STATE OF NORTH CAROLINA
UTILITIES COMMISSION
RALEIGH

DOCKET NO. E-100, SUB 165

In the Matter of:	)	NC WARN AND CENTER FOR
2020 Biennial Integrated Resource	)	BIOLOGICAL DIVERSITY'S
Plans and Related 2020 REPS	)	INITIAL COMMENTS ON
Compliance Plans	)	DUKE'S INTEGRATED
	)	RESOURCE PLANS

Pursuant to North Carolina Utilities Commission ("NCUC" or "Commission") Rule R8-60(K) and the Commission's *Order Granting Second Extension of Time* entered on February 26, 2021, NC WARN ("NC WARN") and the Center for Biological Diversity ("The Center"), through undersigned counsel, submit the following Initial Comments concerning the 2020 Integrated Resource Plans ("IRP") of Duke Energy Carolinas, LLC ("DEC") and Duke Energy Progress, LLC ("DEP") (collectively, the "Companies" or "Duke Energy").

SUMMARY

The Companies' IRPs are deficient in several respects. NC WARN and The Center retained Williams E. Powers ("Mr. Powers"), an engineer with over thirty-five (35) years of experience in the fields of power plant operations and environmental engineering, to review the Companies' IRPs. Following a detailed review, Mr. Powers found that the Companies' IRPs are deficient in at least the followings respects:

- The Companies' IRPs propose a substantial buildout of natural gas-fired generation. As a result of North Carolina and federal policies requiring a shift away from carbon emissions, as well as Duke Energy's own stated carbon-

emission reduction goals, the Companies' proposed proliferation of natural gas will result in substantial stranded assets.

- The Companies' IRPs overstate the cost of battery storage and understate the cost of natural gas-fired generation. Additionally, the Companies downplay the effectiveness in North Carolina of solar energy paired with battery storage. Duke Energy's proposed emphasis on natural gas is in large part premised upon these fundamental mistakes.

- The Companies' IRPs do not accurately reflect the capacity available to DEC and DEP. In fact, data requests in this docket have revealed that the Companies' operating reserve margins are higher than represented, and furthermore that the Companies have far more capacity than is needed for reliability. By understating their available capacity, the Companies have wrongly proposed a buildout of natural gas-fired generation.

These findings demonstrate that, as discussed further below, the Companies could economically revise their plans in a manner that more effectively addresses the urgency of a rapid transition away from fossil fuels in order to address the climate crisis.

As a means of correcting the Companies' IRP errors and addressing the climate crisis, NC WARN and The Center conclude these Initial Comments by proposing a modification of the Companies' "Earliest Practicable Coal Retirement portfolio," in which battery storage displaces new gas-fired generation. Mr. Powers's report provides detailed support for this modification of the Earliest Practicable Coal Retirement portfolio.

For these reasons, among others, NC WARN and The Center respectfully request that the Commission reject the Companies' IRPs and order that the Companies file revised IRPs which correct the errors described herein.

INDEX OF ATTACHMENTS

The following is a list of the attachments filed contemporaneously with these Initial Comments. These attachments are referenced in the present Initial Comments and/or Mr. Powers's report.

Attachment 1: Review of DEC and DEP's 2020 Integrated Resource Plans by William Powers;

Attachment 2: Wood Mackenzie Power & Renewables and U.S. Energy Storage Association, *U.S. Energy Storage Monitor: Q4 2020 Executive Summary*, December 2020;

Attachment 3: DEP's 2019 FERC Form 1;

Attachment 4: DEC's 2019 FERC Form 1;

Attachment 5: DEC & DEP's Responses to SELC's Data Request No. 2-12;

Attachment 6: DEC & DEP's Responses to NC WARN/The Center's Data Request No. 4-5; and

Attachment 7: Transcript of the NCUC Staff Conference, March 2, 2015.

LEGAL STANDARD

Commission Rule R8-60 requires that DEP and DEC provide to the Commission a biennial IRP report in even-numbered years. The biennial report must contain the detailed information described in Commission Rule R8-60(i).

With respect to integrated resource planning, the Public Utilities Act, N.C. Gen. Stat. §§ 62-1 *et seq.*, states that "[i]t is hereby declared to be the policy of the State of North Carolina:"

> To assure that resources necessary to meet future growth through the provision of adequate, reliable utility service include use of the entire spectrum of demand-side options, including but not limited to conservation, load management and efficiency programs, as additional sources of energy supply and/or energy demand reductions. To that end, to **require energy planning and fixing of rates in a manner to result in the least cost mix of generation and demand-reduction** measures which is achievable, including consideration of appropriate rewards to utilities for efficiency and conservation which decrease utility bills.

N.C. Gen. Stat. § 62-2(a)(3a) (emphasis added). Similarly, the Commission's rules state that "[t]he purpose of this [integrated resource planning] rule is to implement the provisions of G.S. 62-2(a)(3a) and G.S. 62-110.1 with respect to least cost integrated resource planning by the utilities in North Carolina." Commission Rule R8-60(a).

Under Commission Rule R8-60, IRPs must forecast growth in demand for electricity over a 15-year period and be designed to determine the "least cost mix" of meeting the expected demand. The purpose of IRPs is to "provide for the orderly expansion of the State's electric generating capacity in order to create the most reliable and economical power supply possible **and to avoid the costly overbuilding of generation resources**." *State ex rel. Utilities Comm. v. Empire Power Co.*, 112 N.C. App. 265, 278, 435 S.E..2d 553, 560 (1993) (emphasis added) (*citing State ex rel. Utilities Comm. v. Eddleman*, 320 N.C. 344, 362, 358 S.E.2d 339 351 (1987)).

During biennial IRP proceedings, the Commission relies upon reports, comments and other evidence, and determines the sufficiency of the information provided in addition to the reasonableness of the utility plans, and the Commission may direct further action based upon its conclusions in the proceeding.[1]

DISCUSSION

The following constitutes a discussion of the errors in the Companies' respective IRPs and accompanying recommendations to correct those errors. Sections I, II and IV constitute summaries of Mr. Powers's report (**Attachment 1**), which should be consulted for additional details and supporting citations.

I. Duke Energy's Proposed Increased Reliance Upon Natural Gas-Fired Generation Is Inconsistent with Applicable Policy and Will Result in Stranded Assets.

In addition to applicable State and federal policies, Duke Energy's own policy calls for achievement of carbon neutral electricity generation by certain time benchmarks. The Companies' IRPs, however, propose an increased reliance upon natural-gas fired generation, which is inconsistent with these goals and will result in stranded assets.

