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U.S. NUCLEAR REGULATORY COMMISSION'S

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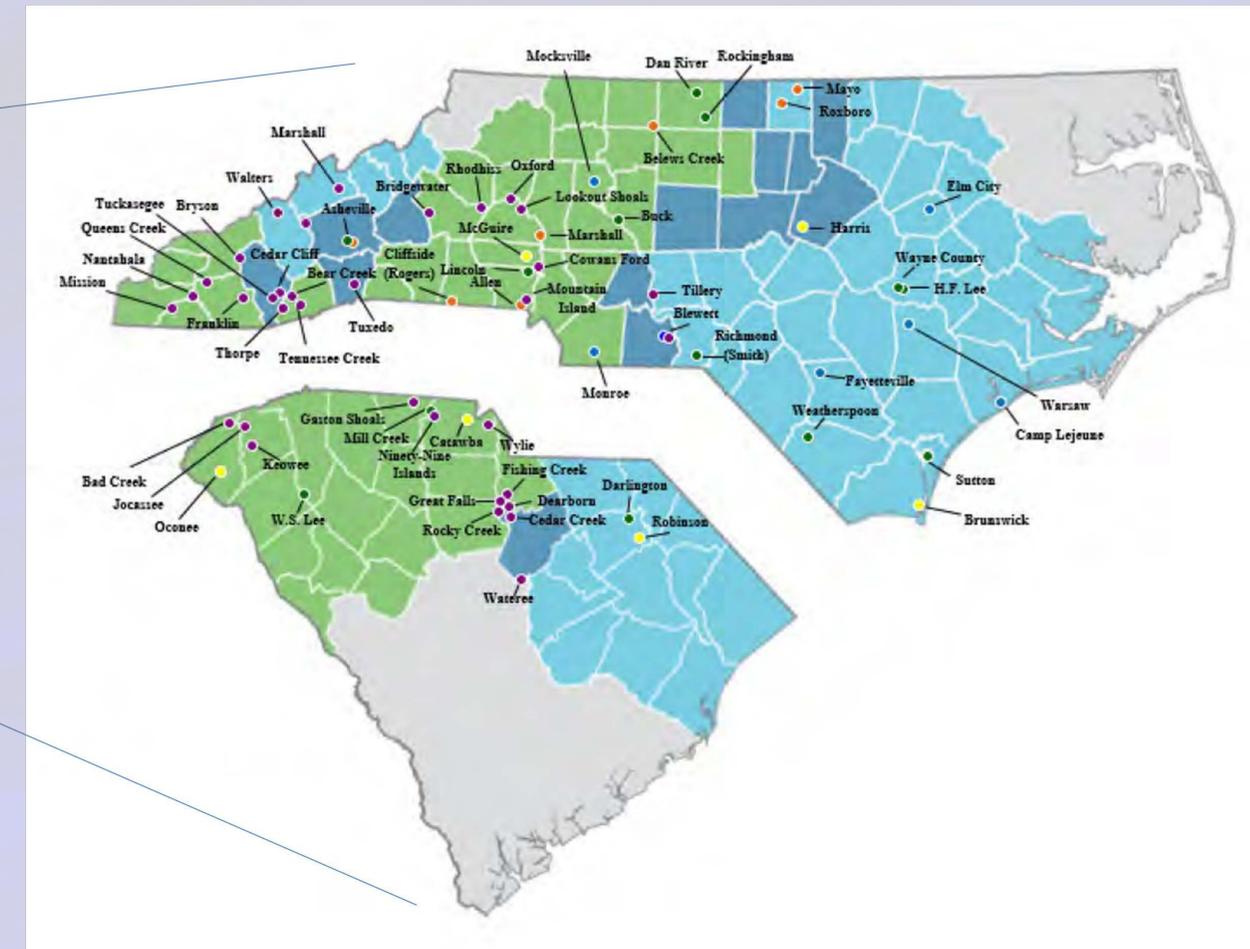
