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July 1, 2021

VIA Electronic Filing

Kimberley A. Campbell, Chief Clerk
North Carolina Utilities Commission
4325 Mail Service Center
Raleigh, North Carolina 27699-4300

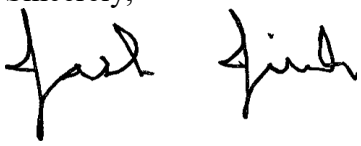
Re: Duke Energy Carolinas, LLC's and Duke Energy Progress, LLC's Supplemental Reply Comments
Docket No. E-100, Sub 165

Dear Ms. Campbell:

Please find enclosed for filing *Duke Energy Carolinas, LLC's and Duke Energy Progress, LLC's Supplemental Reply Comments* in connection with the above-referenced proceeding.

If you have any questions, please let me know.

Sincerely,



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Deputy General Counsel

Enclosure

STATE OF NORTH CAROLINA
UTILITIES COMMISSION
RALEIGH

DOCKET NO. E-100, SUB 165

BEFORE THE NORTH CAROLINA UTILITIES COMMISSION

In the Matter of 2020 Biennial Integrated Resource Plans and Related 2020 REPS Compliance Plans	)))))	DUKE ENERGY CAROLINAS, LLC'S AND DUKE ENERGY PROGRESS, LLC'S SUPPLEMENTAL REPLY COMMENTS

Pursuant to North Carolina Utilities Commission (the "Commission") Rule R8-60(k) and the Commission's June 21, 2021 *Order Granting Motion to File Supplemental Reply Comments*, Duke Energy Carolinas, LLC ("DEC") and Duke Energy Progress, LLC ("DEP" and, together with DEC, the "Companies" or "Duke Energy") hereby respectfully submit their Supplemental Reply Comments addressing the second corrected version of the *Report of Synapse Energy Economics, Inc.* (the "Second Corrected Synapse Report" or the "Report") prepared by Synapse Energy Economics, Inc. ("Synapse") and filed by the North Carolina Sustainable Energy Association, Carolinas Clean Energy Business Association, the Southern Alliance for Clean Energy, the Natural Resources Defense Council, and the Sierra Club (collectively, the "Joint Synapse Sponsors") on May 27, 2021, as well as the reply comments of other intervenors relying upon or proposing that the Commission adopt the Second Corrected Synapse Report.

INTRODUCTION

The Companies' May 28, 2021 Reply Comments reaffirmed the accuracy and technical soundness of the Companies' 2020 Integrated Resource Plans (the "2020 IRPs" or "IRPs") and highlighted the comprehensive nature of the IRPs, which provide multiple

potential pathways into the energy future across a range of scenarios, all of which ensure continued reliability for customers and include substantial renewable resources and carbon reduction.

These Supplemental Reply Comments respond solely to the Second Corrected Synapse Report, which is, in fact, the third iteration of the Synapse Report that has been filed in this proceeding. For the third time, Synapse has introduced its Report as presenting an unbiased alternative "scenario that replaces Duke's coal fleet with a portfolio of renewables, storage, and energy efficiency reflecting updated and more realistic cost assumptions."[1] Based upon the Companies' review, however, the Report continues to rely on errant assumptions in order to present a results-oriented alternative portfolio that heavily favors the implementation of unprecedented levels of energy efficiency ("EE"), renewable resources, and battery storage while understating the costs and risk of their preferred portfolio. The report suggests the Companies' fleet should adopt new technology at a rate that far exceeds the Companies' already aggressive and industry-leading clean energy transition plans while completely ignoring risks to consumers associated with such a strategy. Indeed, the Companies have adopted near- and long-term goals to reduce carbon emissions by at least 50% by 2030 and to net-zero by 2050, while ensuring that energy remains affordable and reliable for all of their customers in North and South Carolina. Each of the portfolios included in the 2020 IRPs set the Companies on a path to achieve both those goals. In contrast, while the Second Corrected Synapse Report purports to present a "viable pathway toward meeting a clean energy future"[2] that has "no detrimental

[1] Second Corrected Synapse Report, at 1.
[2] *Id.* at 3.

effect on ratepayers[,]"[3] the Companies have determined that the Second Corrected Synapse Report—like its predecessors—continues to be inaccurate in its modeling, extremely unrealistic in many of its assumptions, and lacks the regulatory rigor that the Companies' Carolinas IRP organization proudly employs to ensure IRPs filed with this Commission are capable of adequately, reliably, and affordably providing increasingly clean electric service to customers over the next 15 years.

While the First and Second Corrected versions—filed on March 22, 2021, and May 27, 2021, respectively—each purport to correct errors identified in earlier versions and, indeed, do improve certain aspects of the Report's modeling and assumptions, the Second Corrected Synapse Report still falls far short of: (1) mimicking the Companies' Base Case with Carbon portfolio in order to provide a reasonable baseline for comparison; (2) proposing a realistic alternate resource portfolio which, if pursued, would allow the Companies to reliably serve customers' capacity and energy needs; and (3) fails to fairly and realistically characterize the projected costs to serve DEC's and DEP's customers over the next 15-year resource planning period under the Joint Synapse Sponsors' preferred alternate resource portfolio.

For these reasons and as further discussed in these Supplemental Reply Comments, the analyses and conclusions presented in the Second Corrected Synapse Report are so fundamentally flawed that they should be rejected, and the Commission should not rely upon them or otherwise give them any weight in evaluating the reasonableness of the Companies' 2020 IRPs.

[3] *Id.* at 43.

The Companies also briefly respond to the Reply Comments of the Attorney General's Office ("AGO") which—less than 24 hours after filing of the Second Corrected Synapse Report—advocated for the Commission to adopt the Second Corrected Synapse Report as more accurate in its assumption, appropriate in its objectives, and reasonable in its conclusions than the Companies' IRPs. These Reply Comments—along with the purported replies of other intervenors—are demonstrably result-oriented rather than fact based and should be given little weight by the Commission.[4]

REPLY TO INTERVENOR COMMENTS REGARDING SECOND CORRECTED SYNAPSE REPORT

The Second Corrected Report purports to address three significant errors identified by the Companies and admitted by the Report's primary author on cross-examination at the South Carolina evidentiary proceeding on the Companies' IRPs. In an attempt to remediate those errors, this third version of Synapse's Report (1) updates the capacity

[4] Consistent with Duke Energy's Motion for Leave to file Supplemental Reply Comments and the Commission's June 21, 2021 Order allowing the same, the Companies have limited the scope of these Supplemental Reply Comments to address only the Second Corrected Synapse Report and the AGO's reply comments advocating the Commission adopt or otherwise rely upon the Report. However, the Companies additionally note that many intervenors filed extensive reply comments, effectively using the reply comment process as an opportunity to re-argue and/or restate arguments set forth in their initial comments and, in some limited cases, to introduce new arguments. The Commission's historic practice, along with equitable considerations, suggest that reply comments should be limited in scope to those points and arguments that can be reasonably characterized as addressing new points and arguments raised by other parties in initial comments. That is, reply comments should in fact be "replying" or "responding" to unique points and arguments raised in initial comments. Substantial equitable and fairness concerns are raised where parties introduce entirely new points or arguments in reply comments that actually relate to the Companies' initial IRP filing and therefore could have been made during initial comments. Such an approach unfairly deprives the Companies of an opportunity to respond to such new points and arguments. And the efficiency of the regulatory process is undermined when parties leverage reply comments simply to re-state prior points and arguments from initial comments. While no express limit on the scope of reply comments was imposed in this proceeding, the Companies believe the Commission should consider expressly limiting the scope of reply comments in future IRP proceedings. This will ensure that the Companies (and the Commission) are not disadvantaged by interevening parties delaying making substantive arguments critiquing the IRPs until reply comments and also reasonably limit reply comments to new issues identified through initial comments versus rehashing already-made arguments criticizing the Companies' IRP. For the benefit of the Commission, the Companies are providing Attachment 1 to these Supplemental Reply Comment to assist the Commission in identifying the restated arguments made by each intervenor and describing where each point was already generally addressed in the Companies' initial Reply Comments.

modeling of the Catawba Nuclear Station to reflect DEC's partial ownership in the station, reducing DEC's available nuclear capacity by approximately 1,700 MW; (2) adjusts its modeling to ensure that the Companies' 17% Capacity Planning Reserve Margin could be met in the so-called "Reasonable Assumptions" scenario using system resources and *not* via a capacity penalty price whereby the Companies would be assumed to purchase power from outside the system to fill a temporary capacity gap; and (3) reproduces the winter peak day generation profiles with a more accurate depiction of a Carolinas winter load shape. While the Companies agree that the Synapse authors address some of the issues identified by Duke Energy and conceded in the South Carolina IRP proceeding through the Second Corrected Synapse Report, it falls far short of remediating most, if not all, of the criticisms identified in the Companies' initial Reply Comments. As a result, even with these "corrections," the Report remains unrealistic in many of its assumptions, inaccurate in major aspects of its modeling, and promoting flawed findings and conclusions that are not reasonable or reliable to inform the Companies' future system planning.

I. The "Mimic Duke" Portfolio in the Second Corrected Synapse Report Still Fails to Accurately Mimic the Companies' Base Case with Carbon Portfolio and Sets an Unrealistic and Inflated Baseline Cost

As the Companies explained in their initial Reply Comments, the "Mimic Duke" portfolio serves an integral role in the Synapse analysis as it is intended to "model a similar portfolio to Duke's Base Case with Carbon Policy, in order to provide basis for comparison."[5] In this way, the Mimic Duke portfolio is critical to achieving the Report's primary objective of showing that the Companies can maintain power system reliability

[5] Joint Synapse Sponsors Initial Comments at 9. The Second Corrected Synapse Report acknowledges that the Mimic Duke portfolio is "not identical" to the Base Case with Carbon Policy portfolio, but suggests that it is "similar" enough to provide a baseline comparison. Second Corrected Synapse Report, at 5.

while accelerating coal retirements, reducing load through EE and DSM, and replacing the remaining needed capacity and energy with new renewable generation and energy storage—purportedly all at a lesser cost than demonstrated in the Companies' IRPs.

While the Second Corrected Synapse Report does correct certain flaws in the Mimic Duke portfolio that were present in the First Corrected Synapse Report, the most recent Mimic Duke portfolio still fails to closely replicate the Companies' Base Case with Carbon Policy such that it can be credibly used as a baseline for comparison to the Reasonable Assumptions Portfolio.

First, the Companies' initial Reply Comments detailed a host of areas in which Synapse's Mimic Duke portfolio deviated significantly from the Companies' Base Case with Carbon portfolio, including by, among other things, (1) modeling a single, joint balancing authority for the DEC and DEP systems rather than the three distinct balancing authorities modeled in the Base Case with Carbon Policy portfolio; (2) upwardly adjusting the forecasted cost of natural gas in the model; and (3) forcing retirement of all new gas resources by 2050 rather than their estimated 35 year useful lives as modeled by the Base Case with Carbon Policy.[6] None of these cost inputs and modeling assumptions were modified in the Second Corrected Synapse Report, and, in the Companies' view, undercut the reasonableness of Synapse's Report even before analyzing more significant flaws.

Second, the Companies have uncovered that the Second Corrected Synapse Report's correction to properly account for the joint ownership of Catawba Nuclear Station has introduced another significant error in Synapse's analysis. As explained in the Companies' initial Reply Comments, the First Corrected Synapse Report significantly

[6] *See* Duke Energy Progress, LLC and Duke Energy Carolinas, LLC's Reply Comments, Docket No. E-100, Sub 165 (May 28, 2021) ("DEC/DEP Reply Comments"), at 238-41.

overstated the DEC system's available capacity by incorrectly assuming 100% ownership of the 2,379 MW Catawba Nuclear Station. To properly account for DEC's *partial* ownership of the Catawba Nuclear Station, the Second Corrected Synapse Report removed approximately 1,700 MW of carbon-free nuclear generation from the portfolio. In updating this information, however, Synapse made an additional error by purporting to identify a capacity shortage in DEC where there is none, a result due in part to Synapse's failure to include demand response programs as available capacity in its model.[7,8]

In an attempt to help fill this erroneous near term capacity gap and otherwise address the 1,700 MW downward capacity adjustment to reflect DEC's actual Catawba ownership share, the Second Corrected Synapse Report forces an additional 2.6 GW of solar from 2021 through 2026 into the Mimic Duke portfolio—an increase from zero (0) MW of forced or economically-selected solar over the same time period in the First Corrected Synapse Report. Because solar has very little firm winter capacity value, Synapse's new Mimic Duke portfolio incurs a capacity penalty early in the planning horizon to "satisfy" the capacity planning reserve margin, before eventually adding 1,650 MW of new combined cycle ("CC") and combustion turbine ("CT") gas units to fill the capacity and energy gap created by correcting DEC's available nuclear capacity in the Second Corrected Report.

