2019 Ohio State Infrastructure Report

(January 1, 2019 – December 31, 2019)

May 2020

(updated July 2020)

Table of Contents

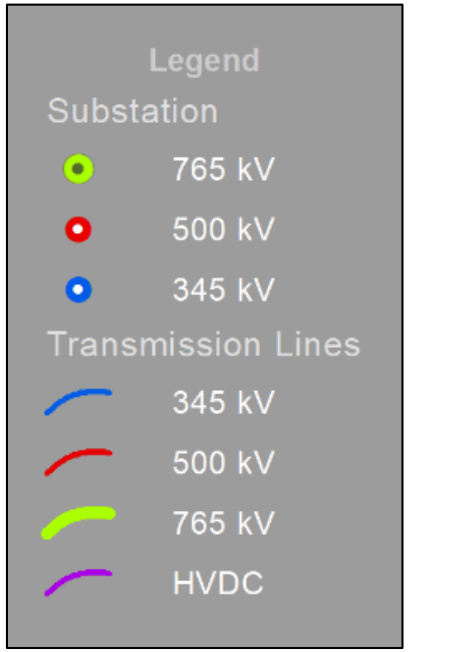
Executive Summary
(May 2020)

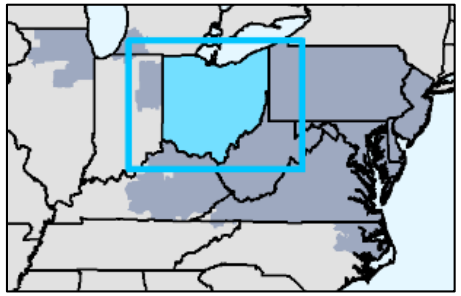
- **Existing Capacity:** Natural gas represents approximately 45.3 percent of the total installed capacity in Ohio while coal represents approximately 44.0 percent. In PJM natural gas and coal are 42.4 and 28.7 percent of total installed capacity.
- **Interconnection Requests:** Solar represents 47 percent of new interconnection requests in Ohio, while natural gas represents approximately 45.9 percent of new requests.
- **Deactivations:** 809 MW in Ohio gave notification of deactivation in 2019.
- **RTEP 2019:** Ohio's 2019 RTEP projects total approximately $1 billion in investment. Approximately 77.5 percent of that represents supplemental projects. These investment figures only represent RTEP projects that cost at least $5 million.

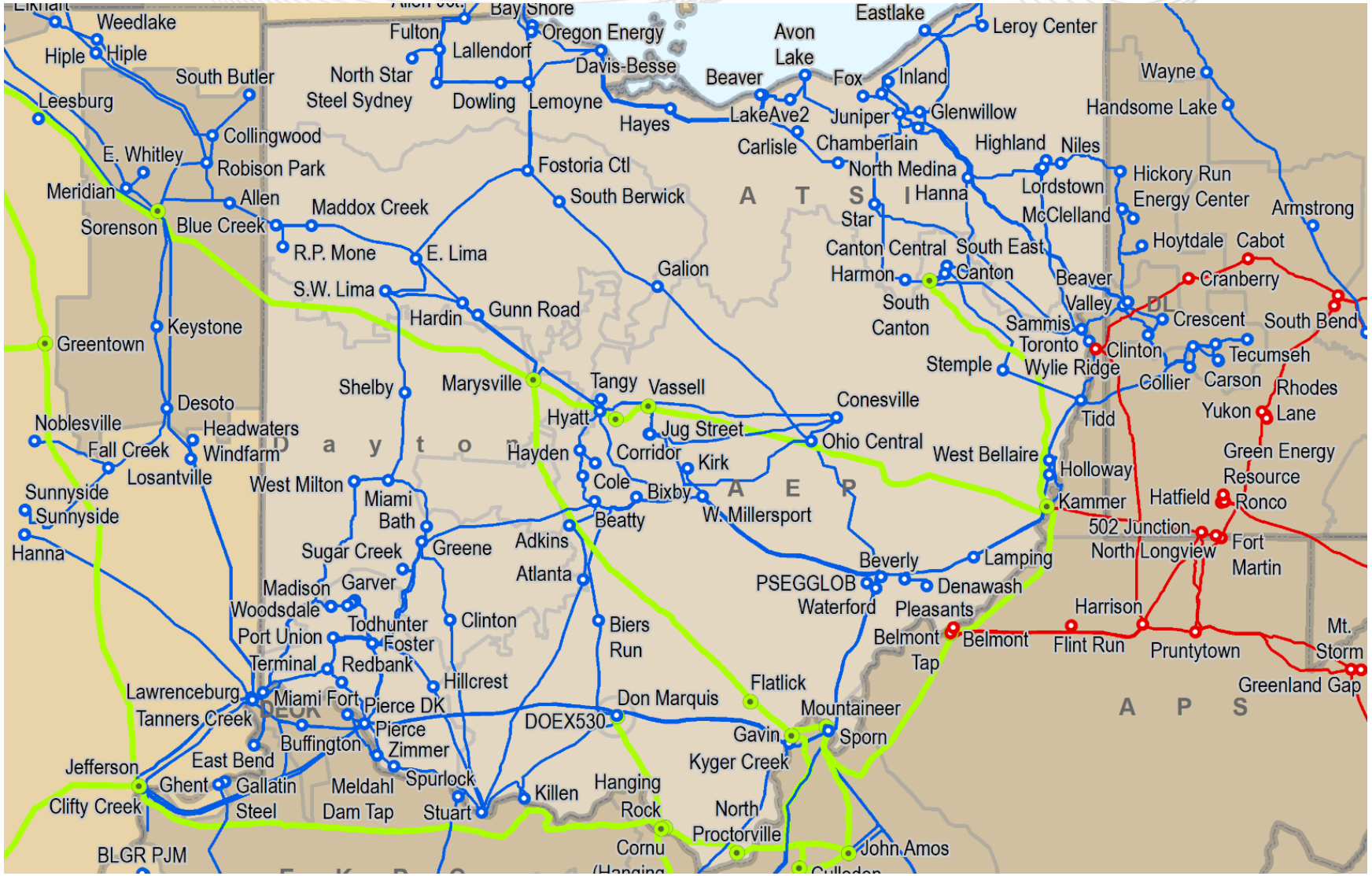
Executive Summary
(May 2020)

- **Load Forecast:** Ohio's load is projected to grow between 0.0 and 0.9 percent annually over the next ten years. Comparatively, the overall PJM RTO projected load growth rate is 0.6 percent.
- **2022/23 Capacity Market:** No Base Residual Auction was conducted in 2019. For the most recent auction results, please see the 2018 Ohio State Infrastructure Report.
- **1/1/19 – 12/31/19 Market Performance:** Ohio's average hourly LMPs generally aligned with PJM average hourly LMPs.
- **Emissions:** 2019 carbon dioxide, sulfur dioxide, and nitrogen oxide emissions are decreased from 2018 levels.

