Grid Edge and Customer Programs

Highlights

- Duke Energy remains a national and regional leader in delivering energy savings for its customers. The Companies' energy efficiency programs delivered well over three times the annual savings of the national average for utilities to their customers.

- To achieve the amount of energy efficiency modeled in the Carolinas Resource Plan, in the near-term, the Companies will need to obtain regulatory approvals associated with (1) the addition of new programs and measures, (2) necessary modifications associated with the valuation of energy efficiency benefits and (3) longer-term, broader modifications to expand the number of customers participating in the Companies' energy efficiency programs.

- Although the Companies may offer a variety of innovative and creative Grid Edge Programs, the success of these programs and magnitude of the resulting energy savings ultimately depends on customers electing to participate. The Companies are actively reviewing funding opportunities from both the Inflation Reduction Act of 2022 and Infrastructure Investment and Jobs Act to identify potential opportunities to help their customers overcome financial barriers to invest in energy efficiency and demand-side management programs to drive down cost.

- Demand Response plays a key role in helping customers manage their energy costs and usage and in planning for a reliable and resilient energy future. Projected load growth, the retirement of load following resources and increasing penetration of solar generation bring urgency to the work.

- The Companies expect adoption of electric vehicles and behind-the-meter generation and storage to continue to grow and evolve, presenting both unprecedented opportunities and complex challenges to the utility sector.

Duke Energy Progress, LLC's ("DEP") and Duke Energy Carolinas, LLC's ("DEC" and, together with DEP, the "Companies") Grid Edge and customer programs are intended to provide customers with a variety of options to manage their electric use to both reduce monthly bills and provide value to the electric grid. The Grid Edge programs discussed in this Appendix include programs that mix customer offerings and utility technology programs designed to allow the management of the electric system (and shape overall energy loads) in ways that defer or eliminate the Companies' need to build additional peak operational generation resources as additional customers are added to the Carolinas electric system. To that end, Grid Edge programs can help to "shrink the challenge" of transitioning the electric systems to a cleaner energy future. Grid Edge refers to technologies, programs and investments that advance a decentralized, distributed and two-way grid. The "edge" refers to the edge of the electricity network, or grid, where the Companies' electricity reaches customers' homes and businesses. Grid Edge programs include energy efficiency ("EE") and demand-side management ("DSM") programs, certain rate designs, voltage control efforts, renewable energy programs, electric transportation programs and behind-the-meter generation and storage. These customer-owned energy-related technologies continue to develop and mature, providing customers the opportunity to leverage the value that adopting these technologies adds to the utility system.

The Grid Edge programs discussed herein fall into the following categories and will be further described in more detail in this Appendix.

Energy Efficiency Programs

The Companies' portfolio of EE programs encourages customers to reduce energy usage, which in turn can help these customers reduce their electricity bills. EE programs, such as the Residential Smart $aver® Appliance and Device program and others discussed later in more detail in this Appendix, offer proven, cost-effective means for reducing energy consumption from the grid.

Demand Response Programs

Demand Response ("DR") programs are already incentivizing Carolinas' customers to allow the Companies to reduce peak energy demand on the electric system when and where it's needed. Traditional DR programs have historically enabled the Companies to decrease their reliance on older, more expensive generation and spot market power purchases. The Companies plan to evolve their use of DR to both reduce peak load and to shape load in ways that help the Companies maximize their use of renewable and cleaner resources. To accomplish this, dynamic loads such as electric vehicles ("EVs") and customer-sited energy storage should be incorporated in the Companies' efforts.

Voltage Optimization (Conservation Voltage Reduction)

The Companies are utilizing systems designed to control distribution grid equipment and deploying new technology to optimize voltage, which results in reduced peak demand and energy usage. DEP currently utilizes the Distribution System Demand Response ("DSDR") program that focuses on reducing megawatts ("MW") at peak (peak shaving) and is developing another solution that focuses on continuous megawatt-hour ("MWh") reductions (energy savings). DEC uses systems that will

primarily support the reduction of MWh. Conservation Voltage Reduction ("CVR") technology allows the Companies to conserve energy at a circuit or system level.

Rate Design

Rate Design is a load shaping tool that uses time differentiated rates and other forms of dynamic pricing to encourage customers to change their load profiles. New rate designs may encourage behavioral changes to benefit customers and the system. Such pricing ideas consider the growth of new energy technologies such as EVs and behind-the-meter solar and storage, as well as existing loads that may be able to respond more easily to modernized pricing structures.

Electric Vehicles

A collection of rates, deployed assets and customer programs will be needed to support the significant growth in electric transportation in the Carolinas. Adoption simplification and managed charging strategies for residential, fleet and commercial customers vary, but each approach will leverage customer-focused design processes to remove barriers to adoption and combine usage monitoring with load control geared to help customers manage their costs and ensure readiness of the grid for electrification.

Behind-the-Meter Generation and Storage

Behind-the-meter generation generally refers to customer-sited resources, primarily solar and solar coupled with storage. Most of these resources are governed by net metering tariffs. The growth in behind-the-meter resources has been fostered in large part by legislative activities in the states, notably South Carolina Act 236 of 2014, South Carolina Act 62 of 2019, and North Carolina Session Law 2017-192. The customer-sited technologies will allow customers to use renewable energy to reduce their energy consumption from the grid and, if the customer chooses, could support peak demand reduction in conjunction with a DR program.

Clean Energy Customer Programs

The Companies' Clean Energy programs provide greater access to a renewable energy supply, primarily via solar generation, to offer additional partnering opportunities for customers. These programs have been designed to support large commercial and industrial customers, small-medium businesses and residential customers. These programs empower customers to support the reduction of carbon emissions from the Companies' electric systems by providing programs that facilitate customers' access to renewable energy, either directly, through financial incentives or through the sale of Renewable Energy Credit ("REC").

With respect to the North Carolina Utilities Commission ("NCUC")'s December 31, 2022 order on the Companies' resource plan, the Companies have continued to explore avenues to reduce customer load by implementing new EE/DSM Programs. For example, in the past eight months since the order, DEC obtained approval from the NCUC for a Residential Income-Qualified High Energy Use Program

Pilot, which helps income-qualified customers with high energy use receive much-needed home repairs and EE retrofits that will improve housing safety and reduce their electricity usage and overall costs.[1] The NCUC also approved DEP's Residential Income-Qualified EE and Weatherization Program[2], which works alongside North Carolina's Weatherization Assistance Program ("NCWAP") providers to allow them to use NCWAP funding to address health and safety issues that typically prevent EE measures from being installed in a home. As discussed in more detail below, the Companies have filed Smart $aver® retrofit programs at the NCUC that would use the tariff on-bill repayment offering that is currently pending. The Companies are also continuing to make progress in advancing EE/DSM programs in South Carolina as explained in this Appendix. The Companies' efforts to explore implementing EE and DSM programs for wholesale customers are discussed in Appendix G (Integrated System and Operations Planning).

Risks to Reaching Grid Edge and Customer Program Targets

The amount of annual EE (1% of eligible load) that is assumed to be achieved in the Carolinas Resource Plan ("the Resource Plan" or "the Plan") modeling represents a very ambitious target. Stated differently, the Companies' proposed Plan is built on a foundation that will require substantial advancement of EE in the Carolinas in unprecedented ways. This target reflects an aggressive long-term forecast of EE savings that is more than double the level assumed in the Companies' 2020 Integrated Resource Plans.

To achieve the amount of EE modeled in the Resource Plan, in the near-term the Companies will need to obtain regulatory approvals associated with (1) the addition of new programs and measures, (2) necessary modifications associated with the valuation of EE benefits and (3) longer-term, broader modifications to expand the number of customers participating in the Companies' EE programs. Ability to receive regulatory approvals from all required authorities and jurisdictions for proposed activities may impact progression towards the 1% of retail sales EE target.

In addition to obtaining timely and needed regulatory approvals, ultimately the Companies must overcome the significant barriers to customer participation in EE programs, such as inflation, supply chain shortages and potential economic downturns. Regarding DR programs, the Companies will continue to engage stakeholders to assess the incentives needed to encourage customers to reduce peak demand through rate design and programs to manage load, such as EV-related services, and obtain the appropriate regulatory approvals to encourage increased customer adoption and participation. Even with these incentives, however, DR programs can be inconvenient to customers; accordingly, some customers may not be willing to participate at any price. For certain grid improvement programs that will enable energy savings and integration of distributed energy resources ("DERs"), there are also supply chain risks associated with obtaining necessary supplies in the currently projected timeline. Material and equipment supply chain disruptions may lead to construction

[1] Order Approving Pilot, Docket No. E-7, Sub 1272, issued March 1, 2023.

[2] Order Approving Program, Docket No. E-2, Sub 1299, issued March 1, 2023.

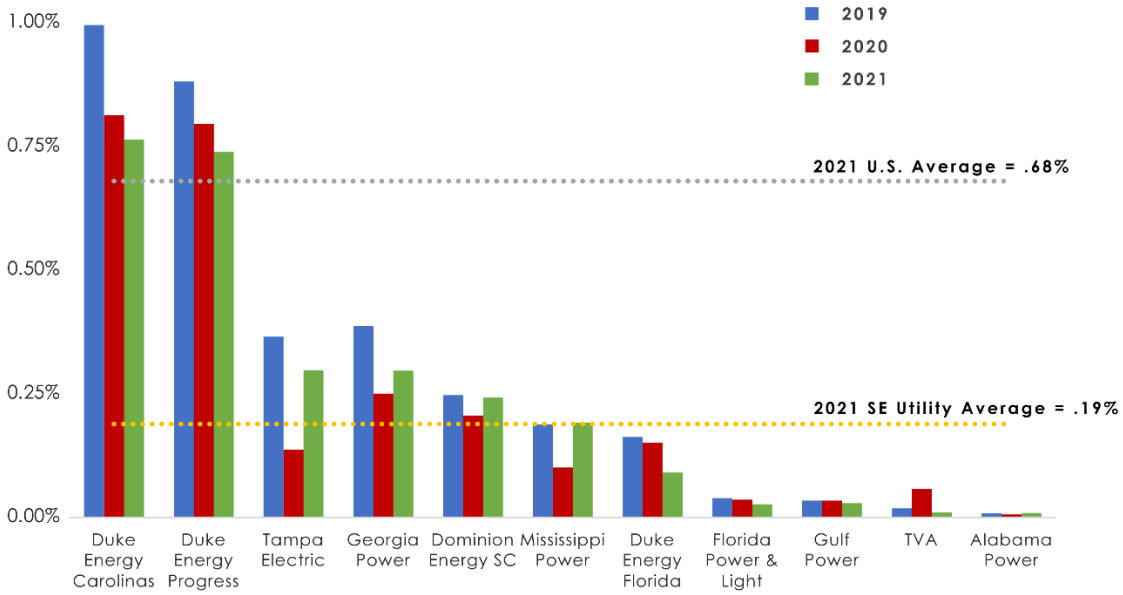
delays or inability to develop certain types of programs at the costs or amounts assumed in the modeling.

Energy Efficiency

A Changing Energy Landscape

For over a decade, the Companies have worked constructively with stakeholders to actively pursue and offer their customers innovative and cost-effective EE programs. This long-term commitment to EE has been possible in large part due to constructive regulatory models that appropriately align the Companies' incentives with customers' interests and promote achievement of energy savings in as cost-effective a manner as possible. These factors, along with Duke Energy's belief that EE programs are a key component of the electric utility service, led it to continue its long-standing trend of being both the regional and a national leader in EE. As detailed in Figure H-1 below, the Southern Alliance for Clean Energy's March 23, 2023 report on "Energy Efficiency in the Southeast" shows that the Companies' EE programs delivered well over three times the annual savings of the national average for utilities. While the annual savings achievement for the Companies' utilities has decreased from 2019 and 2020, that decrease has been driven by the change in lighting standards phasing out of A-line LED bulbs, as discussed in more detail below, and the unprecedented COVID-19 pandemic, which limited the Companies' ability to interact with customers and the customers' ability to undertake large efficiency upgrades.

Figure H-1: Efficiency Performance of Major Southeastern Utilities[3]



[3] Southern Alliance for Clean Energy, Energy Efficiency in the Southeast, Fifth Annual Report, March 2023, available at https://cleanenergy.org/wp-content/uploads/Energy-Efficiency-in-the-Southeast-Fifth-Annual-Report.pdf.

As the Companies entered 2023, the EE program management teams were optimistic the EE market would return to pre-pandemic levels. With COVID-19 restrictions and safety concerns of recent years lifted, staff was able to fully engage with customers to help them achieve their energy and sustainability goals. As technologies evolve, allowing for more innovative offerings, customers seeking to control their energy usage, lower peak demand and ultimately save on electric bills require more support from the Companies than before the pandemic. Fundamental changes to the market pose new challenges and opportunities for customers to adopt EE programs. The reality is that inflation and interest rates hinder many customers from seriously considering substantial investment in efficiency upgrades. Customers across all segments are facing more urgent challenges given current macroeconomic conditions. These economic challenges, however, may be mitigated through a combination of opportunities of Inflation Reduction Act of 2022 ("IRA") funds, utility program rebates, increased energy consulting and robust customer engagement, which will be critical to help move past these challenges and spur EE adoption.

Challenges to Expanding the Energy Efficiency Portfolio

Cost of Capital for Investments

Although capital remains available to most customers, inflation and the associated increased cost of capital has depressed market activity for EE investment. As discussed in greater detail below, for those residential customers struggling to find access to capital, the Companies' Tariffed On-Bill ("TOB") Repayment can provide capital at a reasonable cost and provide a repayment that is workable and affordable for customers. Higher interest rates make new construction and existing homes less affordable today than in previous years. Families and business owners are delaying investments in hopes of lower interest rates and a reduction in inflation in the future. Business customers in particular base these decisions on strategic priorities and a near-daily examination of how to allocate resources. Based on program management teams' experience in the market, the customer business focus has shifted away from operational growth, and more towards maintaining profits and boosting efficiency within their current facilities. These decisions have led to a decrease in EE and clean energy investment.

Standards Advancement

Advancements in EE equipment and appliance standards have generally paved the way for increased energy savings being realized in the Companies' load forecast, but they have also impacted the Companies' EE portfolios' savings because they have increased the marginal cost of new equipment and confused customers regarding both equipment choices and real benefits. Families and businesses at all income levels are being challenged by higher prices for most consumer goods and services needed for daily living or to run a sustainable business. Prioritizing energy upgrades and dedicating more resources to energy saving investment is an option most families and businesses cannot afford to make when the return on investment is not obvious or immediate. The many families and businesses that are delaying investments will look to repair existing older equipment when possible. Situations with an emergency or required equipment replacement present an opportunity to choose a high efficiency option or go with the lesser efficiency standard option, both of which are likely

an efficiency gain over the existing equipment. Cost and a lack of clarity, however, could steer customers to purchase the lesser efficiency standard option when they lack incentives and information to purchase the higher efficiency standard appliance.

One example of the consequences of higher energy standards on the Companies' EE offerings pertains to the changes in lighting standards. In the past, the Companies have offered residential lighting EE programs that gave participating customers the ability to make simple and inexpensive updates to their home by using utility incentives to offset the costs. The Energy Independence and Security Act changed lighting standards, which accelerated non-specialty LED lighting becoming the baseline standard. Residential EE programs that offer general service bulb technologies have consequently seen decreasing energy savings. In short, those changes in lighting standards have essentially eliminated most residential utility lighting programs that previously were key to generating awareness and education for customers trying to determine the right lighting solution for their home.

Regional heating, ventilation and air conditioning ("HVAC") standards changes have compounded the difficulties for businesses supporting the industry because manufacturers are still experiencing supply chain challenges caused by the pandemic. On January 1, 2023, new efficiency standards went into effect. Testing requirements have changed for the units with new ratings of Seasonal Energy Efficiency Rating ("SEER")2 and Heating Season Performance Factor ("HSPF")2. Under these new testing requirements, all split systems must meet a minimum efficiency of 14.3 SEER2 for both air conditioning and heat pumps and 7.5 HSPF2 for heat pumps. Packaged units must meet 13.4 SEER2 and 6.7 HSPF2. This change is confusing to customers as SEER2 and HSPF2 differ from prior efficiency standards, which was 14 SEER for both air conditioning and heat pumps and 8.2 HSPF for heat pumps. This confusion around the new applicable EE standards has compounded supply-chain issues because vendors must ensure new stock is compliant with the new standards. The Companies continue to work with their trade ally network and distributors to lessen the confusion and supply chain issues associated with HVAC standard changes. Overcoming these challenges is necessary because soon-to-be-available IRA rebates may be coordinated and coupled with utility-offered incentives, which will likely lead to more demand.