The additional resources that Synapse incorporated into its Mimic Duke portfolio to account for partial ownership of the Catawba Nuclear Station also exacerbated the

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[7] *See* Attachment 2, Joint Synapse Sponsors' Response to Duke Energy's Fourth Data Request, No. 4-10 ("The update to the Duke nuclear capacity to reflect the correct ownership share for the Catawba Nuclear Station resulted in a small capacity deficit beginning in 2022"); 4-8 ("Synapse did not assume any demand response programs in either of its modeled scenarios.")

[8] As the 2020 IRPs clearly demonstrate, DEC has adequate capacity length when accounting for Catawba Nuclear joint ownership. *See* DEC 2020 IRP, at 100 (Table 12-E Base Case with Carbon Policy Load, Capacity, and Reserve Table-Winter); DEP 2020 IRP, at 101 (Same).

significant resource deviations from the Base Case with Carbon Portfolio (the portfolio purportedly being mimicked) and also inappropriately inflates the cost of the Mimic Duke portfolio baseline. As shown in Table 1, the Mimic Duke portfolio now includes ***more than 3,000 MW of additional gas resources*** over and above the Companies' Base Case with Carbon Policy while it assumes 0 MW of demand response as compared to the over 1,400 MW in the Companies' Base Case with Carbon Policy.

Table 1: Capacity Comparison of the Companies' 2020 IRP Base Case with Carbon Policy Portfolio and the Second Corrected Synapse Report Mimic Duke Portfolio

	Duke Base Case with Carbon Policy	Synapse Mimic Duke, Second Corrected	Delta
Total Incremental Solar	**8,395**	**4,875**	**-3,520**
Economically Selected Solar	3,675	2,250	-1,425
Total Incremental Wind	**750**	**150**	**-600**
Economically Selected Wind	750	150	-600
Total Incremental Storage	**2,188**	**0**	**-2,188**
Economically Selected Storage	1,889	0	-1,889
Total Economically Selected Gas	**7,328**	**10,401**	**3,073**
Economically Selected CT	3,656	8,295	4,639
Economically Selected CC	3,672	2,106	-1,566
Demand Response	**1,434**	**0**	**-1,434**

In further contrast, the total incremental renewable resources (including solar, wind, and storage) in the Mimic Duke portfolio is ***6,308 MW less than*** the amount planned for in the Base Case with Carbon portfolio. By selecting significantly more gas and significantly fewer renewable resource, the Mimic Duke portfolio wholly fails to approximate the capacity resources planned for use in the Companies' Base Case with Carbon portfolio, let alone provide a credible baseline for comparison to Synapse's alternate Reasonable Assumptions portfolio.

Taking a closer look at these numbers, the forced inclusion of 2.6 GW of forced in solar in the Second Corrected Report further reduces the amount of economically selected solar compared to the First Corrected version of the Report from 3,375 MW to 2,250 MW. Additionally, the first year of economically-selected solar in the Second Corrected Mimic Duke scenario did not change from 2034 in the previous version, and remains a significant disconnect to the Companies' Base Case with Carbon Policy portfolio, which starts economically selecting solar ten years earlier in 2025. The complete lack of storage in the Mimic Duke portfolio also does not track with what can reasonably be expected from a future with carbon policy. The Companies' Base Case with Carbon Policy portfolio economically selected nearly 2 GW of storage between stand-alone storage and storage pair with solar over the 15-year planning period. The lack of economic selection storage and failing to economically select any renewable resources before 2034 in the Mimic Duke portfolio, in a scenario with a price on carbon and a significantly higher gas price[9] than assumed in the Companies' IRPs, should be a red flag to the Commission that Synapse's results-oriented modeling has led to illogical results.

Simply put, the Second Corrected Synapse Report's flawed Mimic Duke portfolio still fails to provide a credible benchmark to the Companies' Base Case with Carbon policy given the stark difference in portfolio components and selective modeling liberties taken to inflate the price of the portfolio before comparing it to Synapse's Reasonable Assumptions portfolio.

[9] Gas Assumptions in Mimic Duke result in an average fuel cost for Existing Natural Gas Combined Cycle that are approximately 40% higher than those in the Companies' IRPs and approximately 100% higher for New Natural Gas Combined Cycles.

II. The Second Corrected Synapse Report Still Fails to Appropriately Model the Companies' Existing System Operations

In addition to the issues described in Section I, the Second Corrected Synapse Report is founded on numerous modeling errors and flawed modeling assumptions of the Companies' existing system operations. The Companies described these issues in detail in their initial Reply Comments, a majority of which were not remediated by the corrections to the Second Corrected Synapse Report.[10]

First, while the Second Corrected Synapse Report addresses the overstated capacity available to DEC from the Catawba Nuclear Station, it fails to similarly recognize that DEC owns less than 100% of the W.S. Lee Combined Cycle Station. This information is presented on the same pages of the 2020 DEC IRP describing DEC's ownership interest in the Catawba Nuclear Station.[11] Failing to account for this partial ownership interest results in a 100 MW overstatement of DEC's access to efficient, low carbon natural gas generation to serve native load customers. As stated in the Companies' initial Reply Comments, the overstatement of access to low carbon, efficient generation benefits the Reasonable Assumptions portfolio, as this scenario has far less energy on the system to serve (largely due to unrealistic EE savings assumptions, discussed below) and is less constrained by the removal of coal unit must run designations.[12]

Second, as explained in the Companies' initial Reply Comments, Synapse's modeling of must run designations for certain of the Companies' coal units enforces unduly restrictive assumptions (and increases costs) in the Mimic Duke portfolio that are not

[10] DEC/DEP Reply Comments, at 242-248.
[11] DEC 2020 IRP, at 102, 215.
[12] DEC/DEP Reply Comments, at 225.

present in the Reasonable Assumptions portfolio.[13] The Second Corrected Synapse Report similarly includes this error in modeling its proposed Mimic Duke portfolio. In particular, the must run designations imposed in the Mimic Duke portfolio forces coal units with this designation to run year-round, when in reality and as modeled in the Companies' IRPs, the must run requirements are indexed to the utility's load. The Synapse modeling assumption forces these units to run, out of economic order, regardless of the load. The impact of this modeling error is significant, as it forces some coal units to run as much as 5,642 hours more than it otherwise should, an increase of 1300%.

Not only does the Synapse model impose unnecessary must run requirements for the coal units in the Mimic Duke scenario that results in higher system costs, it also erroneously raises the projected carbon emissions of the system, which further increases the cost of the system under this scenario due to the inclusion of the explicit cost of carbon emissions, as discussed later. In contrast, Synapse's modeling relieves the must run requirement in the "Reasonable Assumptions scenario. [14] This modified assumption understates the actual cost of the Reasonable Assumptions portfolio and does so, notably, without imposing an associated cost and time to implement such a solution to ensure reliable system operations as must run coal units are assumed to be retired from the System.

Other flawed assumptions used in developing the Reasonable Assumptions portfolio also remain in the Second Corrected Synapse Report. For example, the EE/DSM assumptions as discussed in the Companies' initial Reply Comments and in Section V of these Supplemental Reply Comments are not reasonable, or likely even feasible, in the

[13] The Companies' Reply Comments provide a fulsome explanation of must run designations. *Id.* at 244-48.
[14] *See* Second Corrected Synapse Report at 19, and Attachment 2, Joint Synapse Sponsors' Response to Duke Energy's Fourth Data Request, No. 4-9.

Carolinas. Furthermore, Synapse's simplifying assumption to model one joint balancing area with a single load and reserve margin, and with resources in either utility being used to meet the system load, regardless of transmission limits, is also not reasonable assumption for the Companies' independent system planning obligations, as previously discussed in the initial Reply Comments.[15] Moreover, no ancillary requirements were modeling in the Synapse modeling.[16] Again, this is an unrealistic assumption, and one that continues to favor the renewables heavy Reasonable Assumptions portfolio. In such a portfolio, the requirements for responding to the variability of renewables will likely increase, thereby increasing the total system cost. In sum, omitting these real world system operational requirements and costs continues to overstate the reliability and understate the resulting cost of Synapse's preferred alternative portfolio.

III. Adding over 30,000 MW of new Renewable Capacity During Next 15 Years is not a "Reasonable Assumption"

Overall, the build out of capacity resources in the Synapse Reasonable Assumptions portfolio creates significant risk to the Companies' ability to reliably plan for and construct the 30,000+ MW of new generating capacity that would be needed to retire the Companies' coal units and to ensure DEC and DEP are able to reliably serve customers' load requirements 24 hours a day, 7 days a week, 52 weeks a year. The amount of new resources added to the DEC and DEP systems under the Reasonable Assumptions scenario exceeds the planned new capacity required to be interconnected of the Base Case with Carbon

[15] DEC/DEP Reply Comments at 242; *see also* Attachment 2, Joint Synapse Sponsors' Response to Duke Energy's Fourth Data Request, No. 4-17 (recognizing that modeling DEC and DEP separately "both would likely need to add more resources in order to meet separate reserve margins for DEC and DEP rather than a combined reserve margin").

[16] Attachment 2, Joint Synapse Sponsors' Response to Duke Energy's Fourth Data Request, No. 5-3 ("Ancillary service requirements were not modeled in the Synapse analysis in either the Mimic Duke or the Reasonable Assumptions scenario").

Policy by more than 12,000 MW during the planning period, or, on average, by over 800 MW per year. Put another way, the Synapse Reasonable Assumptions scenario would require Duke to plan for and build or acquire 68 percent more new capacity than the Companies' Base Case with Carbon Policy, all while retiring the Companies' coal fleets. This amount of interconnected resources is greater than *any* of the six resource plans included in the 2020 IRPs. And, notably, the Reasonable Assumptions portfolio relies on extremely high levels of EE to offset additional energy and peak capacity needs, which often have to be met separately when relying on variable energy resources. Table 2 illustrates the stark delta in terms of capacity additions between the Companies' Base Case with Carbon Policy portfolio and the Reasonable Assumptions portfolio.

Table 2: Capacity Comparison of the Companies' 2020 IRP Base Case with Carbon Policy Portfolio and the Second Corrected Synapse Report's Mimic Duke Portfolio

	Duke Base Case with Carbon Policy	Synapse Reasonable Assumptions, Second Corrected	Delta
Incremental Solar	8,395	17,820	9,425
Incremental Land-Based Wind	750	2,500	1,750
Incremental Off-Shore Wind	0	750	750
Incremental Storage (stand alone and paired)	2,188	11,788	9,600
Incremental Gas	7,328	0	-7328
Total Incremental Interconnected Capacity*	**17,792**	**29,966**	**12,174**
Average Interconnected per Year	**1,186**	**1,998**	**812**

* Battery Paired with Solar does not require additional interconnection, so incremental capacities do not equal the incremental interconnected capacity

Due to low capacity factor renewables and decreasing capacity value of storage as more is added to the system, more nameplate capacity is needed to be connected to fill the resource requirements compared to replacing coal retirements with new natural gas resources. The distributed nature of renewables means that not only will the Companies need to connect

more nameplate capacity each year, but an increased number of new generating facilities will need to be interconnected to the grid, necessitating increased interconnection studies and, likely, additional transmission network upgrades. Said another way, the more distributed the resources, the more challenging to timely interconnect all of them with respect to physical and economic feasibility.

As discussed in the Companies' initial Reply Comments, the Reasonable Assumptions portfolio's reliance on new and emerging technology creates operational underperformance risk, technology reliability risk, and portfolio integration and execution risk.[17] The amount of storage incorporated into the Companies' service territories by 2035 as contemplated by the Reasonable Assumptions portfolio is ultra-aggressive, as the amount of incremental storage planned for under the Reasonable Assumptions portfolio is over 500% greater than assumed in the Companies' Base Portfolio with Carbon Policy and also ***five (5) times the amount of storage currently installed on utility systems in the entire United States as of the end of March 2021.***[18]

As the Companies' emphasized in their Reply Comments, pointing to recent testimony to Congress by NERC President and CEO, Mr. James Robb, "[i]t is imperative to understand and plan for the different operating characteristics of variable, inverter-based resources. This includes time to study, plan for, and develop effective solutions to the challenges."[19] Committing to an unbalanced and unproven resource mix of over 30,000

[17] DEC/DEP Reply Comments, at 196.
[18] According to the U.S. Energy Storage Monitor Q2 2021 Report published by Wood Mackenzie in June 2021, there has been 2,580 MW of (front of the meter) battery storage deployed in the US since Q3 2008. Wood Mackenzie Power & Renewables, U.S. Energy Storage Monitor Q2 2021 Report (June 2021), at 37.
[19] James R. Robb, North American Electric Reliability Corporation, Testimony Before United States Senate Committee on Energy and Natural Resources, Full Committee Hearing on the Reliability, Resiliency, and Affordability of Electric Service (March 11, 2021) (NERC Robb March 11, 2021 Testimony to Congress"), at 9 included as Attachment 2 to DEC/DEP Reply Comments.

