2017 North Carolina State Infrastructure Report

(January 1, 2017 – December 31, 2017)

May 2018

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

Table of Contents

Executive Summary

(May 2018)

- **Existing Capacity:** Natural gas represents approximately 24.6 percent of the total installed capacity in North Carolina while hydro and solar represents approximately 46.9 percent and 21.8 percent, respectively. This differs from PJM where natural gas and coal are at 37 and 32 percent of total installed capacity.
- **Interconnection Requests:** Solar represents approximately 88 percent of new interconnection requests in North Carolina.
- **Deactivations**: Approximately 209 MW of capacity in North Carolina retired in 2017. This represents more than 10 percent of the 2,084 MW that retired RTO-wide in 2017.
- **RTEP 2017:** North Carolina RTEP 2017 projects total more than $124 million in investment. None of the projects were supplemental projects.
- **Load Forecast**: North Carolina load growth is nearly flat, averaging between .8 and .9 percent per year over the next 10 years. This is slightly higher than the PJM RTO load growth projections of .4 percent over the next 10 years.

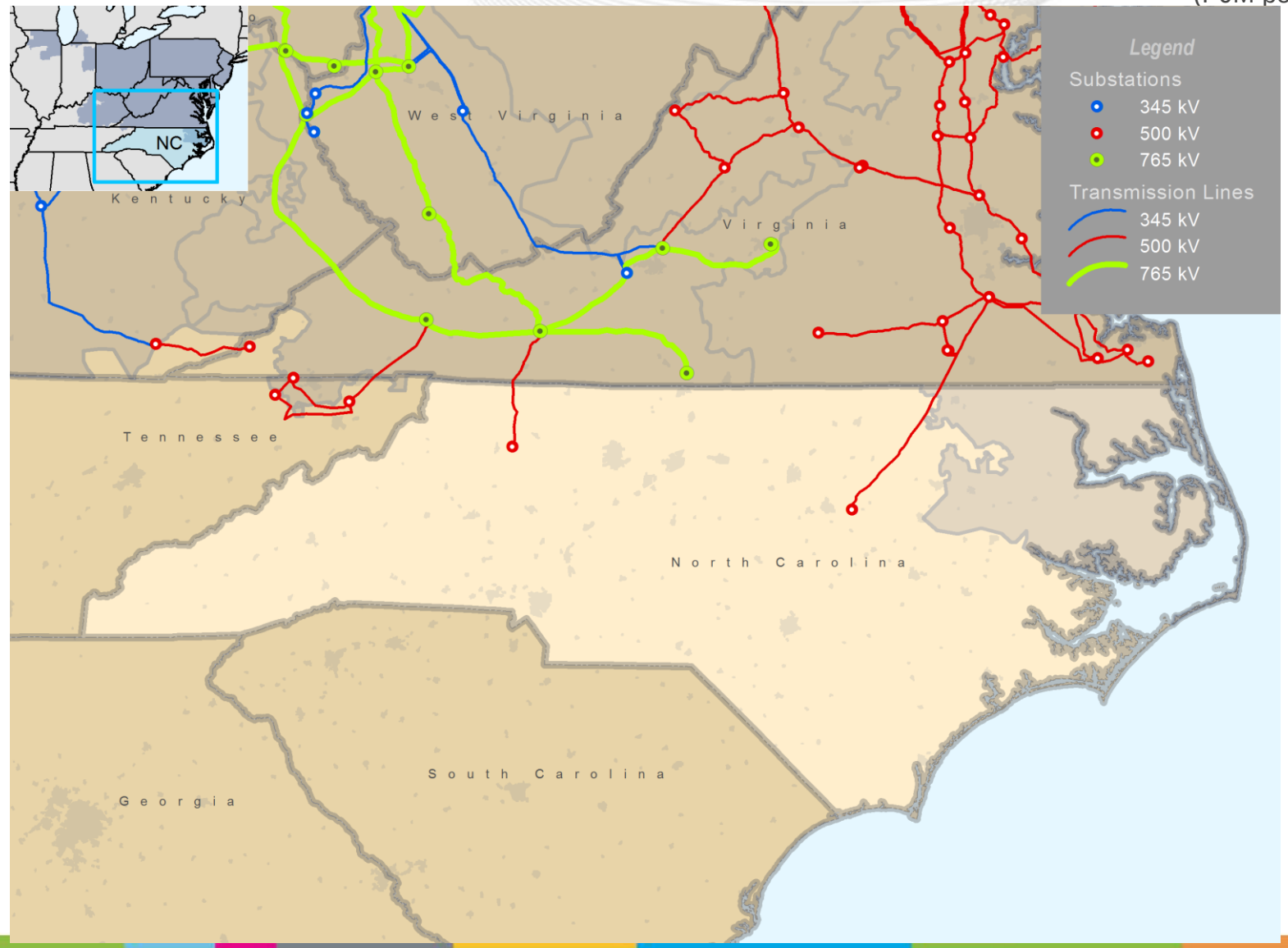
Executive Summary

(May 2018)

- **2021/22 Capacity Market:** North Carolina cleared 48 MW more Demand Response and Energy Efficiency resources than in the prior auction.
- **6/1/15 – 12/31/17 Performance:** North Carolina's average locational marginal prices were consistently at or above PJM average LMPs. Imported resources represented 74.0 percent of generation produced in the Dominion region of North Carolina.
- **Emissions:** 2017 carbon dioxide, nitrogen oxide, and sulfur dioxide emissions are all slightly down from 2016.

North Carolina – PJM Service Area

(PJM portion of NC only) (December 31, 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

