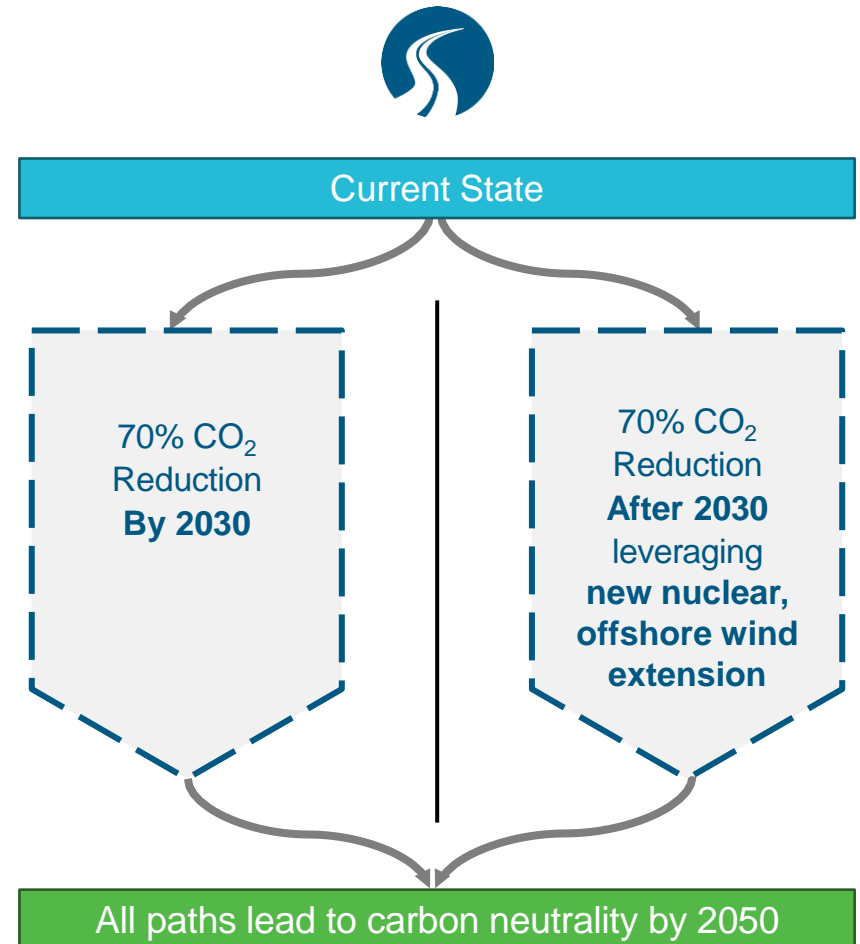


Carbon Plan Overview

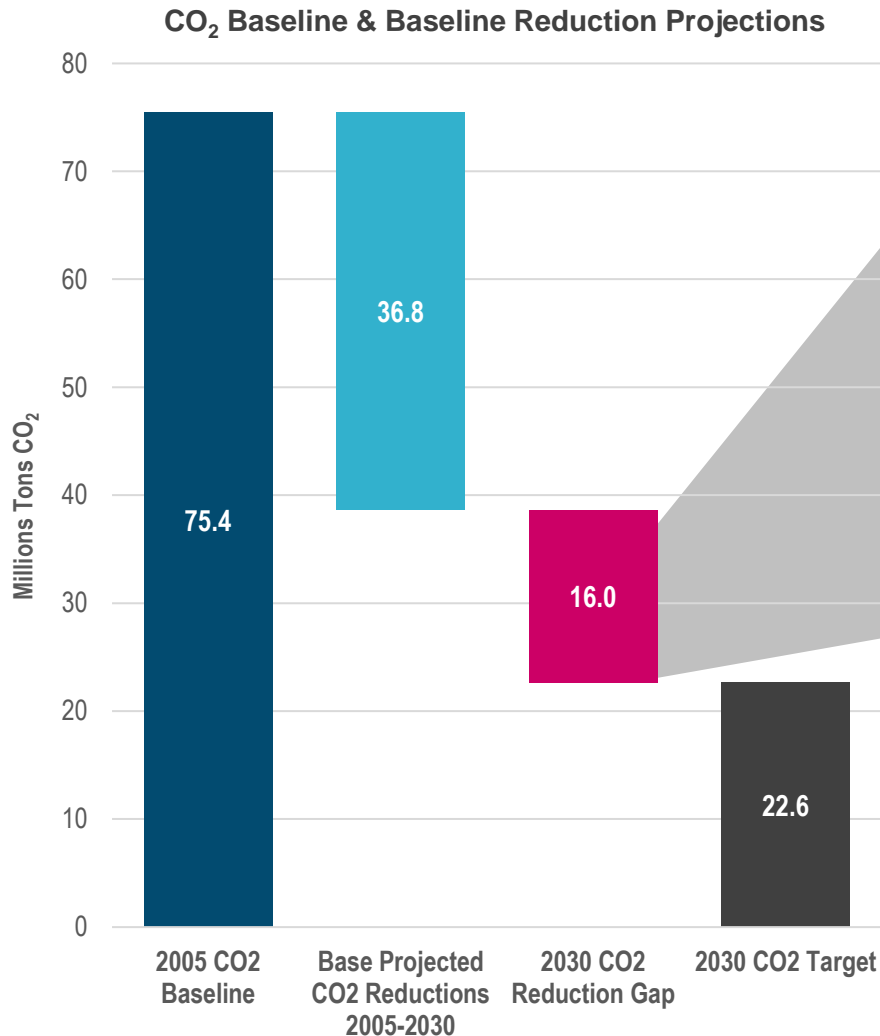


Pathways to carbon neutrality under HB951

- By December 31, 2022, the **North Carolina Utilities Commission (“NCUC”)** shall **develop with stakeholder input** an initial Carbon Plan to achieve a reduction of 70% CO₂ emissions by 2030 and carbon neutrality by 2050
 - **Commission discretion to determine timing and resource mix** to achieve both **least cost** compliance and **CO₂ reduction** goals; and
 - **Maintain or improve grid adequacy and reliability** as resources change
 - Reviewed **every 2 years** and adjusted as necessary
 - Commission discretion to extend compliance as needed in the event the Commission authorizes construction of a **nuclear** or **wind** facility or as necessary to maintain reliability



