

**STATE OF NORTH CAROLINA  
UTILITIES COMMISSION  
RALEIGH**

DOCKET NO. E-100, SUB 179

BEFORE THE NORTH CAROLINA UTILITIES COMMISSION

In the Matter of:		
Duke Energy Progress, LLC, and Duke	)	JOINT COMMENTS OF
Energy Carolinas, LLC, 2022 Biennial	)	NC WARN AND THE
Integrated Resource Plans and Carbon Plan	)	CHARLOTTE
	)	MECKLENBURG NAACP

Pursuant to the North Carolina Utilities Commission’s (“NCUC” or “Commission”) *Order Requiring Filing of Carbon Plan and Establishing Procedural Deadlines* entered on November 19, 2021 in the above-referenced docket, as extended by the Commission’s *Order Granting Extension of Time* entered on November 29, 2021, Intervenor NC WARN and the NAACP Charlotte-Mecklenburg County Branch #5376-B<sup>1</sup> (collectively, “NC WARN *et al.*”), through undersigned counsel, hereby submit the following Joint Comments concerning the proposed Carbon Plan filed on May 16, 2022 (the “Carbon Plan”) by Duke Energy Carolinas, LLC (“DEC”) and Duke Energy Progress, LLC (“DEP”) (collectively, the “Companies”).

**SUMMARY**

The Companies’ Carbon Plan is deficient in several respects. NC WARN *et al.* retained William E. Powers (“Mr. Powers”), an engineer with over thirty-five (35)

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<sup>1</sup> A Petition to Intervene on behalf of NAACP Charlotte-Mecklenburg County Branch #5376-B was filed on July 14, 2022 and is currently pending before the Commission.

years of experience in the fields of power plant operations and environmental engineering, to review the Companies' Carbon Plan. Attached hereto as **Attachment 1** is Mr. Powers' *Report on Assumptions Used in Duke Energy May 2022 Carbon Plan* ("Report"). As detailed in Mr. Powers' Report, the Companies' Carbon Plan is deficient in the following respects, among others:

- Battery storage is a rapidly expanding technology, and many of the Companies' competitors, including NextEra Energy, parent company of Florida Power & Light, consider solar paired with storage to have a production cost which is far less than natural gas-fired generation. The Companies lag far behind their peers in implementing battery storage technology, and the Companies' Carbon Plan further exacerbates this problem by targeting a mere 350 MW of cumulative operational storage by the end of 2027.

- The relative lack of battery storage in the Carbon Plan is the result of several significant flaws in the Companies' Carbon Plan analysis. For instance, in generating the Carbon Plan, the Companies used a flawed formula for calculating the number of hours of battery storage relative to the nameplate capacity of a solar array. Furthermore, when analyzing the performance of solar plus storage, the Companies placed several artificial and unnecessary constraints which had the effect of lowering the reliability value of solar plus storage. As a result of these errors in the Companies' analysis, the Companies' Carbon Plan proposes very little battery storage.

- The Companies' analysis of natural gas-fired generation is likewise deeply flawed. The Companies have proposed a massive natural gas buildout

consisting of 2,400 MW of combined cycle units (“CC”) and 6,400 MW to 7,500 MW of combustion turbine (“CT”) through 2050. Even worse, under the Companies’ Alternative Fuel Supply Sensitivity Analysis, the Companies propose as much as 800 MW of CC and 10,900 MW of CT through 2050.

- This natural gas buildout is based upon several flawed premises. For instance, the Companies assume that these natural gas plants will be able to operate exclusively on hydrogen (“H<sub>2</sub>”) by 2050. The Carbon Plan candidly admits the uncertain nature of this blanket conversion to H<sub>2</sub> by 2050, yet the Companies have provided no analysis whatsoever about what happens to this massive buildout of natural gas in the event that it proves impractical to consummate such a widespread conversion to H<sub>2</sub>. If such a conversion proves unworkable, the Companies will be unable to achieve timely carbon neutrality and will be faced with substantial stranded natural gas assets.

- There are many other flaws in the Companies’ analysis of natural gas-fired generation. For instance, the Companies’ analysis does not properly account for the volatility of natural gas pricing. Further, the Companies seemingly made several inaccurate capital cost assumptions when analyzing the cost of this natural gas buildout. Moreover, the Companies failed to analyze the impacts of methane emissions from natural gas generation.

- The Companies’ massive buildout of CCs and CTs is partly being driven by excessive reserve margins and unrealistic projected demand growth. When these analytical errors are corrected, it becomes unnecessary to engage in a massive buildout of natural gas.

- The Companies' Carbon Plan professes the importance of "Grid Edge" technologies, yet the Companies' Carbon Plan projects far less NEM solar than was recently forecasted in the Companies' 2020 Integrated Resource Plans. In fact, the Companies' NEM tariff proposals in a separate docket (NCUC Docket No. E-100, Sub 180) will cause substantial harm to the proliferation of NEM. These errors should be corrected so that the Companies' Grid Edge programs can have a meaningful impact.

- The Carbon Plan also proposes a substantial investment in Small Modular Reactors ("SMRs"), namely 600 MW through 2035, as well as 9,900 MW to 10,200 MW of "New Nuclear" through 2050. However, at present, SMRs are not commercially viable, and it is entirely speculative that such technology will ever be practical. Therefore, the Companies' unrealistic proposal to purchase and install substantial amounts of SMRs should be rejected.

- Governor Cooper's Executive Order No. 246 recommended that the Commission consider the federal social cost of greenhouse gas emissions in its decision-making processes. Further, Executive Order No. 246 correctly noted that "[c]limate change disproportionately impacts people of color, low-income communities, and Indigenous communities," and therefore, "responsible solutions to climate change must equitably reduce GHG emissions." The Companies' Carbon Plan fails to address these social costs, especially including the impacts of the Carbon Plan upon people of color, low-income communities and Indigenous communities.

- In Section VIII of these Joint Comments, NC WARN *et al.* proposes a counter carbon plan (the “Counter Carbon Plan”). In very general terms, this Counter Carbon Plan consists of the following elements: (a) wholesale urban solar plus storage on commercial and industrial buildings and parking lots, large undeveloped urban parcels and brownfields, (b) adding 4 hours of battery storage to utility-scale solar in operation in North Carolina, (c) shutting down coal-only units by 2024 and operating dual gas/coal units only on natural gas until retirement in 2035, and (d) converting nuclear units to synchronous condensers in the post-2035 timeframe. This Counter Carbon Plan represents the least-cost mix of generation and would achieve one-hundred percent (100%) carbon-free electricity by 2035

Numerous additional errors are identified in Mr. Powers’ Report, which should be consulted for further details. Accordingly, NC WARN *et al.* makes the following recommendations concerning the Companies’ Carbon Plan:

- (a) The Companies should correct the errors described herein regarding their analysis of battery storage;

- (b) The Companies should model three (3) new solar plus storage profiles, solar plus 4-hour storage, solar plus 6-hour storage, and solar plus 8-hour storage, and provide the Electric Load Carrying Capability for the Commission’s review in creating a Carbon Plan;

- (c) Based upon the results of corrections discussed herein regarding the Companies’ analysis of battery storage, the Commission should require the Companies to vastly increase their future implementation of battery storage in a

manner which is consistent with NC WARN *et al.*'s Counter Carbon Plan described herein;

(d) The Companies should correct the errors described herein regarding their analysis of natural gas;

(e) The Companies should provide updated analyses which encompass the significance of methane emissions from natural gas-fired generation;

(f) The Companies should correct their unrealistic natural gas price projections;

(g) The Commission should direct the Companies to use the final capital cost of the Lincoln 402 MW CT and the Asheville 560 MW CC as the base case 2022 capital cost assumptions for CTs and CCs in the Carbon Plan;

(h) Based upon the results of the corrections regarding natural gas described herein, the Commission should require the Companies to vastly decrease their future reliance upon natural gas-fired generation in a manner which is consistent with NC WARN *et al.*'s Counter Carbon Plan described herein;

(i) The Companies should correct the errors described herein regarding their reserve margin analysis;

(j) In calculating Planning Reserve Margin and Operating Reserve Margin, the Companies should be ordered to assume that they will meet winter peak demand with available non-firm imports;

(k) Based upon the results of the corrections to the reserve margin analyses discussed herein, the Commission should require the Companies to revise and reduce their reserve margin proposals;

(l) The Companies should correct the errors described herein regarding their demand growth rate forecast;

(m) Based upon the results of the corrections to the Companies' demand growth rate forecast as described herein, the Commission should require the Companies to revise and reduce their demand growth rate forecast;

(n) The Companies should correct the errors described herein regarding their Grid Edge program;

(o) Following an investigation, including a Value of Solar Study, the Companies should be required to correct their proposed NEM tariffs as discussed in detail by NC WARN in the separate NEM docket (NCUC Docket No. E-100, Sub 180);

(p) Based upon the results of the corrections to the Companies' Grid Edge program described herein, the Commission should require the Companies to revise and prioritize the proposed Grid Edge program;

(q) The Commission should reject the Companies' proposal to purchase and install SMRs;

(r) As discussed in Governor Cooper's Executive Order No. 246, the Commission should require the Companies to file revised studies analyzing the impacts of the Carbon Plan upon the low-income and BIPOC communities;

(s) The Companies should be required to conduct the outreach to the low-income and BIPOC communities contemplated by Executive Order No. 246;

(t) The Commission should adopt NC WARN *et al.*'s Counter Carbon Plan; and

(u) Any additional flaws with the Carbon Plan identified in these Joint Comments or Mr. Powers' Report should be corrected.