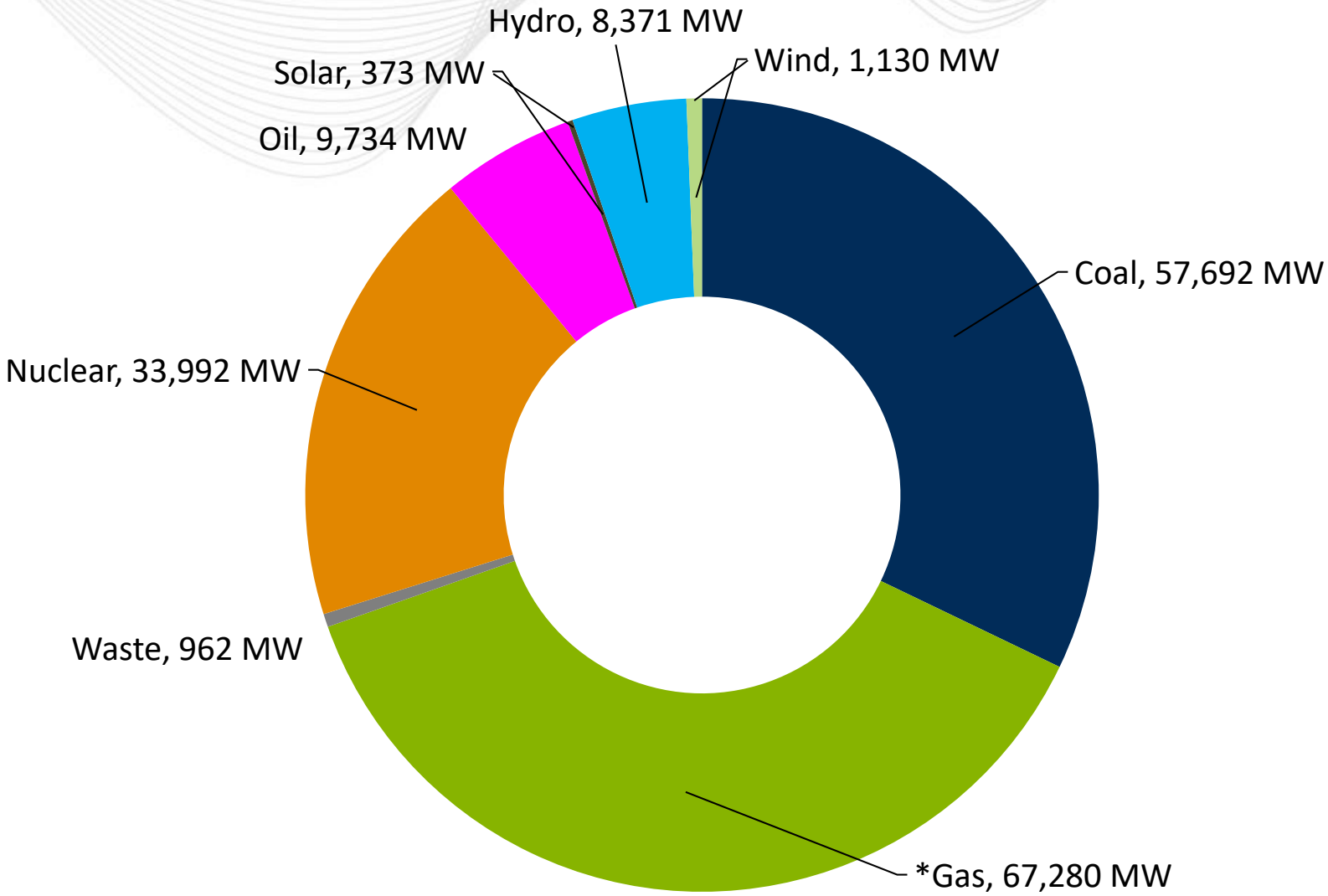
Generation Portfolio Analysis

PJM – Existing Installed Capacity

(MW submitted to PJM, December 31, 2017)

In PJM, natural gas and coal make up nearly 70 percent total installed capacity. Nuclear represents another 18.9 percent.

* Gas Contains	
Natural Gas	66,836.3 MW
Other Gas	443.8 MW



North Carolina – Existing Installed Capacity

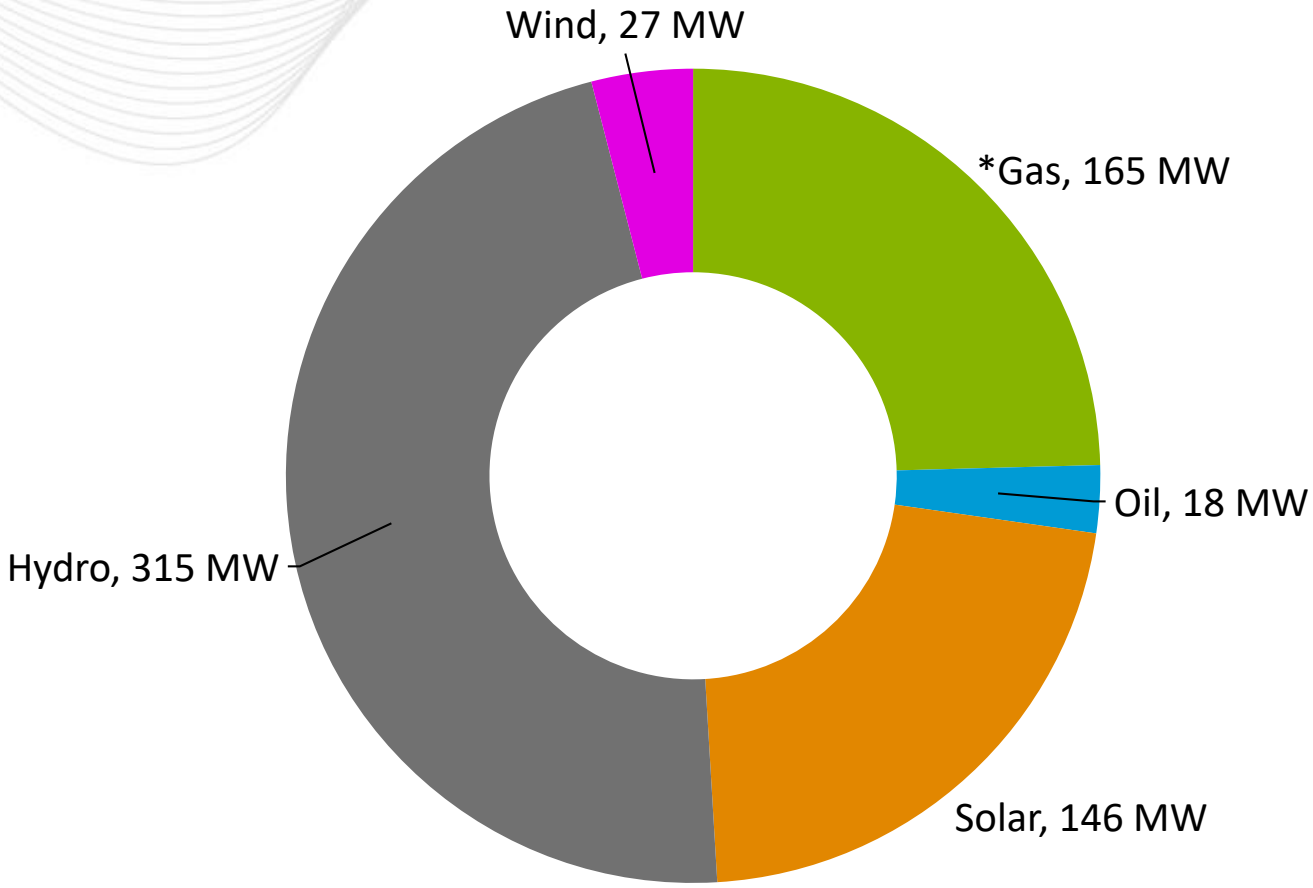
(MW submitted to PJM, December 31, 2017)

Summary:

Natural gas represents approximately 24.6 percent of the total installed capacity in the North Carolina territory while hydro represents approximately 46.9 percent.

Overall in PJM, natural gas represents approximately 37 percent of installed capacity while coal represents 32 percent.