Interim Carbon Target & Available Levers



3-pronged approach to planning

1. Shrink the Challenge

- Grid Edge and Customer Programs
- Load Reduction and Modification

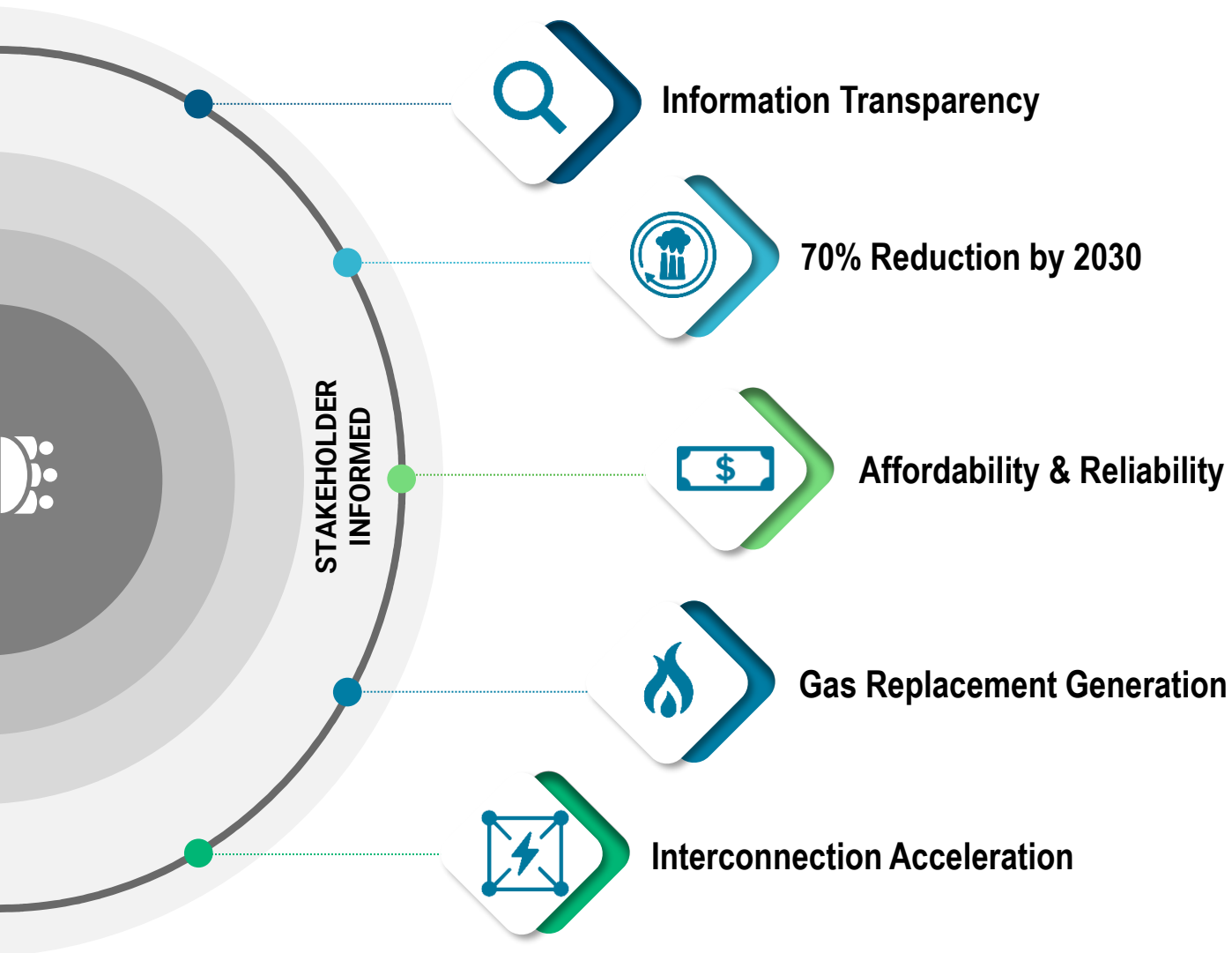
2. Add Carbon-Free Resources

- Solar
- Wind
- Small Modular Reactor ("SMR") / Advanced Nuclear
- Nuclear Upgrades

3. Ensure Reliability and Operational Flexibility

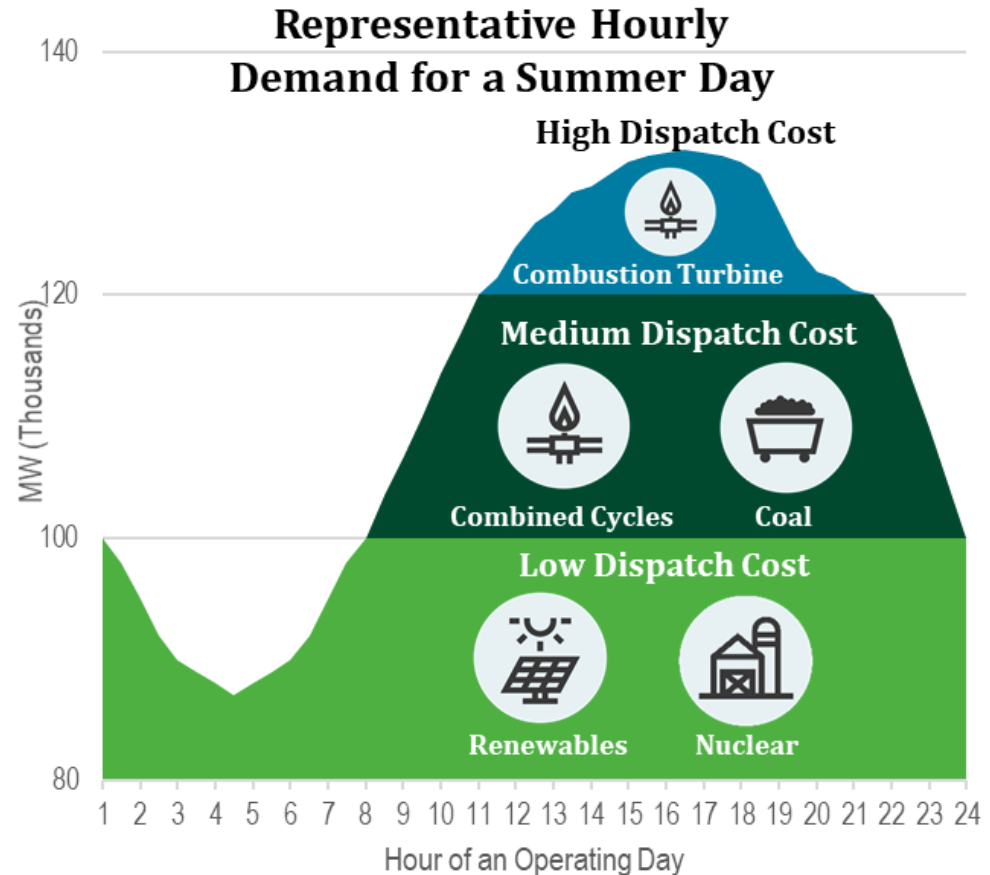
- Energy Storage
- Dispatchable Resources – Combined Cycles and Combustion Turbines
- Retire Coal