### **INDEX OF ATTACHMENTS**

The following is a list of the attachments filed contemporaneously with these Joint Comments. These attachments are cited in both the present Joint Comments and Mr. Powers' Report:

- Attachment 1: Report on Assumptions in Duke Energy May 2022 Carbon Plan, William E. Powers;
- Attachment 2: The Companies' Response to SELC's Data Request No. 2-12 in Docket No. E-100, Sub 165;
- Attachment 3: The Companies' Response to NC WARN's Data Request No. 4-5 in Docket No. E-100, Sub 165; and
- Attachment 4: Transcript of NCUC Staff Conference, March 2, 2015.

### **DISCUSSION**

The following constitutes a discussion of the deficiencies in the Companies' Carbon Plan. Large portions of this discussion constitute summaries of Mr. Powers' Report, which Report should be consulted for additional details and supporting citations.

- I. **The Companies' Analysis of Battery Storage Is Deeply Flawed.**
  - A. **The Companies Already Lag Far Behind Their Peers in Implementing Battery Storage Technology, and the Carbon Plan Would Further Exacerbate this Gap.**

At present, the Companies have very little battery storage: as of May 2022, the Companies have only 13 MW of operational battery storage.<sup>2</sup> It is therefore

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<sup>2</sup> Carbon Plan, Appendix K, p. 2, Table K-1.



unacceptable that the Companies' Carbon Plan continues this trend and proposes very little battery storage. Specifically, the Companies target 350 MW of cumulative operational battery storage by the end of 2027: "[T]he Carbon Plan assumes the deployment of approximately 350 MW of nameplate capacity (approximately 110 MW in DEC and 240 MW in DEP) with various storage capacity durations through 2027."<sup>3</sup>

This low rate of deployment of battery storage by the Companies is completely divergent from the fact that battery storage is a rapidly expanding technology. The actual battery storage deployment rate in the United States was 3,500 MW per year in 2021.<sup>4</sup> In his Report, Mr. Powers documents how "[b]attery storage deployments are expected to reach 7,500 MW per year in 2025, of which about 80 percent is grid battery storage."<sup>5</sup> The Companies' storage goal, namely 350 MW through 2027, is merely about one percent (1%) of the projected installed capacity in the United States through 2025.<sup>6</sup>

Given these trends, it is clear that the Companies are lagging behind their peers on implementing battery storage. By way of example, the California Independent System Operator ("CAISO") had about 2,500 MW of operational 4-hour battery storage at the end of 2021 and anticipates having 12,000 MW of battery storage by 2025.<sup>7</sup> The CAISO has an all-time summer peak load of about

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<sup>3</sup> Carbon Plan, Appendix E, p. 26.

<sup>4</sup> Powers' Report, pp. 3-4.

<sup>5</sup> *Id.* at 5.

<sup>6</sup> *Id.* at 5-6.

<sup>7</sup> *Id.*

50,000 MW, compared to the Companies' combined summer peak record of 34,079 MW.<sup>8</sup>

In their Carbon Plan, the Companies treat natural gas-fired generation, especially CTs, as preferable to solar paired with storage. The Companies' position is completely inconsistent with the findings of other utilities throughout the country. For instance, NextEra Energy, the parent company of Florida Power & Light ("FPL"), states that "batteries are now more economic than gas-fired peakers (CTs), even at today's natural gas prices."<sup>9</sup> NextEra Energy included a forecast of late 2020s production costs for selected generation technologies in a June 2022 Investor Conference presentation. That forecast concluded that solar with 4-hour battery storage had by far the lowest production costs.<sup>10</sup> Mr. Powers' Report includes a summary of the production cost forecast by NextEra Energy. What follows is Table 4 taken from Mr. Powers' Report:<sup>11</sup>

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<sup>8</sup> *Id.* at 5.

<sup>9</sup> GreenTech Media, *NextEra looks to spend \$1B on energy storage in 2021*, April 22, 2020; see also Powers' Report, p. 15.

<sup>10</sup> Powers' Report, pp. 15-16.

<sup>11</sup> *Id.*

**Table 4. NextEra Energy late 2020s production costs for selected generation technologies**

Generation technology	Production cost, \$/MWh
Solar with 4-hour battery storage*	30 - 37
Existing natural gas-fired	35 - 47
Existing nuclear	34 - 49
Existing coal-fired	43 - 74
New natural gas CC	56 - 69

\* Assumes a 4-hour battery to achieve roughly equivalent reliability during peak hours for comparison with dispatchable generation sources.

Notably, FPL is the largest investor-owned utility in Florida and is the competitor of the Companies' sister operating corporation, namely Duke Energy Florida.<sup>12</sup>

It is difficult to square the Companies' refusal to meaningfully deploy battery storage with the nationwide rapid proliferation of battery storage. As discussed in the next subsection of these Joint Comments, the Carbon Plan's failure to propose meaningful levels of battery storage is a direct result of several analytical flaws in the Companies' analysis of storage.

B. The Companies' Analysis of Battery Storage in the Carbon Plan Is Deeply Flawed and Thereby Understates the Value of Storage to the Grid.

There are several significant flaws with the Companies' analysis of battery storage in the Carbon Plan. Each of those flaws has the effect of understating the value of battery storage to the grid. When these flaws are corrected, it becomes

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<sup>12</sup> *Id.* at 15.

obvious that battery storage should be deployed much more extensively in the Carbon Plan.

For example, the Companies in the Carbon Plan use an incorrect definition of the number of hours of battery storage relative to the nameplate capacity of a solar array. According to Mr. Powers, “[t]he generally accepted industry definition of the number of hours of battery storage relative to the nameplate capacity of the solar array is the number of hours of storage at the capacity rating of that solar array.”<sup>13</sup> Mr. Powers used the following example to explain this concept: “if the solar array is rated at 75 MW, then four hours of battery storage is  $75 \text{ MW} \times 4 \text{ hours} = 300 \text{ megawatt-hours (MWh)}$ .”<sup>14</sup>

Inexplicably, the Companies did not use this generally accepted definition. Instead, the base case solar-plus-storage system modeled by the Companies is a 75 MW solar array coupled with 20 MW battery storage with four (4) hours of storage at 20 MW. As a result of this divergence from generally accepted practice, the Companies’ analysis assumes about one (1) hour of storage at 75 MW, not four (4) hours of storage at the capacity rating of the solar array.<sup>15</sup> In other words, the Companies departed from industry standard in a manner that had the result of understating the value of battery storage to the grid. The Companies provided no explanation for why they chose to depart from industry standard.

Indeed, the Companies in the Carbon Plan repeatedly place their thumb on the scale in a manner which harms the prospects of battery storage. For instance,

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<sup>13</sup> Powers’ Report, p. 5.

<sup>14</sup> *Id.*

<sup>15</sup> *Id.*

the Companies' Electric Load Carrying Capability ("ELCC") analysis is flawed with respect to solar paired with battery storage. As a result of the defects with the Companies' ELCC analysis, the Companies claim—incorrectly—that solar paired with battery storage, above a certain relatively modest level, provides little additional reliable capacity.<sup>16</sup>

At the outset, it is helpful to discuss the role of the ELCC analysis in the Carbon Plan. An ELCC is the "capacity value of a resource and can be thought of as a measure of the reliable capacity contribution of a resource being added to an existing generation portfolio."<sup>17</sup> The Companies rely upon this ELCC analysis to render their conclusion that solar plus storage becomes noneconomical above certain levels.

The Companies' ELCC analysis was flawed in the following manner: the Companies modeled a solar plus storage facility with a vastly undersized storage component.<sup>18</sup> Mr. Powers' Report described the Companies' approach as follows: "The utility-scale solar plus battery building block in the Carbon Plan ELCC analysis is a 75 MW solar array coupled to 20 MW of battery storage with 80 MWh of storage capacity. This is approximately one hour of storage at the solar array design capacity of 75 MW."<sup>19</sup>

Self-evidently, the more battery storage that is added to a solar resource, the higher the ELCC value.<sup>20</sup> The Companies have not provided any explanation

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<sup>16</sup> *Id.* at 16-18.

<sup>17</sup> Carbon Plan, Appendix E, p. 11.

<sup>18</sup> Powers' Report, pp. 16-20.

<sup>19</sup> *Id.* at 18.

<sup>20</sup> *Id.* at 17.

for why their modeled solar plus storage facility was capped at a 20 MW battery with 80 MWh of storage capacity. This artificial limitation in the Companies' analysis drastically reduced the ELCC assigned to solar plus storage and directly led to a flawed conclusion that solar plus storage is noneconomical.<sup>21</sup>

As an alternative to the Companies' approach, it is helpful to consider the ELCC of a solar-plus-storage facility with a properly sized storage component. Mr. Powers analyzed the following scenario:<sup>22</sup>

On a clear summer day, a 75 MW solar array may produce as much as 600 MWh of solar power. In this case, a solar array with battery storage designed to absorb six hours of solar output at the design output of the 75 MW solar array, or 450 MWh, would assure the solar output is fully deliverable with an ELCC at or near 100 percent.

Simply put, the ELCC score is largely driven by the size of the storage component accompanying a solar array. The Companies, for unexplained reasons, undersized the storage portion of their modeled solar-plus-storage facility, thereby reducing the ELCC assigned to a solar-plus-storage facility.

Other portions of the Carbon Plan confirm that this limitation is completely artificial and unnecessary. For instance, the Companies assume that standalone battery storage will be capable of discharging 4 hours, 6 hours, or 8 hours of power at rated capacity.<sup>23</sup> As discussed by Mr. Powers, "these conservatively designed, relatively long-duration standalone battery installations have high ELCCs."<sup>24</sup> The

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<sup>21</sup> *Id.* at 16-20.

