2020 Ohio State Infrastructure Report

(January 1, 2020 – December 31, 2020)

April 2021

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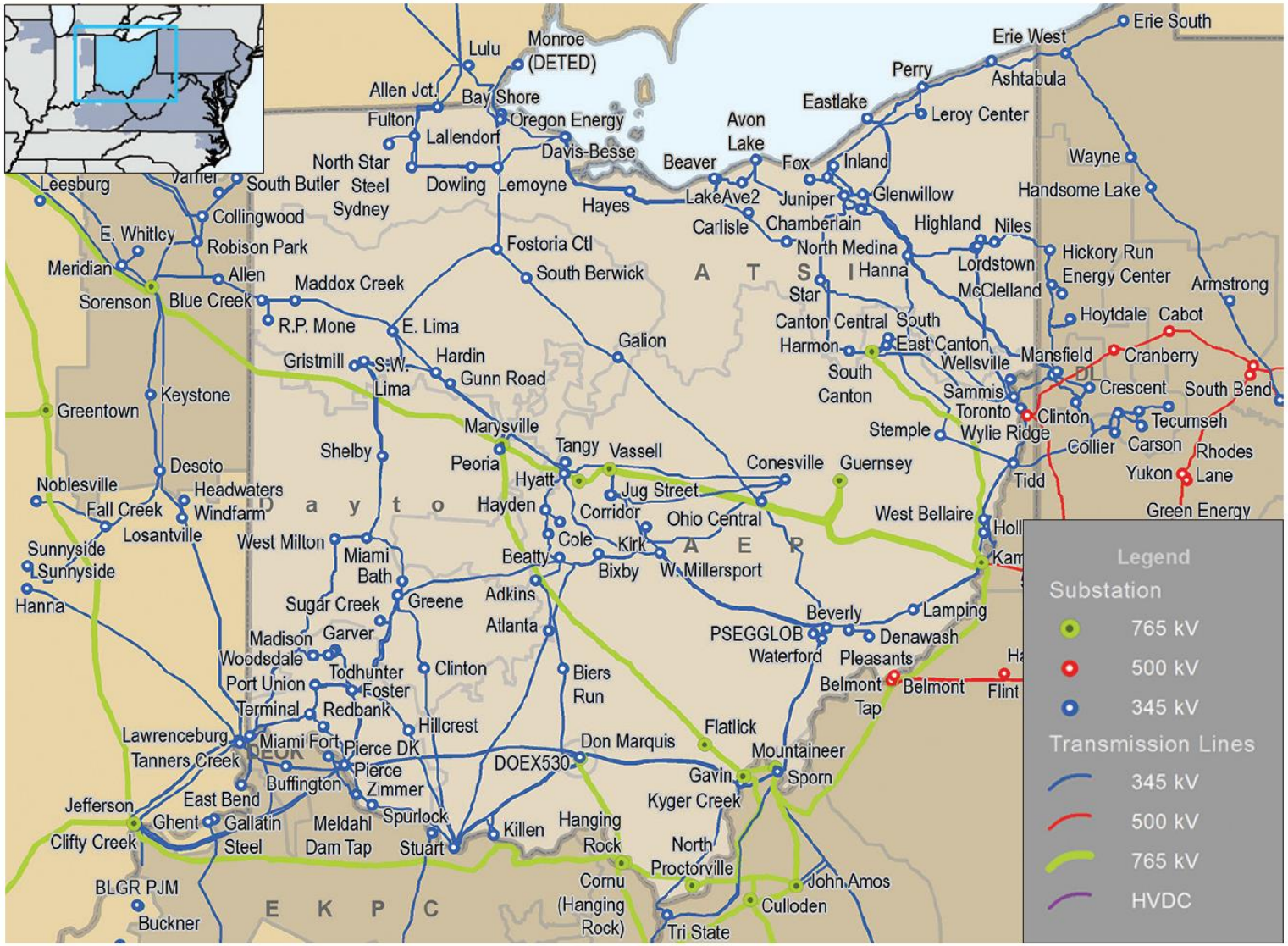
- **Existing Capacity:** Natural gas represents approximately 47.3 percent of the total installed capacity in Ohio while coal represents approximately 41.2 percent. Comparatively, in PJM natural gas and coal are 43.4 and 27.5 percent of total installed capacity.
- **Interconnection Requests:** Solar represents 55 percent of new interconnection requests in Ohio, while natural gas represents approximately 36.3 percent of new requests.
- **Deactivations:** One storage facility in Ohio gave notice of deactivation in 2020.
- **RTEP 2020:** Ohio's 2020 RTEP projects total approximately $1.12 billion in investment. Approximately 97.6 percent of that represents supplemental projects. These investment figures only represent RTEP projects that cost at least $5 million.

- **Load Forecast:** Ohio's summer peak load is projected to grow between 0.3 and 0.6 percent annually over the next ten years, based on the service territory. Comparatively, the overall PJM RTO projected summer peak load growth rate is 0.3 percent.
- **2022/23 Capacity Market:** No Base Residual Auction was conducted in 2020. For the most recent auction results, please see the 2018 Ohio State Infrastructure Report.
- **1/1/20 – 12/31/20 Market Performance:** Ohio's average hourly LMPs generally aligned with PJM average hourly LMPs.
- **Emissions:** 2020 carbon dioxide emissions decreased slightly from 2019 levels, while sulfur dioxide and nitrogen oxide emission levels remained flat.