Carbon Plan stakeholder feedback themes



IRP Modeling Simulates the Power System Operations Over Time

- Electricity demand and supply need to be in balance at each point in time.
- Production cost models capture hourly, seasonal, and annual complexities of actual power systems
- Planning simulation tools consider the fit of resource to the type of demand
 - Is it needed every hour? Is it needed occasionally over the year? Is it only needed as load goes above a certain level?
 - Is the need for dependable capacity at time of system peak demand.

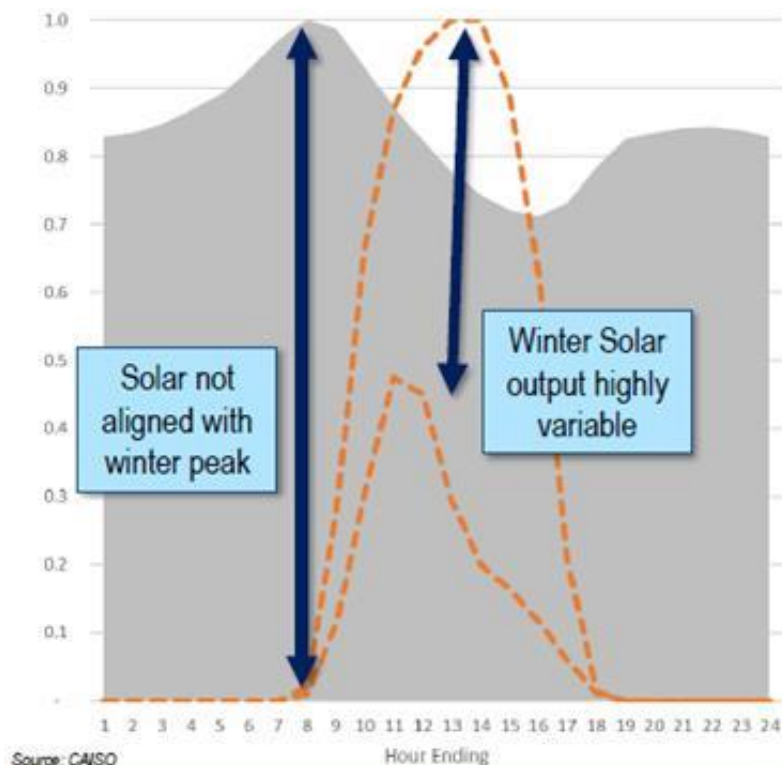


Source: Adapted from PJM by ICF.

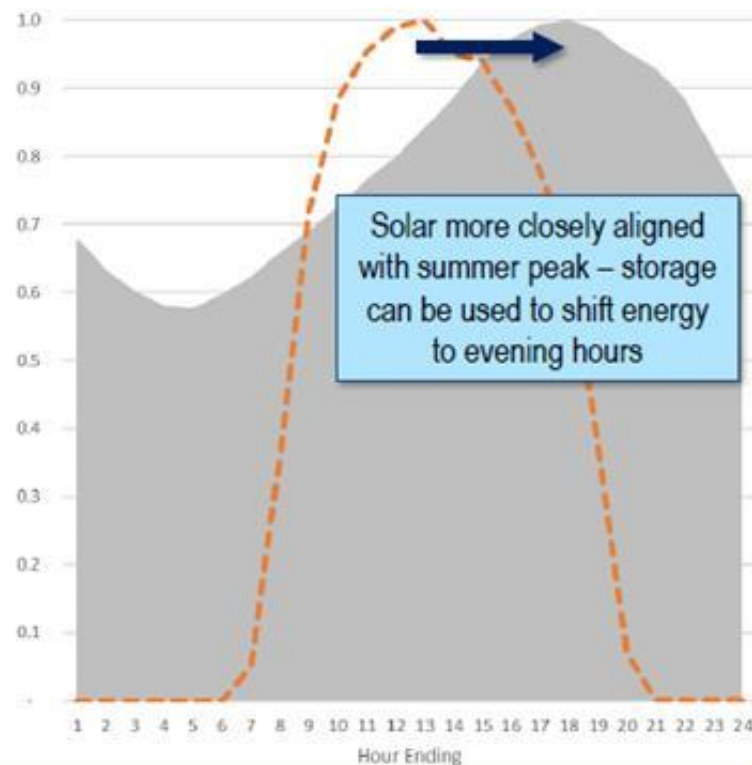
Carolinas' Require a Diverse Mix of Resources

--- Solar Generation ■ Load

Carolinas: winter peaking



California: summer peaking



**SOLAR + STORAGE INSUFFICIENT TO MEET WINTER PEAK IN THE CAROLINAS;
NATURAL GAS GENERATION NEEDED TO SUPPLY POWER ON COLD/DARK MORNINGS**

Pathways to 70% | Resource snapshot in year 70% achieved



Note 1: Gray blocks denote coal retirements , which are dependent on addition of resources shown

Note 2: Remaining coal planned to be retired by year end 2035.

Note 3: New Solar includes solar + storage, excludes projects related to pre-existing programs such as HB 589 and Green Source Advantage.

Note 4: Capacities as of beginning of the target year of 70% reduction.