<sup>22</sup> *Id.* at 18.

<sup>23</sup> Carbon Plan, Appendix E, p. 33, Table E-36: Standalone Battery Modeling Assumptions.

<sup>24</sup> Powers' Report, p. 18.

Companies have not explained why a similar assumption was not made in the ELCC analysis of solar plus storage facilities.

In summary, the Companies modeled a solar plus storage facility with a badly undersized battery storage component. This modeling should be rejected as unreliable and flawed. As a result, Mr. Powers made the following recommendation:<sup>25</sup>

The Companies' ELCC modeling indicates that as more-and-more battery storage capacity is added, longer-and-longer battery durations are needed to maintain high ELCC values. That is what should be modeled. What should not be modeled is a single solar plus battery storage profile with a badly undersized battery storage component. The predictable result is that solar plus battery storage will provide little contribution to reliable capacity, and therefore must be supplemented with other resources like CTs.

**Recommendations:** In light of the foregoing, NC WARN *et al.* makes the following recommendations concerning the Companies' Carbon Plan:

(a) The Companies should correct the above-described errors with their analysis of battery storage.

(b) "The Companies should model three new solar plus storage profiles, solar plus 4-hour storage, solar plus 6-hour storage, and solar plus 8-hour storage, and provide the ELCCs for the Commission's review in creating a Carbon Plan."<sup>26</sup>

(c) Based upon the results of the above-stated corrections, the Commission should require the Companies to vastly increase their future

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<sup>25</sup> *Id.*

<sup>26</sup> Powers' Report, p. 21.

implementation of battery storage in a manner which is consistent with NC WARN *et al.*'s Counter Carbon Plan described herein.

**II. The Analysis Supporting the Companies' Massive Natural Gas Buildout Is Flawed.**

A. The Natural Gas Buildout Proposed in the Carbon Plan

In the Carbon Plan, the Companies propose a massive natural gas buildout. Specifically, the Companies propose 2,400 MW of CC and 6,400 MW to 7,500 MW of CT through 2050.<sup>27</sup> Even worse, under the Companies' Alternative Fuel Supply Sensitivity Analysis, the Companies propose as much as 800 MW of CC and 10,900 MW of CT through 2050.<sup>28</sup>

This significant reliance upon natural gas-fired generation is curious, because the Companies' Carbon Plan is chocked full of admissions about the significant risks associated with further increased reliance upon natural gas generation. Appearing below is Table 2 from Mr. Powers' Report, which summarizes the numerous instances where the Carbon Plan freely acknowledges the risks of increased reliance upon natural gas-fired generation:<sup>29</sup>

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<sup>27</sup> Carbon Plan, Appendix E, p. 77, Table E-71.

<sup>28</sup> *Id.* at p. 86, Table E-85.

<sup>29</sup> Powers' Report, pp. 8-9.



**Table 2. Companies' statements in Carbon Plan of risks of reliance on natural gas**

Source	Statement
Chp. 2, p. 4	Finally, as part of the sensitivity analysis discussed in Chapter 3 (Portfolios) and in Appendix E (Quantitative Analysis), all portfolios were also analyzed under an alternative fuel supply sensitivity that examined how the portfolios would change if future access to a limited amount of Appalachian gas supply does not materialize.
Chp. 2, p. 17	Limited Appalachian gas supply (limit of two new CCs up to 2,400 MW)
App. E, p. 31	In the alternate fuel supply sensitivity, natural gas supply is assumed to be more limited and therefore the Companies limit the selection of CCs to a single new CC unit. Additionally in this sensitivity, the assumption for generic CC is a 2x1 F-Class CC with dual fuel capabilities ("CC-F"), operating on both natural gas and ULSD (diesel).
App. E, p. 32	In the alternate fuel supply sensitivity, with limits on natural gas supply, the new CC is assumed to operate on ULSD in potentially natural gas limited periods, responsive to supply constraints and price volatility, and on natural gas the remainder of the year when supply is less limited.
App. E, p. 41	Because there is uncertainty on how incremental natural gas supply to the DEC and DEP service territories will materialize, the Companies have developed a base fuel supply assumption and an alternate fuel supply sensitivity for the Carbon Plan.
App. E, p. 42	The Companies also developed an alternate fuel supply sensitivity, which assumes that DEC and DEP do not receive access to any Appalachian gas via firm transportation capacity . . . this sensitivity limits operations of some generation units to coal and ULSD during times of potentially limited supply and price volatility.
App. E, p. 85	Effect of supply constraint on P1 in 2030: +1,800 MW batteries, - 1,600 MW of CCs, +1,000 MW of CTs.
App. E, p. 86	Table E-84: Large additions of CTs and nuclear between 2035 and 2050.
App. E, p. 89	Because the lack of fuel supply diversity in this sensitivity, natural gas delivered to the Carolinas continues to see price volatility . . .

Indeed, increased reliance upon natural gas is extremely problematic. Several of these problems are discussed in the following subsections of these Joint Comments.

B. The Companies' Proposed Natural Gas Buildout Is Premised Upon the Risky and Unwarranted Assumption that the Natural Gas Fleet Will Be Able to Transfer to One Hundred Percent (100%) Hydrogen by 2050.

As noted, the Companies' Carbon Plan proposes a significant natural gas buildout as a means of achieving carbon neutrality by 2050.<sup>30</sup> This massive natural gas buildout is based upon a completely unwarranted assumption by the Companies: namely, the Carbon Plan assumes that all natural gas-fired generation will convert to one hundred percent (100%) hydrogen fuel by 2050.<sup>31</sup>

The importance of this unwarranted assumption cannot be overstated. Appearing below is Table 5 from Mr. Powers' Report, which summarizes many foundational assumptions by the Companies concerning a conversion of all CTs and CCs to 100% H<sub>2</sub> by 2050.<sup>32</sup>

**Table 5. Carbon Plan assertions regarding CT and CC conversion to 100% H<sub>2</sub> by 2050**

Reference	Statement
Chp. 2, p. 18	Figure 2-4: Key Base Assumptions for Selectable Supply-Side Resources: <ul style="list-style-type: none"> <li>• Hydrogen (H<sub>2</sub>) blending at existing CC and CT units in 2035+</li> <li>• Hydrogen market assumed available by 2040</li> <li>• All new CTs 2040+ are assumed to be operated on 100% H<sub>2</sub></li> <li>• Existing CT and CC units on the system in 2050 as well as all CTs and CCs added to the portfolios operate on hydrogen in 205</li> </ul>
App. E, p. 31	As 2050 approaches, the Companies assume hydrogen becomes a readily accessible fuel as a green hydrogen market develops.
App. E, p. 31	To account for the incremental equipment, the (post-2040) CT cost is increased to reflect these

<sup>30</sup> Carbon Plan, Appendix E, p. 77, Table E-71; *id.* at 86, Table E-84.

<sup>31</sup> Powers' Report, pp. 23-26.

<sup>32</sup> *Id.* at 24.

	configuration changes to allow for operating 100% on hydrogen.
App. E, p. 32	All CCs that are selected in the Carbon Plan, regardless of the fuel supply assumption, are assumed to be converted to 100% operations on Hydrogen by 2050 to comply with the 2050 carbon neutrality target.
App. E, p. 43	First, starting in 2035, a small amount of hydrogen (1% by heat content, ~3% by volume) is assumed to be blended into the natural gas supply for all resources.
App. E, p. 43	Over time the amount of hydrogen blended into the natural gas fuel supply grows moderately (to 3% by heat content or approximately 10% by volume by 2038 and to 5% by heat content or approximately 15% by volume by 2041) but remains a small fraction of total fuel supply in the pipelines.
App. E, p. 43	By 2050, the remaining combustion units on the system are assumed to operate exclusively on hydrogen to meet the Carbon Plan modeling target of zero carbon emissions by 2050. The Carbon Plan assumes a green hydrogen market develops, by which hydrogen is produced from non-carbon emitting means, such as from excess energy from renewables or nuclear.
App. E, p. 43	Supply of hydrogen carries a significant uncertainty.

Hence, it is obvious that a principal assumption of the Companies' Carbon Plan is a shift of all CCs and CTs to burning 100% H<sub>2</sub> by 2050.

This assumption is not supported by the evidence. For instance, the Companies' Carbon Plan freely admits that numerous "limitations and uncertainties around the implementation of hydrogen" exist.<sup>33</sup> The Companies acknowledge that these "limitations and uncertainties" "include[] the cost of production, storage costs, production reliability, generation asset technology limits

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<sup>33</sup> Carbon Plan, Appendix O, p. 3.

(low emission combustion), limited operational experience with variable resource grids and transportation as a result of pipeline material and volume limits.”<sup>34</sup>

Not only is the Companies’ presumption unsupported by the evidence, but the Carbon Plan does not address what happens if this transfer to H<sub>2</sub> proves to be impractical. According to Mr. Powers, “There is no assessment of what happens with the CTs and CCs if those uncertainties are not resolved by 2050.”<sup>35</sup> Relatedly, “[t]he issue of stranded costs associated with new gas-fired generation, and who will be responsible for those stranded costs, is not addressed by the Companies in the Carbon Plan” in the event that the Companies’ assumptions about H<sub>2</sub> do not come to fruition.<sup>36</sup>

C. The Dangers Associated with Methane Emissions from Natural Gas-Fired Generation

House Bill 951 is tailored to the reduction of carbon dioxide emissions and arguably does not address the emission of other greenhouse gases, such as methane. Nonetheless, the Commission is empowered to give weight to the dangerous emission of methane from natural gas generation. For instance, the following authorities allow the Commission to give due consideration to the emission of methane:

- Governor Cooper’s Executive Order No. 246 recommended that the Commission consider the federal social cost of greenhouse gas

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<sup>34</sup> *Id.*

<sup>35</sup> Powers’ Report, p. 24.