PJM Service Area – Ohio

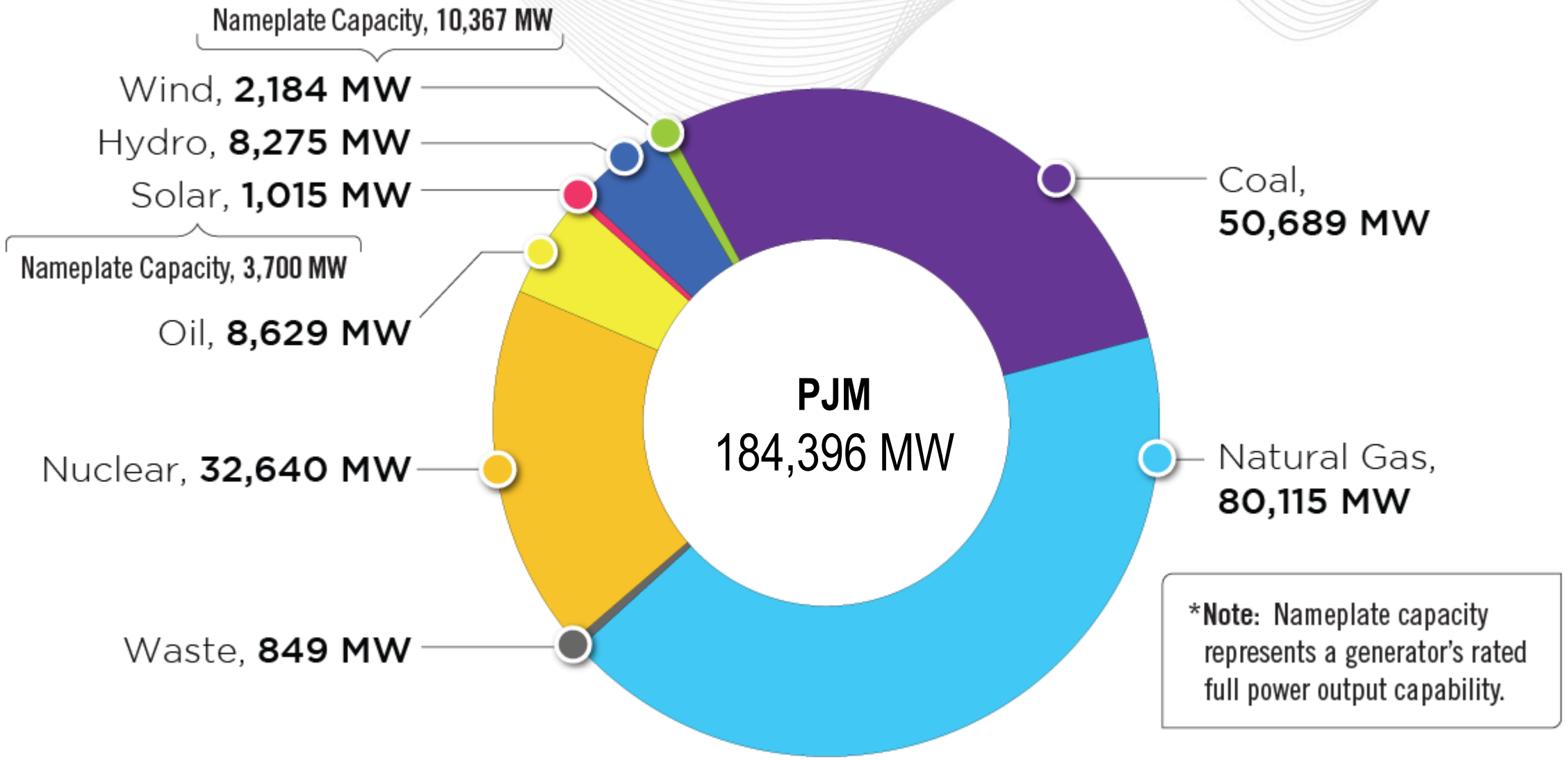


Planning

Generation Portfolio Analysis

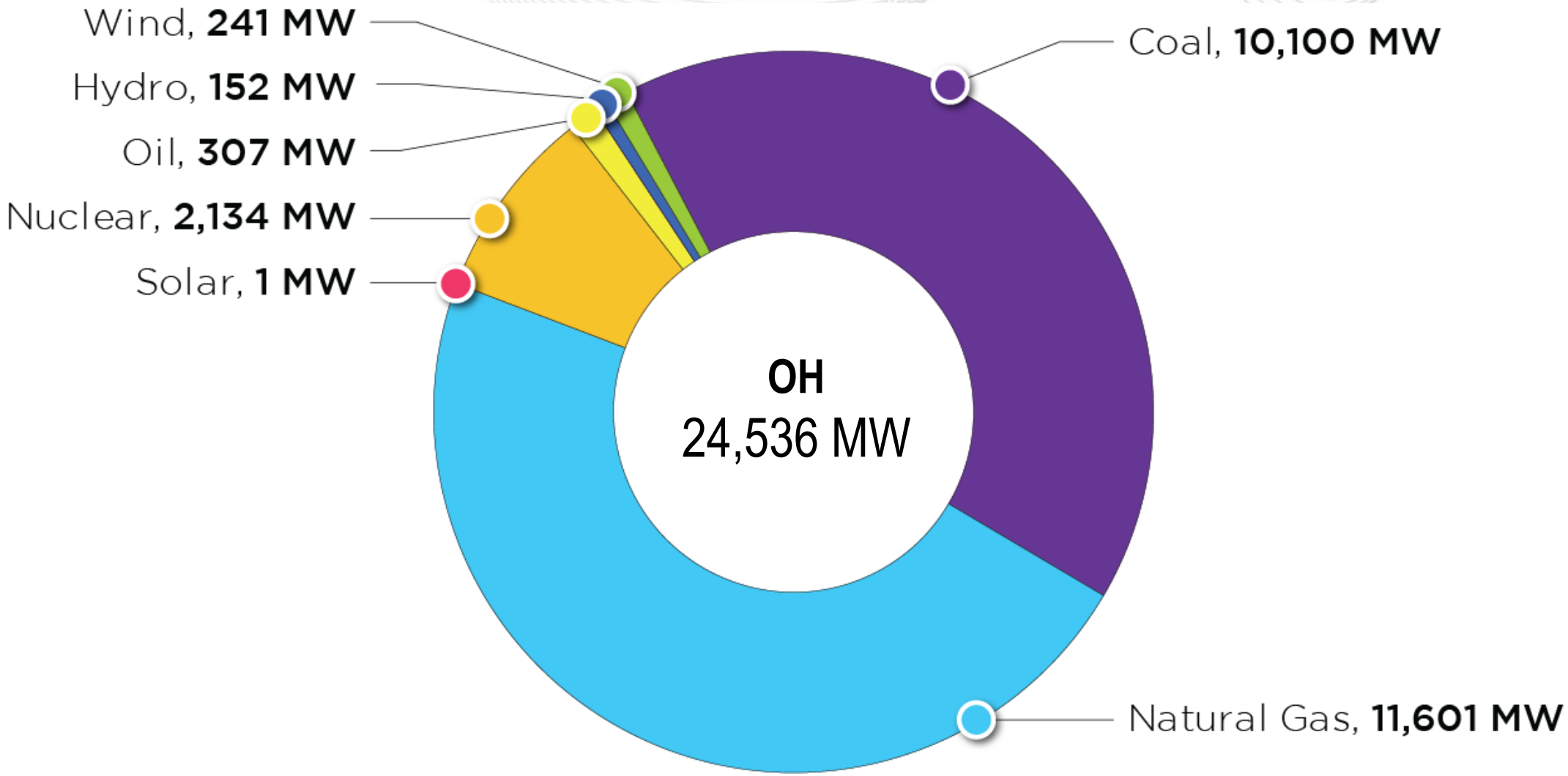
PJM – Existing Installed Capacity

(CIRs – as of Dec. 31, 2020)



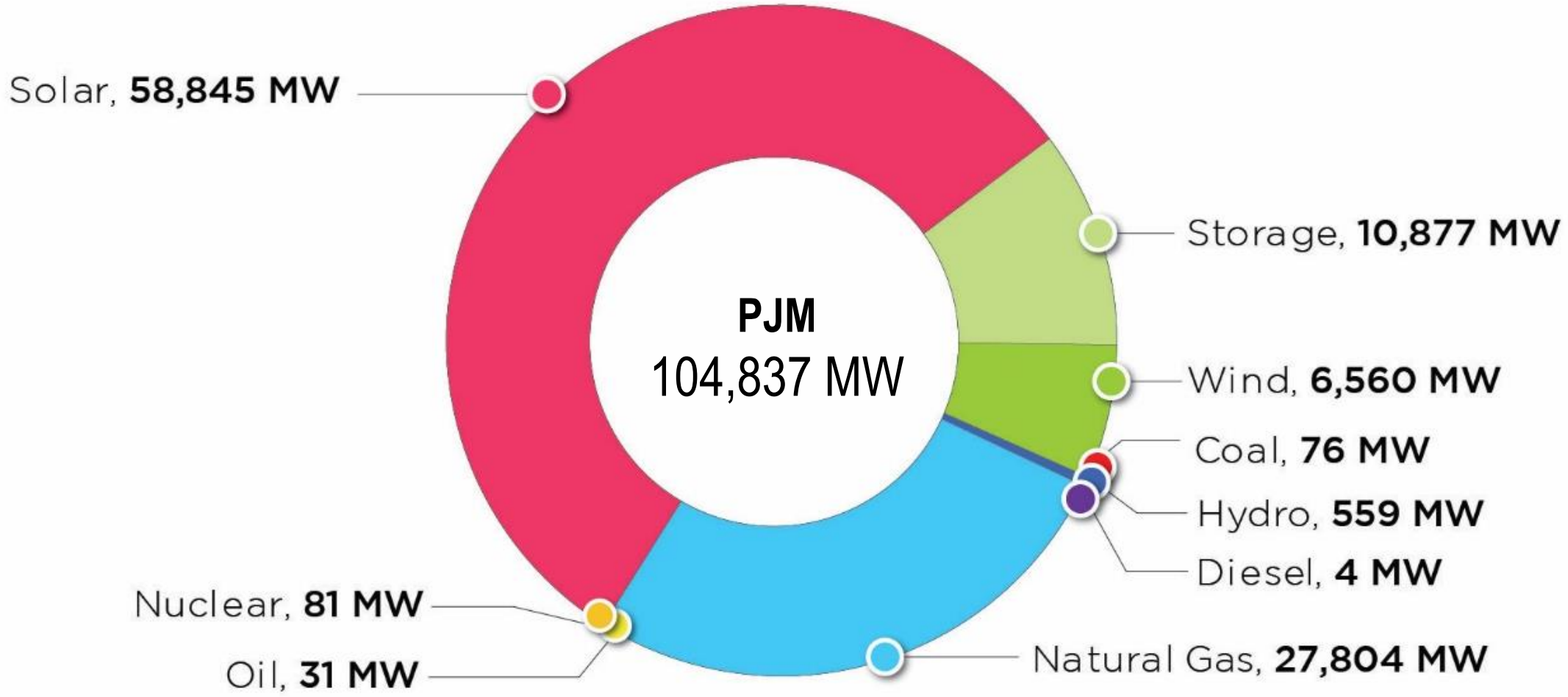
Ohio – Existing Installed Capacity

(CIRs – as of Dec. 31, 2020)



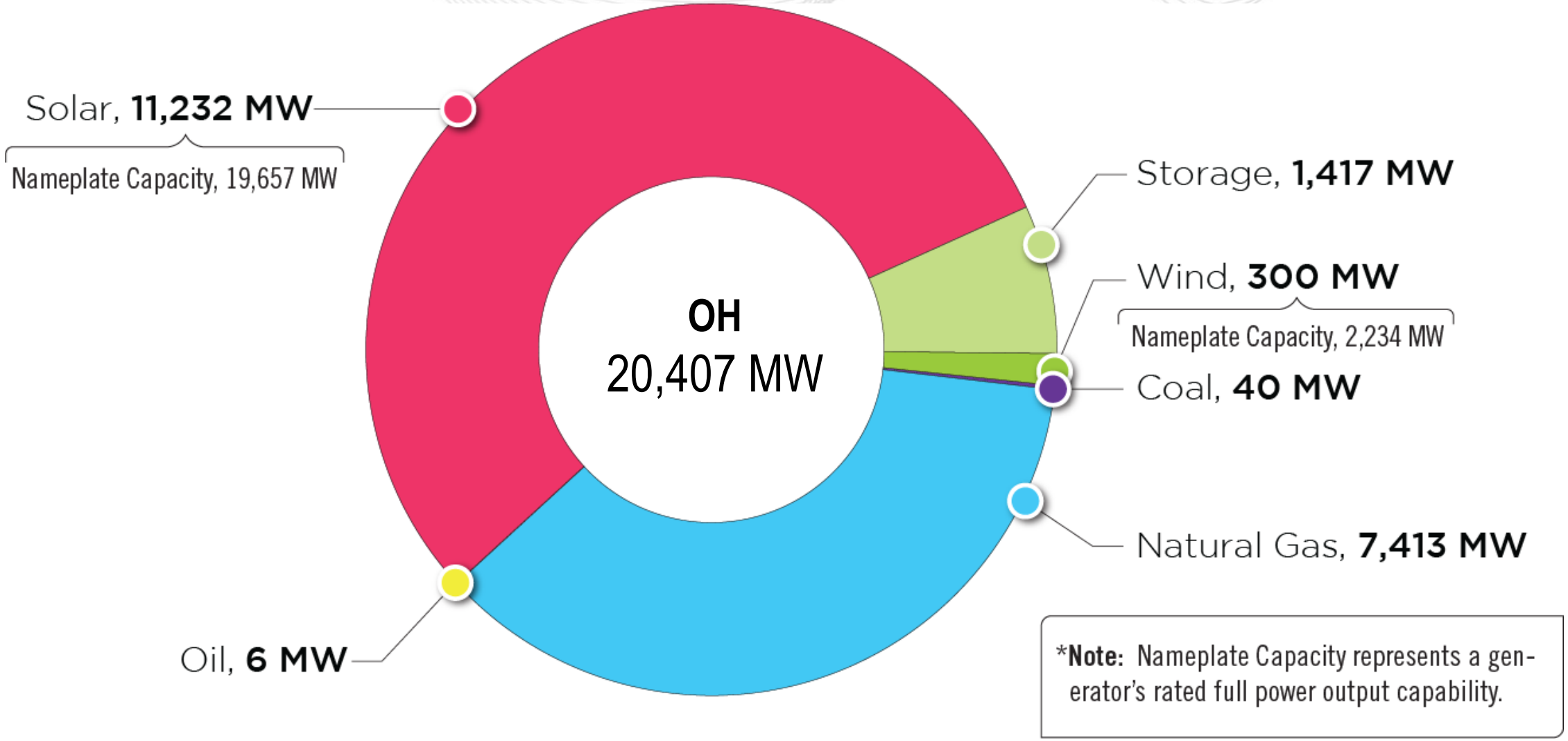
PJM – Queued Capacity (MW) by Fuel Type

(Requested CIRs – as of Dec. 31, 2020)



Ohio – Queued Capacity (MW) by Fuel Type

(Requested CIRs – as of Dec. 31, 2020)