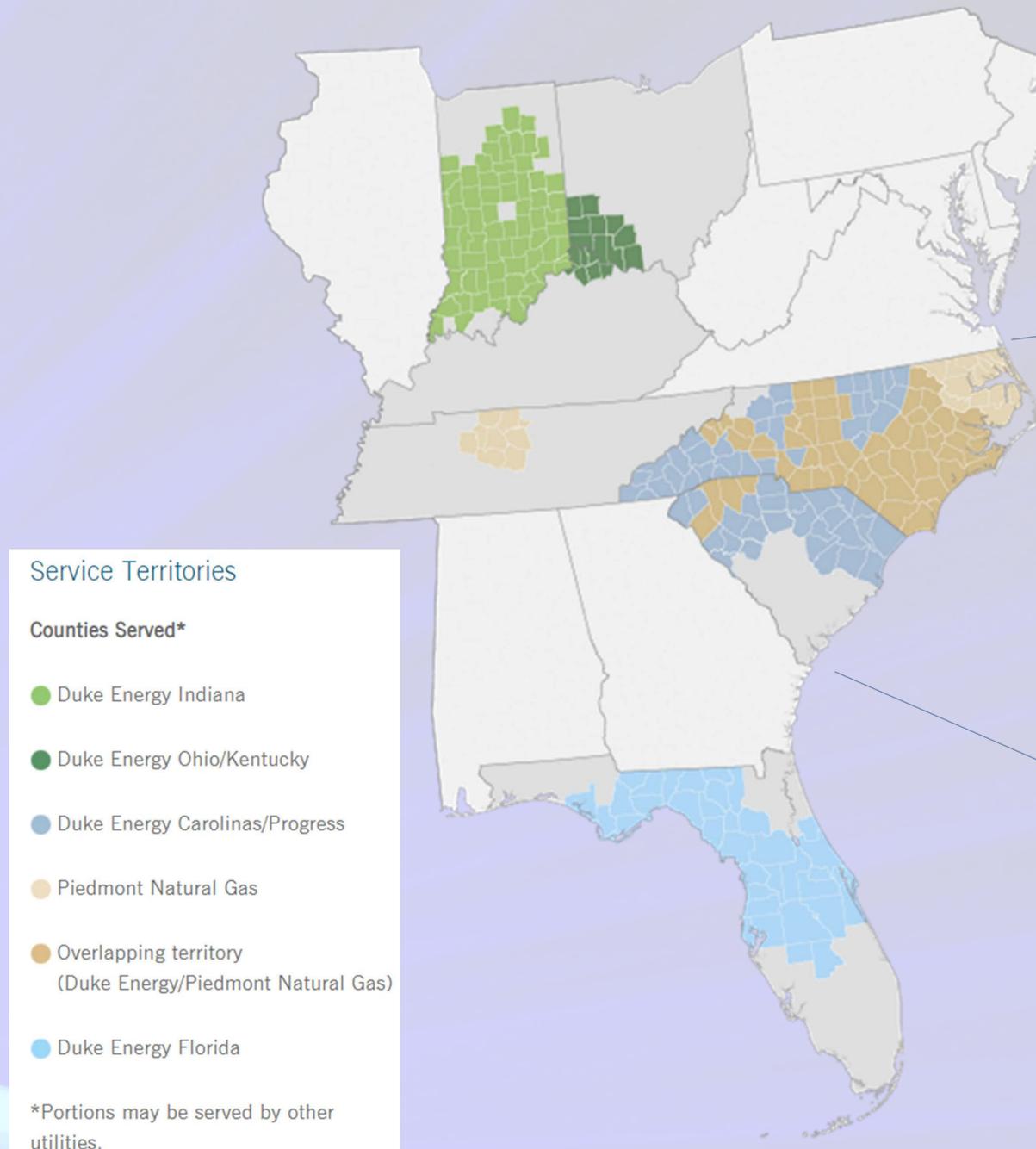
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# The Key Role of Nuclear Power in the Clean Energy Transition