PJM Service Area – Ohio





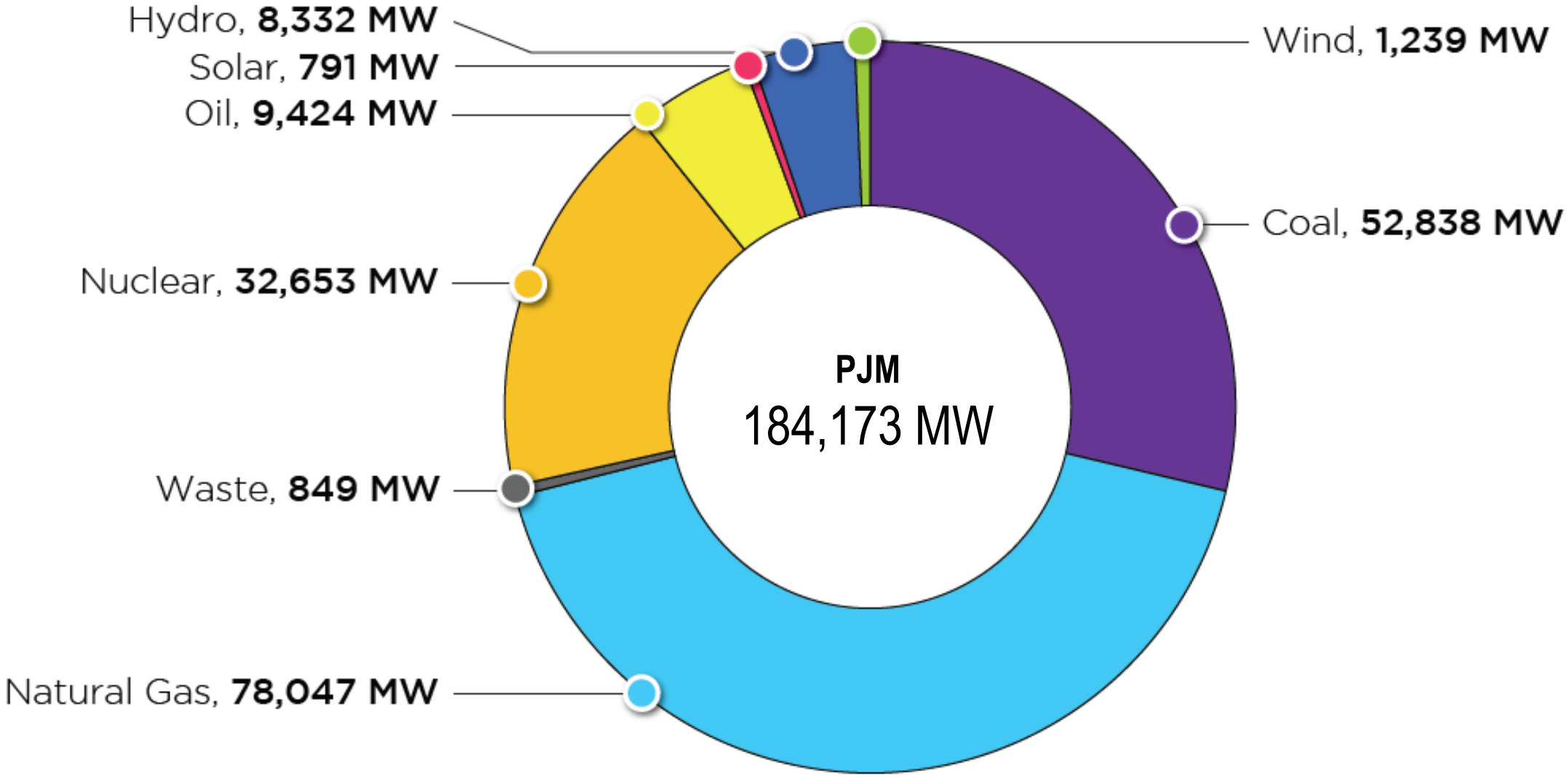


Planning

Generation Portfolio Analysis

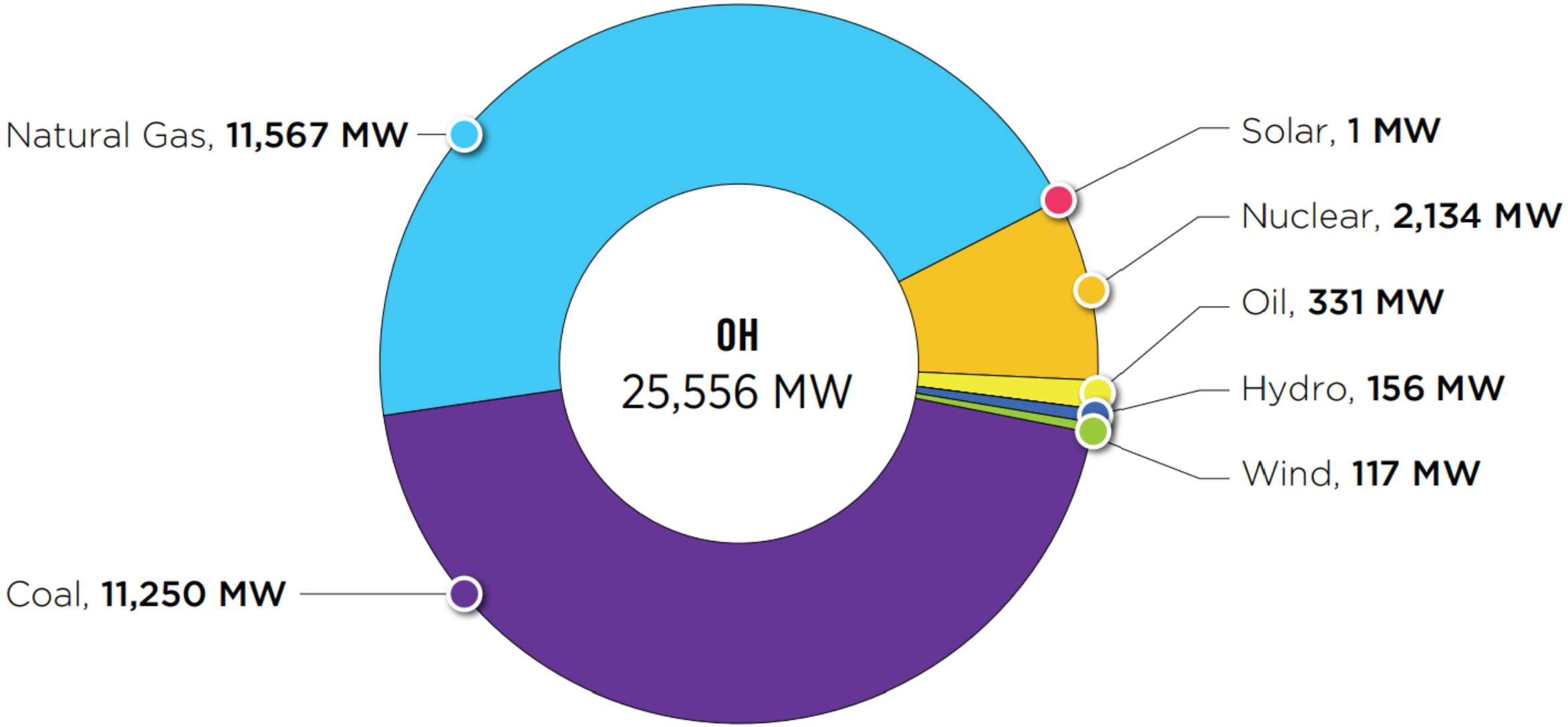
PJM – Existing Installed Capacity

(CIRs – as of Dec. 31, 2019)



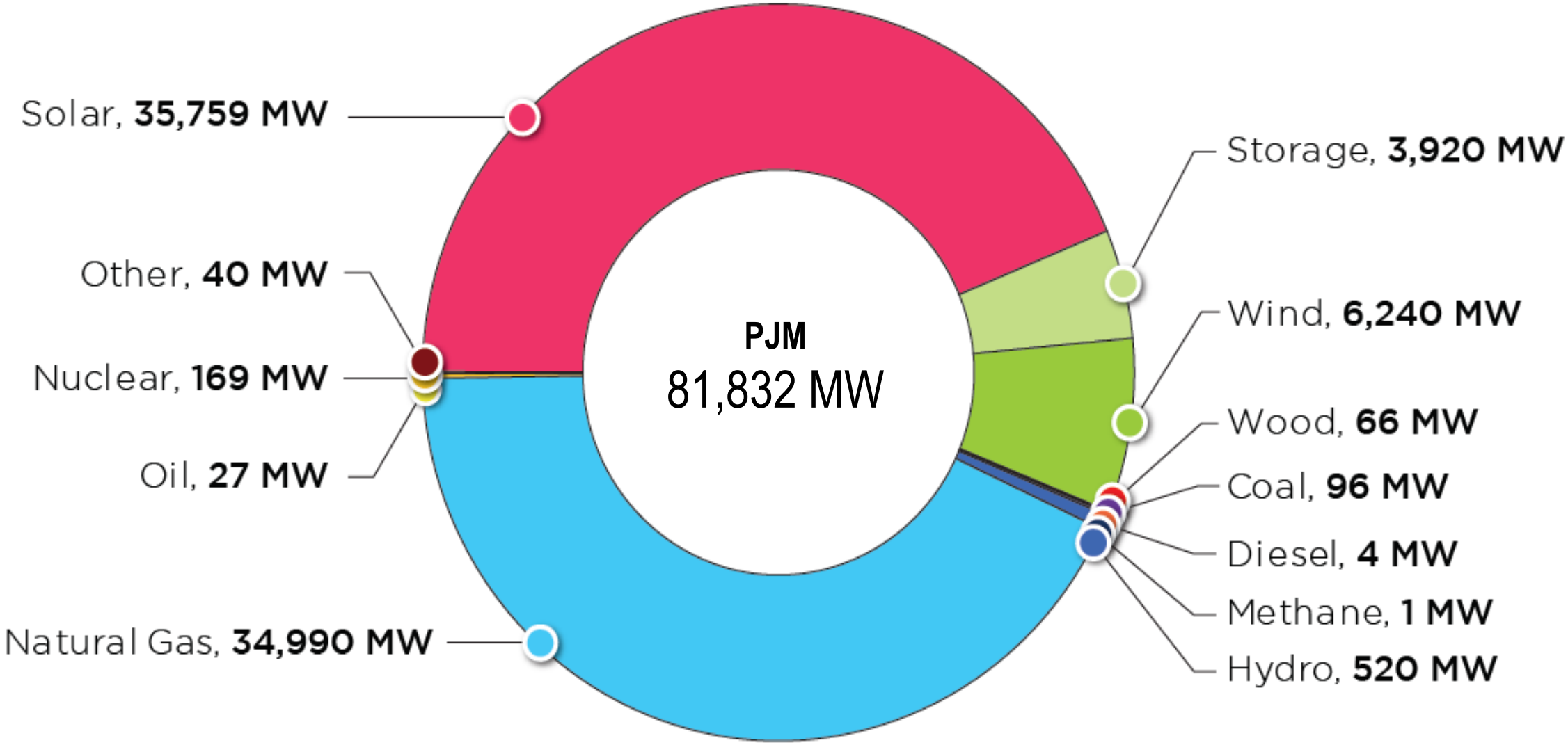
Ohio – Existing Installed Capacity

(CIRs – as of Dec. 31, 2019)



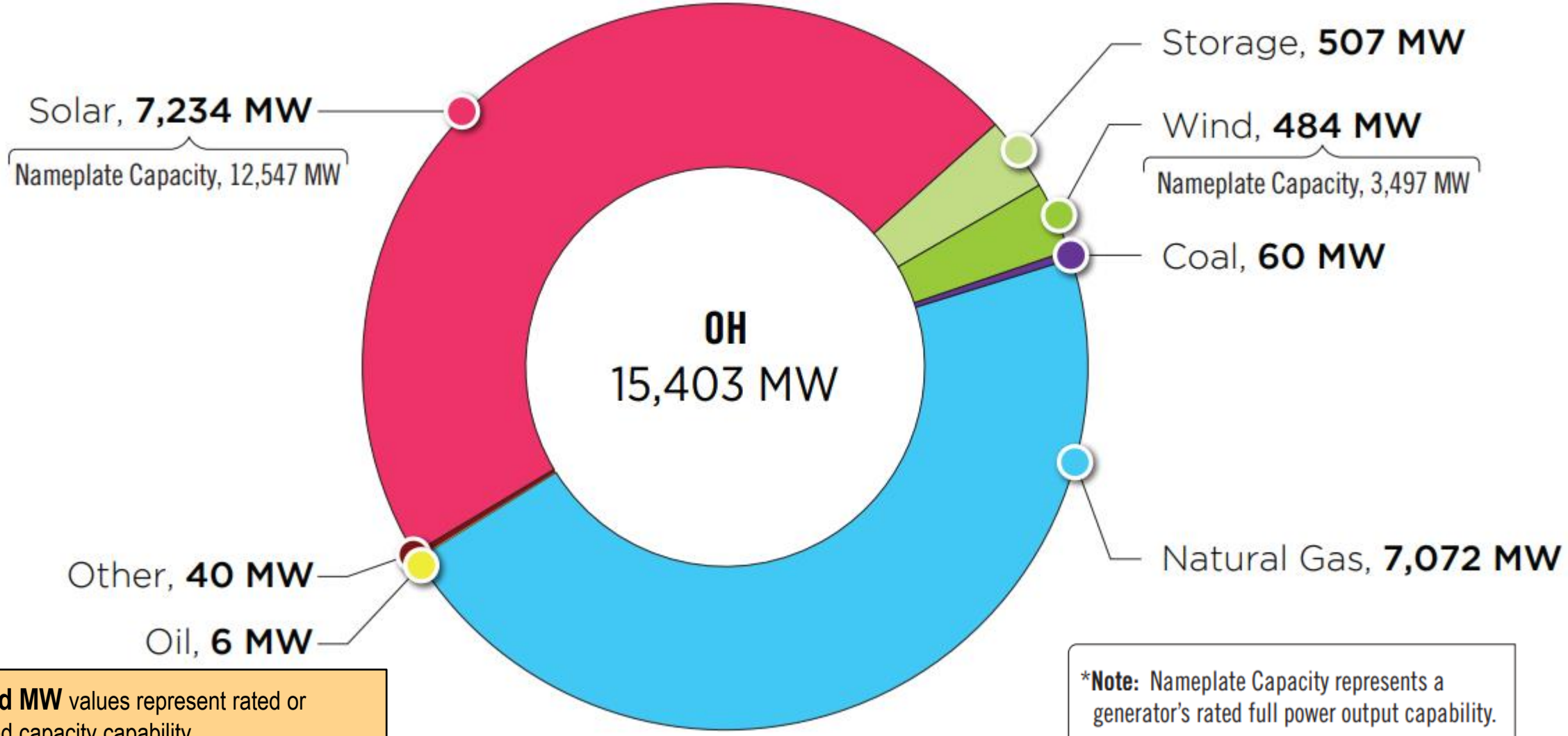
PJM – Queued Capacity (MW) by Fuel Type

(Requested CIRs – as of Dec. 31, 2019)



Ohio – Queued Capacity (MW) by Fuel Type

(Requested CIRs – as of Dec. 31, 2019)