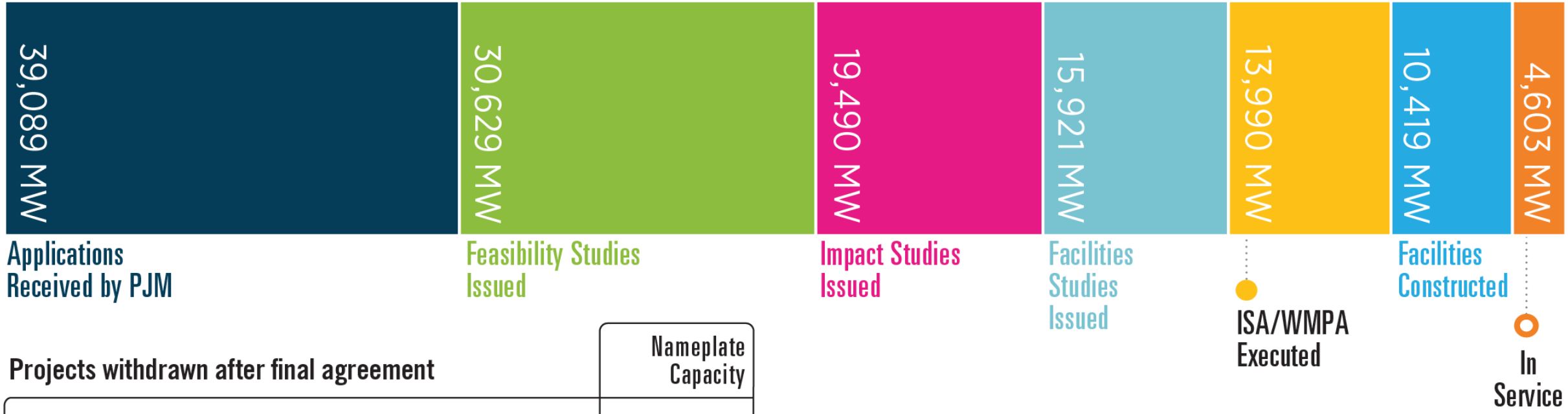
Ohio – Interconnection Requests

(Unforced Capacity – as of Dec. 31, 2020)

		In Queue						Complete					
		Active		Suspended		Under Construction		In Service		Withdrawn		Grand Total	
		Projects	Capacity (MW)	Projects	Capacity (MW)	Projects	Capacity (MW)	Projects	Capacity (MW)	Projects	Capacity (MW)	Projects	Capacity (MW)
Non-Renewable	Coal	1	11.0	0	0.0	2	29.0	11	239.0	16	8,923.0	30	9,202.0
	Diesel	0	0.0	0	0.0	0	0.0	1	7.0	0	0.0	1	7.0
	Natural Gas	11	2,250.6	2	1,710.0	6	3,452.3	27	3,926.9	33	13,134.4	79	24,474.2
	Nuclear	0	0.0	0	0.0	0	0.0	1	16.0	0	0.0	1	16.0
	Oil	0	0.0	0	0.0	2	5.5	0	0.0	1	5.0	3	10.5
	Other	0	0.0	0	0.0	0	0.0	0	0.0	2	135.0	2	135.0
	Storage	22	1,417.4	0	0.0	0	0.0	6	0.0	24	756.2	52	2,173.7
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	8	40.9	9	26.1	17	67.0
	Solar	167	10,640.1	2	209.0	13	382.5	1	1.0	119	3,655.6	302	14,888.1
	Wind	6	176.3	2	26.0	3	97.2	7	164.9	70	1,773.1	88	2,237.5
	Grand Total	207	14,495.5	6	1,945.0	26	3,966.5	64	4,507.6	285	28,669.6	588	53,584.2

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

Ohio – Progression History of Interconnection Requests

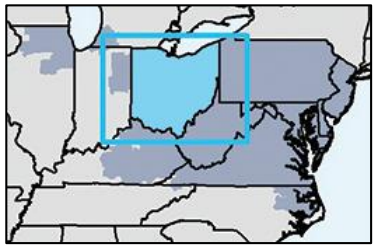


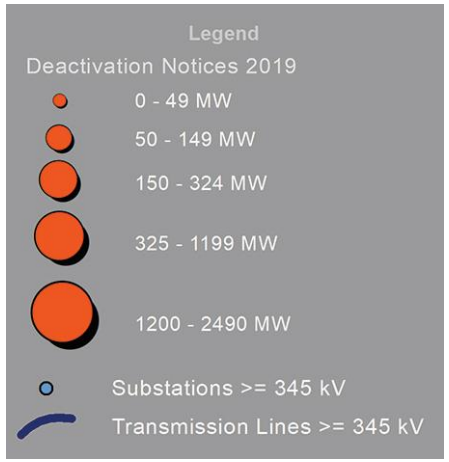
Projects withdrawn after final agreement			Nameplate Capacity
22	Interconnection Service Agreements	3,557 MW	5,399 MW
12	Wholesale Market Participation Agreements	22 MW	82 MW

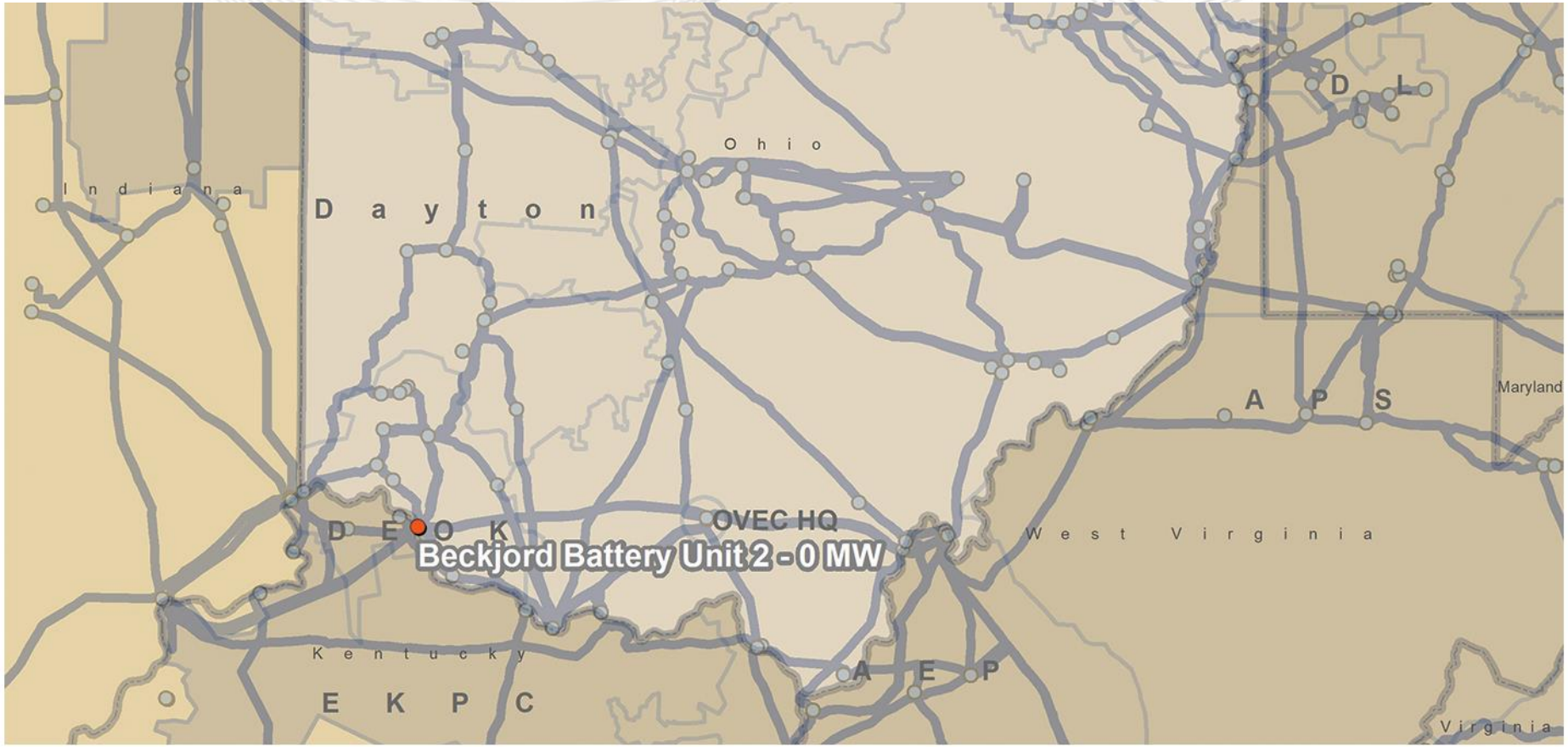
Percentage of planned capacity and projects that have reached commercial operation	12% Requested capacity megawatts	18% Requested projects

This graphic shows the final state of generation submitted to the PJM queue that completed the study phase as of Dec. 31, 2020, meaning the generation reached in-service operation, began construction, or was suspended or withdrawn. It does not include projects considered active in the queue as of Dec. 31, 2020.

Ohio – Generation Deactivation Notifications Received in 2020







Unit	TO Zone	Fuel Type	Request Received to Deactivate	Actual or Projected Deactivation Date	Age (Years)	Capacity (MW)
Beckjord Battery Unit 2	DEO&K	Storage	11/13/2020	2/3/2021	5	0.00

