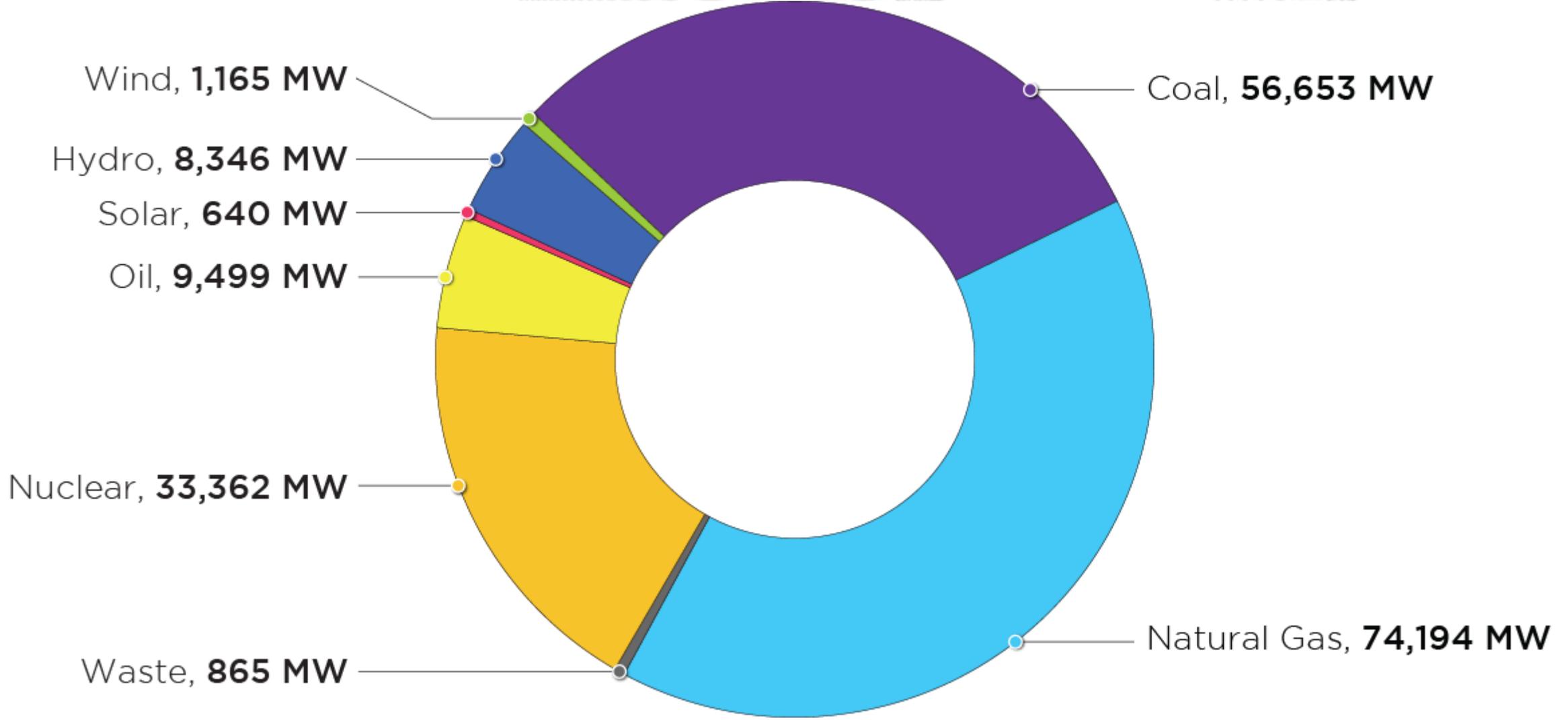
- **Existing Capacity:** Natural gas represents approximately 36.1 percent of the total installed capacity in Indiana while coal represents approximately 59.9 percent. This differs from PJM where natural gas and coal are at 40.2 and 30.7 percent of total installed capacity.
- **Interconnection Requests:** Natural gas represents approximately 50.5 percent of new interconnection requests in Indiana.
- **Deactivations:** Indiana had no generation deactivations or deactivation notifications in 2018.
- **RTEP 2018:** Indiana RTEP 2018 projects total more than \$901 million in investment. Approximately 47.5 percent of that represents supplemental projects. These investment figures only represent RTEP projects that cost at least \$5 million.
- **Load Forecast:** Indiana load growth is nearly flat, averaging 0.5 percent per year over the next 10 years. This aligns with PJM RTO load growth projections.

- **2021/22 Capacity Market:** Indiana cleared 140 MW more Demand Response and Energy Efficiency resources than in the prior auction.
- **1/1/18 – 12/31/18 Market Performance:** Indiana's average hourly locational marginal prices were generally lower than PJM's average hourly LMPs. Coal resources represented 48.5 percent of generation produced in Indiana while natural gas and wind resources represented 36.0 and 15.1 percent, respectively. Indiana exported 26.5 percent of the generation produced within the state.
- **Emissions:** 2018 carbon dioxide, nitrogen oxides, and sulfur dioxide emissions are all slightly down from 2017.



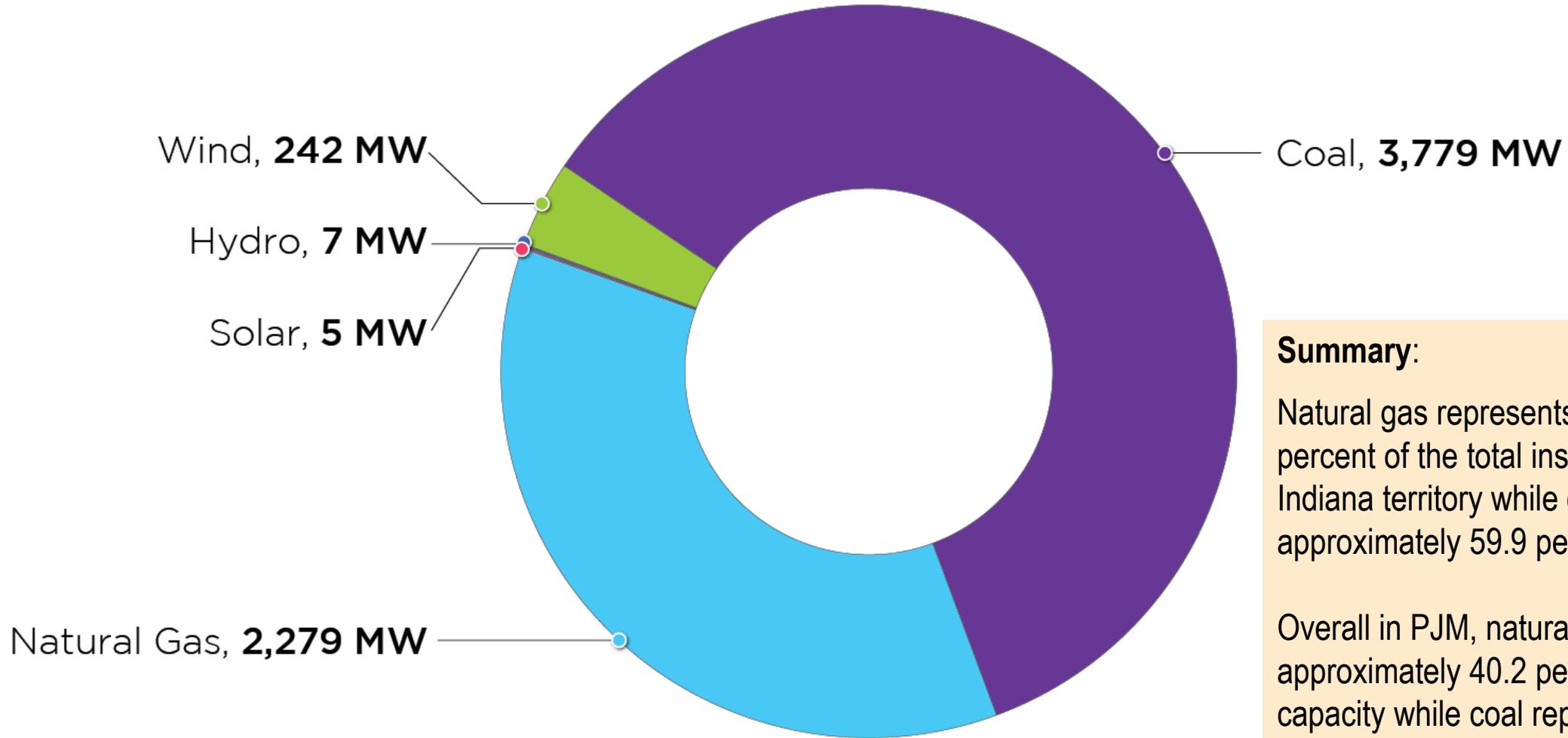
# Planning

## Generation Portfolio Analysis



# Indiana – Existing Installed Capacity

(MW submitted to PJM, December 31, 2018)