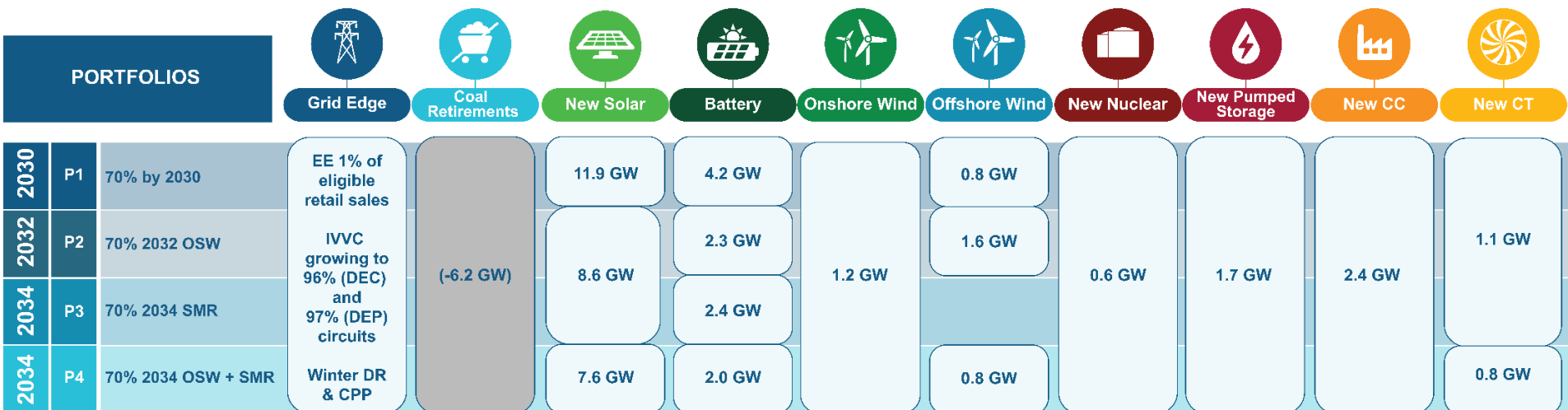
Note 5: IVVC = Integrated Volt/Var Control

Note 6: CPP = Critical Peak Pricing

Note 7: Battery includes batteries paired with solar.

All paths continue towards carbon neutrality, timing is key

Resource snapshot in 2035



Note 1: Gray blocks denote coal retirements, which are dependent on addition of resources shown

Note 2: Remaining coal planned to be retired by year end 2035.

Note 3: New Solar includes solar + storage, excludes projects related to pre-existing programs such as HB 589 and Green Source Advantage.

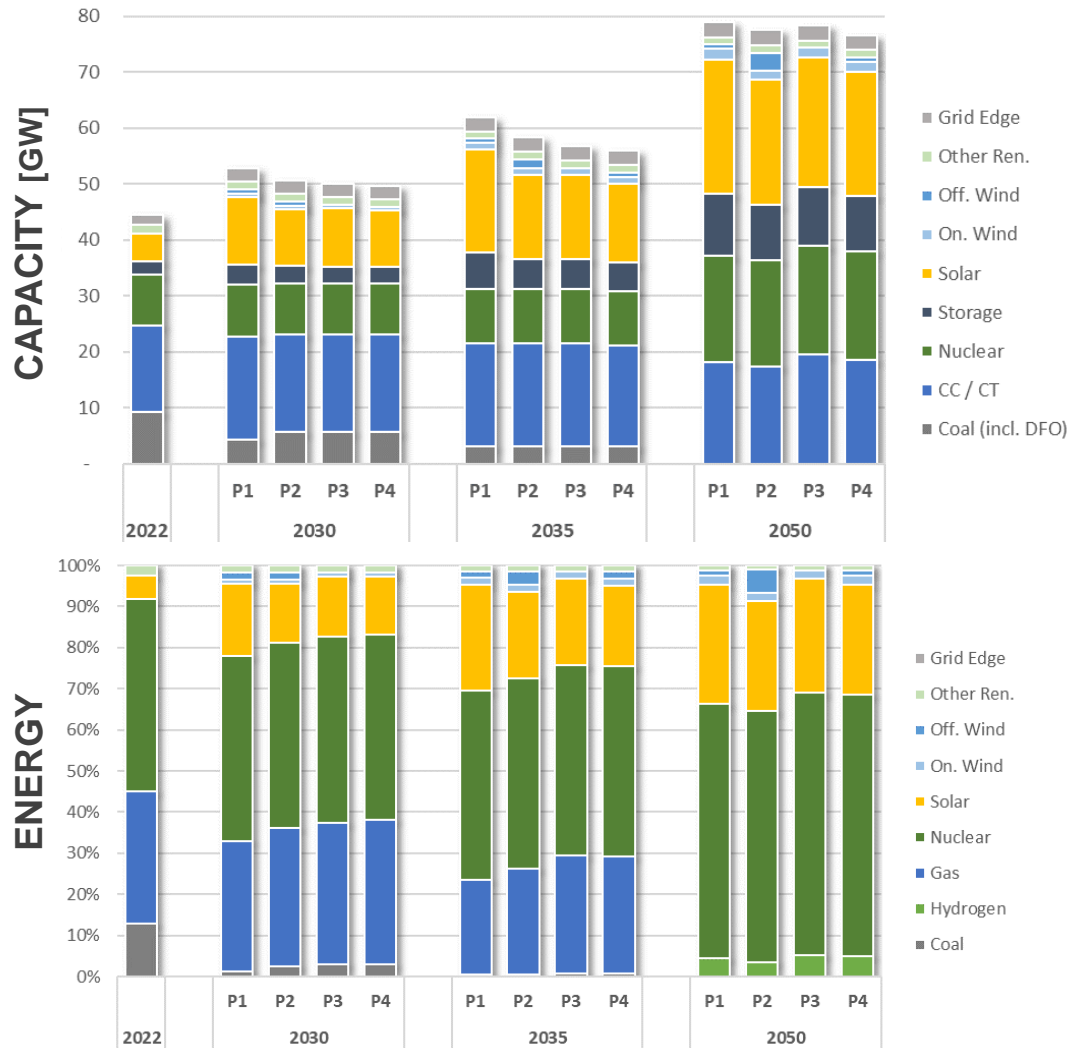
Note 4: Capacities as of beginning of 2035.