Planning

Transmission Infrastructure Analysis

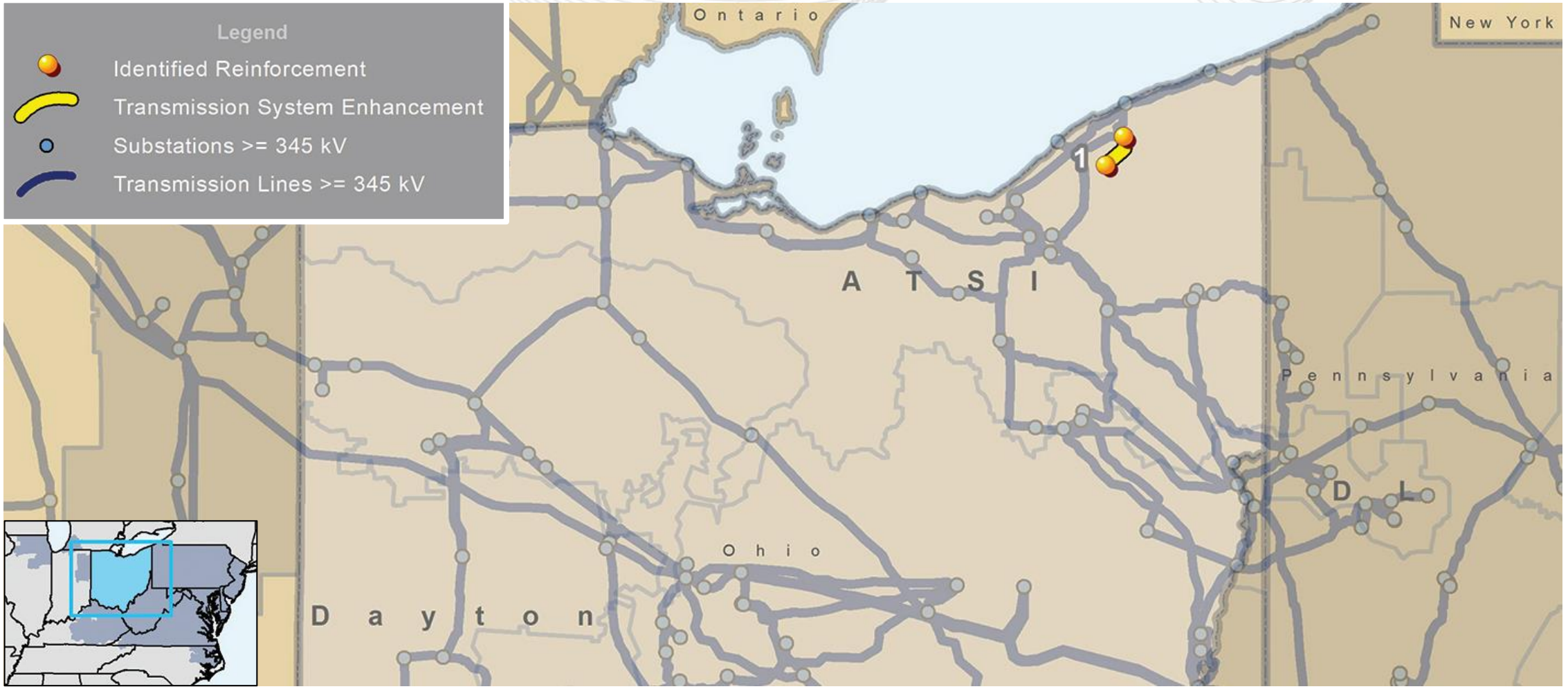
Please note that PJM historically used $5 million as the threshold for listing projects in the RTEP report. Beginning in 2018, it was decided to increase this cutoff to $10 million. All RTEP projects with costs totaling at least $5 million are included in this state report. However, only projects that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

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	Required In-Service Date	Project Cost ($M)	TO Zone	TEAC Date
1	b3152	Reconductor the 8.4 mile section of the Leroy Center-Mayfield Q1 line between Leroy Center and Pawnee tap to achieve a rating of at least 160 MVA/192 MVA Summer Normal/Summer Emergency.	6/1/2024	$14.10	ATSI	11/14/2019
	b3153	Construct a greenfield 0.3 mile 138 kV double circuit line tapping the Beaver-Black River (ATSI) 138 kV line; Install five (5) monopole 138 kV double circuit steel structures with concrete foundations and string 1590 ACSR conductor. Expand the Amherst No.2 substation with the installation of three (3) 138 kV circuit breakers; one (1) 138/69/12 kV 130 MVA transformers; two (2) 69 kV circuit breaker. Install one (1) 69 kV breaker towards Nordson.	6/1/2020	$7.50	AMPT	11/22/2019
	b3159	Build a new 138/69 kV substation. Install one (1) 138 kV circuit breaker, one (1) 138/69 kV 130 MVA transformer, three (3) 69 kV circuit breakers. Build a 0.15 mile 138 kV 795 ACSR transmission line between the FE Brim 138/69 kV substation and the newly proposed AMPT substation (three steel poles). Loop the Bowling Green Sub No.5 – Bowling Green Sub No.2 69 kV lines in and out of the newly established substation.	6/1/2024	$5.70	AMPT	12/18/2019

Ohio – RTEP Network Projects

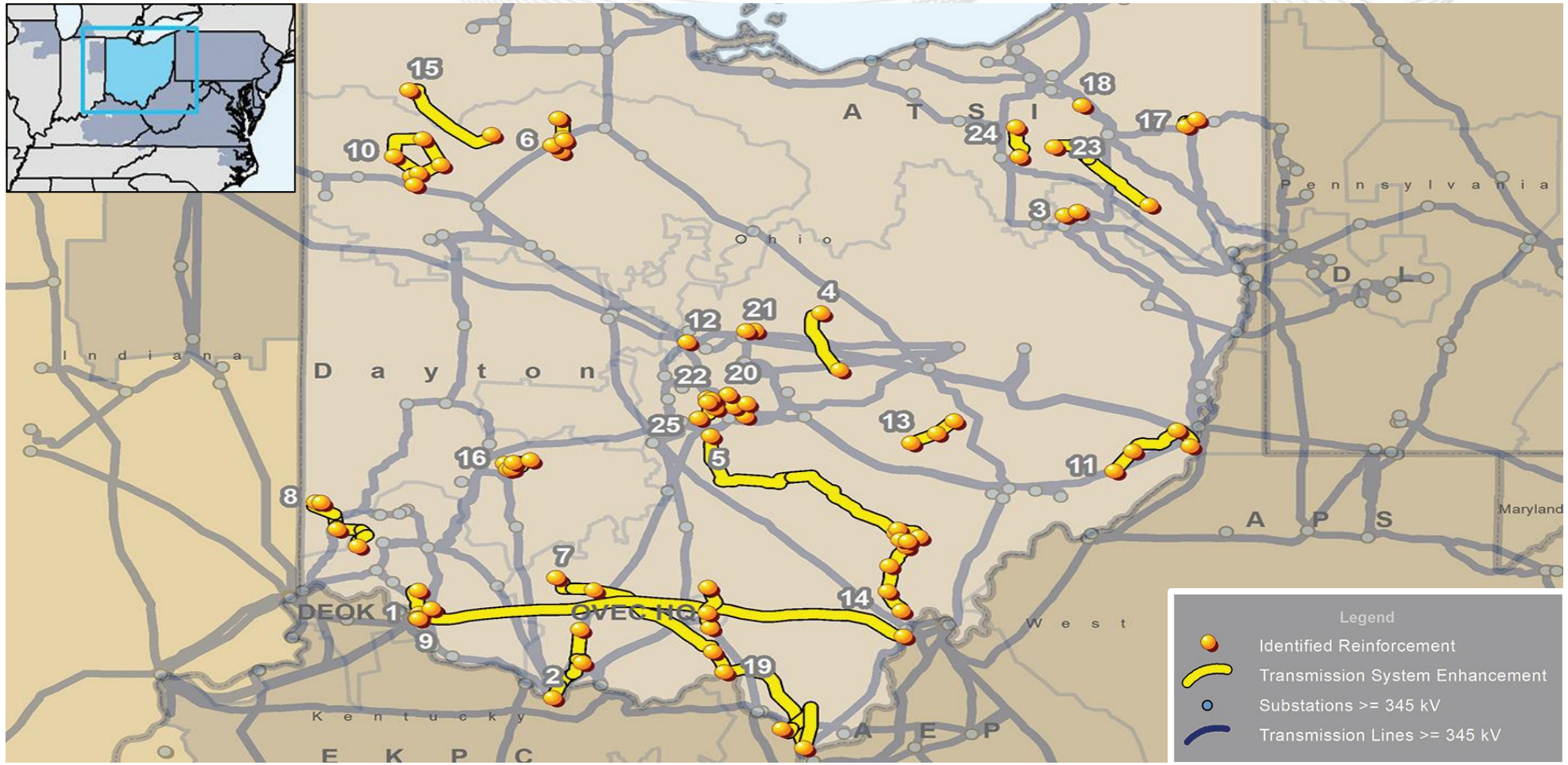
(Greater than $5 million)

Ohio had no network project upgrades in 2020.

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. The costs of network projects are borne by the interconnection customer.

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	s2181	At Clermont 138/69 kV: Retire the substation. Remove all equipment, foundations, underground cables, cableways, fencing and the control building. Connect the 138 kV feeder from Beckjord to the feeder from Summerside. Connect the 69 kV feeder from Blairville to the feeder from Amelia. At Beckjord 138/69 kV: Replace the 138 kV oil-filled circuit breaker that connects to the high side of the existing 138/69 kV transformer. Install a new 138 kV breaker connecting to a new 138/69 kV, 150 MVA transformer. Expand the substation and install four 69 kV circuit breakers to form a ring bus.	5/25/2023	$13.30	DEO&K	1/17/2020
2	s2184	Rebuild 22.0 miles of the existing 28.5-mile Stuart-Seaman 69 kV circuit with 795 ACSR. Retire approximately three miles of the line between West Union and structure 86. Thirty-two of the line's 170 structures were replaced since 2012 and will not be replaced as part of the rebuild.	12/1/2024	$65.00	AEP	2/21/2020
		Construct approximately 2.5 miles of new line from structure 86 on the Stuart-Seaman 69 kV line to Copeland station utilizing 795 ACSR.				
		Rebuild the 2-mile West Union-Copeland 69 kV line utilizing 795 ACSR. The line is part of the Stuart-Seaman 69 kV circuit and is currently radial fed from West Union switch.				
		Establish a 4-breaker 69 kV ring (3000A, 40kA) at the existing Copeland station to serve the Adams Rural Electric Cooperative, Inc. and AEP Ohio customers currently served from a hard tap at the end of the radial.				
		Retire existing West Union switch.				
		Install new 2000A 3-way phase-over-phase switch at Panhandle.				
		Replace the existing Poplar Flats switch with a new 2000A three-way phase-over-phase switch.				
		Remote end upgrade and equipment relocation work will be required at Seaman station to accommodate the new line at the station.				

Ohio – TO Supplemental Projects

(Greater than $5 million)

Map ID	Project	Description	Projected In-Service Date	Project Cost ($M)	TO Zone	TEAC Date
3	s2185	Rebuild the 4-mile Sunnyside-Torrey 138 kV circuit. Supplement the existing right-of-way as needed to solve encroachments and other constraints.	8/1/2022	$12.70	AEP	2/21/2020
4	s2186	Rebuild the existing 138 kV line with 19.4 miles of new 1033 ACSR.	7/1/2023	$42.20		
5	s2198	Build new 0.3-mile double-circuit 138 kV extension from the Harrison-Lemaster 138 kV circuit to the new Lockbourne 138 kV station. Fiber will also be installed on the line.	9/23/2021	$13.80		
		Remove the existing 138 kV radial line from AEP Harrison to SCP Harrison station.				
		Build three short lines to interconnect to SCP's Lockbourne station to serve their three transformers.				
		Build a new 138 kV 5-breaker switch station (Lockbourne) with 3000A 40kA breakers and a capacitor bank (28.8 MVAR) to provide service to three SCP deliveries at the site.				
		Remove existing breaker 3E from the ring bus at Harrison.				