<sup>36</sup> *Id.* at 24-25.

emissions in its decision-making processes,<sup>37</sup> and that calculation includes methane,<sup>38</sup>

- Governor Cooper’s Executive Order No. 80 directed the development of a Clean Energy Plan, including certain greenhouse gas emissions reduction goals;<sup>39</sup> and
- The Public Utilities Act expressly declares that it is “the policy of the State of North Carolina . . . [t]o encourage and promote harmony between public utilities, their users and **the environment**”.<sup>40</sup>

According to Mr. Powers, “[n]atural gas is 70 to 90 percent methane,” and “[m]ethane is more than 80 times as potent a greenhouse gas as CO<sub>2</sub> over its first 20 years in the atmosphere.”<sup>41</sup> In fact, methane “accounts for about 30 percent of global warming.”<sup>42</sup>

The problem with methane emissions is not limited to the burning of natural gas at a generation facility. In fact, a significant “percentage of methane leaks into the atmosphere during well drilling, storage, compression, and transport,” and it “is also vented as a routine aspect of pipeline maintenance operations.”<sup>43</sup> Indeed,

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<sup>37</sup> *Executive Order No. 246*, January 7, 2022, p. 3, at <https://governor.nc.gov/media/2907/open> (accessed on May 6, 2022) (emphasis added).

<sup>38</sup> Interagency Working Group on Social Cost of Greenhouse Gases, U.S. Government, *Technical Support Document: Social Cost of Carbon, Methane, and Nitrous Oxide Interim Estimates under Executive Order 13990*, February 2021, [https://www.whitehouse.gov/wp-content/uploads/2021/02/TechnicalSupportDocument\\_SocialCostofCarbonMethaneNitrousOxide.pdf](https://www.whitehouse.gov/wp-content/uploads/2021/02/TechnicalSupportDocument_SocialCostofCarbonMethaneNitrousOxide.pdf).

<sup>39</sup> *Executive Order No. 80*, October 29, 2018, at <https://files.nc.gov/governor/documents/files/EO80-%20NC%27s%20Commitment%20to%20Address%20Climate%20Change%20%26%20Transition%20to%20a%20Clean%20Energy%20Economy.pdf> (accessed on March 22, 2022).

<sup>40</sup> N.C. Gen. Stat. § 62-2(a)(5) (emphasis added).

<sup>41</sup> Powers’ Report, p. 41.

<sup>42</sup> *Id.*

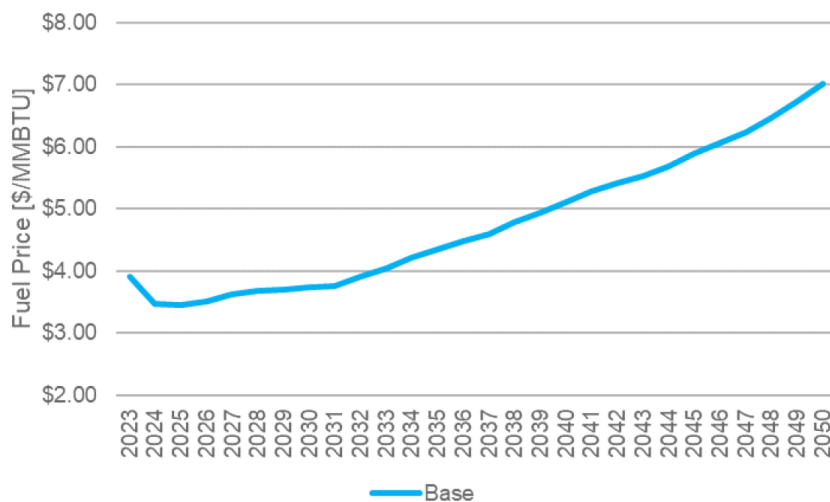
<sup>43</sup> *Id.* at 11.

“[m]ethane has a worse climate impact than coal if more than about 3 percent is lost to leakage upstream of the combustion source.”<sup>44</sup>

Accordingly, eliminating new CCs and CTs from the Companies’ Carbon Plan would address both CO<sub>2</sub> emissions at the stack and upstream methane leakage associated with the natural gas that is ultimately combusted from the gas turbines.

D. The Carbon Plan Makes Unreasonably Optimistic Assumptions About the Future Base Price of Natural Gas.

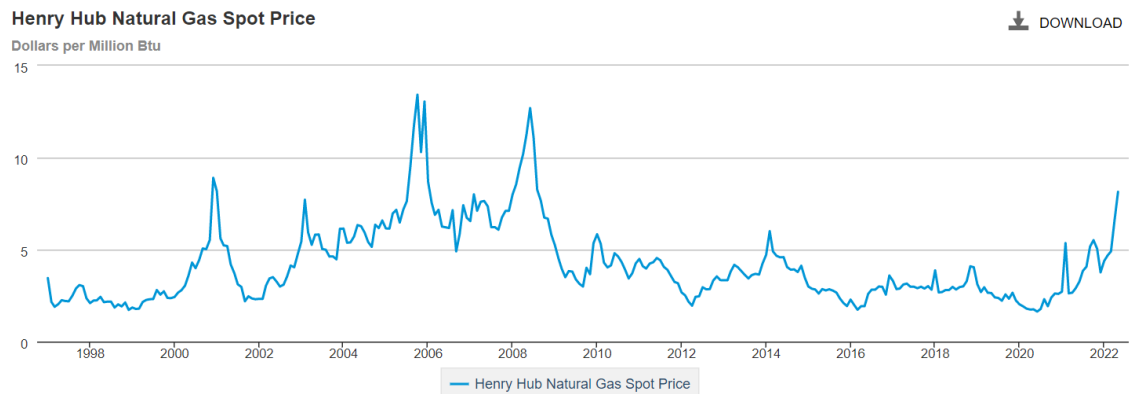
The Companies’ proposed natural gas buildout is further problematic because of the Carbon Plan’s unreasonably optimistic projection of future natural gas prices. The Carbon Plan assumes a low base price for natural gas of under \$4/MMBtu through 2032, rising to \$5/MMBtu in 2040. The Carbon Plan included Figure E-6, which depicted a Henry Hub natural gas price forecast utilized in the Carbon Plan modeling. Figure E-6 from the Carbon Plan is as follows:<sup>45</sup>



<sup>44</sup> *Id.*

<sup>45</sup> Carbon Plan, Appendix E, p. 40, Figure E-6: Base Henry Hub Natural Gas Price Forecast [\$/MMBTU]

The Carbon Plan modeling of natural gas pricing does not properly account for the substantial price volatility which is presently inherent to the natural gas market. Below is a figure taken from Mr. Powers' Report which reflects the substantial historic Henry Hub benchmark natural gas price volatility:<sup>46</sup>



According to Mr. Powers, “[n]atural gas prices have been especially volatile in 2022, with the May 2022 Henry Hub price over \$8 per million Btu.”<sup>47</sup> In fact, “Western Europe has become a high demand priority delivery point for U.S. natural gas in the form of LNG in the wake of the Ukraine war, driving increases in U.S. natural gas prices.”<sup>48</sup> Given these circumstances, the Companies’ projection of natural gas prices is unreasonably optimistic and should be rejected.

E. The Companies’ CC and CT Capital Cost Assumptions Are Flawed.

As would be expected, a fundamental input to the production cost model used in the Carbon Plan by the Companies to compare the cost of the different portfolios is the capital cost of the generation technologies. The Carbon Plan

<sup>46</sup> Powers’ Report, p. 9.

<sup>47</sup> Powers’ Report, p. 9.

<sup>48</sup> *Id.*

contains hundreds of tables and figures within twenty-four (24) separate appendices and attachments. Yet nowhere do the Companies identify the capital cost assumptions used for the generation technologies included in the Carbon Plan.<sup>49</sup>

For example, the Carbon Plan states that the Companies used “proprietary third-party engineering estimates” for several generation technologies that play a major role in the Carbon Plan portfolios, including CTs and CCs.<sup>50</sup> By failing to disclose these capital cost assumptions, it becomes extremely difficult to evaluate the Companies’ production cost model or to assess the merits of the Companies’ various portfolios.

That said, the significant natural gas buildout proposed in the Carbon Plan closely tracks the Companies’ proposals in their 2020 Climate Report.<sup>51</sup> That 2020 Climate Report identified capital cost assumptions of \$650/kW for CCs and \$550/kW for CTs.<sup>52</sup> It is likely that similar assumptions were used in the Carbon Plan.<sup>53</sup>

These capital cost assumptions are far too low given the Companies’ recent historical experiences. For instance, the actual capital cost of the 560 MW Asheville CC plant, which came online in 2020, was \$817 million.<sup>54</sup> “This is

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<sup>49</sup> *Id.* at 11-15.

<sup>50</sup> *Id.* at 12; see, e.g., Carbon Plan, Chapter 2, p. 24.

<sup>51</sup> Duke Energy 2020 Climate Report, *Achieving A Net Zero Carbon Future*, April 2020, <https://www.duke-energy.com/media/pdfs/our-company/climate-report-2020.pdf?la=en>

<sup>52</sup> *Id.* at 24; Powers’ Report, p. 13.

<sup>53</sup> Powers’ Report, pp. 2-3, 13-14.