### Summary:

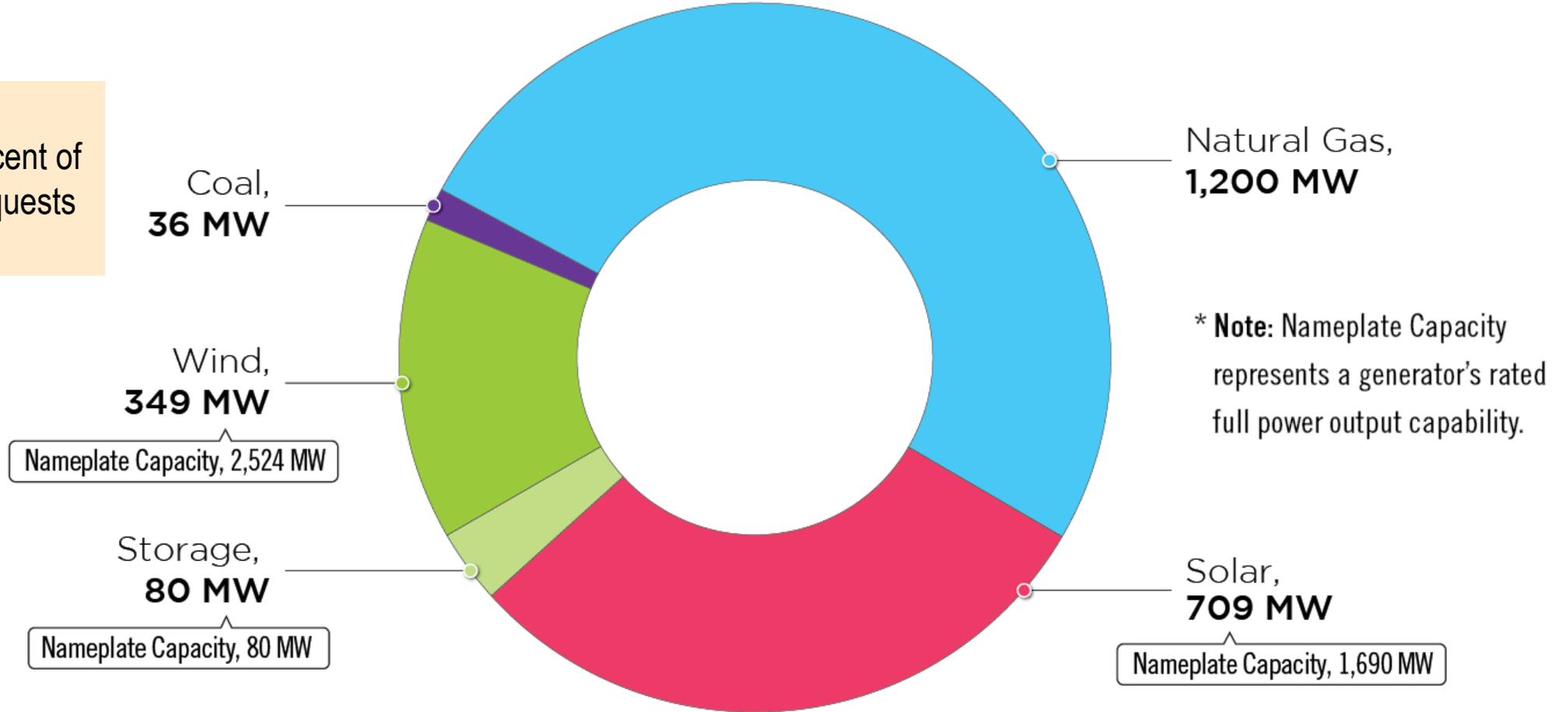
Natural gas represents approximately 36.1 percent of the total installed capacity in the Indiana territory while coal represents approximately 59.9 percent.

Overall in PJM, natural gas represents approximately 40.2 percent of installed capacity while coal represents 30.7 percent.

# Indiana – Queued Capacity (MW) by Fuel Type

(as of December 31, 2018)

Natural gas represents approximately 50.5 percent of new interconnection requests in Indiana.



# Indiana - Percentage of Projects in Queue by Fuel Type

(as of December 31, 2018)



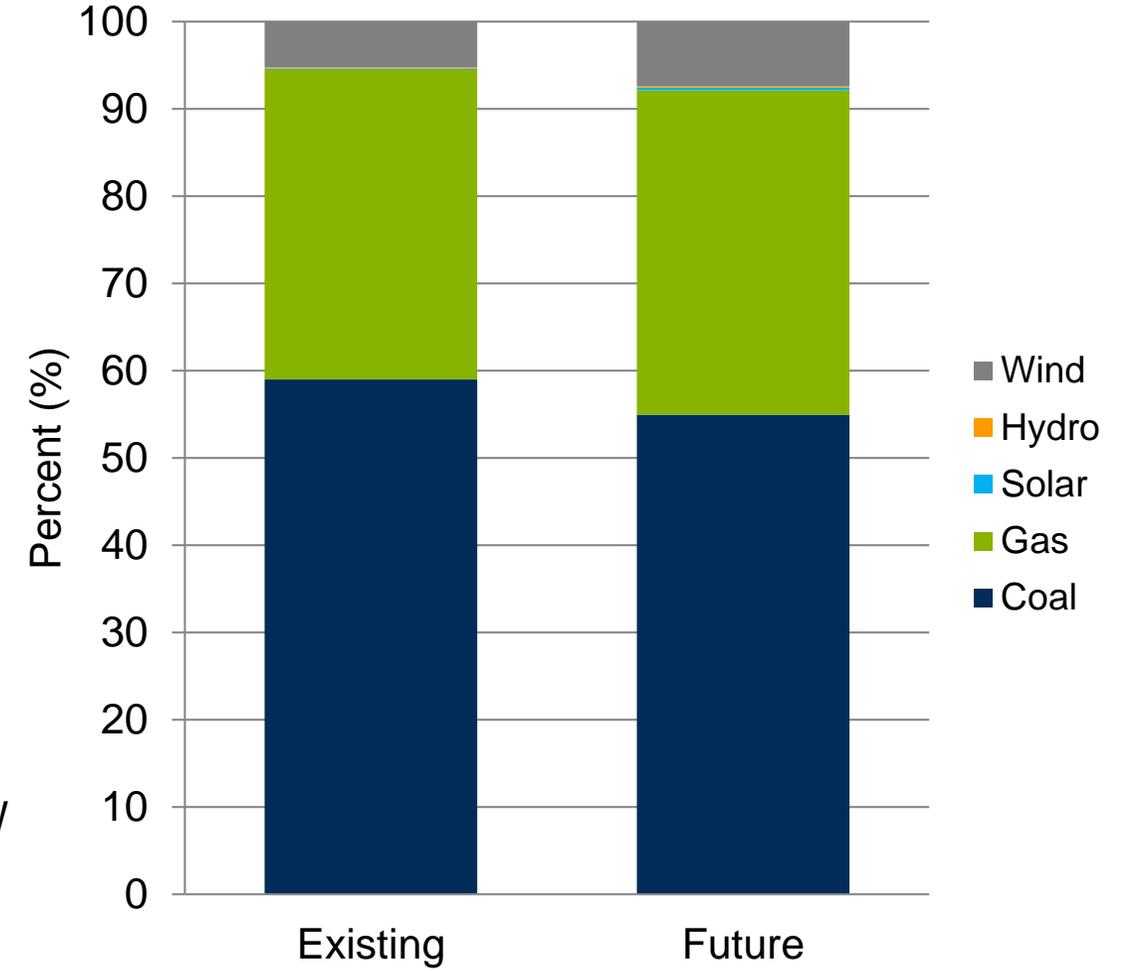
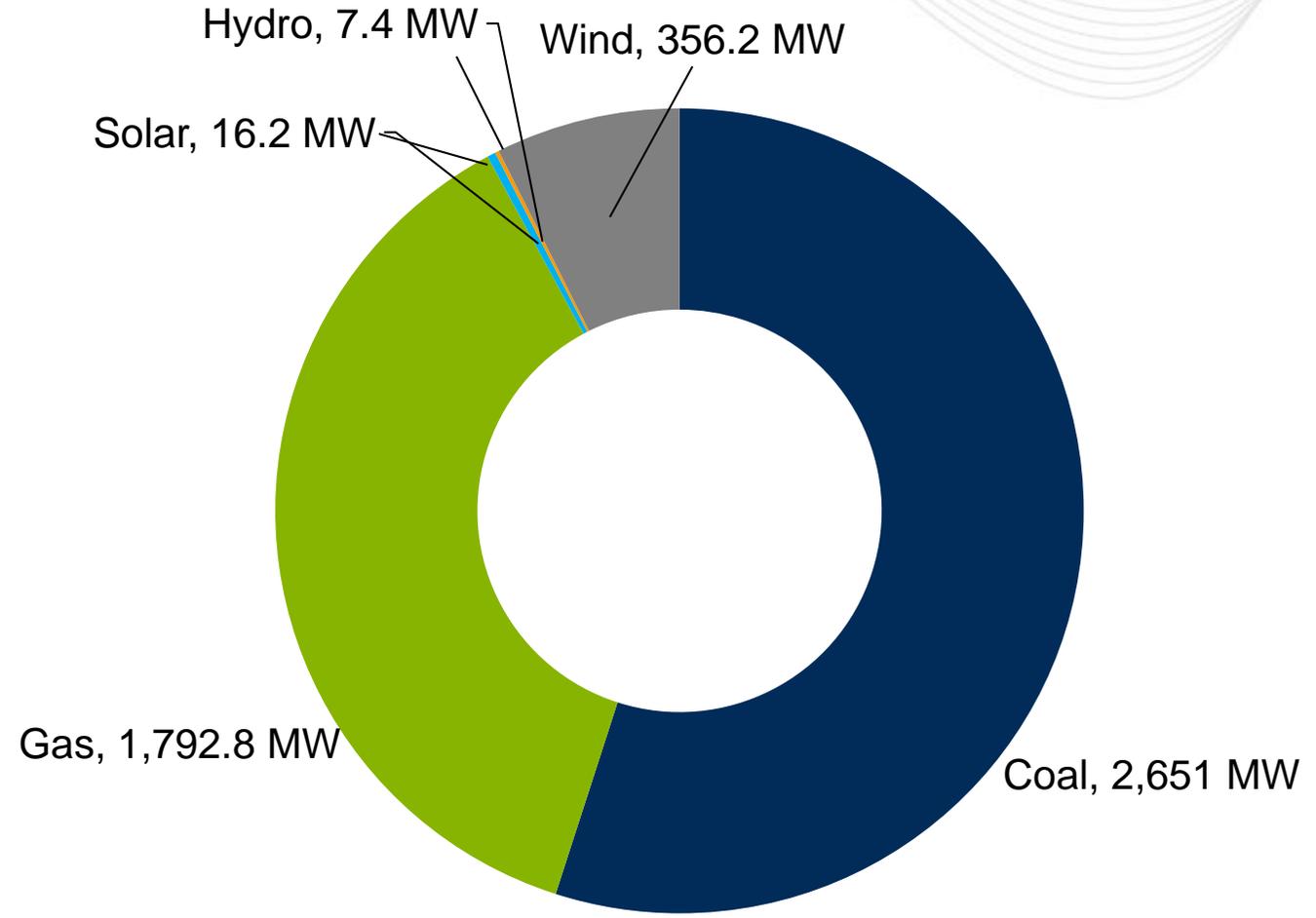