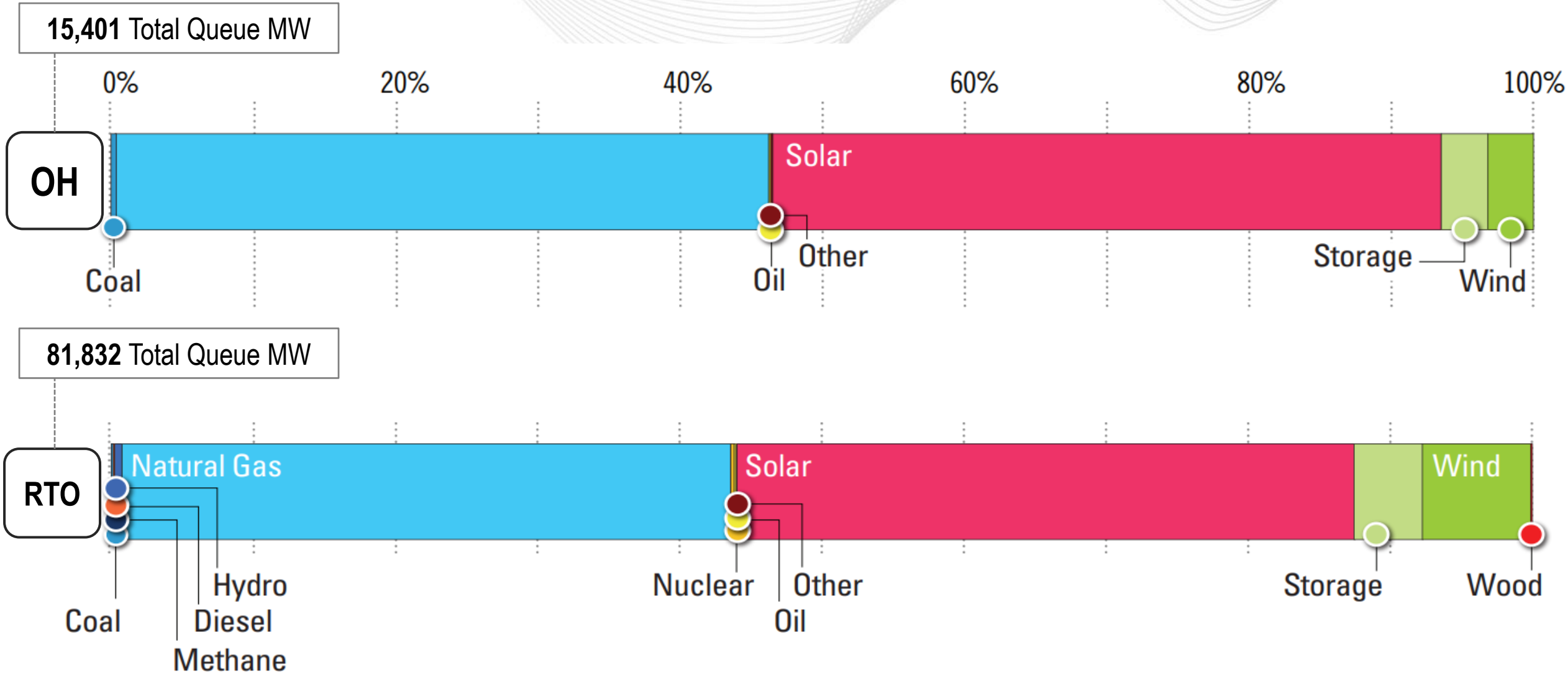


Bolded MW values represent rated or unforced capacity capability.

*Note: Nameplate Capacity represents a generator's rated full power output capability.

Ohio – Percentage of MW in Queue by Fuel Type

(Dec. 31, 2019)



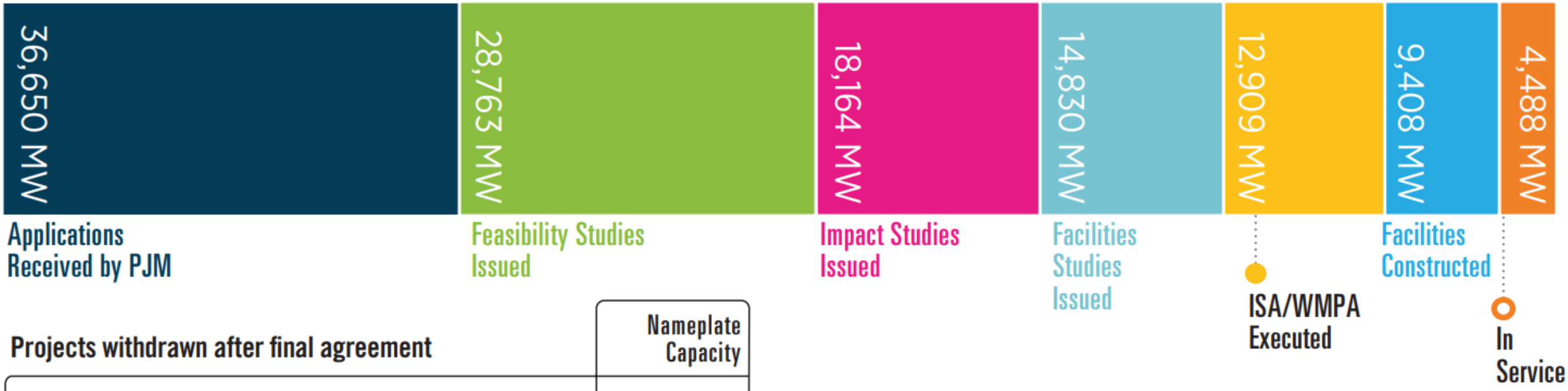
Ohio – Interconnection Requests

(Unforced or Rated Capacity – as of Dec. 31, 2019)

		In Queue						Complete				Grand Total	
		Active		Suspended		Under Construction		In Service		Withdrawn			
		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)	No. of Projects	Capacity (MW)
Non-Renewable	Coal	3	40.0	0	0.0	1	20.0	14	269.0	15	8,883.0	33	9,212.0
	Diesel	0	0.0	0	0.0	0	0	1	7.0	0	0.0	1	7.0
	Natural Gas	12	2,759.5	0	0.0	7	4,312.3	25	3,886.9	31	13,010.4	75	23,969.1
	Nuclear	0	0.0	0	0.0	0	0	1	16.0	0	0.0	1	16.0
	Oil	2	5.5	0	0.0	0	0	0	0.0	1	5.0	3	10.5
	Other	1	40.0	0	0.0	0	0	0	0.0	2	135.0	3	175.0
	Storage	13	504.8	0	0.0	1	1.9	8	0.0	20	548.0	42	1,054.7
Renewable	Biomass	0	0.0	0	0.0	0	0.0	1	0.0	3	185.0	4	185.0
	Hydro	0	0.0	0	0.0	0	0.0	1	112.0	8	76.2	9	188.2
	Methane	0	0.0	0	0.0	0	0.0	9	50.9	9	26.1	18	77.0
	Solar	109	6,768.2	2	11.4	11	454.3	1	1.0	100	2,692.1	223	9,926.9
	Wind	11	333.2	2	45.5	5	104.9	5	125.0	66	1,671.5	89	2,280.0
	Grand Total	**151**	**10,451.2**	**4**	**56.9**	**25**	**4,893.4**	**66**	**4,467.7**	**255**	**27,232.3**	**501**	**47,101.5**

Note: The ”Under Construction” column includes both “Engineering and Procurement” and “Under Construction” project statuses.

Ohio – Progression History of Interconnection Requests

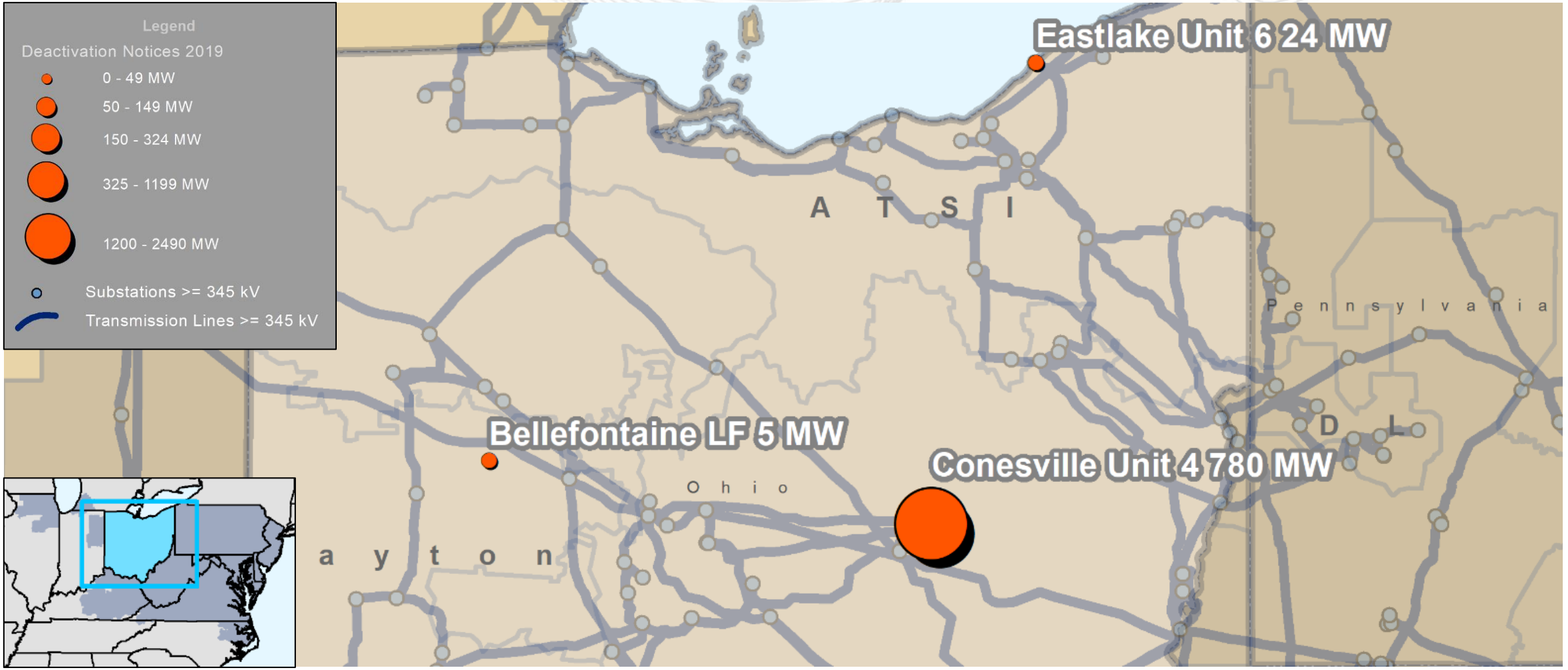


Projects withdrawn after final agreement			Nameplate Capacity
20	Interconnection Service Agreements	3,530 MW	5,229 MW
10	Wholesale Market Participation Agreements	16 MW	52 MW

Percentage of planned capacity and projects that have reached commercial operation	12% Requested capacity megawatt	19% Requested projects

This graphic shows the final state of generation submitted in all PJM queues that reached in-service operation, began construction, or was suspended or withdrawn as of Dec. 31, 2019.