* Gas Contains	
Natural Gas	165 MW
Other Gas	0 MW



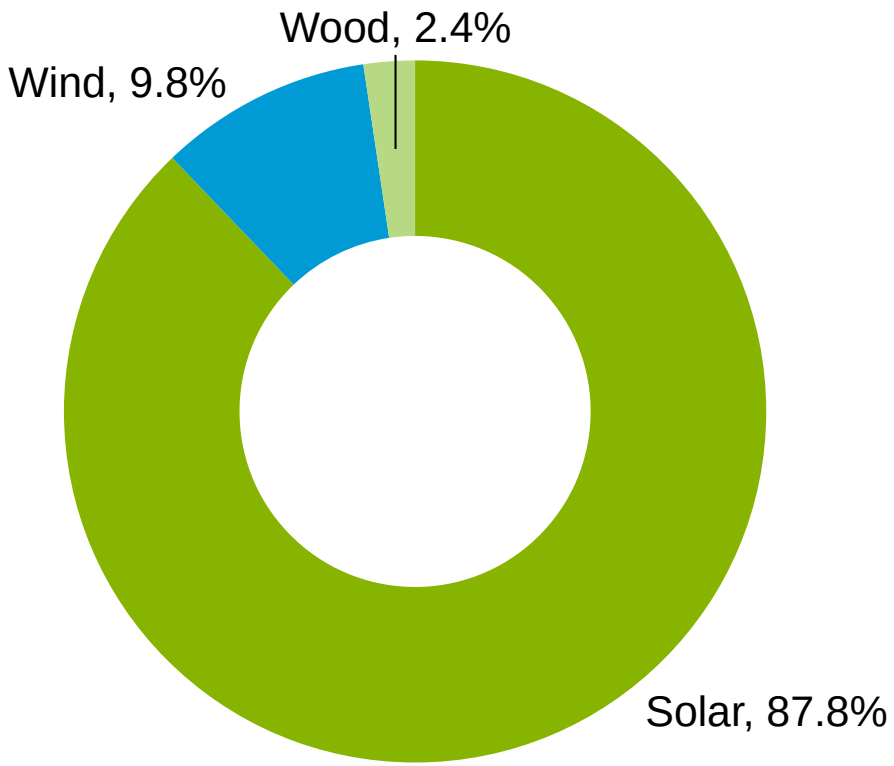
North Carolina – Interconnection Requests

(Requested Capacity Rights, December 31, 2017)

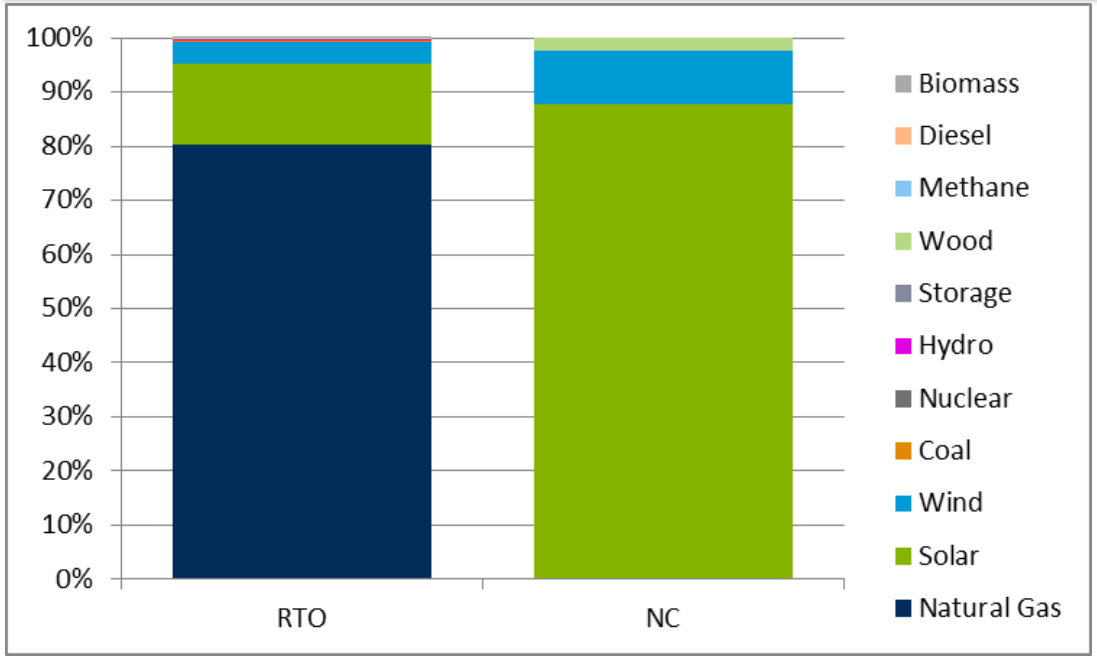
Solar represents approximately 88 percent of new interconnection requests in North Carolina.

Fuel Source	Capacity, MW	Nameplate Capability, MW
Solar	1,864.9	2,835.6
Wind	208.0	730.3
Wood	50.0	62.5
Total	**2,122.9**	**3,628.4**

Total MW Capacity by Fuel Type



Fuel as a Percentage of Projects in Queue



North Carolina – Interconnection Requests

(As of December 31, 2017)