MW of new renewable energy capacity resulting from intervenor-introduced biases in system planning could have critical consequences for customers introducing both economic and reliability risks. In contrast, the Companies' IRPs present a well-planned, consistent, incremental approach to integrating renewables and storage that will best allow the Companies to develop effective solutions to offset these risks.

IV. The Report's Load Shape Modeling Assumptions Fail to Reflect Real World Operations and Continues to Understate Cost while Overstating Reliability

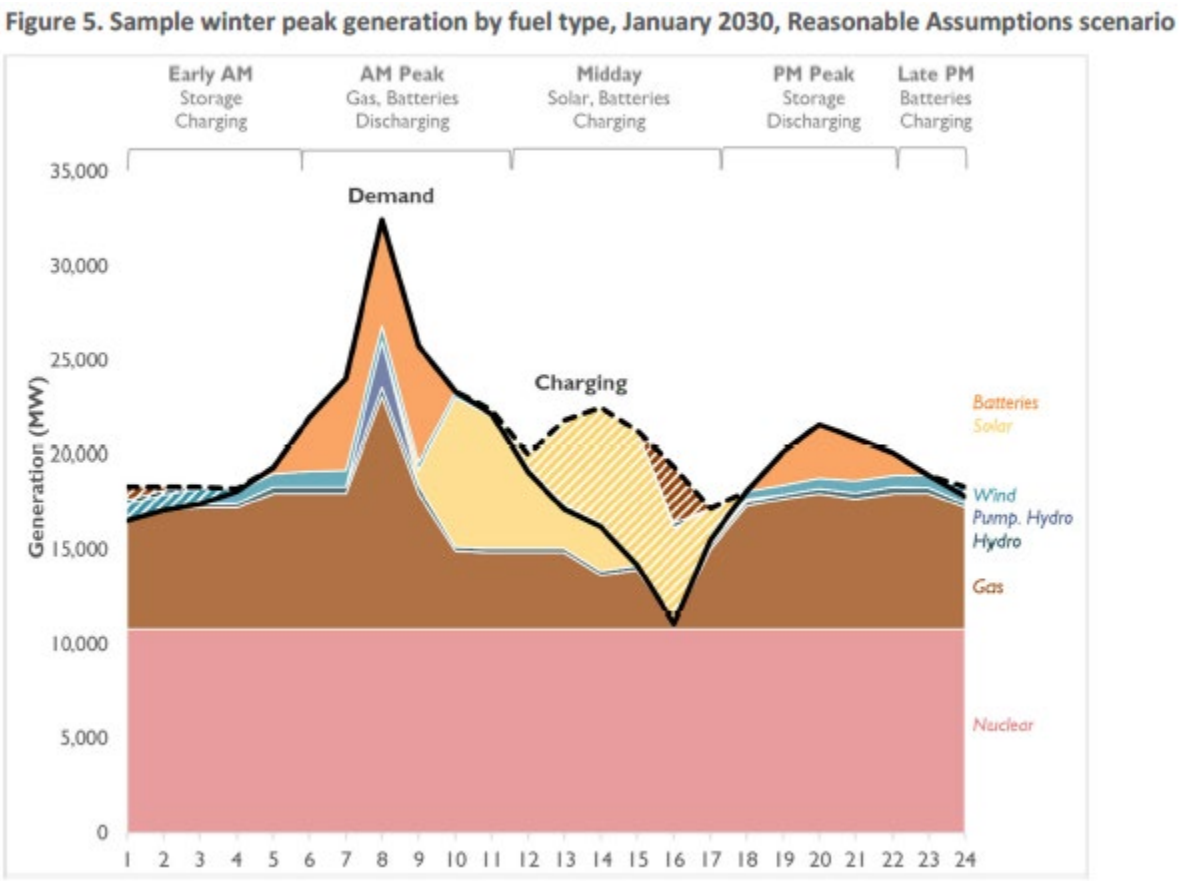
The Second Corrected Synapse Report purports to correct the load shapes represented in Figures 4 and 5 of the two previous Synapse Reports, which, as the Companies explained in their initial Reply Comments, distorted future load shapes during the planning period and did not realistically plan for customers' loads that the Companies will need to be able to serve in the future. Specifically, as the Companies highlighted in initial Reply Comments, Figures 4 and 5 distorted the peak winter load shape into a "needle peak" with a deep, mid-day valley which failed to resemble any peak winter load shape actually observed by the Companies in the real world.[20] The Companies understand that the distorted shape occurred because Synapse used its Encompass modeling software to aggregate all the peak days in the month of January into a representative day rather than using the Companies' specific hourly forecast. As a result, the model did not allow Synapse to accurately identify the needs of DEC's and DEP's real world operations in the future and therefore is not reliable to select the appropriate resources to meet that need.[21]

While the Second Corrected Synapse Report presents a more realistic load shape in revised Figures 4 and 5,[22] the Report fails to mention that these illustrations were *not* used

[20] DEC/DEP Reply Comments, at 250.
[21] DEC/DEP Reply Comments, at 248-253.
[22] Second Corrected Synapse Report, at 18.

to develop either the Mimic Duke or Reasonable Assumptions portfolios or to calculate the projected costs to operate the system with these portfolios. Instead, these corrected load shapes were introduce into the model after the fact in an attempt to demonstrate the model's reliability. Importantly, the Mimic Duke and Reasonable Assumptions portfolios were developed *based on the same distorted load shape* discussed in the Companies' initial Reply Comments, which is presented in Figure 1 below.[23]

Figure 1: Synapse Report Figure 5, First Corrected Version.



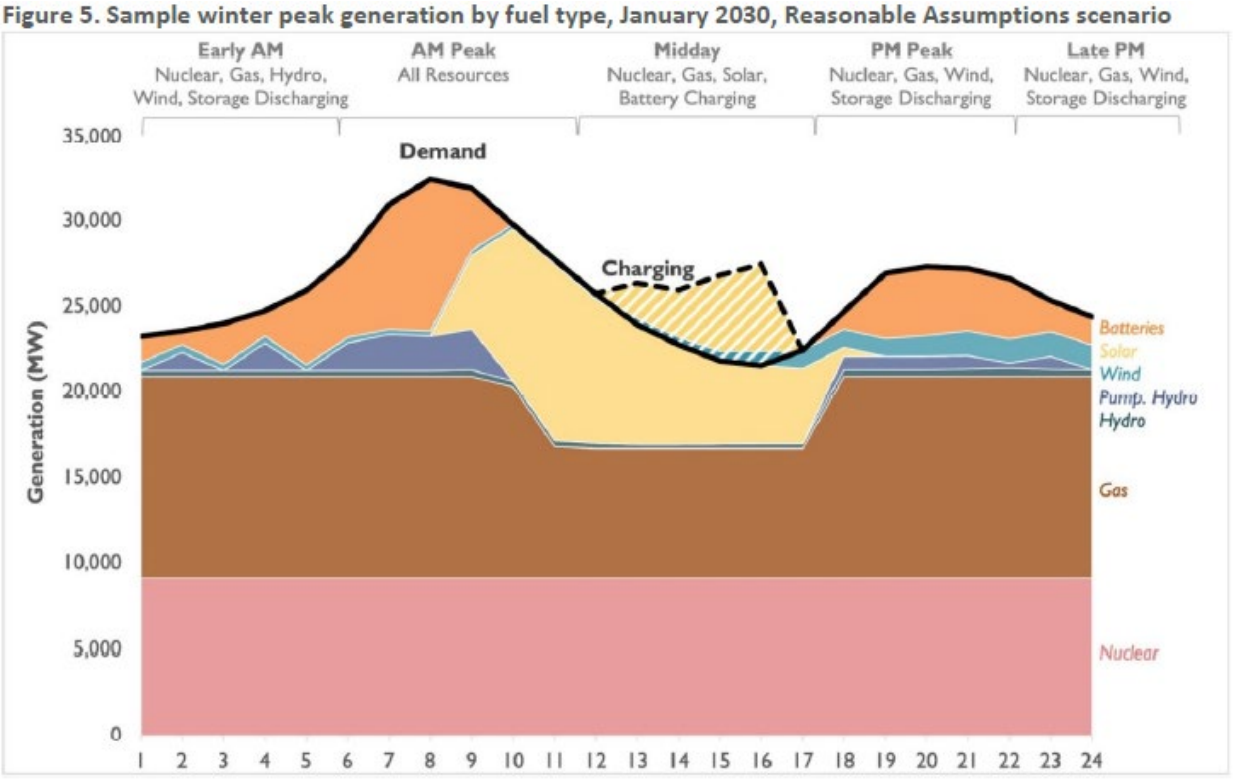
[23] *See* the Joint Synapse Sponsors' Response to DEC/DEP Data Request ("DR") No. 4-14 (explaining that Synapse did not run the Mimic Duke and Reasonable Assumptions scenarios in an hourly model; instead, "the scenarios were run in hourly mode for the month of January 2030 only for the limited purpose of presenting the information in Figures 4 and 5"). A copy of the Joint Synapse Sponsors' Response to DR No. 4-14 is attached hereto as Exhibit 1.

As explained in the Companies' initial Reply Comments, this load shape, with its steep needle peak and deep, mid-day valley, favors the selection and use of low cost, shorter duration capacity resources like battery storage and increases costs for traditional resources.[24] Figure 1 shows how the narrow peak allows for large amounts of battery storage to clip the peak by discharging during these hours of high demand, and then recharging the battery during the deep valley, when solar energy is generating during daylight hours. This artificially increases the value and promotes the selection of the battery storage resources in Synapse's Reasonable Assumptions portfolio, while at the same time discouraging solar additions in the Mimic Duke portfolio as the Companies' winter peaks do not align with the distorted load shape used for the selection of resources. Importantly, the Second Corrected Synapse Report relies upon the same inaccurate and unrealistic load shape in its capacity expansion and hourly production cost modeling to actually develop the two portfolios.[25]

For the purpose of presenting updated Figures 4 and 5 in the Report, however, Synapse ran an additional production cost run with a more realistic peak winter load shape to create the graphs and to show that the generation of each portfolio can meet load with a more realistic real world load shape. Figure 2 is the updated Figure 5 from the Second Corrected Synapse Report, showing the change in load shape for these previously presented graphs.

[24] DEC/DEP Reply Comments, at 252.
[25] *See* Joint Synapse Sponsors' Response to DR 4-14.

Figure 2: Synapse Report Figure 5, Second Corrected Version.

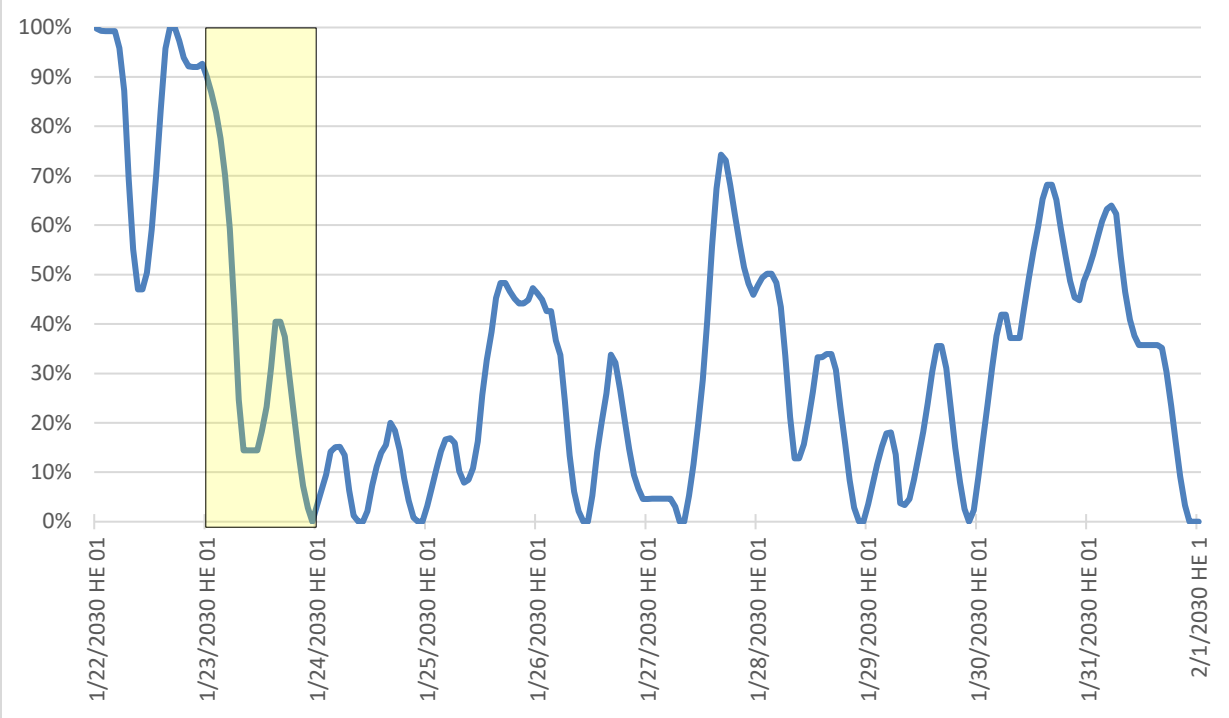


While Synapse displays these graphs in its Second Corrected Report to show how even in peak winter events, the Reasonable Assumptions portfolio is just as reliable, the Companies disagree that Synapse's limited analysis supports this conclusion.[26] First, the Reasonable Assumptions portfolio relies on an overly optimistic EE forecast to lower peaks and reduce energy needs around the clock at levels that are unachievable, as discussed in Section V below. Second, the load forecast used as a basis for the IRPs utilized weather normal load data meaning that the Reasonable Assumptions portfolio runs the risk of exhausting its available storage energy following the peak load day used for this graph. Figure 3 below uses the data consistent with Figure 5 from the Synapse Report, produced by Synapse in discovery, to show the battery storage energy availability under the

[26] Second Corrected Synapse Report, at 34-37.