Ohio – TO Supplemental Projects

(Greater than $5 million)

Map ID	Project	Description	Projected In-Service Date	Project Cost ($M)	TO Zone	TEAC Date
6	s2199	Rebuild approximately 3 miles of New Liberty-North Baltimore 34 kV line.	8/1/2022	$85.90	AEP	2/21/2020
		Rebuild 8 miles of North Findlay-North Baltimore No.1 34 kV line (advanced construction date due to imminent failure).				
		Rebuild 0.15 miles of Whirlpool Extension.				
		Build 1 mile of Oilers Switch Extension.				
		Rebuild 2.9 miles of New Liberty-Findlay Center 34 kV line.				
		At North Findlay station, replace 34.5 kV CBs F, G, H, J, K, L with 34.5 kV, 2000A 40 kA breakers. Replace 34.5 kV circuit switcher BB (40kA). Replace T1 and T2 with 90 MVA 138/69/34 kV transformers.				
		At New Liberty station, remove existing T1 and T2. Replace with one 90 MVA ,138/69/34 kV transformer. Install high-side circuit switcher for new transformer. Expand station to build new 34.5 kV ring bus with (6) 2000A 40kA breakers.				
		At Oilers switch station, build new ring bus in the clear with four 2000A 40 kA breakers to replace Morrical switch.				
		At North Baltimore station, rebuild station with four 2000A 40 kA breakers.				
		Install three-way 1200A switch called Touchstone to replace Liberty switch.				
		Replace Cherry Street switch with a two-way 1200A switch.				
		Replace West Melrose switch with 1200A switches.				
		Replace Harvard Avenue switch with a three-way 1200A switch.				
		Install three-way 1200A switch called Totten to eliminate the hard tap to the customer.				
		Install two-way 1200A switch called Centrex to eliminate the hard tap to the customer.				
		Replace Griffith switch with a two-way 1200A switch.				
		Replace Whirlpool MOABs with 1200A capability.				

Ohio – TO Supplemental Projects

(Greater than $5 million)

Map ID	Project	Description	Projected In-Service Date	Project Cost ($M)	TO Zone	TEAC Date
7	s2201	Rebuild 43.4 miles single-circuit line between Hillsboro-South Lucasville with 1033 ACSR.	9/30/2022	$126.80	AEP	2/21/2020
		Rebuild 8.5 miles double circuit between Millbrook Park-South Lucasville with 1033 ACSR.				
		Install a new three-way 2000A 138 kV, phase-over-phase switch at Sinking Springs.				
8	s2211	Locust ring bus: Install four 69 kV breakers in a ring bus configuration. Split the main feeder into two circuits. Terminate the two new main feeder circuits and the feeder to McGuffey each into their own position on the ring.	6/1/2023	$27.29	DEO&K	3/19/2020
		McGuffey automatic throw over: Install voltage sensing, control and associated equipment to implement an automatic throw-over (ATO) scheme in McGuffey Substation.	12/31/2023			
		Locust-Millville sectionalizing: Install switching facilities with energy management system (EMS) control and an ATO scheme in a new station at the Buckeye Rural Electric Cooperative (BERC) Stillwell-Beckett tap. Loop the main feeder though the new facilities. Install switching facilities with EMS control and transmission line sectionalizing (TLS) in or adjacent to BREC-Oxford Station. Loop the main feeder through the facilities.				
		Millville ring bus: Install four 69 kV breakers in a ring bus configuration. Split the main feeder into two circuits. Extend the feeder that supplies BREC-Layhigh to Millville. Terminate the two new main feeder circuits, the feeder to BREC-Layhigh and the feeder to Hensley each into their own position on the ring.	6/1/2023			
		Millville-Fairfield sectionalizing: Install switching facilities with EMS control and TLS in or adjacent to BREC-Ross. Loop the main feeder though the new facilities. Install switching facilities with EMS control and TLS at or near the tap to BREC-Colerain. Loop the main feeder though the new facilities. Install ATO in River Circle Substation. Loop the main feeder through the facilities.	12/31/2023			

Ohio – TO Supplemental Projects

(Greater than $5 million)

Map ID	Project	Description	Projected In-Service Date	Project Cost ($M)	TO Zone	TEAC Date
9	s2213	Install a new transmission switching station (Arboles) to connect 138 kV lines to Don Marquis, Waverly, and Wakefield as well as four radial lines to serve the two new loads. The station will have 11 CBs (3000A 40 kA) in a breaker-and-a-half configuration. Department of Energy requires three feeds and has requested 138 kV service.	11/1/2021	$34.80	AEP	3/10/2020
		Reconfigure the existing Don Marquis extension in the six-wire configuration for 0.4 miles and rebuild 0.7 miles of the existing Marquis-Wakefield line as double circuit for two feeds from Waverly and Don Marquis.				
		Construct ~0.3 miles of new line to terminate the South Lucasville circuit into Arboles.				
		Construct two independent lines to serve the X-555 substation (DP No.1). The lines will be ~0.4 miles long each.				
		Construct two independent lines to serve the X-5001 substation (DP No.2). The lines will be ~0.8 miles long each.				
		At Don Marquis 345 kV, install three 345 kV, 4000A 63 kA circuit breakers to terminate the OVEC lines from Pierce and Kyger Creek. Install intertie metering. (AEP work)				
		At Kyger Creek station, remove X-530 No.1 exit and associated equipment. Update remote end relaying towards Don Marquis.			OVEC	
		At Pierce station, remove X-530 No.1 Exit and associated equipment. Update the remote end relaying towards Don Marquis.				
		Reconfigure 71.5 miles of the Pierce-Don Marquis line in the six-wire configuration. Construct 0.13 miles of line to tie into Don Marquis station.				
		Reconfigure 50.4 miles of the Kyger Creek-Don Marquis line in the six-wire configuration. Construct 0.5 miles of line to tie into Don Marquis station.				
		At Don Marquis 345 kV, install three 345 kV, 4000A 63 kA circuit breakers to terminate the OVEC lines from Pierce and Kyger Creek. Install intertie metering. (OVEC work)				

Ohio – TO Supplemental Projects

(Greater than $5 million)

Map ID	Project	Description	Projected In-Service Date	Project Cost ($M)	TO Zone	TEAC Date
10	**s2215**	Rebuild 16 miles of 69 kV single-circuit line from North Continental Switch (existing switch to be retired) to Roselms Switch (located next to the existing Paulding Putnam Electric Cooperative Roselms station).	8/15/2022	$92.10	AEP	3/19/2020
		Build 9.4 miles of single-circuit 69 kV line from Roselms to near East Ottoville 69 kV Switch.				
		Rebuild 7.5 miles of double-circuit 69 kV line between East Ottoville Switch and Kalida Station (combining with the new Roselms to Kalida 69 kV circuit).				
		Rebuild 5.1 miles of single-circuit 69 kV line from East Ottoville to North Delphos.				
		At North Continental, remove normally open bypass switch.				
		At Fort Brown switch, install a three-way 69 kV, 1200 A phase-over-phase switch with sectionalizing capability.				
		At West Oakwood switch, install a three-way 69 kV, 1200 A phase-over-phase switch with sectionalizing capability.				
		At Roselms switch, install a new three-way 69 kV, 1200 A phase-over-phase switch with sectionalizing capability.				
		At Kalida station, move CB J from low side of Transformer 2 to terminate the new line from Roselms Switch. Move the circuit switcher XT2 from high side of transformer 2 to the high side of transformer 1. Remove existing T2 transformer.				
		Remote end work at North Delphos station.				
		At East Ottoville, install a three-way 69 kV, 1200 A phase-over-phase switch with sectionalizing capability.				
		At Ottoville station, install two three-way 69 kV, 1200 A, phase-over-phase switches with sectionalizing capability.				
		At Fort Jennings, replace hard tap with a three-way 69 kV, 1200 A phase-over-phase switch, with sectionalizing capability.				

Ohio – TO Supplemental Projects

(Greater than $5 million)

Map ID	Project	Description	Projected In-Service Date	Project Cost ($M)	TO Zone	TEAC Date
11	s2216	At Lamping station, install a 138 kV breaker string with two breakers, a 90 MVA, 138-69 kV transformer, and one 69 kV breaker.	5/1/2023	$30.10	AEP	3/19/2020
		Construct a 10-mile 69 kV transmission line between Lamping and the Woodsfield area.				
		At the existing Woodsfield municipal electric station, install a three-way 69 kV switch with SCADA functionality (Cranes Nest Switch).				
		At the existing hard tap to Woodsfield municipal, install a three-way 69 kV switch with SCADA functionality (Standingstone Switch).				
		Remove the existing Cameron two-way switch and install a new three-way 69 kV switch with SCADA functionality.				
		At Switzer station, install two 138 kV line breakers (toward Herlan and Natrium).				
		At the 138 kV remote-end of Natrium, replace the line protection relays to coordinate with the upgrade at Switzer.				
		Modify the existing Switzer-Woodsfield 69 kV transmission line on each side of the switches due to the switch installation.				
12	s2217	At Hyatt station, replace two 345/138 kV, 300 MVA transformers 1A & 1B with 450 MVA units. Install three 345 kV, 5,000A / 63 kA circuit breakers to separate the transformer protection zones. Replace 138 kV breaker 105S with a 3,000A / 63 kA breaker. Install new 138 kV 3,000A breakers to terminate the second transformer.	11/27/2019	$25.00	AEP	3/19/2020
13	s2223	Rebuild ~12 miles of the Crooksville-Philo 138 kV circuit.	9/30/2022	$30.90	AEP	3/19/2020
		Replace Cannelville switch with a new phase-over-phase switch. Relocate the existing Cannesvsille-Guernsey-Muskingum Electric Cooperative 138 kV line to new Cannelville switch. The switch needs to be relocated to maintain service to the customer while the line is being rebuilt.				