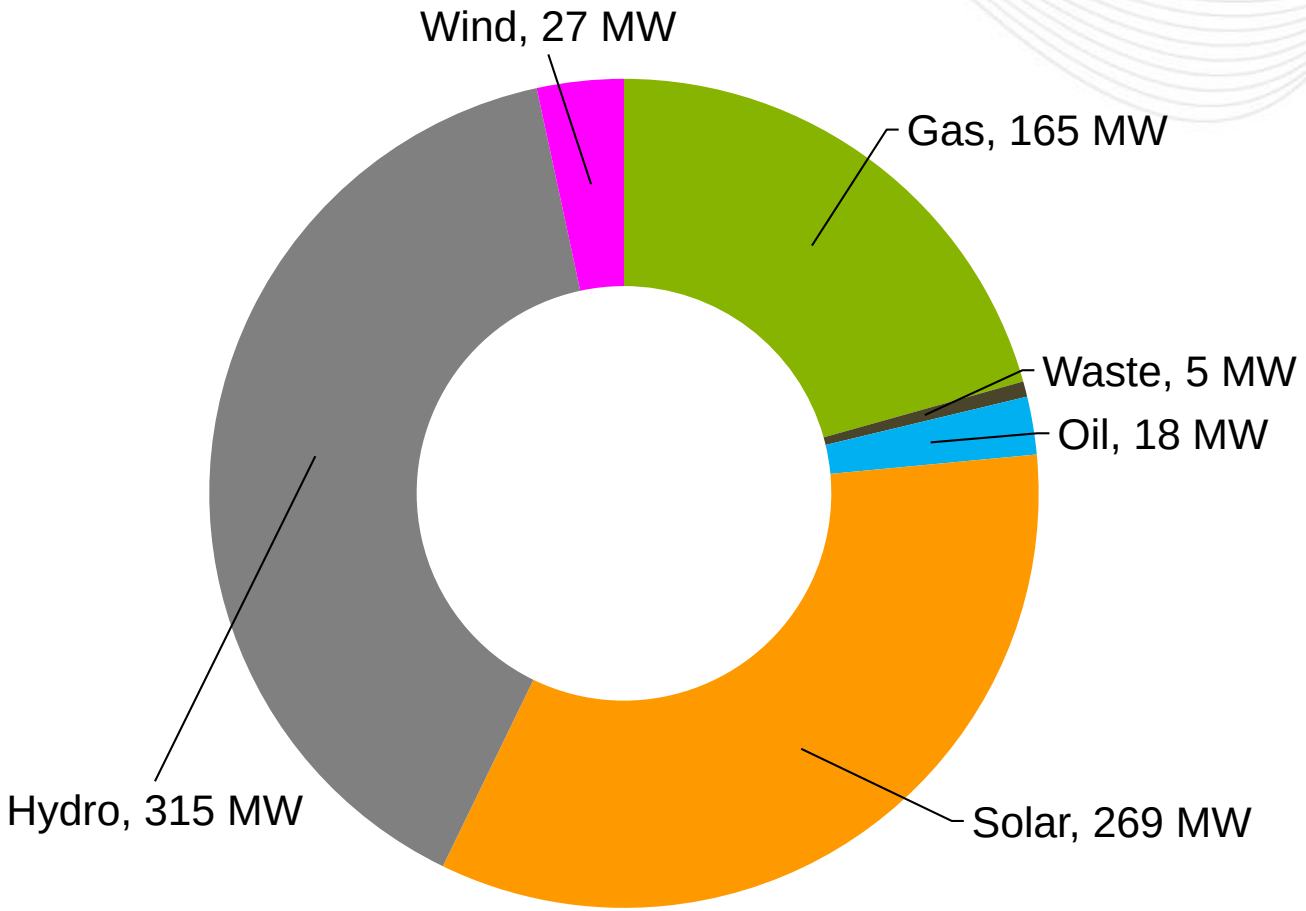
	Complete				In Queue				Grand Total	
	In Service		Withdrawn*		Active		Under Construction**			
	MW	# of Projects	MW	# of Projects	MW	# of Projects	MW	# of Projects	MW	# of Projects
Renewable	116	9	1,646	56	1,665	31	458	13	3,885	109
Methane			12	1					12	1
Solar	116	9	1,376	46	1,535	30	330	10	3,356	95
Wind			178	8	130	1	78	2	386	11
Wood			80	1			50	1	130	2
Grand Total	**116**	**9**	**1,646**	**56**	**1,665**	**31**	**458**	**13**	**3,885**	**109**