Reasonable Assumptions scenario for the final 10-day period in January 2030. The winter peak day, shown in Figure 5 from the Synapse report, is highlighted in yellow. The day preceding the winter peak day shows the system's storage capacity is at full capacity. Over the next two days, however, the system completely drains the battery. The days following the peak winter day show the limited amount of opportunity for the batteries to recharge before being called on again to discharge to zero.

Figure 3: Storage Availability During Winter Peak Day in Synapse Report Figure 5 and Succeeding Days



Using this limited, one month simulation of weather normal load and depressed peak and energy needs from the unreasonable EE assumption creates increased reliability risk if the batteries do not have any available capacity charge. If a simulation with these more realistic load shapes is run over an entire study period, or with non-weather normal load forecasts, or if winter weather events resulting in sustained, elevated loads, then portfolios overly reliant on batteries like the Synapse Reasonable Assumptions portfolio

have the potential to create serious reliability risks absent significantly overbuilding energy and battery capacity resources (to an even greater extent than already done in the Reasonable Assumptions portfolio), to ensure power system reliability is maintained for the Companies' customers. For this reason, the Companies' initial Reply Comments heavily emphasize the need for more study of storage capacity value and the future role of battery storage in system operations in light of events such as the recent extreme cold weather reliability events in ERCOT.[27]

Moreover, as previously discussed in the Companies' initial Reply Comments, portfolios with energy-limited and variable energy resources, such as the Reasonable Assumption portfolio would likely require a much larger planning reserve margin, increasing the cost of the system.[28] This is especially true if neighboring utilities also rely heavily on variable and energy-limited resources.

In sum, because the production cost model used to develop the Mimic Duke and Reasonable Assumptions resource portfolios was run using the same distorted load shape presented in the First Corrected Synapse Report, the reliability issues and true cost to run the system and ensure operational reliability are once again not fully reflected in the presented results. Moreover, the reliability of the Reasonable Assumptions portfolio is brought into question when simply looking at the storage capacity throughout the peak winter day. Extreme winter events such as those seen in recently in California, Texas, and even North Carolina in the last decade can last days, with sustained, elevated load and lack of availability of solar irradiance and wind. As the Companies transition to a lower carbon energy system, it will take time to study and understand the effects and performance of the

[27] DEC/DEP Reply Comments, at 206-209.
[28] *Id.* at 254.

system with these resource. A steady approach, which maintains all resources as options to meet customers' energy, reliability, and affordability needs is of paramount importance.

V. Synapse Report's Assumptions Surrounding Energy Efficiency Continue to be Unreasonable and Largely Dependent on Events Outside of the Companies' Control

The Second Corrected Synapse Report continues to maintain the same unsubstantiated and unrealistic assumptions surrounding EE savings and costs as used in the First Corrected Report.[29] The Companies described these shortcomings in extensive detail in the initial Reply Comments and maintains that these flawed assumptions continue to fundamentally undermine the credibility of the Report as a whole.[30]

Synapse continues to rely on the assumptions underlying the Energy Efficiency Policy scenario from the American Council for an Energy-Efficient Economy's September 2020 research report ("ACEEE Report") as the basis for their "Reasonable Assumptions" scenario. As discussed in the Companies' initial Reply Comments, it is important to reiterate for the Commission that the ACEEE Energy Efficiency Policy scenario relies almost entirely on significant and costly assumed changes in legislation and energy policy to support its aggressively optimistic assumptions of higher EE savings potential. Additionally, as discussed in initial Reply Comments, the majority of the proposed increased savings potential are not within the purview or control of utility-sponsored EE programs even in the highly unlikely event that all of these policies are adopted in the immediate future.[31] Accordingly, increases in EE savings to ultimately reach a level of

[29] *See* Attachment 2 Joint Synapse Sponsors' Response to Duke Energy's Fourth Data Request, No. 4-7 ("The energy efficiency calculations were unchanged from the original Synapse Report").
[30] DEC/DEP Reply Comments, at 255-62.
[31] *Id.* at 261-62.

1.5% in EE savings annually by using savings from speculative legislation, as done in Synapse's Reasonable Assumptions scenario, is not reasonable.

In order to ensure that the Companies can reliably serve customers' future energy needs, it is critically important that EE assumptions utilized in system planning through an IRP be grounded in a market potential study or other credible and realistic analysis, especially in the near-term, because any overstatement of EE potential will directly result in an understatement of the load forecast and potentially lead to inadequate resources to serve customer energy needs. The aggressive EE savings, which are higher than anything previously identified or recommended by the EE Collaborative, also exacerbate upside electrification risks.

In addition to the important reliability concerns introduced by overstated EE savings potential, the Second Corrected Synapse Report again makes the unfounded assumption that savings levels nearly triple those assumed in the Companies' EE forecasts, which, again, are based on an extensive Market Potential Study ("MPS"), can be attained ***at the same cost per kWh*** as measures offered under current programs and with current legislation and policy constraints regarding cost-effectiveness. This assumption is simply not realistic. As stated in the Companies' initial Reply Comments, there are numerous factors that make this a highly speculative and unlikely future outcome.[32]

To estimate a more realistic, but likely still understated, level of spending required to attain Synapse's significantly higher assumed levels of EE savings, the Companies utilized the program costs indicated by our current 5-year EE plan along with the costs forecast by the Companies' retained expert, Nexant, Inc., in the MPS for the remainder of

[32] *Id.* at 260-62.

the IRP planning period. For the EE savings levels up to the Companies' Base Case projections, this analysis assigned costs at the exact same level as used in the Companies' EE forecasts. For the additional, unspecified EE kWh savings assumed to be achievable by Synapse, the incremental cost per kWh for the additional savings projected in the Companies' High Case EE forecast[33] was used to project the additional spending required. This is a *very* conservative cost per kWh estimate as the High Case incremental kWh savings in any given year represents an increase of less than 10% relative to the Base Case. On the other hand, Synapse's purportedly "Reasonable Assumptions" forecast in several years more than doubles the incremental annual kWh savings in the Companies' Base Case. These significantly higher kWh savings would likely cost substantially more to achieve than the incremental cost per kWh assumed for the IRP High Case. Applying these modified costs assumptions to Synapse's assumed EE savings potential result in an increase of over $1.36 billion in present value revenue requirement ("PVRR") to the cost of Synapse's Reasonable Assumptions scenario over the planning period.

In sum, the Second Corrected Synapse Report does not modify the overly-aggressive EE savings forecasts from prior versions of the Report and the Companies continue to view these assumptions as overstated in terms of achievability and grossly understated in terms of cost to achieve, even if they were feasible.

VI. The Assumed Reasonable Assumptions Portfolio Cost Savings are Grossly Inaccurate

The Second Corrected Synapse Report boldly claims that the Reasonable Assumptions portfolio is "an alternate clean energy resource portfolio that reduces total

[33] DEC 2020 IRP, at 270; DEP 2020 IRP, at 262.

system cost by $7.4 billion and CO2 emissions by 74% compared to a scenario similar to Duke's modeled Base Case with Carbon Portfolio."[34] Strikingly, the $7.4 billion marks an increase of $200 million from the potential "savings" identified in the First Corrected Synapse Report, an increase caused, at least in part, by the issues with Synapse's revised modeling, planning, and operational assumptions described above.

But even setting aside the inaccurate assumptions and errors that artificially inflate the cost of the Mimic Duke portfolio while favoring Synapse's preferred Reasonable Assumptions scenario, the bulk of these touted "savings" continue to be illusory for the same reasons explained in the Companies' initial Reply Comments.[35] For example, nearly 60% of the cost delta between the Mimic Duke and Reasonable Assumptions portfolios in the Second Corrected Synapse Report arises from Synapse's improper inclusion of an assumed carbon tax in both of its portfolios. While the Companies use carbon pricing as a proxy for energy policy in their 2020 IRPs, such costs are explicitly excluded from the PVRR analysis for each of the six portfolios due to the future unknown of carbon regulations compliance costs.[36] Synapse's inclusion of such costs ignores that there is much disagreement at the state and federal levels regarding how best to implement energy policy and that a direct carbon tax appears unlikely.

Another illusory cause of the delta between the Mimic Duke and Reasonable Assumptions is that each scenario inexplicably uses different assumptions to evaluate the cost of technology. The Mimic Duke portfolio purports to use the Companies' technology

[34] Second Corrected Synapse Report, at 1.
[35] DEC/DEP Reply Comments, at 263-64.
[36] *See* DEC 2020 IRP, at 16, n.2 (explaining "PVRRs exclude the cost of CO_2 as tax. Including CO_2 costs as tax would increase PVRRs by ~$11-$16B. The PVRRs were presented through 2050 to fairly evaluate the capital cost impact associated with differing service lives").

costs, while the "Reasonable Assumption" portfolio relies on the National Renewable Energy Laboratory ("NREL") Annual Technology Baseline ("ATB") Advanced costs for land-based wind, off-shore wind, and battery energy storage, but not solar. In other words, for these technologies comprising approximately 15,000 MW of the capacity planned in Synapse's Reasonable Assumptions scenario, Synapse cherry picked the lowest technology cost estimates available for renewable resources to artificially accentuate the purported "savings" of the Reasonable Assumptions portfolio over the Mimic Duke portfolio.

Notably, for solar, Synapse used the Companies' estimate—and *not* the NREL ATB Advanced case—for construction of new solar. This is likely because the Companies' cost estimate for new solar was lower than the NREL ATB Advanced case for the majority of the planning horizon.

Aside from picking and choosing the most beneficial cost estimates, Synapse's reliance on the NREL ATB Advanced scenario—as opposed to the Moderate scenario—in and of itself improperly skews the overall cost estimate of the Reasonable Assumptions portfolio. Because the Advanced scenario assumes the availability of technology that may not be market-ready, its cost estimates are far from settled. NREL acknowledges as much by defining the Advanced scenario as "[i]nnovations that are far from market-ready today are successful and become widespread in the marketplace. New technology architectures could look different from those observed today. Public and private R&D investment increases."[37] To better assess the impact of Synapse's inconsistent, biased pricing approach, the Companies calculated a cost adjustment based on both the Synapse data and the NREL ATB Moderate (base planning) case. This update to solar, wind, and battery

[37] NREL, Annual Technology Baseline, Definitions, https://atb.nrel.gov/electricity/2020/definitions.php (last visited June 30, 2021).

costs resulted in a nearly $3 billion increase to the PVRR plan costs in the Reasonable Assumptions portfolio, doing away with nearly 75% of the purported "savings."