Workforce and Trade Ally Shortages

Across the Duke Energy vendor and trade ally networks, staffing recruitment and retention has been a great challenge. With gaps in contractor employment, trade allies are not able to commit to projects, and therefore customers may be unable to find contractors to install EE equipment. Less qualified workers and higher wages have caused a challenge for businesses to maintain expected profit margins and have caused many companies to sacrifice performance until the right workers can be trained. This is especially challenging when contracts for measure installation were executed before inflationary risks were considered. Employee loyalty has diminished as the tight labor market creates higher wages and more upward mobility for skilled workers. Constant turnover causes disruption in the programs and increases costs as management spends more time and resources training new employees. Additionally, some trade allies do not have the administrative support to complete the back-office paperwork and submit claims for EE rebates.

Availability of Eligible Equipment

Residential HVAC, electrical, windows, doors and heat pump water heaters are all experiencing significant price increases and/or supply chain delays which stretches project timelines and complicates worker scheduling efficiency. Due to limited availability of high-end commercial equipment, fewer installations have taken place or opportunities for efficiency are missed because standard efficiency equipment is more readily available to customers. For midstream programs, distributors that are unable to stock high efficiency equipment resort to selling standard efficiency, particularly in cases of emergency replacements. Commercial equipment distributors have reported lead times ranging from 25 to 50 weeks for direct expansion units and 25 weeks for water source heat pump systems.

Funding Opportunities and Challenges

The combination of IRA funds and EE utility program incentives will help customers overcome some of the economic barriers customers are facing in terms of inflation and rising interest rates. The Companies are actively reviewing both the IRA and the Infrastructure Investment and Jobs Act ("IIJA") to identify potential funding opportunities to help their customers in this regard. Stacking the incentives from all funding structures will make investing in EE more attractive and understandable for all customers, but the short-term challenge is developing clear, cogent customer guidance on all the IRA and IIJA resources available. Customers themselves may not be knowledgeable about how to access funds or determine the project specifications for which they are eligible. Most State Energy Offices ("SEOs") have not yet launched or even communicated the structure, resources and requirements to implement qualifying energy upgrades utilizing tax reductions or state-provided monetary incentives. Still, the Companies are actively engaging with the pertinent state and federal agencies to define the scope of the opportunities and outline the processes for application, and they intend to provide both digital tools and robust guidance to customers on how to access funds. Customers will benefit from the Companies' efforts to coordinate dedicated oversight, program management. and tools that clearly lay out the roadmap to access the available funding. While the Companies work to develop this roadmap, the United States Department of Energy ("DOE") and SEOs are finalizing eligibility criteria and the process for customers to apply for the incentives. More discussion on the IRA and IIJA is found below.

Contributions to the Resource Plan

The Companies' forecasting methodology around EE continues to treat it as a priority resource by considering its contribution as a load modifier. The 2023 EE forecast is based on an updated Market Potential Study performed by an independent third party and features three significant methodological updates.[4] First, the economic screening performed was based on the Utility Cost Test, consistent with the update to the Companies' EE/DSM Cost Recovery Mechanism that became effective in January 2022. Second, the third party utilized a more aggressive customer adoption methodology than before,

[4] The Carolinas EE/DSM Collaborative has been engaged in the development of the updated MPS through multiple meetings over the past 12 months.

in that it was based solely on measures providing a positive financial payback, instead of prior Duke Energy customer adoption of similar programs, which had been used before. Finally, the third party projected significantly higher customer adoption of EE measures that will be eligible for IRA rebates. The Companies' EE forecasts were then modeled in the base case applying an annual minimum or floor of 1% of eligible load (i.e., total retail sales less "opted out" customer load).[5] A high case applying a 1.5% of eligible load annual minimum or floor was also modeled as a sensitivity.

The Companies believe that the application of an assumed annual floor or minimum amount of EE, based on a percentage of eligible load, in the EE forecast utilized in the resource plan may be leading to overly aggressive long-term EE forecasts. As discussed above, the "eligible load" associated with the Companies' EE forecast excludes the load associated with customers that cannot participate in utility-offered EE ("UEE") programs (non-residential customers that have opted out of participation in the Companies' UEE programs under North Carolina Gen. Stat. § 62-133.9(f) and NCUC Rule, or Public Service Commission of South Caroline ("PSCSC") order). A closer examination of the Companies' updated retail load forecasts shows that the increases in the load forecast are largely because of transportation electrification and new load from economic development. Additional detail can be found in Appendix D (Electric Load Forecast). Unfortunately, at the current time there is little opportunity for the Companies to find EE savings from these new loads, so including them in eligible load has the effect of creating a higher annual floor, which is effectively more than 1% or 1.5% because there are no known EE programs that would apply to this new load. For example, if the number of EVs forecasted to be adopted by 2030 has increased by 25%, that causes an increase of 500 MWh in the residential load forecast. Accordingly, the 2030 annual floor for EE will have increased by 5 MWh (1% of the incremental 500 MWh). Since there are not currently EE standards for EVs that would allow the Companies to promote high-efficiency EVs and deliver EE savings, the Companies will need to achieve those savings from existing electricity end uses or risk falling short of its forecast. While higher savings due to IRA rebates are anticipated over the next decade, those time-bound rebates will eventually end and cause the EE forecast to trail off down to the 1% of eligible sales threshold for the remaining time-horizon. For this reason, the Companies believe that in future resource planning, the Companies should adjust eligible load to remove sources of load growth like electrification of transportation and economic development-related load to ensure that the utilization of an annual minimum EE savings assumption does not create an unrealistic and unattainable long-term forecast of EE savings.

[5] "Opted out" customer load refers to the load corresponding with industrial and large commercial customers who can "opt out" of participation in the EE/DSM rider under N.C. Gen. Stat. § 62-133.9(g) and Commission Rule R8-68(d).

Figure H-2: Annual Energy Efficiency Savings 2023 Forecasts – DEP

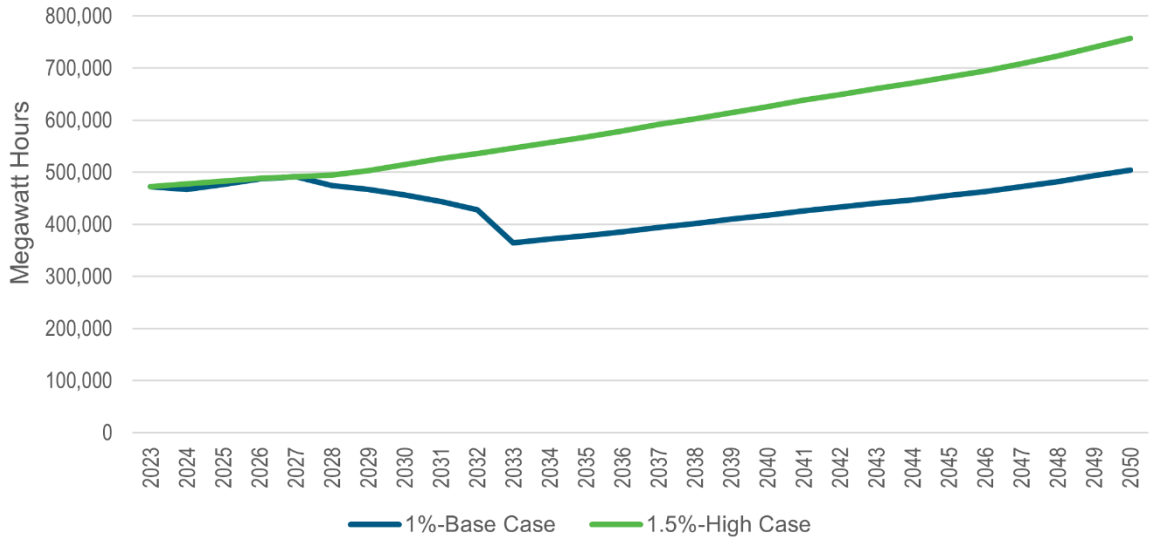


Figure H-3: Annual Energy Efficiency Savings 2023 Forecasts – DEC

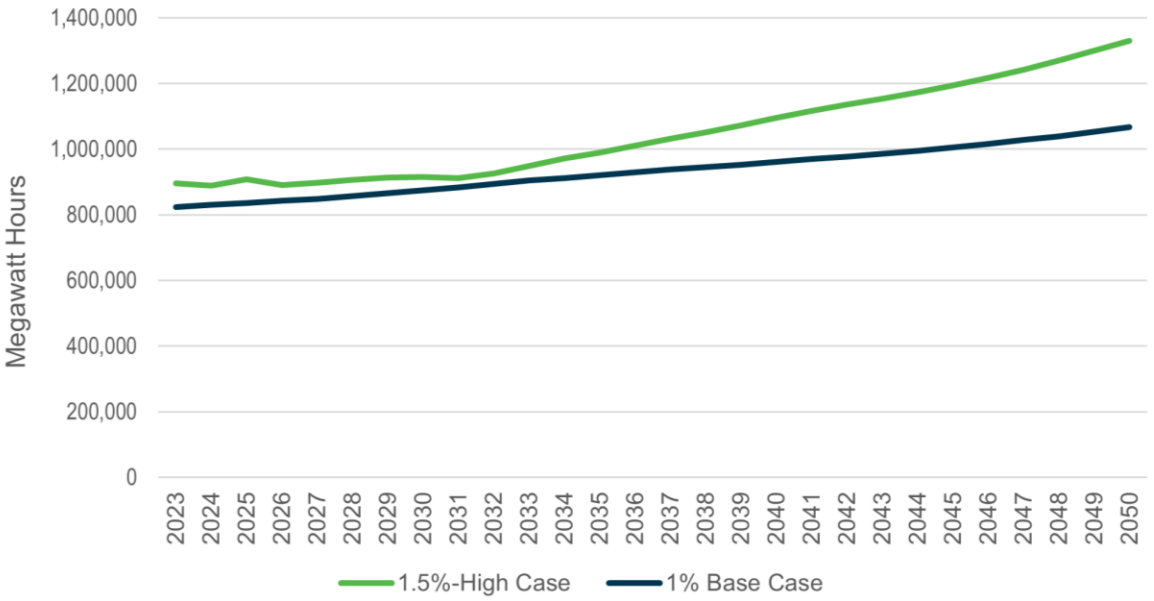


Figure H-2 and Figure H-3 above illustrate the forecasted annual UEE savings included in the Resource Plan. Over the 28-year period, the annual savings achieved through DEP's UEE programs are projected to reduce system load by over 12,405 Gigawatt-hours ("GWh") under the base case assumption leveraging a 1% of eligible load annual minimum assumption, and 16,600 GWh under the high case sensitivity assumption leveraging a 1.5% of eligible load annual minimum assumption. Similarly, the annual savings achieved through DEC's utility EE programs are projected to reduce system loads by over 26,150 GWh under the base case assumption leveraging a 1% of eligible load

annual minimum assumption, and over 29,350 GWh under the high case sensitivity assumption leveraging a 1.5% of eligible load annual minimum assumption.

Figure H-4: Comparison of 2023 Base Case Annual Energy Efficiency Savings with 2022 Base Case Annual Energy Efficiency Savings – DEP

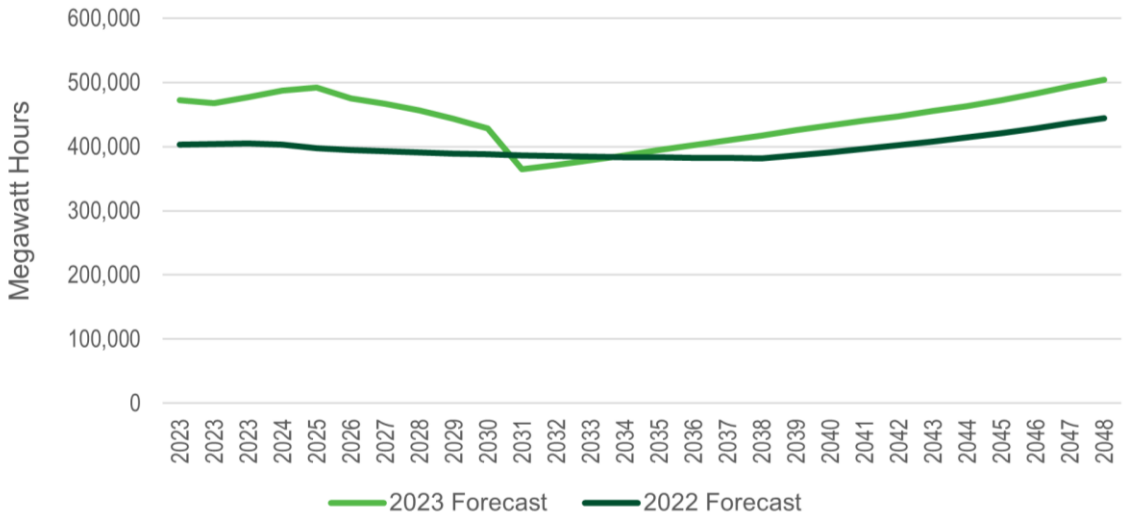


Figure H-5: Comparison of 2023 Base Case Annual Energy Efficiency Savings with 2022 Base Case Annual Energy Efficiency Savings – DEC

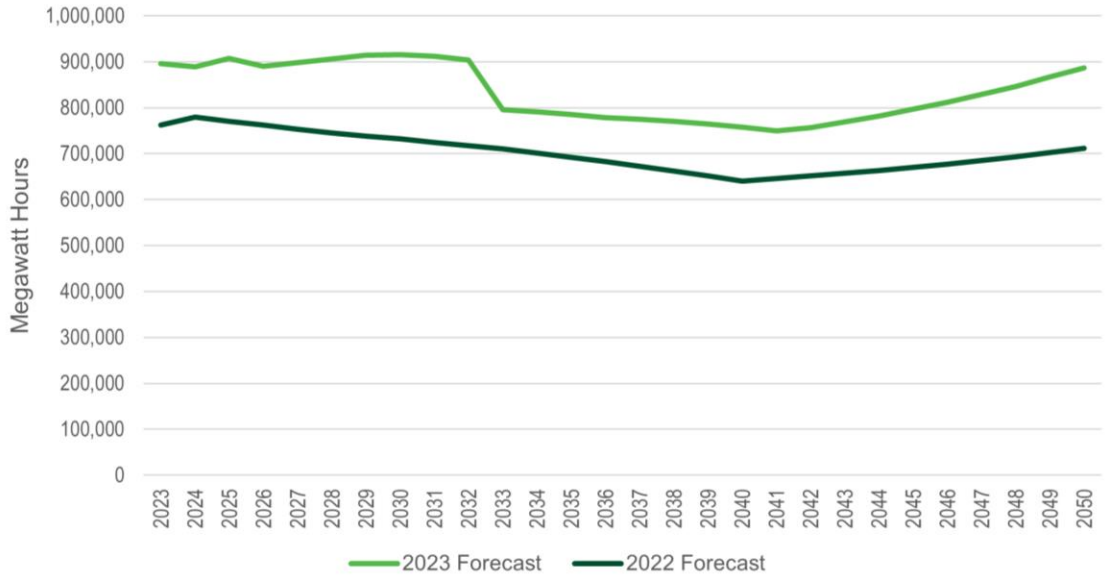


Figure H-4 and Figure H-5 above compare the annual forecasted UEE savings in the 1% of eligible sales minimum base case forecasts from 2022 to 2023 for DEP and DEC, respectively. Over the 28-year period, the forecasted amount of annual energy efficiency saving has increased by over 11.1%

for DEP and over 18.7% for DEC between the 2022 and 2023 forecasts. The annual forecasted savings show significant increases in the first ten years reflecting the availability of IRA rebates in coordination with utility programs.