<sup>54</sup> *Id.* at 14.



equivalent to a unit CC cost of about \$1,460/kW, over double Duke Energy's assumed CC cost of \$650/kW."<sup>55</sup> Using a similar analysis, Mr. Powers concluded that, given the Companies' recent historical experiences, "a unit CT cost [is] approximately \$1,250/kW, compared to Duke Energy's assumed CT cost of \$550/kW."<sup>56</sup>

As noted, the Companies have proposed a massive natural gas buildout. It is obvious that this increased reliance upon natural gas is largely premised upon untenably optimistic cost assumptions which are completely inconsistent with the Companies' recent history.

**Recommendations:** In light of the foregoing, NC WARN *et al.* makes the following recommendations concerning the Companies' Carbon Plan:

(d) The Companies should correct the above-described errors with their analysis of natural gas.

(e) The Companies should provide updated analyses which encompass the significance of methane emissions from natural gas-fired generation.

(f) The Companies should correct their unrealistic natural gas price projections.

(g) "The NCUC should direct the Companies to use the final capital cost of the Lincoln 402 MW CT and the Asheville 560 MW CC as the base case 2022 capital cost assumptions for CTs and CCs in the Carbon Plan."<sup>57</sup>

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<sup>55</sup> *Id.*

<sup>56</sup> *Id.*

<sup>57</sup> *Id.* at 15.

(h) Based upon the results of the above-stated corrections, the Commission should require the Companies to vastly decrease their future reliance upon natural gas-fired generation in a manner which is consistent with NC WARN *et al.*'s Counter Carbon Plan described herein.

### III. The Carbon Plan Proposes Excessive Reserve Margins.

#### A. The Companies Propose an Extremely Conservative Reserve Margin.

A crucial input for the Carbon Plan is the reserve margin. According to the Companies, “[c]onsistent with the Companies’ 2020 Integrated Resource Plans (‘IRPs’), the Companies used a 17% minimum winter planning reserve margin in developing the Carbon Plan portfolios based on results from the 2020 Resource Adequacy Study conducted by Astrape Consulting.”<sup>58</sup>

This seventeen percent (17%) planning reserve margin (“PRM”) is unnecessarily high. According to Mr. Powers, a 17 percent PRM is a very conservative reliability planning standard.<sup>59</sup> Furthermore, the Companies’ proposed PRM drastically **increases** over time. As stated by Mr. Powers: “In the case of Carbon Plan Portfolio 1, the only portfolio designed to achieve 70 percent carbon reduction by 2030, the PRM is 26.3 percent in 2030 and rises to 29.0 percent in 2035.”<sup>60</sup> These PRM values represent reserves far in excess of 17 percent, namely of about 3,000 MW in 2030 and 4,300 MW in 2035.<sup>61</sup> These PRMs are unnecessarily high.

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<sup>58</sup> Carbon Plan, Chapter 2, p. 6.

<sup>59</sup> Powers’ Report, pp. 27-34.

<sup>60</sup> *Id.* at 27.

<sup>61</sup> *Id.*

B. The Companies' Excessive Proposed Reserve Margins Partly Result from Their Failure to Properly Account for Available Imports.

These excessive PRMs are an artifact of the Companies' refusal to consider energy imports when calculating operating reserve margins ("ORM").<sup>62</sup> This refusal is completely indefensible. For instance, the Companies have previously stated that they assume that they "will rely on" nearly thirty percent (30%) of their reserve margin being met with non-firm supply during peak demand days.<sup>63</sup> By omitting these imports—which in fact happen—from their calculation of ORM, the Companies are able to defend an unnecessarily high PRM.

In fact, the evidence shows that ample power is available for import by the Companies. The Companies' Carbon Plan uses a winter peak condition to formulate the various portfolios. Conversely, the balancing authorities to the north, namely PJM, and the south, namely Georgia Power/Southern Company, are both summer peaking territories.<sup>64</sup> For instance, the PJM summer peak is approximately 20,000 MW higher than the winter peak. "As a result, PJM and Southern Company have ample reserves available for export to meet DEC and DEP winter peak demand, even when DEC and DEP are experiencing simultaneous winter peaks."<sup>65</sup>

The availability of ample non-firm imports is illustrated by examining February 20, 2015, which was the highest "same day" demand on the DEC and

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<sup>62</sup> *Id.* at 28-29.

<sup>63</sup> *Id.* at 29.

<sup>64</sup> *Id.* at 31.

<sup>65</sup> *Id.*

DEP systems for the 2014-2019 time period.<sup>66</sup> On this date, the Companies met demand by relying upon a substantial amount of available non-firm imports. Mr. Powers prepared the following Table 11 summarizing the non-firm imports relied upon by the Companies on February 20, 2015:<sup>67</sup>

**Table 11. Non-firm imports relied on by DEC and DEP on February 20, 2015**

Utility receiving non-firm imports	Source of non-firm imports	Quantity of non-firm imports (MW)
DEC	Santee Cooper	1,412
	Alcoa Power - Yadkin Division	256
DEP-East	PJM Interconnection	1,391
DEP-East	South Carolina Gas & Electric	932
DEP-West	TVA	248
DEP-West	PJM Interconnection	698

During a Staff Conference before the NCUC concerning the polar vortex on February 20, 2015, the Companies indicated that they had access to an ample supply via multiple transmission import pathways and had no reliability problems.<sup>68</sup> When asked by the Commission “how far were you [i.e., DEC and DEP] from having to shed load,” the Companies’ witness responded as follows:<sup>69</sup>

Well, so certainly there were several other options still available. We had not called on VACAR reserves, so we still had firm transmission availability to bring reserves in. There were still energy options. **We still could have pushed more non-firm energy.**

Later during the Staff Conference, Duke Energy’s witness again testified to the ample available energy purchases and the ease with which the Companies met load during a uniquely high-load event:<sup>70</sup>

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<sup>66</sup> *Id.* at 33.

<sup>67</sup> *Id.*

<sup>68</sup> **Attachment 4**, Transcript of Staff Conference, March 2, 2015.

<sup>69</sup> *Id.* at 11-12 (emphasis added).

<sup>70</sup> *Id.* at 17 (emphasis added).

We were able to bring in—you know, I think we were importing about 1,200 MW of energy at one time into our BAA. That’s a sizeable energy move in a very stressful time. So we were able to move energy in from PJM. We moved energy in from Southern Company. We had our reserve sharing capabilities on our firm transmission. **So I didn’t see any deficiencies.**

Clearly, based upon the above testimony, the Companies consider non-firm imports to be both available and reliable. The Companies’ PRM projections should be corrected to reflect the availability of non-firm imports.

C. Avoidable Winter Peaks Are Being Created by The Failure to Deploy Demand Side Management.

The Companies’ failure to deploy available Demand Side Management (“DSM”) at winter peak is creating avoidable winter peaks.<sup>71</sup> For example, the Companies’ highest winter peak demand in recent years occurred during the first two (2) weeks of January 2018.<sup>72</sup> During this period, DEC had 428 MW of DSM available to meet the winter peak in 2018, and DEP had 478 MW of DSM available to meet the winter peak in 2018.<sup>73</sup> Shockingly, DEC did not deploy **any** DSM for that purpose.<sup>74</sup> Only slightly better, DEP deployed no DSM on January 5, 2018, and it deployed less than half of its available DSM, 225 MW, on its winter peak day of January 7, 2018.<sup>75</sup>

According to Mr. Powers, the Companies “are using examples of low ORMs on winter peak days to justify PRMs that are much higher than Duke Energy’s 17

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<sup>71</sup> Powers’ Report, p. 37.

<sup>72</sup> *Id.* at 37-38.

<sup>73</sup> *Id.* at 38.

<sup>74</sup> *Id.*

<sup>75</sup> *Id.*

percent PRM target,” yet “neither company is consistently using the available DSM resources to increase the ORM on winter peak days and reduce the justification for excessive PRMs.”<sup>76</sup> Accordingly, the Commission should reject the Companies’ proposed natural gas expansion as unnecessary given these excessive PRMs.

**Recommendations:** In light of the foregoing, NC WARN *et al.* makes the following recommendations concerning the Companies’ Carbon Plan:

(i) The Companies should correct the above-described errors with their reserve margin analysis.

(j) In calculating PRM and ORM, the Companies should be ordered to assume that they will meet winter peak demand with available non-firm imports.

(k) Based upon the results of the above-stated corrections, the Commission should require the Companies to revise and reduce their reserve margin proposals.

**IV. The Companies’ Forecasted Demand Growth Rate Is Not Supported by the Evidence.**

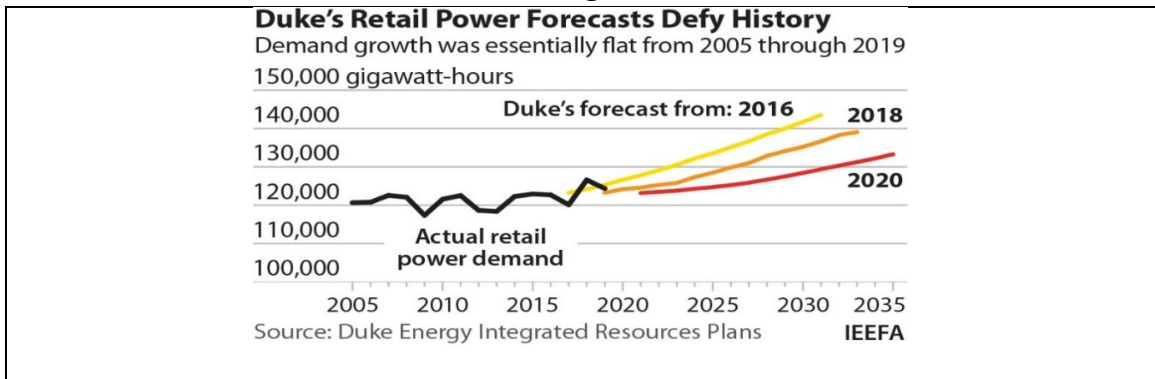
The Companies’ proposed natural gas buildout is largely based upon the purported need for new generation assets due to the substantial projected demand growth predicted in the Carbon Plan.<sup>77</sup> At the outset, it should be noted that the Companies have consistently overstated their demand growth during the last several Integrated Resource Plan proceedings, and the Companies’ aggressive projections have not come true. The following Figure 8, cut-and-pasted from Mr. Powers’ Report, illustrates the Companies’ history of overstating demand growth:

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<sup>76</sup> *Id.*

<sup>77</sup> See, e.g., Carbon Plan, Appendix F.