In addition, the Companies discovered a material modeling error in Synapse's attempt to levelize the cost of solar, wind, and battery resources. In both the First and Second Synapse Reports, Synapse claims that it levelized the cost of these resources and offered them to the model using the Companies' weighted average cost of capital ("WACC") and financing assumption. The logic the authors use is to allow the model to choose resources primarily based on energy benefits rather than the capacity needs of the system.[38] First, this is a faulty argument, as both the System Optimizer model, which the Companies used to perform capacity expansion modeling, and Encompass, which Synapse used, both have the ability to select resources with primarily energy related benefits. The models, if set up properly as the Companies did, allow for resources to be selected if it lowers the cost of the system regardless of whether a capacity need exists or not. Second, in its modeling, Synapse attempted to levelize the cost of renewables and storage. For the renewables, Synapse attempted, as it stated in the Report,[39] to use the Companies' WACC, but did not ultimately use the Companies' WACC in the actual leveling calculations. This results in an understatement of costs in the levelization process from 10 to 30% depending on technology or year the resource comes into service. In the separate calculation of the levelization of the cost of storage, the Companies' WACC was again improperly applied, along with improperly calculating and adding-in the fixed O&M costs of the technology. When these corrections to the levelization of Synapse's data, results in a further cost increase to the Reasonable Assumptions Portfolio of over $2 billion.

[38] Second Corrected Synapse Report, at 12-13.
[39] *Id.*

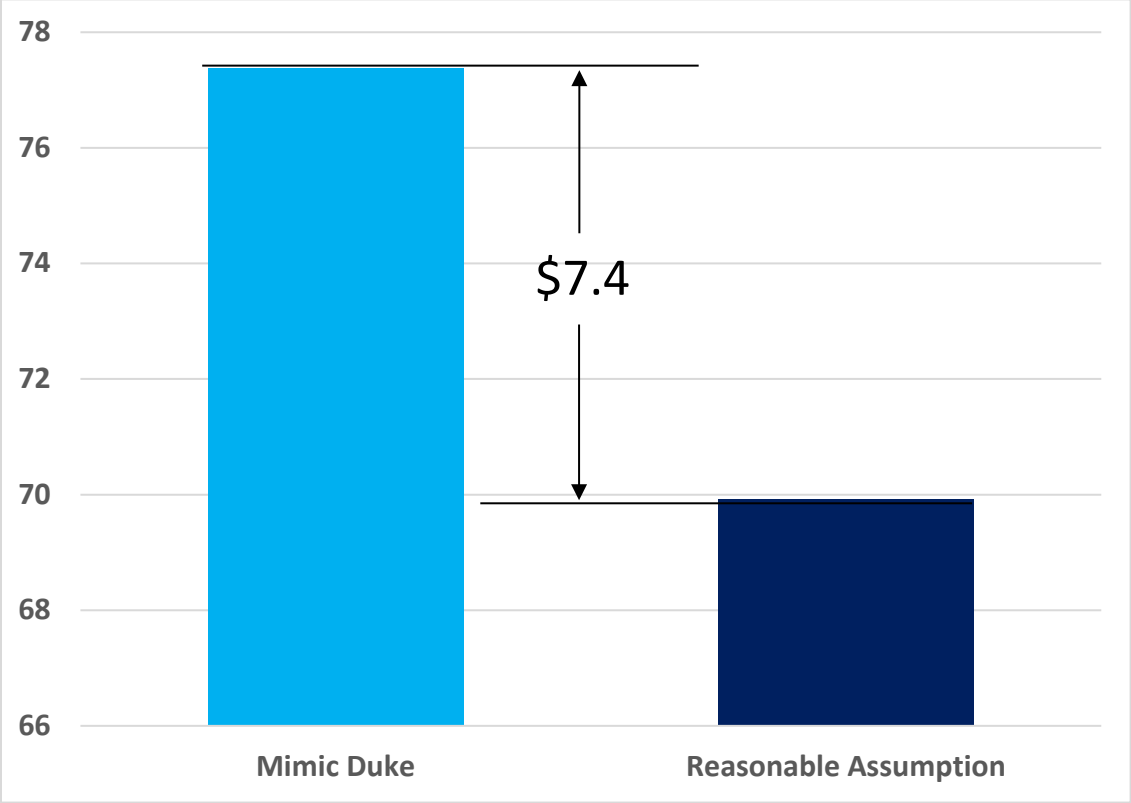
Finally and as discussed above, the Second Corrected Synapse Report significantly underestimates the cost of the aggressive additions to EE in the Reasonable Assumptions scenario. Synapse assumes that incremental EE costs per additional kWh saved will remain flat forever, even at the extremely high level of savings assumed in the Reasonable Assumptions portfolio. As discussed in the Companies' initial Reply Comments, additional EE savings, and especially cumulatively over time, becomes increasingly costly as the most cost effective measures become saturated resulting in less cost-effective measures making up a greater portion of future EE portfolios or higher incentives and marketing costs are required to increase participation for existing measures.[40] Using the incremental EE cost per kWh between the IRP's Base Case and High Case EE forecasts, the Companies developed a conservative cost adjustment for Synapse's much higher EE savings assumptions in the Reasonable Assumptions portfolio. This adjustment, while significant on a portfolio PVRR basis, still likely understates the true cost of the "Reasonable Assumptions" EE additions as the annual incremental savings in the Companies' High Case EE forecast increases energy savings by about ~10% relative to the Base Case, whereas Synapse assumes 80-100% more EE than the IRP Base Case, assumption. Adopting the logical assumption that incremental EE costs will rise at least modestly when trying to achieve very high savings levels equates to approximately $1.36 Billion in increased PVRR cost for the Synapse "Reasonable Assumptions" portfolio.

Below in Figures 4 through 5, the Companies show the Second Corrected Synapse Report's PVRR cost assumptions, the adjustments to correct major identified errors in these plans as discussed above, and the final adjusted PVRR for each of the portfolios. Making

[40] DEC/DEP Reply Comments, at 259.

the appropriate adjustments to the costs of the plans, as discussed above quickly shows the Reasonable assumption portfolio to be more costly than the Mimic Duke portfolio, again even with its unreasonable assumptions tied to this portfolio, as assumed by Synapse.

Figure 4: Original PVRR Calculations for Mimic Duke and Reasonable Assumption [Billions $, 2021]



The original PVRRs calculated by Synapse shows a $7.4 billion savings of the Reasonable Assumptions portfolio over the Mimic Duke portfolio. Figures 5 and 6 show the relative impact of each adjustment to address each of the issues mentioned above for each of the portfolios. Excluding the explicit cost of carbon is colored green with a downward arrow showing the reduction in the cost of both plans. The following three categories, Technology Cost Adjustment, Renewables and Storage Levelization Correction, and EE Cost Correction, are colored red and show increases to the Reasonable Assumption portfolio to correct these errant cost assumptions, while these adjustments have no impact

to the Mimic Duke portfolio. After the sum of these adjustments, the final cross-hashed bar in each of the graphs shows the total adjusted cost of the portfolio.

Figure 5: PVRR Adjustments to Mimic Duke [Billions $, 2021]

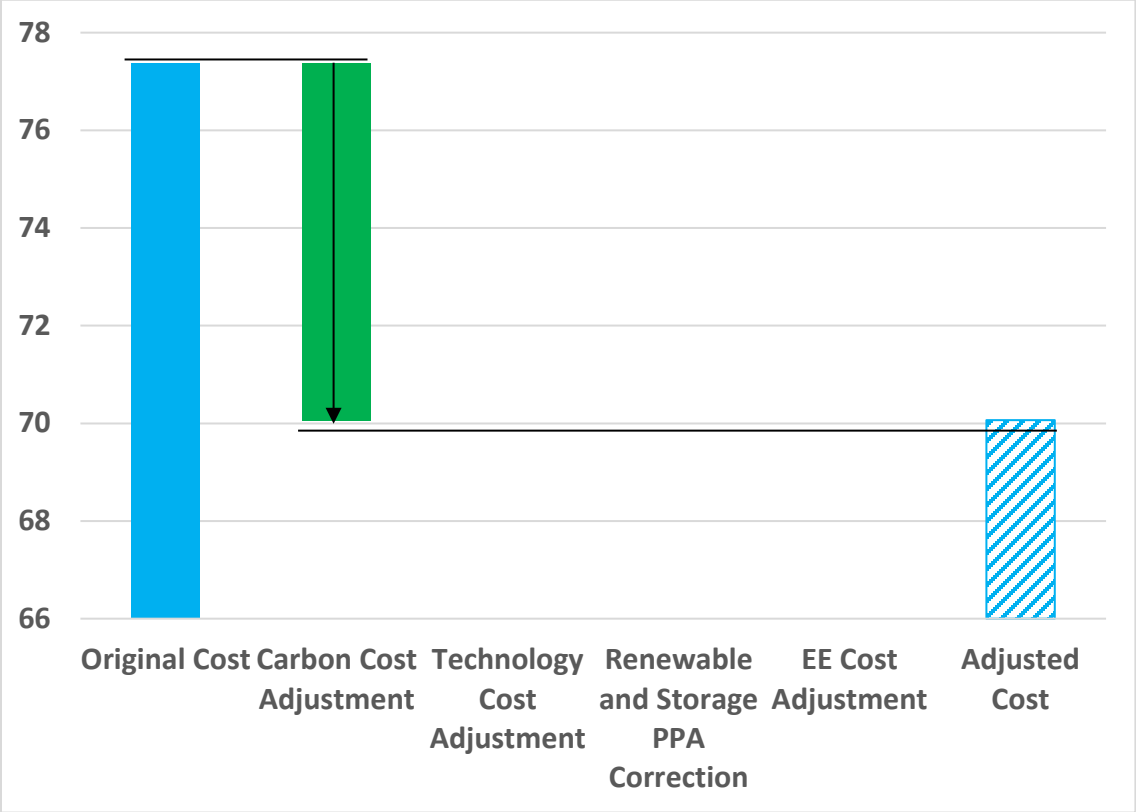
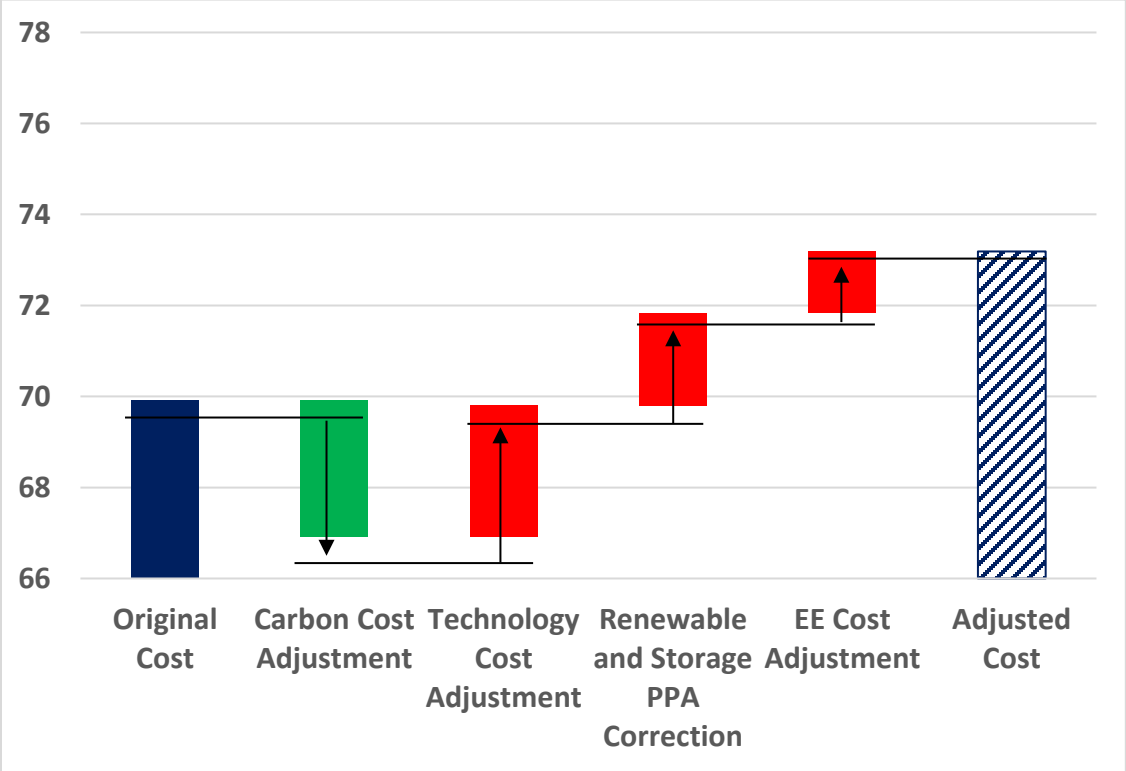
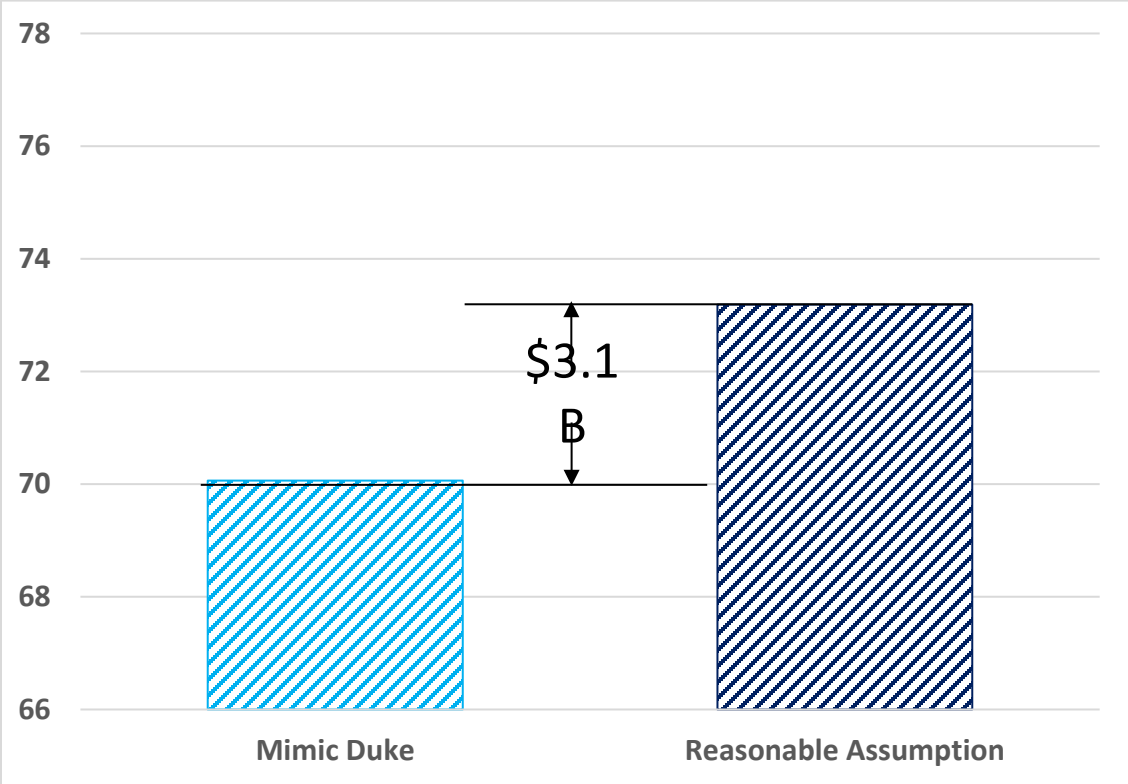