Figure H-6: Comparison of 2023 High Case Sensitivity of Annual Energy Efficiency Savings with 2022 High Case Sensitivity of Annual Energy Efficiency Savings – DEP

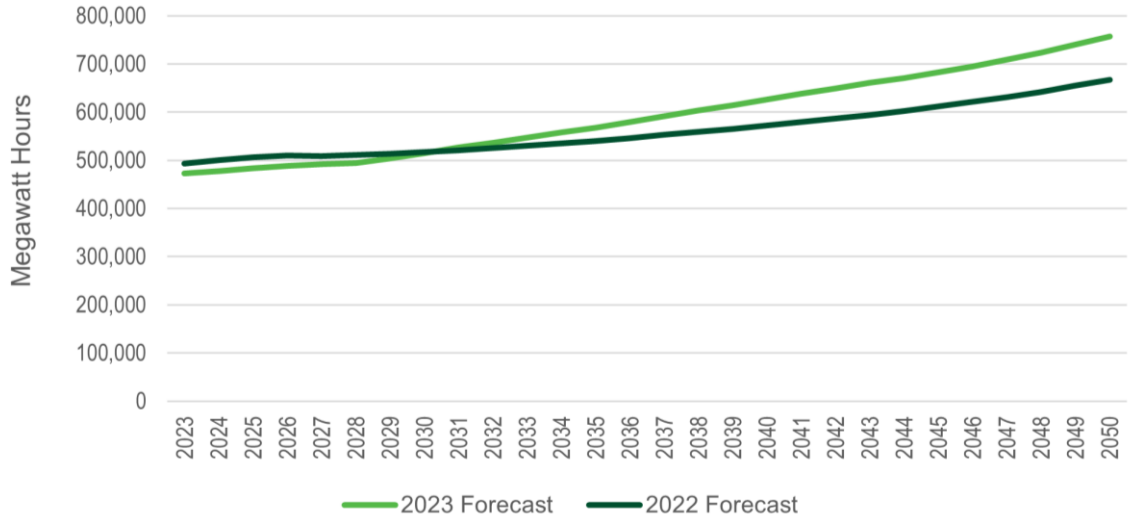


Figure H-7: Comparison of 2023 High Case Sensitivity of Annual Energy Efficiency Savings with 2022 High Case Sensitivity of Annual Energy Efficiency Savings – DEC

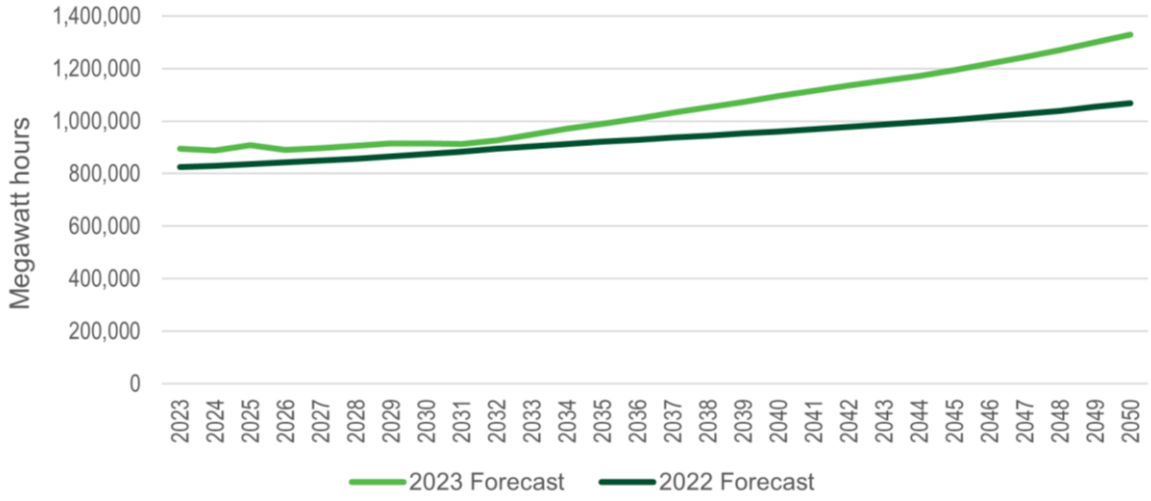


Figure H-6 and Figure H-7 above compare the annual forecasted UEE savings in the 1.5% of eligible sales minimum base case forecasts from 2022 to 2023 for DEP and DEC, respectively. Over the 28-year period, the forecasted amount of annual EE saving has increased by over 5.7% for DEP and over 12.2% for DEC between the 2022 and 2023 forecasts.

Enablers

When the Companies developed their aggressive long-term EE forecast of annual savings of at least 1% of eligible sales, they identified several enablers necessary to achieve the targeted level of savings over a 25-plus year horizon. The Companies have taken multiple actions and received regulatory orders relevant to a number of these strategic ideas. Approval of the enablers will allow the Companies to move forward in expanding their EE and DSM programs and pilots with clarity and certainty on how their costs and energy savings will be calculated.

Inclusion of Enablers in EE/DSM Cost Recovery Mechanisms in Docket Nos. E-7, Sub 1032 and E-2, Sub 931

On April 27, 2023, the Companies filed a letter at the NCUC to initiate a review of the DEC and DEP EE/DSM cost recovery mechanisms in Docket Nos. E-7, Sub 1032 and E-2, Sub 931 to consider the inclusion of four specific potential enablers of more EE and DR impacts. This targeted review is intended to explore how DEC's and DEP's EE/DSM cost-recovery mechanisms (collectively, the "Mechanisms") should potentially be revised to accommodate and incorporate the four specific "enablers." Upon approval, these proposed enablers will allow the Companies to achieve greater load reduction through their EE/DSM programs, resulting in more potential for customers to save energy and manage their electric utility bills. These enablers include:

- Updating the inputs underlying the determination of utility system benefits used in cost benefit tests in the Mechanisms,
- Using the as-found baseline for specific EE measures,
- Changing the definition of low-income customer.
- Developing guidelines for expedited regulatory approval of EE/DSM programs.

In connection with this review, an initial North Carolina stakeholder meeting was held on June 29, 2023, wherein the Companies shared proposed drafts to revise their respective EE/DSM Mechanism. Invited attendees included all parties to the North Carolina dockets associated with establishing existing EE/DSM Cost Recovery Mechanisms (Docket Nos. E-7, Sub 1032 and E-2, Sub 931) as well as the parties to the 2022 initial proposed Carbon Plan (Docket No. E-100, Sub 179). The Companies solicited stakeholder input on the proposals and are working to file the updated Mechanisms at the NCUC in time to allow for the necessary NCUC approvals to implement them by no later than January 1, 2024.

In South Carolina, the Companies have entered into agreements with numerous interested parties, including the Office of Regulatory Staff, Walmart, Nucor Steel, South Carolina Coastal Conservation League, the Southern Alliance for Clean Energy, the Natural Resources Defense Council and Sierra Club not to revise the Mechanism until 2026, though it is possible this could be revisited with the parties to accommodate changes that would benefit customers. The Settlement Agreements were filed December 4, 2020, in Docket Nos. 2015-163-E and 2013-298-E.

As Found Savings

One enabler included in the proposed revisions to the EE/DSM Mechanism is the recognition, in certain appropriate circumstances, of an "as found" baseline for calculating energy savings. Although the Companies have proposed to include this calculation in the Mechanism revisions for clarity purposes, the fact is that "as found" as a baseline for EE savings has already been used in the Companies' EE/DSM portfolios, depending upon the circumstances. Moreover, the Companies have discussed with the North Carolina Public Staff the necessity of indicating at the EE/DSM program approval state whether the Companies intend to use "as found" in their evaluation, measurement and verification of the proposed program. Finally, the pending Smart$aver® Early Replacement and Retrofit Program is a critical element component of the pending TOB repayment programs discussed herein that are currently pending before the NCUC. Therefore, the Companies have included it for discussion here.

In the past, the Companies' EE programs have provided incentives to customers to make investments in high-efficiency appliances and equipment that exceed the state and federal building codes and appliance standards. For example, the current HVAC Standard is SEER 15. This means the Companies' programs provide incentives for HVAC units that are SEER 16 or higher, and the energy and capacity savings associated with installing a SEER 16 are only calculated on the savings achieved versus the baseline SEER 15 unit, regardless of the SEER rating of the equipment replaced. This "traditional baseline" approach has raised challenges with the Companies' existing programs to be able to cost-effectively offer program incentives sufficient to encourage customers to replace measures before they fail. Customers are, therefore, often unwilling to install more efficient equipment when their current equipment is still working, although they may recognize that consuming less electricity could lower their energy bills sufficiently over time to justify the expenditure. This traditional baseline-based approach used by the Companies also has masked the actual energy and capacity savings that accrue to the utility system as a result of these early replacements encouraged by utility EE programs.

To support the needed recognition of the higher "as found" savings and to support the TOB Repayment Program, discussed below, which is intended to help customers undertake larger projects and replace working equipment, the Companies filed applications for approval of the Smart$aver® Early Replacement and Retrofit Program in North Carolina and South Carolina. Specifically, the Companies filed for approval of the Smart$aver® Early Replacement and Retrofit Program with the NCUC on September 27, 2022, in Docket Nos. E-7, Sub 1278 and E-2, Sub 1308, and with the PSCSC in Docket Nos. 2013-298-E and 2016-149-E on April 28, 2023. These applications are still pending before the NCUC and PSCSC. The proposed programs will assist the Companies' efforts to identify working, inefficient equipment eligible for Smart $aver® incentives and model the savings resulting from its replacement based on how it is found operating in the residence. Using the customers' billing history and advanced metering infrastructure data, the Companies can match higher energy savings with higher customer incentives, thus driving down initial costs. The Companies believe that with higher early replacement incentives, customers will find it more affordable to replace, rather than repair or maintain, inefficient equipment. The acceleration and recognition of higher energy savings associated

with customers electing to make early replacements and retrofits will lead to higher EE achievements and system savings.

Tariffed On-Bill Repayment Program

Another enabler to load reduction, which falls outside of the EE/DSM Mechanism, is the Companies' TOB Repayment Program. At the time the 2022 resource plan was filed in North Carolina, the Companies were working with stakeholders to develop an on-tariff repayment program to help remove barriers to customers accessing the upfront capital that is required to make EE-related investments. The passage of HB 951 had formalized the need for utilities to offer an on-bill repayment program supporting customer investment into EE/DSM technologies. Additionally, a TOB Working Group had been established as a result of a settlement in DEC's and DEP's previous general rate cases. On September 30, 2022, the Companies' filed proposed tariffs with the NCUC that, among other things, established an on-utility-bill program that had been developed in consultation with the TOB Working Group and that was informed by similar offerings by other utilities and cooperatives. In South Carolina, the PSCSC approved a settlement for DEP in May 2023 in Docket No. 2022-254-E by which DEP is required to propose for approval a TOB Pilot Program in South Carolina no later than December 31, 2023, which DEP is currently preparing.

The proposed TOB program that is currently pending at the NCUC will enable customers to invest in EE upgrades, such as high efficiency HVACs, air sealing and insulation, duct replacement and heat pump water heaters that will be repaid over time through a monthly service charge as part of the customer's monthly electric bill. The TOB program defines the obligation of the customer and utility, provides customer protections, and provides general requirements to ensure that both participants and non-participants benefit from making EE measures affordable. Several features of the TOB program are intended to increase energy savings and ensure that the costs of the program are appropriately assigned to the customers who benefit from the TOB. These features include: (1) a 12-month billing history to establish a baseline consumption for modeling projected savings, (2) maintenance and repair of the equipment is performed by the Companies, (3) the TOB tariff and a monthly service charge are tied to the meter at the premises, not to the individual customer, and (4) the TOB monthly service charge is part of the premises' electric bill and a failure to pay the charge could result in disconnection of electric service.

Stakeholders have generally supported the Companies' proposed tariffs. Consistent with the goals of an on-utility-bill repayment program, the proposal offers a great deal of potential in enabling the levels of EE included in the Companies' long-term resource plan.

PowerPair^{SM} Solar and Battery Installation Pilot Program

In April 2022 and in March 2023, the PSCSC and the NCUC, respectively, issued orders declining to approve the Companies' proposed Smart$aver® Solar Program. In its order declining to approve the proposed EE program offering to incentivize residential roof-top-solar, the NCUC instead ordered the Companies to file a solar paired with storage pilot that would provide a similar incentive per watt of installed solar capacity but would be recovered under the North Carolina Renewable Energy and Energy Efficiency Portfolio Standard. On June 21, 2023, in Docket Nos. E-2, Sub 1287 and E-7, Sub

1261, the Companies filed for NCUC approval of their proposed PowerPair[SM] Solar and Battery Installation Pilot Program ("Pilot Program") a residential pilot program designed to help customers through homeowner incentives to offset the cost of installing solar and battery system making the switch more affordable. The Companies have proposed the Pilot Program be effective January 1, 2024. The Pilot Program will evaluate the operational impacts to the electric system of behind-the-meter residential solar paired with storage, the cost-effectiveness of those impacts, and the role of residential solar paired with storage in meeting applicable carbon reduction requirements. The Companies filed the Pilot Program after garnering feedback from stakeholders, and the filing details how IRA and utility-offered rebates can cut the cost of the necessary solar panels and battery almost in half. The Pilot Program remains pending.

Maximizing Impact of Inflation Reduction Act Efficiency Incentives

As discussed earlier, the 2022 passage of the IRA can assist customers by driving down the costs of their investments in EE improvements. The IRA appropriated over $9 billion for residential EE and electrification financial assistance programs in the form of consumer rebates and funds for technical training. Almost half the funding ($4.3 billion) is in the form of award grants to SEOs to develop and implement Home Energy Performance-Based, Whole-House Rebates, also known as Homeowner Managing Energy Savings ("HOMES") Rebate Program. Additionally, the IRA provides $4.275 billion to SEOs and $225 million to Indian tribes to implement high-efficiency electric home rebate ("HEEHR") programs. While the funds have not yet been disbursed to the different SEOs, the DOE issued a Request for Information about how the funds should be disbursed and the Companies filed a response with DOE on March 2, 2023.

The availability of these IRA Rebates over the next ten years, which can be used in conjunction with the incentives offered through the Companies' EE programs, provide a significant opportunity to achieve higher savings. For this reason, and to build on potential synergies for the benefit of customers, the Companies have been actively developing strategies to become the "go to place" for customers to not only learn about and better understand the IRA Rebates available, but also to act as a potential point of assistance to apply for the IRA Rebates. The Companies plan to leverage the highly successful and broad-reaching My Home Energy Report ("MyHER") EE program to create customer awareness and engage with them around potential IRA incentives that can be coupled with the Companies' EE program incentives for the upgrades. The Companies also plan to leverage the Home Energy House Call ("Home Audit") Program to identify efficiency opportunities and perform the necessary modeling to determine the anticipated level of savings to determine incentive levels under HOMES.

Accelerating Bringing New Energy Efficiency/Demand-Side Management Technologies and Programs to Market

The Companies continue to see longer lead times to receiving regulatory approvals needed to implement new EE/DSM technologies, delivery channels and pilots into the market to help deliver energy and capacity saving that can be realized. The Companies believe that it has a designed a thoughtful and reasonable proposed modification to their Mechanisms to accelerate the piloting

process. The Companies believe creating an Efficiency Innovation Program, which would create an annual budget to accommodate a number of small-scale projects that do not require regulatory approval would help to get these new programs to market more quickly. The Companies will provide annual reporting on the projects funded within the Efficiency Innovation Program and would not seek lost revenues or utility incentives associated with the project until such time that the small-scale projects are filed and approved as part of an EE/DSM pilot or program.

Execution Plan

Most significantly, the Companies will continue to coordinate with SEOs to become customers' go-to resource to assist them in accessing their IRA funds and the complementary utility incentives to overcome the economic barriers they face in investing in EE measures. The Companies will continue to work with their EE/DSM Collaborative to expand and improve upon EE and DSM programs and make them more attractive and available for more customers — both residential and non-residential. The Companies continue to move forward to obtain approval and, once approved, implementation, of their pending programs and proposed revisions to the EE/DSM Cost Recovery Mechanism, which should aid in allowing for the Companies to offer additional cost-effective EE measures to customers.

Demand Response

A Changing Energy Landscape

DR plays a key role in helping customers manage their energy costs and usage, adding value to the grid and planning for a reliable and resilient energy future. The Companies plan to employ customer-sited resources as grid resources to meet peak needs, maximize renewable generation and minimize fuel cost volatility on a more frequent basis. The historic usage of DR to avoid building generation needed for a small quantity of peak hours per year continues and evolves. Small pilots of the newer use cases to reduce customer load to avoid generation starts intraday associated with cloud coverage or at sunset are currently occurring. Projected load growth, the retirement of load following resources and increasing penetration of solar generation bring urgency to the work. While in this high growth phase, maintaining DR as a cost-effective alternative to generation capacity need at peak times remains a critical priority. Understanding that increasing market penetration and different capability utilization may require increased incentive levels to attract customers, the Companies continue to investigate maintaining program cost-effectiveness through different programmatic options that will enable them to leverage the full potential utility system values that may be created by the programs.