# Indiana – Interconnection Requests

(Unforced Capacity, As of December 31, 2018)

	Complete				In Queue				Grand Total	
	In Service		Withdrawn		Active		Under Construction			
	No. of Projects	Capacity, MW	No. of Projects	Capacity, MW	No. of Projects	Capacity, MW	No. of Projects	Capacity, MW	No. of Projects	Capacity, MW
<b>Non-Renewable</b>	7	791.0	8	2,671.3	3	1,180.0	3	136.0	21	4,778.3
Coal	3	30.0	2	901.0	0	0.0	1	36.0	6	967.0
Natural Gas	4	761.0	2	1,747.0	2	1,100.0	2	100.0	10	3,708.0
Storage	0	0.0	4	23.3	1	80.0	0	0.0	5	103.3
<b>Renewable</b>	13	359.1	55	3,555.2	23	1,005.1	2	52.0	93	4,971.4
Methane	2	8.0	1	3.6	0	0.0	0	0.0	3	11.6
Solar	3	5.1	13	2,005.0	12	708.5	0	0.0	28	2,718.5
Wind	8	346.0	41	1,546.7	11	296.7	2	52.0	62	2,241.3
<b>Grand Total</b>	20	1150.0	63	6,227.0	26	2,185.0	5	188.0	114	9,750.0

Based on known queued interconnection requests and deactivation notices through December 31, 2022, adjusted to reflect the probability of commercialization as indicated by historical trends specific to an interconnection request's state/zonal location and fuel type.



# Indiana – Progression History Interconnection Requests

Projects under construction, suspended, in service, or withdrawn (as of December 31, 2018)



**Projects withdrawn after final agreement**

- 3 Interconnection Service Agreements – 71.4 MW (Nameplate Capacity, 420 MW)

**Percentage of planned capacity and projects reached commercial operation**

- 15.5 % requested capacity megawatt
- 23.9 % requested projects

# Indiana – Actual Generation Deactivations and Deactivation Notifications Received in 2018

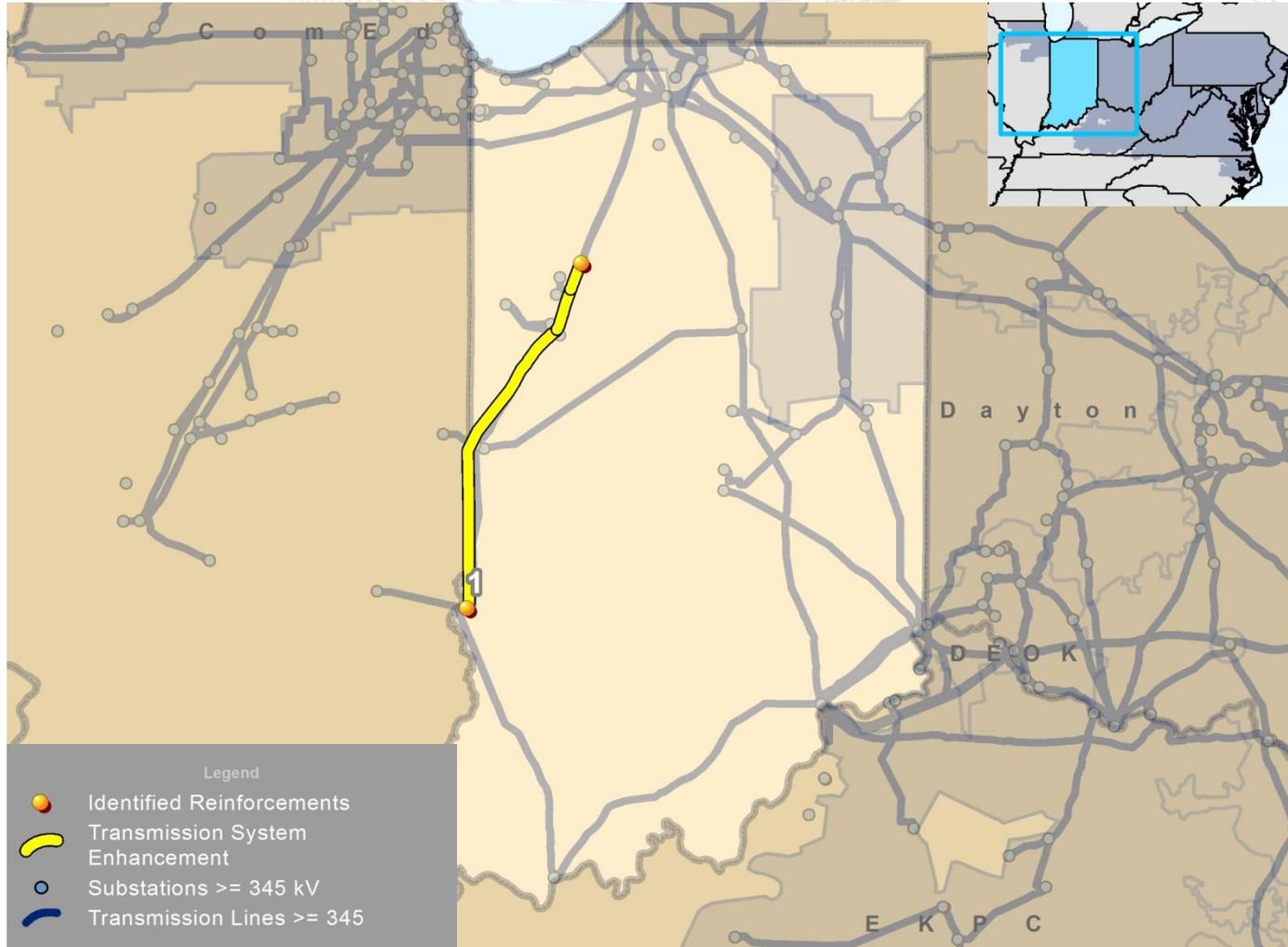
Indiana had no generation deactivations or deactivation notifications in 2018.