Ohio – Generation Deactivation Notifications Received in 2019



Ohio – Generation Deactivation Notifications Received in 2019

Unit	TO Zone	Fuel Type	Request Received to Deactivate	Pending/Actual Deactivation Date	Age (Years)	Capacity (MW)
Bellefontaine Landfill Generating Station	DAY	Methane	11/20/2019	12/31/2019	10	5.0
Conesville 4	AEP	Coal	1/23/2019	6/1/2020	46	780.0
Eastlake 6	ATSI	Oil	11/20/2019	2/18/2020	45	24.0

Planning

Transmission Infrastructure Analysis

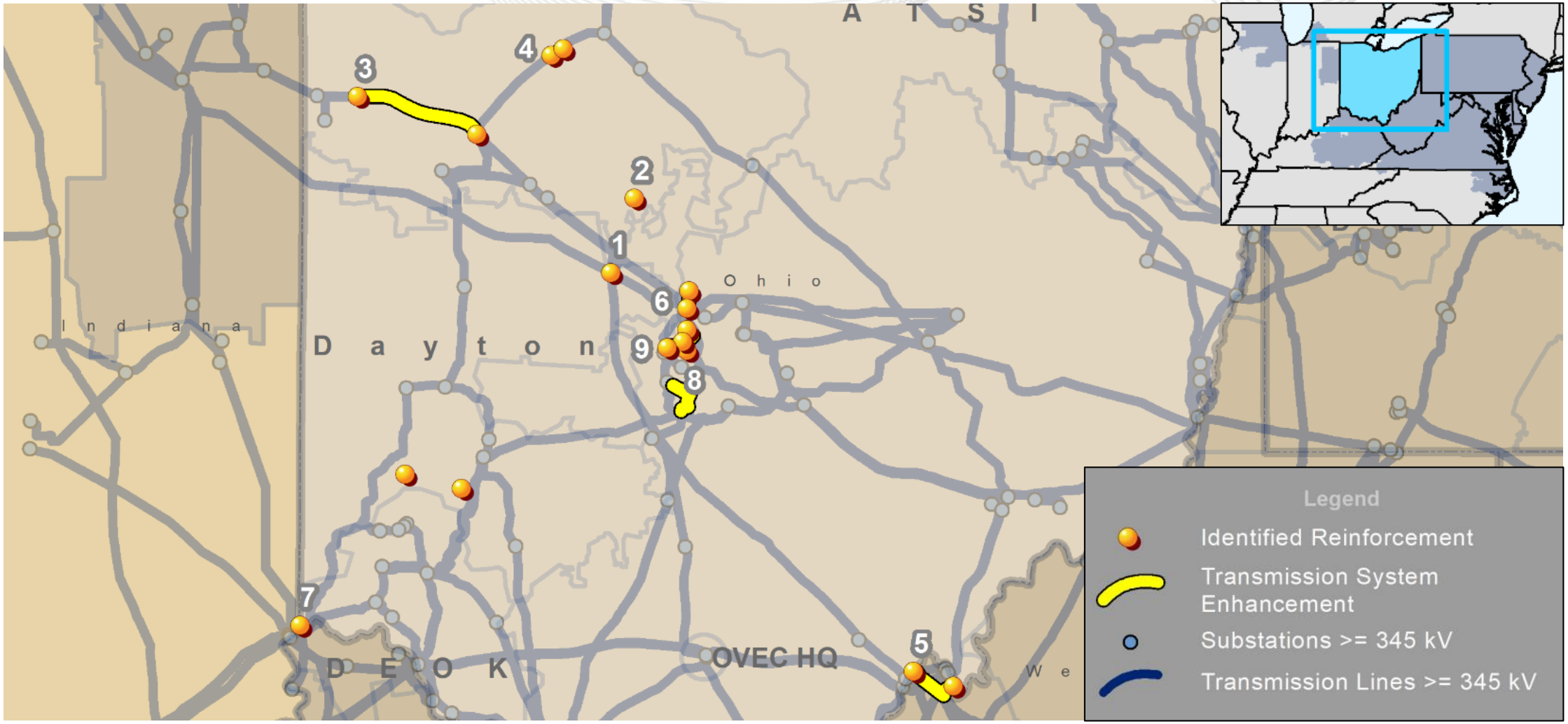
Please note that PJM historically used $5 million as the threshold for listing projects in the RTEP report. Beginning in 2018, it was decided to increase this cutoff to $10 million. All RTEP projects with costs totaling at least $5 million are included in this state report. However, only projects that are $10 million and above are displayed on the project maps.

For a complete list of all RTEP projects, please visit the “RTEP Upgrades & Status – Transmission Construction Status” page on pjm.com.

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

Ohio – RTEP Baseline Projects

(Greater than $10 million)



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

Ohio – RTEP Baseline Projects

(Greater than $5 million)

Map ID	Project	Description	Projected In-Service Date	Project Cost ($M)	TO Zone	TEAC Date
1	b1570	Add a 345 kV breaker at Marysville station and a 0.1 mile 345 kV line extension from Marysville to the new 345/69 kV Dayton transformer.	6/1/2021	$20.1	AEP	4/11/2019
2	b2794	Construct a new 138/69/34 kV station and one 34 kV circuit (designed for 69 kV) from new station to Decliff station, ~5.5 miles, with 556 ACSR conductor (51 MVA rating).	6/1/2021	$28.9	AEP	5/31/2017
3	b2833	Re-conductor the Maddox Creek-East Lima 345 kV circuit with 2-954 ACSS Cardinal conductor.	12/1/2021	$30.5	AEP	1/12/2017
4	b3086	Rebuild New Liberty-Findlay 34 kV line structures 1–37 (1.5 miles), utilizing 795 26/7 ACSR conductor.	6/1/2022	$13.0	AEP	10/26/2018
		Rebuild New Liberty-North Baltimore 34 kV line structures 1–11 (0.5 miles), utilizing 795 26/7 ACSR conductor.				
		Rebuild West Melrose-Whirlpool 34 kV line structures 55–80 (1 mile), utilizing 795 26/7 ACSR conductor.				
		North Findlay: Install a 138 kV 3000 A 63 kA line breaker and low side 34.5 kV 2000 A 40 kA breaker, high side 138 kV circuit switcher on T1.				
		Ebersole Station: Install second 90 MVA 138/69/34 kV transformer. Install two low side (69 kV) 2000A 40kA breakers for T1 and T2.				

Ohio – RTEP Baseline Projects

(Greater than $5 million)

Map ID	Project	Description	Projected In-Service Date	Project Cost ($M)	TO Zone	TEAC Date
5	b3095	Rebuild Lakin-Racine Tap 69 kV line section (9.2 miles) to 69 kV standards, utilizing 795 26/7 ACSR conductor.	12/1/2022	$23.9	AEP	11/29/2018
6	b3105	Rebuild the Delaware-Hyatt 138 kV line (~4.3 miles) along with replacing conductors at both Hyatt and Delaware substations.	6/1/2020	$16.0	AEP	3/7/2019
7	b3108	Install 100 MVAR reactor at Miami 138 kV substation.	6/1/2019	$15.0	DAY	3/7/2019
		Install 100 MVAR reactor at Sugarcreek 138 kV substation.				
		Install 100 MVAR reactor at Hutchings 138 kV substation.				
8	b3109	Rebuild 5.2 mile Bethel-Sawmill 138 kV line including.	6/1/2019	$34.5	AEP	2/20/2019
9	b3112	Construct a single circuit 138 kV line (~3.5 miles) from Amlin to Dublin using 1033 ACSR Curlew (296 MVA SN), convert Dublin station into a ring configuration, and re-terminate the Britton underground cable to Dublin station.	6/1/2020	$39.3	AEP	3/25/2019
	b3210	Replace approx. 0.7 miles Beatty - Galloway 69 kV line with 4000 kcmil XLPE cable	6/1/2023	$5.3	AEP	7/24/2019

Ohio – RTEP Network Projects

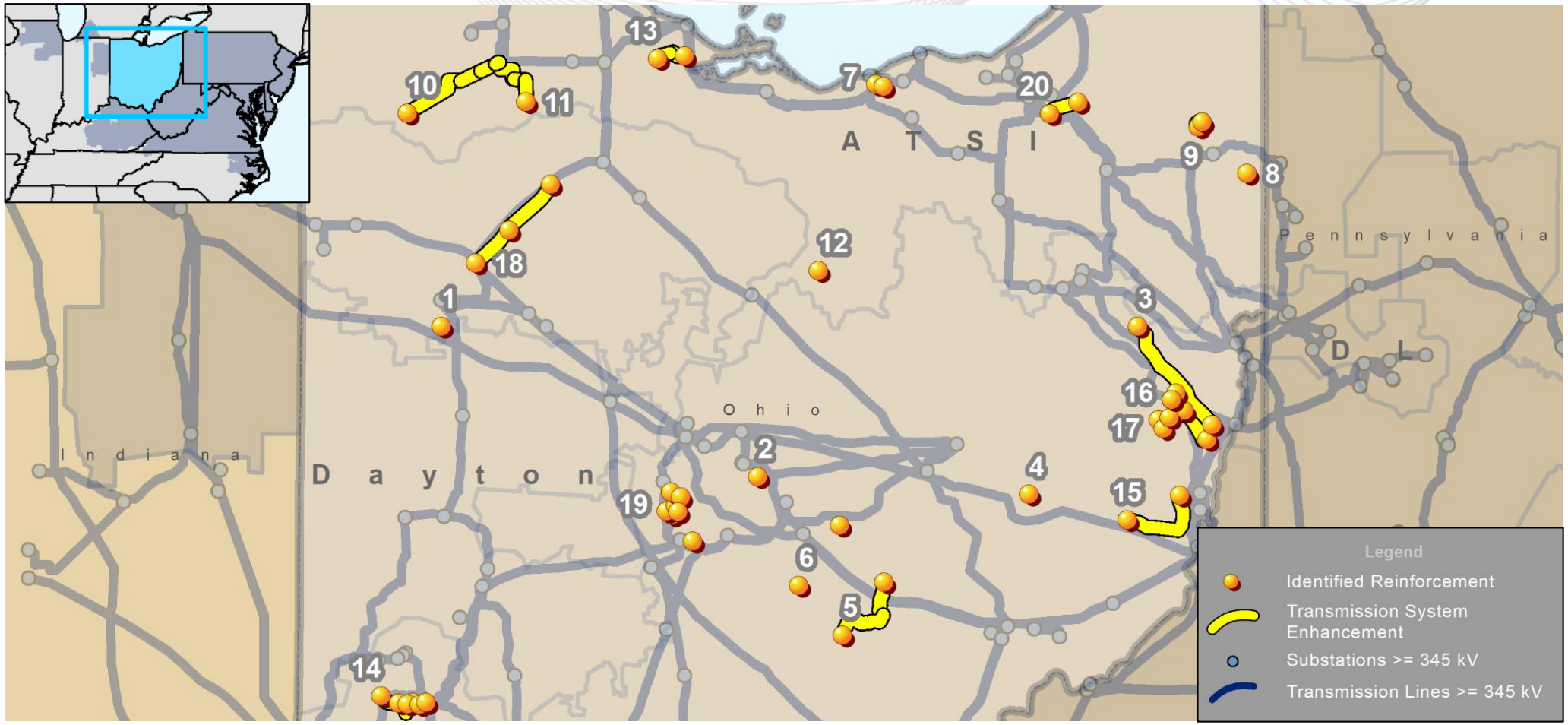
(Greater than $5 million)

Ohio had no network project upgrades in 2019.

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, as well as certain direct connection facilities required to interconnect proposed generation projects.

Ohio – TO Supplemental Projects

(Greater than $10 million)



Note: Supplemental projects are transmission expansions or enhancements that are not required for compliance with PJM criteria and are not state public policy projects according to the PJM Operating Agreement. These projects are used as inputs to RTEP models, but are not required for reliability, economic efficiency or operational performance criteria, as determined by PJM.