As the Commission is aware, Duke Energy issued a 2020 Climate Report, entitled *Achieving a Net Zero Carbon Future*, which set a goal of net-zero CO_2

[1] *See, e.g.*, Order Accepting Integrated Resource Plans and Accepting REPS Compliance Plans, Docket No. E-100, Sub 147, at p. 60 (June 27, 2017) (concluding that the evaluations of battery storage "have not been fully developed to a level sufficient to provide guidance as to the role this technology should play going forward" and that "the utilities should provide in future IRPs or IRP updates a more complete and thorough assessment of battery storage technologies")

emissions from electric generation by 2050.[2] Despite its commitments to reduce the emission of CO_2, Duke Energy's 2020 Climate Report stated that "[e]ven in 2050, natural gas capacity needs to remain on the system . . . ."[3] Touting its carbon-neutral goals, the Companies' IRPs extensively discuss and rely upon the 2020 Climate Report.[4]

A similar carbon-neutrality target was set by the State of North Carolina. In Executive Order No. 80, Governor Cooper directed the development of a state Clean Energy Plan.[5] The resulting Clean Energy Plan sets goals to reduce electric utilities greenhouse gas emissions by 70% below 2005 levels by 2030 and achieve carbon neutrality by 2050.[6]

Policy at the federal level is even more aggressive. On January 27, 2021, President Biden issued an Executive Order addressing "the climate crisis which includes achieving a carbon-free electric power sector by 2035."[7]

Duke Energy's proposed emphasis on natural gas is at odds with these goals. For example, assuming achievement of these net-zero goals, Duke Energy's proposed additions of natural gas units are likely to result in stranded

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[2] Duke Energy 2020 Climate Report, *Achieving A Net Zero Carbon Future*, April 2020, p. 1: https://www.duke-energy.com/_/media/pdfs/our-company/climate-report-2020.pdf?la=en.
[3] *Id.* at 2.
[4] DEC's 2020 IRP, pp 131-42; DEP's 2020 IRP, pp 132-42.
[5] *Executive Order No. 80*, October 29, 2018: https://files.nc.gov/governor/documents/files/EO80-%20NC%27s%20Commitment%20to%20Address%20Climate%20Change%20%26%20Transition%20to%20a%20Clean%20Energy%20Economy.pdf.
[6] *North Carolina Clean Energy Plan*, October 2019, https://files.nc.gov/ncdeq/climate-change/clean-energy-plan/NC_Clean_Energy_Plan_OCT_2019_.pdf.
[7] Powers's Report, Att. 1, p. 10.

assets. Duke Energy's 2020 Climate Report states that "all natural gas combined-cycle units built in the 2020s are assumed to have a 20-year book life. Beyond 2030, all natural gas additions are assumed to be combustion turbines ('peakers') only."[8] As noted, the federal government has accelerated the target date for carbon neutrality from electricity generation to 2035. "The total capital costs of new gas-fired generation built in the 2020s could not be recovered from ratepayers by 2035, assuming a 20-year book life."[9]

Therefore, Duke Energy's proposed natural gas buildout is inconsistent with federal and state policy, and moreover, is a poor use of ratepayer funds. As discussed further below, it also fails to meet the demands of climate science.

II. DEC and DEP Maintain Far More Capacity Than Is Necessary to Meet Demand.

In their respective IRPs, DEC and DEP propose a substantial increase in capacity. To justify this increased capacity, DEC and DEP understate their operating reserves and overstate their demand growth. Moreover, the evidence shows that the Companies have historically failed to adequately utilize demand-side management. When appropriate corrections are made, it becomes obvious that Duke Energy already possesses sufficient capacity to meet demand and achieve reliability.

A. DEC and DEP Understate Their Operating Reserves.

In an effort to argue that its operating reserves have frequently been perilously low, Duke Energy's respective IRPs discussed actual operating

[8] Duke Energy 2020 Climate Report, p 29.
[9] Powers's Report, Att. 1, p 11.

reserve margins ("ORM") on extreme winter peak days in the 2014-2019 period.[10] However, these supposed periods of low ORM are actually the result of errors and omissions from the IRPs.

For example, in response to data requests in this docket, DEC was forced to lower the winter peak demand values for a number of the supposedly low ORM days listed in its IRP.[11] The resulting adjustments dramatically increased the ORMs for several of the winter peak dates identified by DEC. The adjustments are summarized in the following table:[12]

Date	Peak demand in Table 9-A (MW)	ORM in Table 9-A (%)	Revised highest winter day peak demand (MW)	Revised ORM (%)
1/30/14	19,151	2.4	18,275	7.3
01/05/18	21,620	8.0	19,077	22.4
1/31/19	18,875	7.2	16,880	19.9

The Companies' supposedly low ORMs are also unreliable because Duke Energy fails to include the quantity of non-firm imports relied upon to meet the winter peak during the proffered dates. Tucked away in a footnote, DEC and DEP's IRPs admitted that the Companies did not include non-firm energy purchases which did in fact occur on those "ORM less than 10 percent" days when calculating the ORMs shown.[13]

[10] DEC's 2020 IRP, p 69; DEP's 2020 IRP, p 71.
[11] Powers's Report, Att. 1, pp. 12-13.
[12] *Id.* at 13.
[13] DEC's 2020 IRP, p 71; DEP's 2020 IRP, p 73.

In fact, non-firm purchases are readily available to Duke Energy. For example, after the polar vortex incident on February 20, 2015—an extreme weather event which would uniquely tax Duke Energy's capacity—Duke Energy's witness testified during a Staff Conference before the NCUC that the Companies had access to an ample supply via multiple transmission import pathways and had no reliability problems.[14] 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:

> 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.**[15]

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:

> 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.**[16]

Given this general availability of non-firm energy purchases, DEC and DEP maintain larger generation fleets than are necessary to reliably meet

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[14] Powers's Report, Att. 1, pp 16; *see also* Transcript of Staff Conference, March 2, 2015, Att. 7.
[15] Transcript of Staff Conference, March 2, 2015, Att. 7, pp 11-12 (emphasis added).
[16] *Id.* at 17 (emphasis added).

reserve margin targets, and the Companies' failure to include these non-firm energy purchases in their ORM calculations renders such calculations completely unreliable.

In addition to omitting non-firm energy purchases from its ORM calculations, Duke Energy also omits to mention that substantial amounts of its own supply assets were unnecessarily idle during crucial winter peak events.[17] In response to data requests, the Companies provided lists of all DEC and DEP generators that were in reserve and not operational on the low ORM winter peak days listed in the 2020 IRPs. For all said dates, "DEC and DEP has 1,000s of MW of combustion turbines, pumped storage, hydro, combined cycle units, and coal units in reserve and available to meet demand."[18] By way of example, the following table describes the Companies' available, idle capacity during the near-record winter peak day of January 5, 2018:[19]

[17] Powers's Report, Att. 1, p 14.
[18] *Id.*
[19] *Id.*

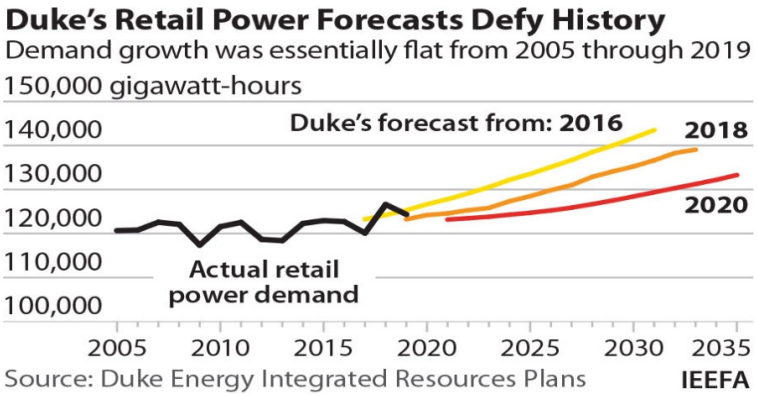
Date	Peak demand (MW)	Unused and available supply assets (MW)	Equivalent ORM (%)
DEC			
01/05/18	19,077	CT = 1,071 MW pumped storage = 547 MW hydro = 241 MW coal = 49 MW steam = 168 MW DSM = 428 MW Total = 2,504 MW	13.1 (no non-firm imports) 18.5 (non-firm imports add 29% to reserve margin)
DEP			
01/05/18	15,048	CT = 857 MW (non F.O.) CC = 103 coal = 24 DSM = 478 MW Total = 1,462 MW	9.7 (no non-firm imports) 13.7 (non-firm imports add 29% to reserve margin)

For all of these reasons, among many others described in Mr. Powers's report (Attachment 1), Duke Energy has ample capacity to reliably meet demand even during extreme winter peak events.

