



2016 North Carolina State Report

July 2017



1. Planning

- Generation Portfolio Analysis
- Transmission Analysis
- Load Forecast

2. Markets

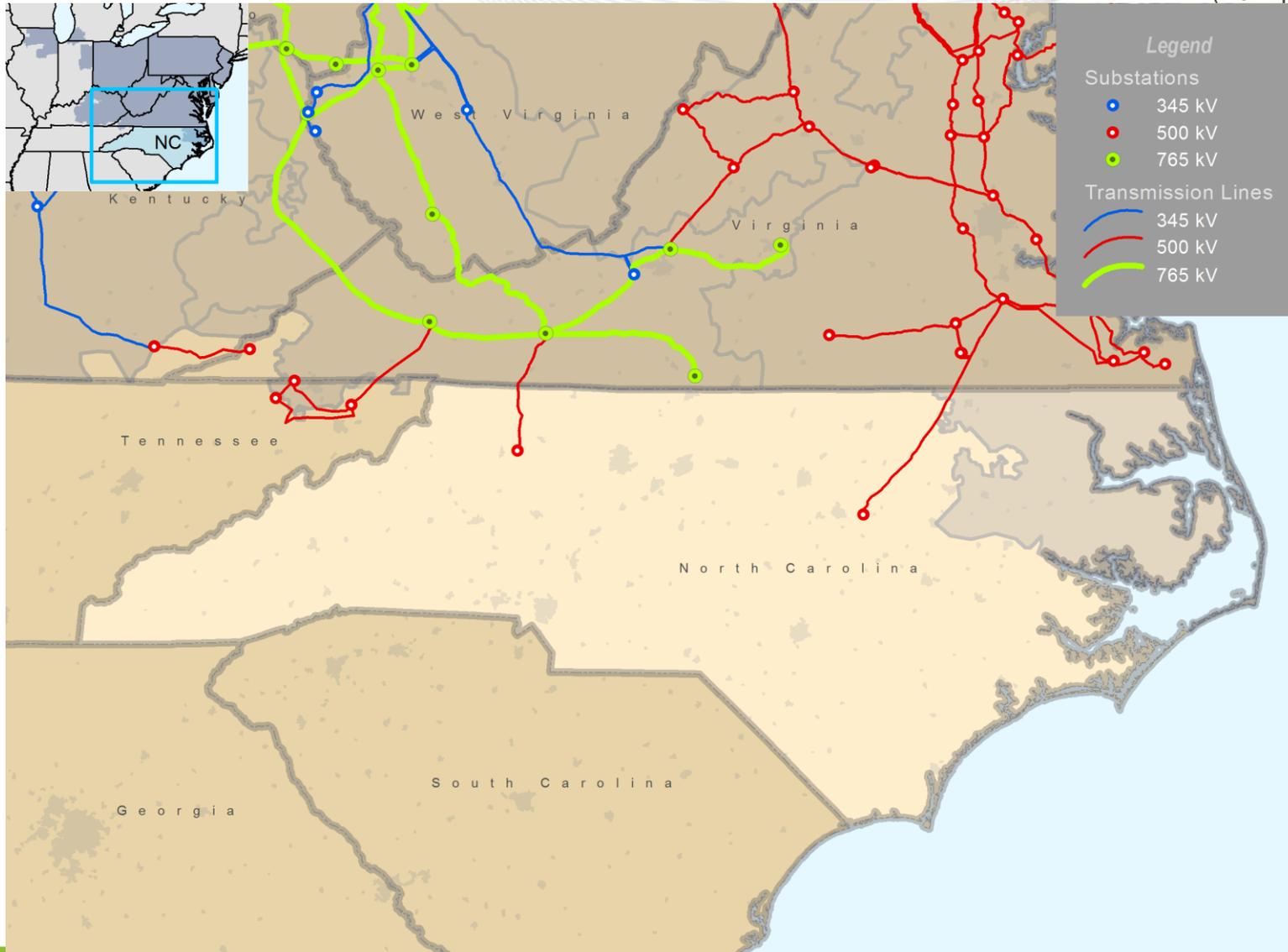
- Capacity Market Results
- Market Analysis

3. Operations

- Emissions Data

- **Existing Capacity:** Natural gas represents approximately 20 percent of the total installed capacity in North Carolina while coal represents approximately 26 percent. This differs from PJM where natural gas and coal are relatively even at 35 and 34 percent respectively.
- **Interconnection Requests:** Solar represents approximately 85 percent of new interconnection requests in the part of North Carolina serviced by PJM.
- **Deactivations:** No generating units in North Carolina deactivated in 2016. This compares to 392 MW of capacity retirements PJM-wide in 2016.
- **RTEP 2016:** North Carolina RTEP 2016 projects total more than \$11 of investment in primarily network projects.
- **Load Forecast:** North Carolina load growth is nearly flat, averaging between .4 and .5 percent per year over the next 10 years. This aligns with PJM RTO load growth projections.

- **2020/21 Capacity Market:** Compared to the PJM footprint, North Carolina's distribution of generation, demand response and energy efficiency is similar.
- **6/1/14 – 5/31/17 Performance:** North Carolina's average daily locational marginal prices were consistently at or above PJM average daily LMPs. Imported resources represented 79 percent of generation produced in the Dominion region of North Carolina.
- **Emissions:** 2016 carbon dioxide, nitrogen oxide, and sulfur dioxide emissions are all slightly down from 2015.



PJM operates bulk electric system facilities (and others monitored at lower voltages), in Northeastern North Carolina including those of Dominion North Carolina Power (DOM). These transmission facilities deliver power to customers from native generation resources and those throughout the RTO – arising out of PJM market operations – as well as power imported interregionally from systems outside PJM.