Ohio – TO Supplemental Projects

(Greater than $5 million)

Map ID	Project	Description	Projected In-Service Date	Project Cost ($M)	TO Zone	TEAC Date
1	s1856	Build new 345/138 kV Gristmill station cutting into the Southwest Lima, Shelby 345 kV line. Build a new 138 kV Gemini station southeast of the City of Wapakoneta to serve the load request. Build a new 138 kV line connecting Gristmill and Gemini. Build a new 138 kV line from the new 138 kV Gemini station to existing West Moulton 138 kV Station. Rebuild the West Moulton 138 kV station as a four-breaker ring bus. Remove the existing City of St Marys hard tap and bring it into West Moulton 138 kV station.	12/31/2020	$132.4	AEP	1/11/2019
		Build a new 345/138 kV Gristmill station tapping the Southwest Lima-Shelby 345 kV line.				
		Build a new 138 kV Gemini station southeast of the City of Wapakoneta to serve the load request.				
		Build a new 138 kV Gristmill-Gemini line.				
		Build a new 138 kV Gemini-West Moulton line. Rebuild the 138 kV West Moulton station as a four breaker-ring bus.				
		Remove the existing City of St Marys hard tap off the Southwest Lima-West Moulton 138 kV line and terminate it at West Moulton 138 kV station (~0.2 mi).				
2	s1857	Customer 138 kV delivery request near Babbitt station.	2/1/2020	$47.6	AEP	2/20/2019

Ohio – TO Supplemental Projects

(Greater than $5 million)

Map ID	Project	Description	Projected In-Service Date	Project Cost ($M)	TO Zone	TEAC Date
3	**s1859**	Rebuild the 29-mile Gable-Carrollton 138 kV circuit. Remove double circuit lattice towers with six-wired configuration . Install double-circuit steel poles with six-wired ACSS Yukon conductor.	11/1/2021	$42.1	AEP	1/11/2019
4	**s1864**	Rebuild East Cambridge station into a 69 kV, six-circuit-breaker ring bus with 69 kV 3000 A 40 kA breakers. Install a low side 34.5 kV 1200 A 25 kA circuit breaker on transformer No. 1. Build a new control house, bus work and install new line relaying. Re-terminate the transmission lines into the new station.	12/15/2019	$13.3	AEP	2/20/2019
5	**s1866**	Rebuild ~8.7 miles of the East Logan-New Lexington 69 kV circuit between New Lexington and Shawnee with 795 ASCR 26/7. Replace the Shawnee 69 kV 1200 A MOABs with 2000 A switches. Replace the New Lexington 69 kV line riser towards East Logan. Replace the New Lexington 600 A disconnects for circuit breaker “A” with 2000 A switches.	12/31/2021	$20.2	AEP	3/25/2019
6	**s1867**	Rebuild 18.4 miles of the Thornville-Lancaster 69 kV line utilizing 795 ACSR (26/7) conductor.	11/27/2019	$23.7	AEP	2/20/2019

Ohio – TO Supplemental Projects

(Greater than $5 million)

Map ID	Project	Description	Projected In-Service Date	Project Cost ($M)	TO Zone	TEAC Date
7	s1876	Expand the Sugarcreek 138/69 kV substation by installing a new 138/69 kV 200 MVA transformer and a 69 kV ring bus. Build a new 69 kV line from Sugarcreek to Normandy substation connecting to the load center. These upgrades will provide a critical fourth source into the load center which will address shoulder peak loading concerns and will improve reliability of the three terminal 6610 Yankee-Caesars-Trebein 69 kV line that has historically been a poor performing circuit.	12/31/2021	$15.9	DAY	4/23/2019
		Replace the 138/12 kV transformer at Normandy substation with a 69/12 kV transformer. This will provide operations greater flexibility for switching loads through parallel distribution bank operation at Normandy.				
		Loop the Dayton Mall-Yankee-Normandy line No. 6671 in and out of the Yankee substation to eliminate a three terminal arrangement. Install one 69 kV breaker at Normandy to separate the bus. Install one 69 kV breaker at Yankee substation to eliminate the three terminal line.				
8	s1947	Lincoln Park-Riverbend 138 kV Line. Build a new 138 kV line from Riverbend to Lincoln Park substation (~5.7 miles). Convert the Riverbend substation into a four-breaker ring bus configuration by installing two 138 kV breakers. Expand the Lincoln Park 138 kV ring bus by installing one 138 kV breaker allowing for a new line terminal.	12/31/2022	$25.9	ATSI	3/25/2019

Ohio – TO Supplemental Projects

(Greater than $5 million)

Map ID	Project	Description	Projected In-Service Date	Project Cost ($M)	TO Zone	TEAC Date
9	**s1950**	Elm 138 kV Ring Bus: Convert Ivanhoe 138 kV substation to a six-breaker ring bus configuration by installing two 138 kV breakers. Convert Elm 138 kV substation to a five breaker ring bus configuration (future six) by installing four 138 kV breakers. Build ~3 miles of 138 kV line from Ivanhoe to Elm.	6/1/2023	$12.1	ATSI	3/25/2019
10	**s1952**	Weldon 69 kV Ring Bus and Line Build. Construct a new four breaker ring bus (Weldon Substation) outside the existing Canfield Steel substation. Network the new four.breaker ring bus by completing the following: Loop the existing Canfield Steel radial 69 kV circuit into the new Weldon substation. Loop the existing Berlin Lake-Boardman 69 kV line into new Weldon substation by constructing ~0.6 miles of 69 kV line adjacent to existing Canfield Steel 69 kV radial circuit. Build new Weldon-Kimberly 69 kV line (~6.4 miles). Install new line exit switch and SCADA to the line exits at Kimberly. Install auto-sectionalizing scheme at Canfield substation.	6/1/2023	$17.4	ATSI	3/25/2019

Ohio – TO Supplemental Projects

(Greater than $5 million)

Map ID	Project	Description	Projected In-Service Date	Project Cost ($M)	TO Zone	TEAC Date
11	**s1953**	Richland-Weston 69 kV Line-Conversion from 34.5 kV. Richland Substation: Install one new 69 kV breaker and reconfigure the 69 kV yard to a three breaker ring bus with a new 69 kV line exit to Weston substation. Remove all 34.5 kV equipment post conversion (ex: Richland 138 - 34.5 kV transformer No. 1 and circuit breakers). Expand Weston substation to a four breaker, future six breaker ring bus with 69 kV line exits for the new Richland line, and the Midway and Tontogany 69 kV lines. Remove all 34.5 kV equipment post conversion. New Richland-Weston 69 kV Line: Build new 5.6 mile 69 kV line to network Richland-Maroe and Weston-Malinta radial lines. Convert the existing Richland-Maroe 34.5 kV line to 69 kV (~19 miles); customers to upgrade existing substation equipment at Holgate and Maroe to 69 kV. Convert the existing Weston-Malinta 34.5 kV line to 69 kV (~13 miles); customers to upgrade existing substation.	12/31/2023	$50.0	ATSI	3/25/2019
12	**s1963**	Longview-Mohican 69 kV line (Longview-Coulter 69 kV line segment). Rebuild the Longview-Coulter 69 kV line segment (~15.8 miles of the 22.1 mile line), replace four line switches (A-10, A-19, A-23 and A-27) and add SCADA control. Terminal equipment at Longview substation to be upgraded under ATSI-2019-021, including: line relaying, substation conductor, and disconnect switches.	12/31/2022	$22.2	ATSI	3/25/2019

Ohio – TO Supplemental Projects

(Greater than $5 million)

Map ID	Project	Description	Projected In-Service Date	Project Cost ($M)	TO Zone	TEAC Date
13	**s1964**	Brush Wellman-Ottawa 69 kV Line Rebuild the Brush Wellman-Ottawa 69 kV line (~7.3 miles) Replace four line switches; A-7240, A-7228, A-7235 and 7235 N.O Upgrade the terminal equipment at Brush Wellman substation including Substation conductors and relay communication equipment.	12/31/2022	$10.0	ATSI	3/25/2019
14	**s1992**	Rebuild Socialville and Simpson into three-breaker 138 kV ring buses. Rebuild Montgomery into a five-breaker ring bus. Extend the Montgomery tap 0.25 miles to connect at Socialville. Connect Cornell-Wards Corner that runs through Montgomery, at Montgomery. This configuration limits the 150 MW load loss to these maximums: 30 MW Port Union-Socialville, 34 MW Socialville-Simpson, 48 MW Simpson-Foster.	6/1/2023	$14.2	DEOK	7/24/2019
15	**s2003**	Rebuild the Glencoe-Somerton 69 kV circuit (22 miles) with single-circuit 795 ACSR conductor. Replace the Pipe Creek 69 kV hard tap with a 1200 A-rated three-way switch (Jacobsburg Switch). Replace the Beallsville 69 kV hard tap with a 1200 A-rated three-way switch (Beallsville Switch).	6/1/2022	$61.5	AEP	7/24/2019

Ohio – TO Supplemental Projects

(Greater than $5 million)

Map ID	Project	Description	Projected In-Service Date	Project Cost ($M)	TO Zone	TEAC Date
16	**s2004**	Rebuild the 9.3 mile, Dillonvale-Parlett 69 kV line using 795 ACSR conductors.	11/15/2022	$47.9	AEP	5/20/2019
		Rebuild 2.5 mile section of 69 kV line from Parletto Blackhawk using 795 ACSR conductors.				
		Rebuild ~2 mile section of the Blackhawk-North. Hopedale-Miller Switch 69 kV circuit using 795 ACSR conductors.				
		Retire the 0.12 mile radial 69 kV line from Rose Valley switch.				
		At Hopedale 69 kV station, install new H-frame for T-line termination and 69 kV line disconnect group/gang operated air breaks (40 kA, 1200 A).				
		At North Hopedale switch, replace the 69 kV switch with a new phase-over-phase switch (40 kA, 1200 A).				
		Retire the 69 kV switch at Rose Valley.				

Ohio – TO Supplemental Projects

(Greater than $5 million)

Map ID	Project	Description	Projected In-Service Date	Project Cost ($M)	TO Zone	TEAC Date
17	s2007	Rebuild 9.65 miles of 69 kV Sparrow-Parlett-Cadiz line as single circuit using 795 ACSR conductor, energized at 69 kV. Install.	12/1/2020	$41.53	AEP	6/17/2019
		Retire 0.41 miles radial, de-energized 69 kV line routed west from Unionvale switch.				
		Retire Unionvale 69 kV switch.				
		Replace and re-locate East Cadiz 69 kV switch with a three-way phase-over-phase switch (2,000 A) with motor-operated air breaks on each side.				
		Modify 69 kV relaying at South Cadiz, Parlett and Sparrow.				
18	s2060	Build a Boutwell 138/69/34.5 kV station as a three breaker ring bus cutting into the East Lima-New Liberty 138 kV circuit. Install a 138/69/34.5 kV 90 MVA transformer. Install low side 69 kV bus and line breaker to feed line towards Lancers switch.	11/15/2022	$59.2	AEP	9/25/2019
		Cut in the East Lima-New Liberty 138 kV circuit and build to new Boutwell station.				
		Construct a new 3.75 mile single circuit 69 kV (34.5 kV operated) line using 556 ACSR conductor connecting the Hancock Wood Airport delivery point with the new Boutwell Station.				
		Construct 1.5 miles of greenfield single circuit 69 kV (34.5 kV operated) line using 556 ACSR conductor from North Woodcock to the South Mt Cory-Woodcock Switch 69 kV line (34.5 kV Operated).				
		Rebuild the 1.7 mile, 34.5 kV line from Woodcock Switch Bluffton Airport as single circuit 69 kV (34.5 kV operated), using 556 ACSR conductor.				
		Rebuild 1.3 mile of existing 34.5 kV line as double circuit 69 kV line to loop Beaverdam station into the Dolahard-East Lima 69 kV circuit, using 556 ACSR conductor.				