Note 5: IVVC = Integrated Volt/Var Control

Note 6: CPP = Critical Peak Pricing

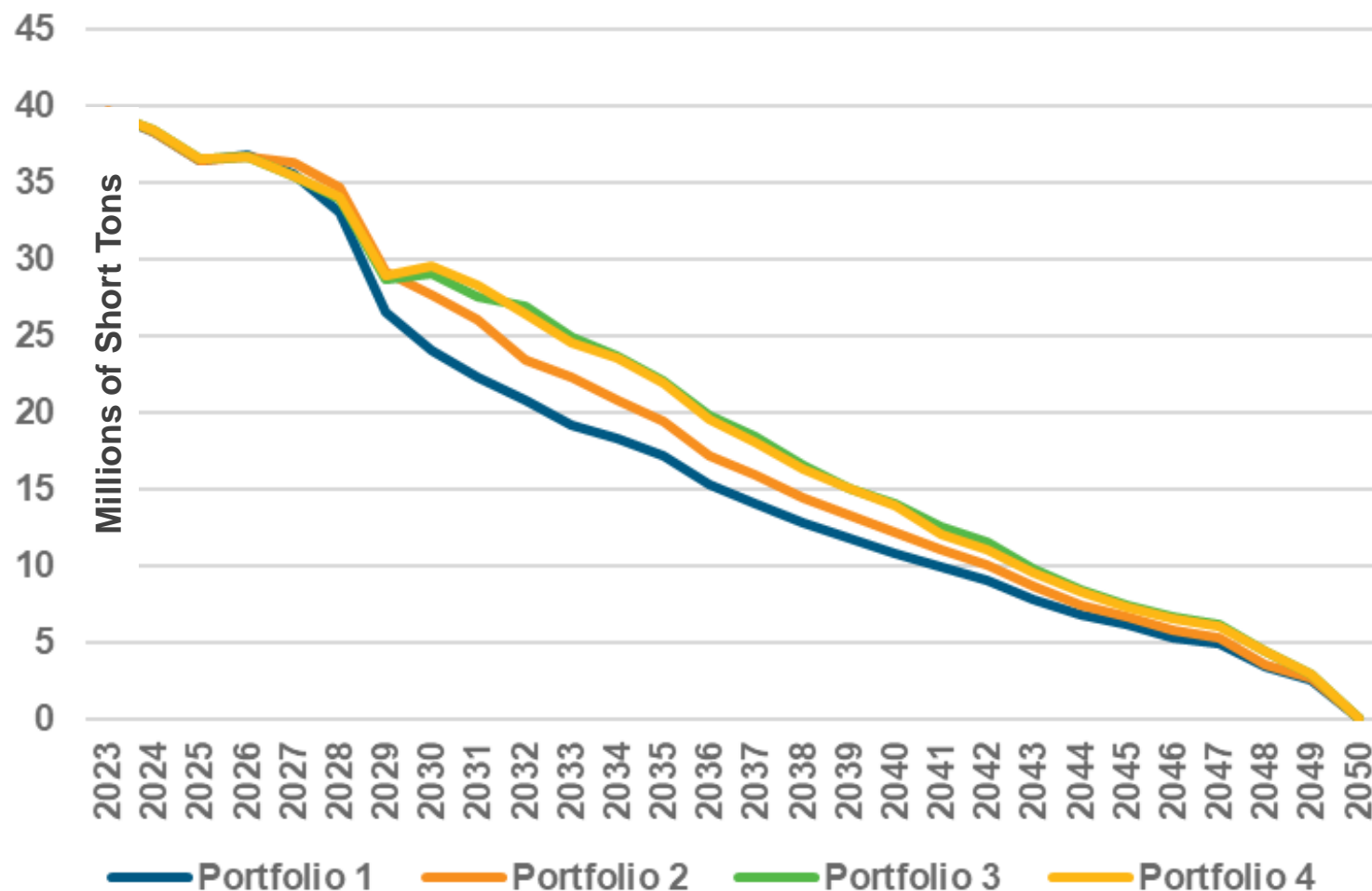
Note 7: Battery includes batteries paired with solar.

Capacity (Nameplate) and Energy Mixes by Portfolio



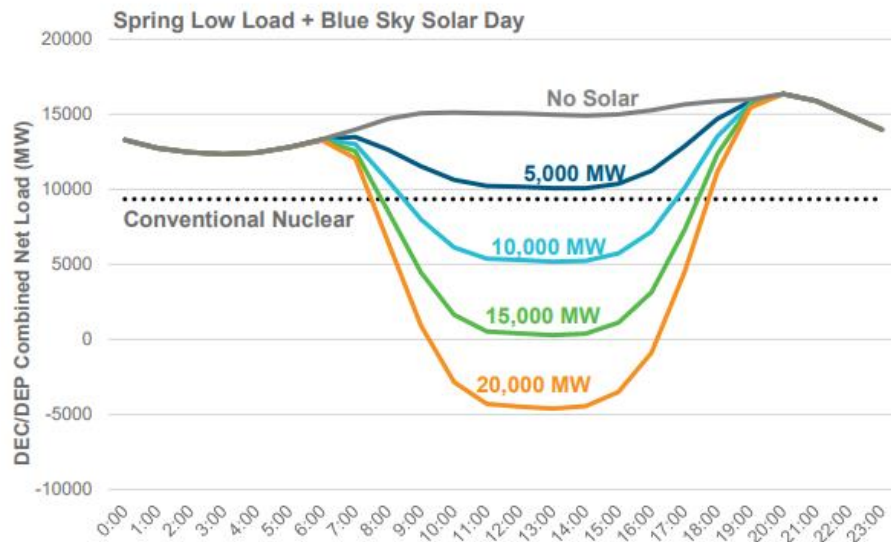
- Pace of energy transition in the near term is the key difference across portfolios
- Capacity and energy mixes converge as carbon neutrality is approached