# Planning

## Transmission Infrastructure Analysis

Indiana had no baseline project upgrades in 2018.

Note: Baseline upgrades are those that resolve a system reliability criteria violation.



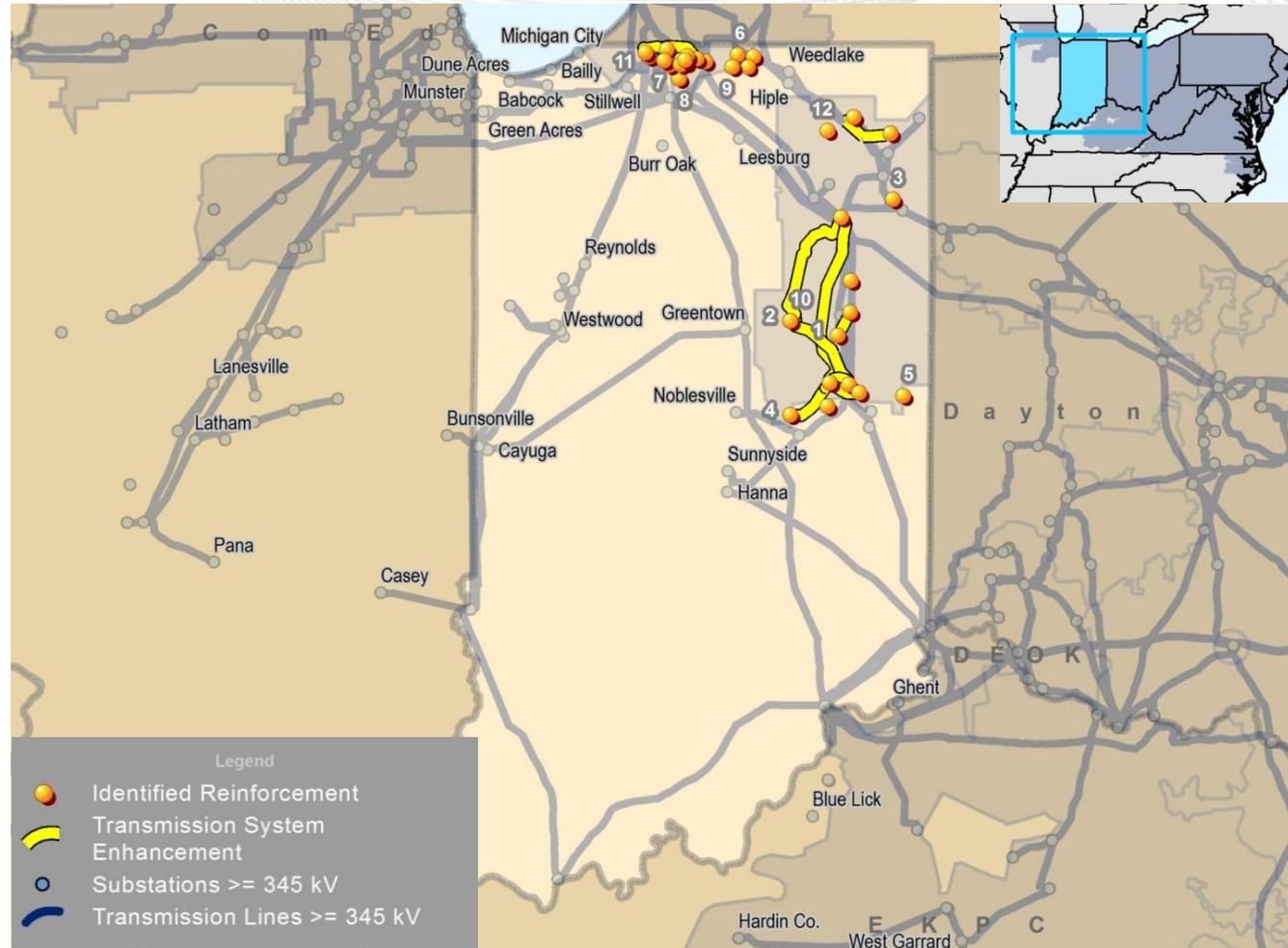
Note: Network upgrades are new or upgraded facilities required primarily to eliminate reliability criteria violations caused by proposed generation, merchant transmission or long term firm transmission service requests.



# Indiana – RTEP Network Projects

(Greater than \$5 million)

Map ID	Project	Description	Project Driver	Queue	Required In-Service Date	Project Cost (\$M)	TO Zone	2018 TEAC Review
1	n5034	Build a new Sullivan-Reynolds 765 kV line.	Merchant Transmission	X3-028	6/1/2021	\$464	AEP	9/13/2018
	n5735	Build a new 345 kV Switching Station.	Generation	AC2-080 (Wind)	12/31/2019	\$9.25	AEP	9/13/2018



Note: Supplemental projects are transmission expansions or enhancements that are not required for compliance with the following PJM criteria: system reliability, operational performance or economic criteria, pursuant to a determination by the Office of the Interconnection and is not a state public policy project.



# Indiana – TO Supplemental Projects

(Greater than \$5 million)

Map ID	Project	Description	Projected In-Service Date	Project Cost (\$M)	TO Zone	2018 TEAC Review
1	s1430	Replace two circuit breakers at Liberty Center and install a new high-side 69 kV circuit switcher.	12/20/2019	\$14.98	AEP	1/8/2018
		Replace three circuit breakers at Hartford City 69 kV with 40 kA models.	6/1/2020		AEP	1/8/2018
		Rebuild approximately 8.5 miles of the Hartford City-Montpelier 69 kV line utilizing aluminum conductor steel cable (68 MVA rating, non-conductor limited).	7/23/2019		AEP	1/8/2018
2	s1495	Rebuild approximately 32 miles of the Delaware-Sorenson & Sorenson-Deer Creek 138 kV double circuit line using aluminum conductor steel cable (257 MVA rating).	12/2/2019	\$84.3	AEP	1/30/2018
		Rebuild approximately 3 miles of the Deer Creek 138 kV double circuit extension using aluminum conductor steel cable, 257 MVA rating.	12/2/2019		AEP	1/30/2018
3	s1496	Rebuild approximately 2 miles of single circuit line with aluminum conductor steel cable from Anthony Station to Structure 66 (just south of Lakeside station) and continue to Storm Water Station. The rebuilt 34.5 kV circuit from Anthony-Storm Water 34.5 kV will be limited by switches at Storm Water creating an overall rating of 41/45 MVA and 53/57 MVA.	9/23/2020	\$16.6	AEP	1/30/2018
		At Water Pollution Station, replace two 34.5 kV circuit breakers with 1200 A 25 kA breakers.	9/23/2020		AEP	1/30/2018
		At Anthony Station, replace a 34.5 kV circuit breaker with a 25 kA breaker.	3/25/2020		AEP	1/30/2018
4	s1498	Rebuild the approximately 19 miles of the Delaware-Madison double circuit 138 kV line utilizing double circuit aluminum conductor steel cable.	12/20/2019	\$54.8	AEP	1/30/2018
		Replace risers at Delaware station with 1200 A jumpers.	12/18/2021		AEP	1/30/2018
		Replace the switches at Daleville station with 100 kA switches.	12/31/2021		AEP	1/30/2018
5	s1508	Rebuild from structure near Anchor Hocking Station to structure near Price station using approximately 6.5 miles aluminum conductor steel cable.	5/14/2020	\$10.6	AEP	2/14/2018



# Indiana – TO Supplemental Projects (cont.)

(Greater than \$5 million)