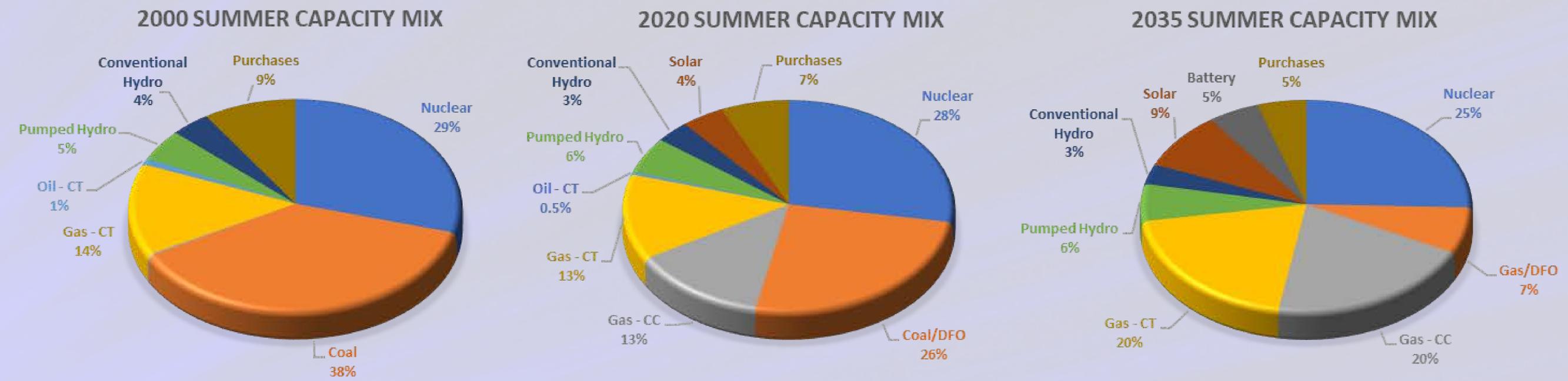
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## Duke Energy Carolinas and Duke Energy Progress





## Duke Energy's Changing Resource Mix



Nuclear Uprates	599
Coal Retired	(3054)
Gas CC Added	5380
Pumped Hydro Uprates	465
Solar (Nameplate MW) Added	4146

Nuclear Uprates	84
Coal Retired	(6920)
Gas CC Added	3456
Pumped Hydro Uprates	260
Solar (Nameplate MW) Added	3750
Battery Storage Added	2188

Source: 2020 DEC and DEP IRPs

## Influences on Resource Changes in the Carolinas

NC General Statute § 62-2(3a) requires “...energy planning and fixing of rates in a manner to result in the least cost mix of generation and demand side reduction measures which is achievable,...”

SC Code of Laws § 58-37-40 – Directs the Commission to consider in IRPs: resource adequacy and capacity, consumer affordability and least cost; compliance with environmental regulations; reliability; commodity price risks; diversity of generation supply

NC SB1078 (2001) - NC Clean Smokestacks Act – 77% NO<sub>x</sub> Reduction and 73% SO<sub>2</sub> Reduction by 2013

NC SB3 (2007) – REPS - 12.5% of retail electricity sales from renewable energy resources by 2021

DEP long-term PPAs with avoided cost rates from \$55 to \$85 per MWh for Qualifying Facilities