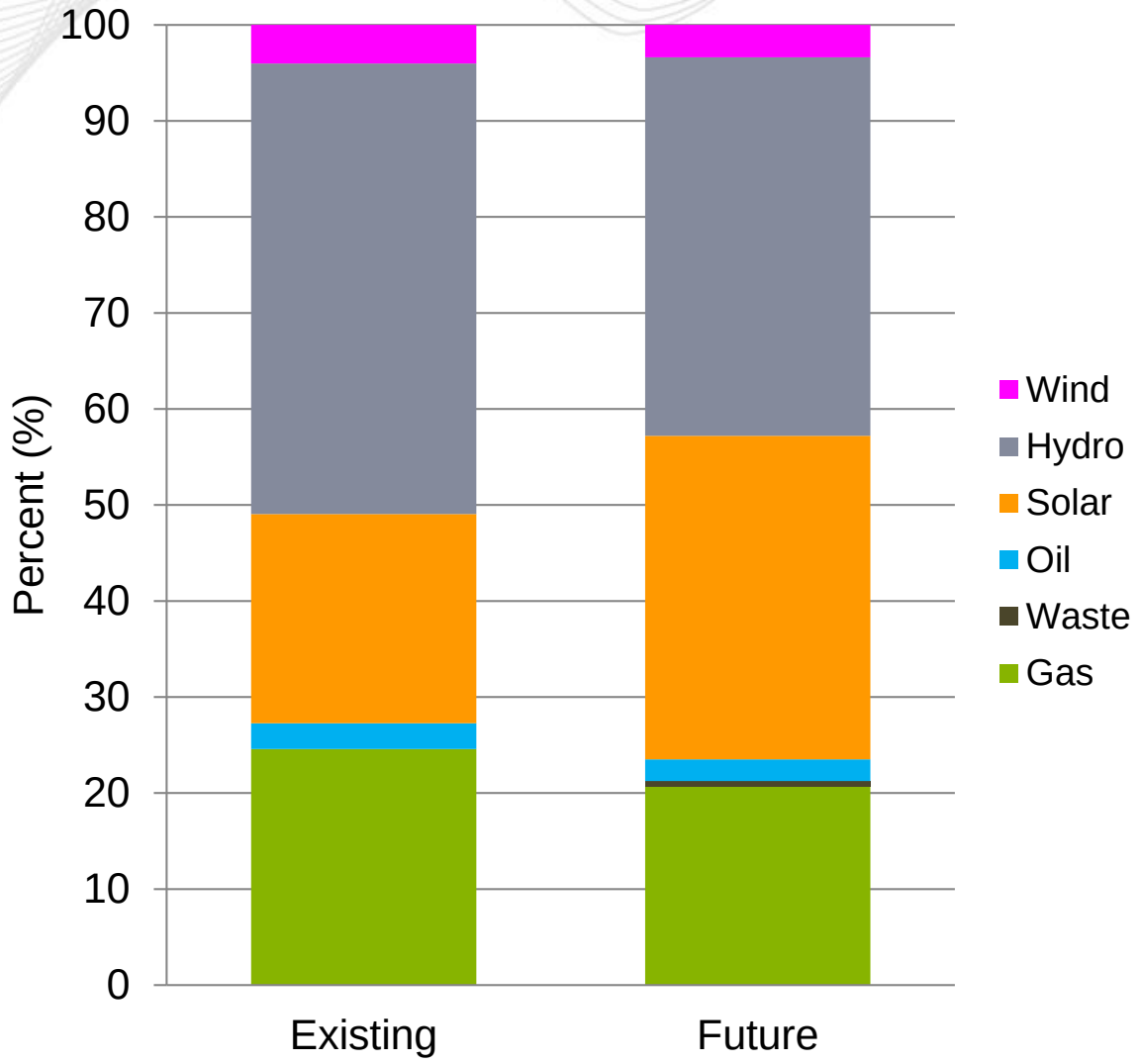
*May have executed final agreement

** Executed final agreement (ISA / WMPA)

North Carolina – Future Capacity Mix

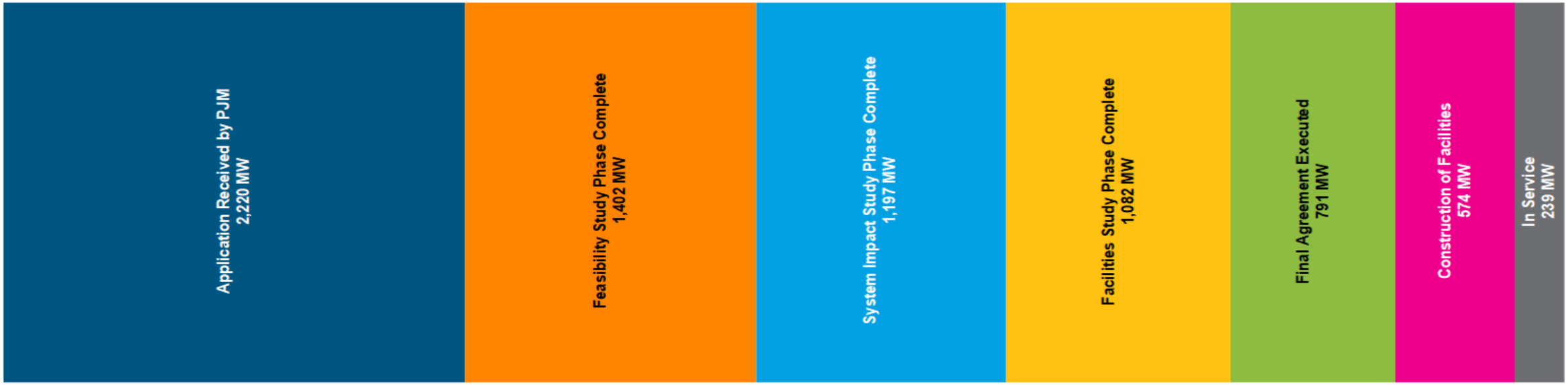
Based on known queued interconnection requests and deactivation notices through December 31, 2022, adjusted to reflect the probability of commercialization as indicated by historical trends specific to an interconnection request's state/zonal location and fuel type.





North Carolina – Progression History Interconnection Requests

Projects under construction, suspended, in service, or withdrawn – As of December 31, 2017

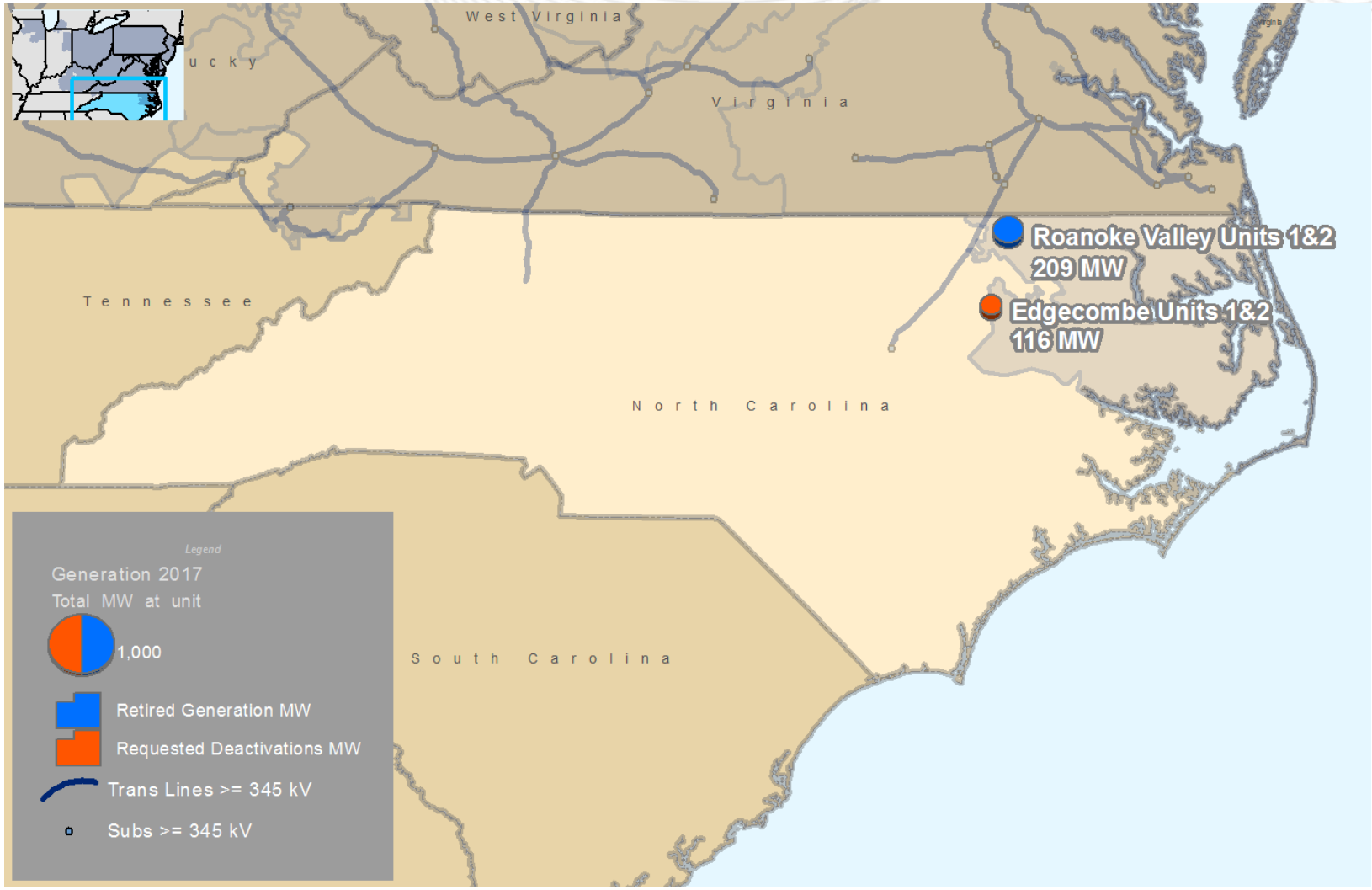


Projects that withdrew after a final agreement

	Number of Projects	Capacity, MW	Nameplate Capability, MW
ISA	6.0	217.6	613.6

10.8% of requested capacity megawatt and **14.1%** of projects reaches commercial operation

North Carolina – Actual Generation Deactivations and Deactivation Notifications Received in 2017



North Carolina – 2017 Generation Deactivations

(Capacity, As of December 31, 2017)

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

Summary:

- Two units in North Carolina deactivated in 2017.
- 10 generating units totaling 2,084 MW of capacity deactivated in PJM in 2017.