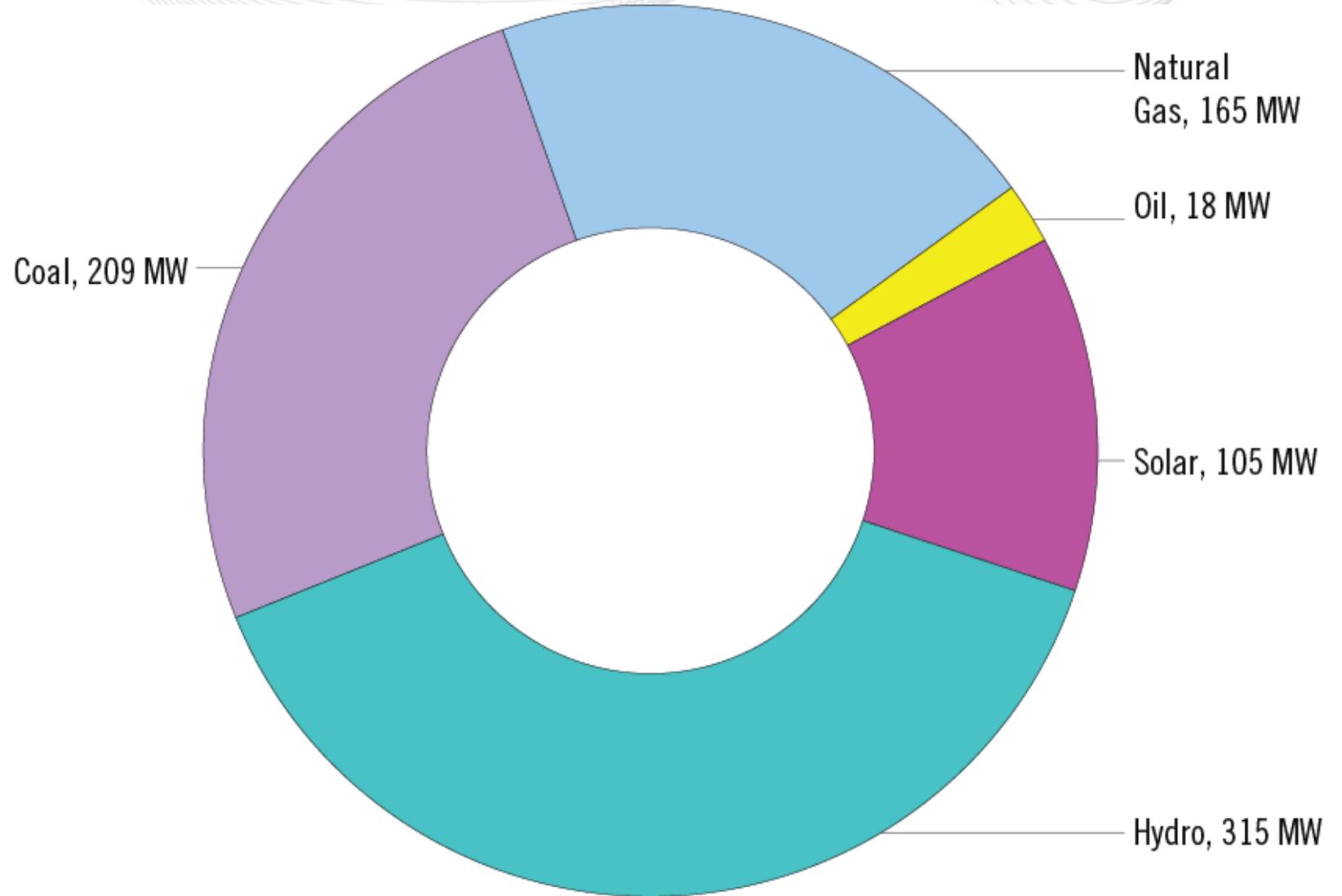
Planning

Generation Portfolio Analysis

Summary:

Natural gas represents approximately 20 percent of the total installed capacity in North Carolina while coal represents approximately 26 percent.

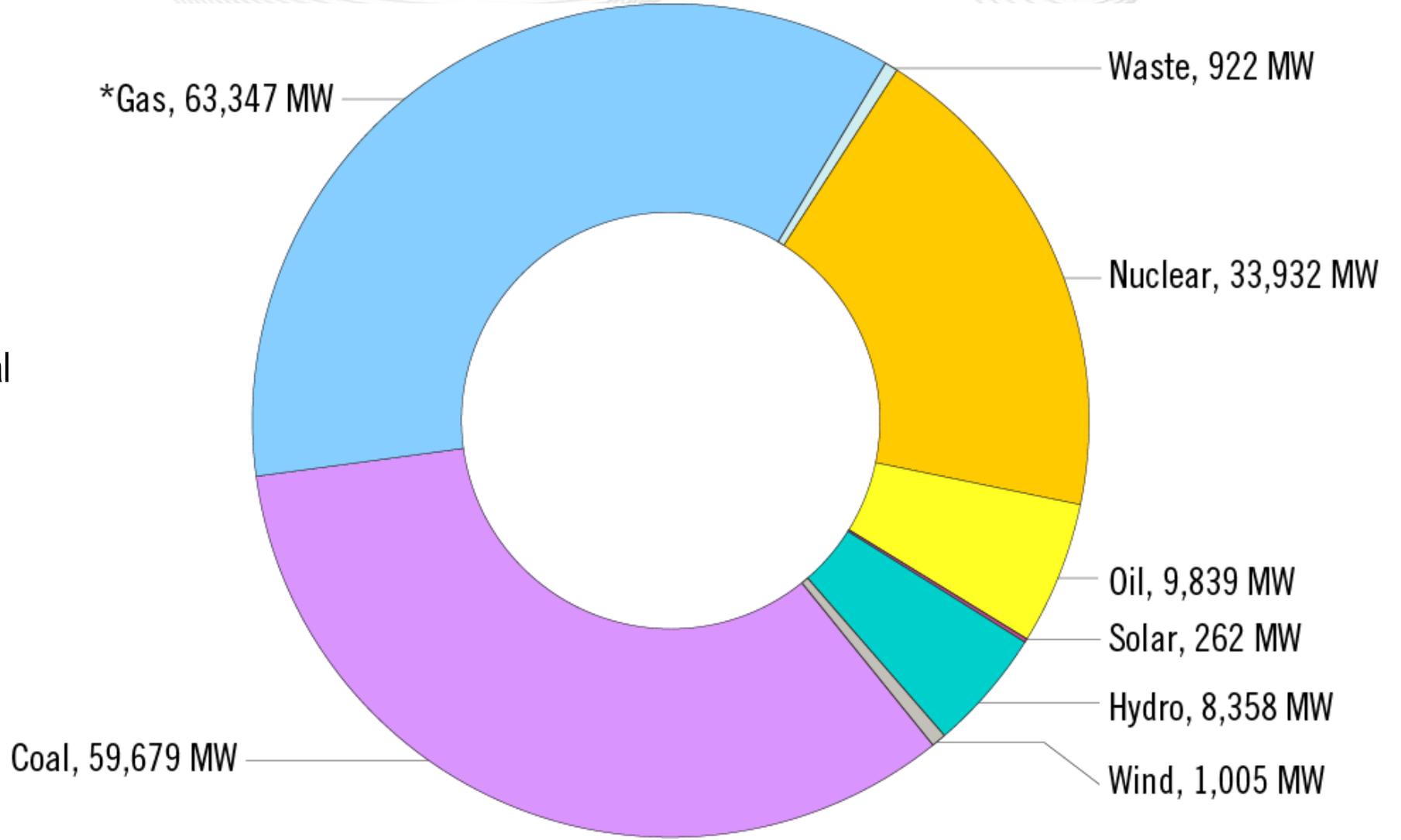
Overall in PJM, natural gas and coal are relatively even at 35 percent and 34 percent respectively.