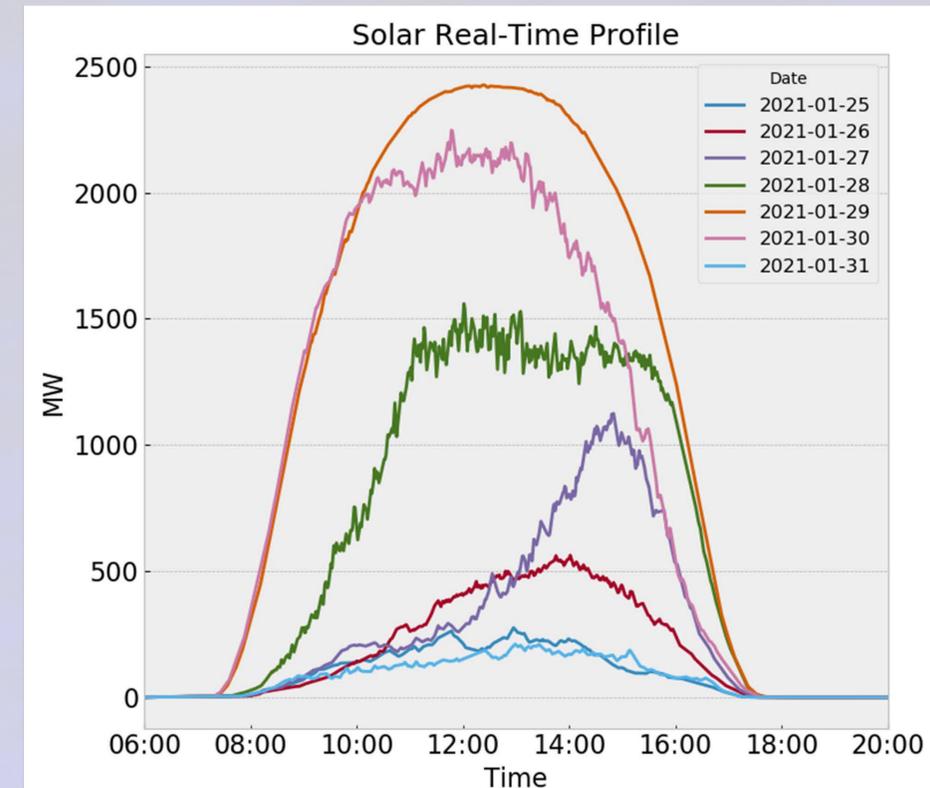
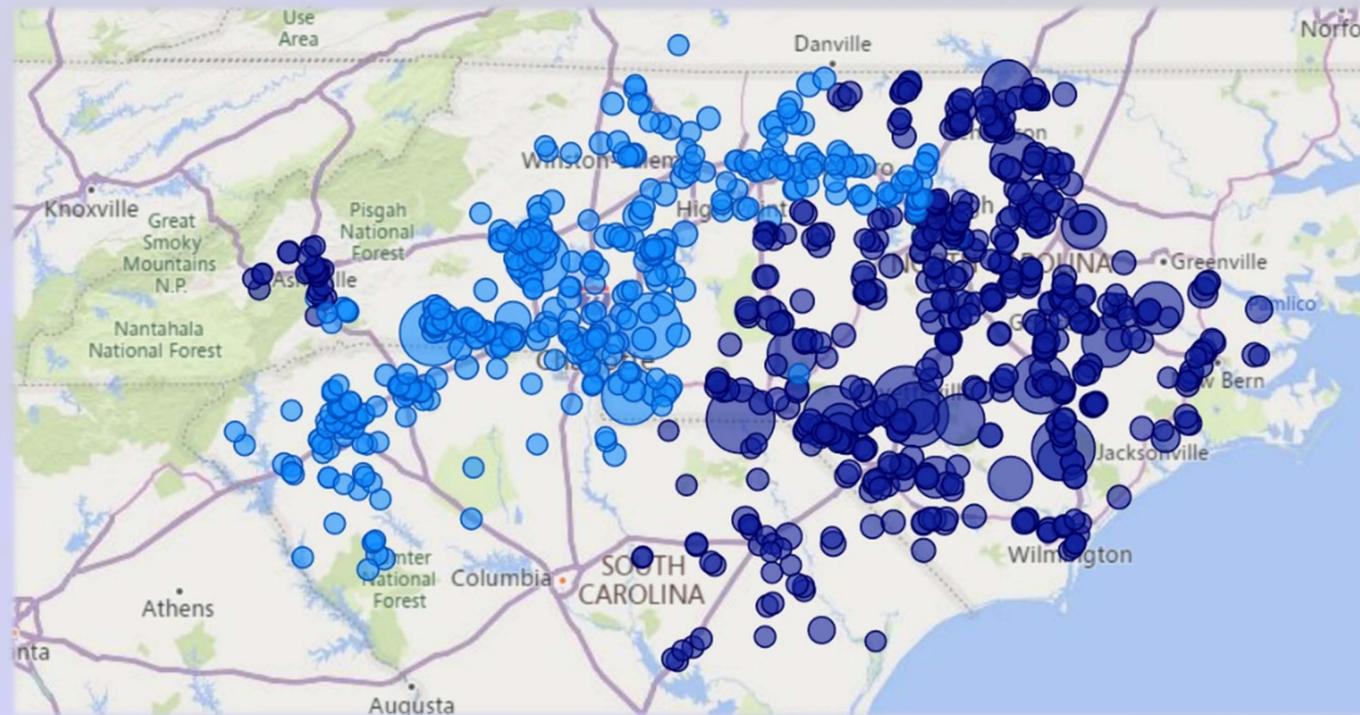
35% NC Renewable Energy Tax Credit (“RETC”) – ended 2015