**Figure 8. Comparison of Duke Energy actual demand growth to forecast demand growth<sup>78</sup>**



Actual retail sales growth for DEC from 2016 through 2021, which is the most recent five-year period shown in the Carbon Plan, averaged 0.0 percent.<sup>79</sup> Instead of using this period, the Companies opted to analyze the period of 2012 to 2021 and thereby assert a sales growth rate forecast for DEC of 0.8 percent.<sup>80</sup> This number is skewed and unreliable because 2012 was an unusually low retail sales year, as reflected in the above-provided Figure 8.<sup>81</sup> By arbitrarily beginning the calculation of demand growth on 2012, the Companies were able to project a demand growth for DEC of 0.8 percent. However, the most recent—and reliable—trends, namely over the last five (5) years, reflect an average annual growth of 0.0 percent.<sup>82</sup>

<sup>78</sup> Powers' Report, p. 34; see also D. Wamsted - Institute for Energy Economics and Financial Analysis, *Key Shortcomings in Duke's North Carolina IRPs: An Issue-by-Issue Analysis: Part 2*, February 2021: [http://ieefa.org/wp-content/uploads/2021/02/Key-Shortcomings-in-Duke-North-Carolina-IRPs\\_Part-2\\_February-2021.pdf](http://ieefa.org/wp-content/uploads/2021/02/Key-Shortcomings-in-Duke-North-Carolina-IRPs_Part-2_February-2021.pdf).

<sup>79</sup> Powers' report, p. 35.

<sup>80</sup> *Id.*

<sup>81</sup> *Id.*

<sup>82</sup> *Id.*

A similar analysis applies to DEP. The Carbon Plan shows that retail sales for DEP declined from 2016 through 2021, the most recent five-year period, at a rate of -0.7 percent.<sup>83</sup> Hence the Companies arbitrarily expand their analysis to the 2012-2021 time period.<sup>84</sup> As noted, 2012 was an unusually low retail sales year. By pegging the analysis to 2012, the Companies project demand growth for DEP of 0.4 percent. This projected demand growth seemingly ignores that, over the last five (5) years, DEP's retail sales have declined at a rate of -0.7 percent.<sup>85</sup>

**Recommendations:** In light of the foregoing, NC WARN *et al.* makes the following recommendations concerning the Companies' Carbon Plan:

(l) The Companies should correct the above-described errors with their demand growth rate forecast.

(m) Based upon the results of the above-stated corrections, the Commission should require the Companies to revise and reduce their demand growth rate forecast.

**V. The Companies' "Grid Edge" Program Should Be Given a Higher Priority.**

In the Carbon Plan, the Companies place great importance upon the "Grid Edge" program, which is intended to "'shrink the challenge' by reducing energy requirements and modifying load patterns through grid edge and customer programs allowing more tools to respond to fluctuating energy supply and demand."<sup>86</sup> The proposed Grid Edge program includes energy efficiency, DSM,

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<sup>83</sup> *Id.* at 36.

<sup>84</sup> *Id.*

<sup>85</sup> *Id.*

<sup>86</sup> Carbon Plan, Executive Summary, p. 9.



customer self-generation (*i.e.*, NEM solar), voltage management and other distributed energy resources.<sup>87</sup> Unfortunately, the specifics of the Carbon Plan do not actually give any priority the Grid Edge program. For instance, the Companies' failure to adequately rely upon DSM were discussed above.

Additionally, the Companies' Carbon Plan significantly deemphasizes NEM solar. The Carbon Plan forecasts a fifteen percent (15%) growth rate for NEM solar through 2030.<sup>88</sup> Conversely, the Companies' 2020 Integrated Resource Plans projected substantially more NEM solar. According to Mr. Powers:<sup>89</sup>

The Companies' growth projection for NEM has substantially declined between the 2020 DEC and DEP IRPs and the Carbon Plan. There were 169 MW of NEM solar online in the Companies' territories in North Carolina at the end of 2021. The Companies projected in the 2020 IRPs that 745 MW would be online in North Carolina by 2035. This is a NEM solar increase in North Carolina of 576 MW between the end of 2021 and 2035.

The Carbon Plan projects a NEM addition rate of 26.5 MW per year in North Carolina, the equivalent of an additional 371 MW by 2035. The Carbon Plan reduces the role of NEM solar dramatically, relative to the 2020 IRP forecasts, despite identifying NEM solar as a first priority in reducing carbon emissions.

Unfortunately, the Carbon Plan does not provide an explanation justifying this substantial decline in new NEM solar capacity in North Carolina between the Companies' 2020 Integrated Resources Plans and the present Carbon Plan. However, it should be noted that, in the separate NEM docket,<sup>90</sup> the Companies

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<sup>87</sup> Carbon Plan, Appendix G, p. 1.

<sup>88</sup> Carbon Plan, Chapter 2, p. 12.

<sup>89</sup> Powers' Report, p. 39.

<sup>90</sup> NCUC Docket No. E-100, Sub 180

have proposed changes to their NEM tariffs which will materially harm the value of rooftop solar systems. According to Mr. Powers' report in the separate NEM docket, the evidence shows "a 30 percent reduction in value for these NEM systems under the proposed tariff and without the incentive payment."<sup>91</sup>

The Companies profess the importance of the Grid Edge program, including NEM solar, and yet the Companies have proposed tariffs which harm NEM solar. The Commission should require the Companies to strengthen the Grid Edge program by, among other things, correcting their proposed NEM tariffs.

**Recommendations:** In light of the foregoing, NC WARN *et al.* makes the following recommendations concerning the Companies' Carbon Plan:

(n) The Companies should correct the above-described errors with their Grid Edge program.

(o) Following an investigation, including a Value of Solar Study, the Companies should be required to correct their proposed NEM tariffs as discussed in detail by NC WARN in the separate NEM docket (NCUC Docket No. E-100, Sub 180).

(p) Based upon the results of the above-stated corrections, the Commission should require the Companies to revise and prioritize the proposed Grid Edge program.

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<sup>91</sup> Joint Initial Comments of NC WARN et al., Attachment A, Report of William E. Powers, p. 10, NCUC Docket No. E-100, Sub 180.

**VI. The Carbon Plan's Proposed Use of Small Modular Reactors Should Be Rejected.**

All four (4) of the Companies' portfolios rely upon a substantial investment in Small Modular Reactors ("SMRs"). Specifically, the Companies propose 600 MW of SMRs through 2035,<sup>92</sup> as well as 9,900 MW to 10,200 MW of "New Nuclear" through 2050.<sup>93</sup> However, SMRs are presently not commercially viable, and it is highly speculative that such SMRs will ever be practical. Therefore, the Companies' proposal to purchase and install expensive SMRs should be rejected.

According to Mr. Powers, "[b]ringing reliable and cost-effective SMRs into the marketplace remains highly speculative and high-risk."<sup>94</sup> The challenges of relying upon SMRs include the following: "unproven and challenging designs, cost viability and economies-of-scale, lack of full regulatory or investor approval, radioactive waste, safety and security, and competition from cheaper, safer alternatives."<sup>95</sup>

Indeed, NuScale, considered the leading developer of SMRs in the United States, is years behind schedule on developing a commercially viable SMRs. According to Mr. Powers, "Cost estimates for [NuScale's] SMR are speculative, as no units have yet been built or operated."<sup>96</sup> For instance, NuScale reached an agreement with the Utah Associated Municipal Power Systems in 2017 to build

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<sup>92</sup> Carbon Plan, Appendix E, p. 77, Table E-70.

<sup>93</sup> *Id.* at 77, Table E-71 (stating that "New Nuclear" includes "SMR and advanced nuclear with integrated storage").

<sup>94</sup> Powers' Report, p. 22.

<sup>95</sup> *Id.*

<sup>96</sup> *Id.*

twelve (12) 50 MW modules that would come online in 2024.<sup>97</sup> The plan was later increased to six (6) 77 MW modules projected to come online in 2029.<sup>98</sup> However, “[t]he currently projected NuScale production cost could be more than twice the cost of utility-scale solar and wind power generation.”<sup>99</sup>

The Companies’ plan to rely upon SMRs is too speculative to be approved. Accordingly, NC WARN *et al.* recommends that the Commission reject any reliance upon SMRs.

**Recommendation:** In light of the foregoing, NC WARN *et al.* makes the following recommendation concerning the Companies’ Carbon Plan:

(q) The Commission should reject the Companies’ proposal to purchase and install SMRs.