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

*** Gas Contains**

Natural Gas	62,941 MW
Other Gas	405 MW



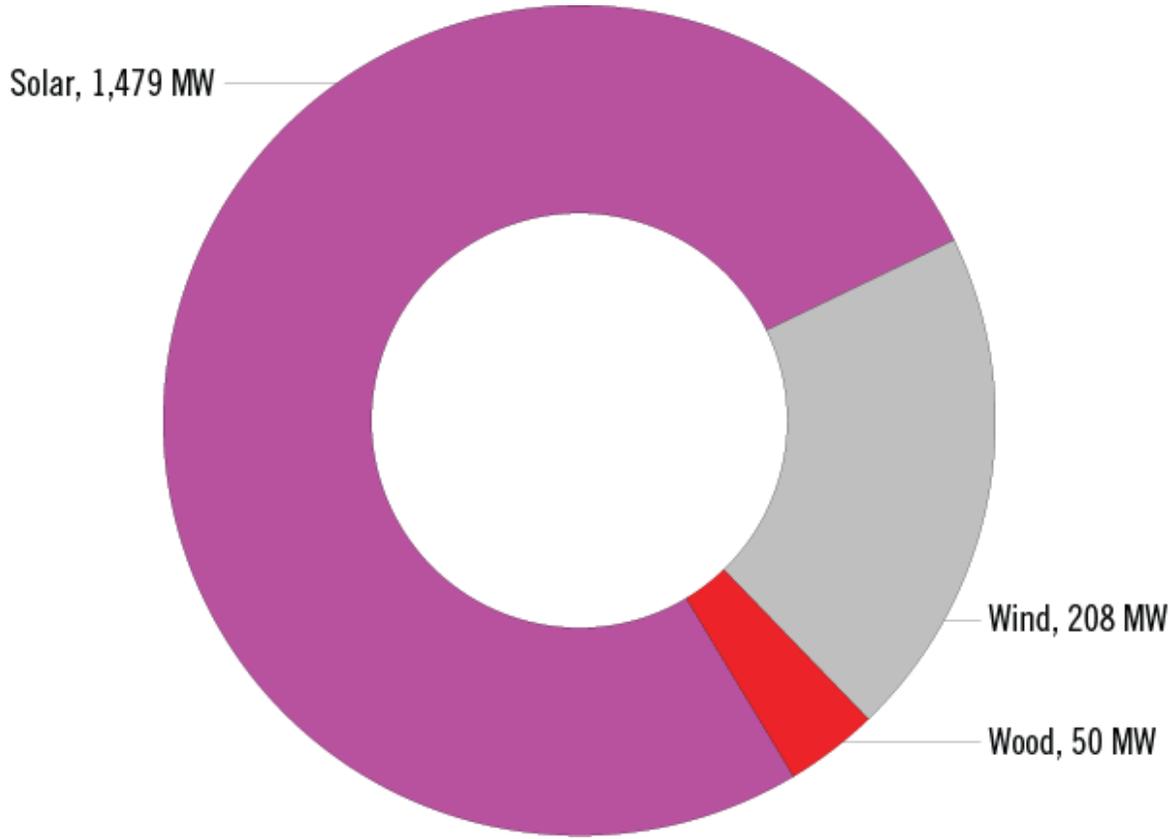


North Carolina - Interconnection Requests

(Requested Capacity Rights, December 31, 2016)

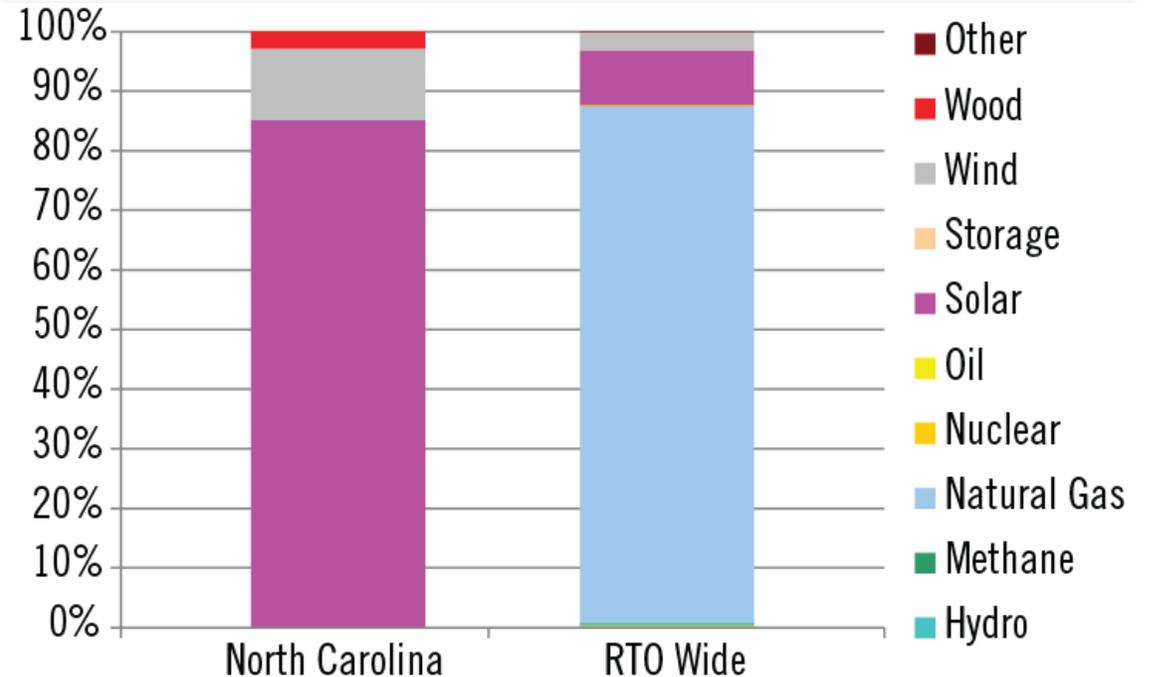
Solar represents 85 percent of new interconnection requests in North Carolina.