Map ID	Project	Description	Projected In-Service Date	Project Cost (\$M)	TO Zone	2018 TEAC Review
6	s1549	At Osolo station, replace two 34.5 kV breakers with 69 kV 40 kA breakers. Replace Transformer 1 with a 138/69/34.5 kV 75 MVA unit and install a high-side circuit switcher. Install two line breakers and a bus tie breaker in between the two loads utilizing 138 kV 40 kA breakers.	4/10/2020	\$12.1	AEP	3/9/2018
		At East Elkhart station, replace Transformer 2 with a 138/69/34.5 kV 75 MVA transformer. Replace a circuit breaker with a 40 kA 69 kV breaker.	4/10/2020		AEP	3/9/2018
7	s1550	Rebuild from Tulip Road to Grandview station utilizing 7.4 miles of single circuit aluminum conductor steel cable (64 MVA rating) built to 69 kV but energized at 34.5 kV. From Grandview-West Side, build 1.2 miles of double circuit aluminum conductor steel cable built to 69 kV but operated at 34.5 kV. Remove the emergency switch toward Bendix station. Remove the Grandview hard tap and feed the station radially from West Side.	11/30/2018	\$17.2	AEP	3/9/2018
8	s1582	At Jackson Road station, replace 138 kV air blast circuit breakers with new 63 kA circuit breakers. Install five new 63 kA 138 kV breakers. Install three new 345 kV circuit breakers with 63 kA model. Replace 345/138/34.5 kV Transformer 3 with a 675 MVA unit.	12/31/2018	\$13.79	AEP	3/8/2018
9	s1592	Rebuild Harrison Street station as a 69 kV ring bus station using 340 kA breakers.	4/1/2019	\$38.9	AEP	3/27/2018
		Rebuild Lusher Avenue as a 69 kV station using a bus tie breaker with two air breakers on the line exits.	4/1/2019		AEP	3/27/2018
		Install a 69 kV 3000 A 40 kA breaker at Concord station toward Harrison Street. Install a 69 kV (34.5 kV operated) 3000 A 40 kA breaker at Concord station toward AE Comp.	4/1/2019		AEP	3/27/2018
		At Dunlap Station replace Transformer 2 with a 138/69-34.5 kV 90 MVA transformer. The transformer will have a high-side 40 kA circuit switcher. Install two 138 kV line breakers using 40 kA breakers. Replace two circuit breakers with 69 kV 40 kA models.	4/1/2019		AEP	3/27/2018
		Rebuild Elkhart Hydro to 69 kV standards but operate it at 34.5 kV. Replace two circuit breakers with 40 kA breakers. Install a 3000 A 40 kA 69 kV line breaker.	4/1/2019		AEP	3/27/2018
		Remove Harrison Street Tap Switch.	4/1/2019		AEP	3/27/2018
		Build approximately 1.5 miles of line from the existing Concord-Wolf de-energized 138 kV line to Harrison Street at 69 kV utilizing aluminum conductor steel cable (64 MVA rating). Retire the line portion from AE Comp-Harrison Street.	4/1/2019		AEP	3/27/2018
Build approximately 1.5 miles from the Dunlap-Concord line to Harrison Street station. Rebuild 0.5 miles of the existing Dunlap-Lusher line to 69 kV standards and retire the portion between Harrison Street Tap and the new line. All new line will utilize aluminum conductor steel cable (64 MVA rating).	4/1/2019	AEP	3/27/2018			



# Indiana – TO Supplemental Projects (cont.)

(Greater than \$5 million)

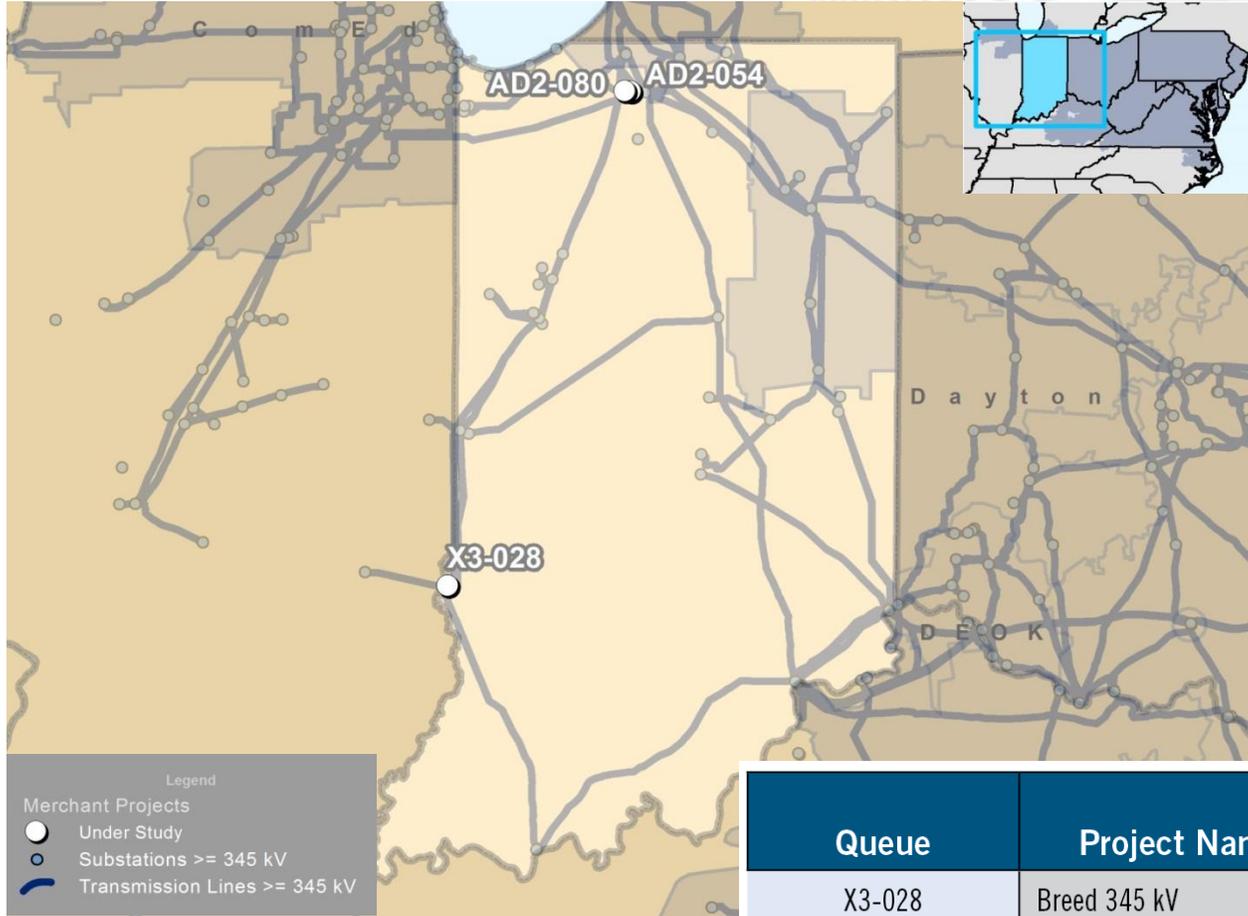
Map ID	Project	Description	Projected In-Service Date	Project Cost (\$M)	TO Zone	2018 TEAC Review
10	s1610	At Desoto station, install four 345 kV 63 kA breakers in the 345 kV yard with two breakers protecting the Tanners Creek No. 1 line, a breaker protecting Transformer 1's high side, and an additional breaker protecting Transformer 2's high side. Install five 138 kV kA breakers.	4/29/2019	\$21.1	AEP	4/5/2018
		At Delaware station, retire exits toward College Corner and Selma Parker. Upgrade risers and busses on Deer Creek and Desoto exits.	4/29/2019		AEP	4/5/2018
		Retire 7 miles of the Delaware-College Corner/Selma Parker double circuit 138 kV line and re-terminate it into Desoto station.	4/29/2019		AEP	4/5/2018
		Rebuild roughly 2 miles of the Delaware-Deer Creek/Desoto line using aluminum conductor steel cable (257 MVA rating).	4/29/2019		AEP	4/5/2018
11	s1611	At German Station, install 40 kA 138 kV line breakers towards South Bend Station and Olive Stations.	6/30/2020	\$68.8	AEP	4/5/2018
		At South Bend Station, upgrade risers towards Olive and Twin Branch.	6/30/2020		AEP	4/5/2018
		At Twin Branch Station, upgrade risers towards South Bend.	6/30/2020		AEP	4/5/2018
		At Olive Station, install one 345 kV circuit breaker, one 138 kV circuit breaker, replace a 69 kV circuit breaker and replace 138/69/34 kV Transformer No. 3 with 60 MVA 138/69 kV transformer.	6/30/2020		AEP	4/5/2018
		Rebuild existing double circuit South Bend-New Carlisle 138 kV with aluminum conductor steel cable (257 MVA rating), approximately 18.74 miles.	6/30/2020		AEP	4/5/2018
		Rebuild existing six-wired Twin Branch-South Bend 138 kV line asset with single circuit line with aluminum conductor steel cable (257 MVA rating), approximately 4.8 miles.	6/30/2020		AEP	4/5/2018
		Rebuild existing double circuit Olive Entrance B 138 kV Line with aluminum conductor steel cable (257 MVA rating), approximately 1 mile.	6/30/2020		AEP	4/5/2018
Split the East Side-South Bend line from of the South Bend-Twin Branch shared pole.	6/30/2020	AEP	4/5/2018			
12	s1613	Rebuild the existing Auburn-Kendallville 69 kV line using aluminum conductor steel cable overhead conductor (~15 miles, 102 MVA rating).	6/30/2019	\$16.9	AEP	4/17/2018
		At Kendallville Station, replace three 69 kV circuit breakers and associated equipment with 69 kV 40 kA circuit breakers.	6/30/2019		AEP	4/17/2018
		At Albion Station, replace one 69 kV circuit breaker and associated equipment with 69 kV circuit breaker.	6/30/2019		AEP	4/17/2018