B. Duke Energy Overstates Demand Growth.

Mr. Powers's report reviews DEC and DEP's prior IRP filings and proves that these utilities consistently overestimate demand growth in their respective service territories.[20] The following figure illustrates Duke Energy's tendency to overstate demand growth:[21]

[20] *Id.* at 18-20.
[21] 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.



"The actual average DEC retail sales growth rate, including residential, commercial and industrial customers, was 0.2 percent between 2010 and 2019."[22] Yet, DEC's "forecast retail sales growth rate, with energy efficiency and DSM applied, is 0.5 percent."[23] Similarly, "[t]he average actual DEP retail sales growth rate, including residential, commercial, and industrial customers was 0.4 percent between 2010 and 2019," yet DEP's "forecast retail sales growth rate, with energy efficiency and DSM applied, is 0.8 percent."[24]

As the above figures show, and Mr. Powers's report describes in more detail, the Companies' forecasted sales growth rates are yet again too high. Given the Companies' tendency to overstate forecasts for demand growth rates, their said forecasts are simply unreliable and should be rejected.

C. Duke Energy Is Not Adequately Using Demand-Side Management at Winter Peak.

Moreover, Duke Energy is not adequately using demand-side management resources during winter peak. The highest winter peak demand in the DEC and DEP systems in recent years occurred during the first two (2)

[22] Powers's Report, Att. 1, p 19.
[23] *Id.*
[24] *Id.* at 20.

weeks of January 2018.[25] DEC had 428 MW of demand-side management available to meet the winter peak in 2018.[26] However, DEC did not deploy any demand-side management for that winter peak.[27] Similarly, DEP had 478 MW of demand-side management available to meet the winter peak in 2018.[28] Just like DEC, DEP deployed no demand-side management to meet that peak.[29] Duke Energy's operating reserves are not nearly so troublesome when one assumes that DEC and DEP use their available demand-side management to meet winter peak.

III. Duke Energy's IRPs Must Be Revised to Provide the Urgent Greenhouse Gas Reductions Necessary to Address the Climate Crisis.

In August 2019, in approving the Companies' proposed 2018 IRPs, the Commission recognized the need for the Companies' plans to account for the reductions in Greenhouse Gas ("GHG") emissions necessary to address the climate crisis.[30] The Commission re-affirmed that the Companies' IRPs must address these issues in declining to consider testimony concerning the climate crisis in the most recent DEC rate case. [31]

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[25] DEC's 2020 IRP, p 71; DEP's 2020 IRP, p 73.
[26] DEC's 2018 IRP, Docket No. E-100, Sub 157, p 162.
[27] Powers's Report, p 21.
[28] DEP's 2018 IRP, Docket No. E-100, Sub 157, p 156.
[29] *Id.* at 253-54.
[30] In the Matter of 2018 Biennial IRPs and Related REPS Compliance Plans, Docket No. E-100, Sub 157, Order Accepting IRPS at 89-90 and Appendix A at 3-4 (Aug. 27, 2019).
[31] Order Granting in Part and Denying in Part Motion To Strike in Docket No, E-7, Sub 1214 (Mar. 3, 2020) (striking climate scientist Shaye Wolf's testimony that detailed the incongruities between DEC proposed costs and the urgent need for rapid GHG emissions reductions to meet the demands of climate science, finding

Accordingly, the Commission should at this time consider whether the Companies' existing and planned resource mix meet the demands of climate science for rapid GHG emissions reductions across all sectors.

As discussed below, while the urgency of the climate crisis has only continued to grow since the Companies' last IRPs, the 2020 IRPs continue to fail to meet the moment, and approving the IRPs will allow the Companies to continue a business-as-usual approach fundamentally at odds with the vital transformation urgently needed to avoid the worst impacts of climate change in North Carolina and beyond in the coming years.

A. The Climate Crisis Demands Immediate and Substantial Reductions in GHG Emissions.

i. Human-Caused Climate Change Poses Enormous Risks to Human Health and the Environment.

The U.S. federal government, and scientists globally, have determined that human-caused climate change is bringing widespread harms throughout the country and the world. As the U.S. government summarized in its most recent authoritative Report on the subject (the Fourth National Climate Assessment, or "Fourth NCA"), "evidence of human-caused climate change is overwhelming and continues to strengthen, [ ] the impacts of climate change are intensifying across the country, and [ ] climate-related threats to Americans' physical, social, and economic well-being are rising."[32]

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that "the basics of resource planning and generation mix are IRP issues and will not be addressed in this rate case.").

[32] U.S. Global Change Research Program, *Impacts, Risks, and Adaptation in the United States*, Fourth National Climate Assessment, Volume II (2018) at 36, *al Climate Assessment, Volume II* (2018), https://nca2018.globalchange.gov/; *see*

That Report also makes clear that the harms of climate change are long-lived, and for that reason the steps taken *now* to combat – or to not combat – GHG pollution will have implications for many decades to come.[33] Indeed, as detailed by the Intergovernmental Panel on Climate Change (IPCC), the leading international scientific body for the assessment of climate change, without prompt action across all sectors, the world is headed to 2°C or more of warming in the coming decades, which will lead to catastrophic climate change impacts.[34] That Report makes plain that the next decade is absolutely crucial to avoiding the most devastating impacts.

The different futures that we will experience at or above 2°C, as opposed to below 1.5°C, are stark, including, for example, substantially more deadly heatwaves and drought; exposing 10 million more people to flooding, with the added risk of collapsing ice sheets making flooding exponentially worse; the

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also U.S. Global Change Research Program, *Climate Science Special Report: Fourth National Climate Assessment, Vol. I* (2017), https://science2017.globalchange.gov/; U.S. EPA [U.S. Environmental Protection Agency], Endangerment and Cause or Contribute Findings for Greenhouse Gases Under Section 202(a) of the Clean Air Act; Final Rule, 74 Federal Register 66496 (2009); Duffy, Philip B. et al., Strengthened Scientific Support for the Endangerment Finding for Atmospheric Greenhouse Gases, 363 Science 1 (2019) at 1.

[33] U.S. Global Change Research Program, *Impacts, Risks, and Adaptation in the United States, Fourth National Climate Assessment, Volume II* (2018), https://nca2018.globalchange.gov/ at 34; *id at* 1347 ("[m]any climate change impacts and associated economic damages in the United States can be substantially reduced over the course of the 21st century through global-scale reductions in greenhouse gas emissions").

[34] Intergovernmental Panel on Climate Change, *Global Warming of 1.5°C, An IPCC special report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty* (2018).

virtual elimination of coral reefs; doubling of the number of vertebrate and plant species losing more than half their range; and up to several hundred million more people exposed to climate-related risks and susceptible to poverty by 2050.[35] Climate change poses particularly severe threats to public health and safety, and especially the health and safety of the most vulnerable communities, including children, older adults, low-income communities, some communities of color, immigrant groups, and persons with disabilities and pre-existing medical conditions.[36]

Accordingly, many studies have also demonstrated the lives that can be saved through addressing the causes of climate change now.[37] Similarly, the Fourth NCA projects that "by the end of this century, thousands of American lives

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[35] IPCC, 2018: *Summary for Policymakers. In: Global Warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty* [Masson-Delmotte, V. et al. (eds.)] at 7-11.