Total MW Capacity by Fuel Type



	MW	# of Projects
Active	1,407	38
Under Construction	329	7
Suspended	0	0
Total	1,736	45

Fuel as a Percentage of Projects in Queue





North Carolina - Interconnection Requests

(Requested Capacity Rights,
December 31, 2016)

	Active		In Service		Suspended		Under Construction		Withdrawn		Total Sum	
	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	0	0.0	0	0.0	0
Coal	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0
Diesel	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0
Hydro	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0
Methane	0.0	0	0.0	0	0.0	0	0.0	0	12.0	1	12.0	1
Natural Gas	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0
Nuclear	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0
Oil	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0
Solar	1,278.0	37	105	8	0.0	0	201.0	4	684.0	29	2,269.0	78
Storage	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0
Wind	130.0	1	0.0	0	0.0	0	78.0	2	178.0	8	386.0	11
Wood	0.0	0	0.0	0	0.0	0	50.0	1	80.0	1	130.0	2
Other	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0
Total	1,408.0	38	105.0	8	0.0	0	329.0	7	954.0	39	2,797.0	92

Executed final agreement

Withdrawn

May have executed final agreement

All MWs that enter the queue and either went into service, are near operation or withdrew. (1,389 MW)

North Carolina – Progression History Interconnection Requests

(Requested Capacity Rights, 2005 - 2016)



Following Final Agreement execution, 50 MW of capacity withdrew from PJM's interconnection process. Another 329 MW have executed agreements but were not in service as of December 31, 2016. Overall, 7% of requested capacity MW reaches commercial operation. The PJM average is 11%.



North Carolina – 2016 Generation Deactivations

(Capacity, As of December 31, 2016)

Unit	MW Capacity	TO Zone	Age	Actual Deactivation Date
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Summary:

- No generating units in North Carolina deactivated in 2016
- Across PJM, 11 generating units totaling 392 MW of capacity deactivated in 2016



North Carolina – Deactivation Notifications Received in 2016

(Capacity, As of December 31, 2016)

Unit	MW Capacity	TO Zone	Age	Actual Deactivation Date
Roanoke Valley 1	165	DOM	22	3/1/2017
Roanoke Valley 2	44	DOM	21	3/1/2017

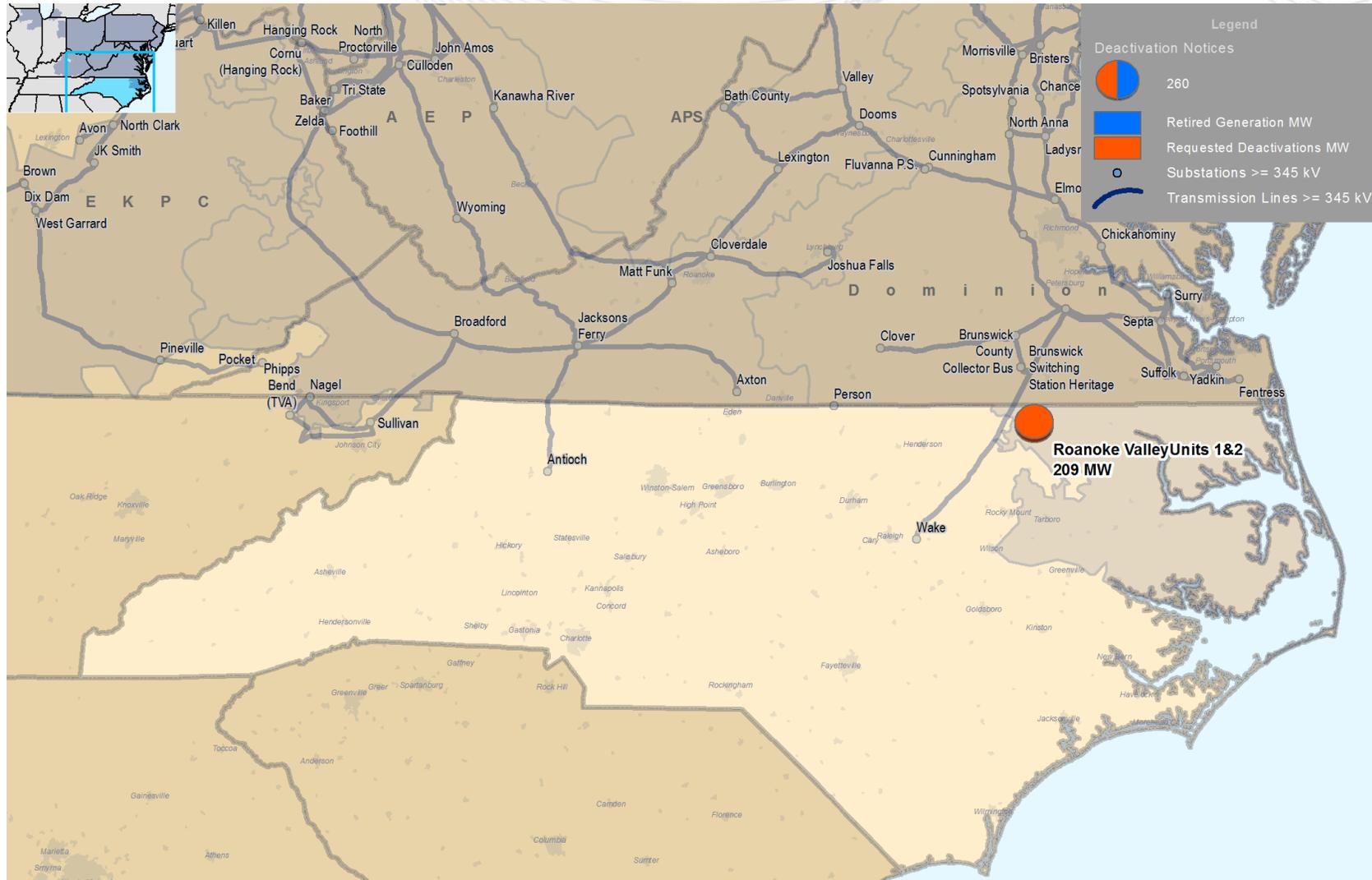
Summary:

- Two North Carolina generators submitted generator deactivation notification in 2016
- Across PJM, 23 PJM generating units notifications to deactivate, ranging in date from 2016 - 2020.
- Roanoke Valley units 1 and 2 deactivated on March 1, 2017



North Carolina – Deactivation Notifications Received in 2016

(Capacity, As of December 31, 2016)



Planning

Transmission Infrastructure Analysis



North Carolina - RTEP Baseline Projects

Greater than \$5 million

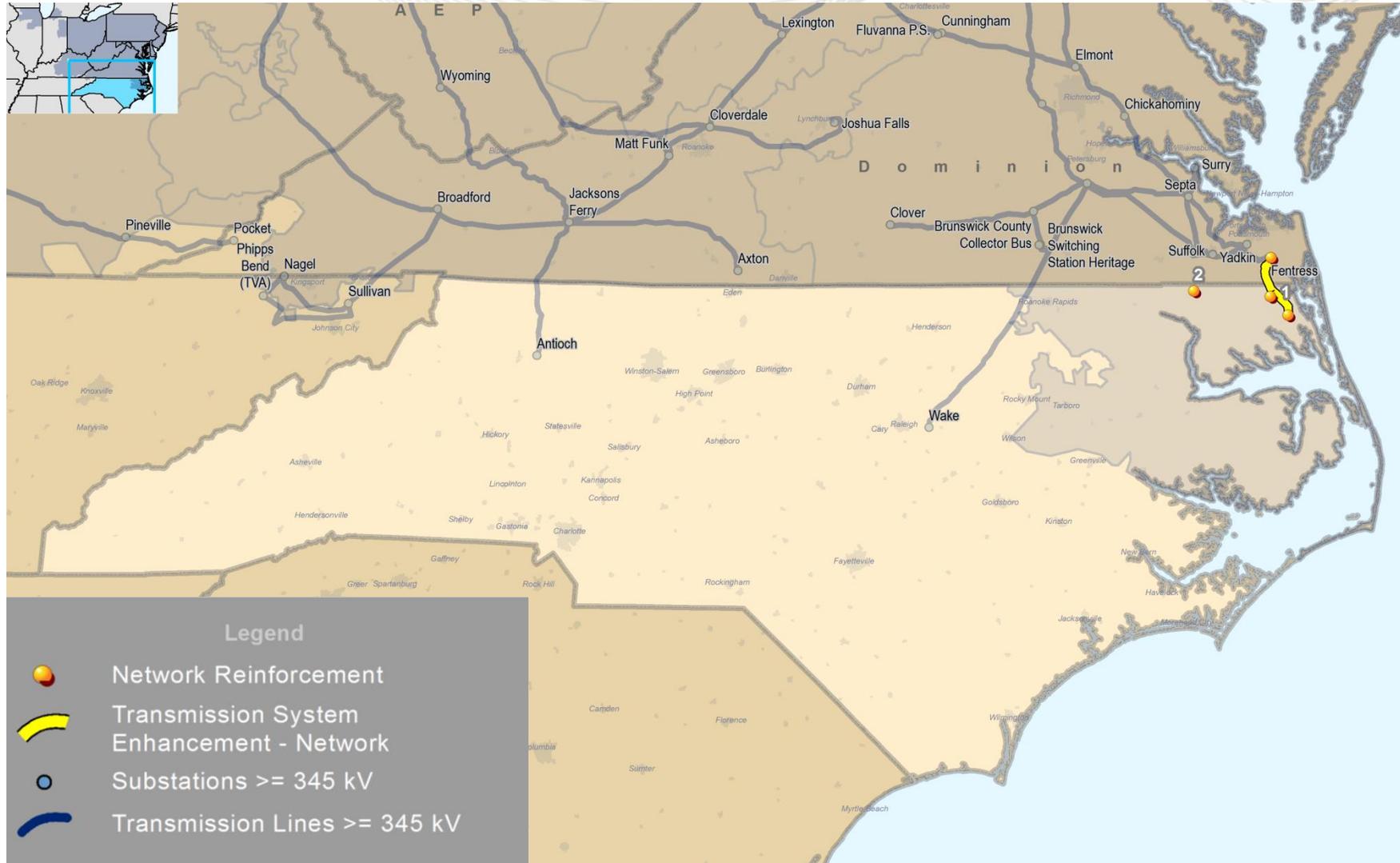
			NC Baseline Project Driver								
Map ID	Project ID	Project	Baseline Load Growth/ Deliverability & Reliability	Congestion Relief - Economic	Operational Performance	Generator Deactivation	TO Criteria Violation	Required Date	Cost (\$M)	Designated Entity*	2016 TEAC Review
		None									

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



North Carolina – RTEP Network Projects

Greater than \$5 million





North Carolina - RTEP Network Projects

Greater than \$5 million

Map ID	Project ID	Project	NC Network Project Drivers			Required Date	Cost (\$M)	TO Zone(s)	2016 TEAC Review
			Generation Interconnection	Merchant Transmission Interconnection	Long-term Firm Transmission Service				
1	n4717	Build 230kV switching station (3 breaker ring bus) and loop the 230kV circuit between Fentress and Shawboro into the new switching station	AA1-132			9/30/2016	\$5.60	Dominion	10/6/2016
2	n5070	Build a new three breaker ring bus at Haslett substation	AA1-138			10/31/2015	\$5.66	Dominion	10/6/2016

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.