DR's ability to provide the kind of load flexibility required for frequent load shaping is unproven in the Carolinas. HVAC DR, which has a high potential for customer discomfort, sometimes referred to as "friction," is the main tool for load flexibility today. Customers are likely to leave a program that inconveniences them too often. Duke Energy Florida's usage of water heaters provides a template for how the Carolinas could use low-friction customer sited-assets in the future. The Companies are taking advantage of federal funds to operate resources to shape load with two projects in North Carolina. Demonstrations of daily load optimization at a small number of other similarly sized utilities exist and are closely watched for learnings.

Critical components to high frequency load shaping are diversity of resources and control technologies, as well as scale. Similar to load following resources, a mix of DR appliances is needed to ensure coverage every day. Each load that can be controlled has a different load shape throughout the day and night and can vary seasonally; therefore, each load needs to be analyzed for its availability and positioned in the resource plan accordingly. For instance, residential EVs are unlikely to provide much load reduction on a winter morning at 7 a.m. because they would be charged overnight. Similarly, air conditioning load is not present on the grid when the temperature is mild.

Methods to control customer loads have increased with the confluence of more connected devices in the home and interest in using customer resources for the grid. Manufacturers see customer value and are partnering with device aggregators to make the customer resource available to utilities through their software platforms. This new model provides lower upfront cost than the Companies traditional approach to installing load control switches on devices, and they also typically offer the customer more control in controlled event participation. Customer choice may convince more customers to enroll in a DR program, but partial event participation is still a variable to be observed and understood. Offering customers a variety of options for load shaping increases curtailment use cases throughout the year and allows customers to provide load flexibility in the ways that suit them best. Additional appliance options will also bring more customers into DR programs. With the scale expected due to increasing controllable device penetration and more device types available to be controlled, program usage for an individual customer may be less frequent, helping to retain customers over time. The current plan reflects only Commission approved programs. As new programs are tested and proved viable, they will be filed with the Commissions and added to the resource plan. The Companies see great promise in EVs and customer-sited storage as grid assets, but customer willingness to share their capability with the community is still nascent.

Because the current plan only includes approved programs, the Companies are optimistic about the projected DR capability. There are many new appliances and products promising load curtailment opportunities coming to the market. The Companies are watching for commercial viability, testing and then adding them to the plan as the Companies believe they can be reliably controlled. Customer adoption of smart thermostats is the most important assumption in the current residential plan.

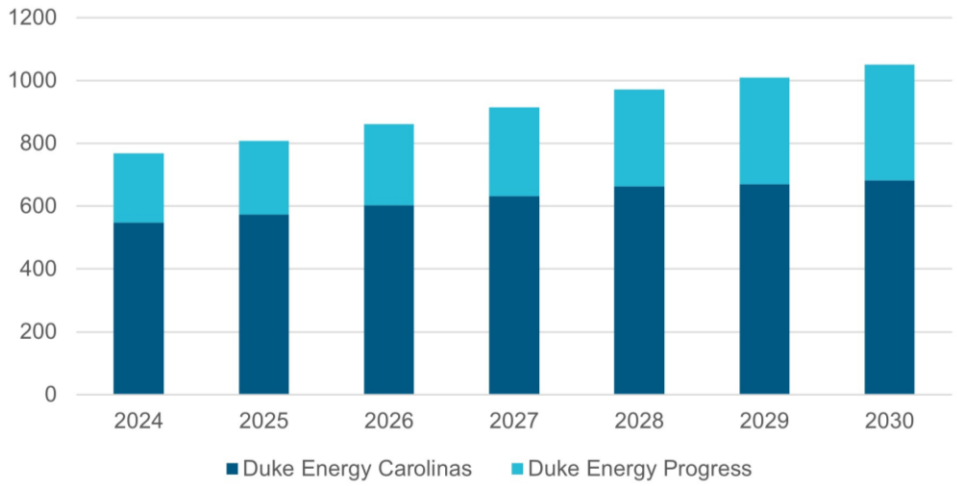
Contributions to Resource Plan

The Companies continue to project 1,050 MW of winter capability in 2030. Table H-1 and Figure H-8 below show DR winter capability as of May 1, 2023, and the updated growth targets through 2030. Please note these are Duke Energy-operated retail DR programs only.

Table H-1: Demand Response Capability as of May 2023

	DEC	DEP
Summer	1100 MW	665 MW
Winter	530 MW	223 MW

Figure H-8: Planned Winter Demand Response Capability



Enablers

The growth plan shown above in the Figure H-8, with the programs and technology available to the Companies today, is achievable. Specific policy actions would reduce the time to achieve the 2030 goal and perhaps significantly increase capability in 2030.

Earlier this year, a docket was opened in North Carolina to review actions identified in the initial 2022 proposed Carbon Plan that were important to achieving the goals. While these actions are being discussed in the context of increasing DR resources to enhance the contribution of Grid Edge and customer programs in the Companies' resource planning, they achieve system-wide benefits (for example, utility system savings based on new EE/DSM programs) and will therefore be deployed and are applicable to both North Carolina and South Carolina.

- **Building standards** – The Companies are watching for changes in building standards that may enable more connected appliances to be in service in future years. Connected appliances offer additional opportunities for load control at less upfront cost.

- **System value for summer resources** – The Companies are only actively seeking new enrollment in programs that offer winter capacity savings. With increasing penetration of solar generation and EVs, the 5 p.m. – 8 p.m. strain on centralized resources to begin production quickly may become a more important value to consider in determining cost effectiveness. A benefit of DR is its ability to slow the late day ramp up of load as residential customers return

home. Recruiting customers into thermostat programs is also complicated by customers not knowing if they heat with electric or gas. Targeting additional summer participation and potentially increasing the incentives for customers willing to provide DR capability during the entire year could benefit both the utility and customers.

- **Cost test flexibility** – Like many businesses, DR programs can be expensive to launch and may take five years to become cost effective and provide ratepayer benefits. Stretching the timeframe to achieve cost effectiveness could allow more programs to come to market. In addition, the measure life of a device can impact its cost effectiveness in that undervaluing it may keep it from being cost effective.

- **Pathways for large customers to participate with non-critical loads** – Large customer DR today is geared toward customers who can cease operations to participate in an emergency event. In the future, the Companies need more participation from customers who are willing to adjust non-critical loads for the benefit of balancing the grid. A new regulatory construct is needed to allow for this.

Execution Plan

The most important initiative on the DR team is growing winter peak capability, meeting customers where they are with the control type that is best suited for them. Initiatives include:

- **Residential thermostat load control program** – The largest driver of winter capability growth in the Resource Plan is thermostat control of electric heat. With the DR offer embedded in the set-up process of Wi-Fi enabled, or smart, thermostats, they provide an ideal enrollment path for customers. In addition, thermostat control is a more viable path for renters and multifamily dwellers than utility installed load control devices on HVAC. The Companies have embarked on several initiatives to grow the resource, but customers who already own a thermostat still face a multi-step process through the manufacturer's app to enroll. Initiatives to offer the program through outbound calling to customers who have purchased a thermostat from Duke Energy's online store and inbound callers to the call center have not been successful for this reason. Cooperation from manufacturers on allowing the Companies to enroll customers will be critical to achieving the thermostat program enrollment goals. As time varying rates increase in penetration, rate optimization scheduling is important and is an area of conversation with manufacturers. A newer concern being researched are the causes of disconnection and attrition, which are significantly higher than load control switch programs.

- **Residential heat strip direct load control switch program** – Winter Storm Elliot analysis shows that heat strips drove a significant portion of the peak load, with individual customer demand spiking when auxiliary heat strips were activated. A DEC program was filed in North Carolina and South Carolina in Q3 2022 which NC approved in Q4 2022, and SC approved in Q2 2023. DEP NC West has had a program for many years, and filings have been made in the other areas of DEP to allow for enrollments. Like any new initiative, there are early learnings that will be incorporated into future operation. For instance, many customers do not

know if they have auxiliary heat and because entering the home is necessary for this program it requires more customer coordination than air conditioning switch installation which is outdoors, not requiring customer interaction. This program is included in the Resource Plan modeling.

- I**ncome Qualified program** – A modification to the DR tariffs has been shared with the Companies' Carolinas EE/DSM Collaborative and is intended to be filed in Q3–Q4 of 2023 to allow switches and thermostats to be installed as part of Neighborhood Energy Saver participation. In addition, any customer who has participated in one of Duke Energy's income qualified programs in the previous two years will be eligible. Although Duke Energy owned load control switches are provided to every participant, those choosing to participate in the thermostat program use a thermostat they provide. For income qualified customers, Duke Energy will provide the thermostat and installation at no cost. Customers without Wi-Fi access will be connected with federal programs if they would like to acquire it. This program is included in the Resource Plan modeling.

- **Better integration with Energy Efficiency offers** – Similar to the Neighborhood Energy Saver program, DR programs are being incorporated as part of the electric heat customer experience within EE programs. For instance, when a Home Energy House Call customer is asked if they would like to purchase a thermostat, they are also told that there is an additional incentive to help pay for the thermostat if the customer enrolls in DR. Similar integrations exist or are being developed for Smart Saver, Residential, New Construction, the Online Savings Store, Retail Instant Savings and Multifamily programs. These initiatives are included in the Resource Plan modeling.

- **Behavioral Demand Response program** – Where mechanical DR communicates with an appliance at the customer's premise, Behavioral DR, communicates directly with the customer asking them to take steps at specific times to reduce load. These actions can add to the effect of mechanical DR and reach customers who are not already enrolled in DR. The MyHER program platform is being modified to allow for email and text messages pre and post events to communicate with customers in a pilot population in 2023 and 2024. The impacts for this program are accounted for in the EE modeling.

- **Behind-the-Meter Residential Storage program** – As discussed above, the NCUC denied the Companies' requests for a Smart Saver Solar Program; instead, the NCUC required the Companies to file a Solar Paired with Storage Pilot. In response, the Companies have filed the PowerPair℠ Pilot Program designed to help customers offset the cost of installing solar and battery system making the switch more affordable. The Pilot Program also provides an opportunity for a percentage of customers to enroll in DR for an additional incentive. The Pilot Program is a three-year program with 60 MW of capability and will likely be available in 2024. The Pilot Program is not included in the Companies' 2023 Resource Plan modeling because customer adoption is unclear. It is expected to be included in the Companies' next resource plan as more information is gathered about the program.

- **Small and Medium Business ("SMB") winter program** – Filed in Q3 2022 and approved by the NCUC in Q4 2022 and the PSCSC in Q1 2023, SMB customers have an option for winter load reduction payments. This is a Bring Your Own kW program that allows SMB customers, similar to large business customers, to reduce load in the manner best for them. It will be available for winter 2023-24 and is included in the Resource Plan modeling.

- **Water Heater program** – Installing switches for DR remains uneconomic; however, water heater manufacturers tell the Companies that they are selling more Wi-Fi connected water heaters. The Companies are considering tariffs that allow residential participation for any device which can be connected to a Duke Energy operated control system. This program is not included in the modeling as it is in the early stages of development.

- **EV Managed Charging** – Pilots and programs filed in the Carolinas, as well as other EV programs, are discussed in the EV section of this Appendix. There is no modeling for the programs in this Resource Plan. Future plans are expected to include any load controllable at winter peak.

- **Energy Orchestration** – Duke Energy is working on programs to optimize the value of Grid Edge assets for both the customer and the bulk electric system. Eventually, the Companies must develop and implement an operational strategy through the use of sophisticated software and control systems partnered with planning and operations teams to model, monitor and control customer sited resources. The Companies need to rapidly increase the visibility and scale of customer adoption by offering incentivized products and services with the ability to manage these resources to fulfill system capacity needs, support the reliability of the grid and meet regulatory commitments. Orchestrating demand is an important component of real-time grid management. To achieve this integration of Grid Edge DERs and customer-sited assets (i.e., thermostats, batteries, solar, EV managed charging, vehicle to grid) is vital. This will help Duke Energy support the optimization of renewable resources and grid infrastructure as part of an affordable, reliable and clean future.

- **Switch Customer Comfort** – In support of Energy Orchestration, DEC conducted two tests last year controlling HVAC through switches on significantly lower duty cycles than during peak shaving events — 15% versus 50%–66%. The Companies agree with North Carolina Public Staff that getting more load reduction on a yearly basis should be a goal. Historically customers have left the program when it is used more frequently which has caused it to be used sparingly. Determining levels at which switches can be utilized without customer attrition is critical to being able to use them more frequently. Two tests were conducted in September 2022 in DEC that saw no discernable attrition or customer call volume. A future tariff modification may allow for incremental hours of usage to gain more understanding of customer behaviors.

- **DEC Large Customer PowerShare Firm Load Reduction option** – PowerShare participants willing to commit to a specific quantity of hours to curtail load at the request of DEC, can earn an additional incentive. PowerShare today is an emergency only program which most customers do not want to see used. With this three-year pilot planned to be filed in Q3 2023,

the Companies hope to track avoided combustion turbine start expenses and avoided purchase power. This program does not represent incremental peak reduction capability since a requirement of the program will be PowerShare participation.

While much work is underway to increase DR capability, notably risks are at play as well. None of these are accounted for in the modeling.

Challenges to Expanding Demand Response Capability

- **IRA-Related Efficient Appliance Adoption** – DR participants who replace old electric heat pumps and water heaters with energy efficient appliances, including heat pump hot water heaters, will have less load to curtail. At scale, the contribution by those participants could reduce the amount of overall load reduction available to the Companies if enough new customers are not acquired. This is similar to the per customer reduction in summer load shed available as air conditioning units have improved in efficiency. Overall, the Companies encourage this adoption, but recognize how it impacts DR.

- **Time Varying Rates** – Customers who are incentivized, through lower bills, to use less electricity at peak times will likely have less load available to curtail. As an upside to this risk, the Companies plan to co-market Wi-Fi enabled thermostats to help customers manage their load during higher priced times and hopes to acquire more thermostat DR customers as a result. The Companies plan to begin marketing these rates in 2024. Future measurement and verification studies will evaluate the impact of these rate structures and technologies on-peak load contribution from DR programs.

- **Dependence on Third Parties** – Manufacturers of thermostats, EVs, home batteries and other Wi-Fi enabled devices will grow in importance to reliability as the residential DR capability increases. In the future, with energy orchestration, the Companies are going to rely on customer-sited resources as grid resources. If significant partners end their participation or significantly increase their costs with little notice, replacing that load flexibility may be costly.

- **Voltage Optimization** – In recent years, the Companies have improved its ability to lower customer demand through voltage reduction. In the future it will likely be used at peak when DR is also operating. The Companies are currently studying this and will include in modeling for the next resource plan.

- **Changes to the Large Customer Landscape**

    - Rates are being implemented in the next year that will change the peak periods. Many customers are time of use (“TOU”) rate participants. Their behavior changes should reduce peak and may impact the Companies’ peak load reduction capability due to having less load at peak to curtail or leaving the program due to the reduced incentive.

- Large customer load is a function of broader economic trends and how strong demand for their products are. Historically when the economy is in a downturn, large customers have less load on the system, resulting in less load to curtail.

- Much of the growth in large customer programs in recent years is cryptocurrency customers locating in DEC. If a reversal in the profitability of that business type occurs, and they close their businesses, load shed capability from those customers will decrease significantly.

Voltage Optimization

A Changing Energy Landscape

Voltage Optimization performed through a function called Integrated Volt-Var Control ("IVVC"), is the coordinated control of substation and power line equipment to manage voltage and power factor on distribution circuits. In DEP, by operating DSDR in peak shaving mode, operators may lower voltages on a circuit during times of high energy demand, delaying the need to deploy peak generation assets. Another operational mode, CVR, supports energy reduction on a year-round basis. CVR enables sustained voltage reduction during the 90% of hours not classified as peak, which ultimately reduces the amount of fuel required to meet customer demand. The devices installed to enable voltage optimization also to help to modernize the grid, improve voltage management to customers, while supporting the growth of DERs.

Beyond its ability to directly reduce generation needs, the grid will be enhanced to manage two-way power flow. Two-way power flow on a circuit can occur when solar and other DERs generate more power than is needed on the distribution circuit. Implementation of the IVVC program will help transition the grid to manage power flow as DER penetration increases.

Voltage optimization capabilities lead to:

1. Less peak load on the grid, which could result in a reduced need to build additional peaking generation assets.
2. Optimized control of Volt-VAR devices, improving the grid's ability to respond to dynamic system conditions, such as DER (solar) intermittency and EV charging, while delivering reduced distribution line losses.

Contributions to Resource Plan

A voltage reduction of 2% driven by CVR technology roughly equates to a 1.4% reduction in load for CVR-enabled circuits. Table H-2 and Table H-3 below show the MW resulting from peak shaving for both DEP and DEC through 2038.