North Carolina – Deactivation Notifications Received in 2017

Unit	MW Capacity	TO Zone	Age	Projected Deactivation Date
Edgecomb NUG	116	Dominion	27	10/31/2020

Summary:

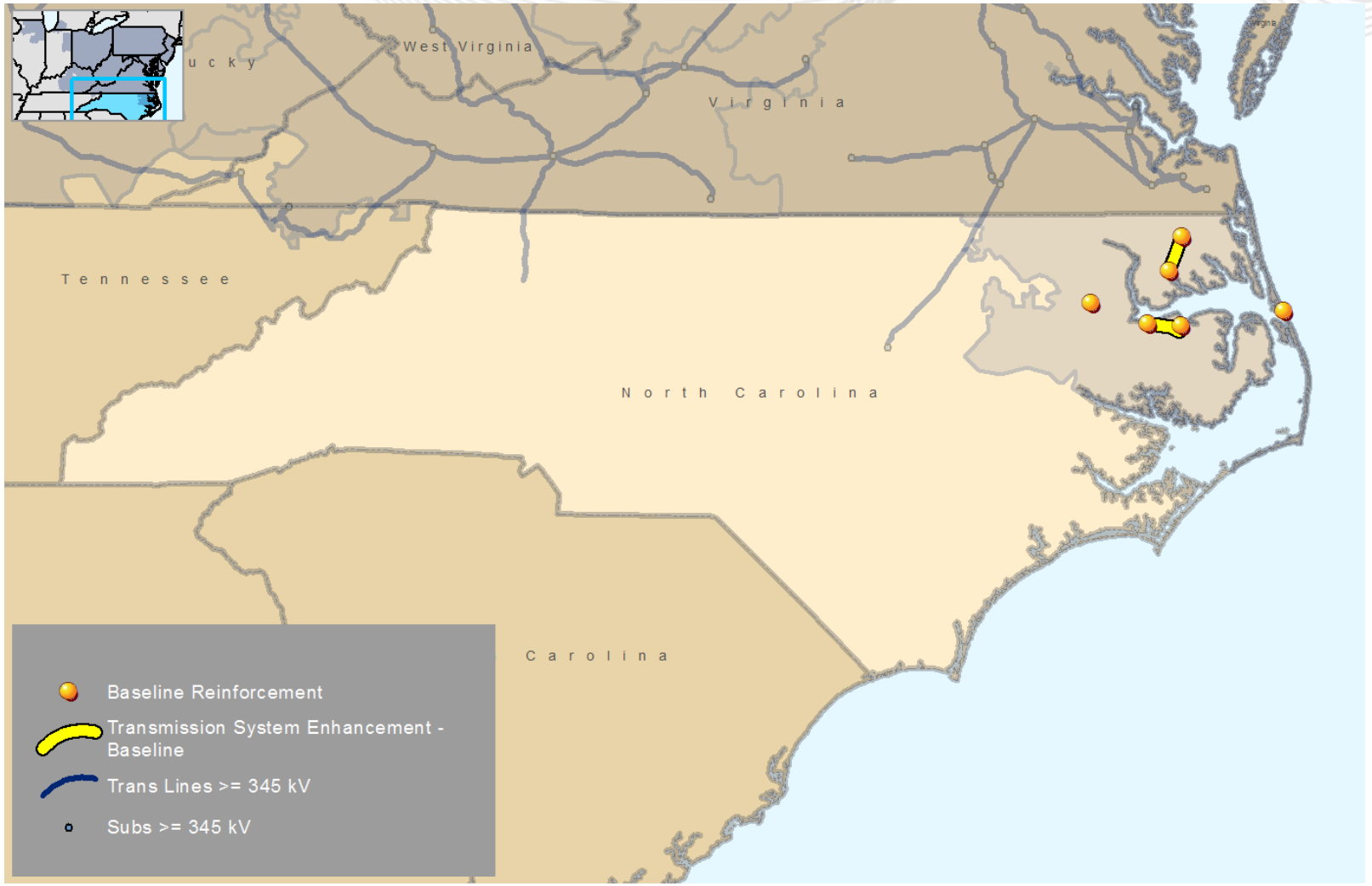
- In 2017 one generating unit in North Carolina announced its intention to deactivate.
- In 2017, a total of 12 PJM generating units announced their intent to deactivate, ranging in dates from 2018 - 2020.

Planning

Transmission Infrastructure Analysis

North Carolina – RTEP Baseline Projects

(Greater than $5 million)



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

North Carolina – RTEP Baseline Projects

(Greater than $5 million)

Project ID	Project	Project Driver	Required In Service Date	Project Cost ($M)	TO Zone(s)	2017 TEAC Review
b2757	Install a +/-125 MVAR Statcom at Colington 115 kV	TO Criteria Violation	6/1/2017	$ 30.0	Dominion	10/6/2016
b2900	Build a new 230-115kV switching station connecting to 230kV network Line #2014 (Earleys – Everetts). Provide a 115kV source from the new station to serve Windsor DP.	TO Criteria Violation	12/30/2022	$ 11.5	Dominion	8/29/2017
b2876	Rebuild Line #101 from Mackeys - Creswell 115 kV, 14 miles, with double circuit structures. Install one circuit with provisions for a second circuit. The conductor used will be at current standards with a summer emergency rating of 262 MVA at 115kV.	TO Criteria Violation	12/30/2022	$ 40.0	Dominion	8/29/2017
b2929	Rebuild 230kV Line #2144 from Winfall to Swamp (4.3 miles) to current standards with a standard conductor (bundled 636 ACSR) having a summer emergency rating of 1047 MVA at 230kV.	TO Criteria Violation	12/30/2022	$ 6.0	Dominion	9/14/2017
b2871	Rebuild 230kV line #247 from Swamp to Suffolk (31 miles) to current standards with a summer emergency rating of 1047 MVA at 230kV.	TO Criteria Violation	12/30/2022	$ 31.0	Dominion	5/4/2017

North Carolina – RTEP Network Projects

(Greater than $5 million)

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 – RTEP Network Projects

(Greater than $5 million)

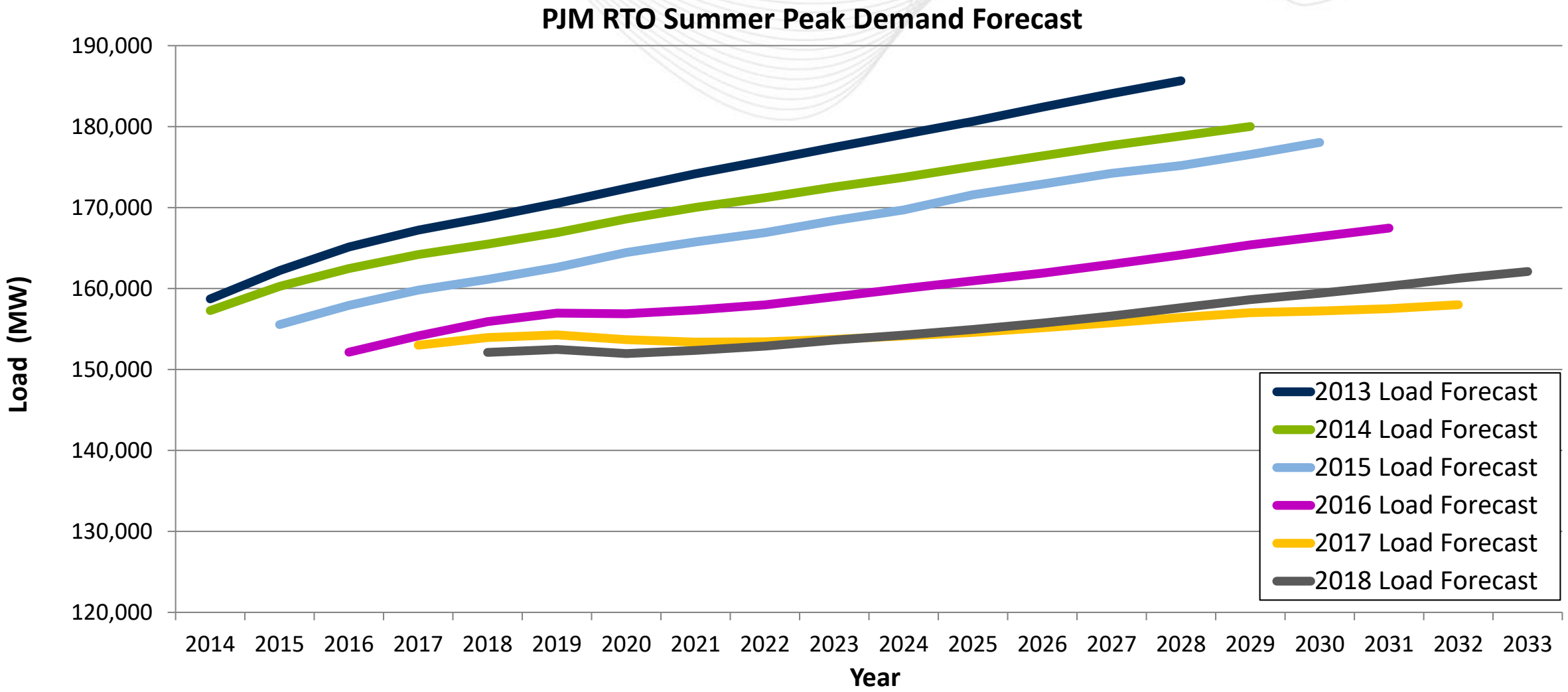
Project ID	Description	Project Driver	Queue	Required In Service Date	Project Cost ($M)	TO Zone(s)	2017 TEAC Review
n5191	three breaker ringbus	Generation	AA2-053	1/1/2019	$ 5.6	Dominion	10/12/2017