Ohio – TO Supplemental Projects

(Greater than $5 million)

Map ID	Project	Description	Projected In-Service Date	Project Cost ($M)	TO Zone	TEAC Date
14	s2224	Rebuild the existing ~8 mile Elliott-Lee 69 kV line to 138 kV and retire the existing 69 kV line.	10/1/2024	$55.50	AEP	3/19/2020
		Retire approximately 11.5 miles of the Philo-Rutland 138 kV line from Lee station north, including the de-energized portion of the line that runs through the Plains community.				
		Convert Lee to 138 kV service and install two line MOABs connected to the 138 kV line between Dexter and Elliot.				
		At Clark Street, replace 69 kV circuit breakers 61 & 64 (3000A 40 kA).				
		At Elliot, install a new 138/69 kV transformer (130 MVA) in addition to high- and low-side protection (3000A 40 kA) which will replace transformer No. 1 at Strouds Run that will be retired. Replace existing 138 kV circuit breaker 102 and 69 kV circuit breakers 61 and 66 (3000A 40 kA). Install 138 kV circuit breaker (3000A, 40 kA) on the new 138 kV line towards Dexter (via Lee) along with a 138 kV bus-tie breaker (3000 40 kA). Retire 69 kV circuit breaker 67"due to the conversion of Lee station to 138 kV.				
		Rebuild ~3.68 miles of single-circuit line from the Poston-Strouds Run line as double-circuit 138 kV transmission line to eliminate the hard tap on the line.				
		At Strouds Run, install a 138 kV line breaker (3000A 40 kA) towards Lemaster. Replace Transformer No. 2 high-side circuit switcher with a circuit breaker (3000A 40 kA). Replace the 69 kV circuit breaker 66 (3000A 40kA). Retire 138/69/13 kV, 33.6 MVA Transformer No.1, 69 kV circuit breaker 63 and circuit switcher No. 1.				
		At Lemaster station, install a 138 kV breaker (3000A 40kA) to accommodate the new circuit.				
		Remove Rosewood switch.				
15	s2246	Richland-East Leipsic 138 kV Line: Rebuild entire 15.8 mile of the ATSI-owned Richland-East Leipsic 138 kV line. Replace existing conductor (636 ACSR) with 795 ACSR. Install OPGW along the entire line. Upgrade Richland line terminal: Substation equipment for replacement includes: Breaker B13250, disconnect switches, line trap, CVT,tuner and COAX, substation conductor, relaying, and revenue metering.	12/31/2022	$16.90	ATSI	2/21/2020

Ohio – TO Supplemental Projects

(Greater than $5 million)

Map ID	Project	Description	Projected In-Service Date	Project Cost ($M)	TO Zone	TEAC Date
16	s2255	Construct a new 4-breaker ring bus substation called Jasper and build a new 1.5 mile transmission line extension from the existing 63611 switch to the new Jasper Substation for separate 69 kV feeds from Xenia Substation and Glady Run Substation. Install two new 69 kV breakers at the South Charleston Substation. Install a single 69 kV breaker and switch at the Cedarville Substation.	12/31/2023	$10.20	DAY	4/20/2020
17	s2264	Magellan 138 kV breaker-and-a-half: Construct a 138 kV 11-breaker breaker-and-a-half (future 12-breaker) substation. Loop the Highland-GM Lordstown 138 kV line by building approximately 0.5 miles of 138 kV line using 795 ACSR near structure 3069. Provide three 138 kV metering package. Install two capacitors totaling 86.4 MVAR @ 144.1 kV (multiple step). Build roughly 3.5 miles of 138 kV line from Highland to Magellan using 795 ACSR utilizing an open-arm position on the Highland-Lordstown No. 1 345 kV line.	8/31/2021	$31.80	ATSI	4/20/2020
18	s2265	Convert the Streetsboro 69 kV straight bus to a 5-circuit breaker ring bus. Build a double-circuit 69 kV line approximately 1.8 miles from Streetsboro Substation to eliminate the three-terminal line. Create Darrow-Streetsboro (~6.7 miles) and Ravenna-Streetsboro (~8.6 miles) 69 kV lines.	6/1/2020	$10.10	ATSI	1/17/2020
19	s2272	Rebuild the 35 miles of the South Point-Portsmouth double-circuit 138 kV line between Millbrook Park and South Point with 795 ACSR (257 MVA) or equivalent conductor. Rebuild the 3.8 miles of the Bellefonte Extension line (138 kV) from the South Point-Portsmouth 138 kV line to Bellefonte with 795 ACSR (257 MVA) or equivalent conductor. Perform remote-end work at South Point 138 kV station.	12/15/2025	$148.70	AEP	5/22/2020

Ohio – TO Supplemental Projects

(Greater than $5 million)

Map ID	Project	Description	Projected In-Service Date	Project Cost ($M)	TO Zone	TEAC Date
20	s2282	Rebuild ~5.0 miles of 138 kV line between Astor-Shannon. The existing refugee switch will be retired. Rebuild ~0.5 miles and construct ~4.6 miles of greenfield 138 kV line between Groves and Shannon to eliminate the three-terminal line. Rebuild ~4.3 miles of 138 kV line between Bixby and Shannon. Reconfigure lines at Shannon to accommodate the new 138 kV circuit from Groves. Install two new 138 kV 3000A 40 kA circuit breakers on circuits towards Brice and Bixby to prevent dissimilar zones of protection when bringing the third 138 kV circuit to the station.	11/1/2024	$60.80	AEP	6/19/2020
21	s2283	Build ~3.75 miles of single-circuit 138 kV transmission line from new Condit three-way MOAB switch (tapping the Centerburg-Trent 138 kV circuit) to Lott station (Consolidated Co-op). Build Condit three-way MOAB 138 kV switch.	6/1/2024	$10.64	AEP	6/19/2020
22	s2284	Retire ~3.8 miles of underground oil-filled pipe type 138 kV circuit between Canal St.-Marion Rd. Build ~3.1 miles of underground single-circuit 138 kV line between Marion Rd. and Mound St. using cross-linked polyethylene-insulated cable. At Canal Street, install two new 138 kV CBs (3000A 63 kA) to electrically terminate the Buckeye Steel-Gay St. 138 kV circuit that runs through the station. Replace breaker 4 with new 138 kV CB (3000A 63 kA). At Mound Street, install new 138 kV CB (3000A 63 kA) to accommodate new circuit from Marion Rd. At Vine Street, install a 2 percent series line reactor towards Gay Street station to limit fault contribution increases from reconfigurations of lines in the area. Perform remote-end relay work at Gay Street. Perform remote-end relay work at Bixby station. Perform relay upgrades and line termination structure replacement at Marion Road.	5/1/2022	$45.00	AEP	6/19/2020

Ohio – TO Supplemental Projects

(Greater than $5 million)

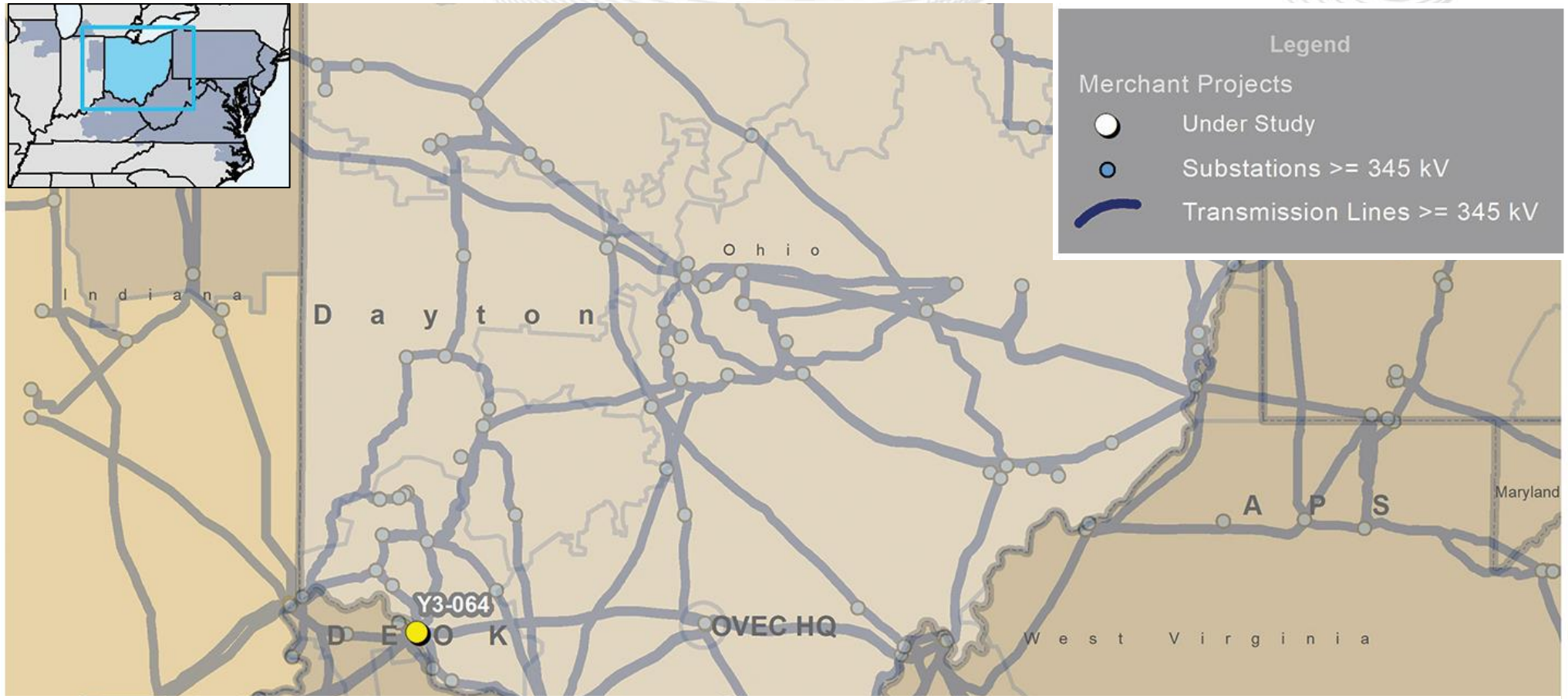
Map ID	Project	Description	Projected In-Service Date	Project Cost ($M)	TO Zone	TEAC Date
23	**s2297**	Convert East Akron 138 kV Substation into breaker-and-half configuration. Install a new control building. Reuse two breakers (B75 and 76). Upgrade three breakers (B43, B46 and B253) with 138 kV, 40 kA, SF6 circuit breaker. Install seven additional 138 kV, 40 kA, SF6 circuit breakers. Replace and install switches, surge arrestors, capacitive voltage transformers, station service voltage transformers. Upgrade wave trap on Knox exit. Replace line tuner and coax.	12/30/2023	$13.80	ATSI	5/22/2020
24	**s2298**	Convert Barberton 138 kV Substation into double bus, double breaker configuration. Install a new control building. Reuse two breakers (B75 & 76). Upgrade five breakers (B124, B45, B74, B37 & B357) with 138 kV, 40 kA, SF6 circuit breakers. Install nine additional 138 kV, 40 kA, SF6 circuit breakers. Replace and install switches, surge arrestors, CVTs, SSVTs. Upgrade less than 0.1 mile section of the Barberton-West Akron 138 kV line from 605 ACSR conductor to 795 ACSS conductor.	12/1/2024	$14.70	ATSI	5/22/2020
25	**s2342**	Marion-Parsons 40 kV: Retire ~5.2 miles of double-circuit 40 kV line between Marion and Parsons. Parsons 138 kV Extension: Extend the Canal Street-White Road 138 kV circuit to Parsons with ~2.0 miles of double- circuit 138 kV line (Greenfield) using 795 ACSR, 26/7 Drake conductor. Extend fiber cable and install redundant fiber cable for relaying and communication to Parsons station. Parsons 138 kV substation: Replace existing 40 kV yard with 138 kV ring bus. Perform remote end work at Canal Street and White Road stations. Marion 138 kV substation: Retire existing circuit breaker 21.	8/1/2022	$27.89	AEP	10/16/2020
	s2180	Rebuild 4.2 miles of feeder between Wyscarver and Marion Merrell Dow 69 kV with 101 new steel poles, hardware and conductor. The capacity of the line will increase from 73MVA to 100MVA (substation switch limited).	3/11/2027	$8.60	DEO&K	1/17/2020