30% Federal solar investment tax credit incentive (“ITC”) – decreasing after 2022 down to 10% in 2024

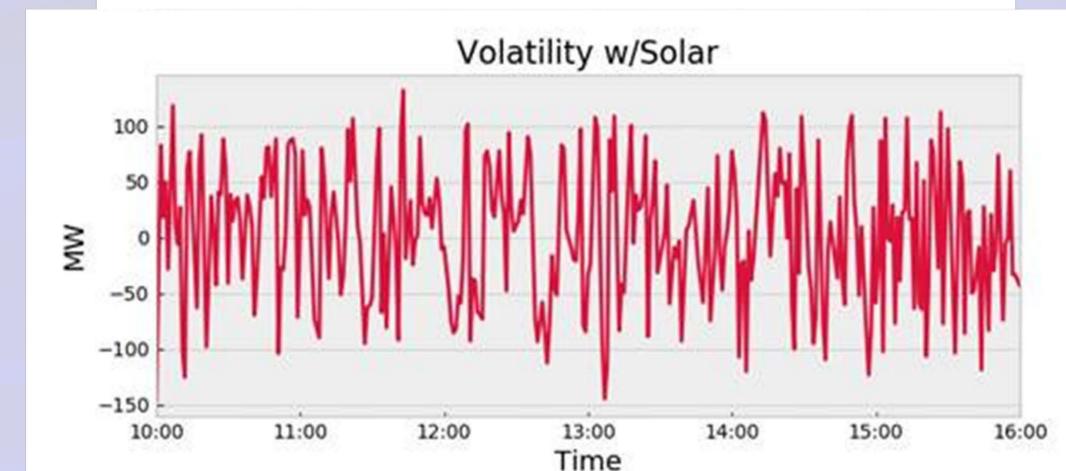
NC HB589 (2017) - Competitive Procurement of Renewable Energy (CPRE) - Procure 2660MW of renewable energy over 45 months via competitive bid

SC Act 62 (2019) - Once an electrical utility has executed interconnection agreements and power purchase agreements with qualifying small power production facilities located in South Carolina with an aggregate nameplate capacity equal to twenty percent of the previous five-year average of the electrical utility's South Carolina retail peak load, that electrical utility shall offer to enter into fixed price power purchase agreements with small power producers for the purchase of energy and capacity at avoided cost, → purchase 1060MW nameplate solar with 10-yr contracts