Ohio – TO Supplemental Projects

(Greater than $5 million)

Map ID	Project	Description	Projected In-Service Date	Project Cost ($M)	TO Zone	TEAC Date
18	**s2060**	Retire portions of 34.5 kV line between Blue Lick & Beaverdam and Woodcock Switch & South Mt. Cory buses. (12.3 miles).	11/15/2022	See Previous Slide	AEP	9/25/2019
		At North Woodcock station, replace 138/69/34.5 kV transformer No. 1 with a new 90 MVA bank. Install 138 kV circuit breakers (3000 A, 40 kA) on the line towards East Lima and the high side of transformer No. 1. Replace 69 kV circuit breaker A with a new 69 kV breaker (2000 A, 40 kA). Replace 34.5 kV circuit breaker E with a new 69 kV circuit breaker E (2000 A, 40 kA), operated at 34.5 kV. Install a new 69 kV circuit breaker (2000 A, 40 kA), operated at 34.5 kV, on the Morrical circuit. Replace the 34.5 kV grounding bank and retire the 34.5 kV cap bank.				
		Install 69 kV 1200 A phase-over-phase switch (Lancers Switch) at the airport delivery point.				
		Install 69 kV 1200 A phase-over-phase switch (Pirate Switch) at the hard tap.				
		Install 69 kV 1200 A phase-over-phase switch (Fliprock Switch) at National Lime & Stone hard tap.				
		Retire the 34.5 kV Woodcock switch.				

Ohio – TO Supplemental Projects

(Greater than $5 million)

Map ID	Project	Description	Projected In-Service Date	Project Cost ($M)	TO Zone	TEAC Date
19	s2063	Rebuild and relocate approx. 1.5 miles between Blair and Galloway to avoid a neighborhood along the existing line path.	5/31/2022	$50.1	AEP	9/25/2019
		Relocate Ballah-Madison 69 kV line exit to new Beatty 69 kV yard.				
		Connect 138/69 kV Cole station (new 69 kV yard) between Blair and Galloway.				
		At Beatty station, replace the 450 MVA 345/138 kV transformer with 675 MVA unit and retire the low side reactor. Replace 1-50 MVA 138/69 kV transformer with a 90 MVA unit and retire second 138/69 kV 50 MVA transformer. Replace 1-138 3,000 A 50 kA circuit breaker 6W with 4,000 A 63 kA. Install four 138 kV 3,000 A 63 kA circuit breakers. Rebuild 69 kV bus as ring bus, replacing three of four 69 kV 1,200A 20 kA circuit breakers with 2,000 A 40 kA circuit breakers. The fourth circuit breaker will be retired.				
		At Cole station, install a new 138/69 kV 90 MVA transformer. Install two 138 kV 3000 A 63 kA breakers with bus work to connect proposed 138/69 kV transformer. Install two 138 kV 3000 A 63 kA breakers with bus work to connect AEP-Ohio's requested 138/13 kV delivery point. Install three new 69 kV 2000 A 40 kA breakers in a ring configuration.				

Ohio – TO Supplemental Projects

(Greater than $5 million)

Map ID	Project	Description	Projected In-Service Date	Project Cost ($M)	TO Zone	TEAC Date
19	**s2063**	At Trabue station, install three 138 kV 3000 A 40 kA circuit breakers and associated relaying. Install a new 138 kV 14.4 MVAR capacitor with switcher.	5/31/2022	See Previous Slide	AEP	9/25/2019
		At Hilliard station, upgrade 69 kV capacitor to 28.8 MVAR. Replace three 69 kV 1200 A 21 kA circuit breakers with 2000 A 40 kA circuit breakers. Replace two sets of high speed ground switch/motor-operated air breaks transformer protection with circuit switchers.				
		Perform 69 kV remote end relaying work at Galloway.				
		Perform 69 kV remote end relaying work at Roberts.				
		Perform 69 kV remote end relaying work at Fisher.				
		Perform 69 kV remote end relaying work at Blair.				
		Perform 69 kV remote end relaying work at Nautilus.				

Ohio – TO Supplemental Projects

(Greater than $5 million)

Map ID	Project	Description	Projected In-Service Date	Project Cost ($M)	TO Zone	TEAC Date
20	**s2079**	Build ~5 miles of 69 kV line from Treat to Cantex to create the 69 kV Aurora-Chamberlin line No. 2. Operate the existing Aurora-Chamberlin 69 kV line radial out of Chamberlin. Serve Mantua 69 kV substation from Garrettsville. Add SCADA control switches at Treat and Cantex tap. Add an auto-sectionalizing scheme at Geauga substation.	8/14/2020	$11.0	ATSI	5/20/2019
	s1783	Build 1.2 mile, 138 kV, 301MVA feeder on an existing Duke right of way to the customer's property. Install two 138 kV breakers and associated equipment at Garver substation.	12/31/2019	$7.56	DEOK	1/11/2019
	s1862	Replace 69 kV circuit breakers "B" and "D" with new non-oil breakers and upgrade relaying at Lancaster station. Replace circuit breakers "E" and "F" with new non-oil breakers and upgrade relaying at Baltimore station.	12/15/2019	$5.23	AEP	1/11/2019
	s1863	Build a new greenfield 69 kV station (Chrome) with an in-and-out configuration utilizing two 69 kV 3000 A 40 kA circuit breakers. Build a new control house, relaying, and required bus work. Re-terminate tranmission lines into the new station. Remove of the old Cyclops station.	6/15/2019	$5.3	AEP	2/20/2019

Ohio – TO Supplemental Projects

(Greater than $5 million)

Map ID	Project	Description	Projected In-Service Date	Project Cost ($M)	TO Zone	TEAC Date
	s1926	Rebuild 138 kV buses 3 and 4 at Beckjord substation. Replace three and retire one 138 kV oil-filled circuit breakers. Replace/repair foundations as necessary.	12/31/2020	$5.55	DEOK	4/23/2019
	s1945	Beaver Substation - New 138/69 kV Substation. Build a new 138/69 kV substation near the existing Beaver 138 kV substation. * Extend 138 kV line (Approximately 0.1 miles) from the Beaver 138 kV substation to the new site * Install one 138 / 69 kV 100/134 MVA transformer * Build a three breaker 69 kV ring bus and control house. * Loop in/out the existing Black River-Shinrock 69 kV line with double circuit line extension (approximately 0.3 miles) to the new 69 kV ring bus. * At Shinrock replace the existing Electromechanically Relays. * Add auto-sectionalizing scheme at Axtel substation. * The project will add new 138/69 kV source to the area. * Provide operational flexibility and increased reliability * Provide additional capacity on the Beaver-Black River 138 kV line	12/31/2020	$7.4	ATSI	3/25/2019

Ohio – TO Supplemental Projects

(Greater than $5 million)

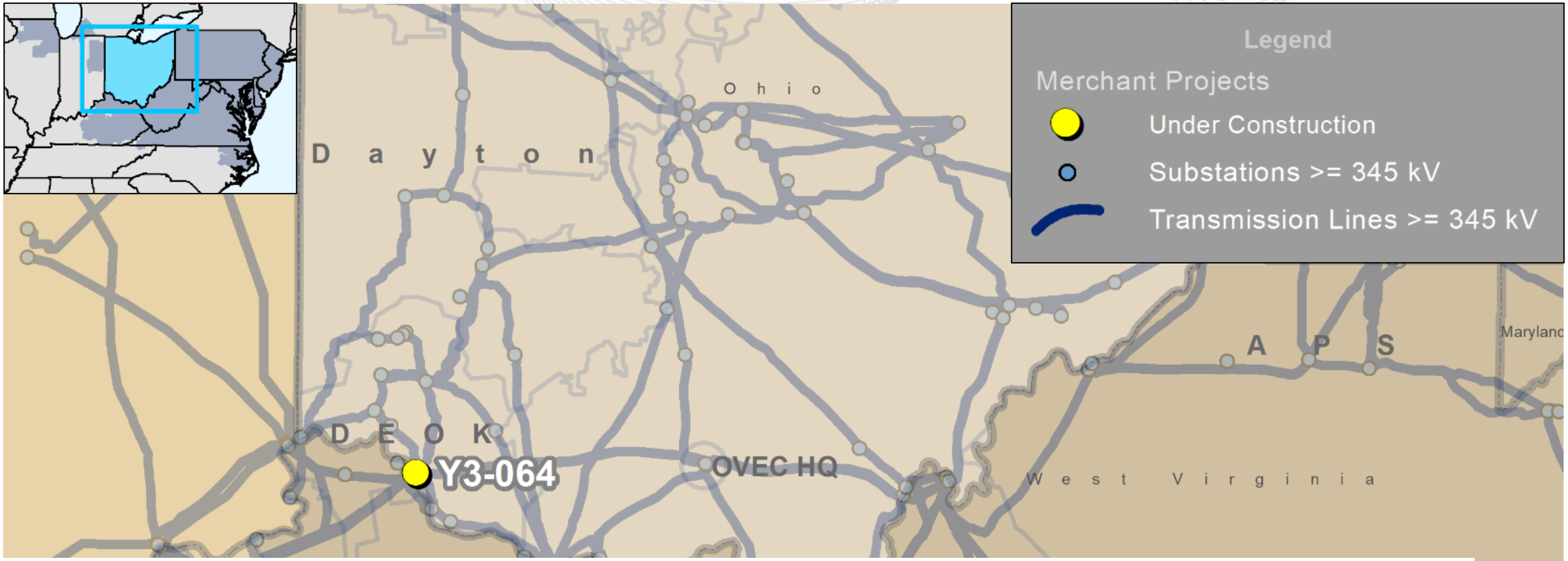
Map ID	Project	Description	Projected In-Service Date	Project Cost ($M)	TO Zone	TEAC Date
	s1951	Jackman 69 kV Ring Bus and Transformer * Expand Jackman substation to a five breaker 69 kV ring bus by adding 5 breakers. * Create positions for two transformers, a capacitor bank, and two line exits. * Add a 138 kV high side breaker and install a 138 / 69 kV 100/134 MVA transformer. * Close the normally open circuit switcher at Hawley substation to network the Jackman 69 kV system with the Vulcan sourced 69 kV system by replacing both 69 kV circuit switchers at Hawley substation with 69 kV circuit breakers.	12/30/2023	$8.1	ATSI	3/25/2019
	s2062	Extend the Wilson - Hess 138 kV line to the new 138 kV bus at Fifth Avenue station and install fiber between Fifth Ave and Hess.	6/1/2021	$5.1	AEP	9/25/2019
		At Fifth Avenue substation, install new 138 kV bus work in ring bus configuration. Install two 138 kV breakers and associated switches on new bus work rated at 3000 A/63 kA.				
		Remote end work at Wilson Road station.				
		Remote end work at Hess station.				