Ohio – TO Supplemental Projects

(Greater than $5 million)

Map ID	Project	Description	Projected In-Service Date	Project Cost ($M)	TO Zone	TEAC Date
	s2187	Install approximately 0.5 Miles of 138kV double circuit line to tie the greenfield Culbertson station to the Ohio Central – Philo #1 138kV circuit. Culbertson 138kV: Install 4 greenfield 138kV 2000A 40kA CBs in a ring bus configuration to serve the new customer station.	9/1/2020	$9.90	AEP	2/21/2020
	s2221	Remove ~3.3 miles of the Derwent – Summerfield 69 kV line. Build a new 69 kV line (~2.42 miles) from Lashley to the existing Summerfield line to loop the customers served from the existing radial. Install a new 69kV 1200A 3-way POP switch (Lashley) with auto-sectionalizing MOABs to serve the Senecaville GM co-op. Install 1 - 69kV 2000A wave trap at Senecaville (AEP) Station for relaying coordination. Install 1 - 69kV 2000A wave trap at the GM Senecaville Station for relaying coordination. At Derwent station, remove the Summerfield line exit and associated equipment.	11/1/2024	$9.80	AEP	3/19/2020
	s2222	Build a new single circuit 138 kV line (~1.5 mi) to connect the new Ilesboro delivery point to the Lemaster - Ross 138kV circuit using 336.4 ACSR. Install a new 3-way phase over phase 138 kV 2000 A switch (Fiddlestix) with MOABs on the Lemaster – Ross 138kV circuit. Update remote end work at Lemaster.	12/1/2022	$5.20	AEP	3/19/2020
	s2254	Convert the existing Russia Substation from a tapped substation to a ring bus arrangement and complete 69kV transmission line work to loop lines in and out of the substation. Upgrade the existing auto sectionalizers at Loramie Upgrade the existing auto sectionalizers at Versailles Upgrade the existing auto sectionalizers at Versailles	12/31/2023	$5.30	DAY	4/20/2020
	s2388	Convert the Nevada 138 kV substation into a 4-breaker ring bus, using two existing 138 kV breakers. Upgrade substation conductor at the Nevada substation from 795 ACSR to 954 ACSR. Establish two redundant fiber paths between Boardman and Nevada for line relaying. Upgrade relays at Sammis and Boardman.	6/1/2023	$7.80	ATSI	4/20/2020

Ohio – Merchant Transmission Project Requests

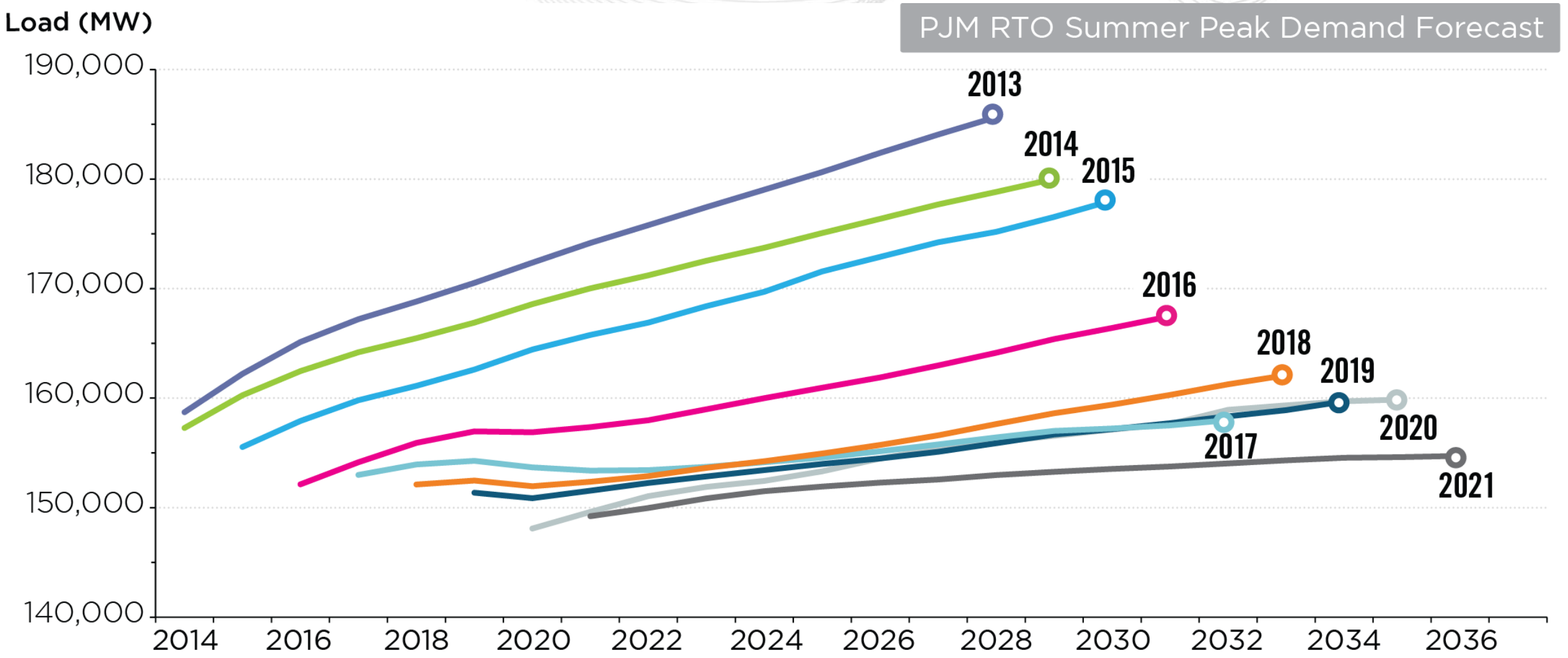


Queue Number	Queue Name	TO Zone	Status	Actual or Requested In-Service Date	Maximum Output (MW)
Y3-064	Pierce-Beckjord 138 kV	DEO&K	Under Construction	12/20/2020	160.0

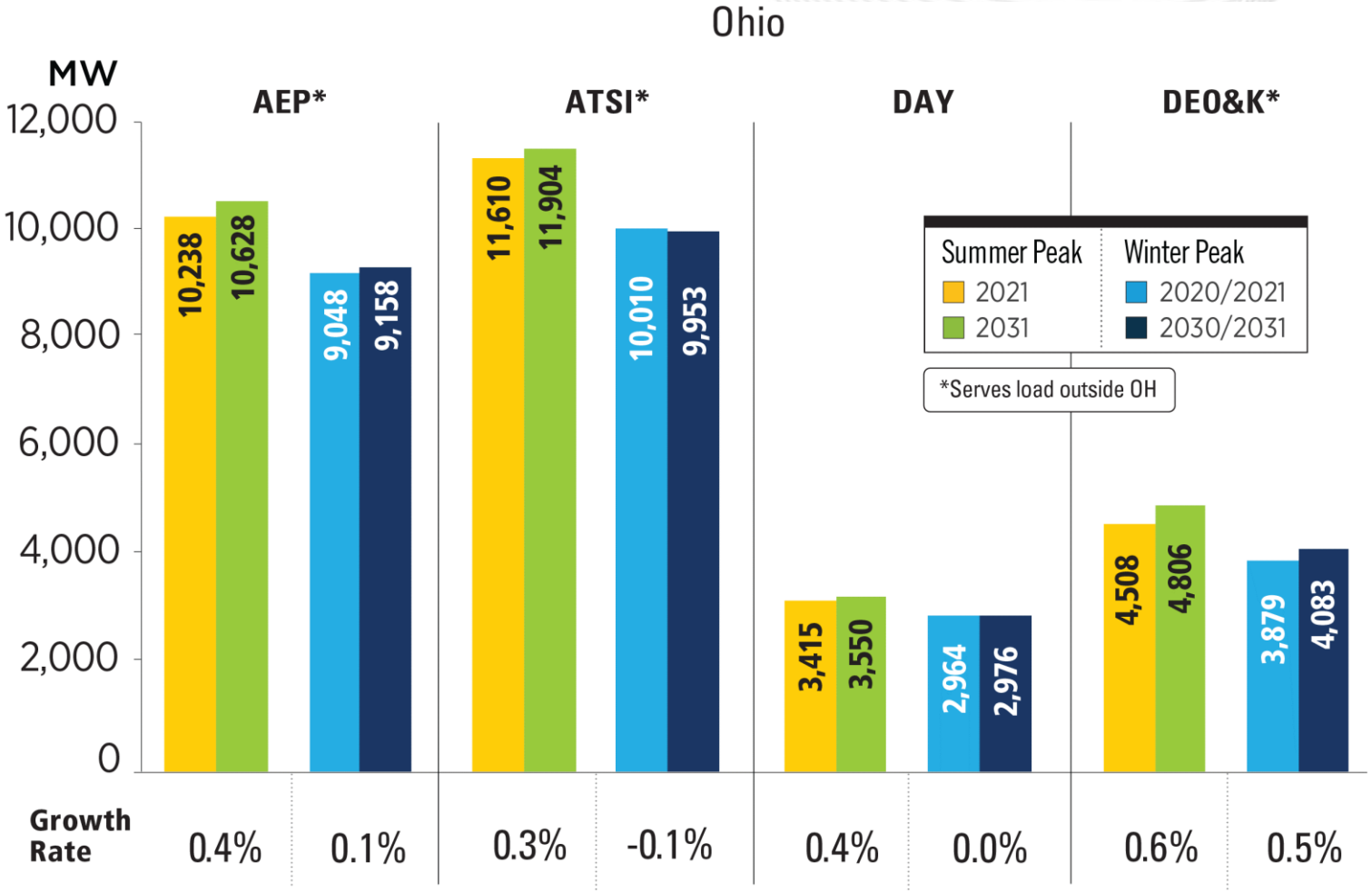
Planning
Load Forecast

PJM Annual Load Forecasts

(Jan. 2021)