## Integrating Renewables



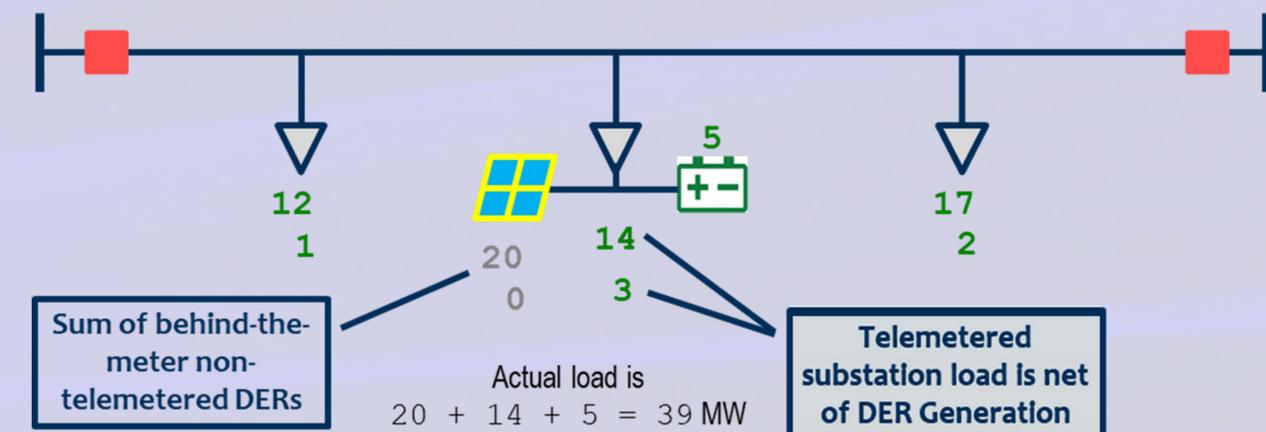
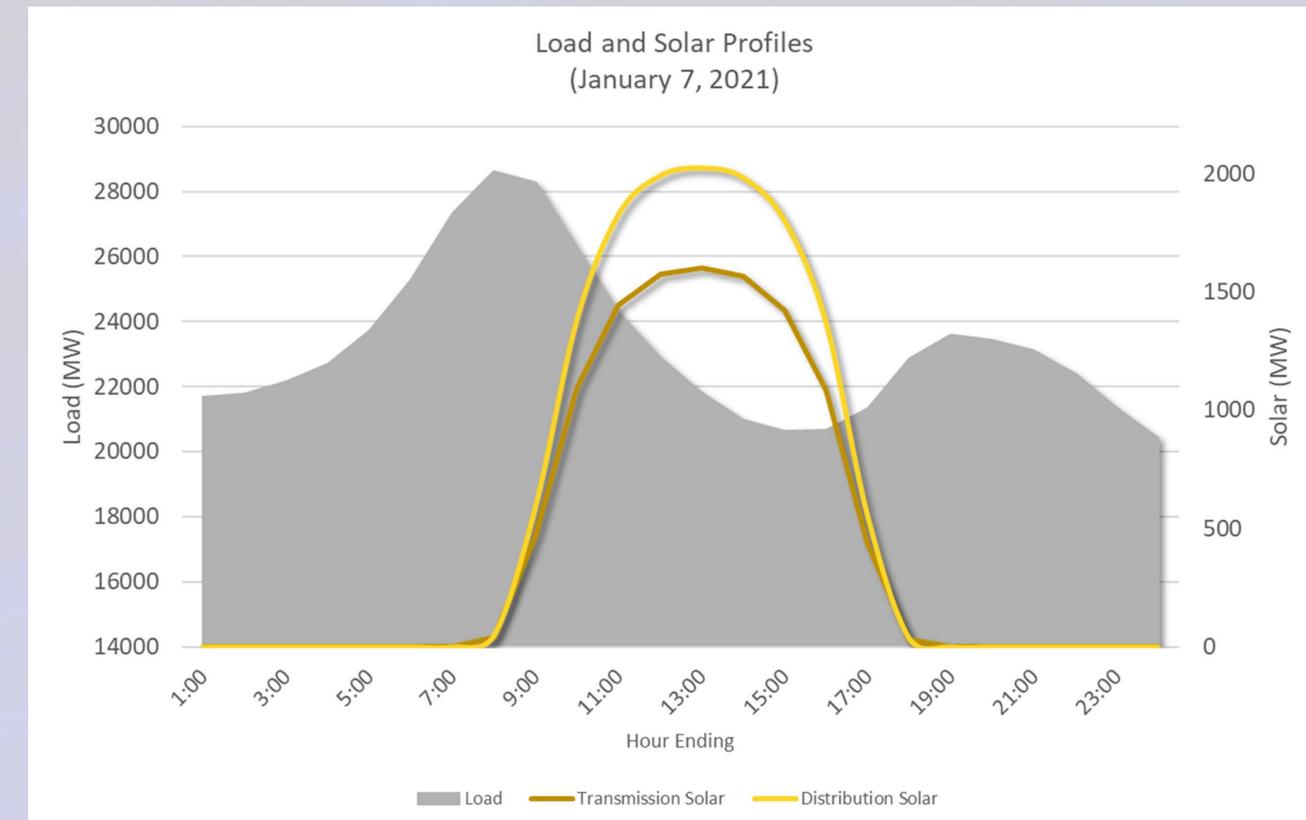
Region	Connected Solar (Nameplate MW) Feb 2021
<b>DEC</b>	<b>1142</b>
Transmission	532
Distribution	610
<b>DEP</b>	<b>2983</b>
Transmission	1094
Distribution	1695
Wholesale	194