Table H-2: DEP DSDR to IVVC Conversion: CVR MWh Reduction Forecast (90% of Hours)/ Peak Shaving MW Schedule (10% of Hours)

Year	DSDR to CVR Deployment (%)	Total Reduction (MWh)	Peak Shaving (MW)
2024	0%	CVR Not Applicable	145
2025	10%	39,478	146
2026	100%	398,335	148
2027	100%	401,920	149
2028	100%	405,537	150
2029	100%	409,187	151
2030	100%	412,870	152
2031	100%	416,586	155
2032	100%	420,335	156
2033	100%	424,118	157
2034	100%	427,935	159
2035	100%	431,668	161
2036	100%	438,133	163
2037	100%	444,127	165
2038	100%	451,111	167

Note : Energy reduction does not account for system losses upstream of distribution retail substations.

Table H-3: DEC IVVC: CVR MWh Reduction Forecast (90% of Hours)/Peak Shaving MW Schedule (10% of Hours)

Year	Energy Reduction (MWh)	Peak Shaving (MW)
2024	49,413	27
2025	233,707	129
2026	318,030	177
2027	336,844	190
2028	352,827	195
2029	356,003	197
2030	359,207	199
2031	362,440	201
2032	365,702	203
2033	369,096	204
2034	372,573	206
2035	379,049	210
2036	384,490	212
2037	389,983	215
2038	396,379	217

Enablers

To implement IVVC across the DEC footprint, DEC is deploying the needed devices in three phases. In contrast to DEC, DEP already has peak-shaving capability and is currently working to expand the capabilities of the existing DSDR equipment beyond peak shaving to support CVR. To implement IVVC across both DEC and DEP footprints in a manner consistent with the approaches further detailed in the execution plan section below, regulatory approvals have been and will be required throughout implementation process to enable the Companies voltage optimization efforts in the Carolinas. The following list summarizes ongoing and future regulatory activities to support and enable voltage optimization efforts in DEC and DEP.

- **DEC CVR Phase 1 –** Regulatory approval was received with the Grid Improvement Plan and this project is in-flight.
- **DEC CVR Phase 2/3 –** In North Carolina, this effort will be submitted with Multi-year Rate Plan ("MYRP") Q3 2023. In South Carolina, this effort will be submitted with Grid Improvement Plan Extension Q4 2023.
- **DEP CVR –** Regulatory approval was received with the Grid Improvement Plan and this project is in-flight.

Execution Plan

Today, the DSDR function provides peak shaving capabilities across the DEP footprint, allowing operators to reduce system peak when deemed necessary. DEC is systematically deploying assets to help support future voltage optimization. While DEC is designing IVVC to dynamically support the needed modes of either peak shaving or CVR, DEP DSDR solely provides peak shaving; however, using the Distribution Management System ("DMS") along with the deployment of targeted control devices sensor adjustments, DEP could equip the existing voltage optimization system with the CVR operating mode to reduce even more fuel consumption.

To fully implement IVVC across the DEC footprint, DEC is deploying the needed devices in three phases. The DEC IVVC Phase I scope accounts for approximately 67% of the total circuits (73% of eligible circuits) across DEC. This will enable voltage reduction capabilities for approximately 70% of DEC current base load.

The current plans for DEC IVVC Phase II include equipping an additional 17% of DEC's circuits with voltage reduction capabilities that will enable voltage reduction capabilities for an additional 10% of current base load. Lastly, Phase III will be implemented so that IVVC can achieve its maximum potential of successful installation across 96% of eligible circuits in the DEC service territory, representing approximately 82% of base load.

Table H-4 below highlights the percentage of all DEC circuits equipped with IVVC capabilities compared to the percent of IVVC eligible circuits and the approximate percent of total base load that the IVVC function will affect.

Table H-4: IVVC Deployment Phases (DEC)

IVVC Deployment Phases in DEC	% of All Circuits	% of Eligible Circuits	Approx % of Total Base Load
Phase 1	67%	73%	70%
Phase 2	16%	17%	10%
Phase 3	6%	6%	2%
Total	**89%**	**96%**	**82%**

To maximize operational flexibility and value, the future DMS can support additional operating modes, such as peak shaving capability and emergency modes of operation. When the phases of IVVC are deployed, DEC intends to operate in CVR mode approximately 90% of the hours in the year. Approximately 10% of the peak hours will be allocated to other IVVC operating modes.

The DEC CVR plan targets an estimated 2% voltage reduction. Through initial testing, DEC determined that it achieves this voltage reduction target when operating the system at an average CVR factor of 0.7.

In contrast to DEC, DEP already has peak-shaving capability thanks to the legacy DSDR program that achieved full functionality in July 2014 across 97% of eligible circuits. DEP is currently working to expand the capabilities of the existing DSDR equipment beyond peak shaving to support CVR.

The DSDR and CVR modes of operation will be implemented by the software within a centralized DMS. The original assumption was that a transition between operational modes was not possible. Based on updated assumptions, DEP does not expect that changing the predominant operational strategy from DSDR to CVR will reduce peak shaving capability available today. The new DMS in place today has the capability to transition between different modes of operation. Therefore, coming out of CVR would allow the system to return to a steady state that supports the current levels of peak shaving. Enhancements to the DMS and field devices will provide flexibility for both capacity and energy-saving capabilities while preserving options for efficient management of the grid.

Rate Design

A Changing Energy Landscape

Rate design modernization options present valuable opportunities for the Carolinas, including customers of all classes. Pricing and rate design seek to achieve multiple goals that must be carefully balanced. The Companies' rates must be structured so that they do not unreasonably discriminate under the law while at the same time encourage beneficial consumption patterns to improve system efficiency and keep costs low for all customers. Accordingly, rate design often involves complicated tradeoffs that involve both system dynamics and wide-ranging differences across customer classes and individual customers, particularly when considering varying levels of energy technology adoption.

Several factors create opportunities to enhance customer and system value from rate design, including:

- **Technology Support** – The Companies' investments in smart meters, data analytics capabilities and a new billing system enable more potential options for creative and tailored rate designs to match increasingly diverse customer expectations. Not only is data more available than ever before, but the Companies can now extract actionable insights and have the sophisticated tools necessary to implement improvements based on the findings.

- **Desire for Options** – Customers desire and expect more pricing options and more control over energy costs, as evidenced by the participation and comments in the recent year-long collaborative Comprehensive Rate Design Study which included the participation of over 50 stakeholders and organizations. As a result of that collaborative work, the Companies proposed new rate design options in their previous or ongoing general rate cases, and the Companies continue to engage informally with stakeholders on potential options.

- **Grid Dynamics** – The electric grid is becoming more complex and dynamic with the ongoing energy transition, and solutions must include both supply-side and demand-side considerations, including novel pricing approaches.

- **Distributed Energy Technology** – Customers are increasingly adopting distributed energy technologies, such as rooftop solar, advanced energy management systems and energy storage devices – including an expected increase in dual usage of storage for transportation and backup power. Such adoption is reducing the homogeneity across customer groups, which requires more sophisticated pricing to address issues of fairness and clarity.

Contributions to Resource Plan

New TOU periods and specific rate design elements such as Critical Peak Pricing ("CPP") includes callable events (typically limited to a specific number per year) with high price signals will together encourage customer load reduction during times of grid constraint to avoid the higher energy prices. Customers will be able to passively (with programmable or smart devices) or actively (through responding to called events) reduce loads during such grid constraint events, providing beneficial firm capacity reduction as seen below in Table H-5.

Table H-5: Price-Responsiveness from New Rate Designs

	DEP		DEC	
Year	Summer (MW)	Winter (MW)	Summer (MW)	Winter (MW)
2024	24	17	39	29
2025	38	29	62	50
2026	55	44	91	76
2027	76	62	125	107
2028	100	83	164	144
2029	126	106	206	108
2030	153	132	251	133
2031	180	158	296	160
2032	207	184	339	185
2033	231	207	378	210
2034	252	229	413	231
2035	270	247	441	249
2036	284	263	465	265
2037	296	275	484	277
2038	305	285	498	287

Enablers

The following list contains the key enablers needed for the Companies to successfully implement rate design modernization:

- PSCSC and NCUC approval of the Companies' proposed rate designs, including new TOU periods and new tariffs such as Hourly Pricing.
- Customer adoption and use of technology or behaviors to respond to price signals in a consistent and dependable manner.
- Company activities and communications to increase customer awareness of rates, opportunities to save and price-response strategies with savings estimates that are attractive and actionable by a large number of customers.

Execution Plan

The Companies have proposed, will propose, or recently received approval for modernized rate designs in its Carolinas service territories. The Companies are presently developing a strategy to engage and educate customers on the new designs and savings opportunities, starting with those customers most likely to adopt and/or provide benefits through price-responsive activities.

Electric Vehicles

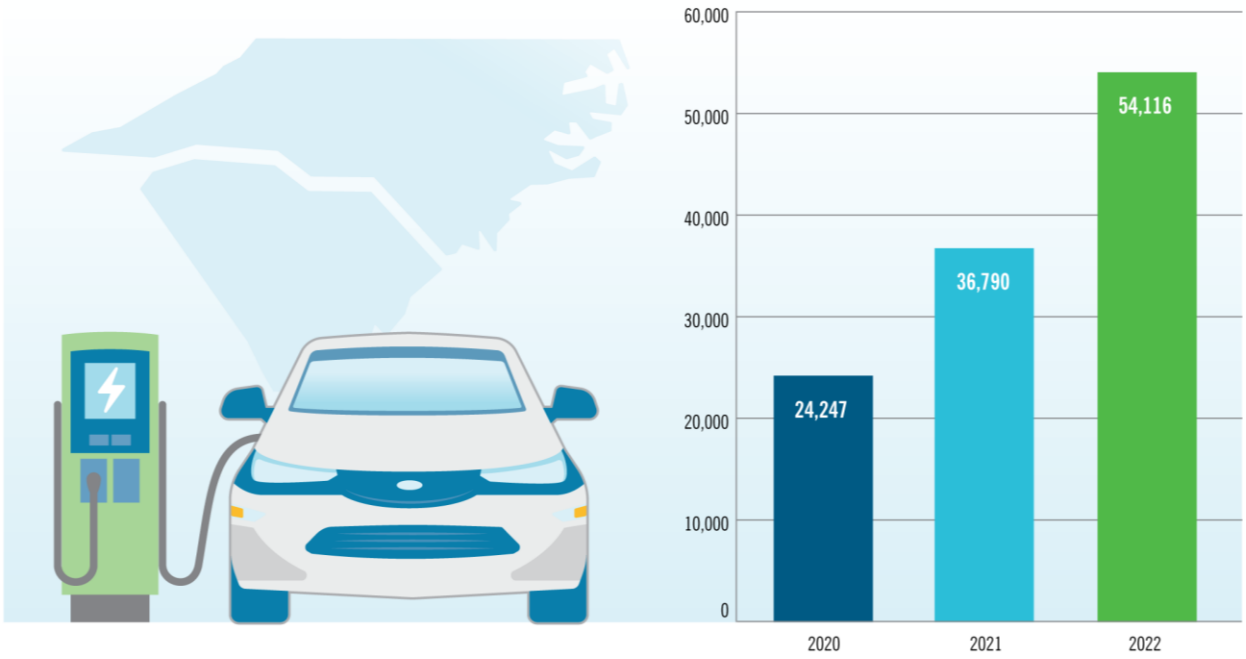
EVs present a set of challenges and opportunities for the utility sector that is both complex and, in some ways, unprecedented. While customers are just beginning to adopt EVs at any scale, federal funding and state policy across the Carolinas are increasingly calling for electrified transportation. The Companies are and will continue to support states and customers as they make the decision to transition to EVs. Programs that simplify adoption and processes that enable the proliferation of EV chargers that will be brought about by state and federal programs will be indispensable.

The load that EVs will add to the system comes with the opportunity to design rates and programs that shape EV charging behavior to not only increase the cost-effectiveness of the system, but also to align EV load with times of renewable generation and to inform effective system planning. To that end, utilities also have an obligation to serve, and the Companies are developing programs and new approaches to ensure the grid is ready for electric transportation. Electrification will create unique challenges — especially where localized electric commercial fleet clusters emerge. Moreover, with adoption expected to sharply increase in the coming years, the Carolinas have an opportunity in the here and now to adopt programs that engage the EV driving community while maintaining the flexibility to adjust as the adoption of a relatively nascent technology occurs at scale.

Adoption Trends – Historical

Electric transportation has arrived in the Carolinas. Not only have state governments signaled this with executive orders in both states, but adoption has also increased 50% year-on-year since 2020, leading to over 54,000 EVs on the road in the Companies' footprint as of the end of 2022. Figure H-9 below shows the number of EVs registered in the Carolinas from 2020 to 2022.

Figure H-9: Electric Vehicles Registered in the Carolinas



Active and Approved Programs

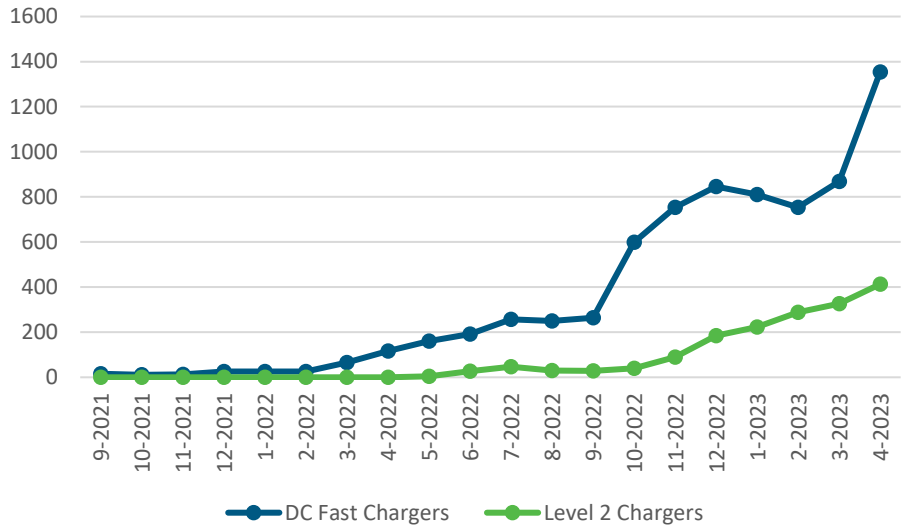
In addition to and in support of the policy directives from both states, the Companies have deployed programs and continue efforts in the Carolinas to support customers as they pursue EV adoption. This support reflects not only the direct link between the provision of electric service and EV charging, but also the Companies goal to enable customers that choose EVs and to ready the grid. Today, in alignment with the activities that are supported by federal funding, these efforts are transitioning from foundational infrastructure deployments to programs and rates that inform, simplify and increase adoption as well as begin the process of managing EV charging loads at scale.

Park & Plug

Referred to as "Public Charging Expansion" in the NCUC's orders in Docket Nos. E-2, Sub 1197 and E-7, Sub 1195 and as "Direct Current Fast Charging Station Program" in the PSCSC's orders in Docket Nos. 2018-321-E and 2018-322-E, the Companies' Park & Plug public charging program will complete deployment of 100 direct current ("DC") fast chargers, 160 Public Level 2 chargers, and 80 Level 2 chargers at multi-unit dwellings by the 4th quarter of 2023. These deployments are part of foundationally enabling infrastructure in the Carolinas, soon to be complemented by the near $180 million total Carolinas National Electric Vehicle Infrastructure ("NEVI") funding deployments and any successful awards from Charging & Fueling Infrastructure grants. The Park & Plug deployments are still in relatively early stages of public use, and utilization of the infrastructure is trending steadily upward.