[36] U.S. Global Change Research Program, Impacts, Risks, and Adaptation in the United States, Fourth National Climate Assessment, Volume II (2018), https://nca2018.globalchange.gov/ at 540, 548; U.S. Global Change Research Program, *The Impacts of Climate Change on Human Health in the United States: A Scientific Assessment* (2016); *see also* Watts, Nick et al., *Health and climate change: policy responses to protect public health,* 386 The Lancet 1861 (2015) at 1861 (explaining that "the implications of climate change for a global population of 9 billion people threatens to undermine the last half century of gains in development and global health").

[37] *E.g.*, Gasparrini, Antonio et al*., Projections of temperature-related excess mortality under climate change scenarios*, 1 Lancet Planet Health e360 (2017); Hsiang, Solomon et al., *Estimating economic damage from climate change in the United States*, 356 Science 1362 (2017); Silva, Raquel A. et al., *Future global mortality from changes in air pollution attributable to climate change*, 7 Nature Climate Change 647 (2017); Burke, Marshall et al., *Higher temperatures increase suicide rates in the United States and Mexico*, 8 Nature Climate Change 723 (2018); Shindell, Drew et al., *Quantified, localized health benefits of accelerate carbon dioxide emissions reductions*, 8 Nature Climate Change 723 (2018).

could be saved and hundreds of billions of dollars in health-related economic benefits gained each year under a pathway of lower greenhouse gas emissions."[38] And conversely, failing to act will not only cause these more direct public health harms, but will also cause devastating economic losses that will even further aggravate these threats. [39]

Finally, the Fourth NCA also finds – with very high confidence – that the *status quo* threatens to bring the planet past tipping points that cannot be cured, and which threaten even more catastrophic impacts.[40] The IPCC issued a very similar warning in 2014,[41] and the evidence that the climate system is

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[38] U.S. Global Change Research Program, Impacts, Risks, and Adaptation in the United States, Fourth National Climate Assessment, Volume II (2018) at 541; *see also* Shindell, Drew et al., *Quantified, localized health benefits of accelerated carbon dioxide emissions reductions,* 8 Nature Climate Change 291 (2018) (finding that, compared with a 2°C pathway, a 1.5°C pathway is projected to result in 153 million fewer premature deaths worldwide due to reduced PM 2.5 and ozone exposure).

[39] U.S. Global Change Research Program, Impacts, Risks, and Adaptation in the United States, Fourth National Climate Assessment, Volume II (2018), https://nca2018.globalchange.gov/ (discussing how "losses in some sectors are estimated to grow to hundreds of billions of dollars by the end of the century"); *id.* at 1358, 1360 (explaining how warming on our current trajectory would cost the U.S. economy hundreds of billions of dollars each year and up to 10 percent of U.S. gross domestic product).

[40] U.S. Global Change Research Program, Climate Science Special Report: Fourth National Climate Assessment, Vol. I (2017), https://science2017.globalchange.gov/ at 411.

[41] Intergovernmental Panel on Climate Change, Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change (2014) at 72-73 ("with increasing warming, some physical and ecological systems are at risk of abrupt and/or irreversible changes" and that the risk "increases as the magnitude of the warming increases.").

approaching these tipping points only further demonstrates the urgent need for immediate action to address these threats.[42]

ii. Climate Change Poses Specific Risks to North Carolina.

Climate change poses significant threats to people, species, and the environment in North Carolina. As summarized in the March, 2020 North Carolina Climate Scientists Report – prepared by leading scientists across the state – North Carolina has already experienced 1 degree Fahrenheit of warming over the past 120 years, and given current emissions trajectories, "North Carolina is projected to warm an additional six to ten degrees by 2100."[43] Under these conditions "the state can expect disruptive sea level rise, increasingly hot nights,

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[42] Intergovernmental Panel on Climate Change, Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change (2014) at 73-74; Lenton, Timothy M. *et al.*, Climate tipping points—too risky to bet against, 575 Nature 592 (2019).

For example, research indicates that a critical tipping point important to the stability of the West Antarctic Ice Sheet has been crossed. U.S. Global Change Research Program, Climate Science Special Report: Fourth National Climate Assessment, Vol. I (2017), https://science2017.globalchange.gov/ at 420 ("observational evidence suggests that ice dynamics already in progress have committed the planet to as much as 3.9 feet (1.2 m) worth of sea level rise from the West Antarctic Ice Sheet alone"); Steffen, Will et al., *Trajectories of the Earth System in the Anthropocene*, 115 PNAS 33 (2018); Lenton, Timothy M. *et al.*, Climate tipping points—too risky to bet against, 575 Nature 592 (2019) ("the evidence from tipping points alone suggests that we are in a state of planetary emergency: both the risk and urgency of the situation are acute").

[43] Kunkel, K.E., *et al., North Carolina Climate Science Report* at 1, N.C. Institute for Climate Studies, available at https://ncics.org/wp-content/uploads/2020/06/NC-Climate-Science-Report_Plain_Language_Summary_Final_March2020_small.pdf

and more days with dangerous heat and extreme rainfall unless the global increase in heat-trapping gases is stopped."[44]

Indeed, scientists have confirmed that global climate change has already exacerbated the severity of storms including Hurricane Florence, Hurricane Michael, and winter storm Diego in 2018, which devastated Duke Energy's Carolina operations and more importantly, hundreds of thousands of North Carolinians.[45] Unlike many places in the United States, North Carolina is already experiencing acute climate change impacts.

These conclusions are consistent with Volume II of the Fourth NCA, which focuses on the regional effects of climate change, including a specific chapter on the Southeast. That Volume concludes that "southern and midwestern populations are likely to suffer the largest losses from future climate changes in

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[44] *Id.*; *see also* Jan. 2020 North Carolina Climate Change Interagency Council Presentation (presenting similar findings), available at https://files.nc.gov/ncdeq/climate-change/interagency-council/Jan-22-2020--Interagency-Climate-Council-presentation-rev.pdf.

[45] Reed, K.A. *et al.*, Forecasted attribution of the human influence on Hurricane Florence, 6 Science Advances eaaw9253 (2020); NOAA and National Weather Service, National Hurricane Center Tropical Cyclone Report: Hurricane Harvey, National Hurricane Center (9 May 2018), https://www.nhc.noaa.gov/data/tcr/AL092017_Harvey.pdf.; Risser, Mark D. & Michael F. Wehner, Attributable human-induced changes in the likelihood and magnitude of the observed extreme precipitation during Hurricane Harvey, 44 Geophysical Research Letters 12,457 (2017); Climate Signals, Hurricane Michael October 2018 (last updated December 4, 2018), https://www.climatesignals.org/events/hurricane-michael-october-2018; NOAA National Centers for Environmental Information (NCEI), U.S. Billion-Dollar Weather and Climate Disasters (2019), https://www.ncdc.noaa.gov/billions/; NOAA, National Centers for Environmental Information (NCEI), Climate Change and Extreme Snow in the U.S. (2019), https://www.ncdc.noaa.gov/news/climate-change-and-extreme-snow-us (explaining that heavy seasonal snow and extreme snowstorms like winter storm Diego occur with greater frequency in the eastern two-thirds of the U.S. as the climate has changed).

the United States," and that, "[a]lready poor regions, including those found in the Southeast, are expected to continue incurring greater losses than elsewhere in the United States."[46] The Report further details that in the Southeast "dangerous high temperatures, humidity, and new local diseases are expected to become more significant in the coming decades"; "[t]he number of extreme rainfall events is increasing"; and "[f]uture temperature increases are projected to pose challenges to human health."[47]

B. Fossil Fuel Emissions, Including From The Companies' Power Plants, Are The Principal Driver For The GHG Emissions Fueling Climate Change.