North Carolina - TO Supplemental Projects

Greater than \$5 million

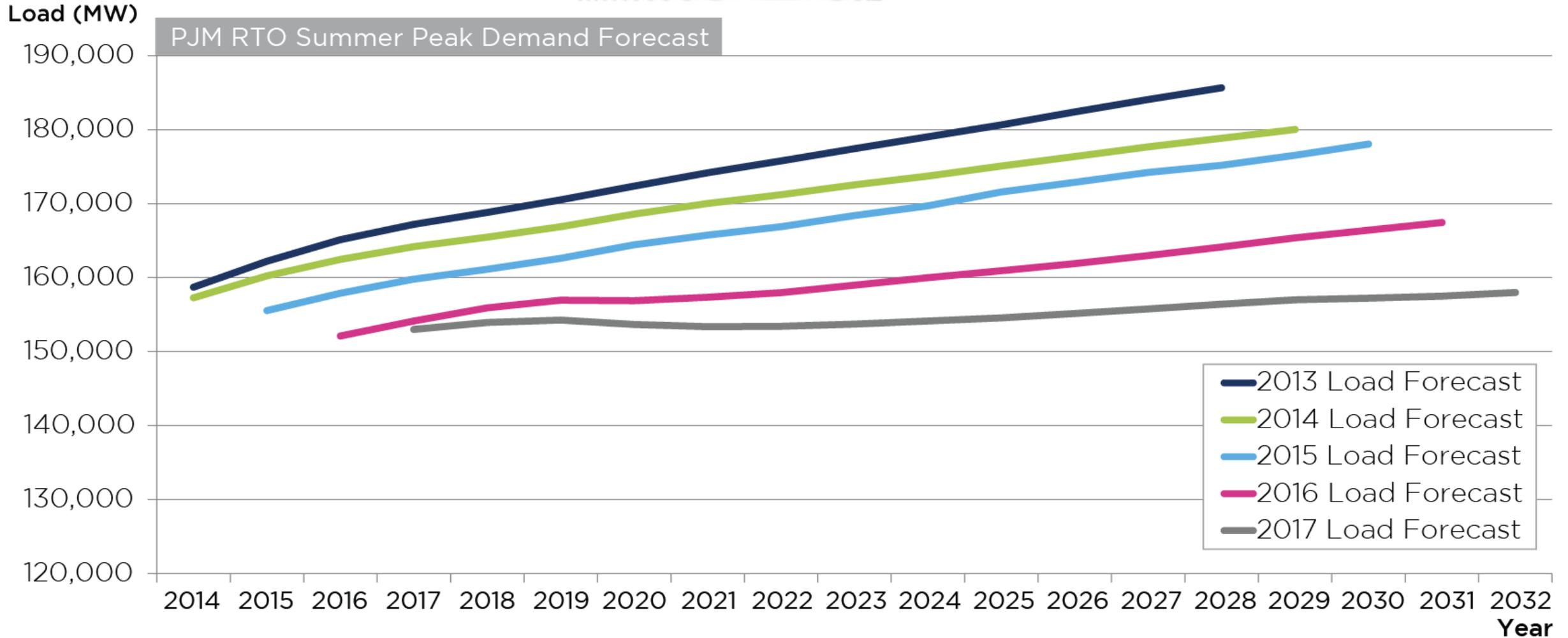
Map ID	Project ID	Project	Required Date	Cost (\$M)	TO Zone(s)	2016 TEAC Review
		None				

Note: Supplemental projects are transmission expansions or enhancements that are used as inputs to RTEP models, but are not required for reliability, economic efficiency or operational performance criteria, as determined by PJM.



North Carolina - Merchant Transmission Project Requests

Queue	Project Name	MFO	Status	In Service Date	TO
	None				





North Carolina – 2017 Load Forecast Report

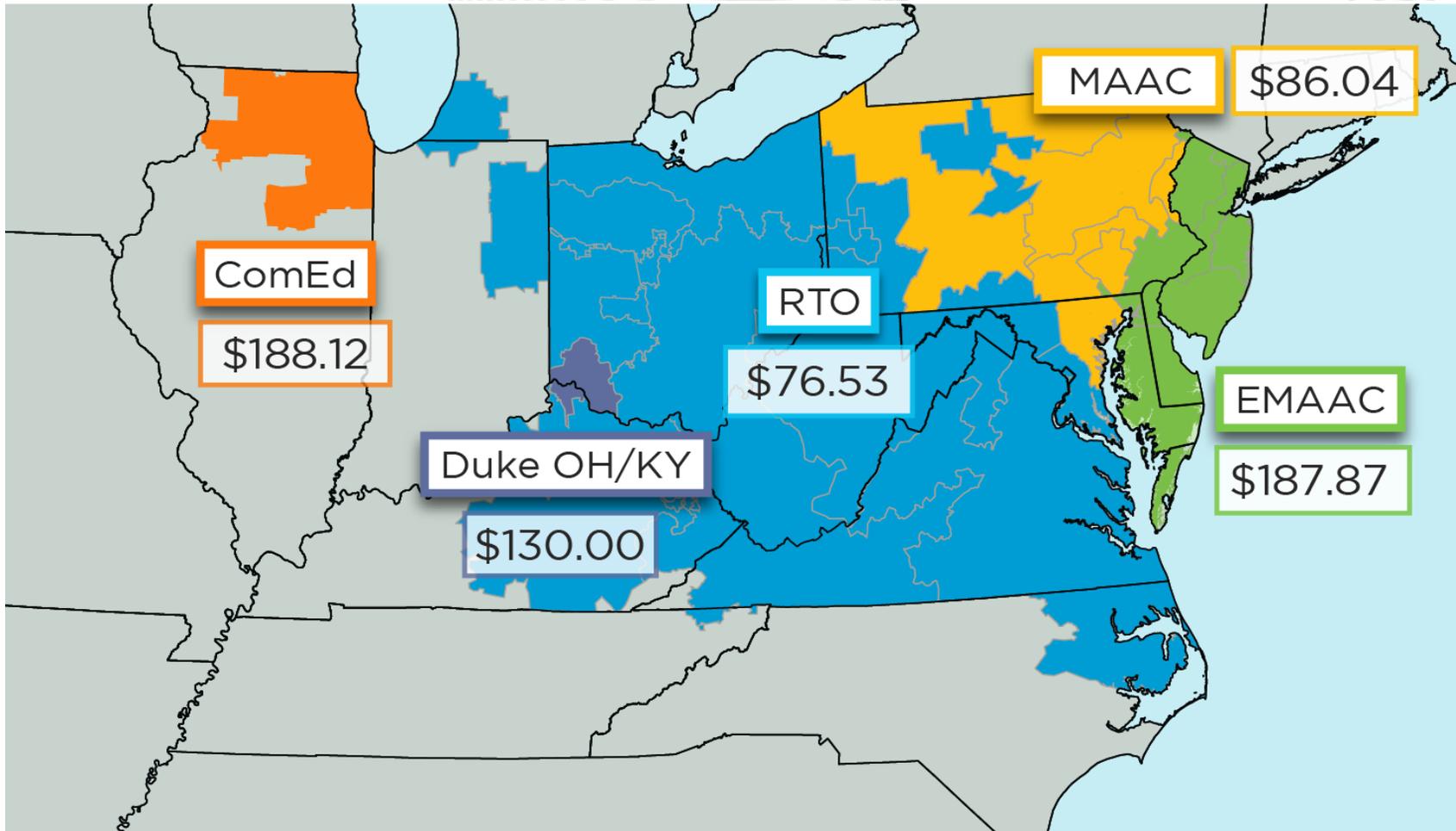
Transmission Owner	Summer Peak (MW)			Winter Peak (MW)		
	2017	2027	Growth Rate (%)	2016/17	2026/27	Growth Rate (%)
Dominion Virginia Power *	1,084	1,127	0.4%	1,049	1,108	0.5%
PJM RTO	152,999	155,773	0.2%	131,391	134,915	0.3%