**VII. The Carbon Plan Fails to Address the Equity Goals of Executive Order No. 246.**

North Carolina Executive Order No. 246 (North Carolina’s Transformation to a Clean Equitable Economy) states:

Climate change disproportionately impacts people of color, low-income communities, and Indigenous communities, and responsible solutions to climate change must equitably reduce GHG emissions, increase community resilience, advance sustainable economic recovery and infrastructure investment efforts, promote public health and health equity, and ensure fair treatment and meaningful engagement in decision-making and implementation.<sup>100</sup>

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<sup>97</sup> *Id.* at 23.

<sup>98</sup> *Id.*

<sup>99</sup> *Id.*

<sup>100</sup> North Carolina, Executive Office of the Governor Roy Cooper, Executive Order No. 246: North Carolina’s Transformation to a Clean Equitable Economy, January 7, 2022.

In addition, EO 246 requires certain decisions of state Cabinet agencies to utilize the social cost of greenhouse gas emissions (SC-GHG) set by the federal Interagency Working Group on the Social Cost of Greenhouse Gases (GHGs), which is currently \$50/ton.<sup>101</sup> The Commission is among the other state entities that are “encouraged” in EO 246 to use the SC-GHG.<sup>102</sup>

The Companies’ Carbon Plan fails to address the issues outlined in EO 246. It proposes the expansion of hydraulic fractured methane (natural) gas facilities and continued coal usage and small modular nuclear reactors (SMRs), all of which pose substantial threats to those living nearby, who are disproportionately low-income and historically marginalized BIPOC (Black, Indigenous, and People of Color) communities.

#### A. Impacts of Gas

The expansion of hydraulic fractured methane (natural) gas facilities will contribute significantly to climate change due to the associated methane emissions.<sup>103</sup> According to the U.S. Environmental Protection Agency: “Because methane is both a powerful greenhouse gas and short-lived compared to carbon dioxide, achieving significant reductions would have a rapid and significant effect

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<sup>101</sup> Hurley, Lawrence, "U.S. Supreme Court rebuffs Republican-led states on greenhouse gas policy," Reuters, May 26, 2022, <https://www.reuters.com/world/us/us-supreme-court-rebuffs-republican-led-states-greenhouse-gas-policy-2022-05-26/>.

<sup>102</sup> North Carolina, Executive Office of the Governor Roy Cooper, Executive Order No. 246: North Carolina’s Transformation to a Clean Equitable Economy, January 7, 2022.

<sup>103</sup> Powers’ Report, pp. 10-11.

on atmospheric warming potential.”<sup>104</sup> Yet the Companies’ Carbon Plan expands the use of this fuel.

New gas infrastructure is likely to be sited disproportionately in low-income and BIPOC communities. In particular, recent research concludes that:

- Natural gas pipelines in the United States tend to be concentrated in counties with high social vulnerability;
- Negative impacts associated with pipelines fall disproportionately on communities with limited capacity to deal with the impacts; and
- Decision-makers who plan and permit pipelines should consider whether new projects maintain the inequitable status quo.<sup>105</sup>

Specific threats and risks of pipelines to environmental justice (“EJ”) communities include: spills and leaks, explosions, structural failures, and construction impacts. These events exacerbate and amplify pre-existing low-income disparities.<sup>106</sup>

A geo-spatial mapping tool using data from The Centers for Disease Control and Prevention and the U.S. Energy Information Administration highlights the overwhelming preponderance of pipeline intrusions within highly vulnerable communities which are disproportionately BIPOC.<sup>107</sup>

The Companies likely expect their additional pipeline capacity to be delivered by the Mountain Valley Pipeline (“MVP”) already in construction, which

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<sup>104</sup> United States Environmental Protection Agency, “The Importance of Methane,” <https://www.epa.gov/gmi/importance-methane>.

<sup>105</sup> Emanuel, R. E., Caretta, M. A., Rivers, III, L., & Vasudevan, P., *GeoHealth*, “Natural gas gathering and transmission pipelines and social vulnerability in the United States” (2021), <https://agupubs.onlinelibrary.wiley.com/doi/epdf/10.1029/2021GH000442>.

<sup>106</sup> *Id.*

<sup>107</sup> *Id.*

has plans to extend into Alamance and Rockingham counties in North Carolina via the MVP Southgate extension.<sup>108</sup> According to the U.S. Department of Agriculture Economic Data Service, both Rockingham and Alamance counties rank above the North Carolina average for percent of the population living in poverty.<sup>109</sup>

Additional costs for new gas infrastructure will overburden low-income BIPOC communities. If the social costs, including health risks and impacts, had been factored in as envisioned by EO 246, the Companies' build-out of gas infrastructure would be even more indefensible.

#### B. Impacts of Continued Coal Use

The Carbon Plan further defies the federal Interagency Working Group social cost of GHGs by continuing to rely on coal until 2036.<sup>110</sup> This ignores the disproportionately high health costs that unfairly burden historically underserved and marginalized communities located near coal plants. This will mean an additional fourteen (14) years of unnecessary GHG emissions, exacerbating climate change and prolonging exposure to air pollution and toxic coal ash for nearby communities.

According to the U.S. Environmental Protection Agency ("EPA"), burning fossil fuels like coal creates inequitable health impacts:

Minority, low-income, and Indigenous populations frequently bear a disproportionate burden of environmental harms and adverse health outcomes, including the development of heart or lung diseases,

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<sup>108</sup> MVP Southgate, "American Pipeline: Delivering American Energy," <https://www.mvpsouthgate.com/>.

<sup>109</sup> USDA Economic Research Service Poverty, <https://data.ers.usda.gov/reports.aspx?ID=17826>.

<sup>110</sup> Carbon Plan, Appendix E, p. 45.

such as asthma and bronchitis, increased susceptibility to respiratory and cardiac symptoms, greater numbers of emergency room visits and hospital admissions, and premature deaths.<sup>111</sup>

The American Public Health Association states that:

Coal power plant emissions impact the health of nearby communities... Coal combustion ... is a major contributor to the “criteria pollutants”... linked to respiratory disease, cardiovascular disease, stroke, diminished cognitive functioning, and adverse birth outcomes.”<sup>112</sup>

The NAACP and other environmental groups have long pleaded with the Companies to retire these coal units. The Companies’ refusal to take these concerns seriously is disappointing and disregards the serious objections of BIPOC communities as expressed herein.

### C. Impacts of New Nuclear Plants

Nuclear power generation also poses health and safety risks to those living near the plants. In addition to the risk of nuclear accidents, people living in a 50-mile radius of a nuclear plant are more inclined to adverse health impacts due to everyday exposure to radioactivity, as reported by researchers in 2016:

Evidence suggests that individuals living near the nuclear power plants face difficult-to-avoid health risks associated with exposure to low level routine radioactive effluents emitted from plants. Given that no level of radiation exposure is considered safe, any excess exposure could have deleterious impacts on human health. The effects of radiation at the cellular

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<sup>111</sup> U.S. EPA, “Power Plants and Neighboring Communities,” <https://www.epa.gov/airmarkets/power-plants-and-neighboring-communities>.

<sup>112</sup> The American Public Health Association, “The Public Health Impact of Energy Policy in the United States” (2018), <https://www.apha.org/policies-and-advocacy/public-health-policy-statements/policy-database/2019/01/28/public-health-impact-of-energy-policy>.



level could lead to irreversible damage and potential premature death. Tritium, to highlight a common isotope, is a carcinogen, mutagen, and teratogen and can easily be incorporated into human tissues causing cancers, chromosomal aberrations, birth defects and miscarriages, and mental retardation after in utero exposure.<sup>113</sup>

These facilities, like coal and gas plants, are likely to be sited disproportionately in low-income and BIPOC communities, as are facilities for disposal of radioactive waste.<sup>114</sup>

#### D. Disproportionate Impact of Low Energy Efficiency Targets

The Carbon Plan aspires to only 1% energy efficiency<sup>115</sup> despite the fact that this milestone has already been achieved by the Companies. Greater investment in energy efficiency measures could lower costs for energy-burdened customers. The Carbon Plan also lacks measures to make solar accessible to low-income customers and communities, such as subsidized rooftop solar and community solar. Instead, Duke Energy is currently requesting changes to net metering that would continue to undermine accessibility to affordable rooftop solar.<sup>116</sup> The Carbon Plan fails to include these critical steps for achieving the energy equity outlined in NC EO 246.

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<sup>113</sup> D. Kyne and B. Bolin, "Emerging Environmental Justice Issues in Nuclear Power and Radioactive Contamination," *Int. J. Environ. Res. Public Health* 13, 700 (2016), <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4962241/>.

<sup>114</sup> D. Endres, "From Wasteland to Waste Site: The Role of Discourse in Nuclear Power's Environmental Injustices," *Local Environ.* 14, 917 (2009).

<sup>115</sup> Carbon Plan, Appendix G.

<sup>116</sup> Joint Application of DEC and DEP for Approval of Net Energy Metering Tariffs, Nov. 29, 2021, NCUC Docket No. E-100 Sub 180.

E. Inadequate Attention to Input from Low-Income and EJ Communities

While developing the Carbon Plan, the Companies did not meaningfully engage diverse community voices as it only held three (3) daytime stakeholder sessions and many members of the public were not able to attend due to work schedules. The Commission directed the Companies to engage with community voices within the framework of the North Carolina Low Income Affordability Collaborative (“NC LIAC”). However, the community proposals generated through those meetings have yet to be accepted by the Companies and are absent from this Carbon Plan.