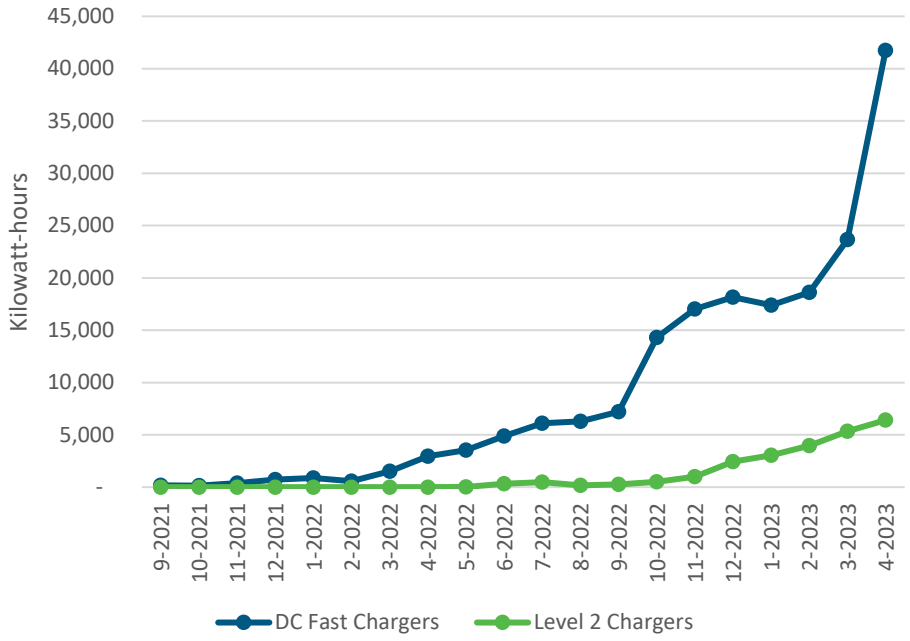
As shown below in Figure H-10, the number of charging "sessions" by EV drivers on the Companies' network has significant leaps in both mid-to-late 2022 as well as early 2023. This increase in charging sessions per month is particularly evident for Park & Plug program DC fast charging that is commonly leveraged for long distance travel and is a function of both more chargers going online as well as increasing utilization of individual chargers in the program. In turn, this increased utilization correlates well to the increasing adoption of EVs in the Carolinas.

Figure H-10: Carolinas Monthly Charging Sessions – Program to Date



Unsurprisingly, with the highest-powered chargers trending upward in utilization, the energy dispensed by the charging network has also trended sharply upward in recent months, reaching nearly 50,000 kilowatt-hours ("kWh") dispensed in April 2023. Assuming three and a half miles driven per kWh, the Park & Plug network alone — excluding private EV charging as well as the Carolinas' other valuable public networks — supported nearly 170,000 miles of electric travel in that single month. Figure H-11 below shows the monthly energy dispensed to date in the Carolinas.

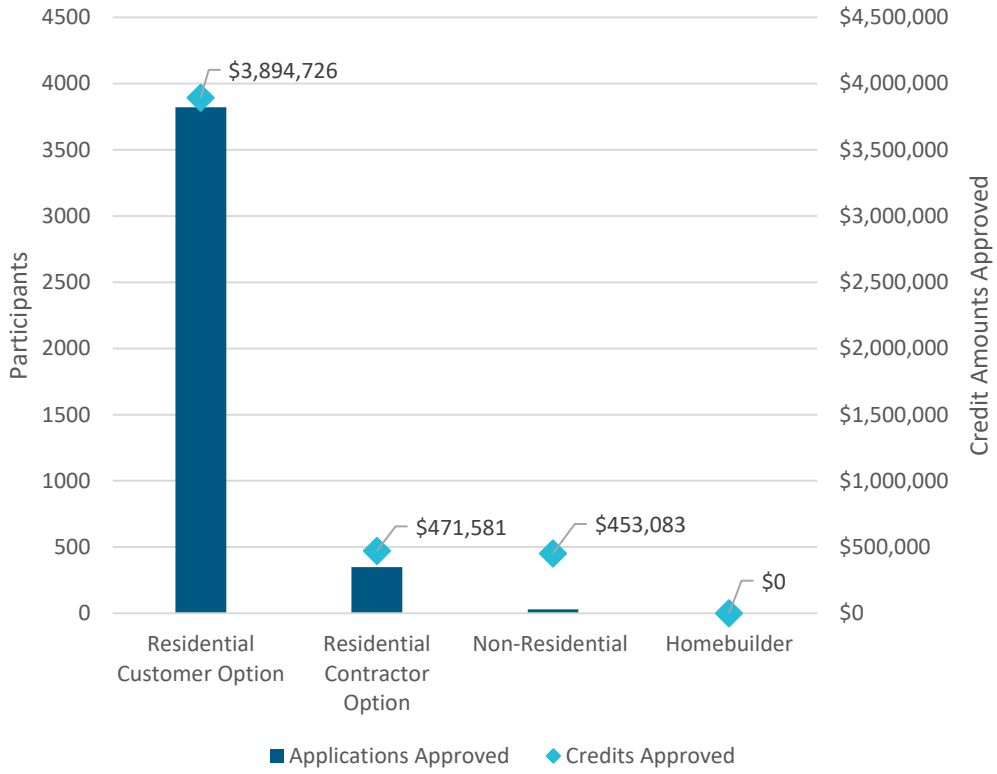
Figure H-11: Carolinas Monthly Energy Dispensed – Program to Date



Charger Prep Credit

Referred to as "Make Ready Credit" in NCUC Docket Nos. E-2, Sub 1197 and E-7, Sub 1195 and PSCSC Docket No. 2022-159-E, the Charger Prep Credit program simplifies EV adoption across a number of customer segments and use cases. The program provides not only capital funding based on anticipated revenue from future EV charging but also — where desired — a Companies-directed qualified contractor to install make ready infrastructure. The program, and the Companies-directed contractor option, in particular, provides an avenue for insight as customers install EV chargers, therefore allowing for better management of transformer loading and local grid reliability. To date, the program has been approved in North Carolina, where participation has been very strong among residential customers and is growing among non-residential customers. The program is pending approval in South Carolina. Figure H-12 below shows the number of participants in the program through June 2023 in North Carolina by customer segment.

Figure H-12: NC Charger Prep Credit Participation by Customer Segment



Vehicle-to-Grid Electric School Bus

Referred to as "EV School Bus Charging" in NCUC Docket Nos. E-2, Sub 1197 and E-7, Sub 1195, the vehicle-to-grid ("V2G") EV school bus pilot provides up to $215,000 on a per bus basis to school districts that electrify buses and agree to allow the Companies to test the ability of the buses' bi-directional charging systems to discharge power to the grid in times of congestion. As such, the program aims to not only validate an advanced technology for managing grid constraints, but to initially quantify its value to the electric system. At this time, the program in North Carolina has enrolled 28 buses and has been extended until the summer of 2025 to enable those buses to be built, delivered and leveraged for grid benefit. A similar program was proposed in South Carolina in Docket Nos. 2018-321-E and 2018-322-E but was not approved.

Residential Off-Peak Credit

Referred to as the "Residential EV Charging Program" in PSCSC Docket No. 2018-321-E, the Off-Peak Credit Program provides residential customers a monthly credit to EV drivers that avoid charging their EV during on-peak, high demand periods. The program does not perform active charging management, but instead asks that participants self-manage their charging whether that be through their EV itself, a networked charger, or other means. While intentionally limited in scale, the pilot has

demonstrated a strong case that simple program structures — even without specific technology requirements — can effectively shift significant EV charging load, especially in the summer peak.

Time of Use – Critical Peak Pricing

TOU periods are being refreshed across the Companies' service territories in the Carolinas and will provide meaningful and beneficial price signals to encourage off-peak charging behaviors for EV owners, including Residential, Fleet and DC Fast Charge. The Companies' new suite of rate options was thoughtfully designed to address the needs of the expanding electric transportation sector, providing favorable economics for those customers who can charge their EVs in grid beneficial manners. For example, constraining charging activities to off-peak hours or avoiding grid events when reserve margins are low. The Companies anticipate EV owners will take advantage of the new price signals by shifting loads to reduce charging costs, while simultaneously benefitting all customers by avoiding adding to demands during capacity constrained times.

Managed Charging/Subscription Rate Pilot

The Managed Charging/Subscription Rate Pilot, developed in partnership with BMW, Ford Motor Company and General Motors, was approved in NCUC Docket Nos. E-7, Sub 1266 and E-2, Sub 1291 in June 2022. This limited pilot, available to 200 customers across the entire North Carolina service area, is intended to demonstrate how managed charging can create benefits for both EV owners and non-EV owners by ensuring charging occurs during non-peak periods. The pilot is designed to evaluate EV technologies for managing and measuring EV load, customer acceptance of utility management of at-home charging and customer interest in a subscription pricing model. Enrollment for the pilot is intended to begin in September 2023, and the pilot itself is intended to launch in November 2023. The pilot will operate for 12 months with the learnings being used to inform future managed charging program options.

Vehicle-to-Grid Pilot

The V2G Pilot Program was approved in NCUC Docket Nos. E-7, Sub 1275 in April of this year. The program is an innovative effort designed to test the DR capabilities of V2G dispatch from capable EVs. Developed with Ford Motor Company to leverage the new Ford Lightning electric truck, the program will enroll up to 100 residential customers in the DEC North Carolina service territory that lease the Lightning and install the necessary home charging integration system.

Facilitating Charging Infrastructure

The Companies are also analyzing the potential for commercial fleet electrification in the Carolinas — identifying potential fleet electrification clusters and performing outreach to both national accounts as well as entities that are historically not large electric consumers. As further described later in the section titled "Efficiently Serving Electric Fleet Load," how the Companies approach facilitating EV adoption for this customer segment will have significant impact on the amount of grid investment that is ultimately required.

Finally, the Companies have been key partners in the planning and deployment of both IIJA and VW mitigation funding to further electrification in the Carolinas. For example, the Companies' expertise in deploying fast charging and in electrical capacity planning within the sourcing processes of other states is being leveraged to bring efficiency to NEVI deployments. The Companies do not anticipate seeking NEVI funding directly, but instead view the program as an opportunity for private operators in the EV charging industry to deploy foundational direct current fast charging infrastructure. As such, the Companies are doing their part to assist the Departments of Transportation, as well as funding recipients. The Companies have also partnered with both the North Carolina Department of Public Instruction as well as with the South Carolina Department of Education to successfully apply for VW mitigation funding and IIJA funding from the Environmental Protection Agency, respectively.

A Changing Energy Landscape

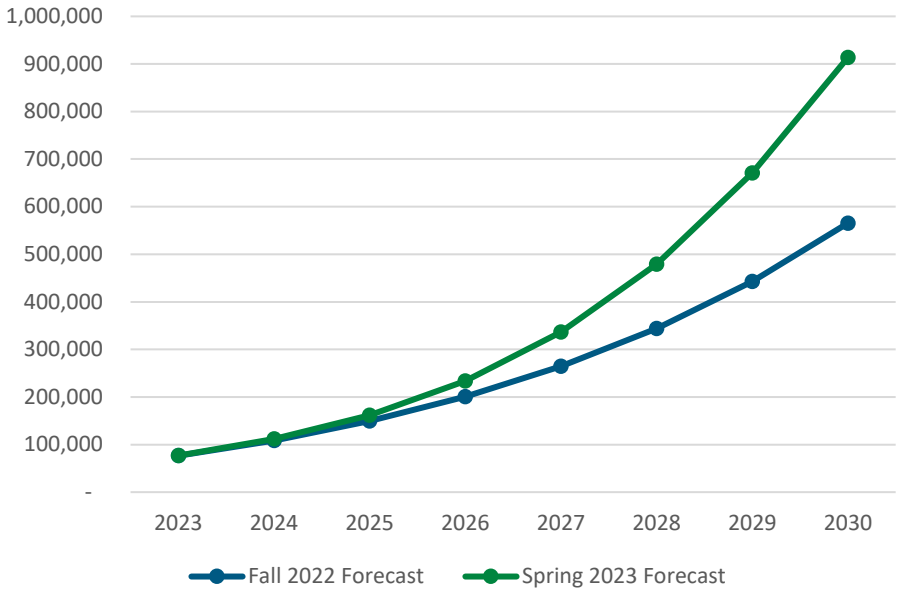
Unsurprisingly, EV adoption is only expected to increase in pace in the Carolinas. This is driven not only by aforementioned state policy, but also by growing customer interest and acceptance of EVs, the impact of federal funding and incentives, automotive OEM EV product lines and sales goals, fleet commitments to and investments in electrification and enabling utility programs.

Moreover, Carolinas manufacturers are investing in EV manufacturing. Increased adoption is driving economic development in North Carolina and South Carolina. Tens of billions of dollars have been invested and announced across the Carolinas for EV, battery and EV charger manufacturing by the likes of BMW, Toyota, Thomas Built, Proterra and Volvo.

Analysis of EV Adoption & Load Projections

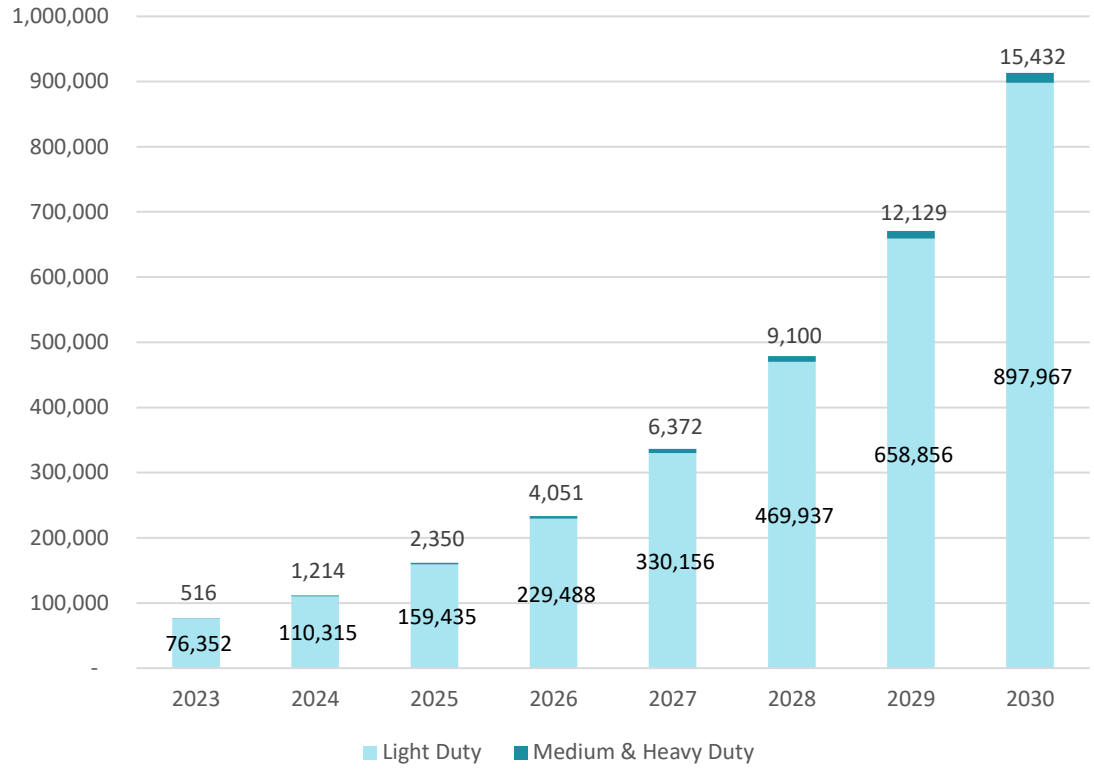
The spring 2023 forecast from Guidehouse's VAST tool shows that over 900,000 EVs are expected on the road in the Carolinas by 2030. This estimate is not reflective of future policies and programs that may be enacted as a result of executive orders in the states. To illustrate the potential for the forecast to evolve, in comparison to the Fall 2022 forecast, the impact of recent legislation — notably the IRA — is significant. Starting in 2026, forecasted adoption grows significantly above last forecast and is ultimately up over 60% by 2030. EV adoption is only growing in the Carolinas, as shown below in Figure H-13.