# Indiana – TO Supplemental Projects (cont.)

(Greater than \$5 million)

Map ID	Project	Description	Projected In-Service Date	Project Cost (\$M)	TO Zone	2018 TEAC Review
13	s1666	Construct approximately 2.5 mile 69 kV underground line between Colfax and Muessel.	9/2/2019	\$40.4	AEP	4/17/2018
		Install Drewry's Extension 34.5 kV.	3/31/2020		AEP	4/17/2018
		Retire Kankakee-Colfax (UG) 34 kV Line.	5/10/2020		AEP	4/17/2018
		Rebuild 0.33 miles of the South Bend-Colfax underground line.	3/31/2020		AEP	4/17/2018
		Rebuild 1.9 miles of the South Bend-West Side Line using aluminum conductor steel cable (64 MVA rating).	5/10/2020		AEP	4/17/2018
		Bendix-Kankakee 34.5 kV line work.	3/31/2020		AEP	4/17/2018
		South Bend station work to set up 69 kV energization.	6/30/2019		AEP	4/17/2018
		Set up 69 kV energization at West Side station.	3/31/2020		AEP	4/17/2018
		Rebuild Colfax station. Install a 69 kV circuit breaker towards Muessel Station. Replace 34 kV circuit breaker with a 69 kV circuit breaker towards South Bend Station. Install a 69 kV standing wave ratio meter, 69/12 kV Transformer 1 and four 12 kV circuit breakers.	5/7/2020		AEP	4/17/2018
		Rebuild Drewrys station as Muessel station in the clear. Install three 69 kV line circuit breakers, a bus tie circuit breaker, two 69 kV standing wave ratio meters, two 69/12 kV transformers and seven 12 kV circuit breakers.	5/10/2020		AEP	4/17/2018
		At St. Mary's College, install 69 kV circuit switcher. Replace 69/12 kV transformer and two 69 kV switches.	4/1/2019		AEP	4/17/2018
		Relocate Goodland Sw to West Side-Bendix 34 kV line.	3/5/2020		AEP	4/17/2018
Remove 34.5 kV breaker at Kankakee.	5/10/2020	AEP	4/17/2018			
s1464	At Twin Branch: Remove and replace 345kV circuit breakers L1, K2 and J2 with 5000A 63kA models, and associated substation works including switches, bus leads, control cable and new DICM.	4/24/2020	\$7.1	AEP	2/8/2018	
s1603	At Madison substation, replace Breaker 'B', 'H' and 'C' with new 34.5 kV 25 kA 1200A models. Remove Breaker 'E'. Replace the 138/34.5 kV transformer with a new 138/34.5 kV 75 MVA model with a high-side switcher. Remove bus 1 and reroute all lines to the rebuilt bus 2.	12/30/2019	\$5.7	AEP	3/27/2018	
s1615	Construct new three-breaker ring bus 138 kV switching station across the road from the existing I&M 138/12 kV Ligonier Station, allowing a 138 kV transmission line reroute through an area with multiple underlying commercial building encroachments. Equipment consists of 138 kV, 40 kA, 3000 A circuit breakers and 3000 A disconnect switches.	7/1/2019	\$5.18	AEP	4/7/2018	



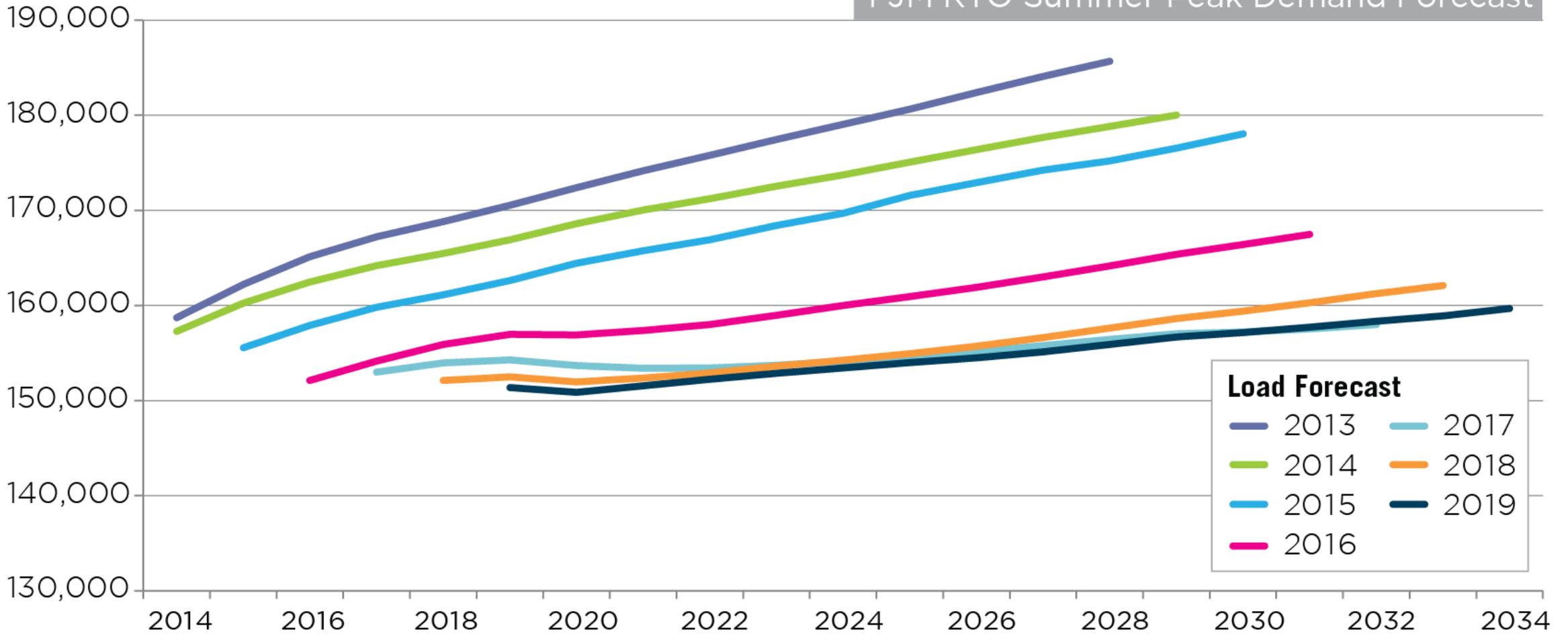
Queue	Project Name	Maximum Output (MW)	Status	Projected In-Service Date	TO Zone
X3-028	Breed 345 kV	3,500	Active	12/31/2016	AEP
AD2-054	Dumont-Stillwell 345 kV	50	Active	6/1/2020	AEP
AD2-080	Dumont-Stillwell 345 kV	309	Active	6/1/2020	AEP

# Planning

## Load Forecast

## PJM RTO Summer Peak Demand Forecast

Load (MW)