There is also an overwhelming body of scientific evidence establishing that GHG emissions from fossil fuels, including fossil power plants, are driving climate change.[48] The Intergovernmental Panel on Climate Change (IPCC), the international scientific body for the assessment of climate change, stated in its Fifth Assessment Report that "[c]arbon dioxide concentrations have increased by 40% since pre-industrial times, primarily from fossil fuel emissions."[49]

In 2018, the IPCC issued a *Special Report on Global Warming of 1.5°C*, which estimated the remaining global carbon budget—the cumulative amount of

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[46] U.S. Global Climate Change Research Program, "Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment, Volume II" (November 23, 2018) at 746.
[47] *Id.*
[48] U.S. Global Change Research Program, Impacts, Risks, and Adaptation in the United States, Fourth National Climate Assessment, Volume II (2018), https://nca2018.globalchange.gov/ at 60 ("fossil fuel combustion accounts for approximately 85 percent of total U.S. greenhouse gas emissions").
[49] Intergovernmental Panel on Climate Change, Summary for Policymakers, Climate Change 2013: The Physical Science Basis, Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Stocker, T.F. et al (eds.)] at 9.

carbon dioxide that can be emitted—for maintaining a likely chance of meeting the 1.5°C climate target under the Paris Agreement, providing clear benchmarks for global and U.S. climate action. The global carbon budget for a 66 percent probability of limiting warming to 1.5°C is approximately 420 $GtCO_2$ to 570 $GtCO_2$ from January 2018 onwards, depending on the temperature dataset used.[50] At the pre-pandemic global emissions rate of 42 $GtCO_2$ per year, this carbon budget would be expended in well under 20 years.

Given this limited remaining global carbon budget, the IPCC report concluded that 1.5°C pathways require global net anthropogenic CO_2 emissions to decline by about 45 percent from 2010 levels by 2030, and to reach net zero around 2050.[51] According to the IPCC, this in turn will require "rapid and far-reaching transitions" across all sectors including electricity generation.[52] Indeed, a critical feature of 1.5°C-consistent pathways is that the power sector must be significantly clean by 2030 and achieve a "virtually full decarbonisation" around mid-century.[53]

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[50] IPCC, 2018: Summary for Policymakers. In: Global Warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty [Masson-Delmotte, V. et al. (eds.)] at 12.
[51] *Id.* at 12.
[52] *Id.* at 15.
[53] Rogelj, Joeri, et al., 2018: Mitigation Pathways Compatible with 1.5°C in the Context of Sustainable Development. In: Global Warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty [Masson-Delmotte, V., et al. (eds.)] (2018) at 112.

At the national level, research on the United States' carbon budget establishes that the U.S. must make urgent, aggressive cuts in domestic fossil fuel emissions to avoid the worst dangers of climate change. The U.S. is the world's largest historic emitter of greenhouse gas pollution, responsible for 25 percent of cumulative global carbon dioxide (CO_2) emissions since 1870, and is currently the world's second highest emitter on an annual and per capita basis.[54] Scientific studies have estimated the remaining U.S. carbon budget consistent with the 1.5°C Paris Agreement target is approximately 25 gigatons (Gt) CO_2 equivalent (CO_2eq)[55] to 57 $GtCO_2eq$ on average,[56] depending on the equity principles used to apportion the global budget across countries.[57] As the U.S.

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[54] LeQuéré, Corinne et al., Global carbon budget 2018, 10 Earth System Science Data 2141 (2018) at Figure 5, 2167; Global Carbon Project, Global Carbon Budget 2018 (published on 5 December 2018) https://www.globalcarbonproject.org/carbonbudget/18/files/GCP_CarbonBudget_2018.pdf at 19 (Historical cumulative fossil CO_2 emissions by country).

[55] Carbon dioxide is not the only greenhouse gas with significant global warming impacts. Scientists use CO_2 equivalents to compare the various greenhouse gases' (e.g., methane, nitrous oxide, etc.) global warming potentials by converting the amounts of these gases to that of an equivalent amount of carbon dioxide with the same global warming potential.

[56] Robiou du Pont, Yann et al., *Equitable mitigation to achieve the Paris Agreement goals*, 7 Nature Climate Change 38 (2017), and Supplemental Tables 1 and 2. Quantities measured in $GtCO_2eq$ include the mass emissions from CO_2 as well as the other well-mixed greenhouse gases (CO_2,methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons and SF_6) converted into CO_2-equivalent values, while quantities measured in $GtCO_2$ refer to mass emissions of just CO_2 itself.

[57] Robiou du Pont et al. (2017) averaged across IPCC sharing principles to estimate the U.S. carbon budget from 2010 to 2100 for a 50 percent chance of returning global average temperature rise to 1.5°C by 2100, based on a cost-optimal model. The study estimated the U.S. carbon budget consistent with a 1.5°C target at 25 $GtCO_2eq$ by averaging across four equity principles: capability (83 $GtCO_2eq$), equal per capita (118 $GtCO_2eq$), greenhouse development rights (-69 $GtCO_2eq$), and equal cumulative per capita (-32 $GtCO_2eq$). The study estimated the U.S. budget at 57 $GtCO_2eq$ when averaging across five sharing

emits around 6 $GtCO_2eq$ each year, the remaining U.S. carbon budget compatible with the Paris climate targets is extremely small and is rapidly being expended, highlighting the urgent need for the U.S. to transition from fossil fuels to clean energy.

Accordingly, a 2019 study highlighted the importance of immediately halting all new fossil fuel infrastructure projects to preserve a livable planet. The study found that phasing out all fossil fuel infrastructure at the end of its design lifetime, starting immediately, preserves a 64 percent chance of keeping peak global mean temperature rise below 1.5°C.[58] This means replacing fossil fuel power plants, cars, aircraft, ships, and industrial infrastructure with zero carbon alternatives at the end of their lifespans, starting now.

In the meantime, the global average atmospheric carbon dioxide in 2019 was 409.8 parts per million (ppm), a level not seen for millions of years.[59] The last time CO_2 in Earth's atmosphere was at 400 ppm, global mean surface temperatures were 2 to 3°C warmer and the Greenland and West Antarctic ice sheets melted, leading to sea levels that were 10 to 20 meters higher than

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principles, adding the constant emissions ratio (186 $GtCO_2eq$) to the four above-mentioned principles. However, the constant emissions ratio, which maintains current emissions ratios, is not considered to be an equitable sharing principle because it is a grandfathering approach that "privileges today's high-emitting countries when allocating future emission entitlements."

[58] Smith, Christopher J. et al., *Current fossil fuel infrastructure does not yet commit us to 1.5°C warming*, Nature Communications, doi.org/10.1038/s41467-018-07999-w (2019).