## Integrating Renewables and Storage

### Impacts on Network Modeling

- Solar injection profiles are not coincident with load profiles
  - Affects the statistical results in state estimation
  - Requires segregation of generation from load
- Separation of generation from load improves
  - State estimation statistics, and thus power flow and contingency analysis accuracy
  - Control and granularity of power flow studies as load and generation can be altered independently
- Accurate state estimation allows for accurate prediction of post-trip switchyard voltage to ensure NPIRs are met





## Our Future - Sustainable, Reliable, Resilient, Cost Effective, Clean Energy, Coexisting Grid

### Climate Change and Clean Energy Sep 27, 2019

NC Governor Executive Order 80:

- 70% reduction in power sector greenhouse gas emissions below 2005 levels by 2030 with carbon neutrality by 2050.
- Strategies for modernizing regulatory and planning processes to foster long-term energy affordability and price stability
- Acceleration of clean energy innovation
- Increase the number zero-emission vehicles (ZEVs) to at least 80,000
- Reduce energy consumption per square foot in state-owned buildings by at least 40 percent from fiscal year 2002-2003 levels

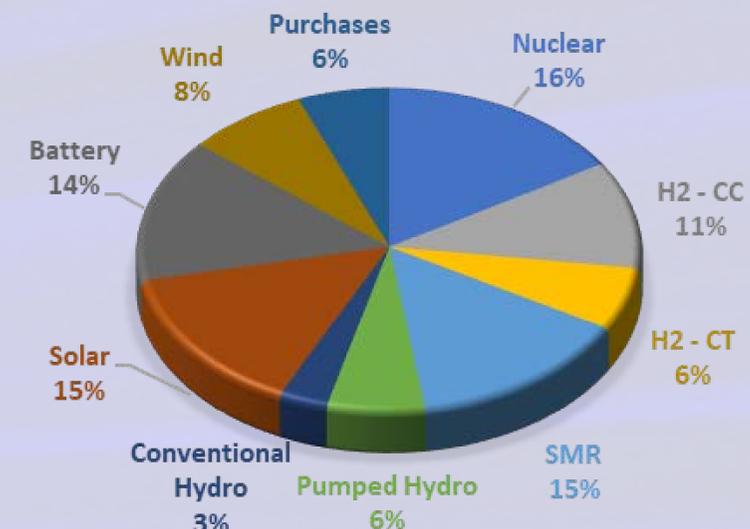
SC H4940 - Electricity Market Reform Measures  
 Study Committee *Approved September 29, 2020*

### Duke Energy aims to achieve net-zero carbon emissions by 2050

September 17, 2019

- **Company accelerates to reducing carbon by at least 50% by 2030**
- **Path to zero carbon requires investments in research, technology**
- **National leaders applaud bold new goals**

2050 SUMMER CAPACITY MIX (??)



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