Figure 6: PVRR Adjustments to Reasonable Assumptions [Billions $, 2021]



The final figure below, Figure 7, compares the adjusted Mimic Duke PVRR to the adjusted Reasonable Assumptions PVRR.

Figure 7: Adjusted PVRR Calculations for Mimic Duke and Reasonable Assumption [Billions $, 2021]



After these corrections and adjustments, the Mimic Duke portfolio becomes $3.1 billion less than the Reasonable Assumptions portfolio, even with its over-reliance on solar and storage and restrictions on new natural gas generation.

While the Companies' analysis corrects some of the most significant errant assumptions within the Synapse modeling, there are still a multitude of simplifying assumptions, unreasonable inputs and inappropriate modeling that, if corrected in a full IRP, would further widen the gap between the cost of a Base Case with Carbon Policy type portfolio and a no new gas generation type portfolio. Correcting these assumptions would more similarly align with the relative costs between the Base Case with Carbon Policy and the no new gas Portfolio F in the Companies' IRPs, which was significantly higher than

the Companies' least cost modeling scenarios. These other factors include, but are not limited to the following:

- Performing production cost modeling using a highly distorted load shape;
- Modeling a single balancing authority for the two utilities;
- No demand response modeled;
- Improperly assuming only Transco Zone 5 natural gas pricing for all existing and new natural gas units;
- Improperly assigning a firm transportation service cost of $1.50/mmbtu of natural gas, a price far too high for the Transco Zone 5 gas pricing assumed, as a variable cost (that should be fixed cost) to new combined cycle generation, which negatively impacts the dispatch of these highly efficient cost and carbon emission units;
- Improperly modeling coal unit must runs in Mimic Duke portfolio and relieving this constraint at no cost in the Reasonable Assumptions Portfolio; and
- Not including transmission costs for increasing levels of intermittent renewables and storage, notably significant costs associated with offshore wind.

In sum, the alternate portfolio recommended by the Report, not only is actually more expensive than the inflated Mimic Duke portfolio costs, but as discussed above has seriously reliability concerns that the authors minimize and understate.

VII. The Attorney General's Office ("AGO") Advocacy for the Commission to Adopt the Second Corrected Synapse Report Without Any Evidence of Meaningful Review Should be Given Little Weight

In its Reply Comments, the AGO appears to adopt the Second Corrected Synapse Report just one day after it was filed, concluding that the "Reasonable Assumptions" portfolio proves that "Duke could achieve more carbon emission reductions at a lower cost without new gas generation by adding renewable resources and battery storage, and by

stepping up energy efficient measures."[41] According to the AGO, the Report "makes reasonable modifications and demonstrates an approach that is appropriate to use for planning purposes [and] considerably more appropriate than Duke's method of forcing in alternative clean energy resources without regard to their cost."[42] Strikingly, and perhaps because the various iterations of the Synapse Report align with its own goal of eliminating new natural gas resources from the Companies' IRPs, the AGO's only criticism of the Second Corrected Synapse Report is that it did not go far enough to realize available cost reductions, casting aside reliability concerns by suggesting that the 17% reserve margin may be unnecessarily high.[43]

To support these arguments, the AGO relies on a second report prepared by Strategen Consulting, LLC, and filed with the AGO's reply comments, which assessed the various iterations of the Synapse Report. While Strategen is quick to conclude that Synapse's modeling approach is "superior to Duke's in many respects,"[44] there is nothing in Strategen'sreport to suggest that Strategen ever pursued discovery or otherwise engaged with the underlying data or modeling assumptions in any version of the Synapse Report, which Strategen had less than 24 hours to evaluate, let alone the Second Corrected Synapse Report. Indeed, many of the shortcomings to Strategen's analysis of the Synapse Report are identifiable from the face of its own report. For example, Strategen claims that Synapse made "relatively few changes . . . to Duke's assumptions when Synapse modeled the resource selection."[45] This claim is demonstrably false. As shown in Table 1 above,

[41] AGO Reply Comments, at 6.
[42] *Id.* at 8.
[43] *Id.* at 9.
[44] Strategen Consulting, LLC, Analysis of Parties' Initial Comments on Duke Energy's 2020 Integrated Resource Plans, at 4 (May 28, 2021) (the "Strategen Report").
[45] *Id.*

Synapse's Mimic Duke portfolio over-selects natural gas resources, while under-selecting renewable resources by orders of magnitude as compared to the Companies' Base Case with Carbon portfolio. Furthermore, Strategen makes additional statements that demonstrate the misinterpretation of the Report itself or failure to sufficiently engage with the data to render a meaningful assessment of the modeling attempt:

- Strategen claims that Synapse modeled the DEC and DEP systems as separate, "islanded systems[,]" but all three versions of the Synapse Report clearly state that Synapse's model combined the DEC and DEP systems as a single, combined balancing authorities, and that Duke itself models three (3) balancing authorities with interconnected transmission to jointly dispatch the system;[46]

- Strategen falsely claims that the Companies fail to include a cost for firm transportation of natural gas, but fails to acknowledge that Synapse improperly modeled their firm transportation of natural gas adder to the dispatch of the resource;[47]

- Strategen takes Synapse's word that it can provide high level indication that the portfolio can meet grid reliability needs, when this is based on a short run simulation or a severely distorted load profile;[48] and

- Strategen claims that Synapse did not run any production cost modeling, when the Report states and the underlying data confirms that Synapse ran production cost models in each of the three Report iterations.

Strategen also question a number of Synapse's modeling decisions, including by, among other things: (1) pointing out the "potential gap in Synapse's analysis" by failing to consider the "potentially significant transmission costs" associated with offshore wind resources;[49] (2) finding that the 1.5% incremental annual savings Synapse assumed related to its proposed EE/DSM deployment was may be "too ambitious as a target for utility-

[46] *Id.* at 5.
[47] *Id.* at 6-7.
[48] *Id.* at 9.
[49] *Id.* at 8.

administered EE/DSM programs";[50] and (3) noting that use of the NREL ATB Low costs for batteries "may be somewhat optimistic."[51] While these observations show a review of the report and consideration of the modeling methodology proposed, Strategen does not offer significant supporting analysis or evidence from the underlying data. The observations are considerably more circumspect than the strong advocacy contained in the AGO's Reply Comments. For all of these reasons, Strategen's analysis of the Second Corrected Synapse Report—which, to the best of the Companies' understanding the AGO and Strategen had for less than 24 hours before filing reply comments—does not give it any additional credibility such that the Commission should rely upon its conclusions in reaching a decision in this proceeding.

CONCLUSION

In conclusion, for the reasons set out in the Companies' initial Reply Comments and these Supplemental Reply Comments, the Companies submit that the Second Corrected Synapse Report does not present a reasonable alternative to or any valid criticism of the portfolios included in the 2020 IRPs and should be given little weight by the Commission in its review of the Companies' 2020 IRPs. The Companies accordingly submit that their 2020 IRPs meet the requirements of all applicable statutes, Commission Rules, and Commission orders and should be accepted.

[50] *Id.* at 9.
[51] *Id.*

This the 1st day of July, 2021.

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Intervenor Reply Comments & Response in Duke Reply Comments

Issue	Party & Reply Comments Cite	Summary of Argument	Relevant Duke Reply Comments
Resource Adequacy & Reserve Margins - Resource Adequacy Study is Reasonable - 17% reserve margin - Approach to Cold Weather and Load Modeling - Neighbor Assistance - Solar Profiles - Winter Peak Study and Resource Adequacy Study Consistency - Historic Operating Reserves	AGO, pages 20-22	Duke's resource adequacy studies do not adequately investigate the benefits of neighbor assistance and AGO agrees with NCSEA/CCEBA that the weather data underlying the study may be skewed.	39-43
	NCSEA/CCEBA, pages 17-18	2020 Resource Adequacy Study does not sufficiently model load resulting from extreme cold events. Joint Commenters were not included in the stakeholder group identified by Public Staff and did not have the opportunity to participate.	25-39
	NCSEA/CCEBA, pages 19-20	Agrees with Tech Customers that Duke's use of a 17% reserve margin fails to consider the Commission's discussion of reserve margins in the 2019 IRP Update Order. Duke should model the ability of carbon-free resources to meet load rather than new natural gas plants.	23-25
	NCSEA/CCEBA, page 22	Agrees with SACE et al. that estimating historical winter loads using historical temperature is flawed due to lack of historical winter load data at very low temperatures.	25-30
	NC WARN & CBD, 2-15, Attachment 1 (Powers Report)	Duke presents inaccurate reserve margins due to the failure to (1) include non-firm energy transfers, (2) include transfers pursuant to the Joint Dispatch Agreement, and (3) account for unnecessarily idle units.	23-39, 46-52
Transmission Reliability - Based on future coal retirements - Generic Network Upgrade inclusion in cost estimates (PS) - Neighbor Assistance	Tech Customers, pages 15-18	Agrees with AGO that Duke's estimated transmission costs associated with importing power and building renewables is unsupported.	55-59
	NCSEA/CCEBA, pages 30-37	Agrees with Tech Customers and other intervernors that the Commission cannot determine whether Duke's IRPs are the most cost-effective long-term plans without more robust analysis of Duke's transmission system. Smart transmission investments that tie Duke to neighboring balancing authorities can allow access to low-cost electricity.	55-66