Planning

Load Forecast

PJM Annual Load Forecasts

(January 2018)



North Carolina – 2018 Load Forecast Report

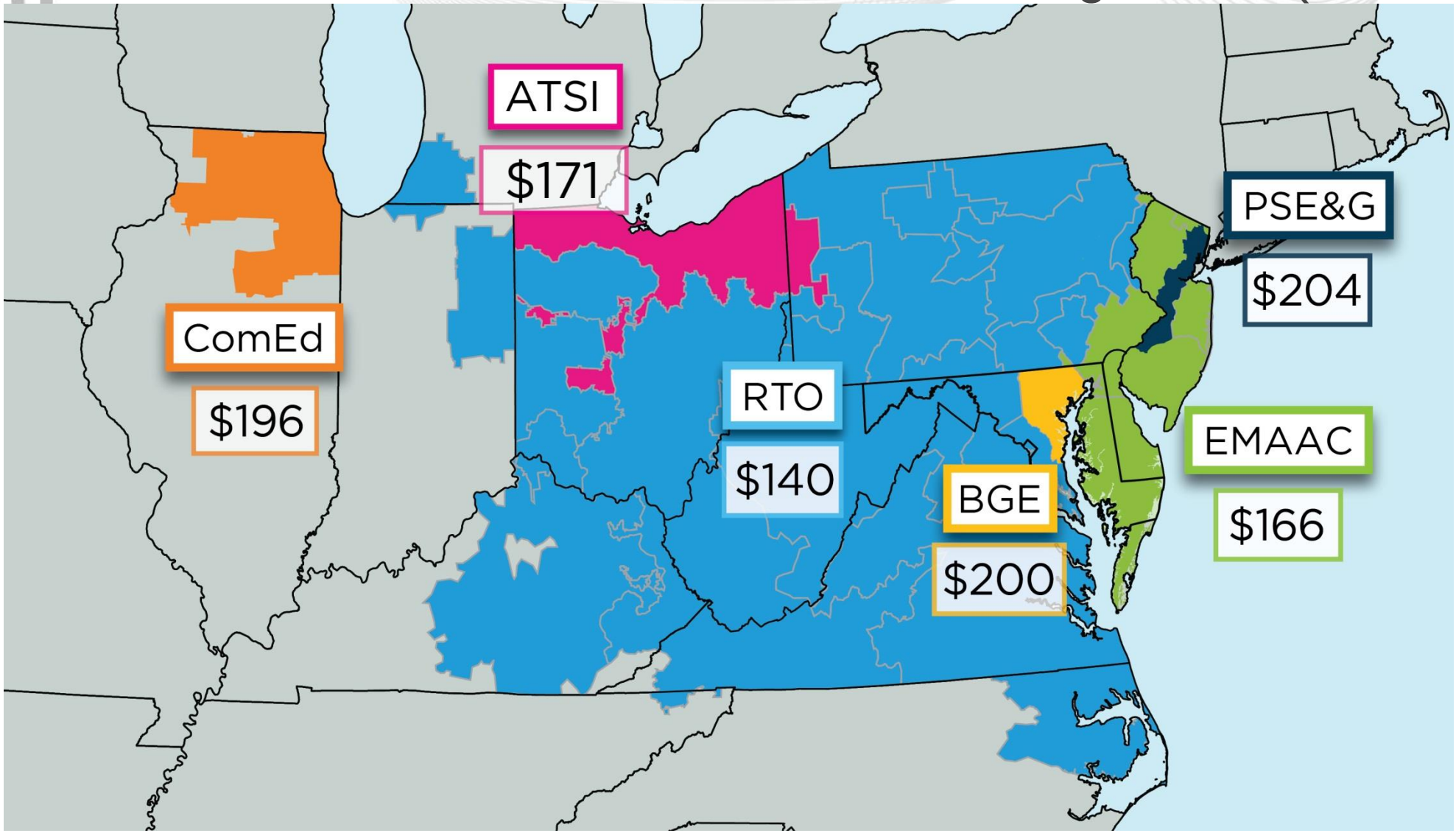
	Summer Peak (MW)			Winter Peak (MW)		
Transmission Owner	2018	2028	Growth Rate (%)	2017/18	2027/28	Growth Rate (%)
Dominion Virginia Power *	1,027	1,109	0.8%	1,005	1,097	0.9%
PJM RTO	152,108	157,635	0.4%	131,463	136,702	0.4%

* PJM notes that 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.