**Load Forecast**

- 2013
- 2014
- 2015
- 2016
- 2017
- 2018
- 2019

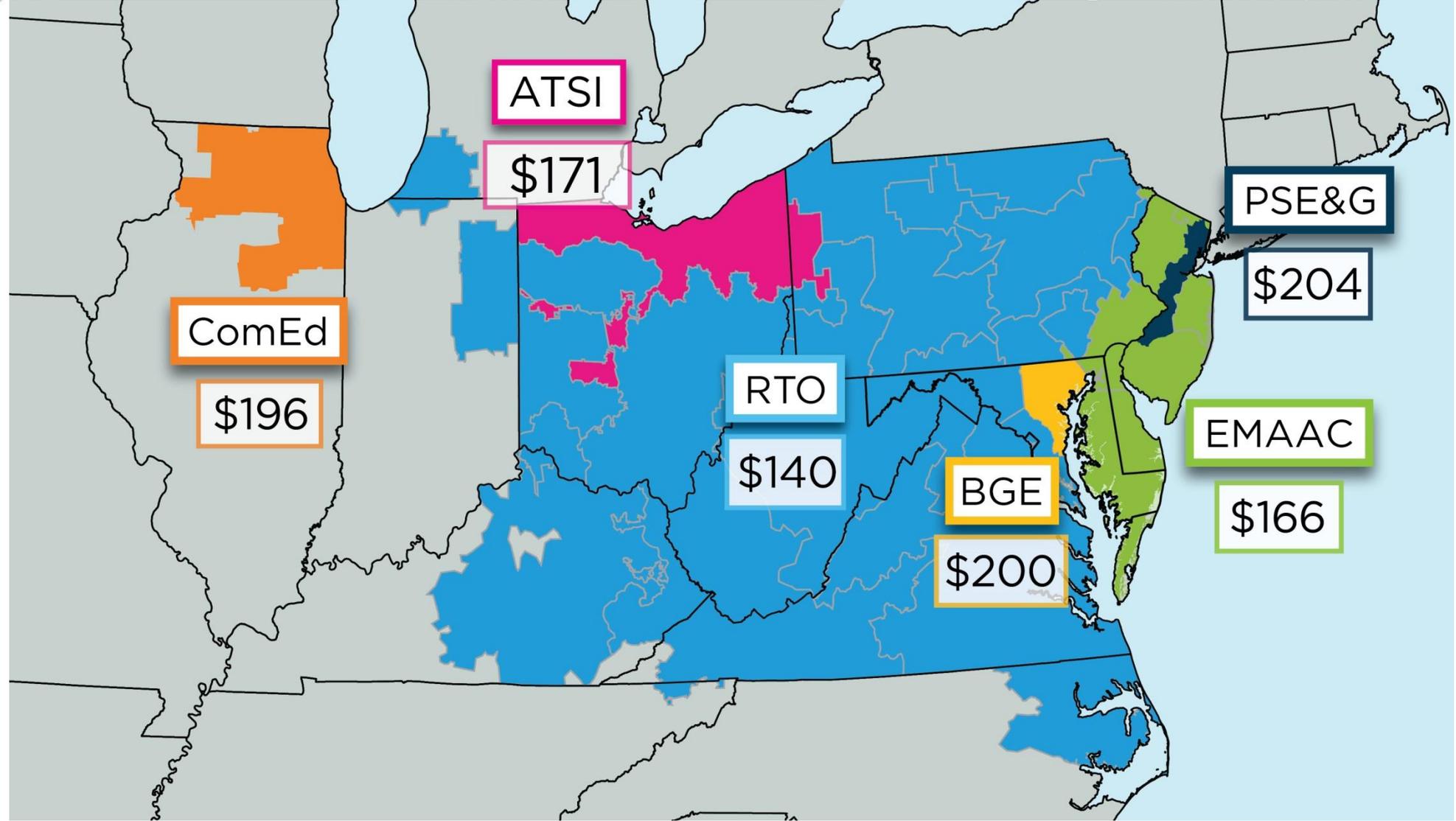
Transmission Owner	Summer Peak (MW)			Winter Peak (MW)		
	2019	2029	Growth Rate (%)	2018/19	2028/29	Growth Rate (%)
American Electric Power Company *	3,848	4,037	0.5%	3,165	3,313	0.5%
PJM RTO	151,358	156,689	0.3%	131,082	136,178	0.4%

\* PJM notes that American Electric Power Company serves load other than in Indiana. The Summer Peak and Winter Peak MW values in this table each reflect the estimated amount of forecasted load to be served by American Electric Power Company solely in Indiana. Estimated amounts were calculated based on the average share of American Electric Power Company’s real-time summer and winter peak load located in Indiana over the past five years.

# Markets

## Capacity Market Results

# 2021/22 Base Residual Auction Clearing Prices (\$/MW-Day)





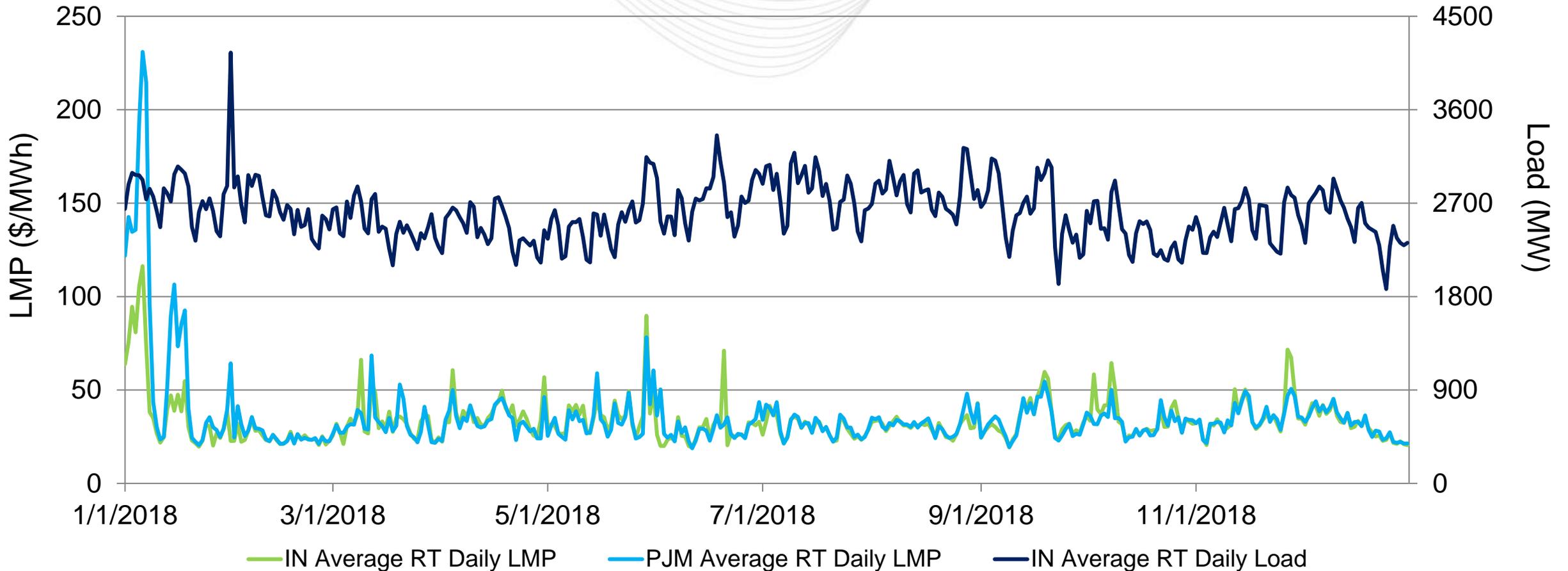
# PJM – 2021/2022 Cleared MW (UCAP) by Resource Type

	<b>Annual</b>	<b>Summer</b>	<b>Winter</b>	<b>Total</b>
<b>Generation</b>	149,616 MW	54 MW	716 MW	150,385 MW
<b>DR</b>	10,674 MW	452 MW	- MW	11,126 MW
<b>EE</b>	2,623 MW	209 MW	- MW	2,832 MW
<b>Total</b>	<b>162,912 MW</b>	<b>716 MW</b>	<b>716 MW</b>	<b>164,343 MW</b>

# Markets

## Market Analysis

Indiana's average daily LMPs generally aligned with PJM average daily LMPs.

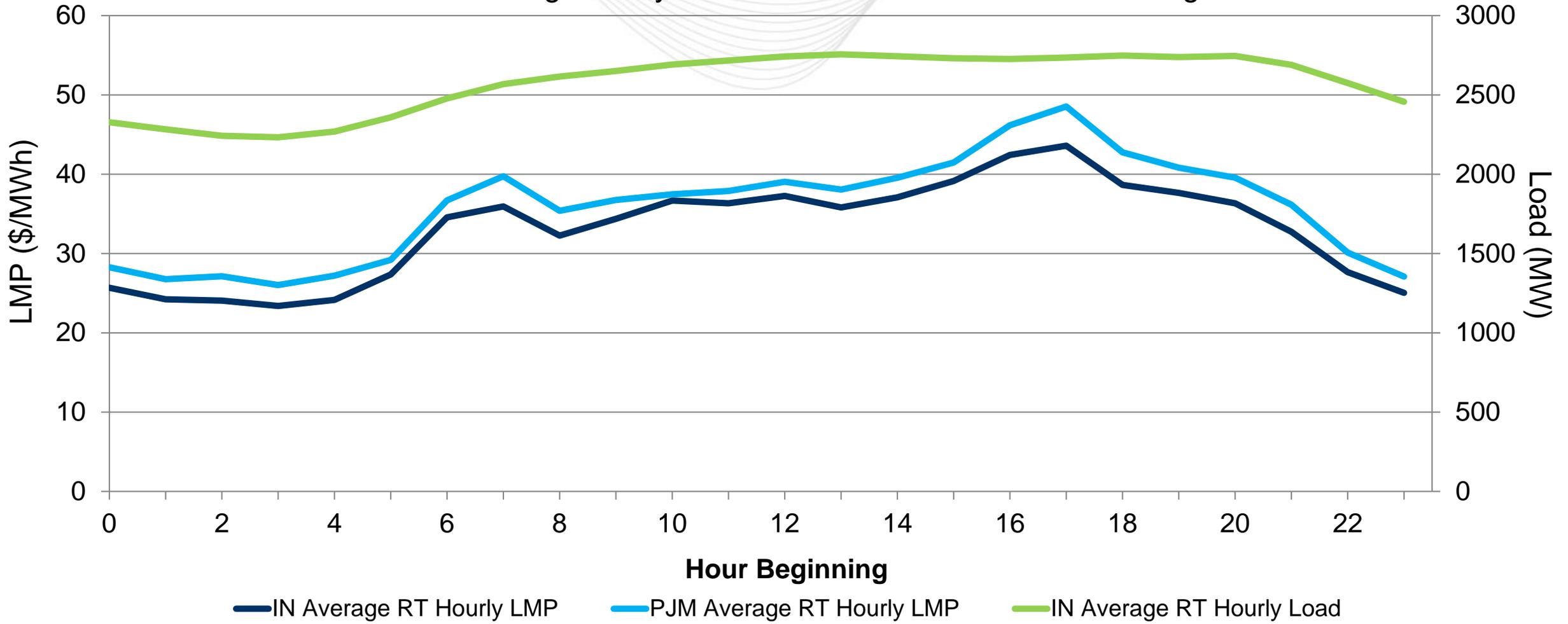


Note: The price spike in January reflects the Cold Snap that lasted from 12/28/17 to 1/7/2018.