*Dominion Virginia Power serves load other than in North Carolina. The Summer Peak and Winter Peak MW values in this table each reflect the estimated amount of forecasted load to be served by Dominion Virginia Power solely in North Carolina. Estimated amounts were calculated based on the average share of Dominion Virginia Power's real-time summer and winter peak load located in North Carolina over the past five years.

*PJM's 2017 forecast reflects methodology improvements implemented in 2016: variables to account for equipment and appliance saturation and efficiency, distributed solar generation adjustments and more refined treatment of weather data.

Markets

Capacity Market Results





North Carolina - Cleared Resources in 2020/21 Auction

(May 23, 2017)

	Cleared MW (Unforced Capacity)	Change from 2019/20 Auction
Generation	559	(284)
Demand Response	29	(7)
Energy Efficiency	8	1
Total	596	(290)

RTO Locational Clearing Price

\$76.53

NOTE: Demand Response and Energy Efficiency are reported to PJM by Transmission Zone. The numbers above reflect the state's pro-rata share of cross-state zones for illustrative purposes.



PJM - Cleared Resources in 2020/21 Auction

(May 23, 2017)

	Cleared MW (Unforced Capacity)	Change from 2019/20 Auction
Generation	155,976	882
Demand Response	7,820	(2,528)
Energy Efficiency	1,710	195
Total	165,506	(1,450)



North Carolina – Offered and Cleared Resources in 2020/21 Auction

(May 23, 2017)

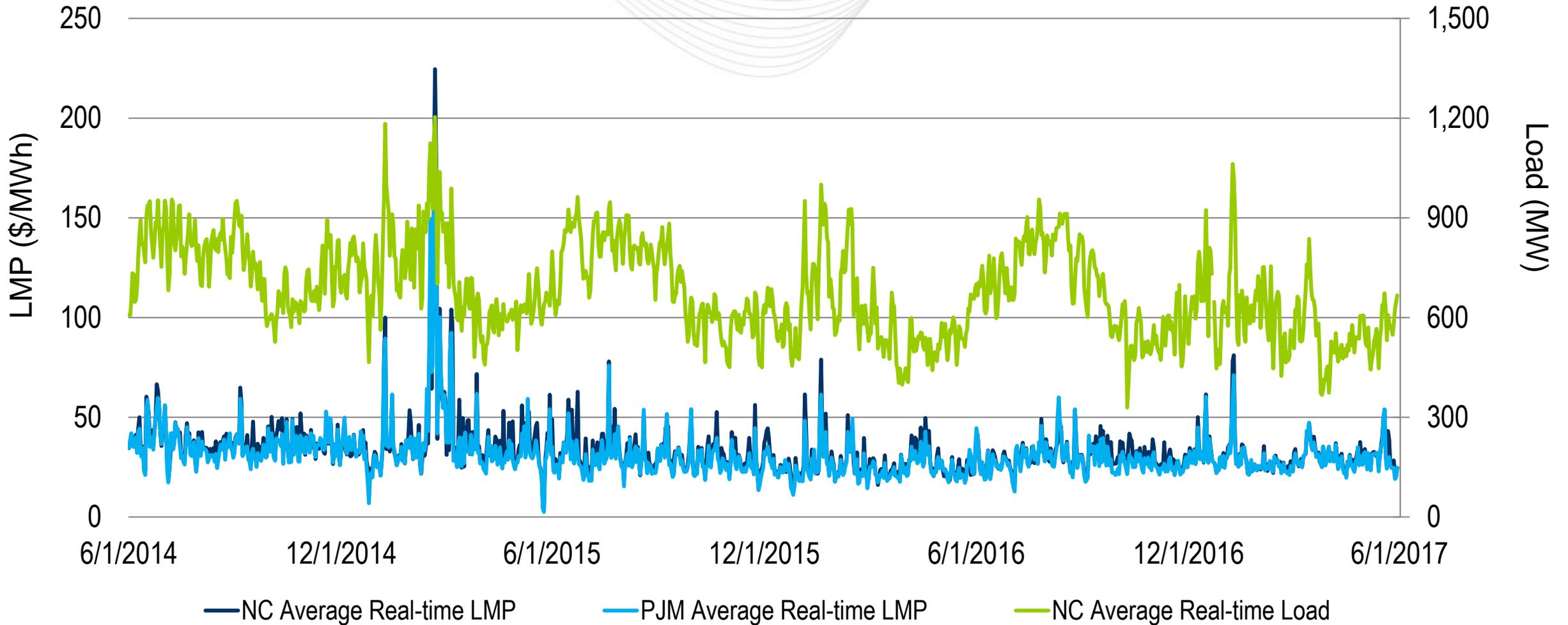
		Unforced Capacity
Generation	Offered MW	821
	Cleared MW	559
Demand Response	Offered MW	34
	Cleared MW	29
Energy Efficiency	Offered MW	14
	Cleared MW	8
Total Offered MW		869
Total Cleared MW		596

NOTE: Demand Response and Energy Efficiency are reported to PJM by Transmission Zone. The numbers above reflect the state's pro-rata share of cross-state zones for illustrative purposes.