Markets

Capacity Market Results

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



North Carolina - Cleared Resources in 2021/22 Auction

(May 23, 2018)

	Cleared MW (Unforced Capacity)	Change from 2020/21 Auction
Generation	646	88
Demand Response	57	28
Energy Efficiency	28	20
Total	731	136

RTO Locational Clearing Price
$140

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 - 2021/2022 Cleared MW (UCAP) by Resource Type

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

North Carolina – Offered and Cleared Resources in 2021/22 Auction

(May 23, 2018)

		Unforced Capacity
Generation	Offered MW	682
	Cleared MW	646
Demand Response	Offered MW	59
	Cleared MW	57
Energy Efficiency	Offered MW	28
	Cleared MW	28
Total Offered MW		769
Total Cleared MW		731

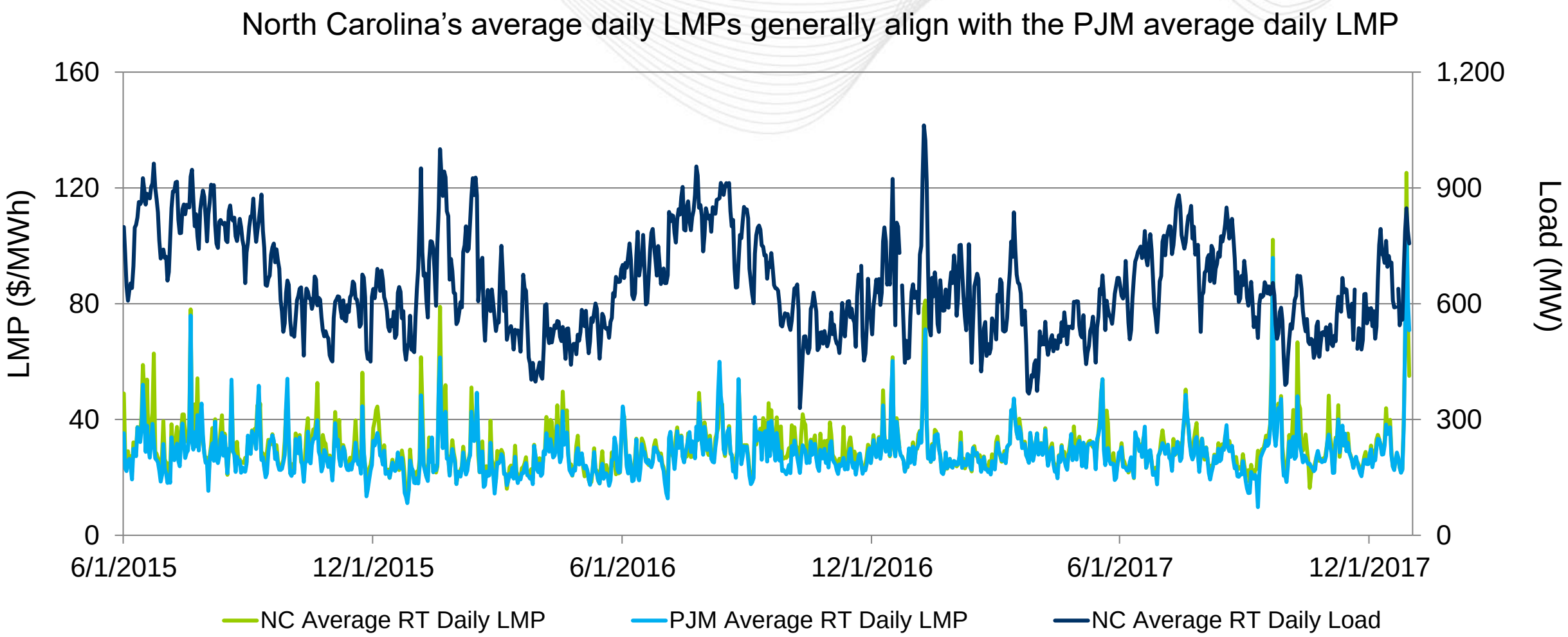
NOTE: Demand Response and Energy Efficiency are reported to PJM by Transmission Zone.
The numbers above reflect the state's pro-rata share of cross-state zones for illustrative purposes.

Markets

Market Analysis

North Carolina - Average Daily Load and LMP

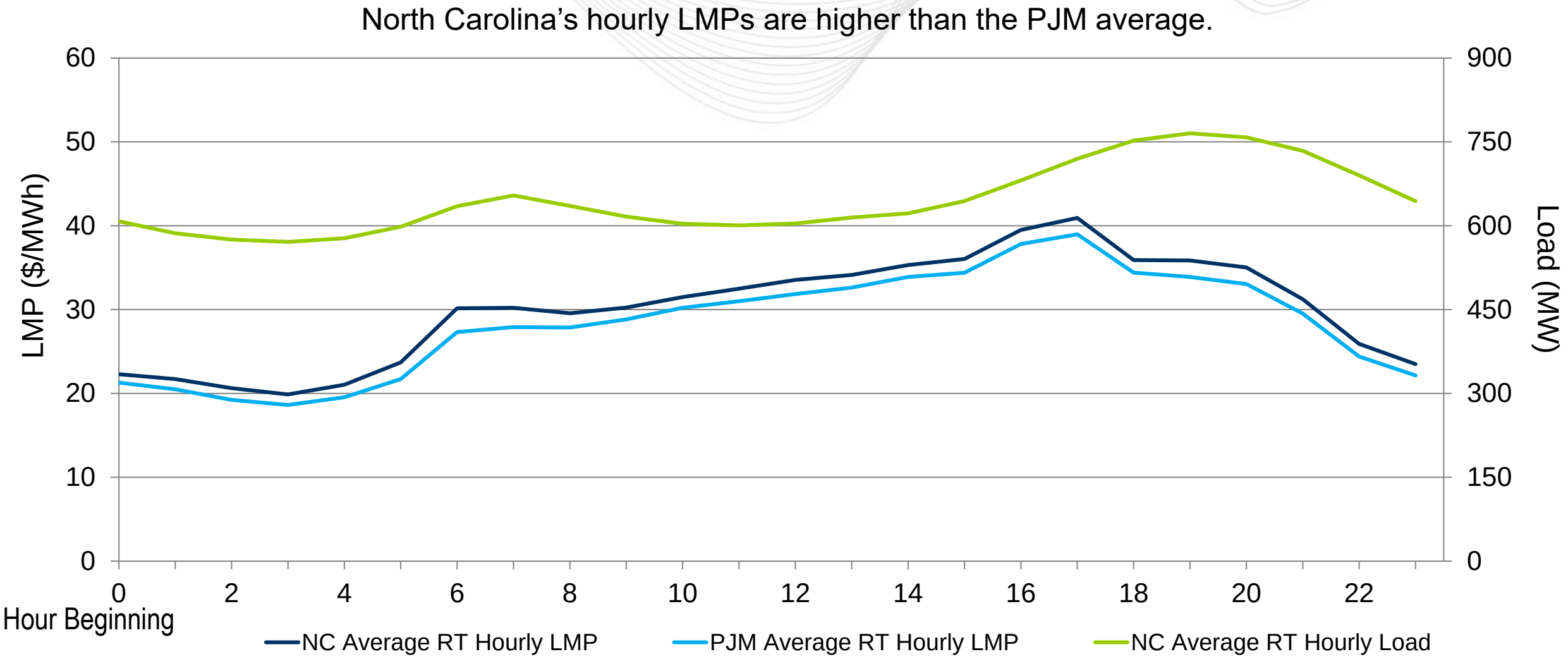
(June 1, 2015 - December 31, 2017)



Note: The price spike on 9/21/2017 reflects the PJM shortage pricing event. The price spike starting 12/28/2017 reflects the beginning of the Cold Snap.

North Carolina – Hourly Average LMP and Load

(June 1, 2015 – December 31, 2017)



Operations
Emissions Data

PJM - Average Emissions (lbs/MWh)

(February 1, 2018)