The Companies promised to reach out separately to environmental justice (“EJ”) communities, ignored attempts of EJ advocacy organizations to propose participants for such meetings, then held one meeting with around fifteen (15) utility-selected EJ stakeholders on May 3, 2022, less than two weeks before the Companies submitted the Carbon Plan. As revealed in testimony from NC NAACP president Deborah Dicks Maxwell at the Carbon Plan public hearing in Wilmington on July 12, 2022, these groups submitted additional input for the plan only to be told belatedly that the plan had already been submitted.

F. Equity Absent from Carbon Plan

Executive Order No. 246 states:

Council of State members, state boards and commissions, higher education institutions, local governments, private businesses, and other North Carolina entities are encouraged to incorporate

environmental justice and equity considerations and benefits into their work.<sup>117</sup>

The Companies' Carbon Plan ignores this directive. It is, instead, a barrier to achieving the mandates of NC EO 246. The Executive Summary of the Carbon Plan, which presents the priorities of the Companies' plans for our collective energy future, repeatedly uses the term "energy transition," but never "just" or "equitable." EJ communities have been historically enslaved, displaced, erased, and ignored. The Commission must ensure that its final Carbon Plan meaningfully engages low-income and BIPOC communities, mitigates the disproportionate impacts of energy production on these communities, and provides them with environmental safety and economic opportunities.

**Recommendations:** In light of the foregoing, NC WARN *et al.* makes the following recommendations concerning the Companies' Carbon Plan:

(r) As discussed in Governor Cooper's Executive Order No. 246, the Commission should require the Companies to file revised studies analyzing the impacts of the Carbon Plan upon the low-income and BIPOC communities.

(s) The Companies should be required to conduct the outreach to the low-income and BIPOC communities contemplated by Executive Order No. 246.

**VIII. NC WARN *et al.*'s Counter Carbon Plan: Prioritize Solar Plus Storage, End Coal Usage, No New Gas, and No New Nuclear.**

Pursuant to House Bill 951, NC WARN *et al.* hereby proposes a Counter Carbon Plan which constitutes the least-cost mix of generation and would achieve

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<sup>117</sup> North Carolina, Executive Office of the Governor Roy Cooper, Executive Order No. 246: North Carolina's Transformation to a Clean Equitable Economy, January 7, 2022.

one hundred percent (100%) carbon-free electricity by 2035. The primary elements of this Counter Carbon Plan are as follows:<sup>118</sup>

- Average 2,000 MW per year of wholesale urban solar plus storage on commercial and industrial buildings and parking lots, large undeveloped urban parcels and brownfields;
- Adding 4 hours of battery storage to the 8,000 MW of utility-scale solar in operation in North Carolina;
- Shutting down coal-only units by 2024 and operating dual fuel gas/coal units only on natural gas until retirement in 2035; and
- Converting nuclear units to synchronous condensers in the post-2035 timeframe to provide grid voltage support.

In Section XIII of his Report, Mr. Powers describes this Counter Carbon Plan in detail. Mr. Powers' Report includes the following Table 13 summarizing the elements of NC WARN *et al.*'s Counter Carbon Plan:<sup>119</sup>

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<sup>118</sup> Powers' Report, p. 47.

<sup>119</sup> *Id.* at 48.

**Table 13. Elements of DG Counter Proposal**

Element	2035 capacity, MW	2035 annual energy production, MWh
Wholesale urban SPS	25,000	38,000,000
Wholesale battery storage (4-hour at solar rated capacity)	28,000	112,000
Battery storage at existing utility-scale solar sites (4-hour at solar rated capacity)	8,000	32,000
Repurposing nuclear units as synchronous condensers	grid support	grid support

As described in detail by Mr. Powers, this Counter Carbon Plan is preferable to the Companies' Carbon Plan. Among other reasons, "[t]he combination of solar power plus battery power (SPS) is a lower-cost and more versatile alternative than CTs to meet peak and seasonal demand going forward."<sup>120</sup> Furthermore, "[w]holesale urban SPS should replace the new CC, CT, remote utility-scale solar, wind and nuclear capacity included in the Carbon Plan."<sup>121</sup> The preference for wholesale urban SPS is because it "can compete on cost with remote utility-scale solar/SPS."<sup>122</sup> These various projects can be interconnected at the distribution level to serve demand in the local area, and will therefore "eliminate the high cost of the transmission build-out, and transmission interconnection capacity limits,

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<sup>120</sup> *Id.* at 54.

<sup>121</sup> *Id.*

<sup>122</sup> *Id.*

anticipated in the Carbon Plan.”<sup>123</sup> Moreover, “[b]attery storage should also be added at existing utility-scale solar sites to maximize the dispatchability of this solar power.”<sup>124</sup>

NC WARN *et al.*'s Counter Carbon Plan is both least cost and achieves the goals of House Bill 951 on an accelerated timeline. This Counter Carbon Plan is preferable and should be adopted by the Commission.

**Recommendation:** In light of the foregoing, NC WARN *et al.* makes the following recommendation concerning the Companies' Carbon Plan:

(t) The Commission should adopt NC WARN *et al.*'s Counter Carbon Plan.

#### **IX. List of Issues for an Expert Witness Hearing**

Pursuant to the Commission's *Order Establishing Additional Procedures and Requiring Issues Report* entered on April 1, 2022, NC WARN *et al.* hereby provides the following list of substantive issues that it believes should be subject to an expert witness hearing:

1. Were there flaws in the Companies' analysis of the likely performance of solar paired with storage?
2. Have the Companies failed to properly account for and analyze the uncertain nature of 100% use of H<sub>2</sub> in natural gas plants by 2050?
3. Have the Companies failed to analyze the significant impacts of methane emissions from natural gas?

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<sup>123</sup> *Id.*

<sup>124</sup> *Id.*

4. Have the Companies failed to properly and reasonably project future natural gas prices?
5. Have the Companies made critical errors on their capital cost assumptions?
6. Have the Companies used unnecessarily conservative planning reserve margins?
7. Are the Companies' demand growth projections reasonable?
8. Should the Companies' proposed Grid Edge program be bolstered?
9. Have the Companies failed to prove that SMRs are economically viable and practical?
10. Should NC WARN *et al.*'s Counter Carbon Plan be adopted by the Commission?

### **CONCLUSION**

WHEREFORE, NC WARN *et al.* make the following recommendations concerning the Companies' Carbon Plan:

- (a) The Companies should correct the errors described herein regarding their analysis of battery storage;
- (b) The Companies should model three (3) new solar plus storage profiles, solar plus 4-hour storage, solar plus 6-hour storage, and solar plus 8-hour storage, and provide the Electric Load Carrying Capability for the Commission's review in creating a Carbon Plan;
- (c) Based upon the results of corrections discussed herein regarding the Companies' analysis of battery storage, the Commission should require the

Companies to vastly increase their future implementation of battery storage in a manner which is consistent with NC WARN *et al.*'s Counter Carbon Plan described herein;

(d) The Companies should correct the errors described herein regarding their analysis of natural gas;

(e) The Companies should provide updated analyses which encompass the significance of methane emissions from natural gas-fired generation;

(f) The Companies should correct their unrealistic natural gas price projections;

(g) The Commission should direct the Companies to use the final capital cost of the Lincoln 402 MW CT and the Asheville 560 MW CC as the base case 2022 capital cost assumptions for CTs and CCs in the Carbon Plan;

(h) Based upon the results of the corrections regarding natural gas described herein, the Commission should require the Companies to vastly decrease their future reliance upon natural gas-fired generation in a manner which is consistent with NC WARN *et al.*'s Counter Carbon Plan described herein;

(i) The Companies should correct the errors described herein regarding their reserve margin analysis;

(j) In calculating PRM and ORM, the Companies should be ordered to assume that they will meet winter peak demand with available non-firm imports;

(k) Based upon the results of the corrections to the reserve margin analyses discussed herein, the Commission should require the Companies to revise and reduce their reserve margin proposals;



(l) The Companies should correct the errors described herein regarding their demand growth rate forecast;

(m) Based upon the results of the corrections to the Companies' demand growth rate forecast as described herein, the Commission should require the Companies to revise and reduce their demand growth rate forecast;

(n) The Companies should correct the errors described herein regarding their Grid Edge program;

(o) Following an investigation, including a Value of Solar Study, the Companies should be required to correct their proposed NEM tariffs as discussed in detail by NC WARN in the separate NEM docket (NCUC Docket No. E-100, Sub 180);

(p) Based upon the results of the corrections to the Companies' Grid Edge program described herein, the Commission should require the Companies to revise and prioritize the proposed Grid Edge program;

(q) The Commission should reject the Companies' proposal to purchase and install SMRs;

(r) As discussed in Governor Cooper's Executive Order No. 246, the Commission should require the Companies to file revised studies analyzing the impacts of the Carbon Plan upon the low-income and BIPOC communities;

(s) The Companies should be required to conduct the outreach to the low-income and BIPOC communities contemplated by Executive Order No. 246;

(t) The Commission should adopt NC WARN *et al.*'s Counter Carbon Plan; and

(u) Any additional flaws with the Carbon Plan identified in these Joint Comments or Mr. Powers' Report should be corrected.

(s) The Companies should be required to conduct the outreach to the low-income and BIPOC communities contemplated by Executive Order No. 246.

(t) The Commission should adopt NC WARN *et al.*'s Counter Carbon Plan.

(u) Any additional flaws with the Carbon Plan identified in these Joint Comments or Mr. Powers' Report should be corrected.

This the 15th day of July, 2022

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CERTIFICATE OF SERVICE

I hereby certify that I have this day served a copy of the foregoing document upon all counsel of record by email transmission.

This the 15th day of July, 2022.

*/s/ Matthew D. Quinn*

Matthew D. Quinn