Ohio – TO Supplemental Projects

(Greater than $5 million)

Map ID	Project	Description	Projected In-Service Date	Project Cost ($M)	TO Zone	TEAC Date
	s2064	Build a new 138 kV line (1.5 miles) from Ashtabula substation to the new customer substation with fiber communications for relay coordination. Relocate the existing Ashta 138 kV line terminal to make room for the new customer line exit. Install one 138 kV circuit breaker and protective relaying at Ashtabula substation for the new customer line exit.	6/1/2020	$6.2	ATSI	7/24/2019
	s2122	On the Darrow – Shalersville 69 kV line, rebuild approx. 6.7 miles of wood pole construction 69 kV line from Darrow substation to Streetsboro substation. Rehab balance of line (approx. 4.5 miles) and correct open maintenance items. Replace two line switches to conform with present standards. Upgrade relaying at remote terminal ends.	12/30/2023	$9.3	ATSI	11/22/2019

Ohio – Merchant Transmission Projects

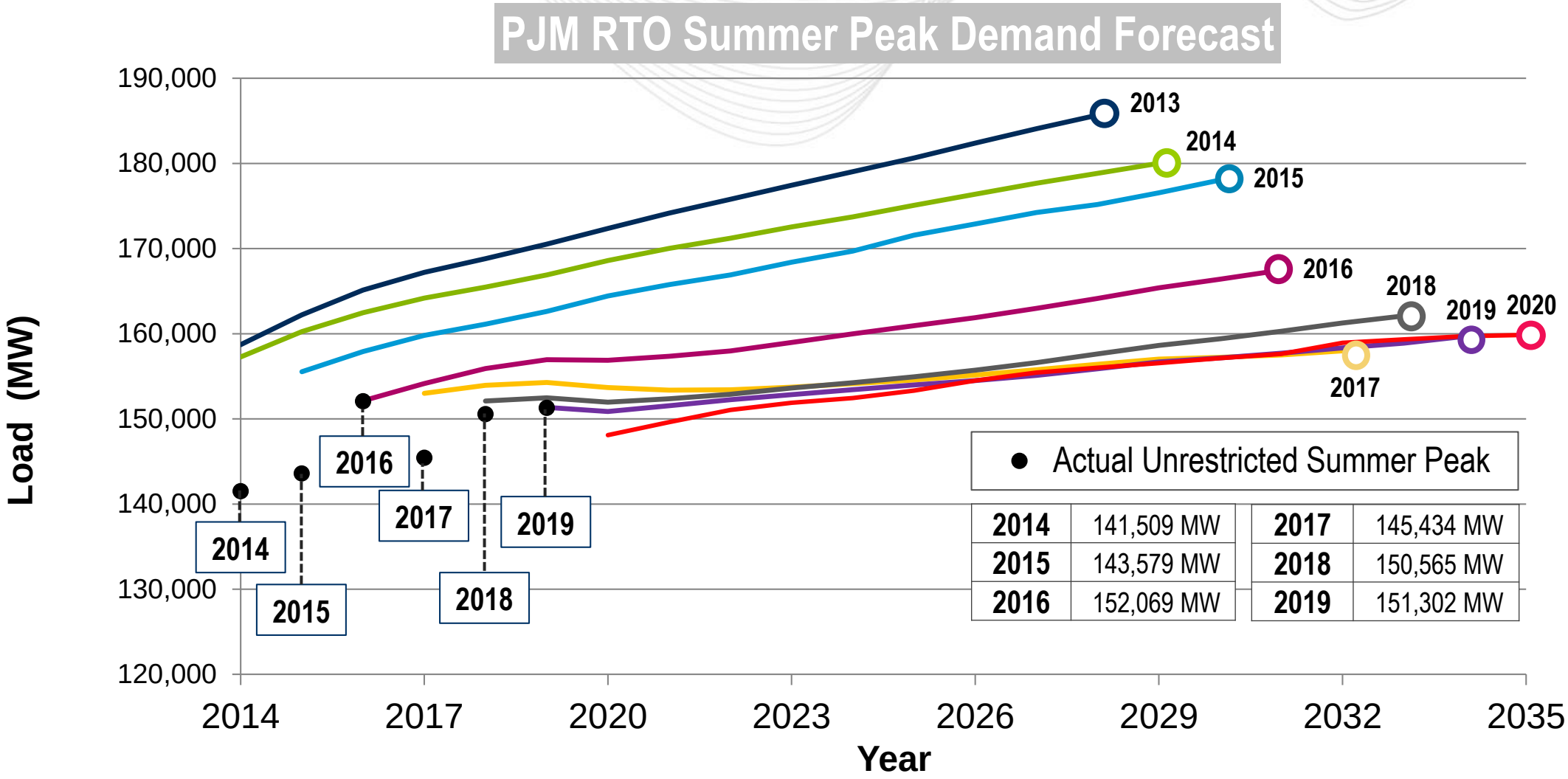


Queue Number	Queue Name	TO Zone	Status	Actual or Requested In-Service Date	Maximum Output (MW)
Y3-064	Pierce-Beckjord 138 kV	DEO&K	Under Construction	12/31/2019	160.0

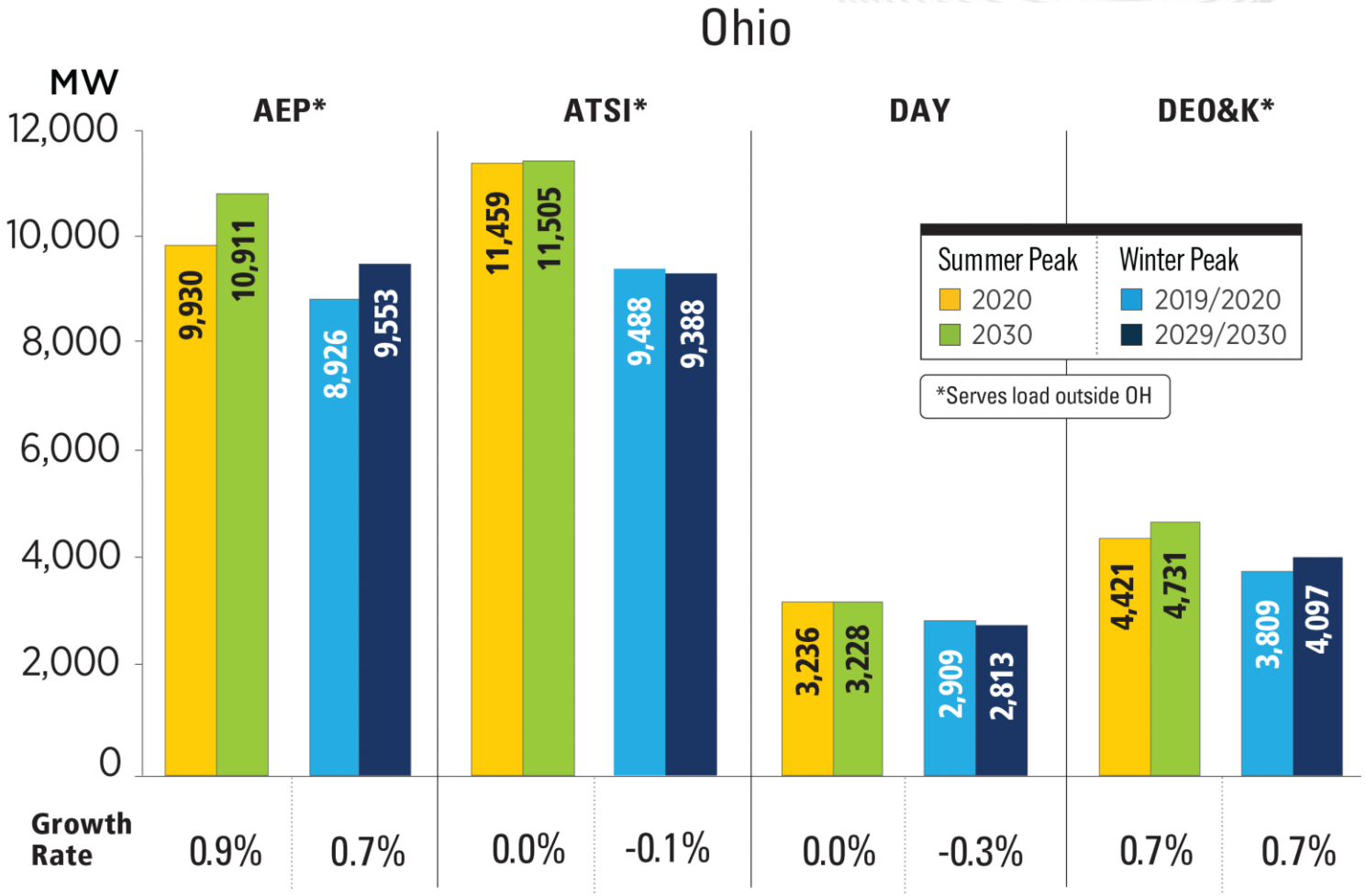
Planning
Load Forecast

PJM Annual Load Forecasts

(Jan. 2020)



Ohio – 2020 Load Forecast Report



PJM RTO Summer Peak

2020	2030
148,092 MW	157,132 MW

Growth Rate 0.6%

PJM RTO Winter Peak

2019/2020	2029/2030
131,287 MW	139,970 MW

Growth Rate 0.6%

The summer and winter peak megawatt values reflect the estimated amount of forecasted load to be served by each transmission owner in the noted state. Estimated amounts were calculated based on the average share of each transmission owner's real-time summer and winter peak load in those areas over the past five years.

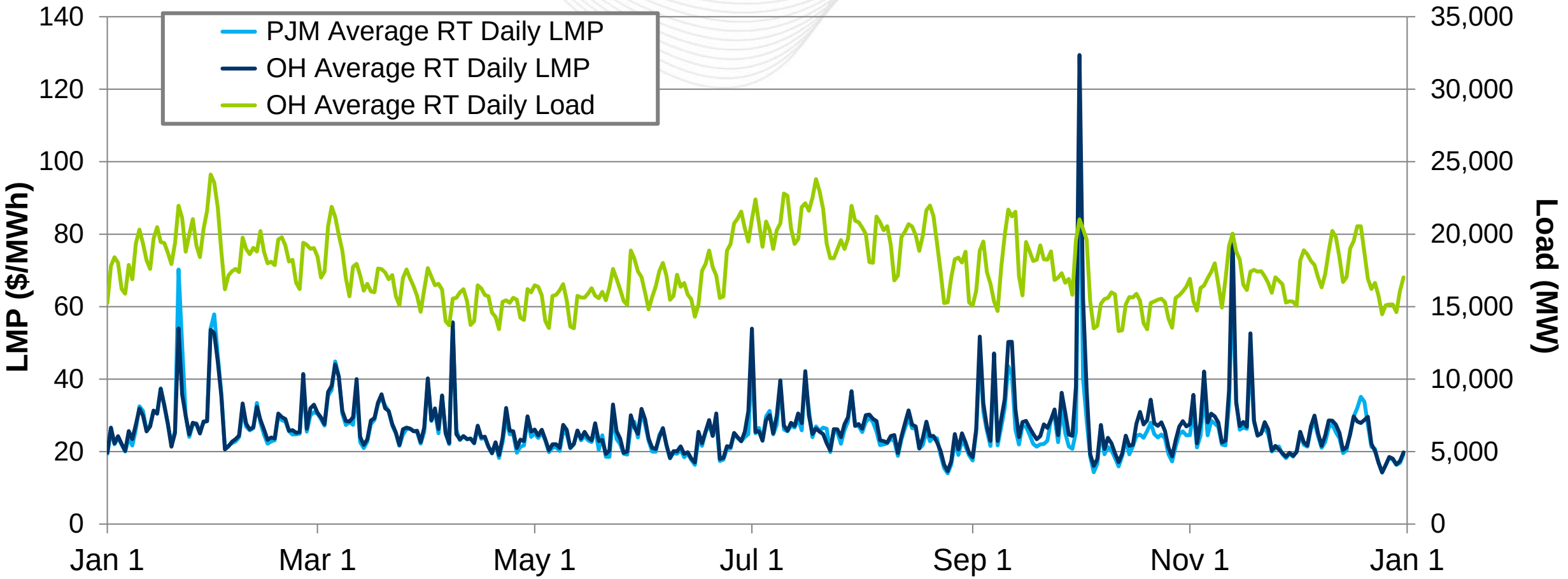
The Load Forecast was produced prior to COVID-19 and will be updated before the next Base Residual Auction to reflect changes in load patterns.