[59] *See* Climate.gov, available at https://www.climate.gov/news-features/understanding-climate/climate-change-atmospheric-carbon-dioxide.

today.[60] The current atmospheric CO_2 concentration is nearly one and one-half times larger than the pre-industrial level of 280 ppm, and much greater than levels during the past 800,000 years.[61] The atmospheric concentrations of methane (CH_4) and nitrous oxide (N_2O), two other potent greenhouse gases, are 257 percent and 122 percent of their pre-industrial levels.[62] Global carbon emissions over the past 15 to 20 years have tracked the highest emission scenario used in IPCC climate projections, the RCP8.5 scenario[63] which is projected to lead to devastating impacts.[64]

The electricity sector, in tandem with the transportation sector, is the leading source of U.S. greenhouse gas emissions, making up 28% of total greenhouse gas emissions in 2017.[65] DEC and DEP's parent company, Duke Energy Corporation, is the largest electricity provider in the country and one of

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[60] LeQuéré, Corinne et al., *Global carbon budget 2018*, 10 Earth Syst. Sci. Data 2141 (2018); World Meteorological Organization, WMO Greenhouse Gas Bulletin, No. 13, October 30, 2017 at 5.

[61] Intergovernmental Panel on Climate Change, Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change (2014) at 4, 44; World Meteorological Organization, WMO Greenhouse Gas Bulletin, No. 13, October 30, 2017 at 1, 4.

[62] World Meteorological Organization, *WMO Greenhouse Gas Bulletin*, No. 13, October 30, 2017 at 2.

[63] U.S. Global Change Research Program, Climate Science Special Report: Fourth National Climate Assessment, Volume I x(2017), https://science2017.globalchange.gov/ at 31, 133, 134, and 152 (e.g. "The observed increase in global carbon emissions over the past 15–20 years has been consistent with higher scenarios (e.g., RCP8.5) (*very high confidence*)" at 31.)

[64] Intergovernmental Panel on Climate Change, Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change (2014) at Figure 2.1.

[65] U.S. Environmental Protection Agency, Sources of Greenhouse Gas Emissions (2019), https://www.epa.gov/ghgemissions/sources-greenhouse-gas-emissions.

the largest in the world.[66] In terms of greenhouse gas emissions, Duke Energy Corporation ranks as the number one producer of CO_2 and NOx emissions of all power providers in the country, emitting 104.6 million short tons of CO_2 emissions and 61.02 thousand short tons of NOx pollution in 2017 alone.[67] In short, Duke Energy Corporation is a prominent contributor to the country's greenhouse gas emissions, and DEC and DEP, as part of the Duke Energy Corporation conglomerate, are a major contributor to total emissions.

C. The Companies Must Prepare An IRP That Meets The Demands Of Climate Science and State Energy Goals By Offering Rapid and Substantial GHG Emissions Reductions.

In light of the demands of climate science, it is evident that Companies must develop a plan to rapidly decarbonize. Indeed, as noted above, the Companies need such a plan to meet the national objective to achieve a carbon-free electric power sector by 2035 and comply with the state's Clean Energy Plan.[68]

However, the Companies are far from meeting any of the above outlined climate targets, and the scenarios outlined in the IRPs will not get the job done. In the Carolinas, Duke's current energy portfolio consists of 25 percent gas, 16 percent coal, and 49 percent nuclear resources. Non-hydro renewables only

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[66] Bank of America *et al.*, *Benchmarking Air Emissions of the 100 Largest Electric Power Producers in the United States* (June 2019), https://www.ceres.org/resources/reports/benchmarking-air-emissions-2019.

[67] M.J. Bradley and Associates, *Benchmarking Air Emissions of the 100 Largest Power Producers in the United States: CO2 Emissions and Emissions Rates – All-Source* (2019), https://www.mjbradley.com/content/emissions-benchmarking-emissions-charts.

[68] North Carolina Clean Energy Plan, October 2019, https://files.nc.gov/ncdeq/climate-change/clean-energy-plan/NC_Clean_Energy_Plan_OCT_2019_.pdf.

make up approximately 6 percent of its capacity.[69] And as explained above, Duke expects by 2035 to significantly build out its gas resources with insufficient renewable energy and storage buildout. In fact, five of its six IRP scenarios (*i.e.*, all but the "no new gas" scenario) involve installing 6.1 GW or more of new fossil gas capacity by 2030. Its base case scenario includes a massive buildout of 10 to 13 new fossil gas plants, comprised of dozens of units, accounting for approximately 10 GW of new capacity in the Carolinas by 2035.[70]

If Duke builds its "base case without carbon policy" scenario, it expects to achieve only a 53 percent reduction in CO_2 emissions by 2035. Even if Duke builds its "base case with carbon policy" scenario, it will have achieved only a 62 percent reduction in CO_2 by 2035.[71] These scenarios are directly at odds with North Carolina's CEP goal of a 70 percent reduction in CO_2 emissions by 2030, the U.S. goal of net-zero emissions by 2035, and far from what climate science demands: an immediate phase out of all fossil fuel resources and a fully decarbonized electricity system by 2050.

Further, as the Energy Transition Institute explained in its 2021 "Carbon Stranding: Climate Risk and Stranded Assets in Duke's Integrated Resource Plan" report, Duke's base case scenario is insufficient to meet the Company's

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[69] DEC's 2020 IRP, p 107.
[70] NC WARN, Duke Energy Carolinas and Duke Energy Progress Gas Capacity Additions in MW, 2021-2035 (Base case without carbon policy, 2020 IRP, winter resource planning) (January 2021), https://www.ncwarn.org/wp-content/uploads/DEC-DEP-Gas-Capacity-Additions-2021-2035-2-scenarios.pdf.
[71] *See* DEC's 2020 IRP Executive Summary, p 15.

own climate goal of reaching net zero carbon emissions by 2050.[72] In fact, its base case would result in an emissions reduction of just 44 percent between 2020 and 2050, missing its corporate commitment by approximately 30 million metric tons of CO_2.[73] The same Report explains that if Duke were to move forward with its base case scenario, significant fossil fuel assets would need to be taken offline and "stranded" in order for the company to meet its climate commitments. These stranded costs, along with those from existing plants, could cost ratepayers in the Carolinas $4.8 billion.[74]

Importantly, although Duke justifies its plans to expand its fossil gas use as an opportunity for "lower cost accelerated coal retirements,"[75] it does not consider the impact of its supply chain methane emissions (*i.e.*, upstream emissions) from its gas buildout. While it is true that CO_2 emissions from a gas-fired power plant at the point of generation (*i.e.*, the smokestack) are half those per unit of energy from coal,[76] methane leaks during all phases of fossil gas production, not just generation. Further, methane is a super-pollutant *87 times* more powerful than CO_2 at warming the climate over a 20-year period.[77]

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[72] Tyler Fitch and Tyler H. Norris, *Carbon Stranding: Climate Risk and Stranded Assets in Duke's Integrated Resource Plan at 43, Energy Transition Institute* (January 2021), https://energytransitions.org/carbon-stranding.
[73] *Id.*
[74] *Id*. at ii.
[75] See DEC's 2020 IRP, p 132.
[76] *See* National Energy Technology Laboratory (NETL), Cost and performance baseline for fossil energy plants, Volume 1: Bituminous coal and natural gas to electricity, (November 2010), DOE/NETL-2010/1397.
[77] *See* U.S. Department of Energy, Understanding Global Warming Potentials (January 25, 2020), https://www.epa.gov/ghgemissions/understanding-global-warming-potentials.