Annual Carbon Emissions Through 2050 by Portfolio

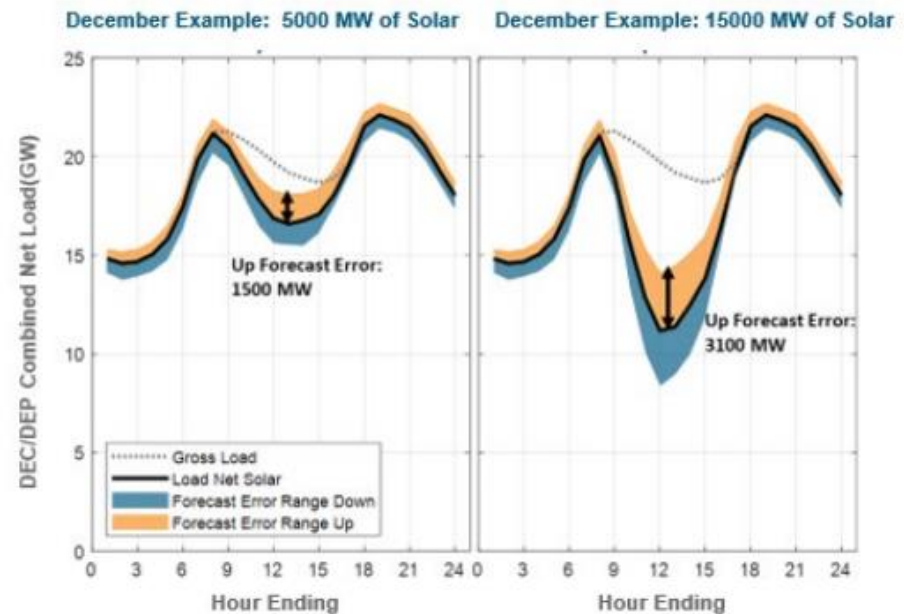


Changing Resource Mix Will Bring New Challenges

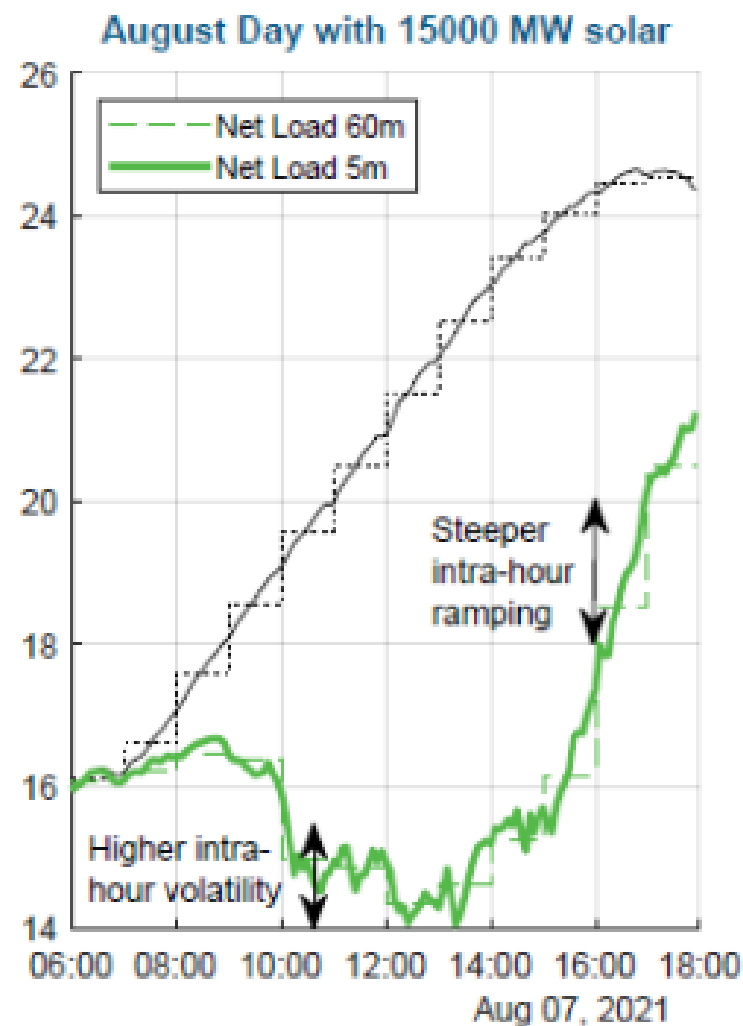
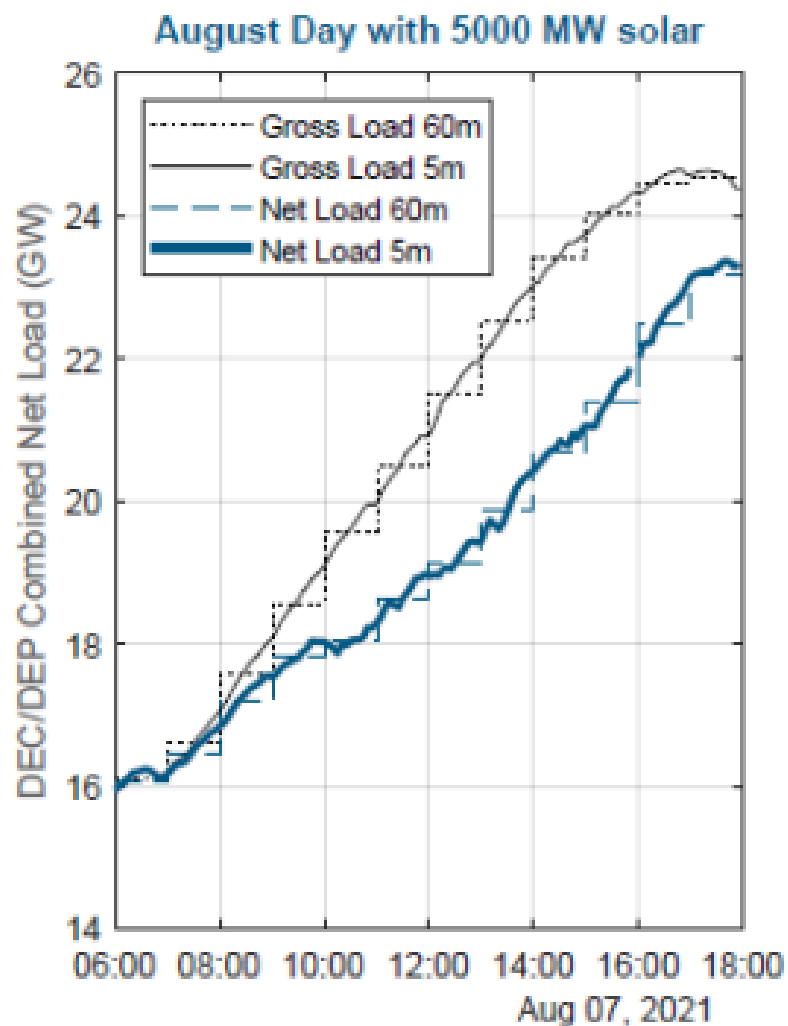
Spring / Fall Net Load Example