Markets

Market Analysis

Ohio – Average Daily Load and LMP

(Jan. 1, 2019 – Dec. 31, 2019)

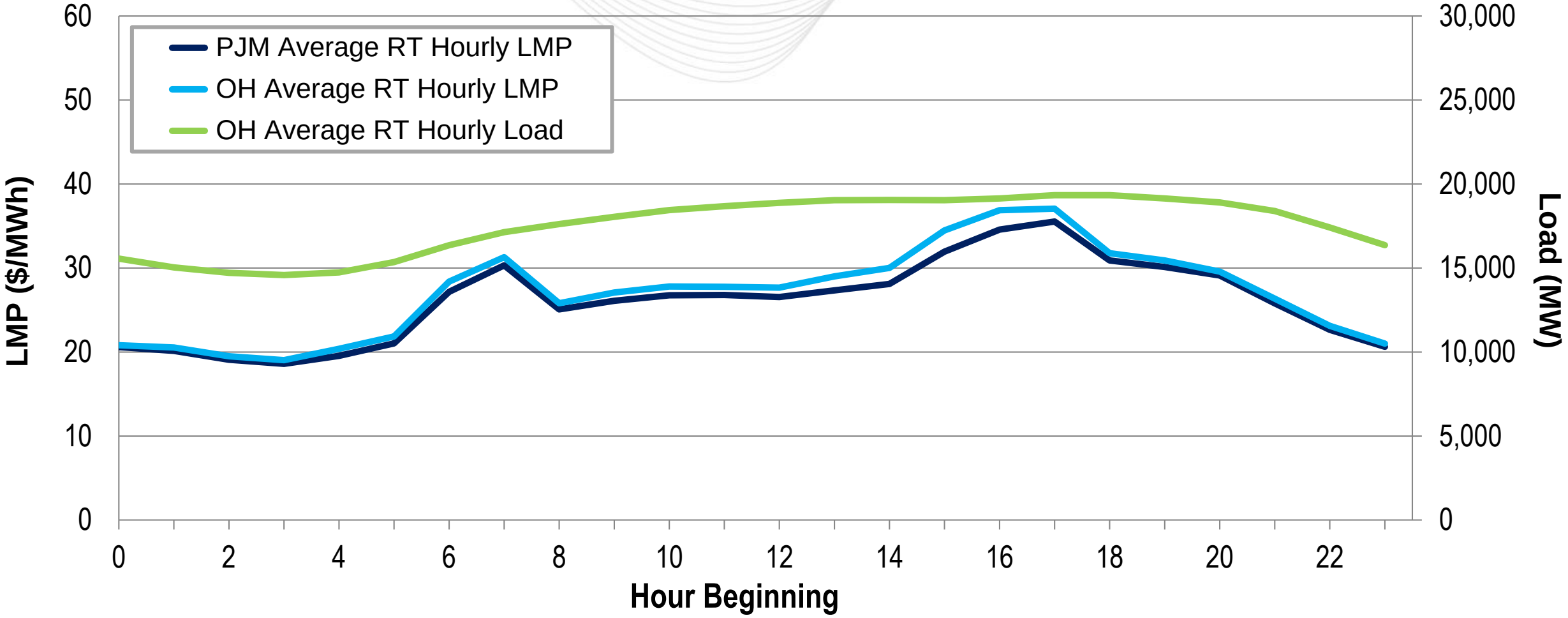


Note: The price spike in October reflects the Performance Assessment Interval event that occurred on October 2nd.

Ohio – Average Hourly Load and LMP

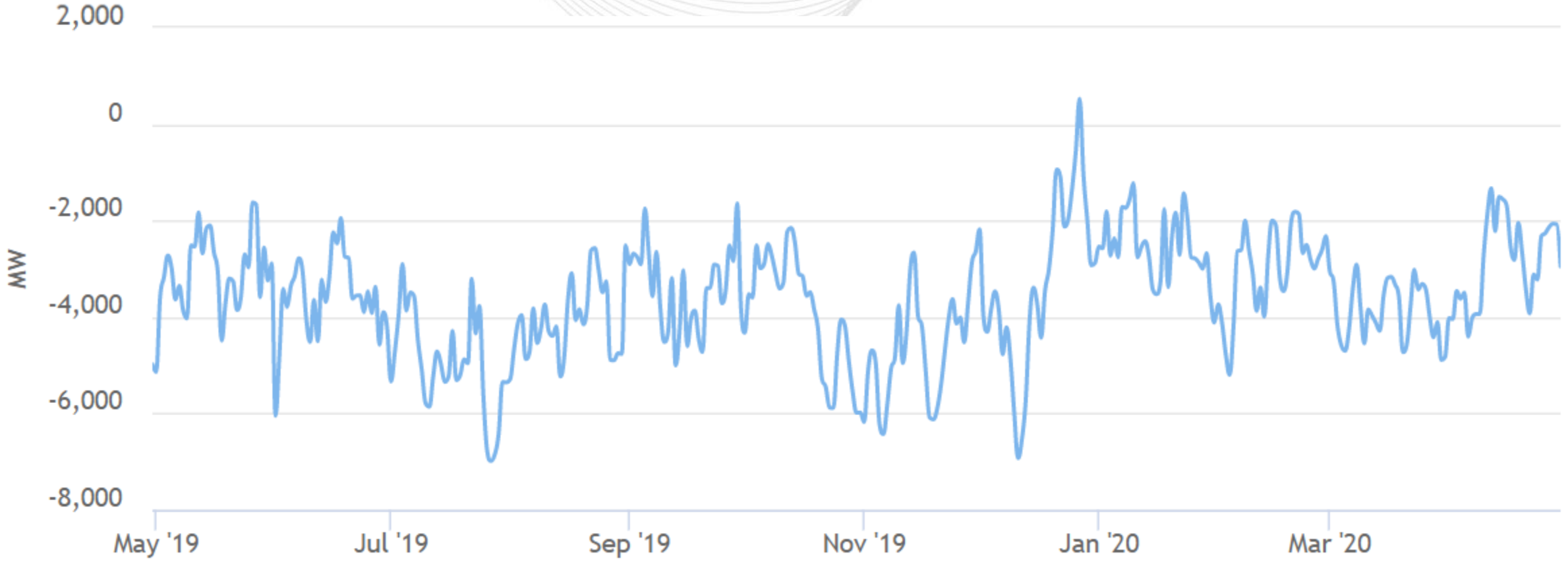
(Jan. 1, 2019 – Dec. 31, 2019)

Ohio's average hourly LMPs generally aligned with the PJM average hourly LMP.



Ohio – Net Energy Import/Export Trend

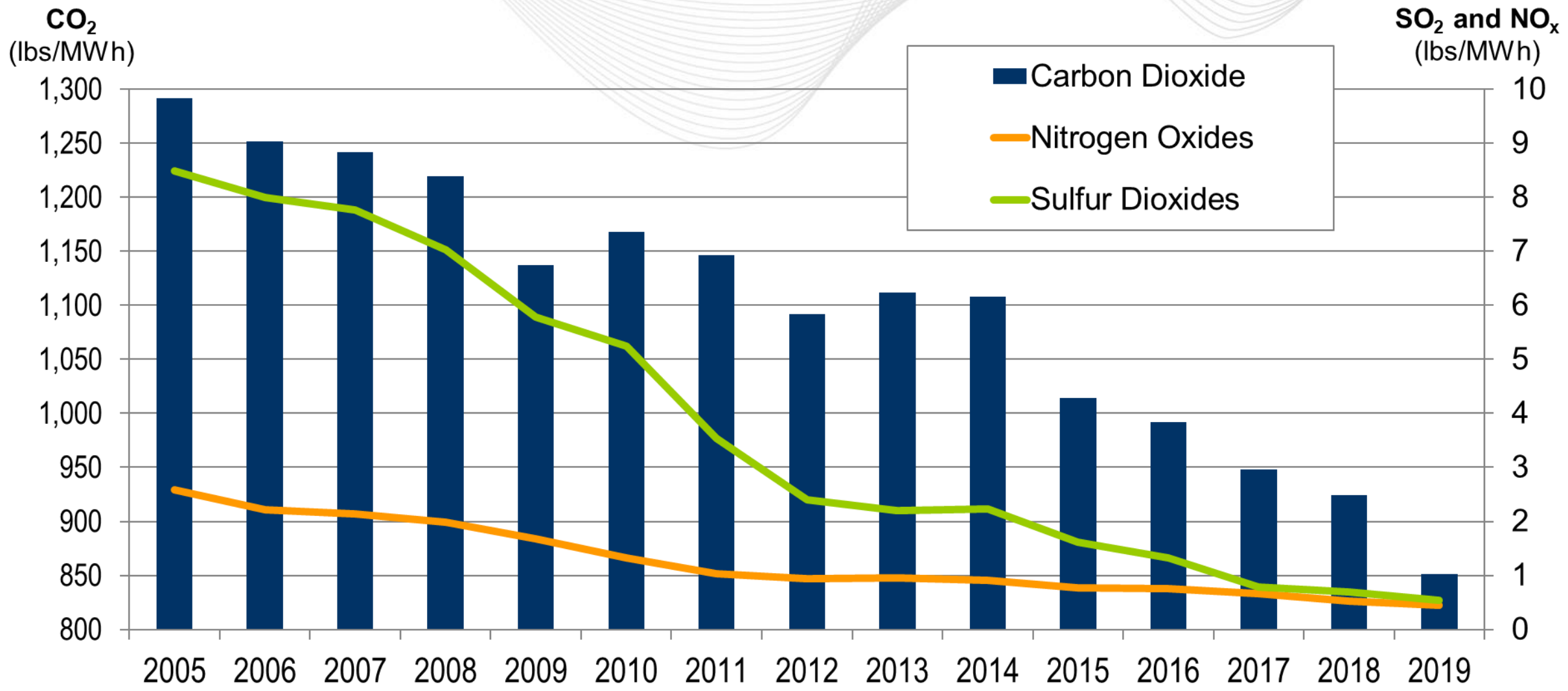
(May 2019 – April 2020)



Positive values represent exports and negative values represent imports.

Operations
Emissions Data

2005 – 2019 PJM Average Emissions



Ohio – Average Emissions with Integrations (lbs/MWh)

(Feb. 7, 2020)