Issue	Party & Reply Comments Cite	Summary of Argument	Relevant Duke Reply Comments
- Grid Strategies Report (NCSEA/CCEBA)	NCSEA/CCEBA, pages 33-34	The Commission should develop a process addressing how ISOP should be transparently integrated into the IRP process.	*New argument not previously raised.*
	AGO, pages 12-13	Duke needs to provide more analysis about the impact of early retirements on transmission.	55-59
Natural Gas Price Forecasting - Limited DS Hub Gas Portfolio - Price Forecasting Methodology	Public Staff, pages 2-10	Artificially low natural gas prices and constrained pipeline capacity for new CC generation plants necessitates developing an alternative portfolio with limited DS trading hub gas. Overreliance on DS trading hub gas could distort the calculation of avoided energy prices.	77
	CIGFUR, page 5	Shares concerns raised by Public Staff.	77
	NCSEA/CCEBA, pages 16-17	Based on concerns raised by other intervenors, natural gas price forecasting methodology relying upon10-year forward market pricing is unreasonable for planning purposes and should be rejected.	70-77
Existing System Resources Assumption - Nuclear License Renewal - Coal Retirement Analysis	AGO, pages 1-2, 11-14	Agrees with intervenors that Duke fails to adequately evaluate the earliest practicable retirement of coal units and a more detailed assessment and plan is needed to address the impact on transmission. Duke's approach forces in coal resources and there is concern regarding stranded assets.	81-105
	NCSEA/CCEBA, pages 26-28	Duke's coal retirement analysis is significantly flawed, including over-complication, lack of objectivity, and lack of transparency.	81-105
CO2 Regulation & Other Environmental Issues - Environmental Laws - Methane Emissions	CIGFUR, pages 4 - 6	Generally agrees with Public Staff that regardless of which IRP portfolio plan is accepted, maintaining flexibility to respond to an uncertain policy and regulatory environment is	108-117

Issue	Party & Reply Comments Cite	Summary of Argument	Relevant Duke Reply Comments
- CO2 Assumptions (PS)		critical; portfolio acceptance should be conditioned on how uncertain CO2 policy may be resolved.	
New Natural Gas Resources - Forced early retirements/stranded assets - New natural gas generation technology as a bridge to net-zero carbon future - Natural gas and integrating renewables/managing reliability risk - Vote Solar carbon stranding and climate risk report	Tech Customers, pages 2, 11-14, 18-21	Agrees with Vote Solar and other intervenors that Duke downplayed financial benefit of renewable generation by underestimating risks of carbon taxation, stranded assets, and natural gas prices. Duke is overstating need to build new gas generation to maintain adequate capacity reserves.	118-138
	CIGFUR, pages 4-5	Commission should direct Duke to supplement IRP filing with additional information necessary to enable parties to more thoroughly evaluate the risks of stranded assets if carbon policy forces early retirement of natural gas plants.	118-131
	AGO, pages 15-17	Agrees with NCSEA/CCEBA and other intervenors that Duke's expanded reliance natural gas does not adequately address the associated risks.	118-131
	NCSEA/CCEBA, pages 14-16	Agrees with Tech Customers and Public Staff that Duke should be required to address in the current proceeding the argument that Duke exaggerates the role of new natural gas generation in the planning period at the expense of renewable generation.	118-131
	NCSEA/CCEBA, pages 28-30	Duke's buildout of natural gas proposed in its IRPs fails to adequately consider and evaluate the risk that a substantial portion of those assets will be stranded.	118-121, 131-139
Solar and Battery Storage ELCC - Synergies between solar and battery storage to determine ELCC values	CIGFUR, page 5	Expects any assessment of relative costs of third-party owned solar or solar plus storage resources be analyzed in the context of reliability issues under different dispatch modes; any third-party owned solar or solar plus storage should be operated in accordance with dispatch mode allowing full utility control and dispatch.	*New argument not previously raised.*
	AGO, page 22	Agrees with NCSEA/CCEBA that Duke's ELCC undervalues solar and storage by not assessing the combined benefit of	150-163

Issue	Party & Reply Comments Cite	Summary of Argument	Relevant Duke Reply Comments
- Value of battery storage to the Companies' system - E3 Report Modeling		diverse resources and how the benefits might evolve over time.	
	AGO, page 23-24	Agrees with NCSEA/CCEBA that Duke makes flawed assumptions about the value, costs, and difficulty of adding renewable energy and storage.	150-163
	NCSEA/CCEBA, pages 18-21	Using the unforced capacity method rather than installed capacity method for thermal resources as Duke does would address the "mismatch" between the methods used to calculate the capacity contribution of thermal resources and ELCC used to calculate the capacity contribution of renewable resources. Agrees with AGO that Duke fails to consider synergies between solar plus storage.	163-166
	NC WARN, page 18	Accuracy of NREL study on impact of integrating increasing levels of solar in dispute.	174-185
Solar as a Resource - Modeling Assumption - Cost Assumptions - Planning for Real World Conditions	AGO, page 24	Duke did not include the extension of the Federal Investment Tax Credit for solar resources.	173-174
Battery Storage as a Resource - Cost assumptions - Operating assumptions - Future study and value of storage	AGO, pages 14-15	Agrees with Public Staff that the Commission should open a rulemaking to evaluate whether and in what circumstances approval should be required prior to construction of battery storage facilities as they replace coal units and other generating resources.	273-276
	NC WARN, page 18	Cost of battery storage versus gas-fired generation in dispute.	185-206
Energy Efficiency & Demand Side Management	AGO, pages 2, 17-19	Duke's EE/DSM assumptions, and factors affecting resource choices, are unreasonable and weaken dependability of Duke's IRPs. The Utility Cost Test should have been used as the	221-226

Issue	Party & Reply Comments Cite	Summary of Argument	Relevant Duke Reply Comments
- Market Potential Study - Winter Peak		primary screening test approved by the NCUC. Duke's recent winter DSM potential study was not reflected in IRPs.	
	AGO, pages 18-19	Agrees with SACE that Duke omitted measures from its Market Potential Studies and the savings potential Duke used was overly conservative by failing to consider emerging energy efficient technologies. Duke also should not have relied on historical program participation data.	215-226
	AGO, page 25	Duke's assumption that EV charging will contribute to the winter morning peak should be revisited.	*New argument not previously raised.*
	NCSEA/CCEBA, pages 22-26	Duke should be required to conduct more robust analyses as recommended by Public Staff now and implement them into its IRPs. Duke should also consider additional longer-term EE measures.	210-226
Economic Evaluation of Portfolios and Sensitivities - Risk analysis - Customer rate impacts	AGO, pages 1, 4-11	Duke's lower-carbon portfolios do not reflect reasonable resource choices or cost estimates. Synapse report shows that Duke can achieve more carbon emission reductions at a lower cost without new gas generation through more renewables and increasing energy efficiency measures and AGO's expert (Strategen) agrees.	234-264
	NCSEA/CCEBA, pages 9-14	Clean technologies and generation resources provide the best path for North Carolina ratepayers, and ultimately, are required to produce the least-cost plan; agrees with Tech Customers that Duke does not adequately consider the benefits of renewable energy.	234-264
Future Modeling - Encompass	AGO, page 24	Agrees with NCSEA/CCEBA that Duke's proposal to add new pumped hydro storage cannot be completed in time to meet the plan and is too costly. Duke's suggestion of hydrogen as a fueling option for new combustion turbines in the future is too speculative.	121
	NCSEA/CCEBA, pages 39-43	Duke should use a more advanced capacity expansion model: EnCompass. The Commission should require Duke to engage	265-268

Issue	Party & Reply Comments Cite	Summary of Argument	Relevant Duke Reply Comments
		stakeholders to discuss the adoption and implementation of EnCompass.	
Proposals for Future Regulatory Actions	Tech Customers, pages 2, 3-11	Duke did not consider whether joining a wholesale market could curtail need to constructive new generation	268-273
- Market Reforms - Rulemaking Proceedings for Need of Battery Energy - All-Source Procurement Proposal	NCSEA/CCEBA, pages 38-39	SEEM is likely to impact reserve margins, transmission investments, and the integration of renewable energy sources and should be modeled as part of Duke's IRPs.	268-273

BEFORE THE NORTH CAROLINA UTILITIES COMMISSION

DOCKET NO. E-100, SUB 165

In the Matter of	)	
	)	NCSEA, CCEBA, SACE, NRDC
2020 Biennial Integrated Resource Plans And	)	AND SIERRA CLUB RESPONSE
Related 2020 REPS Compliance Plans	)	TO DUKE ENERGY
	)	CAROLINAS, LLC AND DUKE
	)	ENERGY PROGRESS, LLC'S
	)	FOURTH DATA REQUEST

The North Carolina Sustainable Energy Association ("NCSEA"), Carolinas Clean Energy Business Alliance ("CCEBA), Southern Alliance for Clean Energy ("SACE"), Natural Resources Defense Council ("NRDC") and the Sierra Club, by and through their legal counsel, hereby respond to the Fourth Data Request of Duke Energy Carolinas, LLC ("DEC") and Duke Energy Progress, LLC ("DEP")(collectively, "Duke").

DATA REQUESTS AND RESPONSES

4-1. Please provide all analyses, workpapers, assumptions, model inputs and outputs upon which Synapse Energy Economics, Inc. ("Synapse") relied upon or which support the "Mimic Duke" and "Reasonable Assumptions" scenarios modeled or analyzed in making any of the assertions in their second corrected report entitled "Clean, Affordable, and Reliable: A Plan for Duke Energy's Future in the Carolinas" dated May 27, 2021 (the "Second Corrected Synapse Report").

a. Please provide all Encompass input files and output files in electronic machine-readable formats as used by the Encompass model.
b. Please provide any outputs referenced in the Second Corrected Synapse Report that are calculated outside of Encompass in electronic form with formulas in place.

Response:

a. See the folder entitled "EnCompass Inputs" for input values. Output values are provided as part of the response to Duke DR 4-1b.
b. See "Response to Duke DR 4-1b, Attachment 1" and "Response to Duke DR 4-1b, Attachment 2"

Person Providing Response: Rachel Wilson, Synapse Energy Economics

4-2. Please identify any other scenarios modeled or analyzed by Synapse as part of its work for you regarding the 2020 DEC and DEP IRPs.

a. For any such scenario identified, please provide all supporting analyses, workpapers, assumptions, model inputs and outputs.

Response:

Any other modeled scenarios have already been identified and provided as part of previous discovery responses.

Person Providing Response: Rachel Wilson, Synapse Energy Economics

4-3. Please explain how the Second Corrected Synapse Report accounted for both energy and capacity of joint ownership in Catawba Nuclear.

Response:

Synapse modeled DEC's share of Catawba Unit 1 at 346 MW through April 30, 2020. The planned uprate shown in DEC's 2020 IRP was modeled to be effective on May 1, 2020, and DEC's share of that uprate was assumed to be 1 MW for modeling purposes.

Synapse modeled DEC's share of Catawba Unit 2 at 340 MW through March 31, 2021. The planned uprate shown in DEC's 2020 IRP was modeled to be effective on April 1, 2021 and DEC's share of that uprate was assumed to be 1 MW for modeling purposes.

Person Providing Response: Rachel Wilson, Synapse Energy Economics

4-4. Please provide the summer and winter reserve margins for DEC and DEP by year for the Mimic Duke and Reasonable Assumptions scenarios as reflected in the Second Corrected Synapse Report.

Response:

See "Response to Duke DR 4-4, Attachment 1.xlsx"

Person Providing Response: Rachel Wilson, Synapse Energy Economics

4-5. Please provide the year-by-year capacity, energy, and CO_2 emissions outputs from the Mimic Duke, Reasonable Assumptions and Reasonable Assumptions with Natural Gas as selectable resource scenarios from the Second Corrected Synapse Report.

Response:

See "Response to Duke DR 4-1b, Attachment 1" for the requested outputs for the Mimic Duke and Reasonable Assumptions scenarios. The Reasonable Assumptions with Natural Gas scenario was not updated for the purposes of the Second Corrected Synapse Report.

Person Providing Response: Rachel Wilson, Synapse Energy Economics

4-6. Please provide the present value revenue requirement for the Mimic Duke, Reasonable Assumptions and Reasonable Assumptions with Natural Gas as selectable resource scenarios from the Second Corrected Synapse Report.

a. Please provide the components on a granular basis broken to at least production cost, new generation capital costs, and other fixed costs.
b. Please provide the workbooks with all formulae intact.

Response:

See "Response to Duke DR 4-1b, Attachment 1" for the requested variables for the Mimic Duke and Reasonable Assumptions scenarios. The Reasonable Assumptions with Natural Gas was not updated for the purposes of the Second Corrected Synapse Report.

Person Providing Response: Rachel Wilson, Synapse Energy Economics

4-7. Please provide the calculations used to increase energy efficiency between the Mimic Duke and the Reasonable Assumptions scenarios in the Second Corrected Synapse Report.

Response:

The energy efficiency calculations were unchanged from the original Synapse Report. Those calculations were provided in response to Duke DR 1-1.

Person Providing Response: Rachel Wilson, Synapse Energy Economics

4-8. Please describe the use of demand response programs (separate from Energy Efficiency) used in the Mimic Duke and Reasonable Assumptions scenarios including costs, capacities (by month), and strike price, throughout the planning horizon from the Second Corrected Synapse Report.

Response:

Synapse did not assume any demand response programs in either of its modeled scenarios.