Accordingly, NCWARN and The Center urge the Commission to direct the Companies to revise their IRPs to meet the demands of climate science.

IV. Duke Energy Should Be Required to Implement a Modified "Earliest Practicable Coal Retirements" Portfolio, with Battery Storage Displacing New Gas-Fired Generation.

The Companies' respective IRPs outline six alternative potential portfolios over the planning horizon. There are fatal defects with each portfolio, which are discussed in Mr. Powers's report.[78] Below, these Initial Comments briefly summarize several of the significant defects with the Companies' analyses. Finally, these Initial Comments propose a modification to the "Earliest Practicable Coal Retirements" portfolio, in which battery storage displaces new gas-fired generation.

A. Duke Energy's IRPs Inaccurately Price the Cost of Both Battery Storage and Natural Gas.

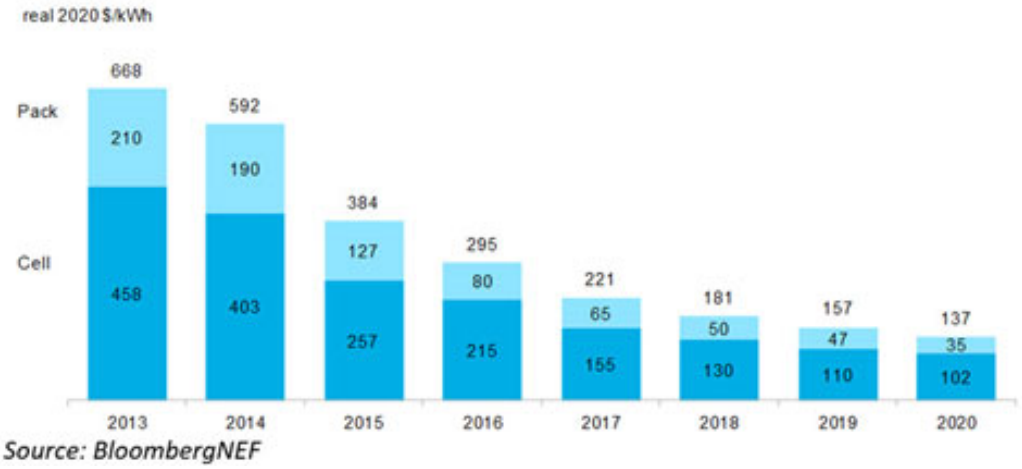
In its 2020 Climate Report, Duke Energy claims that the cost of achieving net zero emissions with battery storage would be three to four times the cost of the net-zero scenario using natural gas.[79] To the contrary, "[t]he cost delta Duke Energy claims between battery storage and gas-fired generation is eliminated when accurate capital costs are assumed."[80]

In reliance upon the National Renewable Energy Laboratory ("NREL"), Duke Energy assumes a lithium battery cost of about $900 kW for battery storage with 4 hours of storage capacity.[81] This estimate is extremely high for

[78] *E.g.*, Powers's Report, pp 2-10, 21-23.
[79] Duke Energy 2020 Climate Report, p 3.
[80] Powers's Report, Att. 1, p 3.
[81] *Id.*

the 2027-2028 timeframe, which are the mid-range years for the 15-year planning horizon.[82]

In fact, a "survey of leading battery manufacturers indicates that battery capital costs are already lower than the NREL forecast for 2027-2028 and steadily declining."[83] Indeed, battery capital costs are expected to reach approximately $100/kWh by 2023, which is about one-half the lithium battery price assumption assumed by Duke Energy for 2027-2028.[84] The following figure illustrates the rapidly declining cost of battery storage:[85]



On the other hand, Duke Energy has vastly understated the cost assumptions for gas turbine power plants. Duke Energy's capital cost assumption for combined cycle is $650/kW and for combustion turbine is $550/kW.[86] However, the capital cost of the 560 MW Asheville combined cycle

[82] *Id.*
[83] *Id.*
[84] *Id.* 3-4.
[85] *Id.* at 4.
[86] *Id.* at 4.

plant, which came on-line in 2020, was $817 million.[87] "This is equivalent to a unit cost of about $1,460/kW, over double Duke Energy's assumed combined cycle cost of $650/kW."[88] Similarly, Mr. Powers's report establishes that Duke Energy underestimated the cost of combustion turbines.[89] In short, the Companies' natural gas plant cost forecasts are too low.

Indeed, other utilities are embracing battery storage as a more cost-effective alternative to combustion turbines. For example, NextEra Energy, the parent company of Florida Power & Light, forecasts that it will spend $1 billion on battery storage projects in 2021.[90] NextEra states that "batteries are now more economic than gas-fired peakers, even at today's natural gas prices."[91] NextEra also states that "gas-fired units . . . still remain in the $30-$40 per megawatt-hour (MWh) range [on a levelized basis], versus wind, which is still in the teens in most parts of the country, and then solar in that [mid-$20s] range." Accordingly, NextEra concludes that "it is very, very competitive, looking at renewables versus gas-fired generation."[92]

It does not make common sense that electric utilities operating in the same markets (Florida) as DEC and DEP's sister utilities are publicly stating now that battery storage is a less expensive alternative to combustion turbines, yet Duke Energy foregoes battery storage in favor of natural gas under the (inaccurate) assumption that battery storage is three to four times more costly

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[87] *Id.*
[88] *Id.*
[89] *Id.* at 5.
[90] *Id.* at 5.
[91] *Id.*
[92] *Id.* at 6.

than gas-fired generation. Once these pricing mistakes are corrected, battery storage is preferable to natural gas.

B. Duke Energy Places Artificial Constraints on Solar Paired with Battery Storage.

Duke Energy claims that, even with a balanced portfolio of wind, solar and storage, further additions of renewables have diminishing value and are uneconomic for purposes of carbon emission reduction. In support of this position, Duke Energy relies upon a study by NREL from January 2020.

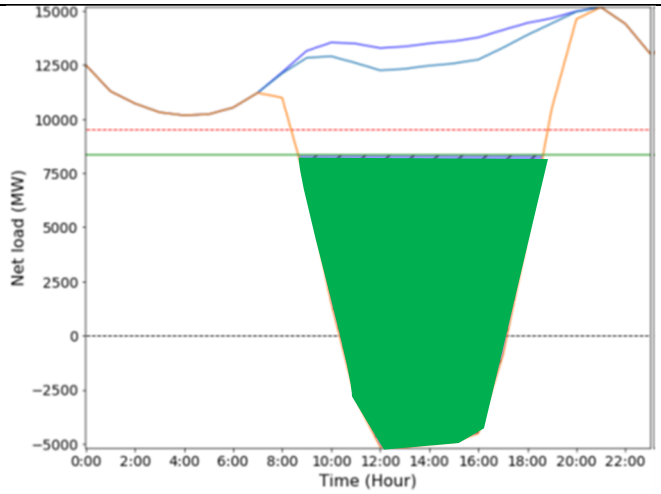
The NREL study is flawed. The report evaluates twelve scenarios with various levels of solar capacity. According to the NREL study, in spring and fall days with light daytime demand, a large amount of solar output must be curtailed when solar penetration exceeds about 10 percent.[93] This curtailment occurs because of inflexible nuclear power serving much of the daytime demand, resulting in no place for solar power to go.[94] "Without battery storage, the amount of solar power that can be utilized on light demand spring and fall days is limited, and excess solar generation must either be curtailed or exported."[95] Shockingly, however, only one scenario (Scenario 9) in the NREL report includes battery storage.[96] This omission renders the NREL report unreliable.