Markets

Market Analysis

North Carolina's average daily LMPs were generally at or above the PJM average daily LMP

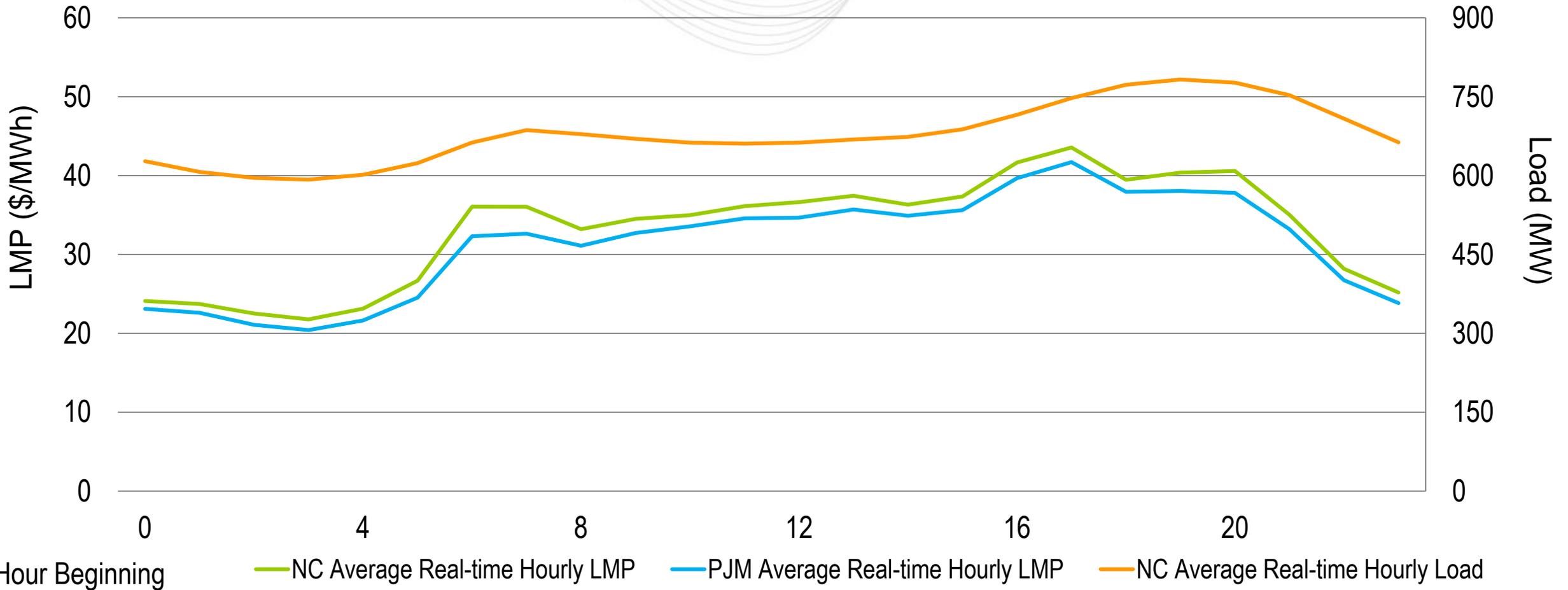




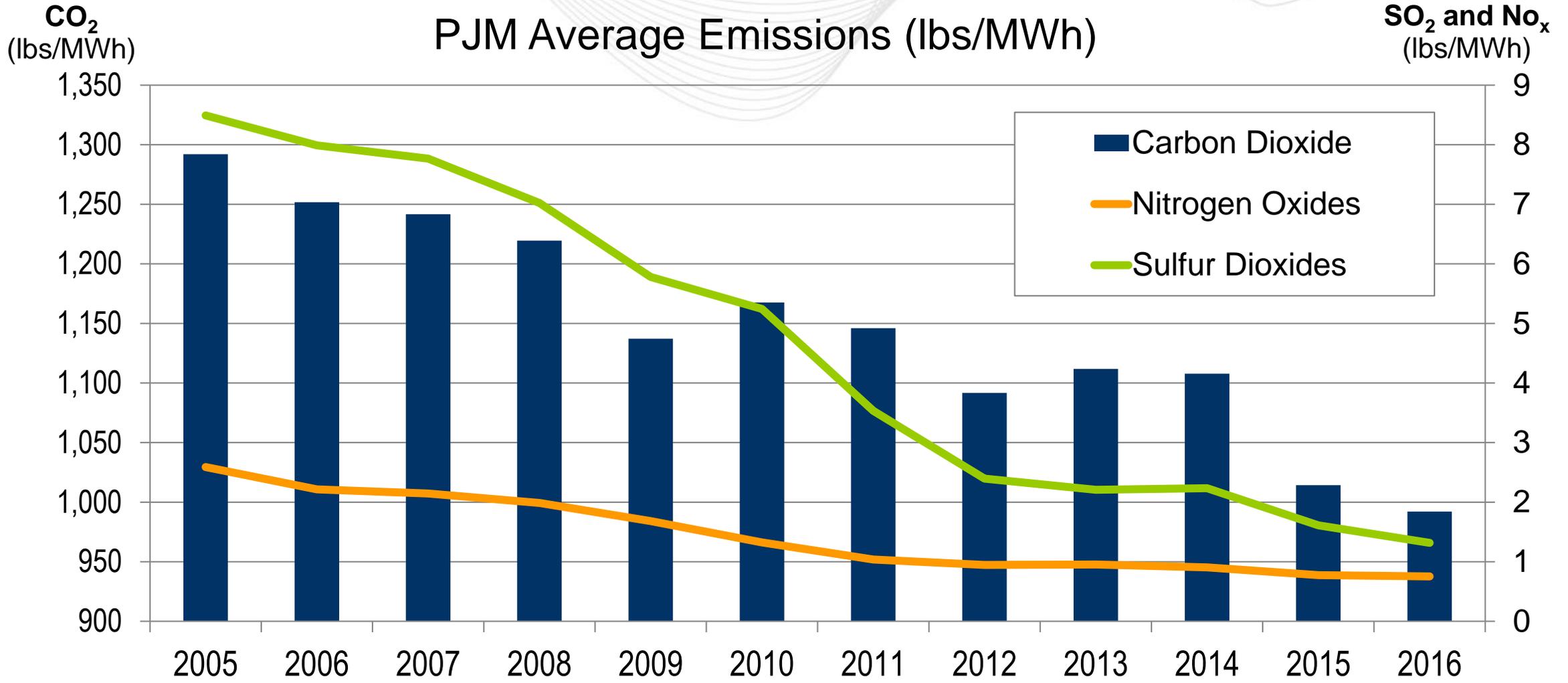
North Carolina – Hourly Average LMP and Load

(June 1, 2014 – May 31, 2017)

North Carolina's hourly LMPs were above the PJM average.



Operations Emissions Data



North Carolina Average Emissions (lbs/MWh)

CO₂
(lbs/MWh)

SO₂ and No_x
(lbs/MWh)