Figure H-13: Forecasted Electric Vehicles in Operation – Carolinas



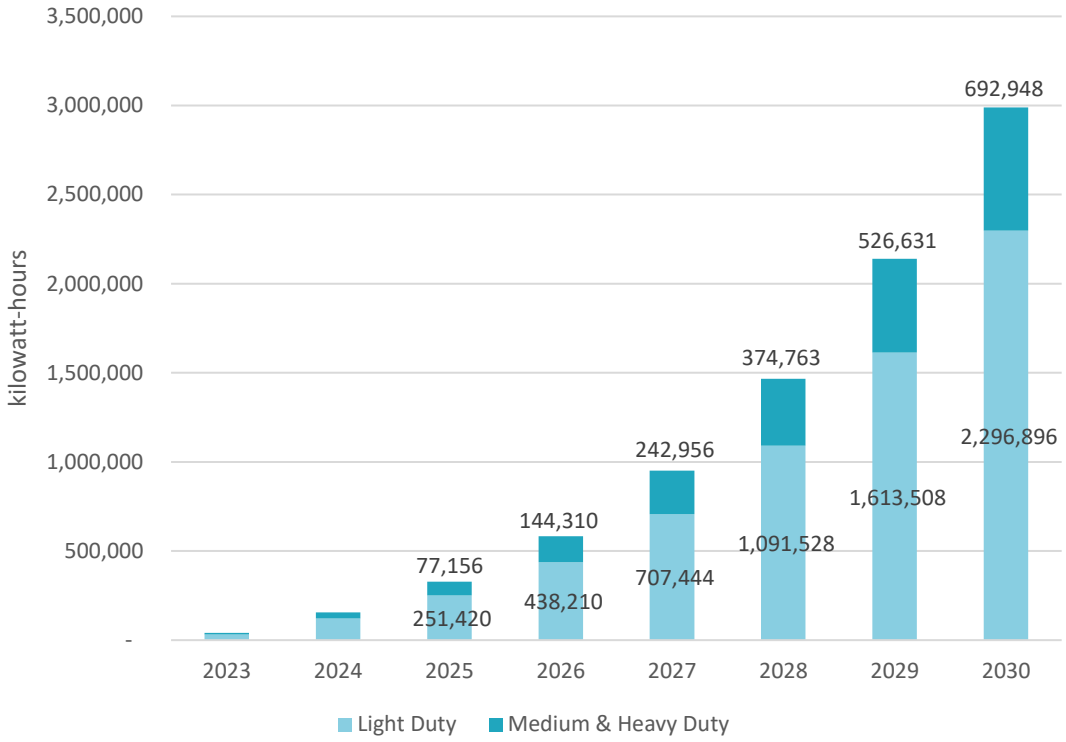
For this analysis, the Companies further break down vehicles in operation by light duty as compared to medium and heavy duty. As seen below in Figure H-14, light duty vehicles consistently dominate adoption forecasts, comprising more than 98% of EVs in operation.

Figure H-14: Forecasted Electric Vehicles in Operation by Vehicle Class – Carolinas



Increased adoption as compared to the prior forecast naturally results in increased load projections from EVs. The breakdown between vehicle classes becomes meaningful because while the overall percentage of heavier duty vehicles is low, the load from these vehicles is significant in relative terms at 20%–25%. Generally, medium- and heavy-duty vehicles point to the presence of fleets. And while consumer EV charging might be well-managed with simple programs as described below, fleet EV loads will create localized load clusters that — even if managed — will also present challenges with the Companies' provision of electric service. Figure H-15 below shows the forecasted EV load by vehicle class in the Carolinas.

Figure H-15: Forecasted Electric Vehicles Load by Vehicle Class – Carolinas

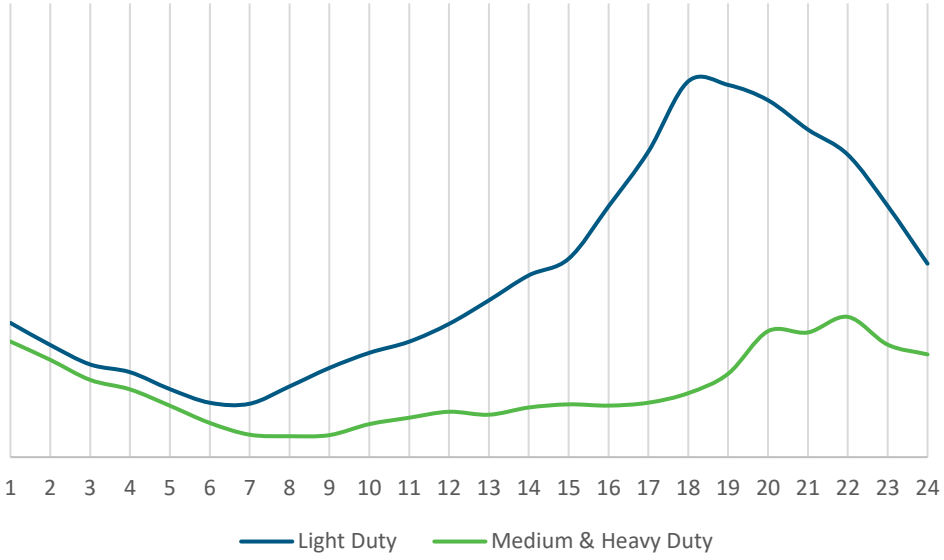


Contributions to Resource Plan

This growth in EV adoption necessitates that the Companies are engaged with customers as they electrify. In such a developing market that represents unfamiliar territory to most customers, they seek a trusted resource to act as a guide and to solve problems. The growth in load likewise warrants that the Companies carefully manage EV charging loads to align demand with renewable resource supply, to defer system investments where possible, and to harness the ability of EV charging load to put downward pressure on rates by spreading fixed utility costs over more kWh sales.

Adoption-simplifying programs can serve to create connectivity between the Companies and EV adopters. However, it is a developing suite of managed charging approaches that will bring the downward rate pressure opportunity associated with EVs. Managed charging is the encouragement of EV charging stations operators — whether consumers or commercial entities — to charge EVs when the grid can more readily accept that load. Figure H-16 below shows a representation of weekday EV charging load shapes by vehicle class in the Carolinas.

Figure H-16: Carolinas Representative Weekday EV Charging Load Shapes by Vehicle Class



The graph above presents charging load shapes for light duty and medium- and heavy-duty EVs as representative of consumer and fleet load shapes, respectively. These shapes demonstrate why EV load management must be considered in two distinct categories. Consumer EVs show significant opportunity for managed charging during the late afternoon and early evening summer system peak hours as well as some opportunity for winter morning peak management — likely at workplace locations where employees plug in as they arrive. Commercial charging patterns are different. Firstly, many fleets are operational during system peaks. Vehicles are not charging because they are in use. Further, because of the demand and/or time-based components of many commercial electric rate schedules, fleet operators are inherently motivated to manage toward charging in less expensive times and to improve load factor by spreading charging over more hours, creating a relatively flatter average load shape.

Consumer EV Load Management

For consumer-owned, light duty vehicles, there are multiple core methods to achieve managed charging. Options with lower complexity are sufficient at lower levels of adoption, but more sophistication is likely needed as adoption ramps up.

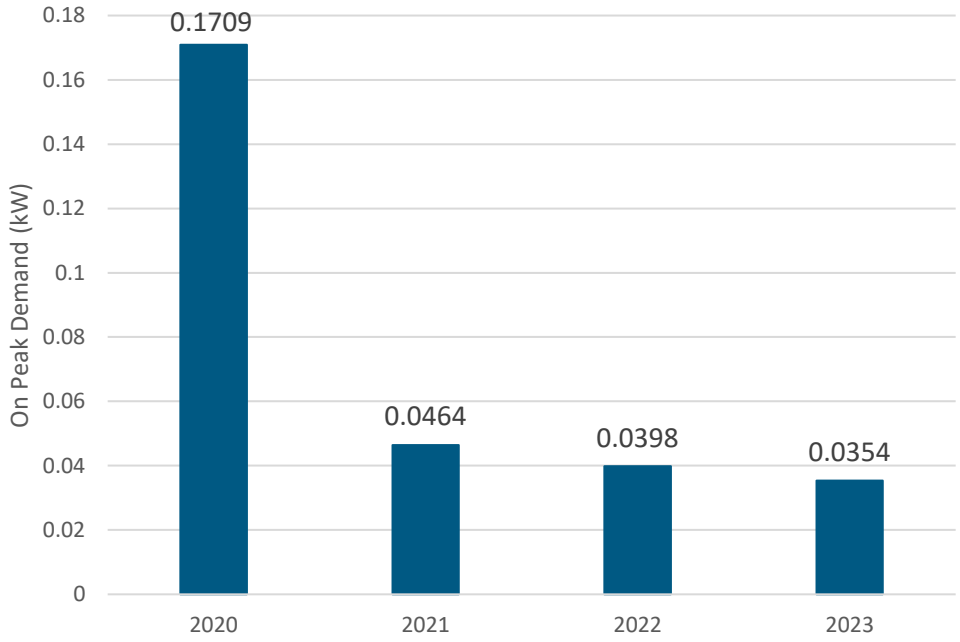
Off-Peak Credit

Perhaps the simplest of managed charging avenues, as described previously, off-peak credit type programs simply ask EV drivers to avoid charging in certain time windows. Likely because of this simplicity, such programs are quite effective, both in recruitment and in shifting load. Duke Energy has demonstrated this effectiveness fully, both in South Carolina and at a larger scale in Florida, not to mention a program well underway in Indiana. In short, the off-peak credit structure is proving

successful and should be made permanent in South Carolina and expansion considered in North Carolina.

Figure H-17 below provides quantitative results on load shifted comparing pre-program habits to post-enrollment habits of South Carolina pilot program drivers as of the spring of 2023. From program inception, a near 80% reduction in per participant on-peak charging demand has been achieved.

Figure H-17: SC Average On-Peak Charging Demand by Off-Peak Credit Participants Over Time



Time of Use Rates

TOU rates are a small evolutionary step for EV managed charging. In fact, TOU may precede an off-peak program, as is the case in North Carolina. TOU rates have slightly more sophisticated pricing signals than off-peak programs, but still manage around system peaks. Importantly, the malleable nature of EV charging means that customers who would benefit from TOU adoption even without an EV can further utilize the rate structure for the significant consumption of their EV.

The Companies are preparing analytics to demonstrate the impact of new TOU-CPP rates on residential EV charging. As the new rates are implemented and customer adoption increases, the shape of EV charging load for customers on TOU that also have EVs can be estimated using metering data and subsequently compared to the unmanaged case.

In addition to driving beneficial demand management for homeowners, the Companies also believe that TOU rates have potential to drive winter peak savings at workplace charging sites. Duke Energy's experience in operating workplace chargers outside the Carolinas informs this perspective. In Florida, workplace charging shows, far and away, the greatest potential to manage against winter peaks.

Active Managed Charging

Active charging management represents the most sophisticated means of managed charging. In such an approach the Companies would actively control charging based on system conditions while balancing grid and consumer needs (for adequately charged batteries). In practice, this approach — still under development with energy orchestration — is envisioned to work like DR programs, but with the added feature that the Companies are turning charging "on" as much as turning it off to achieve that balance.

Enhancements to Core Methods

Load management has, for very good reason, become a topic with no shortage of packaged solutions. The Companies have proposed the three core methods of managed charging (i.e., off-peak credit, TOU rates and active managed charging) to simplify that landscape. That does not mean, however, that other features of managed charging do not have merit. In fact, as previously described, the Companies are testing two such enhancements to managed charging today.

- **Subscription Rates** – The Companies North Carolina-managed charging pilot is an early-stage example of active managed charging. Specifically, the program will pause charging for participants in times of grid constraint — a precursor to actively orchestrating the charging of multiple participants to fall within time of excess capacity. The pilot also tests customer appetite for an adoption-simplifying flat rate for a large allotment of monthly kWh, a feature that provides certainty of charging costs for an often poorly understood technology.

- **Vehicle-to-Grid Functionality** – The North Carolina V2G pilot is also an example of active managed charging in that the Companies elect when to deploy the bidirectional charging capability of participants' EVs. In this case, of course, the functionality is enhanced given that not only is charging paused, but energy already stored in the EV's battery can also be exported to the grid.

Efficiently Serving Electric Fleet Load

While long-standing rate structures already provide a motivation for commercial operators of electric fleets to leverage time of system availability to charge their vehicles, fleet electrification is not without challenges. Today, fleet operating companies face political and customer – and therefore economic – pressure to decarbonize. As electrification of fleets grows, so does the need for substation and feeder capacity. This gives way to a growing risk for customers and utility operators alike. Most fleets operate medium and heavy-duty vehicles which consume significantly more energy than light duty vehicles while requiring near perfect reliability to avoid operational disruptions and profit loss. Moreover, fleets are generally located near to one another in warehousing districts and around access to air transport, leading to an inherent localized load clustering effect. The associated risks, however, can be mitigated through strategic planning, funding and early execution. Put simply, a proactive approach.

Consider a hypothetical, but very realistic, site operating up to one hundred class six trucks (9 ¾ to 13-ton gross weight, typically beverage and rack trucks) and just six class eight trucks (exceeding 16

½ ton gross weight, tractor-trailers, for example). Before electrification, a site like this demands an electric load of approximately 500 kW. With electrification, the demand of this one location could rise to over 4 MW. Assuming that this load could be well-served by existing transmission and distribution equipment, it is likely that another fleet location on the same circuit will electrify in quick succession. Many businesses are exploring the electrification opportunity at the same time, and it is probable that many fleets will electrify in the next five years. This may lead to circuits requiring upgrades to satisfy dozens of MW. In addition, as multiple fleets on a single feeder electrify in quick succession, it could lead to costly rework because requests for upgrades move through a standard process and are usually satisfied only as the customer commits to the load. An initial system upgrade could be partially completed as requests for further, incremental upgrades are received. Efficiency, both in terms of time and cost, is lost as the partially completed upgrade must be redone. Meanwhile, system upgrade timelines are already measured in years while customers can obtain EVs in timeframes increasingly measured in months. Considering this, current approaches to serving load may also delay the economic gains available to fleet operators through electrification. Conversely, if the emergence of this load could be anticipated, the obligation to serve could be fulfilled without unnecessary delays and at lesser overall cost.

Fortunately, not all circuits have significant fleet loads. Many circuits have capacity available for retail and residential requests and/or can achieve upgrades for limited fleet electrification requests in time without delaying fleet customers' goals. The Companies' transportation electrification and system planning experts are surveying the Carolinas' operating regions to determine where opportunities may emerge to serve fleet clusters and therefore meet fleet operators' goals

The Companies' approach identifies areas in which fleets operate now and determines if those have public electrification goals or significant potential economic benefit through electrification. For example, due to lack of vehicles and charging network availability, many coast-to-coast tractor-trailer operators are not ready to electrify. More likely candidates are class eight and class six operators with shorter and consistent daily routes that include loading periods commensurate with recharging. Transit buses and logistics fleets serving more localized mail and package or business-to-business delivery are also ripe for electrification in the next two to five years given that vans and medium-duty box trucks are becoming increasingly available and can be charged in off-shift (not to mention electric system off-peak) hours.

To convert the presence of fleets to probable, localized electric load growth, the Companies' approach assigns this probability of electrification to sites and couples that data with anticipated per vehicle charging loads. Using those, for any given cluster area, blended adoption estimates can be established inclusive of grid impact. Next, clusters are targeted due to their potential to outpace capacity to serve if adoption rates accelerate as anticipated.

The Companies plan, of course, to continually refine this approach while also building electric fleet analytical tools that integrate well with the time-tested system planning approaches already in use. Today, an opportunity may well exist for the Carolinas to continue economic growth by considering approaches to system upgrades that reduce barriers to fleet electrification.

Enablers

An obvious enabler for the Companies' ability to deliver load management and to serve growing electric fleets will be approval of programs — generally backed by broad stakeholder support — as they are proposed to the NCUC and PSCSC. In addition to the adoption simplifying programs, such as the Electric Vehicle Service Equipment tariff program, recently approved in NC and pending before PSCSC for approval, the Companies anticipate filling for expanded off-peak credit programs in the near term. Active managed charging programs remain under development but are likewise a priority.

The Companies have also filed early efforts to proactively serve fleet clusters in the DEC North Carolina rate case and anticipate filing for fleet advisory services programs in the near term. As the Companies' capabilities in meeting electric fleet loads continue to evolve and deepen, support for reconsidering the traditional paradigms to serve new load will be critical.

Execution Plan

The Companies' execution plan focuses on the critical areas of analysis, facilitating infrastructure and load management.

Additional Analysis

Modeling and analysis of EVs, EV charging and its impact on the electric system is critical. Many reasons exist, but primarily, EV technology is new and unfamiliar to most. The next steps in analysis by the Companies will focus on two topics.

- Impact of TOU rates on EV charging: As discussed, the Companies are preparing analytics to demonstrate the impact of new TOU rates on residential EV charging. As TOU adoption grows, this analysis will inform the relative criticality of and pace with which other managed charging program offerings should be deployed.

- Results of the Managed Charging and V2G Pilots: As the programs are deployed, the Companies naturally intend to report findings and lessons learned.

Facilitation of Charging Infrastructure

It bears repeating that the Companies will continue to enhance abilities to obtain information, predict fleet load clusters and plan for proactive grid readiness in those areas. Efforts to identify electric fleet locations are well underway as are plans to build tools to bring automation and further intelligence to integrate critical system planning workstreams with electrification data and insights.

Additionally, the Companies will continue to support customers and stakeholders siting of EV charging infrastructure as a matter of course. This work includes engagement with state government agencies to inform the deployment of IIJA funding as well as coordination with customers that seek to apply for funding at the state and federal levels and require insight as to system capacity and costs of service as they progress in the application process.