Forecast Uncertainty Example: December Day

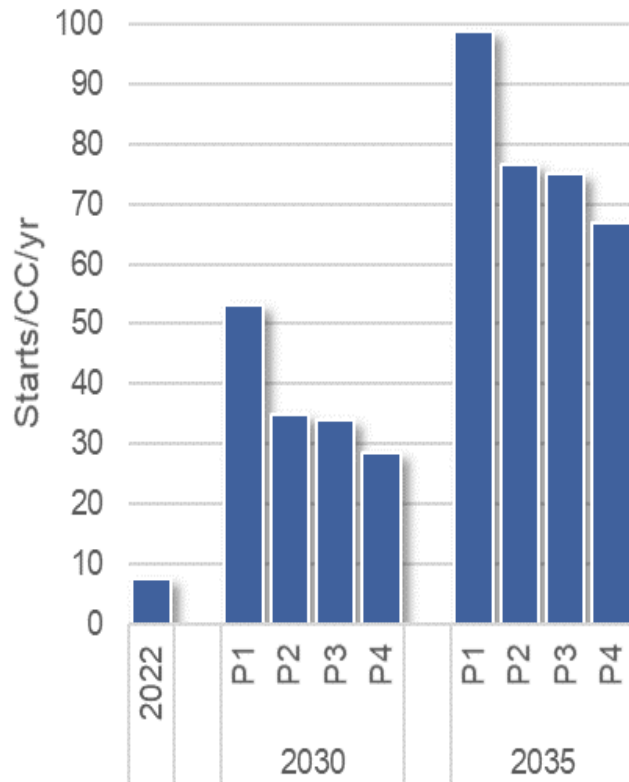


Example August Day Net Load Volatility

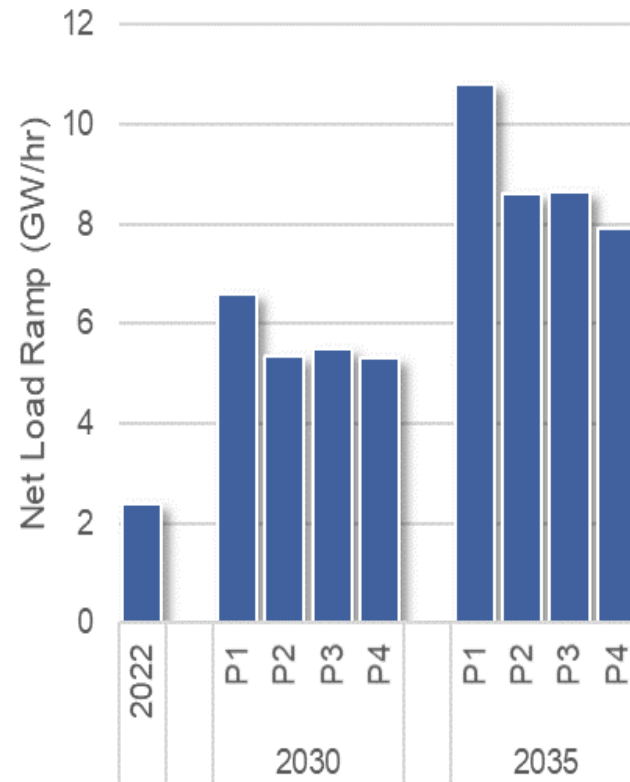


Forecasted CC Starts and Net Load Ramp by Portfolio

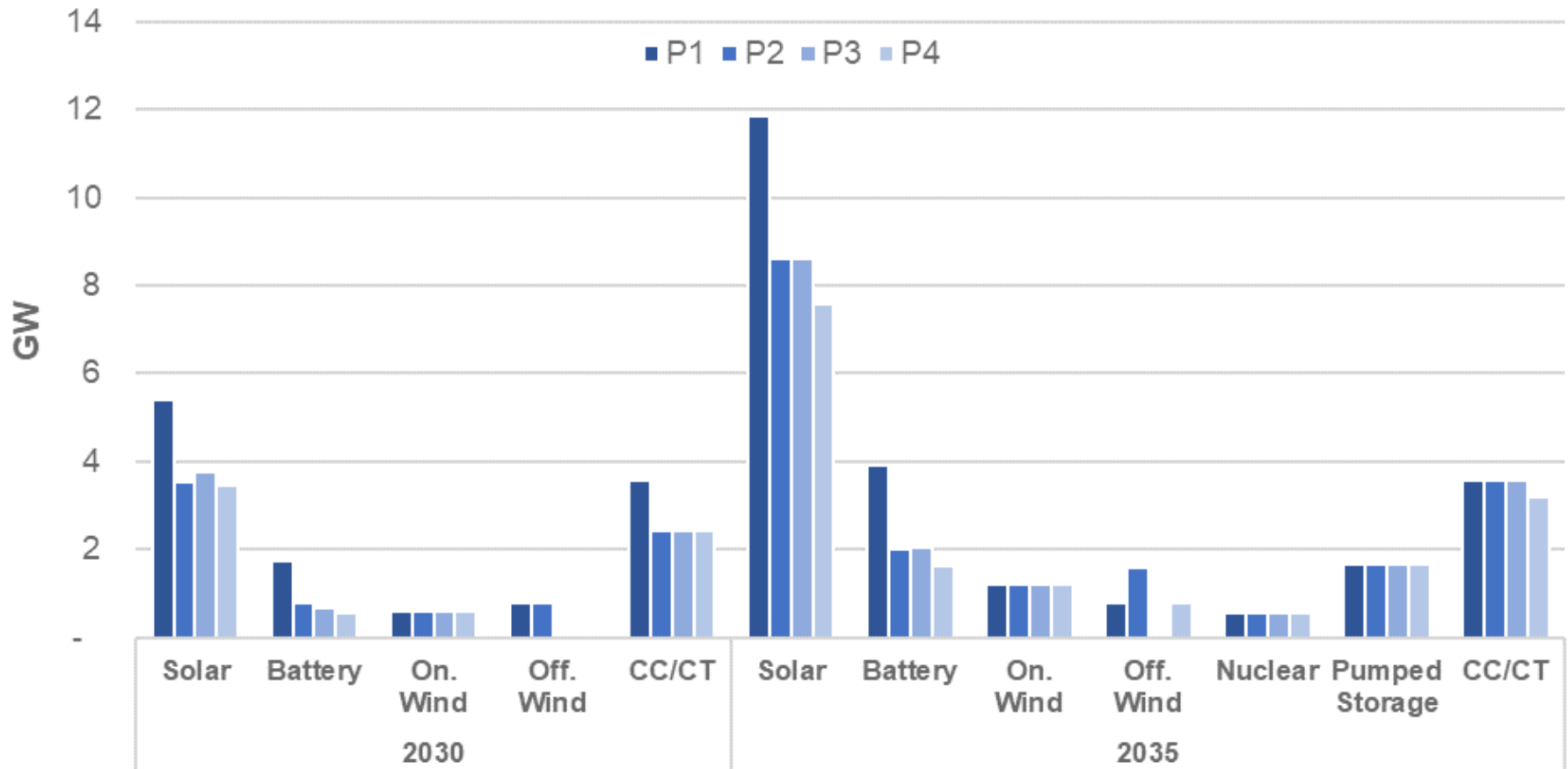
**Forecasted Average CC Starts per Year
(Weather Normal Load)**