Person Providing Response: Rachel Wilson, Synapse Energy Economics

4-9. Please provide all must-run assumptions for any units in the run for the Mimic Duke and Reasonable Assumptions from the Second Corrected Synapse Report.

Response:

See the Response to Duke DR 2-38.

Person Providing Response: Rachel Wilson, Synapse Energy Economics

4-10. Regarding the statement in the Second Corrected Synapse Report that the Mimic Duke scenario "[m]anually builds the solar additions identified by Duke in the IRPs between 2021 and 2025, and allow[s] the EnCompass model to optimize thereafter[,] please explain why Synapse included the baseline forecast Solar in the Mimic Duke Scenario, when it was previously omitted?

a. Please state whether the Mimic Duke scenario included any other unit uprates or additions ? If so, please provide the unit, capacity addition, and year of addition.

Response:

The update to the Duke nuclear capacity to reflect the correct ownership share for the Catawba Nuclear Station resulted in a small capacity deficit beginning in 2022. The solar was built manually between 2021 and 2025 to help meet some of that need under the assumption that these were projects already in the interconnection queue that would with which Duke would execute power purchase agreements.

a. Both the Mimic Duke and Reasonable Assumptions scenario include the DEC and DEP uprates shown in the IRPs.

Person Providing Response: Rachel Wilson, Synapse Energy Economics

4-11. Please describe how a capacity penalty price works in the Mimic Duke model, including by describing the cost of the penalty per MW, how the penalty price was developed, and why this penalty alternative is appropriate for planning. Please also describe any differences in the penalty price between the first corrected Synapse Report dated March 19, 2021 and the Second Corrected Synapse Report.

a. Please state whether Synapse issued an RFI or RFP to determine an appropriate capacity purchase price penalty?

b. Please state whether Synapse applied a capacity purchase penalty price only when capacity shortfall occurred or year-round?

Response:

The capacity penalty price is a proxy for a short-term capacity purchase, assuming that Duke will consider capacity purchases as an alternative when acquiring resources to meet a capacity need. In the Mimic Duke scenario, the capacity penalty price was incurred when the EnCompass model found it to be the most economic alternative to meet a short-term capacity deficit. The unserved capacity price is $101.529 for 1999 in $/kW-year, escalated at an inflation rate of 2.2 percent per year. This was the default value in the Horizons National Database for the SERC-East region.

The capacity penalty price is incurred when the model finds it more economic to incur the penalty price than to build a new resource. This might occur for several reasons, that include, but are not limited to, the following: 1) EnCompass optimizes over the entire analysis period. It might decide to incur a capacity penalty price in a given year if the price of building a new resource is projected to be low enough in a future year that there is a benefit to delaying that build. 2) EnCompass was set to build Full resources only, meaning it could not build partial units. If the reserve margin deficit is sufficiently small, the model might choose to incur the penalty price rather than build an entire new resource. 3) Incurring the penalty price might simply be cheaper than building new capacity if the model does not also have an energy need.

The penalty price was the same between the two reports; however, in the Second Corrected Synapse Report, we ultimately set the price to $2,000 per kW-year in the Reasonable Assumptions scenario only so that the model would incur the additional cost to meet the 17 percent planning reserve margin in every year with new resource builds.

a. No.
b. EnCompass applies the price for unserved capacity to the peak month.

Person Providing Response: Rachel Wilson, Synapse Energy Economics

4-12. Please state whether there were any constraints imposed on the building of new natural gas generation in the Mimic Duke scenario of the Second Corrected Synapse Report? If so, please describe the limits in detail.

Response:

In developing the 2020 IRPs, Duke manually built a specific number of battery storage resources in its modeling, which the Synapse modeling does not do in the Mimic Duke portfolio. As such, the building of gas units in the Mimic Duke scenario was constrained in such a way as to prevent building a larger number of gas-fired units than in Duke's modeled "Base Case" scenarios. The default size for a gas combined cycle unit (CC) in the Synapse analysis is 702 MW. In the Mimic Duke scenario, the "maximum active projects" for new CCs was 0 through 2026, 2 in 2027, 4 from 2028 to 2033, and 6 in 2034 to 2035. The default size for a gas CT in the Synapse analysis is 237 MW. In the Mimic Duke scenario, the "maximum active projects" for new CTs was 0 through 2024, 2 in 2025, 4 from 2026 to 2027, 8 in 2028, 12 in 2029, 16 from 2030 to 2033, and 20 in 2034 and 2035.

Person Providing Response: Rachel Wilson, Synapse Energy Economics

4-13. Please provide the capacity addition limits for solar, solar paired with battery, standalone battery, onshore wind, onshore wind paired with battery, and offshore wind for every year in the Reasonable Assumptions scenario of the Second Corrected Synapse Report.

Response:

See "Response to Duke DR 4-1b, Attachment 1"

Person Providing Response: Rachel Wilson, Synapse Energy Economics

4-14. Per the Cover Letter accompanying the Second Corrected Synapse Report, please clarify whether the Mimic Duke and Reasonable Assumptions scenarios were run in an hourly model, or whether the scenarios were run in hourly mode for the month of January 2030 only for limited the purpose of presenting the information in Figure 4 and 5.

a. Please provide the production cost for the month of January 2030, including both the hourly production cost run and the typical days production cost run.

Response:

The scenarios were run in hourly mode for the month of January 2030 only for the limited purpose of presenting the information in Figure 4 and 5.

a. See "Response to Duke DR 4-1b, Attachment 2"

Person Providing Response: Rachel Wilson, Synapse Energy Economics

4-15. Please explain how Synapse created the hourly load forecast for January 2030 using assumptions for higher EE penetration?

Response:

Synapse did not assume any changes to the load shape as a result of the assumptions for higher EE penetration. The hourly load forecast is thus a result of EnCompass's application of Duke's hourly load shape to the Synapse-adjusted monthly peak and energy values.

Person Providing Response: Rachel Wilson, Synapse Energy Economics

4-16. Please explain how the annual energy savings for EE was converted from an annual percentage target to a peak demand reduction?

Response:

Synapse utilized the individual saving profiles for various DEC/DEP EE measures provided by Duke in "NCSEA DR7-59c - DEC Savings Shapes" and "NCSEADR7-59c - DEP Savings Shapes." The individual measure saving shapes provided by Duke differed greatly -- outdoor lighting EE, for example, only provided savings between 8pm and 7am, while other measures were only applicable in summer or winter. Synapse's annual EE saving projections for DEC

and DEP were allocated to each measure type in the same proportions as existing DEC/DEP EE, as provided by Duke in "NCSEA DR9-3a." The resulting annual savings for each measure type were allocated to each hour of the year based on Duke's individual measure shapes. The resulting profiles were combined into single 8760s for DEC and DEP that included all EE from all measure types. The monthly peak hours from Duke's original hourly load shape were then identified. The EE savings in that hour in the consolidated EE measure profiles were subtracted from those peak hours to create a new monthly peak forecast.

Person Providing Response: Rachel Wilson, Synapse Energy Economics

4-17. Regarding the statement on page Page 1 of the Second Corrected Synapse report that"[t]he purpose of this report is to evaluate the 2020 Integrated Resource Plans (IRP) filed in North Carolina by Duke Energy Carolinas (DEC) and Duke Energy Progress (DEP) . . . and to present an alternative, optimized resource portfolio for the state[,]" please explain whether Synapse took into account that DEP and DEC are separate operating utilities that are independently responsible for capacity planning and serving customers in both North Carolina and South Carolina.

Response:

Synapse modeled DEC and DEP as a single balancing authority. This assumption underlies both the Mimic Duke and Reasonable Assumptions scenarios, and if changed, would affect both scenarios in a similar way, i.e. that both would likely need to add more resources in order to meet separate reserve margins for DEC and DEP rather than a combined reserve margin.

Person Providing Response: Rachel Wilson, Synapse Energy Economics

4-18. Please provide the data used for Figures 4 and 5 in the Second Corrected Synapse Report.

a. Please state whether the Figures are intended to illustrate the generation profile for a particular day? If so, please state which day?
b. Please state whether the generation profiles presented in Figures 4 and 5 were optimized based on preceding and succeeding days? If so, please provide hourly generation by type for the entire period (i.e., month of January, this particular week of optimization, etc.)
c. In Figure 5, please clarify whether gas generation progresses from maximum output from 12:00 a.m. to 9:00 a.m., to minimum output from 11:00 a.m. to 5:00 p.m., and then back to maximum output from 6:00 p.m. to 12:00 a.m.

Response:

Data are provided in "Response to Duke DR 4-1b, Attachment 2."

a. Yes. Mimic Duke depicts January 22, 2030 and Reasonable Assumptions shows January 23, 2030.

b. Yes. The requested data are provided in "Response to Duke DR 4-18, Attachment 1."

c. Output from individual gas generators is provided in "Response to Duke DR 4-1b, Attachment 2."

Person Providing Response: Rachel Wilson, Synapse Energy Economics

4-19. Regarding the statement on page 19 of the Second Synapse Report that "[b]attery capacity is charged by afternoon solar and wind generation," and noting that Figure 5 shows natural gas generation to be online during the charging of the battery, please state whether you agree that "standalone batteries not co-located with storage are charged by all resources on the system and not by any one specific resource. If you disagree, please explain why you disagree.

Response:

Standalone batteries can be charged by any resource on the system. EnCompass will dispatch resources economically to meet the energy requirements associated with both serving load and charging batteries.

Person Providing Response: Rachel Wilson, Synapse Energy Economics

This the 11th day of June, 2021.

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BEFORE THE NORTH CAROLINA UTILITIES COMMISSION

DOCKET NO. E-100, SUB 165

In the Matter of	)	
	)	NCSEA, CCEBA, SACE, NRDC
2020 Biennial Integrated Resource Plans And Related 2020 REPS Compliance Plans	)	AND SIERRA CLUB RESPONSE
	)	TO DUKE ENERGY
	)	CAROLINAS, LLC AND DUKE
	)	ENERGY PROGRESS, LLC'S
	)	FIFTH DATA REQUEST

The North Carolina Sustainable Energy Association ("NCSEA"), Carolinas Clean Energy Business Alliance ("CCEBA), Southern Alliance for Clean Energy ("SACE"), Natural Resources Defense Council ("NRDC") and the Sierra Club, by and through their legal counsel, hereby respond to the Fifth Data Request of Duke Energy Carolinas, LLC ("DEC") and Duke Energy Progress, LLC ("DEP")(collectively, "Duke").

DATA REQUESTS AND RESPONSES

5-1. Please provide any and all analyses, calculations, and/or workpapers that demonstrate how Synpase Energy Economics, Inc. ("Synapse") used the NREL Annual Technology Baseline ("ATB") to develop the costs for battery storage by year in the "Reasonable Assumptions" scenario.

Response:

See "Response to Duke DR 5-1, Attachment 1.xlsx"

Person Providing Response: Rachel Wilson, Synapse Energy Economics

5-2. Please provide any and all analyses, calculations, and/or workpapers that Synapse used to levelize the cost of battery storage by year in the "Reasonable Assumptions" scenario.

Response:

See "Response to Duke DR 5-1, Attachment 1.xlsx"

Person Providing Response: Rachel Wilson, Synapse Energy Economics

5-3. Please explain whether the modeling Synapse performed included any ancillary requirements in its production cost runs, including, but not limited to spin, VA/car reserves, balancing, and regulation. If so, please identify each and every ancillary requirement modeled

in the production cost run and provide any and all analyses, calculations, and/or workpapers that demonstrate how Synapse modeled ancillary services.

Response:

Ancillary service requirements were not modeled in the Synapse analysis in either the Mimic Duke or the Reasonable Assumptions scenario.

Person Providing Response: Rachel Wilson, Synapse Energy Economics

5-4. The Second Corrected Synapse Report assumed EE savings growth from 2022 at .15% annually up to 1.5% of load annually but the workpapers provided showed .2% annual growth to a target of 2.0% of load annually. Please describe in detail Synapse's modeling of assumed EE savings growth over the planning perioed and explain which assumptions were actually used in the Encompass model.

Response:

See "Response to Duke DR 5-4, Attachment 1.xlsx" for the values with .15% annual EE savings growth to the target of 1.5% annually.

Person Providing Response: Rachel Wilson, Synapse Energy Economics

This the 25th day of June 2021.

/s/ Benjamin W. Smith
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CERTIFICATE OF SERVICE

I hereby certify that a copy of the foregoing *Duke Energy Carolinas, LLC's and Duke Energy Progress, LLC's Supplemental Reply Comments* as filed in Docket No. E-100, Sub 165, was served via electronic delivery or mailed, first-class, postage prepaid, upon all parties of record.

This, the 1st day of July, 2021.

/s/E. Brett Breitschwerdt

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