Load Management

Programs to Implement

Duke Energy is finalizing plans with BMW, Ford and GM to launch the Managed Charging Pilot across the North Carolina service area. This pilot will be the first in the nation to utilize the original equipment manufacturer ("OEM")'s jointly owned OVGIP (Open V2G Integration Platform) to manage EV charging and enable DR events to stop charging as needed. Successfully demonstrating the ability to partner with automotive OEMs to offer managed charging programs via a shared platform could enable more rapid and widespread adoption of managing charging programs across Duke Energy's entire service area.

DEC continues to work with Ford as it plans deployment of the software release that will enable V2G dispatch from the Lighting, which is anticipated to be one of the first vehicles in the market featuring the capability. Naturally, as EV adoption continues, the Companies expect that V2G active managed charging could become a significant resource in the Companies' portfolio.

Programs to File

The residential off-peak credit program structure has been proven both in its attractiveness to customers and in its effectiveness in motivating the desired customer charging behavior. The Companies intend to pursue at-scale filings for this program in the very near term.

Once again, the Companies will also continue to evaluate and to validate fleet electrification trends and, at the appropriate time will pursue additional filings that enable the structure necessary to meet the challenges of fleet electrification.

Programs to Design

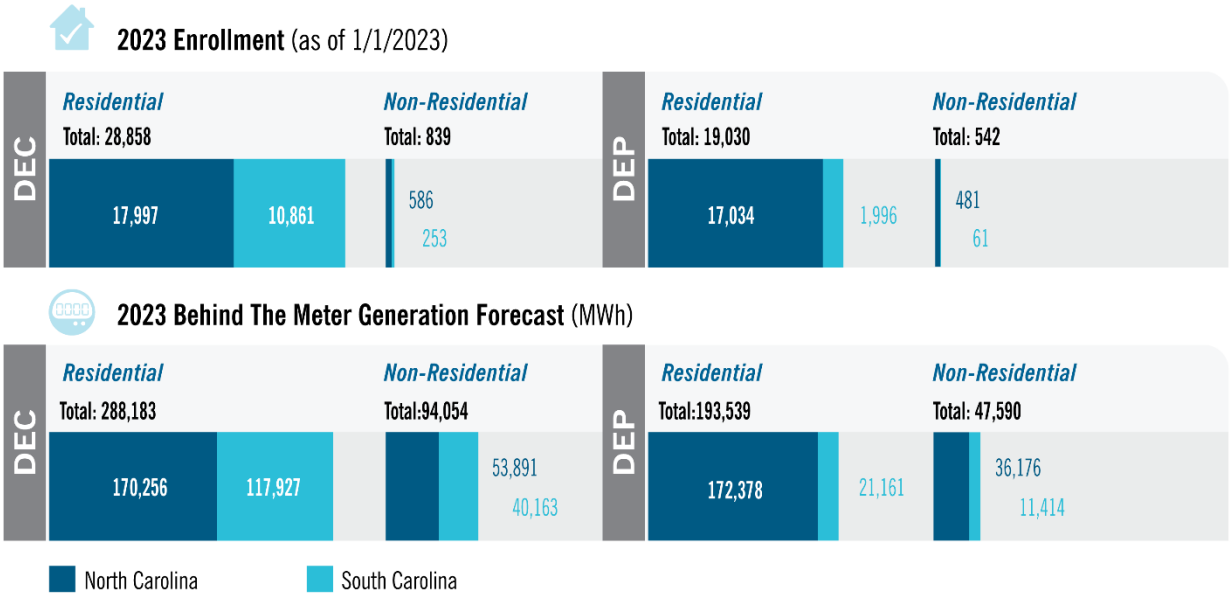
Finally, efforts are underway to design a program structure — with necessary technology approaches — that will enable effective active charging management. Such a program will bring a sophisticated orchestration of EV charging that enables the Companies to spread EV charging, especially in residential scenarios across all times of day that are suitable for accepting additional demand and that minimize impact to grid assets.

Behind-the-Meter Generation and Storage

Behind-the-meter generation generally refers to customer-sited resources, primarily solar and solar paired with storage. Most of these resources are governed by the Companies' net metering tariffs. The growth in behind-the-meter resources has been fostered in large part by legislative activities in the Carolinas, notably South Carolina Act 236 of 2014, South Carolina Act 62 of 2019, and North Carolina Session Law 2017-192. Behind-the-meter resources could also include storage not coupled with solar, but without detailed use cases for these resources or projected counts, the modeling excludes any impacts from these resources.

By year end 2022, approximately 1% of residential customers in North Carolina had installed solar and/or solar paired with storage, while in South Carolina, the penetration was little higher at approximately 2% in DEC and 1.5% in DEP. Figure H-18 below shows the total number of net metering customers as of the end of 2022 as well as the projected energy for 2023 for these systems.

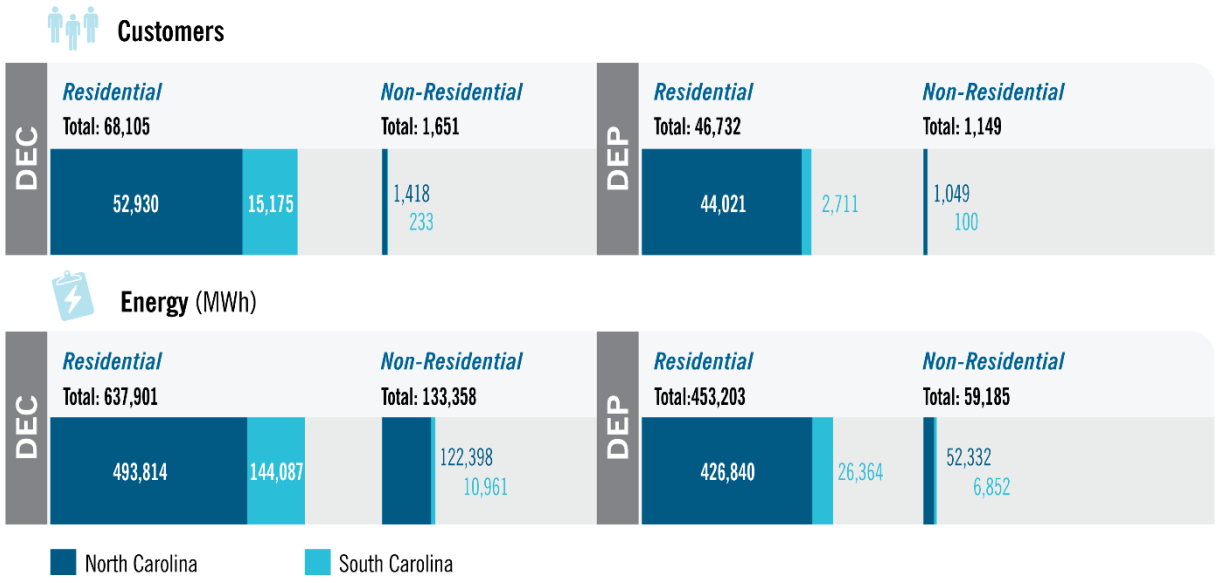
Figure H-18: Number of Customers Enrolled in Net Metering Rates & Forecasted 2023 Behind-the-Meter Generation



Note : Energy calculated for existing connections as of the end of 2022 - does not include the energy from additions throughout 2023.

Net metering is expected to continue to grow throughout the forecast period. While a more detailed discussion is presented in Enabler section below, Figure H-19 below shows the expected additional net metering customer counts by the end of 2030 along with estimates of the energy from these systems for 2030.

Figure H-19: Number of Forecasted Number of Customers Enrolled in Net Metering Rates & Forecasted Behind-the-Meter Generation by 2030



Notes : Data is presented for 2030. The customer data represents the total number of new customers starting from 1/1/2023 through 12/31/2030. The energy data is the projected energy for 2030 associated with all the forecasted net new customers.

A Changing Energy Landscape

As behind-the-meter resources have grown over the past few years, the number of developers and installers has increased as well. For 2022, the top 10 installers in each of the service territories achieved a little over 50% market share, with no one supplier dominating the market. This indicates robust competition among the suppliers, providing a range of options for potential customers to consider and compare.

One trend to note with resources is a higher prevalence of solar coupled with storage. As recently as 2019, solar paired with storage systems represented only about 0.5% of installations in all service territories, while in 2022 this had increased to approximately 10%. Most of the battery installations to-date have been manufactured by Generac or Tesla, although many other brands are available and represented, and as with solar only, there are many developers that are offering and installing solar paired with storage systems.

Enablers

To support the Companies' achievement of decarbonization targets, new net metering rates must be implemented to ensure customers are well-informed of the compensation they can plan to receive for their solar investment. This will include the shift of customers looking to pair storage with solar, necessary technology changes, educating solar installers, continuing to create new marketing material

and training Duke Energy's workforce to clear communicate the benefits of installing solar on-site. The Companies consider the following items key enablers for behind-the-meter resources.

- **Inflation Reduction Act of 2022** –The IRA is expected to have a significant impact on behind-the-meter resources. The two primary provisions in the IRA that support net metering include the extension of the investment tax credit for solar and solar paired with storage systems, and the implementation of the investment tax credit for stand-alone storage systems. Prior to the IRA, residential solar systems were eligible for a tax credit for systems installed by the end of 2023. The IRA has extended the tax credit at 30% of installed cost through the end of 2032, with installations in 2033 eligible for a 26% tax credit, and 2034 installations eligible for a 22% tax credit. A new tax credit for residential stand-alone storage has also been codified in the IRA. In the past, only storage coupled with solar was eligible for tax credits, but the IRA extends the tax credits to stand-alone storage as well (must be at least 3 kWh).

The following enablers are specific to North Carolina:

- **Update on Net Metering** – Two new net metering residential riders (Bridge Rider and Residential Solar Choice) have been approved and will be available to customers beginning on October 1, 2023. Both include monthly netting and customers are able to retain the RECs generated. The Companies developed an Online Solar Bill Calculator that is available on the public website to help customers better understand the estimated billing saving when installing solar. The calculator has several stages of development culminating in Q1 2024 where it will be able to estimate bills using a customer's AMI data which will allow for improved estimates. The Companies have proposed Non-Residential Solar Choice ("Rider NSC") for Non-Residential customers that is pending approval. Key changes include the elimination of standby charges and an increase to the maximum system size from 1MW to 5MW.

- **Update on HB 589 NC Solar Rebate Program** – January 2023 was the final Random Selection Process for customers to apply for available capacity in the program. To date, the program has paid out approximately $49M in rebates to 9,456 customers.

- **PowerPair^{SM} –** As discussed earlier, the Companies' PowerPair^{SM} Pilot Program is currently pending before the NCUC.

The following enablers are specific to South Carolina:

- **Update on Net Metering** – As of January 1, 2023, the Residential and Non-Residential Solar Choice Riders became effective for customers. An Online Solar Bill Calculator was published on the public website in 2022 to help customers better understand the estimated billing saving when installing solar.

- In 2022, the Solar Plus Battery Storage Program Smart Saver Solar was not approved. This currently leaves South Carolina with limited incentives though the state tax credit (25%) is still applicable for rooftop solar.

It is important to note that there are challenges associated with behind-the-meter resources, particularly around market factors as reflected in inflation and supply pressures. It is generally recognized that prices for solar and storage increased in 2022. Long range forecasts show declining prices curves for these technologies, but the market still seems to be facing inflationary headwinds. Resource availability is also an issue, with the solar supply chain concentrated in China. Even excluding geopolitical issues, the reliance on one area for most of the supply chain will result in higher risk profiles.

The IRA as well as the IIJA include many programs designed to help address some of these challenges, with a goal to help re-establish domestic supply chains for both solar and storage resources, and to diversify away from a single, dominant supplier/region. Despite the legislative actions, whose impacts are more likely to be effective in the medium to long term, the near term will still need to navigate around the pressures and risks associated with the market and supply chain.

While keeping abreast of challenges in the behind-the-meter space, the growth of solar paired with storage resources will also warrant further analysis to help with modeling these resources. The storage component can function in multiple roles, from maximizing the value of the coupled solar to providing resiliency and outage protection. As more of these systems are installed, a more detailed understanding of their use cases will be beneficial. The PowerPair℠ Pilot in North Carolina will be an opportunity to start gaining some of these learnings.

Clean Energy Customer Programs (Beyond the Meter)

Current and future customers are continuing to look for ways to meet their sustainability goals in ways that may not involve installing solar panels on their property. These solutions are especially critical for renters, people that are not in a position to do a capital investment or large customers seeking options to meet their aggressive clean energy targets. The Companies' current programs include:

- **Green Source Advantage ("GSA")** – Program is available in both North Carolina and South Carolina. The GSA program is an option for large business customers to select and negotiate terms directly with a supplier of their choice to bring a new renewable resource online locally. The Customer receives the environmental attributes needed to claim they are using renewable, zero-carbon energy.

- **Renewable Advantage** – This program is available to the Companies' North Carolina customers. Renewable Advantage is a mass market REC program, not locally sourced, where the RECs are broken into block sizes which make it a popular option for residential customers. No long-term commitment is required under the program and a portion of the block price goes to support NC Greenpower.

- **Shared Solar** – A shared solar program is typically one where residential and non-residential customers who want to support the development of renewable energy but may be unable to install rooftop solar may bring solar energy online in their communities. Subscribers to a shared solar program may pay for the development and operation of solar facilities (as

well as program administration expenses) and, in return, receive bill credits for their share of the solar energy generation. South Carolina has a 3 MW program that is fully subscribed. The Companies have also offered a shared solar program in North Carolina pursuant to the requirements of N.C. Gen. Stat. § 62-126.8, which, among other things, limits the capacity of an individual shared solar facility to 5 MW and requires the utility to hold customers that do not participate in the shared solar program harmless. No solar projects today have come forward to participate in the Companies' current North Carolina shared solar offering.

In 2022, the Companies began extensive stakeholder engagement to develop the next iteration of Clean Energy Programs. These new programs are critical to both existing and potential new customers as they are looking for ways to meet their sustainability goals. The Companies' future programs include:

- **GSA Choice (NC), Renewable Choice and GSA Modifications (SC)** – Next iteration of the GSA program which provides large business customers the opportunity to partner with a renewable generating facility off-site. It is beneficial as many customers may not have the ability or the space to develop such a facility on their property. Key enhancements to the program include allowing for customers to contract for up to 100% energy matching; the flexibility to partner directly with Duke Energy on a long-term contract for either Duke Energy owned or 3rd party (PPA) generation; and an optional grid-tied energy storage feature to move towards 24/7 clean energy.

- **Clean Energy Impact** – Provides an easy, low-cost option with no long-term commitment for customers to purchase locally sourced Clean Energy Environmental Attributes (RECs and zero-carbon reduction attributes) from local sources. Revenue received from these purchases will go back to benefit all retail rate payers. This will be a new alternative to the current Renewable Advantage program in North Carolina where the RECs included are not from local source as well as an option for South Carolina customers as they currently don't have a mass market REC program.

- **Clean Energy Connection** – Clean Energy Connection is a community solar program where Duke Energy owns the assets and customers of all types can subscribe to benefit from the zero-carbon, renewable energy. This design builds on the success the Companies have seen with the program in Florida and even provides day one savings for income qualified customers who otherwise would be unlikely to have access to renewable energy. This program has not been filed yet in North Carolina or South Carolina.

Additional information on Emerging Programs which have been filed but have not yet been approved can be found on Duke Energy's website organized by programs for businesses[6] and homes.[7]

Rapid Prototyping for Grid Edge and Customer Programs Beyond Energy Efficiency and Demand-Side Management Programs

Due to the increasingly accelerated introduction of new energy consuming and storing technologies that present the opportunity for new Grid Edge and customer programs, there is a growing need to be able to test and prototype offerings around these new technologies. The Companies initiated a Rapid Prototyping stakeholder process in February of 2023 for non-EE/DSM pilot programs. The Companies and a diverse group of stakeholders met during two large stakeholder sessions to date and reviewed rapid prototyping processes in other jurisdictions to discuss guiding principles that could potentially be applicable rapid prototyping guidelines for the Companies to propose. The stakeholder process is ongoing. The Companies plan to complete the stakeholder process in the coming months and file a formal proposal as ordered by the NCUC. The Companies will continue to engage with stakeholders to attempt to reach consensus on which types of pilot programs would qualify for expedited regulatory approval, including the role of stakeholders in pilot program development, but the Companies currently envision the rapid prototyping process applying to smaller, innovative pilot customer programs and rate designs.

[6] Duke Energy, Renewables and EV Emerging Renewable Programs, available at https://www.duke-energy.com/business/renewables-and-ev/emerging-renewables.

[7] Duke Energy, Proposed Emerging Renewables Programs, available at https://www.duke-energy.com/home/renewables-and-ev/emerging-renewables.