Ohio – 2021 Load Forecast Report



PJM RTO Summer Peak

2021	2031
149,223 MW	153,759 MW

Growth Rate 0.3%

PJM RTO Winter Peak

2020/2021	2030/2031
132,027 MW	135,568 MW

Growth Rate 0.2%

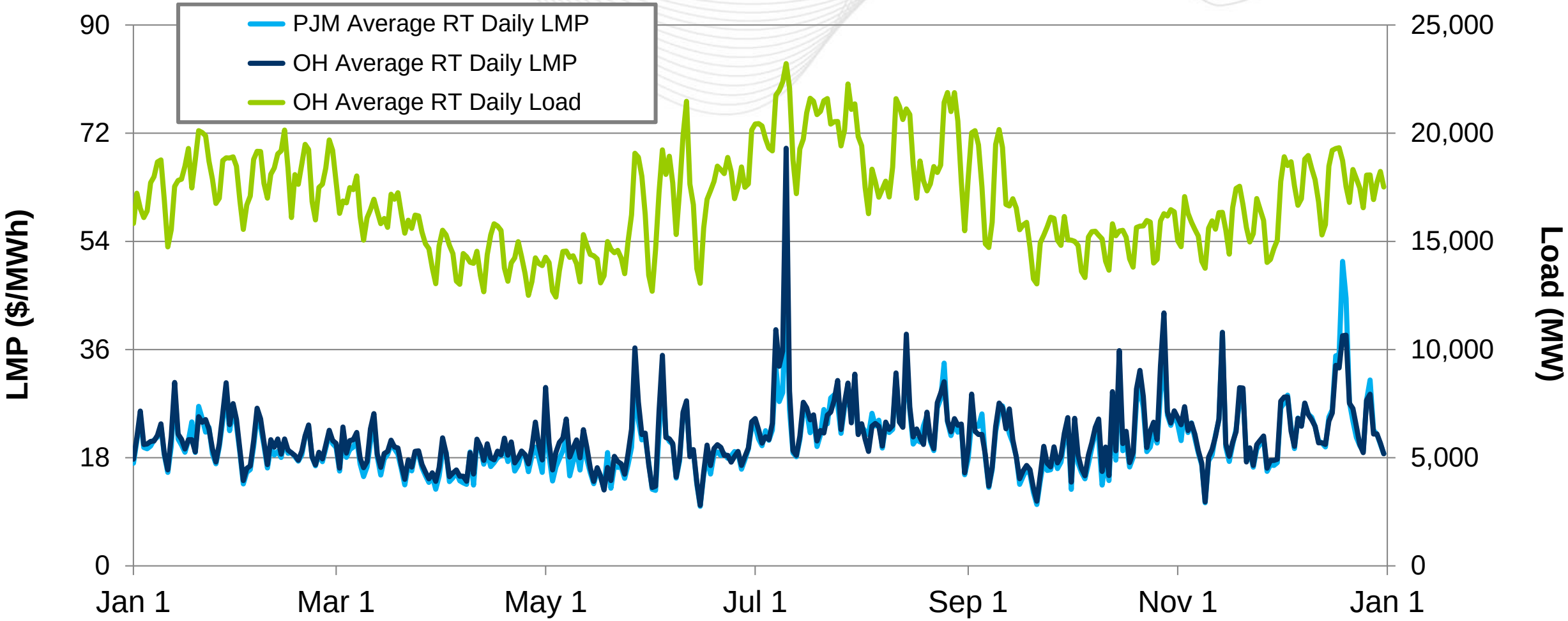
The summer and winter peak megawatt values reflect the estimated amount of forecasted load to be served by each transmission owner in the noted state/district. Estimated amounts were calculated based on the average share of each transmission owner's real-time summer and winter peak load in those areas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

Markets

Market Analysis

Ohio – Average Daily LMP and Load

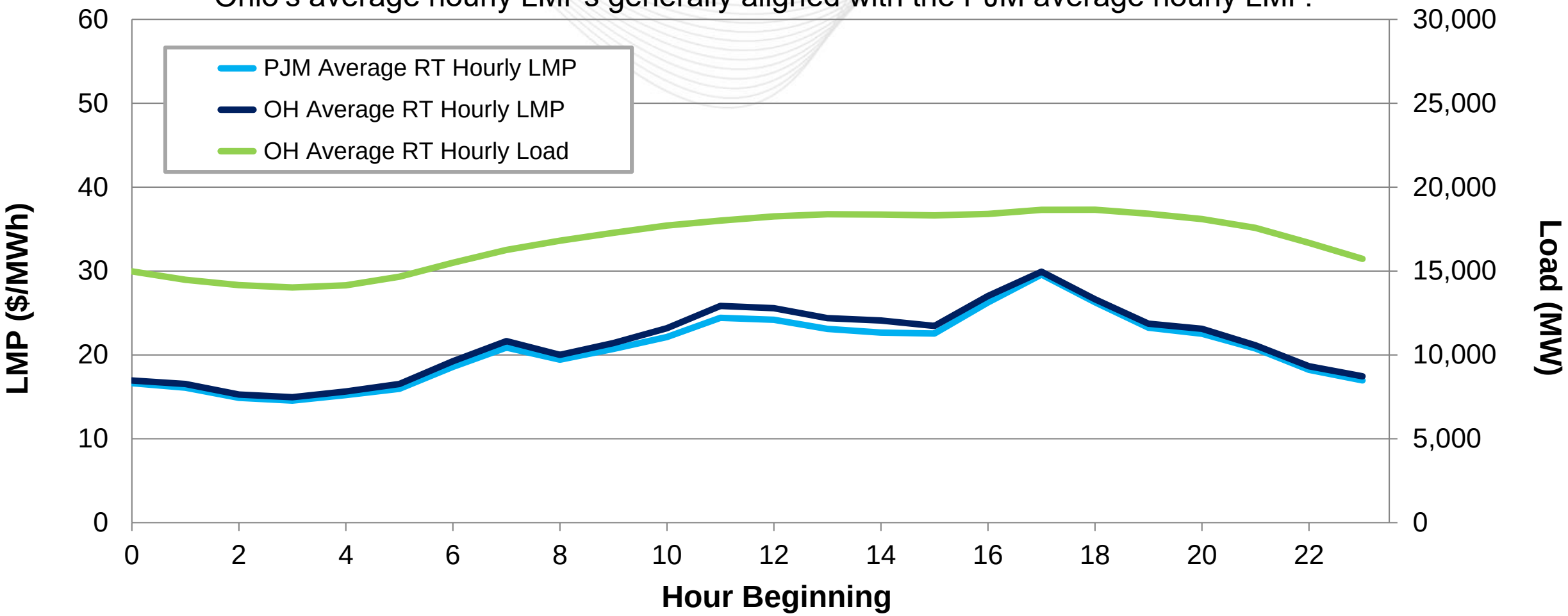
(Jan. 1, 2020 – Dec. 31, 2020)



Ohio – Average Hourly LMP and Load

(Jan. 1, 2020 – Dec. 31, 2020)

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



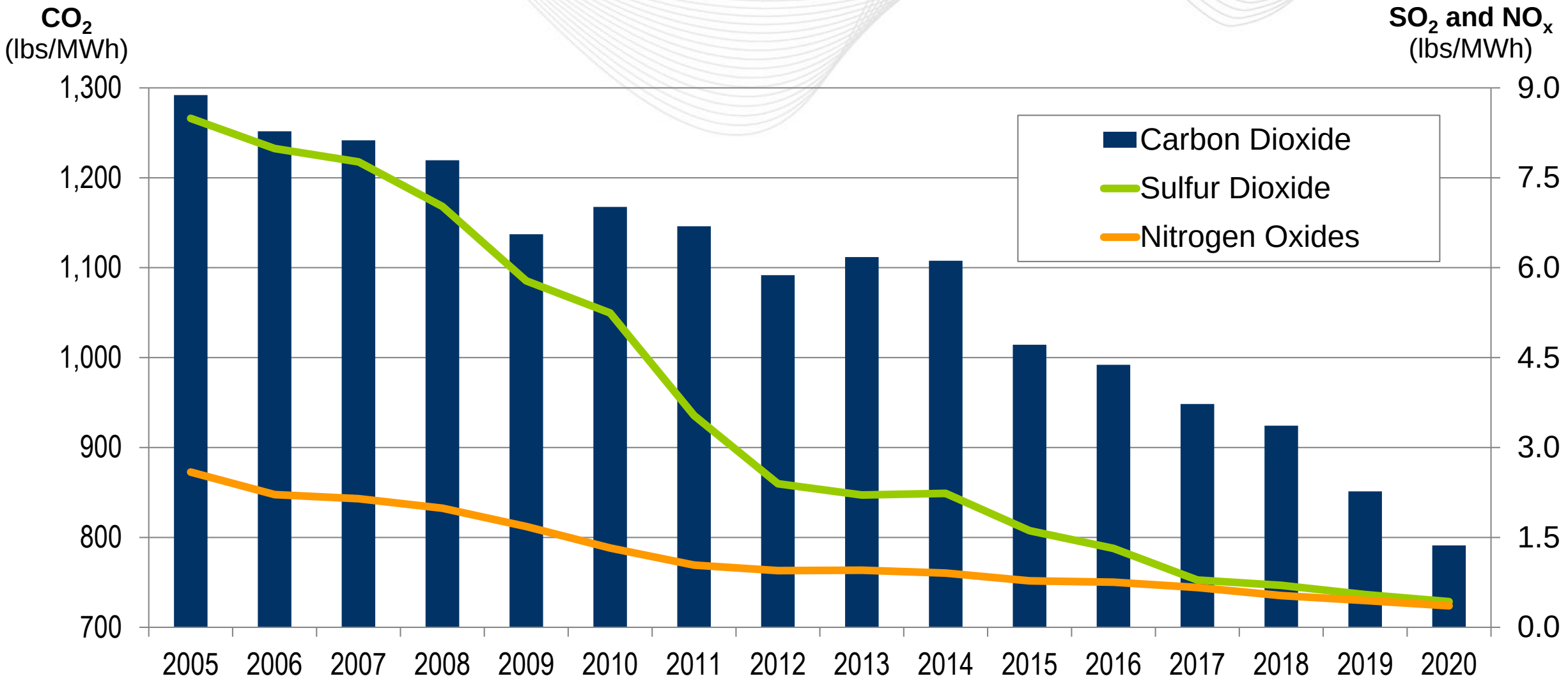
Ohio – Net Energy Import/Export Trend

(Jan. 2020 – Dec. 2020)

Positive values represent exports and negative values represent imports.

Operations
Emissions Data

2005 – 2020 PJM Average Emissions



Ohio – Average Emissions (lbs/MWh)

(Feb. 2021)