Moreover, completely absent from the NREL study is a scenario which increases battery storage capacity consistent with the amount of solar capacity to eliminate, or nearly eliminate, solar power curtailments during light load spring

[93] *Id.* at 7-8.
[94] *Id.* at 8.
[95] *Id.*
[96] *Id.*

and fall days.[97] By way of example, if Scenario 9 were modified to increase the amount of storage to 65,000 MWh, the amount of solar curtailment would be reduced to zero.[98] This is illustrated by the following figure:[99]

Modified Scenario 9 with an increase of storage capacity to 65,000 MWh
(all solar power that would otherwise be curtailed is directed to storage)



"The single solar and storage scenario analyzed by NREL (Scenario 9) leaves the mistaken impression that above some moderate threshold, with or without storage, much of the produced solar power will go to waste (curtailment)."[100] However, this "conclusion" is exclusively the result of artificial limitations placed upon solar paired with battery storage. "When the storage capacity is properly sized to the solar capacity"—as shown in the figure appearing immediately above—"all of the solar capacity can be put to productive use, including on spring and fall days with light demand."[101] Therefore, when

[97] *Id.* at 8-9.
[98] *Id.*
[99] *Id.* at 9.
[100] *Id.* at 9-10.
[101] *Id.* at 10.

matched with properly sized storage capacity, there is no inherent operational ceiling on the amount of solar capacity.

C. The Modified "Earliest Practicable Coal Retirements" Portfolio

To meet the above-described state and federal carbon-neutral goals and address the urgent climate crisis, it is necessary to rapidly retire Duke Energy's coal fleet and reject the Companies' proposed natural gas buildout. In order to affordably meet these objectives, NC WARN and The Center propose that Portfolio C ("Earliest Practicable Coal Retirements") be modified so that new gas-fired generation is displaced by battery storage.

Mr. Powers's report describes in detail the proposed modifications to the Earliest Practicable Coal Retirements portfolio.[102] In general terms, three key modifications to the Earliest Practicable Coal Retirements portfolio are as follows:

1. Substitute imported power for Duke Energy's coal-fired power;[103]

2. Retrofit battery storage to existing utility-scale solar for peaking power;[104] and

3. Expand behind-the-meter solar and battery storage.[105]

Below is a table which summarizes the proposed modifications to the Earliest Practicable Coal Retirements portfolio:[106]

[102] Powers's Report, Att. 1, pp 21-31.
[103] *Id.* at 28.
[104] *Id.* at 28-29.
[105] *Id.* at 29-31.
[106] *Id.* at 27.

	Base without Carbon Policy	Base with Carbon Policy	Earliest Practicable Coal Retirements	Modified Earliest Practicable Coal Retirements: Proposed by NC WARN & The Center
PORTFOLIO	A	B	C	D
System CO_2 Reduction (2030 | 2035)[1]	56% | 53%	59% | 62%	64% | 64%	80% | 100%
Present Value Revenue Requirement (PVRR) [$B][2]	$79.8	$82.5	$84.1	< $84.1 (only Duke Energy capital costs included)
Estimated Transmission Investment Required [$B][3]	$0.9	$1.8	$1.3	$1.3
Total Solar [MW][4, 5] by 2035	8,650	12,300	8,475 new (+3,925 MW existing)	12,400 MW new utility 15,000 MW new customer, (all w/4-hr battery storage)
Incremental Onshore Wind [MW][4] by 2035	0	750	1,350	0
Incremental Offshore Wind [MW][4] by 2035	0	0	0	0
Incremental SMR Capacity [MW][4] by 2035	0	0	0	0
Incremental Storage [MW][4, 6] by 2035	1,050	2,200	2,200	7,000 MW (retrofit 4-hr battery storage, owned by existing 3rd party solar owners)
Incremental Gas [MW][4] by 2035	9,600	7,350	9,600	0
Total Contribution from Energy Efficiency and Demand Response Initiatives [MW][7] by 2035	2,050	2,050	2,050	2,050
Remaining Dual Fuel Coal Capacity [MW][4] by 2035	3,050	3,050	0	0
Coal Retirements	Most Economic	Most Economic	Earliest Practicable	Earliest Practicable[8]

[1]Combined DEC/DEP System CO_2 Reductions from 2005 baseline

[2]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

[3]Represents an estimated nominal transmission investment; cost is included in PVRR calculation

[4]All capacities are Total/Incremental nameplate capacity within the IRP planning horizon

[5]Total solar nameplate capacity includes 3,925 MW connected in DEC and DEP combined as of year-end 2020 (projected)

[6]Includes 4-hr and 6-hr grid-tied storage, storage at solar plus storage sites, and pumped storage hydro

[7]Contribution of EE/DR (including Integrated Volt-Var Control (IVVC) and Distribution System Demand Response (DSDR)) in 2035 to peak winter planning hour

[8]Most Economic retirement dates: Cliffside 6 gas-only beginning 2022, all other coal retired 2022, replaced to the extent justifiable on reliability grounds, with seasonal (winter & summer) firm imports via bilateral contracts with existing CC or advanced CT plants in neighboring balancing areas.

With these modifications, the Earliest Practicable Coal Retirements portfolio constitutes a practical and affordable means for Duke Energy to meet state and federal carbon-neutral goals. The Commission should order Duke Energy to file revised IRPs which adopt these modifications to the Earliest Practicable Coal Retirements portfolio.

V. There Are Several Factual Disputes Concerning DEC and DEP's Respective IRPs, and an Evidentiary Hearing May Be Necessary to Resolve those Factual Disputes.

The Commission has the discretion to convene an evidentiary hearing during any biennial IRP docket. Pursuant to Commission Rule R8-60(k), "[t]he Public Staff or any intervenor may identify any issue that it believes should be the subject of an evidentiary hearing. . . . A hearing to address issues raised by the Public Staff or other intervenors may be scheduled at the discretion of the Commission."

Evidentiary hearings on IRP reports used to be commonplace. For example, an evidentiary hearing was held during the 2005 IRP proceeding[107] and the 2007 IRP proceeding.[108] Upon information and belief, no evidentiary hearing in an IRP docket has been held since the 2007 proceeding.

NC WARN and The Center are waiting until reply comments are filed to ascertain the extent to which there are disputes of fact justifying an evidentiary hearing. However, at this early juncture, it appears likely that there will be disputes of fact over at least the following issues concerning Duke Energy's IRPs:

[107] Docket No. E-100, Sub 103.
[108] Docket No. E-100, Sub 114.

- The accuracy of DEC and DEP's stated operating reserves;
- Whether DEC and DEP have sufficient capacity to achieve reliability;
- The cost of battery storage versus gas-fired generation;
- The accuracy of the conclusions in the National Renewable Energy Laboratory (NREL) study concerning the impact and productivity of integrating increasing levels of solar and battery storage; and
- The reasonableness of DEC and DEP's demand growth projections.

To the extent that disputes of fact remain after reply comments are filed in this docket, NC WARN and The Center intend to file a motion for evidentiary hearing on certain specific contested factual issues.

CONCLUSION

For all of the above reasons, among others, the IRPs of DEC and DEP are defective. The Commission should reject the IRPs and require DEC and DEP to file revised IRPs which correct the issues addressed above.

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This the 1st day of March, 2021.

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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 1st day of March, 2021.

/s/ Matthew D. Quinn
Matthew D. Quinn