# Indiana – Average Hourly LMP and Load

(January 1, 2018 – December 31, 2018)

Indiana's average hourly LMPs were lower than the PJM average

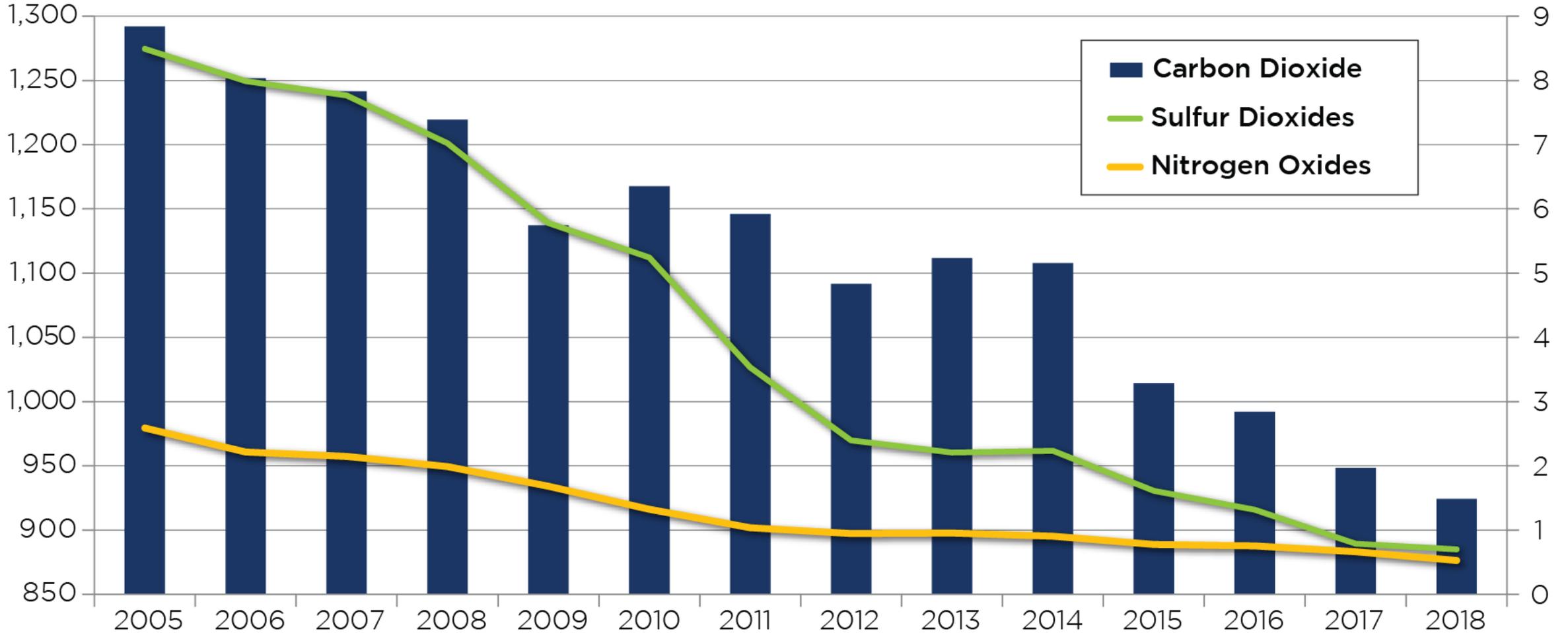


# Operations Emissions Data

# 2005-2018 PJM Average Emissions

CO<sub>2</sub>  
lbs/MWh

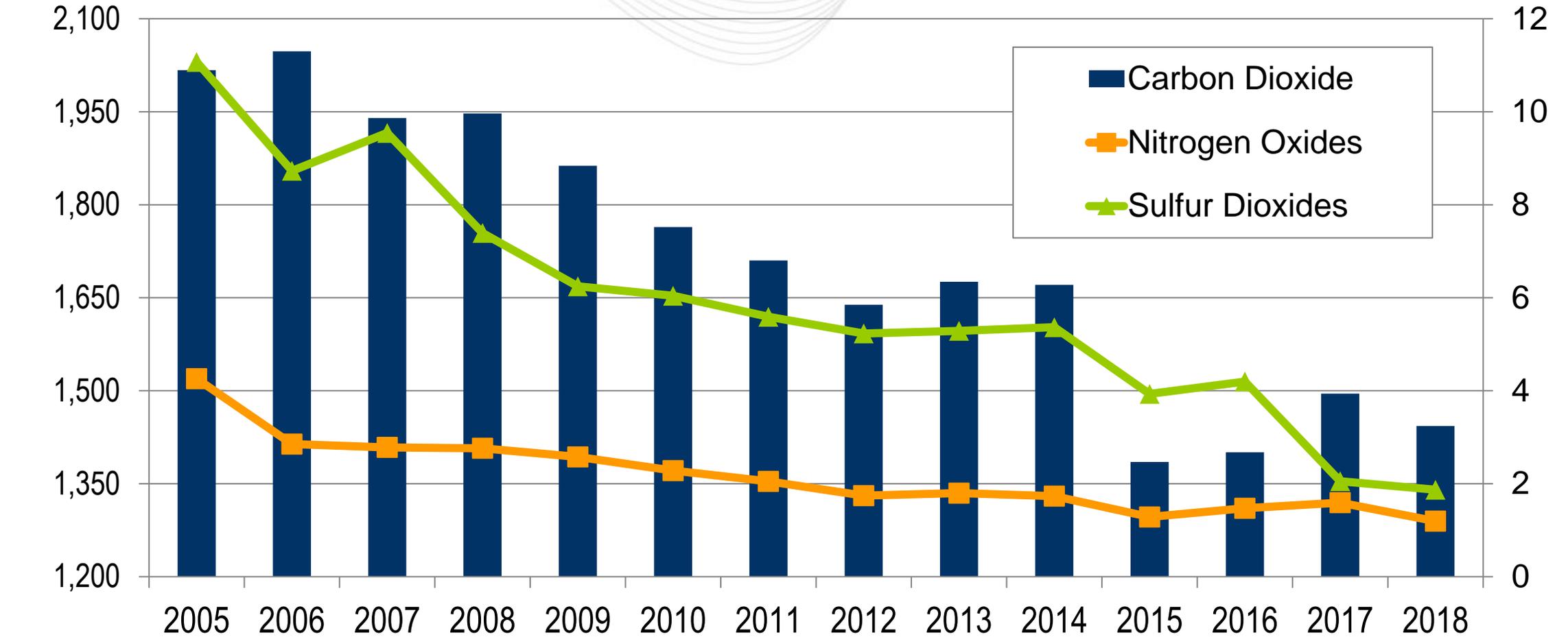
SO<sub>2</sub> and NO<sub>x</sub>  
lbs/MWh



CO<sub>2</sub>  
(lbs/MWh)

## Indiana Average Emissions (lbs/MWh)

SO<sub>2</sub> and NO<sub>x</sub>  
(lbs/MWh)



Please note that PJM has historically used \$5 million as the threshold for listing projects in the RTEP report. Beginning in 2018, it was decided to increase this cutoff to \$10 million. All RTEP projects with costs totaling at least \$5 million are still included in this state report.

For a complete list of all RTEP projects, including those below the RTEP threshold of \$10 million, please visit the “RTEP Upgrades & Status – Transmission Construction Status” page on [pjm.com](https://www.pjm.com).

<https://www.pjm.com/planning/rtep-upgrades-status/construct-status.aspx>