**Forecasted Net Load Ramp (Avg. 95th Percentile
Day Over 41 Weather Years)**



Capacity Additions by 2030, 2035 (Combined Carolinas System)



Notes:

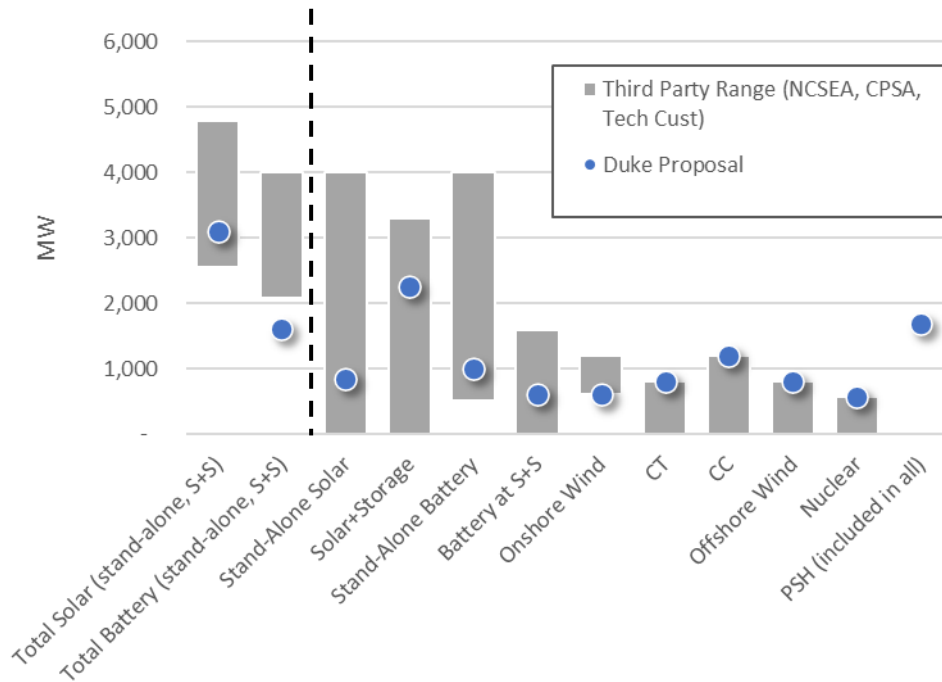
- Beginning-of-year basis
- Excludes projects currently under development
- Solar includes solar+storage; battery includes batteries paired with solar

Proposed Near-Term Actions Supporting All Carbon Plan Portfolios

Resource	Amount	Proposed Near-Term Actions
Proposed Resource Selections: In-Service Through 2029		
Carbon Plan Solar	3,100 MW	<ul style="list-style-type: none"> Begin development of required transmission projects Procure 3,100 MW of new solar by end of 2024 to be placed in service by start of 2029
Battery Storage	1,600 MW	<ul style="list-style-type: none"> Conduct development and begin procurement for 1,000 MW stand-alone storage and 600 MW storage paired with solar
Onshore Wind	600 MW	<ul style="list-style-type: none"> Engage wind development community Procure 600 MW by end of 2024 to be placed in service by start of 2030
New CT	800 MW	<ul style="list-style-type: none"> Submit CPCNs for 2 CTs totaling 800 MW in 2023
New CC	1,200 MW	<ul style="list-style-type: none"> Submit CPCN for first 1,200 MW CC in 2023 Evaluate options for additional gas generation based on pending determination of gas availability
Proposed Resource Development: Options for 70% Interim Target		
Offshore Wind	800 MW	<ul style="list-style-type: none"> Initiate development and permitting activities for 800 MW Conduct interconnection study Initiate preliminary routing, right-of-way acquisition for transmission
New Nuclear⁴	570 MW	<ul style="list-style-type: none"> Begin new nuclear early site permit (ESP) for one site Begin development activities for the first of two SMR units, both to be in service by end of 2034
Pumped Storage Hydro⁵	1,700	<ul style="list-style-type: none"> Conduct feasibility study, develop EPC strategy for 1,700 MW second powerhouse at Bad Creek to be placed in service in 2033 Continue development of FERC application for Bad Creek relicensing

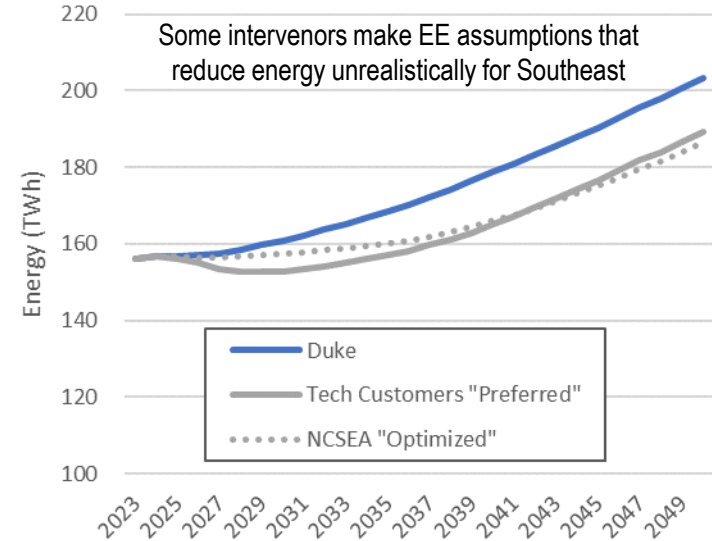
Summary of Duke and Intervenor Near-Term Action Proposals

Range of Proposed Near-Term Actions



Note: AGO recommends *at least* Duke renewables and storage numbers, objects to inclusion of new gas and nuclear resources in near-term actions

Net Load Forecast



Overview of Where We Are – Regulatory Timeline

